

Chapter 1: Overview and the Characteristics of the Great East Japan Earthquake

[Overview of the Earthquake]

On March 11, 2011, at 2:46 p.m., an earthquake with a moment magnitude of (Mw) 9.0 occurred off the Sanriku Coast (38°6'2" N, 142°51'6" E - epicenter at a depth about 24 km). In Kurihara City, Miyagi, the seismic intensity level registered at a seven on the Japanese seismic intensity scale, and an upper six was measured in 37 municipalities in Miyagi, Fukushima, Ibaraki, and Tochigi Prefectures. Seismic activity was observed in most areas of Japan, especially eastern Japan.

The hypocenter covered a wide area of approximately 200 km in width and about 500 km in length off the Pacific Coast which ran from the Tohoku to the Kanto districts, resulting in a massive ocean-trench earthquake which affected a wide area.

The earthquake's force caused the Oshika peninsula (Oshika, Ishinomaki City) to sink approximately 1.2 m vertically and moved approximately 5.3 m towards the east-southeast.

The Japan Meteorological Agency (JMA) named this earthquake, the largest recorded in Japanese history, the "2011 off the Pacific Coast of Tohoku Earthquake," and the government decided to refer to the disaster caused by the earthquake as "The Great East Japan Earthquake Disaster."

[Overview of the Tsunami]

The earthquake off the Pacific Coast of Tohoku was quite powerful even among previous trench-ocean earthquakes, causing tremors across vast areas. The earthquake triggered the greatest tsunami waves ever recorded in Japan along the Pacific Coast from Hokkaido all the way down to Okinawa.

Three minutes after the earthquake, at 2:49 p.m., the JMA announced high-level tsunami warnings for the coastal areas of Iwate, Miyagi, and Fukushima. After that, the JMA then made follow-up reports on the predicted tsunami height and the expanded the tsunami warning zone. At 3:20 a.m. on March 12, the JMA announced tsunami warnings and advisory for the entire coastal regions in Japan.

The maximum inundation height and the maximum upstream height in Miyagi Prefecture was T.P. 19.6 m in Minamisanriku Town (Shizugawa), and T.P. 34.7 m in Onagawa Town (T.P. refers to Tokyo Peil, the standard vertical datum used throughout Japan). The flooded area in Miyagi Prefecture, reached 327 km², the approximate value surveyed by the Geospatial Information Authority of Japan.

[Overview of the Damage]

The death toll from the disaster is 18,703 and the number of missing people is 2,674 across Japan. Those victims mainly lived on the Pacific Coast. This was the third worst natural disaster since the end of the Meiji era in terms of casualties coming after the 1923 Great Kanto Earthquake and the 1896 Meiji Sanriku Earthquake and Tsunami. In Miyagi Prefecture, the death toll is at 10,449 and the number of missing people at 1,299. Nationwide 126,574 buildings were completely destroyed and 272,302 were heavily destroyed, with approximately 120,000 buildings completely destroyed by the tsunami in the flooded areas. In Miyagi Prefecture, 82,889 buildings were completely damaged and 155,099 buildings were heavily damaged. The buildings damage ranged from residences to public buildings and industrial and commercial buildings. The state of damaged buildings varied widely. In addition to collapsed buildings and buildings damaged by the earthquake, there were buildings washed away, damaged, or flooded by the tsunami. Some buildings were burnt by fires which occurred after the

tsunami, while landslides collapsed or damaged other buildings. Furthermore, liquefaction of the soil caused buildings to sink, incline, and crumble.(Figures on human and building damages calculated as of September 1, 2013)

[Evacuation Situation of the Disaster Victims]

In addition to the tsunami damage in coastal areas, damages to the electricity, gas, water and sewage systems were caused by the earthquake, affecting the inland regions of the prefecture. The day after the disaster, 559 evacuation centers were opened throughout the prefecture. The number of the evacuees reached 102,058. On March 14, 320,885 people evacuated across 1,183 evacuation centers, marking the peak number of evacuees in Miyagi, and on March 15, the number of evacuation centers reached 1,323 - the largest number of evacuation centers opened in the prefecture.

In this disaster, many people became "stay-at-home evacuees" (people staying home instead of going to an evacuation shelter). A number of disaster victims evacuated outside of their residential municipalities on a volunteer-base or by arrangements made by the administrative authorities.

Chapter 2: Preparations Carried Out Prior to the Great East Japan Earthquake

[Preparations]

In the wake of the 1978 Miyagi-Okii (offshore) Earthquake, June 12 was established as "Citizens' Disaster Prevention Day" in Miyagi. Every year on June 12 and September 1 (Japan's Disaster Prevention Day), the prefecture conducts comprehensive emergency drills to prepare for large-scale disasters. In each area of Miyagi Prefecture disaster prevention organizations and local residents participate in the drills together. Earthquake resistance technology in buildings and public utility facilities had been developed since fiscal year 1978. In March, 1979, the Miyagi Regional Disaster Management Plan was re-examined and the Earthquake Disaster Counter Measure was developed. Five years from 1979 to 1983 were spent on creating seismic hazard maps and the Miyagi Earthquake Damage Estimation Research and Miyagi Tsunami Damage Estimation Research were conducted for three years from 1984 to 1986.

Following the Great Hanshin-Awaji Earthquake in 1995, Miyagi conducted the 2nd Miyagi Earthquake Damage Estimation Research from fiscal years 1995 to 1996. The results were reflected in the re-examination of the Miyagi Regional Disaster Management Plan in June, 1997. In October, 1995, Miyagi concluded a disaster prevention agreements with affiliated in the prefecture, as well as mutual support agreements in times of large-scale disasters with Hokkaido and the seven other prefectures in Tohoku (including Niigata) in order to promote building a comprehensive network to mutually support each region in the event of an earthquake and other disasters. In 1999, Miyagi announced the newly shared "Consent of Commitment towards Tsunami Vigilance in the Coastal Areas." The consent references improving the prompt and reliable delivery of tsunami warnings, and reinforcing tsunami countermeasures.

In November 2000, the Headquarters for Earthquake Research Promotion publicized the long-term evaluation of the Miyagi-Okii (offshore) Earthquake. The evaluation report showed a 99% probability that Miyagi-Okii (offshore) Earthquake could occur within the next 30 years. In February, 2002, the long-term evaluation of the Nagamachi - Rifu fault line was made public. Following these reports, the prefecture performed the 3rd Miyagi Earthquake Damage Estimation Research from FY 2002 through 2003, which incorporated the predicted tsunami flooded areas.

The Northern Miyagi Earthquake occurred in 2003, but it did not have any influence on the occurrence probability of the Miyagi-Oki (offshore) Earthquake. To prepare for the occurrence of the next Miyagi-Oki (offshore) Earthquake, it became necessary to take immediate earthquake countermeasures. The First Miyagi Earthquake Countermeasures Action Plan (FY 2003 to 2007) was developed and earthquake countermeasures project were propelled by systematizing measures concerning earthquake prevention. Furthermore, for the purpose of exchanging information and collaborating with coastal cities, the Miyagi Tsunami Countermeasures Communications Council was established. The council examined the present state and issues with tsunami countermeasures in the prefecture and in December 2003, the council formulated guidelines for tsunami countermeasures aiming at coastal cities and towns.

The Iwate-Miyagi Nairiku (inland) Earthquake occurred in 2008, causing great damage and casualties in Miyagi Prefecture. In October, of that same year, the Earthquake Countermeasure Implementation Ordinance was created and implemented in April, 2009. The 2nd Miyagi Earthquake Countermeasures Action Plan (FY 2009 to 2012), improving the earthquake countermeasures for residents as a whole including systematic measures. From FY 2010 to 2011, the 4th Miyagi Earthquake Damage Estimation Research was being implemented, but there was no choice but to suspend the research due to the Great East Japan Earthquake. The prefecture was to reflect on the results of the research in the re-examination of the five-year earthquake prevention emergency project plan (FY 2011 to 2015) based on infrastructure measures and the prefecture was to re-examine its original Miyagi Earthquake Countermeasures Action Plan.

Chapter 3: Initial Response and Activities Carried Out

(I) Initial Response and Activities Carried Out by the Prefecture

[The System and the Activities of the Prefectural Disaster Task Force]

To prepare for a Miyagi-Oki (offshore) Earthquake, which was said to occur in the near future, and based on the experiences of the Iwate-Miyagi Nairiku (inland) Earthquake, Miyagi Prefecture implemented a highly effective Miyagi regional disaster management plan, maintain each manual for use at any time, and implemented emergency drills. However, those countermeasures were not enough in this disaster. It will be necessary to enhance preparedness for disaster response without concentrating only on previous experiences.

In this disaster, the amount of work for emergency measures became enormous, such as new work the prefecture did not previously plan for, including fuel support. The original plan for disaster response was not effective, and it became difficult for the staff of the Prefectural Disaster Task Force to respond with the disaster. Therefore, the prefecture established an additional group, mobilizing staff from each department of the prefectural government. In addition to the task force, each division of the prefectural government was forced to carry out disaster response work that was not in the original plans. To carry out emergency measures more efficiently and systematically in the event of a disaster, it is necessary for the Prefectural Disaster Task Force to flexibly carry out response in an organized fashion, approximately dividing work.

There were other issues including insufficient shift rotations for staff working in the task force, lack of coordination between groups and divisions within the prefectural government office. Similar to placing importance on in practical operations, the task force staff needed to place an emphasis on the organization management of the Prefectural Disaster Task Force as a whole controlling each department in the prefectural

office and groups. Furthermore, it is important to build a cooperative system with relevant organizations such as the national government, other prefectural and city governments, designated public institutions, organizations that have concluded cooperative agreements with the prefecture and NPOs, in advance to give respond to emergency situations.

The Prefectural Disaster Task Force Regional and Local Branches (hereafter referred as “regional task force branches,”) were established to coordinate functions between the prefectural disaster task force and municipal governments in times of disaster. However, government buildings along the coastal areas, which would have been a base of operation for the regional task force branches, were severely damaged by the earthquake and tsunami. Therefore, the regional task force branches had difficulty with the initial response immediately after the disaster, and their function as the central local disaster response headquarters became very inadequate. Furthermore, the regional and local task force branches could not grasp the situation or support the municipalities nor communicate and coordinate with the prefectural disaster task force due to the disruption of essential public utilities, lack of communications equipment such as satellite cell phones, and other factors. Staffs commuting to the regional offices are not able to go to work for lack of gasoline and the suspension of public transportation systems. While assuming the regional and local branches could be affected by disasters in the future, it has become necessary to fully carry out countermeasures, including selecting alternate bases, enhancing facilities, and accumulating supplies. More support is needed in the affected municipalities seriously affected by a disaster and staff must be dispatched to those regions. Therefore, it is necessary to consider creating system that can judge and coordinate necessary staff support between regional task force branches on a larger scale and a longer term.

Since relevant organizations were set up in the prefectural office, it was possible to immediately hold meetings to share information and coordinate on rescue efforts, medical relief efforts, and the acceptance and delivery of relief supplies, which proved to be highly effective. However, the prefecture’s system for accepting and coordinating support from other prefectural governments was not sufficiently established. From the proposals made by Yamagata Prefecture, a place to coordinate support from other prefectural governments was created and Miyagi Prefecture received proactive support from many local public bodies.

[Assessing and Publicizing Situation]

Miyagi Prefecture uses a prefectural emergency wireless communications system, using both a satellite system and a terrestrial system. The prefecture improved the functions of the terrestrial system by making multiple routes of transmission and by having a duplex communications system. Measures had also been taken to prevent major problems that may occur with the collection and transmission of disaster information in the event that the prefectural emergency wireless communications system was inoperable. However, because the local municipality offices on the coast and the prefectural government local offices were damaged by the tsunami, operations and the means of communication with staff were severely restricted. Furthermore, the collection and transmission of information on the damage situation among the prefecture, municipalities, and relevant organizations were severely disrupted in a wide area for a long time due to the interruption and congestion of communication networks. Immediately after the disaster occurred, it became extremely difficult to verify the extent of the damage in the prefecture.

Through the support and cooperation from the national government, and telecommunication companies, the

prefecture received communication devices on loan. These devices were delivered, giving priority to municipalities located on the coast, which secured lines of communication between the prefecture and municipalities. In the future, in order to collect and transmit information in a reliable and swift manner and taking into consideration the possibility that the prefectural government building and staff can be severely affected by a disaster, it is necessary to carry out the maintenance an emergency power source for the maintenance of an even more multiplex communication method and communication system.

After the disaster, the regional task force branches dispatched staff to the municipalities in their jurisdiction, which made it effective in the collection of information and communication coordination between the Prefectural Disaster Task Force and municipalities in the initial period. However, time was needed to dispatch staff, because they, themselves, were affected by the disaster and as well as the government buildings. There was also the case where both dispatched staff and municipalities were unaware of their roles and could not fully function. In the future, it is necessary to layout the roles of dispatched staff, and gather information in an organized and systematic way, including the creation a system for collecting information and coordinate communication with municipalities and standardizing the items of information which must be gathered.

[Life-Saving and Rescue Operations]

Under the policy of the disaster task force leader's (the prefectural governor) - "to make every possible effort to save a life," - Miyagi Prefecture cooperated and coordinated on operation with the prefectural police headquarters, fire and rescue squad, the JSDF, and the 2nd Regional Japan Coast Guard Headquarters all whom set up an area inside the task force headquarters. While mutually coordinating with relevant organizations, rescue operations across the coast were progressing independently and proactively on site.

In the initial stage, the task force became busy responding to rescue and information requests from prefectural citizens due to not being able to contact police or fire stations. The classified contact information of the task force leaked out to the public, which made the situation worse and resulted in the task force receiving numerous text and twitter messages. An enormous amount of unreliable and overlapping information and rumors flooded in. It became a huge burden for the task force to confirm and organize all the inquiries and information. It is necessary to carefully handle and disclose contact information in order to avoid interfering with proper operations. It is also necessary to establish a policy regarding which information should be given priority and processed first and how to promptly release specific outcomes - rescue response efforts.

Because large areas in coastal regions were flooded by the tsunami and roads were disrupted, there were a lot of requests for rescue operations by helicopter. As a result, the task force's helicopter coordination group received more requests than it could handle. Various requests of different urgency and authenticity were sent, and counting and sorting out rescue requests were completed ineffectively.

There were not many cases of helicopters being used in a timely and accurate manner. In the future, it will be necessary to receive the support from personnel who have the knowledge in fire rescue and to improve ways of organizing and responding to requests.

The police, fire and rescue squad, the JSDF, and the 2nd Regional Japan Coast Guard Headquarters set up inside the headquarters of the task force formed the search and rescue liaison committee and held meetings every day. Through this committee, a system to share information among each relevant organization was established, and facilitated response in a smooth fashion. Also, the cooperative ties with relevant organizations

that were cultivated through the jointly conducted emergency drills led to smooth cooperation among the organizations. It is important to constantly strengthen ties with relevant organizations at all times, and create an environment for conducting quick and precise life-saving and rescue activities in the event of a disaster. In addition, as the disaster task force must also consider training and creating a system to smoothly implement coordinating of all rescue activities.

[Medical Relief]

Based on previous disaster experiences, Miyagi Prefecture has established a disaster medical coordinator scheme to provide necessary medical care quickly and precisely when there are a large number of victims. Immediately after the disaster, the disaster medical coordinators were stationed at the disaster task force and other locations, playing an effective role in understanding the needs for medical support in affected areas, transferring patients over a large area, and managing incoming support from the outside. During this disaster, there were cases that disaster medical coordinators were commissioned the position on very short notice, having to respond to the situation in disaster-affected areas. In the future, the prefecture needs to consider creating a deployment system of the disaster medical coordinators, so that they can cover all areas in the prefecture.

Soon after the disaster, medical support was mainly carried out by Disaster Medical Assistance Team (DMAT). It was projected that DMAT would carry out medical activities for approximately 48 hours after a disaster; however, during this disaster, DMAT was active for more than 48 hours. Initially, since information could not be collected from medical institutions, and there were no great medical needs in the acute stage due to the tsunami damage, DMAT was forced to be on standby at designated locations. There were cases when DMAT could not effectively display their requested activities during the estimated active period. It is necessary to improve the environment where means of communicating information between the prefecture and medical institutions can be secured when a disaster strikes. Also, in the event of a large-scale disaster, it is necessary to consider a system that will allow medical relief groups to take over for DMAT while maintaining the same prompt response carried out by DMAT. Additionally, it is necessary to prepare a reception system for teams dispatched over a long period.

In this disaster, there was a low demand for medical supplies which were assumed to be necessary for emergency treatment and there was a high demand for medication for chronic diseases which were not stored for emergency. Early on the prefecture requested medical supplies that were limited on hand and medical supplies delivered specifically for tsunami, but due to the Fukushima Daiichi Nuclear Power Plant Accident, medical supplies were not delivered on time to the affected areas due to the nuclear accident.

During a large-scale disaster, air transportation is an effective means to deliver medical supplies, however, transport by helicopter could be difficult depending on the weather. Therefore, the prefecture needs to consider alternative means of transportation and secure a certain amount of supplies. Furthermore, necessary medical supplies are different depending on the disaster situations. Therefore, it is necessary to keep a stock of emergency disaster medical supplies without adhering to the medical supplies needed for only emergencies.

[Securing Emergency Transportation Routes]

Due to the earthquake, pavements cracked and caved in, and paved embankments were destroyed all throughout Miyagi. Bridge collapsing prevention devices were damaged and bridges at rear side of an abutment became uneven. The roads in the coastal areas were severely damaged, and many roads were blocked and closed

to traffic due to the debris piled up from the tsunami. All of the main quays of the ports in Miyagi were unusable.

In such conditions, securing in the early stages a rescue route, fuel transport route, transport routes for delivering large amounts of relief supplies and other logistics route to the coastal areas were one of the most important issues faced by the prefecture. From a broad point of view, restoration work on roads and ports was ranked based on priority. The prefecture made maximum use of limited manpower and materials to effectively proceed with restoration projects by simultaneously prioritizing the work within each restoration project. In the future, it will be necessary to reinforce the coastal roadway network starting with the Sanriku Express way (also known as “the Road of Life”), which was not affected by the tsunami, as well as reinforcing the East-West regional cooperation axis. Furthermore, it is essential to functionally enhance the port facilities that are pivotal points for distributing supplies and delivering fuel.

In order to drive on the express ways for free, which at the time were designated as “emergency transportation routes,” drivers were required to have both the “emergency vehicle authorization certificate” issued by the police and the “disaster relief dispatch vehicle certificate.” However, there were no manuals that outlined when the prefecture should start issuing the certificates, so the prefecture fumbled its way through the process. In this disaster, in addition to vehicles for essential disaster relief, flood prevention, and fire rescue vehicles, vehicles used to transport supplies and fuel were also designated as emergency vehicles as it became an issue of securing distribution for supplies. Also, to speed up disaster response, the prefecture set a validated period and allowed for the certificates to be used multiple times. Based on this issue, Miyagi Prefecture must develop a manual and system that will specifically designate which vehicles should be allowed through some period after the disaster in order to swiftly respond to the supporting side and the receiving side.

(2) Initial Response and Activities by Municipalities

[The Establishment and Management of the Disaster Task Force]

(Securing the Functions of the Municipal Disaster Task Force)

In 11 of the 15 municipalities in the coastal areas, the municipal government buildings, which would have served as the hub for municipal disaster task force, were damaged by the disaster. Of the 11 municipalities, 8 were forced to move their offices to a different location. The lack of sufficient equipment at the new location seriously hindered the capabilities of task forces. There was staff directly affected by the disaster. As a result, the ability of the task force to respond to disasters in the initial stage was decreased drastically both in a personnel and material aspect. In the future, municipal disaster task force must be established and located in areas that are outside of predicted tsunami and flood zones as well as in building that are earthquake and wave impact resistant. Also, it is necessary to secure fuel as well as emergency power sources to get a sufficient amount of electricity. Food and drinkable water must also be stored for local citizens that may evacuate to the municipal government buildings or task force headquarters. Local municipalities must ensure that alternative headquarter locations have emergency means of communication and fuel at the same level as the primary municipal government buildings. Disaster prevention centers in the municipalities must greatly improve their functions.

(Improvements of the Municipal Disaster Task Force)

In the event of a disaster, it is necessary to quickly confirm the safety of the staff in order to promptly establish the disaster response system. Since this disaster occurred during a weekday in the afternoon, it was not a major

difficulty to secure the necessary staff. However, if the earthquake had occurred at night or a day off when the government offices are closed, it would have taken a considerable amount of time to get the system established. On the other hand, a lot of work not originally laid out in the manual came about, including the response to evacuees who had taken shelter in government buildings, issuing “victim certificates” that allow drivers to use expressways for free, making it difficult and chaotic in assigning roles in the municipalities and concentrating a lot of work onto the disaster prevention-related offices. When it became difficult to respond according to the manual, some municipalities carried out activities promptly under the direction of the mayors or by assigning work to the departments that have less work in normal times.

Municipalities in Miyagi Prefecture have been conducting Disaster Task Force drills even prior to this disaster. Since the drills were practical, some municipalities were able to make use of what they learned in the drills when the Disaster Task Force operations began. On the other hand, there were some municipalities which could not function effectively because the drills were theoretical and the importance of the drill was put on the establishment of headquarters for the Disaster Task Force.

In normal times, municipalities need to establish a way to gather staff, especially mayors, executive officers, and disaster prevention staff in the event a disaster should occur on a holiday or at night. Also, municipalities need to develop a manual that outlines an expansive and flexible responding structure in the event of a disaster, as well as outlining necessary work that needs to be carried out and the issue of transferring authority and alternative representatives. It is necessary to also disclose and spread these contents to the staff. In recent years, cities and towns have been merging, and due to the area expansion of cities and towns, local branch headquarters for the Disaster Task Force have been established in areas where the former cities and towns were once located. In these cities and towns, it became difficult for the local branches to contact the municipal Disaster Task Force due to the communication means being suspended. These local branches had to adapt to the situation and corresponded independently, as a result, and there were cases of them avoiding confusion and making prompt responses. In the future, the prefecture should consider a system that enables local branches to correspond without hesitation when the municipal Disaster Task Force cannot give out instructions or orders.

(Disaster Records)

Some municipalities were able to smoothly facilitate the operations of the municipal Disaster Task Force because of their experiences in responding to disasters such as the 1994 heavy rain flooding, the Miyagi Northern Earthquake, and the 2008 Iwate-Miyagi Nairiku (inland) Earthquake and other disasters. This shows the importance of preserving and studying the records of the operations carried out by municipal disaster task forces, and will benefit future disaster prevention.

[Information Gathering and Transmission]

(Diversifying Means of Communications)

Landlines and cellular phones could not be used due to congestion with all municipalities after the disaster. A majority of the disaster priority telecommunication lines in the municipalities were severed. In contrast, the prefectural and municipal emergency wireless communications system and satellite-based mobile phones were operable in most of the municipalities, except in municipalities where their government buildings were damaged or offices were relocated. Telecommunication carriers lent satellite-based mobile phones to municipalities, an

important form of support to the municipalities limited in communication, as it led to securing and reinforcing means of communication in the area. It takes a long time to restore the damage caused to the communication infrastructure from disasters like tsunamis. Therefore, it will be necessary to consider the features of each communication tool and prepare multiple reliable means of communication.

Due to power outages the power source for the municipal emergency wireless communications system was switched to emergency backup batteries, however, batteries were drained due to prolonged power outages. The prefecture needs to consider making improvements with emergency power supplies in the event of a disaster that causes long-term power outages and damage to related facilities, as well as enhancing the earthquake resistance of relevant facilities.

(Improving System for information gathering)

In the initial stage, situations arose where Miyagi Prefecture could not promptly confirm or gather damage information due to the suspension of communication and conflicts surrounding relocation, thus causing problems with collecting the damage status of public institutions within municipal jurisdiction and gathering information from local prefectural office branches. There were cases where the safety of the staff was threatened because they were conducting patrols during tsunami warning (massive tsunami) announcements. On the other hand, although it was difficult for municipalities located in the inland region to pursue various disaster response operations and conduct damage assessment in their own jurisdiction by their staff, there were also cases of damage assessments proceeding smoothly through active cooperation with local organizations such as the fire brigade and neighborhood associations. As the scale of a disaster becomes larger, it becomes more important to accurately and promptly gather information. While taking safety into consideration, there will be a pressing need to ensure a close coordination with local communities and relevant organizations to organize a proactive information gathering system.

[Evacuation Order and Guidance]

(Improving Communication Systems)

After the disaster, most of the municipalities in the coastal area made the decision to announce evacuation orders and instructions early on. However, unable to assess the scale of the oncoming tsunami, some of the municipalities could not sufficiently give out evacuation instruction to the residents and some had only transmitted information through the emergency wireless communications system rather than using loudspeakers setup on public vehicles due to the danger of the tsunami, and traffic. It was difficult to give out evacuation instruction to all residents like the municipalities had planned out before. The prefecture needs to consider and develop a diverse means of communication for future situations.

(Evacuation Activity)

Immediately after the disaster occurred, there were people who avoided danger because they evacuated voluntarily for fear of the tsunami, people who evacuated after receiving evacuation orders which came after the massive tsunami warning was issued, and people who evacuated to designated evacuation centers or to higher ground based on their past experiences with disaster and daily disaster drills. On the other hand, there were people who did not evacuate as they judged that the tsunami would not come even though they received evacuation orders, and there were also people who returned home even after initially evacuating, losing their

lives by the tsunami.

Those who made the underlying decision that the tsunami would not come, may have done so because of past experiences; when evacuation orders were issued, but a tsunami did not come or only a tsunami of a few centimeters in height had reached the coast. Tsunami hazard maps are one way of showing the possible incoming tsunami flooding zone. Therefore, residents living outside of the referred tsunami zone might have perceived their areas as being safe from the dangers of the tsunami. As a result they may have not evacuated early enough. Even if people are given the same information, they act differently depending on their crisis awareness and knowledge. In the future, it will be important to review the people's common tsunami evacuation actions and decisions correspond to their own situation, and conduct evacuation drill that will have the people take the best possible action. At the same time, it will be necessary to examine an appropriate method for transmitting information based on actions of the institutions transmitting the information and the residents.

It is important to educate the residents to evacuate under the assumption that a tsunami will come when they feel an earthquake. They should not believe a tsunami would not come and should not be influenced by past tsunami experiences. It is also important for every resident to take the initiative when a disaster occurs.

In this disaster, securing the safety of residents became an issue because some of the evacuation centers were damaged by the tsunami. There were also cases when residents did not evacuate to their properly designed evacuation centers located inland, which they had done in the evacuation drills, but rather conveniently evacuated to the evacuation centers in their neighborhoods, thus the residents could not evacuate quickly and smoothly. There were other examples of residents who could not evacuate properly because they had evacuated by car and roads were congested.

(Improving the Evacuation Guidance Systems)

When giving out evacuation guidance, municipalities is supposed to take action based on disaster drills, advance plans, and the "initial action" manual. In this disaster, however, there were reports that carrying out actions based on these advance plans brought danger to those involved, as there were cases of fire fighters and others giving out evacuation guidance were endangered or even lost their lives due to the tsunami. In future, it is necessary to improve "action" manuals so that the scale of the disaster prevention activities can be prevented. At the same time, it is also necessary to secure reliable means of transmitting information to ensure the safety of announcers and advisors carrying out evacuation guidance.

[Establishing Evacuation Centers]

In this earthquake disaster, many facilities which were not designated evacuation centers became evacuation centers. According to a survey conducted in the municipalities, as of March 12, 2011, 41.8% of the established evacuation shelters were not designated evacuation centers and it stayed at almost the same percentage for the next two weeks. The facilities that became unofficial evacuation centers varied from hospitals, private buildings, assembly halls, hotels, Shinto shrines, Buddhist temples, pre-schools, private residences, and parking lots of pachinko parlors. This situation came about because designated evacuation centers were inoperable due to damage incurred by the earthquake and tsunami. Furthermore, there were more evacuees than expected and they were admitted by unofficial evacuation centers. In municipalities on the coast, the places where residents escaped to get away from the dangers of the tsunami (hotels, Shinto shrines, stores, and private residents)

automatically became evacuation centers. In municipalities in the inland region, due to the disruption of public utilities (e.g. electricity), residents saw the designated evacuation centers as inconvenient and unsafe, and gathered at community centers and assembly halls, which also automatically became evacuation centers. In addition, evacuees naturally gathered at nearby assembly halls because their designated evacuation centers were too far away, while other communities independently decided evacuation points in their region, and those places became evacuation centers.

Generally, municipalities decide where to establish evacuation centers and decide on the general rules for receiving evacuees. However in this disaster, there were many instances where school staff, facility managers, local residents, and independent disaster prevention groups established evacuation centers independently. There were also situations where municipalities had difficulties assessing these independently established evacuation centers. Depending on a disaster and its scale, it is necessary to assume the possibility of unofficial evacuation centers being established without approval from the municipal staff. Rules for these situations need to be considered. Furthermore, municipalities need to coordinate with facility managers and related members of disaster prevention groups in other regions, and to conduct trainings for emergency preparations, and to prepare them to promptly open evacuation centers and to make sure municipalities are aware of their situations.

[Response to Stranded Persons Unable to Return Home]

In this earthquake disaster, there were many persons not only in central cities and tourist sites, but also in major transportation points. In addition to the support by the government, individuals and companies offered support to those people. Some were taken to the evacuation centers where local residents had gathered. However, it led to problems such as shortages of supplies (including water and food), and overcrowded evacuation centers. The prefecture and municipalities need to consider initiatives to accept stranded people and increase public awareness of this possible situation. It will be important to consider information transmission systems so that actions and decisions can be made in a calm manner when a disaster occurs. Furthermore, it is advantageous for the government and relevant industries and groups to work together to implement countermeasures for stranded persons unable to return home.

[Emergency Supplies]

For the first few days after the disaster, there were a far greater number of evacuees which exceeded the available reserved supplies. This became a major issue faced by municipalities especially those on the coast, and a shortage of food and daily commodities. Although municipalities had signed disaster prevention agreements to receive supplies in times of disasters, supplies could not be transported due to road damages and the breakdown of communication with other local governments. Also, many municipalities did not have enough baby formula and diapers in stock and obtaining them were difficult. In the future, it will be necessary to reconsider the amount of supplies to stock, while taking into consideration the demographics and geographical features of the municipalities. It will also be important to stock supplies that could be used by all victims including people requiring assistance during a disaster. Depending on the scale and conditions of a disaster, it is necessary for residents themselves to always prepare at least the minimum reserve of everyday supplies, as it may be possible that relief supplies cannot be handed out to everyone.

(3) Police Initial Response and Activities

[Miyagi Prefecture Police Headquarters and Police Stations]

In addition to the police headquarters, there are 24 police stations and 224 police boxes and substations throughout Miyagi. In this disaster, considerable damage was caused to police facilities and vehicles. The police headquarters and all 24 police stations were damaged. Eleven police officers lost their lives and two remain missing as of March 11, 2012.

The prefectural police declared a state of emergency the moment the earthquake occurred and established the Miyagi Prefecture Police Disaster Security Task Force, which was headed by the chief of police. All police stations established their own disaster security branch task force, and together with the overall task force, this disaster defense system composed of 3,900 police officers. The police carried out evacuation guidance, rescue and relief efforts, searched for the missing, conducted autopsies, confirmed identification, and responded to missing people reports.

Miyagi police were able to establish this system promptly in a time of disaster because they conducted training on a regular basis. However, their activities were hindered by the damage caused to police facilities and the disruption of public utilities within their jurisdiction. In coastal areas, police stations were damaged by the tsunami and the disaster security branch task forces that were set up in those stations had to move to a new location, hindering their operations. In normal times, it is important to cooperate with relevant organizations and create agreements with those organizations so that police can easily select alternative locations or borrow space in schools and public halls in the event the police stations become damaged due to a disaster.

Helicopters were the only means to carry out relief and rescue operations in areas where ground transportation was impossible due to flooding and debris buildup. Police rescue operations were carried out by three helicopters from the Miyagi police, metropolitan police, and the Aichi Prefectural police. Through these operations 262 people were rescued and supplies were transported over an eleven-day period immediately following the occurrence of the disaster. The police with jurisdiction over coastal areas gave evacuation guidance and performed rescue operations with limited equipment. Despite the flooding and scattered debris, they were able to save many disaster victims. Two months after the disaster, approximately 6,000 people were reported missing. Every day, approximately 800 police searched for the missing. As they were overcome with their work, the missing persons department was set up inside the police's Disaster Security Task Force on May 16. The missing persons department organized and managed the search units making search operations efficient and quick. They were also involved in assessing search operations.

In this disaster, the evacuation order made by municipalities on their disaster prevention wireless radio communications systems did not fully reach residents, and there were many residents who evacuated only after hearing the police's public announcements. Based on such instances, it will be necessary to conduct a practical disaster drill jointly with local governments and local residents centered around the police stations in coastal areas. Also, identification checks became difficult because there were very few personal items found with the bodies. In the future, it will be necessary to introduce new identification methods such as paternal DNA tests and manage an identification check support unit. Also it will be necessary to establish initiatives to make composite drawings available to the public.

[Interprefectural Emergency Rescue Unit]

Based on the experience with disaster security in the 1995 Great Hanshin-Awaji Earthquake, Interprefectural Emergency Rescue Units (IERU) have been set up in every police unit in all prefectures throughout the country, operating as expert teams on disaster management. They are able to respond to needs beyond the boundaries of prefectural and municipal governments. Miyagi Prefecture made a request to the National Police Agency (NPA) to dispatch the IERU at 3:04 p.m. on March 11, 2011. The NPA dispatched around 910,000 IERU police officers (as of March 11, 2012) from across the nation to police headquarters in Miyagi, Iwate, and Fukushima. Total of 4,800 police officers and 1,000 cars were dispatched per day.

In the early morning of March 12, the metropolitan IERU was one of the first units to arrive and following the metropolitan IERU, units from across the nation arrived in the prefecture one after the other. They were involved in activities such as search and rescue, traffic control, autopsies, identity confirmation, and logistical support. In addition, general units were also dispatched to meet the needs in disaster-affected areas, but most of the general units did not have the skills to support themselves in such situations. It is necessary to review the operations of all units and create a system that prepares them for long-term dispatch and diversified response activities.

(4) Initial Response and Activity by Fire Departments and Units

[Operation Systems]

There are 12 fire departments in Miyagi Prefecture. Five of those departments were established directly by cities and the remaining seven were established as partial-affairs associations. They carry out activities in disaster prevention and control throughout Miyagi. In this disaster, 19 firefighters and 108 fire brigade members lost their lives or remain missing (number of firefighters: as of September 11, 2012; number of fire brigade members: as of April 1, 2014). 28 fire department buildings, 48 substation and sub-branch buildings were damaged (as of September 11, 2012), and 229 fire brigade facilities were damaged (as of March 31, 2014). On the day of the disaster, 2,665 firefighters and 11,728 fire brigade members in Miyagi went into action.

Immediately after the earthquake, each fire department in Miyagi automatically came together based on the fire defense regulations, and quickly set up their fire defense task force. Early on, the task force gathered information and confirmed the conditions of their buildings, and as a result of these efforts, an initial response system was established and countermeasures for large-scale disaster were implemented. As there were cases of firefighters who had become victims to the disaster while traveling to the task force headquarters, it will be necessary to consider different methods to ensure the safety of firefighters traveling to the task force headquarters from areas that could be struck by a tsunami.

In order to conduct initial response activities efficiently in times of large-scale disasters, it is essential to determine a comprehensive course of action and operation and key issues through the prompt establishment of the task force headquarters and prompt orders made by commanding leaders. To be able to carry out these actions smoothly, fire departments and units must make efforts to have earthquake countermeasures for their buildings and transmission equipment, secure emergency power supplies, and fuel, and carry out efforts to sustain the functions of the task force. It is especially essential for fire departments and fire stations located in the coastal areas to select land while taking into consideration the potential tsunami flood areas and to strengthen earthquake and tsunami resistance of their facilities.

In this disaster, means of communication was limited significantly because phone service was suspended and radio networks were congested. It is necessary to consider securing satellite-based mobile phone, which is more likely to be used in the event of a large-scale disaster, and means of communication such as priority disaster phones. Also, it is necessary to install temporary antennas in case of damage to transmission facilities. It is important to consider utilizing mobile terminals, reinforcing earthquake resistance in communication facilities, securing an emergency power source for radios, extra power and batteries, and wireless digital radios.

[Rescue and Relief Operations]

One of the characteristics of rescue operations in this disaster is that workers had to also deal with flood damage caused by the tsunami. In flooded areas, it was impossible to travel by car at the initial stage, and in many cases workers went to these sites on foot or by boat. There were also many cases of disaster victims rescued in tsunami flooded areas, as they were buried under debris and submerged in water.

For prompt rescue operations, equipment and heavy machinery utilization methods in tsunami flooded areas should be developed; however, when vehicles and equipment were damaged by the tsunami, rescue workers had no other choice but to depend on their own strength to save lives. For fire stations located in coastal areas, it will be necessary to consider storing equipment in a safe place and securing equipment for rescue operations. Also, it would be advantageous for Miyagi to create a system that could respond to equipment and heavy machinery shortages, such as concluding disaster agreements with general contractors who could provide equipment in times of emergency.

The shortage of life jackets, rescue boats, rubber boots and other equipment necessary for activities carried out in tsunami flooded areas became an issue. Due to the extensive scale of the disaster areas, joint operations with the police, the JSDF and other agencies did not effectively function at first. Additionally, the firefighters overlapped with the police and the JSDF in their search areas, an example of ineffective operations. However, on the following night after the disaster, the agencies held a meeting at the municipal disaster task force headquarters regarding search efforts. They arranged search areas and times, and thereafter the agencies were able to effectively progress with search activities.

In this disaster, cooperation between medical institutions and DMAT in the transportation of patients from isolated hospitals was a very significant task to undertake. This matter suggested the necessity of cooperating with medical institutions even in normal times. It is advisable to create a medical group in the prefectural disaster task force, which includes doctors who have are aware of the local medical resources and to have the group make contacts and carry out coordination. For smooth rescue operations in disaster sites, it is necessary for the fire department and medical institutions to coordinate at the local disaster task force headquarters on triage implementation methods, on which medical institutions patients are being sent to, and have doctors who give guidance and directions. Also, it is necessary to settle on a policy in the early stages and inform the public. In addition, it is important to build a communication system between fire headquarters and medical institutions and share information by placing fire radios at medical institutions and dispatching staff to bring those radios. It is also necessary to hold talks between fire departments and medical institutions during times of calm.

[Firefighting]

According to the survey taken by the fire headquarters in Miyagi, 134 fires broke out due to the disaster.

Eighty seven out of those fires (64.9%) occurred within three days after the occurrence of the disaster. One hundred twenty one fires broke out in the coastal areas, which accounted for about 90% of all the fires. There were many fires that had spread across a large area, or the total area of fires in city centers was large, making this a common trait in the fires that had broken out in the prefecture. The many fires caused by the tsunami were also quite noticeable. In Miyagi Prefecture, large-scale fires occurred at the Port of Sendai-Shiogama industrial complexes (Sendai City, Tagajo City, and Shichigahama Town) and in the center of Kesennuma City. Firefighting operations were carried out over a long period of time.

For fire operations in tsunami flooded areas, there were no water sources for firefighting operations and fire trucks couldn't proceed to the fire because of flooding. In cases like these, firefighting operations were conducted based on the situations of each site. Fire operations included the use of available fire extinguishers on-site, the use of hose packs when going across mountains of debris or the use of small fire trucks with pumps when firefighters had to drive on narrow road caused by obstacles, such as debris. When fires broke out from the debris and it was not possible to extinguish them by water, heavy machinery was used to divide debris into multiple blocks and put out the fires using that method.

During firefighting operations, fire hydrants, firewater tanks and natural water reserves are used. However in this disaster there were many cases where securing water supply became difficult due to damaged fire hydrants near the site and other obstacles. In the event of a large-scale disaster, it is necessary to take into consideration the possibility of having limited water supply and to prepare water tanks, make use of natural water supplies and develop a long-distance water delivery system.

[Support System]

On March 11 at 3:40 p.m., the commissioner of the Fire and Disaster Management Agency ordered for the mobilization of the emergency fire response teams. This was the first time to mobilize such teams since the 2003 revised Fire Service Organization Act. Emergency fire response teams were dispatched to Miyagi Prefecture from 33 different prefectures across Japan. Of the units, ground units were dispatched from 25 prefectures and air units were dispatched from 28 prefectures. The emergency fire response teams worked at nine fire departments in Miyagi Prefecture.

At peak time, emergency fire response teams were dispatched from a maximum of 23 prefectures at one time and they were involved in various activities. However, due to the suspension of landlines and cell phones, the congestion of fire radios and damaged radio towers, it was difficult to secure means of communication, especially when it was important to gather accurate information during initial response. As a result, it was impossible to quickly offer information to the emergency fire response teams. It will be necessary to consider equipping satellite communication devices for communication between the command support units from appointed fire departments and the representative fire departments from each prefecture in Japan.

In regards to receiving support from such teams, an activity base (camp site) was relatively selected smoothly. Operation management by the emergency fire response teams could be done effectively because the command support unit was a part of the command center of the fire departments receiving the support. This successful case should be evaluated. On the other hand, there were instances where fire departments struggled to respond to the support coming in because the support was coming from large-scale prefectural units rather than the emergency medical service units that were needed the most. It will be necessary to understand what support is

necessary in accordance with the damage situations and coordinate to dispatch the appropriate unit size, rather than dispatching prefectural units.

[Measures for Managing the Safety of Firefighters]

There are always risks associated with search operations in tsunami flooded areas, especially with surrounding debris. When the disaster occurred, there were no protective long boots to prevent injury against nails, and there were cases of search personnel getting injured. It would be desirable to prepare protective long boots, dry suits, boats and other equipment necessary for such activities in tsunami flooded areas in advance. Also, it is necessary to consider a way to secure equipment in the event of another disaster by cooperating with neighboring prefectures and taking advantage of the emergency fire response team volunteer system.

In the initial response stage, there was not enough manpower to deploy team members. Despite having their own homes damaged and being uncertain about the safety of their families, some team members were on an unavoidable demanding work rotation. Furthermore, due to the stress caused by prolonged activities and disturbing experiences on site, some team members became sensitive to trivial matters, which was not the case prior to the disaster. There were various ways fire departments that responded to these members. However, the response to stress treatment measures was different among each of the fire departments and some fire departments offered counseling through university experts. In the future, the framework for stress treatment measures in a large-scale disaster should be considered primarily by the national government and the prefecture, and it will be necessary to clearly define the minimal tasks that must be carried out for stress treatment by not only the fire departments, but also by each relevant organization.

[Logistics Support]

Logistics support is an important element to support all activities and it covers a wide range of operations such as securing camp sites and food, refueling, procurement, etc. Some emergency fire response team members struggled to adjust to weather and temperature fluctuations including the cold. They had difficulty preparing equipment including winter tires to use for activities carried out in the snow, and dealing with the cold temperatures when camping.

Sometimes unit members had no choice, but to camp in during the initial response stage. However, when climate conditions were tough or when operation periods were long, unit members may have not been able to get enough rest. Therefore, it is necessary to incorporate the use of accommodation facilities into the plans when considering the burden of the fire departments receiving the support.

In this disaster, there was an instance when a large unit had its operation base adjacent to municipal offices in order to support disaster-stricken areas. Based on the prior disaster plan and past training, the idea arose to establish the operation base for support units within the affected municipalities. However, there were cases of campsites provided in appropriate facilities, but without essential utilities from neighboring municipalities. In the future, it will be necessary to take into consideration the size of a unit and its logistics and coordinate the operation bases. In cases when sufficient number of operation bases cannot be secured, it will be also necessary to cooperate with neighboring municipalities and offer camp sites for emergency fire response teams.

(5) Initial Response and Operations by the Japan Self-Defense Forces

[Operations Systems]

In Miyagi Prefecture, there are five bases of the Japan Ground Self-Defense Forces: Sendai (Miyagino Ward, Sendai City), Kasuminome (Wakabayashi Ward, Sendai City), Funaoka (Shibata Town), Tagajo (Tagajo City), Taiwa (Taiwa Town). The 22nd Infantry Regiment stationed at the Tagajo base is in charge of disaster relief operations and disaster dispatch for Natori City, Iwanuma City, and municipalities located north of Sendai City. The 2nd Engineer Brigade stationed in the Funaoka garrison is in charge of disaster relief operations for municipalities located in southern Miyagi. The base of the Japan Maritime Self-Defense Force is not located in the prefecture. However, the Japan Air Self-Defense Force's 4th Air Wing Matsushima Air Base is located in Higashi-Matsushima City. Within the 4th Air Wing is the 11th Squadron (commonly known as the "Blue Impulse"), which holds flight exhibitions.

Before the disaster, an exclusive phone line (hot line) was installed between the Japan Ground Self-Defense Force Northeastern Army Commandant and the prefectural governor, so that requests could be promptly made to dispatch the Japan Ground Self-Defense Forces for disaster relief. The Japan Ground Self-Defense Forces strengthened mutual cooperation with the prefecture by participating in the prefecture's map exercise and hands-on training, stemming from the lessons of past disasters. Also, they reviewed the agreements regarding disaster relief operations in order to improve initial response in the event of a large-scale disaster.

The Ministry of Defense and the Japan Self-Defense Forces established the Ministry of Defense Disaster Management Headquarters on March 11 at 2:50 p.m. and held the first Ministry of Defense Disaster Management Task Force meeting at 3:30 p.m. In addition, they gathered information from the air. Based on the dispatch requests from the governors of the disaster-affected prefectures, the Minister of Defense gave orders at 6:00 p.m. to conduct large-scale disaster relief operations and at 7:30 p.m. to conduct nuclear disaster relief operations to the units of the Japan Self-Defense Forces. On these orders, the Japan Self-Defense Forces mobilized about 8,400 troops from the day the disaster occurred and put as many troops and equipment despite damage incurred to the bases. Based on the lessons from the past, the highly self-sufficient Japan Self-Defense Force engaged in large-scale and prompt initial responses to save the lives of disaster victims. In Miyagi Prefecture, their operations were terminated on August 1, approximately four and a half months after the occurrence of the disaster.

In this disaster, the Disaster Response Joint Task Force (JTF) was formed for the first time, carrying out joint operations with the ground, air, and maritime branches of the Japan Self-Defense Force. Through the JTF and by getting 100,000 troops ready, the Japan Self-Defense Force smoothly handled the large-scale disaster response operations which included nuclear disaster management operations as well as their regular duties. They prepared a maximum of 107,000 troops (including Ready Reserve Self-Defense Officials and Reserve Self-Defense Officials), 540 aircrafts and 59 vessels. On the other hand, while studying the influence of other duties such as defense, security, and international operations, it is necessary to consider the management of units when dealing with various matters under the assumption that they have to deal with multiple things at the same time over a long period of time.

Due to the large-scale damage, it was not easy to grasp damage conditions in this disaster. There were instances when the information shared and cooperation among the Japan Self-Defense Force, Miyagi Prefecture,

and relevant organizations of municipalities were not enough. However, disaster relief operations, such as rescue, search for missing people, and various livelihood support, which lowering administrative functions of the disaster-hit municipalities was taken into consideration, generally showed successful results. In addition to considering the essential links between local governments, government ministries, and relevant organizations, it is necessary to conduct proactive and continuous training in order to develop more highly effective support operations in the event of a large-scale disaster.

The United States Armed Forces named their humanitarian aid and disaster rescue operations "Operation Tomodachi" and deployed 16,000 troops, approximately 15 vessels 140 aircrafts. Mainly in disaster-affected areas, they engaged in large-scale support operations including search and rescue, transportation of supplies, restoration of Sendai Airport, cleaning schools, removal of debris, and joint U.S.-Japan efforts in concentrated search for the missing. On March 16, the U.S.-Japan Coordination Station was established at the Ministry of Defense and U.S. Forces Japan Headquarters in order to manage U.S. Forces and the Japan Self-Defense Force and to make a close and prompt coordination between the Ministry of Defense, the Japan Self-Defense Forces and the US Armed Forces. In addition, comprehensive coordination could be carried out because the U.S.-Japan Coordination Station was also established within the Northeastern Army headquarters (Joint Task Force headquarters). The mutual cooperation between the Japan Self-Defense Force and the U.S. Armed Forces led to prompt and effective support operations.

(6) Initial Response and Activities of the 2nd Regional Japan Coast Guard Headquarters

[Operation Systems]

The 2nd Regional Japan Coast Guard Headquarters exercises jurisdiction over the coast and offshore areas of the six prefectures in northeast of Japan. In Miyagi Prefecture, the 2nd Regional Japan Coast Guard Headquarters and Miyagi Coast Guard Office are located in Shiogama City, the marine safety stations are in Ishinomaki City and Kesenuma City, and Sendai Air Station is located at Sendai Airport.

Since the offices of Coast Guard were located in the main harbors of the disaster-hit areas, their facilities, vessels, and aircrafts were seriously damaged in this disaster. Executing operations at some of the marine safety stations and the Sendai Air Station became difficult. Immediately after the disaster, the Coast Guard dispatched patrol boats, aircrafts, and special rescue team from across the nation to the areas within the jurisdiction of the 2nd Regional Japan Coast Guard Headquarters and they engaged in rescue activities, searched for missing people, support operations for disaster victims. Their mobilization force in their jurisdiction was up to 54 patrol boats and 19 aircrafts per day at their peak. A total of 13,434 patrol boats, 4,108 aircrafts, and 2,492 special rescue team workers were mobilized by March 11, 2012.

In their search and rescue operations, airlift rescue by helicopter accounted for 80% of the total operations. Deployment of aviation forces played an important role. In the coastal areas where many went missing due to the tsunami, divers were actively engaged in search operations in dangerous ocean conditions due to floating debris. One hundred fifty six beacons were damaged mainly around ports in the Pacific coast of Tohoku regions. Lots of debris and vessels were washed out to the ocean. There were cases that on-site conditions and the description of the charts became contradictory because lighthouses, used as a marker for navigating ships, collapsed or became slanted. The coast guard offered safety information through radio broadcasted ship warnings and

waterway reports on their website.

Based on the disaster, it will be necessary to enhance the disaster management systems for another large scale disaster through improving patrol boats and equipment. Also it is essential to promote countermeasures such as earthquake resistance of navigation beacons and provide power to navigation beacons using renewable energy to prevent destruction and power loss.

(7) Initial Response and Activities by the Government and Disaster Relevant Organizations

[Government On-site Response Headquarters]

Based on cabinet decisions, the national government established Emergency Response Disaster Management Headquarters (Government On-site Response Headquarters) led by the vice minister in Miyagi Prefecture at 6:00 a.m. on March 12. Executive office headquarters were located on the 11th floor of the Miyagi Prefectural Government Building. Based on the Disaster Basic Countermeasures Act, both the Emergency Response Disaster Management Headquarters and Government On-site Emergency Response Headquarters were established for the first time in this disaster. On-site liaison and management rooms were established in both Iwate Prefecture and Fukushima Prefecture.

The Government On-site Response Headquarters, as a Headquarters for Extreme Disaster Management in the field, had a grasp on damages, disaster stricken area relief, and wide area support conditions. They coordinated applicable information from relevant organizations to the Government headquarters, assessed requests coming from disaster areas and transmitted them to the Government headquarters, managed local governments in disaster areas and publicly announced policies conducted by the government in disaster-hit areas. Lastly, they liaised and coordinated personnel of government proposed support agencies, transportation of goods, and supplies.

The initial response by the Government On-site Response Headquarters was prompt. They established their operation base at the prefectural office and established cooperation with the prefectural disaster management headquarters, municipalities, and relevant organizations early on. The Government On-site Response Headquarters played an important role and functioned as a liaison among prefectures, municipalities, government ministries and agencies, and NPO/NGO. The chief of the Government On-site Response Headquarters and the head of the secretariat attended the Miyagi Prefectural Disaster Management Task Force Conference. Especially in this disaster, they were able to accomplish face to face exchanges between the Governor of Miyagi, heads of the disaster area, and secretary of disaster management, and they made decisions and coordination through top down government practices in disaster management. They were also helpful in quickly handling various issues. Since they established their operation base in Miyagi Prefecture, they could build a closer cooperation not only at a government level but also at a business level compared to ordinary times.

[Tohoku Regional Development Bureau]

After the occurrence of the disaster, Tohoku Regional Development Bureau established a disaster management headquarters within their disaster management office. Within 20 minutes after the occurrence of the disaster, liaison dispatch instructions were given to the four prefectures on the Pacific side and to the JSDF. After that personnel were dispatched to municipalities. At 3:23 p.m. prior to the tsunami arrival, only the crew of

the regional development bureau were allowed to dispatch their helicopter from Sendai Airport to gather information as soon as possible while tsunami warnings for a massive tsunami were being announced and facility security cameras were damaged. Crew members trained for these situations based on the lessons of the tsunami caused by the 2010 Chile Earthquake. Personnel had improved disaster relief helicopter operations and trained before the disaster. Through this they were able to promptly engage in information gathering immediately after the disaster, and they could quickly grasp situation on a large scale. In the future, it will be necessary to consider creating a prompt alternative information gathering system, similar to the one used in this disaster. This will be used to be prepared in times when normal means of information gathering cannot be used.

The "Operation COMB" was carried out to clear roads and secure routes from the Tohoku Expressway and National Route 4 (North-South direction) to east, the Pacific coastal areas just like teeth of comb. The roads that were cleaned in this disaster were centered on opening the Tohoku Expressway quickly. Cleaned roads among debris looked similar to trace of combing. According to situations of disasters, flexible measures, such as preferentially trying to clean routes along which have important facilities such as hospitals, will be necessary. Also, the operation was completed in a short time by cooperating with building constructors familiar with local conditions. It is important to establish cooperation with local contractors before a disaster, in order to confirm operation systems and available equipment in the event of a disaster.

Receiving support request from the Tohoku Regional Development Department, regional development departments from across the nation started dispatching the Technical Emergency Control Force (TEC-FORCE) immediately after the disaster. TEC-FORCE is an organization established in 2008 in an effort to give smooth and quick disaster response support to affected local governments when a large-scale natural disaster occurs or when there is a possibility of a disaster occurring. The total number of dispatched personnel from the day the disaster occurred until January 31, 2012 was 18,115 for 31 tsunami-affected municipalities in the coastal areas of the northeast Japan. TEC-FORCE were engaged in a variety of operations such as securing communications, studying disaster situations, grasping support needs, and procurement. Also, Tohoku Regional Development Department set up a TEC-FORCE general headquarters in their offices on March 18 and tried to improve support systems. The TEC-FORCE general headquarters was established to unify command structures for their dispatched personnel and control and support them from overall so that they could work efficiently. When the Ministry of Land, Infrastructure, Transport, and Tourism's main headquarters received information about disaster-hit areas, at the same time they started coordinating the dispatching large number of personnel. However, at the early stage of receiving information, it was important to establish comprehensive sections that manage the TEC-FORCE's entire operations in order to make adjustments while clarifying conflicting information.

[Sendai District Meteorological Observatory]

The Sendai District Meteorological Observatory established the Sendai Meteorological Observatory Disaster Management Task Force at 2:46 p.m. on March 11. Also, Japan Meteorological Agency (JMA) put out an emergency system and established the Disaster Management Task Force at the same time and the same day.

JMA announced an earthquake early warning that anticipated strong tremors in Miyagi Prefecture, Iwate Prefecture, Fukushima Prefecture, Akita Prefecture and Yamagata Prefecture, 8.6 seconds after a seismic wave was first detected. Also, they announced the first tsunami warnings at 2:49 p.m. Three minutes after the occurrence of the earthquake. The height of the expected tsunami at that time was six meters. However, JMA altered its

prediction into more than ten meters at 3:14 p.m. The Agency made follow-up announcements which expanded its tsunami warning range. Taking the loosened earth's crust into consideration, JMA lowered the announcement standards of storm warnings/heavy rainfall warnings concerning landslides and information regarding landslide alerts, and temporarily used those standards in areas with large tremors caused by the earthquake. Also, they lowered the standards of storm warning and heavy rainfall warning, and flood warnings for flooded areas where levees and drainage facilities were affected by the earthquake and tsunami.

In Sendai District Meteorological Observatory, staff members explained the situations of circumstances behind seismic activities, aftershocks conditions and climate predictions at the Prefectural Disaster Task Force Conference. Also, they provided climate support data to relevant organizations and posted linked data on their home page from March 14. Since their seismic observation points, seismic intensity observation points, and tsunami and tide level observation facilities were damaged and they couldn't obtain observed data, they tried to obtain data by temporarily installing instruments. They enhanced the functions of observational instruments by installing emergency power sources and by expanding backup lines which utilized the satellite connection as prolonged blackouts would affect various observational instruments.

[Fire and Disaster Management Agency]

Fire and Disaster Management Agency (FDMA) personnel gathered at the Fire Disaster and Crisis Management Center at the same time as the disaster occurred. They established the Fire and Disaster Management Task Force led by the agency commissioner and started collecting information on the disaster. In light of the enormous damage, FDMA decided that they should exercise the agency commissioner's dispatch authority under the provision of the Fire Service Organization Act Article 44 Clause 5, and ordered 20 different prefectures to dispatch the emergency fire response team (ground team) at 3:40 p.m. FDMA kept collecting information and decided to dispatch additional teams as the serious damage situation became obvious. Also, each section of emergency fire response team gathered and sent information on the damage situation quickly according to their roles. FDMA dispatched emergency fire response team from across the nation to the disaster-hit areas, and served as liaisons and coordinators in regards to the activities of the emergency fire response team.

At 9:00 p.m. on March 11, the dispatched personnel from FDMA arrived at the Prefectural Fire Support Coordination Headquarters. They coordinate fire-fighting operations with Miyagi Prefecture, fire headquarters in Miyagi, the emergency fire response team, concerned government agencies and relevant organizations, and tried to serve as a liaison and coordinated for dispatching the emergency fire response teams.

[Tohoku Electric Power Co., Inc]

Immediately after the disaster occurred, atomic power and thermal power facilities mainly on the Pacific side of Japan were damaged. At the same time as the disaster occurred, all office of Tohoku Electric Power Co., entered their level two emergency mode, the highest level within their disaster prevention system, and activated their disaster response system. They confirmed and examined requested resources from the local municipal governments and relevant organizations in regards to the safety of their employees, the condition of damaged equipment, the situation of supply problem and recovery policy. Then they worked on restoring the plants. Once it began to approach midnight on the day of the disaster, equipment requests came one after the other from the

administrative body of local municipal governments and medical institutions for emergency vehicle mounted electricity generators to deal with power generators running out of fuel. Tohoku Electric Power Co., made an effort to restore power and prioritized electric supply to important institutions such as hospitals by emergency vehicle mounted electricity generator.

Three days after the power outages occurred along with the earthquake, Tohoku Electric Power Company Inc. started operating the thermal power stations and the geothermal power stations which were located on Japan Sea side. They were also engaged in recovery efforts of equipment such as electrical lines, transformer substations, and power lines with the support from various group companies, subcontracting companies, and other power companies. Three days after the occurrence of the disaster, about 80% of power outages were resolved. Eight days later, approximately 94% of power outages were resolved. On June 18, except for the areas flooded by tsunami, power was restored in all areas.

[Nippon Telegraph and Telephone East Corporation]

Communication facilities of Nippon Telegraph and Telephone East Corporation (NTT East Japan) were damaged by the tsunami mainly in the Pacific coastal areas of the Tohoku region. Their exchange buildings were completely destroyed and flooded and relay transmission cables, which connect communication buildings together, and telephone poles were washed out and severed. After the disaster, in the jurisdiction of NTT East Japan there was also a large-scale power outage which exceeded expectations.

Immediately after the disaster, the NTT East Japan headquarters and all branch offices in east Japan established a disaster countermeasures office and started gathering information on the telephone traffic and the damage conditions of the transmission equipment. They restricted communication, except for pay phones and priority telephone lines, and made efforts to secure important means of communication for disaster management related institutions. For communication facilities where electric supplies were interrupted by blackouts, efforts were made in order to secure power sources by switching to batteries, privately-owned electrical power facilities, and mobile vehicle mounted electricity generator. However, since there were no prospects for the procurement of fuel, they provided all remaining fuel to major base buildings to avoid a wide area communication suspension scenario. During long power outages periods, NTT East Japan deployed mobile vehicle mounted electricity generators and transported fuel for electric generators by tankers. In order to secure power for communication systems, they made efforts to restore communication buildings without power. At the same time, they also planned to restore damaged relay transmission lines by reconnecting them where they were severed and setting up new alternative routes.

[Japan Red Cross Society Miyagi Branch]

Immediately after the occurrence of the disaster, the Japan Red Cross Society Miyagi Branch established the Japan Red Cross Society Miyagi Branch Great East Japan Earthquake disaster relief and emergency management headquarters and started disaster rescue activities. Since the building where the branch office was located was damaged by the disaster, they also set up another disaster relief and emergency management headquarters in the Lecture Hall on the 2nd floor of Miyagi Prefectural Government Building. Until March 22, their headquarters' functions were divided at two locations and they carried out relief from both places. The Japan Red Cross Society Miyagi Branch coordinated medical relief groups, regulated and transported relief supplies between

municipalities, established and managed disaster relief volunteer centers, coordinated psychological care, and accepted disaster relief donations.

Medical relief groups from across the nation were dispatched to the affected areas through the Japan Red Cross Society Miyagi Branch and they supported hospitals and extended their medical operations to first aid stations and evacuation centers. Also, they worked in cooperation with DMAT, JSDF and others when transporting patients to medical facilities from disaster-hit areas. It is essential to establish cooperation with relevant organizations for constructing disaster medical relief systems. Therefore, it's desirable to strengthen relationships with local municipal governments, DMAT, JSDF, and medical associations in the future. In addition, based on the fact that branch offices could not function as a primary operation base at the time of disaster, it is necessary to consider and review measures to secure these functions when office buildings are damaged.

[East Nippon Expressway Company Ltd Tohoku Branch (NEXCO)]

Immediately after the earthquake, 35 freeway routes were closed which is approximately 65% of NEXCO's management area. This measured up to 2,300 km of blocked roads. The damages that hindered traffic reached up to 20 routes, which reached to about an 870 km. Unlike the Great Hanshin-Awaji Earthquake, there were no large-scale damages, such as bridges collapsing. However, many of the bridges supports and joints were damaged. On the Joban Expressway partial road subsidence and bends occurred over a length of 1,500 m of road on the embankment sections from the Mito Interchange to Naka Interchange.

After the occurrence of the earthquake, NEXCO blocked expressways and immediately begun emergency inspections to grasp the extent of the damage, so that emergency vehicles and disaster management operation vehicles could promptly gather on-site. NEXCO temporarily restored and secured roadways to give priority to emergency vehicles in unreachable areas among the affected areas. Through consecutive around the clock traffic restrictions, they conducted emergency reconstruction work in the six prefectures of Tohoku and in Ibaraki prefecture. On March 24, at 6:00 a.m. suspension of traffic in almost all lines were lifted and passage for all vehicles including regular vehicles was enabled. NEXCO continued to carry on with their emergency reconstruction work and after half a year they started on main reconstruction.

(8) Initial Response and Operations by DMAT and Medical Institutions

[Operations by Disaster Medical Assistance Team (DMAT)]

Miyagi Prefecture requested the Ministry of Health, Labor, and Welfare to dispatch DMAT. About one hour after the disaster, the Ministry requested DMATs across the nation to go into action. As a result, DMATs from all over the country gathered in Miyagi Prefecture. Around 380 teams, approximately 1,800 members were dispatched in Miyagi, Iwate, Fukushima and Ibaraki prefectures from March 11 to March 22. They were engaged in supporting hospitals and giving medical care at the hospitals in the affected areas. They sent information, transported patients by air ambulance and ambulances, completed wide area medical transports by JSDF's Aircrafts, carried out rescue operations and gave first aid treatment to inpatients at hospitals isolated by the tsunami. In Miyagi, Sendai Medical Center was designated as a gathering spot and operations base. On March 11, at 6:55 p.m. the first team from the Yamagata Prefectural Central Hospital arrived and then DMATs from across

the nation gathered. At the peak, 80 teams gathered. In total, 101 teams were engaged in operations until March 16.

In this disaster, DMAT was dispatched to the disaster-hit areas from all over Japan and worked in a wide range of area. As a result, DMAT office which controls DMAT and the DMAT prefectural management headquarters had an extensive amount of clerical work. In the future, it will be necessary to improve operation systems; this includes revising the chain of command and increasing staff members at presiding DMAT, DMAT office and headquarters. Although, DMAT had self-contained equipment, they faced the situations where they had a shortage of supplies because they were progressing beyond their estimated operation time. Along with making preparation during ordinary times, it is important to develop logistical support that replenishes supplies and conducts shift changes for the DMAT personnel on-site. In addition, there were cases that information gathering and sharing became difficult because the power for communication equipment batteries was lost and the local communications system environment was not good. Therefore, it is necessary to prepare communication environments such as upgrading to satellite mobile phone communications system.

[Operations by Medical Institutions]

Medical institutions located in the coastal area were seriously damaged by the tsunami. Also, in the inland area, some medical institutions' inpatient and outpatient acceptance were limited due to facilities and equipment being damaged. Medical facilities in Miyagi Prefecture were damaged severely. One hundred thirty six facilities in total were completely destroyed; this included nine hospitals, 68 medical clinics, and 59 dental clinics. Total of 1,129 hospital beds were unusable; this included 554 general use sickbeds, 255 sick beds used for long term care, and 320 sickbeds used for mental care. Also, 70 out of 1,621 medical clinics became either obsolete or ceased daily operations, as of May 18, 2011.

After the occurrence of the disaster, DMAT handled medical care during the acute stage, and the disaster base hospital played a major role as a medical care base in disaster-hit areas. On the other hand, prolonged disruption of essential utilities, and lack of reserved fuel and food for patients and personnel became a problem. In order to deal with long-term medical needs, it is essential to stably secure pharmaceutical products and food, in addition to personal support for doctors and nurses. The prefecture needs to consider the current state of these support systems. Also, to be able to provide continuous medical care in safe buildings in the event of a disaster, it is important to make buildings more quake-resistant, especially disaster base hospitals and major local hospitals.

(9) Wide-Area Support and Activities

[Support Between Local Governments]

Immediately after the disaster, personal and material support was given to Miyagi prefecture and its municipalities by many groups from other prefectures and municipalities whether or not agreements were made prior. Support beyond the content of agreements was given, too. Furthermore, many support operations were mutually developed between municipalities in Miyagi Prefecture although they were damaged by the disaster. Although Miyagi Prefecture assumed that other local governments would give them support, the system to accept and manage a lot of support was not fully developed. Therefore, there were situations that had to be dealt with by adjusting to the circumstances. In addition, a wide variety of support request and support channels met

with difficulties to grasp information and conflicting information. As a result, accepting and managing support became complicated. Furthermore, issues such as failing to secure accommodations for dispatched personnel came to light and the prefecture agonized over how to deal with these issues.

Even in municipalities application counters for support personnel, deployment methods to various operations, and operation management methods were unclear. There were cases where at first they could not accept support personnel and manage them in a methodical manner. In these situations, the support side conducted support operations which understood the local needs of the area without waiting for requests directly after the disaster. They conducted self-containment operations that prepared food and bedding. They also did operations based on the counter part method. These support operations were effective because reception preparation and individual management from the reception side wasn't necessary.

Based on the disaster, Miyagi Prefecture will consider methods to grasp the needs of the affected areas, methods to organize matters which need to be offered when accepting support, and ways to summarize and share the information offered from the support side. The prefecture needs to develop a system which actively supports disaster-hit municipalities. At the same time, municipalities will need to develop a support acceptance system that organizes the content of disaster relief and considers the division of roles between municipalities and the support side beforehand. Also, based on the contents of support from this disaster and suffered mutual support agreements made prior to the earthquake, it is desirable to enter agreements with municipalities on a wide scale and review support operations which are conducted based on those agreements. Furthermore, to make cooperation between local municipal governments more efficient and effective, it is important to consider the response from both positions of the support side and receiving side based on the opinions about the support.

[Support From Abroad]

Immediately after the disaster, messages of sympathy and encouragement were sent to Japan from many countries and regions around the world. Also there were various types of offers for support such as dispatching rescue and medical support teams, relief supplies, and donations, etc. According to the survey by the Ministry of Foreign Affairs, there were offers from 163 different countries and regions and 43 international organizations as of December 28, 2012, which is more than double compared to the offers that were made in accordance to the Great Hanshin-Awaji Earthquake.

In Miyagi Prefecture, search and rescue teams and medical support teams from 17 different countries and regions were involved in support operations. On March 12, a search and rescue team from the Republic of Korea started operations first, then other teams followed and carried out operations until July 11. From March 18 to June 23, Miyagi Prefecture accepted relief supplies from 23 different countries and two institutions (U.N. agencies).

Based on the lessons of the Great Hanshin-Awaji Earthquake, contact points to accept rescue teams from overseas were unified in the national government. There were no major disruptions because Japan sent requests to rescue forces to come to Japan with a self-sufficient system, and they simplified the procedures for medical inspections and customs clearance when entering Japan. However, meeting the needs of the affected areas became hard because their needs changed day by day. There was also a great variety of personal support and material support that made it difficult to match these needs. Additionally, there were drawbacks to receiving

support from overseas due to the concerns regarding communication because of language differences, and concerns about the quality of relief supplies such as raw material, its shape, taste, and quality. Miyagi will have to consider providing accurate information to the municipalities and disaster victims of the receiving side. Also, based on Japanese culture and customs, it will be necessary to consider the prerequisite for accepting relief so that Miyagi can quickly present it to the countries offering support.

Chapter 4: Emergency Measures and Restoration Measures

[Management of Evacuation Centers]

(Management Methods)

In this disaster, the evacuation centers were managed by a variety of organizations. The management of centers varied greatly depending on the extent of damage from the earthquake and tsunami, the disaster conditions in municipalities, the number of evacuation centers and evacuees, the composition and the conditions of the evacuees at evacuation centers, and opening period of evacuation centers. Municipalities made efforts to develop an evacuation center management manual and foster independent disaster management organizations. However, during this disaster, those preparations were insufficient, and support from the government was limited. In this disaster, there were cases where inland residents gave support to residents living in coastal areas where the damage was serious. Also, there were cases where neighborhood associations cooperated together to accommodate goods and manage evacuation centers. There were other examples where through disaster management agreements in preparing for a disaster, evacuation centers were able to receive support supplies and used these supplies to support other evacuation centers. Also, various private facilities accepted evacuees, gave supply support, and managed evacuation centers voluntarily.

After the disaster, the personnel of municipalities were dispatched to many evacuation centers as a manager or a liaison. However, there were cases where municipalities in coastal areas could not dispatch their personnel as their buildings were damaged and traffic routes were cut off. Later, as many personnel as possible were dispatched to evacuation centers. Those personnel managed evacuation centers and divided roles through cooperation with teaching staffs, facility managers, voluntary organizations for disaster management, and local residents. There were many examples where management went along smoothly as evacuation centers were run mainly by local residents and evacuees.

On the other hand, there were cases of evacuation centers opening at places other than designated evacuation centers in the beginning of the disaster period. As such the municipalities could not fully grasp the conditions, resulting in support being delayed. There many cases where evacuation centers were independently managed because the municipalities estimated dispatched personnel insufficiently and it was difficult to secure more personnel. In these cases, the local municipalities mainly provided food to these centers. There were similar situations in communities isolated by the tsunami and outlying islands.

At some evacuation centers, the management went along smoothly because there was little damage and centers were needed only for a short period of time. This was due to evacuation training based on advance planning conducted before the disaster. On the other hand, there were many evacuation centers where the management became chaotic due to designated evacuation centers being damaged by the disaster and many undesignated evacuation centers were opened. In addition, there was a shortage of personnel for managing the

evacuation centers and due to some evacuees becoming physically and mentally fatigued, advance planning and management manuals were not fully utilized.

During such large-scale disasters, situations arise where managers of facilities that have become evacuation centers (such as the faculty of schools local community's disaster management organizations, local residents, and evacuees) are forced to build a cooperative system while dealing with the early stage of day-to-day living in an evacuation center. In the future, municipalities will need to clarify the division of roles in the management of an evacuation center according to the actual situation of local communities and develop an effective management manual. Also, it will be important to provide training to personnel who would take charge of disaster management in local communities while improving training and ability to give instructions on a daily basis. Through these efforts, it is necessary for local residents to have a deeper understanding of the importance of self-help and cooperation in disaster management and preparation, and to improve disaster management skills of local communities.

At some evacuation centers, women also took on leading roles and assumed roles as manager of women's need. At such centers, there were cases where female leaders' vantage point as women allowed them to provide extraordinary support and assistance for a variety of needs at centers, giving fine-tuned support at an early stage. However, there were cases immediately after the disaster where the dispatched leaders of evacuation center were only men. Due to this, there were cases where it was especially difficult for women and children to make requests and shortages of necessary supplies occurred. From now on, efforts need to be made to encourage women to take part in the disaster management and to participate in the decision making of evacuation center management.

(Improvement of Life)

There were a lot of needs for food and drinkable water supply, and the installation of the temporary lavatories immediately after the disaster. Once electricity and waterlines were restored, the needs for daily goods such as clothing items and soap increased. As life at evacuation centers stretched on, needs diversified: needs concerning hygiene provisions, securing privacy, ensuring opportunities for laundry and bathing, the change of seasons, and personal issues of evacuees arose.

Among the needs and requests, the prefecture and municipalities received from evacuees, there were items such as formula, baby bottles, and disposable diapers for infants. Also, there were needs for colostomy bags replacements needed especially for the elderly when being nursed, nursing in general, nursing care food, sanitary napkins and underwear. However, there were municipalities with no stockpiles of these items. Time for distribution is needed in order to procure these supplies after learning of these needs.

At the evacuation centers, the system for counseling and understanding the arising needs of evacuees were lacking in regards to considering various factors such as age, gender, whether or not they had a disability. The prefecture and municipalities will endeavor to consider ways to understand the diverse needs of evacuees and a system for consultation. At the same time, it will be important to adequately understand their differing needs and give both tangible and intangible support and necessary to consider in advance how to secure necessary supplies and personnel.

The number of designated evacuation centers and welfare evacuation centers were insufficient and it was difficult to secure locations and supplies. This resulted in a situation where it was difficult to provide support that

took into consideration evacuees' needs. Also, advance preparations and systems for support were insufficient, resulting in a number of issues. There were cases where consideration between evacuees was insufficient; there were those who once had taken shelter at evacuation centers and were later forced to go back and stay at their homes; others who decided from the beginning that communal living was impossible and choose not to go to evacuation centers; and, finally, also people who could not receive any necessary support. The prefecture will need to develop plans which consider the diversity of people requiring assistance and to prepare a support system which promotes an understanding of these issues among citizens.

(Welfare Evacuation Centers)

The pre-designation of welfare evacuation centers in municipalities occurred in 17 out of 35 municipalities before the occurrence of the disaster. This pre-designation was higher than the national average. However there were many municipalities that opened and managed welfare evacuation centers for the first time, learning how to manage them properly as time went on. At its peak, 152 welfare evacuation centers were opened, and all of centers in Miyagi Prefecture closed with the closure of Onagawa Town's welfare evacuation centers on November 10. Welfare evacuation centers were established mainly at agreed upon and pre-designated facilities for elderly. It was thought that these welfare evacuation centers would be able to perform a particular function to take in the elderly. However, there were problems that there were not enough welfare evacuation centers with special needs facilities and centers for pregnant women and infants.

Welfare evacuation center that were hastily established had a difficult time securing supplies, equipment, and staff members to open and manage them. Managing a welfare facility requires preparation of a supply system of goods including supplies needed in the event of a disaster and a reserve equipment. The prefecture needs to consider securing specialized personnel in such fields as social services, health, and medical care, as well as, a support system that makes adjustment to facilities that become welfare evacuation centers.

(Closing Evacuation Centers)

The restoration of essential utilities and construction of temporary homes led to a decrease of evacuees. The municipalities took this opportunity to optimize management and improve support at evacuation centers by integrating dispersed evacuation centers. The integration of the evacuation centers accompanied changes in evacuees' living environment. Therefore a number of municipalities conducted surveys concerning evacuation center operation periods and pre-integration to understand evacuees' thoughts before integrating. To avoid confusion among evacuees, it is vital to select facilities which could be integrated evacuation centers in regional areas in advance. The prefecture and municipalities also needs to consider the standards and the methods of integration.

When all the construction of temporary houses in municipalities was completed, the evacuation centers were finally closed. However, there were still a number of evacuees who wished to continue to live at the evacuation centers partly because repair work on their houses was not progressing, and evacuees felt that life at their new own homes or temporary houses would be inconvenient and uncomfortable. This became an issue for putting evacuees' lives back in order after they left the evacuation centers. For the dissolution of the evacuation centers, we need to grasp the reasons why evacuees have to stay at the evacuation centers and provide direction and necessary information for them to restart their lives at an early point. It is also important to improve transportation in the surrounding environments of temporary and give support to maintain local communities. At its peak, 1,323 evacuation centers were established, and on December 30 evacuation centers in Kesenuma

City were dissolved and all operations finished.

[Providing Information to Evacuees]

Due to means of communication being damaged and disabled, municipalities provided information via various means, such as public announcement flyers, municipal disaster management radio communications system, public relation vehicles, and their websites. Also, 12 temporary disaster management broadcasting stations were established in Miyagi Prefecture and they supplemented the public relations of municipalities. However, each means of relaying information transmission had both its merits and demerits. Some municipalities could not sufficiently transmit the information that evacuees and local residents needed. In the municipalities, with the support from telecommunication carriers cell phones were equipped at the evacuation centers from the day after the disaster. Each carrier also offered services such as the installment of special public phones, toll-free public phones, free loaning of cell phones, and free battery charging. They helped secure means of communication for evacuees and the means of gathering information.

When transmitting information, it is important to secure various means of transmitting information after considering merits and demerits of each different means. When doing so, it is necessary to consider people who require assistance such as the disabled and foreigners. It is also necessary to examine the way that information will be transmitted to stay at home disaster victims. It is also important to arrange personnel who can interpret sign-language and foreign languages, and secure and install means of communication, such as radios, TVs, and personal computers so that evacuees themselves can collect necessary information. In sum, it is necessary to develop an information transmission system in cooperation with ward mayors and district welfare officers.

In this disaster, residents in Miyagi Prefecture had difficulty confirming the well-being of their families. Strong demands demanded that the administration provide safety information on the well-being of their citizens. There were many cases of municipalities that made name-lists at evacuation centers, and they could grasp the well-being of residents. Since designated evacuation centers were damaged and a large number of evacuation centers opened whether or not they were designated, it was especially difficult in the severely damaged coastal areas to confirm and integrate information on the well-being of residents through list of evacuees.

In such situations, Miyagi Prefecture and its municipalities made efforts to meet the needs of the residents by disclosing the lists of evacuees. The prefecture only released information necessary to identify an individual while paying attention to protect the personal information of residents. Municipalities also released personal information from a similar stance. However, some municipalities had difficulty integrating information since there was not a unified format for creating at each evacuation center. In some cases, evacuees were listed on different lists; they were registered in both original and new evacuation centers when they moved to a different evacuation center. Due to this, disclosed information was not always accurate. When providing evacuee information, it is necessary to define its intended use according to the methods of its effective use, while taking pre-consideration of personal information protection and extent of information being disclosed. It is necessary that a set format for list creating be prepared prior to a disaster.

[Stay-at-home Evacuees]

Although there were people who evacuated to evacuation centers once, there were some who returned home since the center was occupied by many people. Since some of them could not adjust to communal living, and

they were concerned for their safety, there were those who felt obligated to stay at home as evacuees due to the concerns about the living environment at an evacuation center and the difficulty of health management. Also there were people who did not evacuate to an evacuation center because there was no direct damage on their residence. They became stay-at-home evacuees who needed support due to the prolonged disruption of lifeline and difficulty getting food at grocery stores. This situation resulted in making a lot of stay-at-home evacuees.

Prior to this disaster, there was no assumption for understanding and supporting stay-at-home evacuees. Since there was a shortage of personnel in municipalities, it was difficult to respond to the needs of those evacuees. Through the chiefs of administrative regions, municipalities continued to respond to direct request received from stay-at-home evacuees. However, there was a delay in grasping the number and the needs of stay-at-home evacuees. As a result, support disparity between the evacuation centers and the stay-at-home evacuees arose. It is necessary for municipalities to cooperate with local networks through independent disaster management organizations and ward mayors who know the local area for gathering information and giving support to stay-at-home evacuees. Also, it is necessary to consider building a system in which evacuation centers would be a base for support.

[Evacuees Outside of Municipalities]

Miyagi Prefecture established a secondary evacuation system and in order to have municipalities understand the system, the prefecture engaged in providing explanations, information, and support for the secondary evacuation system. However, local disaster management projects in many municipalities did not take this system into account, and due to the emotional state of evacuees and the opinions of the municipalities, progress was not made swiftly in these efforts. On the other hand, there were cases where the management of secondary evacuation systems proceeded along smoothly since secondary evacuation centers were established in communities in which municipalities had interactions before the disaster, and the residents on the receiving end were closely united and cooperated in various ways. For making secondary evacuation smooth, it is necessary to consider the emotional state and thoughts of residents, seek understanding from residents regarding evacuation, select specific places for secondary evacuations according to the situation of communities, and compile procedures in manuals. Also, it is desirable to take consideration on how the receiving interests of new system will incorporate the new system.

There were some who voluntarily evacuated as well as evacuees outside of municipalities through the involvement of Miyagi Prefecture and municipalities. Voluntary evacuees made use of the Ministry of Internal Affairs and Communications' nationwide evacuee information system, and they were publicly registered into the system with assistance of local municipal governments' evacuation sites. As a result, the local government of evacuation sites and the local municipal government of the evacuees' original living places could assess the situation of voluntary evacuees. However, it was impossible to assess the situation of evacuees who did not register, because registration to the system was voluntary. It is necessary to learn methods for assessing the diversity of evacuees' circumstances. At the same time, it is necessary to consider how to support diverse evacuees; evacuation centers outside of municipalities, accommodations, places found and rented by evacuees, and residences of relatives, etc.

[Medical Assistance Measures]

It was difficult to dispatch medical assistance teams to grasp the needs and requests from the evacuees and for public health and welfare offices in local communities since their buildings were damaged. However, with support from outside and local medical associations, medical assistance groups finally set up first-aid stations in evacuation centers and aided disaster victims. When a certain size disaster occurs in future, it will be necessary to automatically set up first-aid stations and organize medical assistance groups while gaining support from local medical associations, and to request the dispatch of medical assistance groups from outside relevant organizations and improve reception system. To organize such a system, it is important to establish installation sites for a number of first-aid stations assumed on the scale of disasters and then share them with relevant personnel.

Since most of the medicine which was supplied to evacuation centers was for chronic diseases, it caused mismatching of prior stored medicine. Miyagi Prefecture will need to revise the list of stored medicine by consulting and coordinating with medical associations and hospital pharmaceutical associations based on the demand of the medicine for emergency disaster use. At the same time, it is necessary to continuously examine a variety of disasters and regularly inspect and update the necessary items, the amount of reserves, and storage spaces.

[Healthcare Activities]

Through each of its public health and welfare office, Miyagi Prefecture assessed the damage in municipalities. Miyagi health care operation coordinators also deployed public health nurses to municipalities and gave support by coordinating situations at first-aid stations and evacuation centers, and giving health consultations. They also supplied materials needed for measures against heatstroke and infectious diseases and conducted projects to raise public awareness. Public health nurses were a profession that was assumed would be understaffed in the event of a disaster. Also, it is difficult to secure public health nurses who can engage in long term healthcare operations. Therefore, it will be important to build systems in advance for making mutual support agreements with specific local municipal governments, or holding conferences with the Ministry of Health, Labor and Welfare on long-term dispatch of public health nurses.

Healthcare operations are rarely end in a year and can require long-term efforts. It is important to continue healthcare operations to maintain the health of disaster victims with long term fatigue and accumulated stress. This can be accomplished through health surveys of tenants living in prefabricated temporary houses and private leased homes, mental healthcare measurements for long-term residence in temporary houses, supporting operation of support centers, and taking measures for maintaining health, an issue mainly for the elderly.

[Support for People Requiring Assistance in Times of Disasters]

In this disaster, lists and maps of people requiring assistance were made beforehand. In local communities efforts were made to share information between supporters, welfare officers, local community's disaster management organizations, neighborhood councils, and municipal council of social welfare. After the occurrence of the disaster, those supporters were involved in confirming the well-being of those requiring assistance, supplementing information, and evacuation support by visiting the homes of people requiring assistance. Also,

while there was support and consideration in limiting the disclosure of private information, there were cases where municipalities were hesitant to disclose the information of those in need of support to volunteers and supporters. There still remained issues regarding the sharing of information of people requiring assistance. There were cases of people requiring assistance losing their lives because necessary information for evacuation did not reach them and were not able to judge whether they should evacuate or not. As such, it will be necessary to make agreements beforehand on how to handle the private information of people requiring assistance. It is also necessary for those concerned with this issue to consider a way to grasp the situation of those people requiring assistance in the event of disasters.

[Consulting Counter]

In order to handle the inquiries of disaster victims, Miyagi Prefecture posted on the internet a list of each of the divisions in charge of consultation services for the Great East Japan Earthquake. Also, the Miyagi residents' service center at each prefectural government office complex and the general consultation counters set up in local municipalities functioned as a one stop consultation center, and they became a highly convenient and efficient service for residents in Miyagi Prefecture. The prefecture established specialized consultation counters according to the consultation contents and situations in each respective region. Also, these consultation counters continually went around to different evacuation centers. The prefecture was able to respond precisely to the request of residents' requests appropriately while creating an environment where evacuees could disclose concerns without hesitation. However, at general consultation desk, the cooperation of relevant departments was necessary depending on the consultation content due to the difficulty in fully responding to specialized consultation.

Since this disaster was large-scale, the personnel of municipalities were overwhelmed at times in managing evacuation centers and due to the lack of personnel who could handle consultations. They were unable to prepare a consultation system until the disaster management conditions settled down. The consultation, the inquiries, and the contents of applications brought about revisions in the distribution of donations, emergency repair of houses, and free use of expressway to disaster victims as time passed on after the disaster. In the future, it will be necessary to develop a system based on a series of procedures assembled support victims of disaster and all of their various measures' times of implementation. The Prefecture and municipalities will need to plan in order to advise to residents smoothly including organizing the work flow regarding systems supporting disaster victims or timing of implementation of each measure taken in this disaster, and organizing the system based on the work flow.

[Disaster Volunteers]

The Municipal Council of Social Welfare, the main organization for establishing municipal volunteer centers, was damaged by the disaster, and it was especially difficult to establish and manage volunteer centers in coastal areas. For this reason, the coastal areas received support from Miyagi's inland municipalities and other prefectures' councils of social welfare. They were established in 12 cities and 13 towns in Miyagi Prefecture. Immediately after the disaster, acceptance of volunteers and their activities were limited because restricted areas were established and means of transportation were limited. The total number of volunteers engaged in these activities at municipal volunteer centers extended up to 525,700 in total as of March 31, 2012.

Immediately after setting up disaster volunteer centers, issues began to surface in regards to municipalities accurately understanding the needs for volunteer activities. In addition, among the volunteers who visited the municipalities, there was the problem of volunteers to join certain varieties of volunteer activities which differed from the requests and needs of victims. It will be desirable to consider beforehand the likely needed volunteer work and support in the event of a disaster, to recruit and register volunteers along with highlighting online what volunteer work and activities will be needed.

In this disaster, there were support activities for disaster victims done in collaboration with the administration bodies and NPOs with large scale funds for developing volunteer activities in foreign countries. Their activities involved soup-runs, offering everyday commodities (starter packs) to the residents in emergency temporary houses, and providing school supplies. Support activities for disaster victims in collaboration with the administration and NPOs which had ample funding and personnel, as well as detailed information on the situations in municipalities were effective in promptly providing support to the victims. However, there were no arrangements made to coordinate and cooperation with NPOs before the disaster. Therefore, time and effort were needed to coordinate their activities, and it took time until the NPOs' abilities could fully be utilized. In the future, the Prefecture and municipalities need to make efforts to share more information connected to disaster victim support and consider making arrangements with NPOs which considers the accepting and coordinating with and allow them to join government disaster management task forces as well as makes arrangements for accepting and coordinating pre-existing private volunteers.

[Burial and Cremation]

According to Miyagi's Medical Relief Work in times of Large Scale Disasters Manual, when bereaved families in times of turmoil cannot bury the remains of the deceased due to a disaster, such cases are applicable to Disaster Relief Act. The municipalities have the responsibility to take care of burials, search for bodies, and disposals. However, in this disaster, as a special measure, Miyagi Prefecture carried out the procedures for the municipalities and cooperated with them by keeping in contact with them daily. The prefecture also took care of long-term issues such as preserving and delivering ashes of unidentified persons.

When the disaster occurred, cremation in Miyagi became difficult due to the damage of crematories and fuel shortages. However, by receiving support from other prefectural and municipal governments, the urgent situations created by demands for cremation were somewhat alleviated. The Prefecture and municipalities will need to consider how to deal with cremations when there are fuel shortages and crematories are damaged when a disaster occurs.

[Preservation of Social Order]

After the disaster, there were troubling acts that took advantage of the extraordinary circumstances in regards to a disaster, such as fraud, malignant commerce, the circulation of rumors, and crimes of larceny occurred throughout disaster-affected areas. Operations for the preservation of social order are mainly the responsibility of police. However, Miyagi Prefecture and municipalities needs to cooperate with relevant organizations including the police, to make efforts to quickly transmit accurate information to disaster victims. It is also necessary to promote building a safe and peaceful environment where social order remains stable even in times of emergency and disaster.

[The Procurement and Distribution of Relief Supplies]

In times of disaster, relief supplies go through a distribution system before reaching evacuation centers. Relief supplies from providers and provision points across the nation are passed through primary bases as well as secondary supply collection bases. Then, relief supplies are procured and distributed by a variety of organizations and relevant personnel to evacuation centers. However, various problems arose due to the unprecedented magnitude of distribution of relief supplies on this occasion, resulting in difficulties in smoothly delivering relief supplies to each evacuation centers in all areas.

In this disaster, the JSDF played a central role in transporting supplies at the beginning. As clearing of roads proceeded, the transportation by the JSDF switched to private distribution service providers. A dispatch of personnel from the Warehouse Association of Miyagi Prefecture and the Miyagi Trucking Association came to the Prefectural Disaster Task Force and engaged in providing logical support, support varying from warehousing and inventory control all the way to shipping. They also smoothed out the prefecture's functions in logistics coordination. During times of large-scale disasters, it is difficult for Miyagi Prefecture and its municipalities to secure a distribution system for relief supplies on their own. It is essential to gain the cooperation of professionals who have the experience and knowledge in this field.

After March 12, Miyagi Prefecture was at a stage it could not make contact with its municipalities. The prefecture sent goods that it judged as necessary, including drinkable water and food through a push-type service without waiting for information gathering from their municipalities. Then it went through a stage where it arranged reception system for supply requests from municipalities. After March 19, the prefecture decided to gather information for daily inquires to the municipalities and switched to a pull-type service work flow. After a significant passage of time, the needs of disaster victims diversified. The prefecture presented to the municipality's inventory information which subdivides categories and built a system to collect requests. In order to implement smooth logistics of relief supplies in future disasters, it is necessary to establish an order of priorities for distribution of goods and simultaneously takes into account the conditions of disaster-affected areas. In other words, it is necessary for the prefecture to establish plans that create a system that can correspond with on-site reserved goods, send water and food swiftly through a push-type service with assistance of JSDF regardless of the requests from the disaster-affected areas, establish a logistics system that can offer stable shipment with cooperation with private logistics sectors, provide various supplies even in small amounts in order to meet the diverse needs of prefectural residents.

[Securing Fuel]

The oil industry suffered serious damage to various facilities and transport equipment due to this disaster. Oil availability declined in its entire supply chain. The government secured stockpiles by reducing the private sector stockpile requirements based on the Oil Stockpiling Act, the oil industry focused supplying to Tohoku District at a workable stockpile operations base in Niigata. Since there was no serious damage to Shiogama oil deposit sites, Miyagi Prefecture went forward with the restoration of the Sendai-Shiogama Port with the help of the JSDF. As a result, on March 21, the first tanker came into the port since after the disaster. Then on March 27, a large-size tanker came into port.

In the early stages of the disaster, many municipalities had trouble operating emergency private power

generators and using official vehicles and disaster restoration vehicles due to the lack of fuel. Since the damage was extreme, more time than expected was required until blackouts were resolved and fuel supply systems were restored. Therefore, there were many cases where even the emergency fuel stockpiles in municipalities were not enough. It became difficult for residents to procure fuel, such as gasoline and kerosene, in many municipalities. For residents who needed to use their cars to go to hospitals, municipalities issued refueling cards, so that they could have priority in obtaining fuel. However, in a situation where everyone needed fuel, such measures could not gain the understanding of residents and complaints from residents arose. Many municipalities had difficulty dealing with the issues.

It is desirable to consider the procurement and supply of fuel that will be necessary in times of disaster in advance. Also, Miyagi and municipalities should consider new methods to relay the intention and reasoning being the fuel supply system so in order to quell concerns of unfairness. In regards to the distribution structure of oil products, if the conditions of primary level oil distributors do not improve for the better, fuel provision will remain difficult. It is necessary to build cooperation with industry groups that takes into account the overall distribution structure of oil products to obtain a steady supply of fuel such as the Petroleum Association of Japan.

Miyagi Prefecture asked the national government to supply fuel to hospitals which urgently needed oil supply following the disaster. Since it was impossible to confirm the situations of receiving supply points, support for hospitals was late since Miyagi could not send request to suppliers because of an inability to confirm needs. For these reasons, the prefecture believes it necessary to set a high priority on fuel replenishment and emergency power generators in extraordinary times. It is also necessary to collect information in advance regarding feasible fuel run times, fuel amounts, types of fuel, estimated refuel amounts, and the conditions of fuel intake equipment in those facilities.

[Residence Damage Appraisal]

Various consultations regarding issued proof of affliction for residence damage appraisal were sent to Miyagi Prefecture from disaster victims. Municipalities had difficulty in dealing with complaints regarding the difference of residence damage appraisal issued by other municipalities. After the disaster, despite most personnel in the municipalities who were in charge of investigating and issuing residence damage appraisal took a short-term course covering the appraisal manual before conducting investigations. However, this did not mean that all involved personnel had expert knowledge of buildings. Since proof of damage affects the speed and scale in which disaster victims' lives can be restored, it is important to ensure the reliability of the appraisals. Based on the lesson of this disaster, it is desirable to make preparations in advance, such as creating official regulations regarding proof of affliction, improving training programs, and building a system to make the best use of personnel who have expert knowledge.

[Emergency Temporary Housing]

When the construction of prefabricated temporary houses started, at first sites were selected according to the guidelines of Miyagi Prefecture and the national government's site selection policy. However, the municipalities in coastal areas could not secure enough sites as most flat and usable areas were flooded and the necessary number of temporary houses needed to be built was overwhelming. Thus, in preparation for another massive tsunami disaster, the municipalities should restrict usage of usable lands, procure potential sites in advance, and

revise the guideline for site selection for the construction of prefabricated temporary houses. Also, Miyagi Prefecture and its municipalities need to work together in considering selecting construction sites that exceed the boundaries of municipalities.

At the site selection stage, local residents sent requests from those that would like to live in a group near the town or the region where they formerly resided. Since there were offers to provide sites from residents, it became possible to maintain communities at some temporary prefabricated housing complex before the disaster. Due to the way matters were handled in the selection process for usable land, results were less than hoped for, but in securing residences and preventing the isolation of victims, these efforts were effective and successful. On the other hand, there were problematic cases where residents wished to maintain the communities while demanding, conflictingly, fairness for all those requesting housing. Also, the endeavoring to fulfill residents' requests while respecting their wishes to remain in communities created when living in evacuation centers resulted in the delay of other regions and administrative regions where evacuees entry into housing. During this disaster response, municipal government adopted a unique method which considers the fairness and maintenance of communities in allocation of temporary houses. However, maintaining communities and fairness in the process is fundamentally difficult. As such, it will be necessary for the local municipal governments to support the building a new community after evacuees' relocation to new housing.

As complementary measures to develop prefabricated temporary housing, the prefecture started providing emergency temporary housing through a private housing rental system and aimed to secure houses swiftly. However, many issues arose in operations, including delays in paperwork on deciding occupants and making contracts. The amount of applications which exceeded initial predictions and the frequent addition of support content due to the loose management of the Disaster Relief Act also caused delays. There were also delays in providing information to the occupants of temporary housing. The prefecture will need to study the operation of private housing renting systems and Miyagi Prefecture's systems in times of a disaster and also cooperate with those involved during times and prepare better manuals.

[Education]

(Damage Situations)

In Miyagi Prefecture, the number of dead and missing at schools reached 452. This includes infants, children, students as well as school faculty members in private and public schools. The number of deaths in infants, children, and students were 394 and 22 deaths among school faculty members. The safety of 36 people is still unknown as of March 31, 2012.

As for the damage to school facilities among public schools in Miyagi Prefecture, 762 schools of both prefectural and municipal schools suffered damage. The total amount of damage was 80.7 billion yen, as of December 31, 2012. Also a total of 252 private schools were damaged. This included 157 kindergartens, 32 elementary, junior high, high, middle, and special support schools, and 63 technical and miscellaneous schools. There was a total damage amount of 11.41 billion yen, as of April 2012.

(The Improvement of Disaster Reduction Education and the Development of Evacuation Manuals)

Based on the experience of the 1978 Miyagi-Oki (offshore) Earthquake and the 2008 Iwate-Miyagi Nairiku (inland) Earthquake, Miyagi Prefecture promoted education in disaster preparedness before the disaster in 2011.

According to studies by Miyagi Prefecture, it shows that on the occasion of an earthquake, at many schools students took necessary actions to escape from danger, such as hiding under a desk. The efforts made up until now resulted in students making use of proactive behaviors. However, in this disaster, when escaping from the tsunami, students became victims at home or after their parents picked them up. At schools, due to the prior measures, training, and a lack of information caused by blackouts, causing the decisions to take unnecessary long time. As a result some students were killed by the tsunami.

In future, the prefecture will need to improve disaster education, so that students can recognize danger based on their own judgment and start evacuating. In addition, Miyagi will need to conduct training and prepare an evacuation manual based on examples when dealing with this disaster. Specifically, the prefecture will need to teach students how to escape from danger when a disaster occurs on their way to school or home, to set evacuation places when not only assuming earthquakes and tsunamis, but other various disasters. Miyagi will need also to confirm evacuation routes, and to set rules to handover students to their guardian. As such, it is important to promote high awareness within schools' faculty with a disaster by creating a manual and training.

(Improving School Disaster Management Functions)

During the disaster, many local residents even evacuated to schools which were not designated as an evacuation centers. Whether or not a school is designated as an evacuation center, it functioned as a disaster management base for local communities. As for the management of evacuation centers, in the beginning, especially in the coastal areas, there were situations where some school faculty members had to be in charge because personnel of municipalities in charge of the managing evacuation centers could not get to schools immediately. There were many evacuation centers which opened smoothly in cooperation with communities. However, some had complications as the division of roles in the management of evacuation centers were not organized, and schools did not necessarily have enough functionality as an evacuation center. In addition, at some schools there was a shortage of supplies for the students who remained at school.

After the disaster, schools continued functioning as an evacuation center. However, schools need to resume their function as an educational facility. In order to do so, it is important that the management of schools as an evacuation centers operates smoothly. Through cooperation with local communities and municipalities, Miyagi Prefecture will need to develop evacuation center management manuals and arrange a division of roles as well as continue to improve disaster management functions of schools such as building a linked system through disaster prevention drills and examining and maintaining emergency supplies.

(Efforts for Reopening Schools in Early Stages)

To resume schools, the Miyagi Board of Education set a specific target date and took measures to consider the actual situation of students whose living environment changed due to the disaster. For example, the Miyagi Board of Education supplied school materials that students need such as textbooks, secured means of transportation to school, and gave financial aid. Approximately two months after the disaster, all schools in Miyagi Prefecture were reopened by adjusting class schedules and securing facilities for classes such as gymnasiums, temporary school buildings, and rooms of other schools.

It is important to endeavor to restart schools quickly while cooperating with relevant organizations, so that students can return to their school life without unnecessary delay. There were many cases of schools being designated as local evacuation centers. When a large-scale disaster occurs, it takes time to dissolve evacuation

centers. It is assumed that prolonged situation where school education and evacuation center functions co-exist. It is necessary to work with municipal disaster management bureaus to dissolve evacuation centers to restore its original function as a school. Additionally, it is necessary to examine systems when school education and evacuation center functions co-exist.

(Developing Learning Environments and Support Systems)

Even after schools were reopened, classes were offered under inconvenient learning environments in many schools. In each school, various measures were taken according to the particular circumstances. Along with maintaining school facilities, Miyagi needs to provide fine-tuned support to provide psychological care to students who fell behind in their studies and were traumatized due to the disaster. It is important to prepare a support system and an environment where students can go to school without worries or anxiety.

(Psychological Care for Children and Students)

In Miyagi Prefecture, many students lost their families and friends and loved ones, as well having their homes destroyed and washed away. The surroundings of children's living environment changed drastically.

The Miyagi Board of Education made efforts to give psychological care to children and students from an early stage. They increased the number of dispatched school counselors and their number of visits to the children while obtaining support from other prefectures. They sent counselors to seriously damaged areas and made practical use of social workers, too. In addition, the Miyagi Board of Education held seminars, lectures, and discussions to help school faculty members have a better understanding of psychological care and improve their skills to deal with mental health. While making early efforts for student psychological care, the municipal board of education and each of its schools were committed to understanding their situation from the disaster. Based on their growth stage and their individual situation, meticulous guidance and consultation were given, so that students' physical and emotional signs of distress in their school lives were not overlooked.

Examples from the Great Hanshin-Awaji Earthquake demonstrate that long term impacts from the earthquake, such as children and students who need care reached its maximum number on the third year after the disaster. In the future, it will be important to have not only short-term but long-term psychological care for students.

There also remains the task of securing personnel with expertise. For students' psychological care, it is essential for familiar school faculty members and guardians to understand their psychological as they watch over the students. It is important to provide support that continues to improve cooperation with those involved psychological care for school faculty members also needs to be dealt with at an early stage as it would not only remain as a problem, but also adversely affect students.

(Reconstructing School Facilities to Be Earthquake Resistant)

Before the disaster, Miyagi Prefecture had promoted the renovation of school facilities to be earthquake-resistant in preparation for the Miyagi-Oki (offshore) Earthquake which had been predicted to likely occur in the near future. Although no students were killed by collapsed school facilities caused by the earthquake, there were other signs of non-structural damage: the prefecture will need endeavor to prevent the damage from fallen and toppled objects caused by disasters, as well as make non-structural elements (i.e. indoor objects, such as ceiling materials and lightning apparatuses) earthquake-resistant. It is necessary to make all structures and components of school facilities even more earthquake-resistant.

[The Restoration of Essential Utilities and Public Facilities]

(Water)

Water facilities and aqueducts over rivers collapsed and were washed away especially in coastal areas. It was impossible to draw water from sources because saline water and evaporation residue exceeded water standards. Thirty five municipalities in Miyagi Prefecture experienced water outages amounting to approximately 612,000 households with water cutoff as of March, 2011.

Receiving support from outside of Miyagi Prefecture, business entities of the municipality gradually proceeded with restoration work. On April 17, the water supply was restored to all households in 30 municipalities. However, restoration took time and in the coastal area where enormous damage caused by the tsunami. The water supply was restored in September. During water outages, from the next day of the disaster, emergency water supplies were provided from nationwide business entities through the mutual assistance of JSDF and city water departments. For future disaster management, Miyagi recognized the importance of further strengthening mutual support systems between its cities. Also, it was important to restore lifeline as soon as possible. There were water supplies that had low water pressure and one's that made use of above ground water tanks. These water supplies sustained the lives of residents during restoration periods and it was an effective use of limited equipment and human resources.

(Electricity)

In Miyagi Prefecture, approximately 1,420,000 households lost power at 2:50 p.m. on March 11 in the wake of the disaster and came to be the worst electrical failure in the prefecture's history. Wide-range and prolonged blackouts severely impacted the operations of Miyagi Prefecture, its municipalities, and medical institutions. They also affected the restoration of lifelines such as sewerage facilities. Even with privately owned electrical power facilities had installed, there were fears of fuel running out. Electrical power was necessary in the early stages. There the Tohoku Electric Power Co. supplied power through emergency power source cars and coordinated with those in charge at lifeline facilities. Tohoku Electric Power Co. prevented a second disaster caused by electric outages, through efforts to supply electricity in the early stages. On June 18, power was recovered in all areas possible, excluding areas washed out by the tsunami.

(Gas)

Due to the damage to production facilities, ducts and pipes, eight prefectures and 19 regions experienced gas outages. About 400,000 households were waiting for the restoration. Gas Bureau, City of Sendai resumed supplying the city with gas by April 16. Except for the evacuation advisory areas, such as the eastern coast, where tsunami damage was enormous and restoration work impossible. In Miyagi Prefecture, gas supply was fully restored on December 11 except for the areas where repair was impossible.

In order to resume city gas supply, what was particularly effective was supply area's ramification, earthquake-resistant conduits, and duplicated supply lines, which the Gas Bureau, City of Sendai had previously worked on to prepare the city gas against disasters. Furthermore, with support from gas suppliers nationwide, repairs and opening operations were completed earlier than planned, as well. The municipalities and relevant organizations will need to learn from the damage done by this disaster and further study the operations and support acceptance systems in times of a large-scale disaster as well as study tsunami countermeasure for

facilities to minimize damage and restore the gas supply early.

LP gas supply bases located in the Pacific coast from Tohoku to Kanto, filling stations, and LP gas tank trucks were damaged by the tsunami. While procuring gas tank trucks, each LP gas wholesale company examined how to restore harbor facilities to reopen shipping and receiving. They did this by improving transportation from both within and outside the harbor. Approximately 65% of all households in Miyagi Prefecture use LP gas, and about 88,000 households were affected by the gas outages. On April 21, supplies were restored except for the areas where residential buildings collapsed. The restoration work was completed relatively early. There were massive amounts of containers washed away by the tsunami. In order to prevent a second disaster, LP Gas provision needs to coordinate with prefectures, municipalities, and relevant organizations and consider how to recover those containers in advance.

(Communication)

Exchange buildings and base stations of each telecommunication companies were damaged. There were other damages such as breaking of various types of cables. As a result, telephone and communication services of each carrier were disrupted. Each carrier implemented communication restriction and secured fuel to continue service. Also, with support from branches across Japan, they carried out emergency restoration measures. Furthermore, while their facilities were being restored, they provided various support by lending satellite-based mobile phones and cell phones to administrative agencies and disaster victims.

(Railway)

The Tohoku Shinkansen (superexpress) was damaged at approximately 1,200 places along its entire line. This included damage to the pillars of elevated bridges. However, there was no large-scale damage as the earthquake-resistance measures were up to date. Local train lines in the coastal areas had serious damage from the tsunami, while station buildings and train tracks were washed away or buried. The train tracks which remained above ground were buried in debris. The Sendai Subway, the Sendai Airport Access Line, the Abukuma Kyuko (express line), JR Freight, and the Sendai Rinkai Railway also had various types of damage.

Services on many JR lines in Sendai block recommenced by April 7. Because of the aftershock, train services were suspended again. The entire Tohoku line and Tohoku Shinkansen recommenced service one after the other on April 21 and April 29. As the restoration work proceeded, services resumed successively.

(Airport)

Sendai Airport and its related facilities were seriously damaged by the tsunami. Dirt, debris, and motor vehicles were scattered all over the main facilities such as the runway, taxiway, and apron. Some areas were flooded, and roadways were cracked. Prefectural underpasses near the airport caved in due to liquefaction and pavement subsidence, which exceeded regulated inclines and the fences surrounding the airport collapsed. The terminal was flooded up to the mezzanine second floor, and the first floor was completely destroyed.

During airport restoration, through cooperation with local companies, communication devices, private power generators, and water supply tanks were provided, restoring the office functions of the terminal. In addition, in cooperation with the Ministry of Land, Infrastructure, Transport, and Tourism (MLIT), the JSDF, the US Armed Forces, Miyagi Prefecture, and Natori City, rubble from the disaster was cleared from the airport premises. Through cooperation with MLIT, airport building companies, and airline companies, a portion of provisional

services started on April 13 and some domestic flights resumed. On July 25, regular domestic flight operations, 41 round-trip a day services restarted and temporary international flights went into service.

(Roadways)

All expressways in Miyagi Prefecture were closed immediately after the disaster. There were cracks and bumps on road surfaces. The national roads in coastal areas which were under direct control in Miyagi Prefecture were seriously damaged due to the tsunami. Three bridges were washed away on Route 45. Damage, such as submersion and accumulation of disaster rubble, were widely seen. Up to 1,437 roads controlled by Miyagi Prefecture were damaged. Also, at 128 locations, bridges managed by Miyagi Prefecture were damaged.

Miyagi Prefecture aimed to have traffic regulations lifted to restore damaged roadways. While assessing the importance of roadways, the prefecture set goals and took step-by-step measures to restore roadways. Since early recovery of fuel supplies and power restoration as well as securing to the relief routes to the disaster-affected areas were urgent matters, the prefecture handled it by "choosing and concentrating". The prefecture cleaned up roads to secure fuel transportation routes in Miyagi Prefecture from JX Nippon Oil & Energy Cooperation's Sendai Oil Refinery. The prefecture also prioritized restoring roads for Tohoku Electric Power Co., to resolve power outages promptly.

(Coastal Preservation Facilities)

Sixty three out of seventy seven coastal areas which had coastal protective facilities had severe damages. Seismic vibration caused the subsidence of embankments and the tsunami caused the collapse of embankments. Based on the act on public engineering utilities damaged by the Great East Japan Earthquake recovering works' representation by the National Government for local governments, Miyagi Prefecture requested that the national government carry out disaster recovery construction of a 17.8 km section of embankment along Sendai Bay's southern coast which is managed by Miyagi Prefecture. Accepting the request the national government took unified emergency measures and restoration regarding the 17.8 km bay section. As such, the prefecture then concentrated on the recovery construction of the northern coast. Coastal damage extended throughout Miyagi Prefecture, and it was effective to ask for direct management representation under the government promptly to carry out the recovery construction of the coast throughout the prefecture.

[Industries of Miyagi]

(Agriculture, Forestry and Fisheries)

Financial damages to the agriculture, forestry, and fisheries across Japan from this disaster amounted to approximately two trillion four hundred billion yen. The amount of damage to the field of agriculture, forestry, and fisheries in Miyagi Prefecture was about one trillion three hundred billion yen, which accounted for more than half of the financial damages in Japan, as of March 5, 2012. According to the survey by Ministry of Agriculture, Forestry, and Fisheries, the estimated area of agricultural land affected by tsunami, including washouts and flooding, in Miyagi Prefecture was about 15,000 ha, accounting for 63.6 % of disaster caused damage in Japan.

Miyagi Prefecture evaluated the damage to facilities using aerial photos, utilizing their previous experience with the same method from when the Iwate-Miyagi Nairiku (inland) Earthquake had occurred. Miyagi made estimates of the tsunami disaster protection good use of this experience, and confirmed damaged to facilities

using flood area maps and aerial photos. From these, the prefecture also estimated coastal disaster prevention forests' damage area and extent. This method was useful to obtain a rough estimate of the total damage promptly without troubling municipalities when the area damaged by tsunami was large and entering into the flooded areas was restricted due to the search operations. Accurately grasping the damage conditions in the field of agriculture, forestry, and fisheries is inextricably linked to the contents and scale of emergency and restoration measures to prevent the second disaster and managing facilities. It is important to apply these estimation techniques even in a large-scale disaster and pass on this knowledge and experience to other prefectures as well.

Restoration work for damaged facilities should be started early so that the lives of farmers and fishermen affected by the disaster can return to normal as soon as possible. The jurisdiction of rivers, waterways, and agricultural land is divided up between the national government, prefectures, and municipalities. By drawing up consignment contracts with seven municipalities where farmlands in Miyagi were seriously damaged and cooperating with the Tohoku Regional Agriculture Administration Office, the prefecture was able to efficiently clean up the debris from the whole of its major drainage channel, reducing the burden on local municipalities. In this disaster, the prefecture received advice, supplies, and dispatches of engineers from local governments with experience in disaster evaluation methods and the removal of salt from farmlands damaged by the tsunami. The knowledge provided by local municipal governments with disaster experience, was effective in dealing with the disaster promptly.

(Commerce and Industry)

As of December 10, 2013, the amount of direct damage costs in Miyagi Prefecture was estimated at around 590 billion yen for industry-related damages and 145 billion yen for commerce-related damages. This includes damage to buildings, products, machines, facilities, and equipment of business operators of commerce and industry caused by the earthquake and the tsunami. Other than the direct damage caused by the disaster, traders and manufacturers suffered from indirect damage such as a drop in sales caused by the suspension and reduction of business activities, and a decrease of local customers in the area where business facilities were located. Another example was that traders and manufacturers could not collect payments as their clients also suffered from the disaster.

To support companies which could not be fully supported by the government-financed aid projects alone and based on the needs of affected companies that suffered damage, Miyagi Prefecture institutionalized the prefectural independent projects. Also, the prefecture gave industry restoration support to a wide range of business operators. In addition, to promote the use of each support system, the prefecture made the restoration support system for small-and-medium sized businesses and made related information known using the prefecture's website. In cooperation with relevant organizations, the prefecture visited affected business operators and made efforts to grasp their situations while providing information. The prefecture gave detailed industry and commerce support gave business operators guidance and advice on writing up application forms when using support systems. For a full-scale recovery of the local economy, it is necessary to develop a system gives timely support, systematically visits companies which received subsidies, and grasps the progress of their status.

(Tourism)

Tourist facilities, assets, and routes took serious damage mainly in the coastal areas. Most of the facilities had to suspend their business operations for many weeks due to facilities being washed-away or damage and the

disruption of essential utilities, etc. Most trips to Miyagi Prefecture and overnight reservations were cancelled soon after the disaster. In terms of travel and tourism, entertainment and leisure trips were canceled due to moods of self-restraint and harmful rumors of the Fukushima Daiichi Nuclear Power Plant accident. Even areas unaffected by the tsunami passed up events and social functions. The tourism industry in Miyagi Prefecture was greatly affected by the significant decrease in tourist numbers.

On April 11, a month after the disaster, the prefectural governor made a public announcement across Japan to ask the public not to hesitate to Miyagi. From then on, through various media methods, Miyagi Prefecture made efforts to provide accurate tourism information and restarted their tourism public relations campaign to restore tourism from both inside and outside of Miyagi Prefecture. In comparison to the average year before the disaster, while the number of people using lodging facilities increased, tourist numbers had not recovered. Even in past disasters, it took decade to regain tourists. As such, it is necessary to continue to make an effort to attract tourists in cooperation with organizations concerned.

[Employment Measures]

This disaster caused devastating damage mainly in the coastal areas of Miyagi Prefecture. Many business facilities were forced to discontinue, suspend, or reduce their operations. However, after May, the rates of job availability in Miyagi Prefecture took an upward turn due to the increased number of job openings. Among the three prefectures of Miyagi, Iwate, and Fukushima, Miyagi Prefecture was the fastest in exceeding the national standard in the rate of job availability. In April 2012, the job availability rate in Miyagi Prefecture reached the top nationwide. The strong demand for manual labor led to the improvement of the employment situation. The large deteriorated unemployment rate and the number of employees that Miyagi Prefecture faced immediately after the disaster showed a trend towards improvement.

Since employment issues such as dismissal of employees, suspension of business operations, and cancellation of job offers for new graduates were a concern, Miyagi Prefecture gave support to secure employment for disaster victims and promote implement stable employment. However, employment conditions were more severe in coastal areas than in inland areas. Since the demand for manual labor varies according to industry and the jobs, discrepancies in employment between industries and occupational categories widened. Also, the demand from the disaster and emergency employment programs were persistently urgent. They had a specific period of operation or employment, which did not meet the request of disaster victims who hoped for longer employment.

In addition to creating emergency and temporary employment through disaster emergency employment programs, the prefecture and municipalities will need to make an effort to promote industry restoration, develop new industries rooted in communities, and develop them as a stable employment programs.

[Disposal of Disaster Waste]

In Miyagi Prefecture, according to the original estimate, the disaster produced approximately from 15.5 million ton to 18.2 million ton of debris and waste. In coastal areas in particular, the tsunami produced mass amount of waste, debris and other materials. In addition, houses and motor vehicles were washed away, which posed a problem in identifying the owners of property. Such circumstances served to further complicate matters.

Miyagi Prefecture individually confirmed the plans of 15 municipalities in coastal areas. Since 13 municipalities,

except for Sendai City and Rifu Town, desired to entrust the disposal of disaster waste, the prefecture established an agreement with these municipalities based on the Article 252-14 of the Local Autonomy Law and took on the administrative work for the disposal of the disaster waste. When dividing roles between municipalities and Miyagi Prefecture, municipalities separated combustible materials from incombustible at primary temporary dump sites under their jurisdictions. The prefecture took the separated waste from primary sites and disposed of it by compacting and incinerating waste at secondary temporary dump sites. Miyagi requested other prefectures to dispose of recyclables and other waste.

When disaster waste was brought into a primary temporary dump site, the waste was separated. This was an important step in disposing the massive disaster waste efficiently and at a low cost. However, there were cases, when securing temporary dump sites where a large amount of mixed debris had to be piled up due to the limited number of sites. Another example was there not being a location to keep damaged cars and since location space lacked, several lots were set up. For that, labor management and disaster victims' convenience were affected. It is important to draw up plans in advance to secure temporary dump sites for the disaster waste to more efficiently dispose of the waste.

In principle, when handling disaster waste, it is fundamental for municipalities to engage in disposal in accordance to the Waste Disposal Act. However, Miyagi Prefecture took into consideration the damage situations of affected municipalities and the large amounts of the disaster waste, and proposed a policy where the prefecture would take on the responsibility to dispose of the waste. It would have been extremely difficult for many municipalities to dispose large amounts of disaster produced waste on its own. As such, the prefecture will need to set up a disposal method and plans beforehand to dispose of such disaster waste.

Massive amount of high-pressure gas containers, poisons, and other various hazardous materials were washed away or scattered by the earthquake and tsunami. Miyagi Prefecture coordinated with relevant organizations and conducted hazard elimination operations while providing alerts. When dangerous materials were washed out, it could cause life-threatening situations. Therefore, it is important to take appropriate measures early. It is necessary for the prefecture to formulate contingency plans, develop systems with which Miyagi can cooperate with relevant organizations and deal with such situations.

[Applying Relevant Laws and Ordinances]

In this disaster, situations which could not be dealt effectively with under existing disaster laws and systems arose. Therefore, in various situations laws were flexibly applied and acts on special measures were established. However, there were situations in which the volume of paperwork increased in disaster-affected prefectures, resulting in preventable burdens being placed on disaster victims. Based on the flexible application of laws in this earthquake disaster, the national government will need to make efforts to demonstrate clear guidelines for establishing effective laws and systems and applying of laws flexibly.

[Efforts by the Prefectural Assembly]

During this disaster, the prefectural assembly engaged in various activities aiming at the restoration and reconstruction of the disaster-affected areas and the early recovery of affected residents' lives, activities including monitoring measures for restoration and reconstruction. The assembly was not only limited to looking over restoration and recovery policies being implemented, but also engaged in setting up a select committee,

conducting field surveys mainly in the coastal areas in the prefecture, exchanging opinions with town and city assemblies, and made operation request to the government.

[Imperial Visit]

On April 27, Their Majesties the Emperor and Empress visited Miyagi Prefecture. They paid visits disaster-affected areas and disaster victims in evacuation centers in Minamisanriku Town and Sendai City. Warm and encouraging words from Their Majesties the Emperor and Empress touched each disaster victim's heart and lifted up their spirits.

Chapter 5: Miyagi Prefecture's Public Relations and Press Activities

[Miyagi Prefecture's Public Relations and Press Activities]

Miyagi Prefectural Disaster Task Force Conference and the governor's press conference were held disclosed under standard protocol and imposed no attendance restrictions on the domestic and international press. They distributed conference records and data on damage conditions to all media and optimized both public relations activities and media interviews. Through unrestricted media, Miyagi could provide information frequently and had no issues with the press. The prefecture made efforts to provide accurate and clear provision of its understanding and estimation of conditions and issues, the content of policies dealing with the disaster, and the background of decisions and decision-making.

The press had the tendency to request accurate numbers regarding damages. However, on occasions where the disaster management task forces take an initial response, it is important to estimate and respond press promptly based on rough numbers in case information from the affected areas is not available. In the future, Miyagi will need to cooperate with press organizations and consider better ways to provide information.

After the disaster, Miyagi Prefecture received many inquiries both in and outside of Miyagi regarding the safety of residents. The prefecture received information from municipalities and released the lists of each municipal evacuation centers and evacuees on their website after careful consideration of protecting personal information. Also, the prefecture established the Miyagi Evacuee Information Hotline and responded to inquiries on evacuees' information by telephone. Through these efforts, it was able to offer useful information, but some municipalities were hesitant to provide information on evacuees. From here on out, it will need to discuss with municipalities in advance rules for handling the information of evacuees, while keeping in consideration the protection of personal information.

After the disaster, Miyagi Prefecture immediately changed their top page of their website to the top page of the disaster information website and developed public relations alerts for residents. The prefecture held a press interview for the media and provided information materials as needed, while making efforts to provide information to residents through various means including radio, commercials, information bulletin, and blogs. In times of a disaster, it is important to use every possible method to provide information and utilize each of their respective strengths.

[Activities of the Press]

During this disaster, the disaster news report system was quickly established in TV and radio, and alerts to

evacuate from the tsunami and information on the disaster conditions were released and reported swiftly. Newspaper extras were published on the day the disaster hit and newspaper companies in the disaster-stricken area continued issuing the paper without giving themselves any rest. However, the disaster condition reported in the early stages after the disaster, diverged vastly from the actual scale of the damage. This was because each press organization had difficulty gathering information in the disaster-affected areas. It is desired that each press organization develop a news coverage system that is highly resilient to disasters to the best of their ability. Also, based on the alerts for evacuating, it is demanded that emergency broadcast contents and methods be reviewed.

Press organizations made use of information that is sensitive to disaster victims from social media. After a certain period of time passed since the occurrence of the disaster, both NHK (national public broadcasting organization) and private broadcast stations planned and broadcasted original special programs on the disaster. They continued to make efforts to report the present condition of the disaster-affected areas and the challenges of reconstruction. However, there were cases that the broadcast contents did not fully meet information needs of disaster victims and regional differences according to news reports were observed. Based on residents' evaluation on disaster reports and valid efforts in this disaster, it is necessary to build and consider various systems for providing information.

Chapter 6: Dealing with the Nuclear Power Plant

[Management of the Onagawa Nuclear Power Plant]

Due to the tsunami, the Environmental Radioactivity Research Institute of Miyagi was completely destroyed and the Onagawa Nuclear Power Plant had severe damages caused by the earthquake and the tsunami. At its units 1, a fuel oil tank collapsed and a fire occurred on the high-voltage power panel. At the units 2, some of the functions of the emergency diesel generator and the reactor's auxiliary cooling water system were lost. Also, the environment radiation monitoring system server, radiation measuring instruments, mobile observation vehicle, four out of seven prefectural monitoring stations, and 10 out of 12 monitoring points (monitoring points for integrated dose) were completely destroyed.

Miyagi Prefecture supervised inspection of environmental radiation around Onagawa Nuclear Power Plant with the backup servers of the environment radiation monitoring system at the prefectural government office. Also, the prefecture conducted on-site inspections twice and confirmed the damage conditions of facilities as well as the kind of emergency safety measures being taken. With respect to the environmental radiation monitoring system around the Onagawa Nuclear Power Plant, Miyagi Prefecture started utilizing Germanium semiconductor detectors from January 23, 2012 and installed portable monitor link posts, which were replacements for the damaged monitoring stations. Mobile observations vehicles as well as machinery needed for analysis were also installed. The prefecture considered sites and equipment specifications for installing approximately ten fixed monitoring stations 10 to 30 km from the Onagawa Nuclear Power Plant.

During this period, the nuclear reactor's cold shutdown maintained, preventing radiation leakage at the Onagawa Nuclear Power Plant. Based on this experience, Miyagi Prefecture will need to continue, employing all means possible, to construct a safe and secure disaster preparedness system preparing for the worst case of another disaster or accident. This will entail reinforcing the contents of the regional disaster plans (nuclear disaster countermeasures edition), revising manuals and installing several monitoring stations

[Management of the Fukushima Daiichi Nuclear Power Plant Accident]

(Brief Outline of the Accident)

The Fukushima Daiichi Nuclear Power Plant lost all external power sources due to the disaster, however, power sources in the plant were secured and the reactors were cooled as the emergency diesel generators automatically started to provide power for the plant. After that the tsunami hit the plant, and power supply facilities such as emergency diesel generators and the seawater coolant pumps became unusable. Units 1 to 6 all lost AC power sources. Also, DC power sources were lost in units 1, 2, and units 4, resulting in the failure of the reactor surveillance and cooling systems at the central control room became inoperable. As such, the nuclear reactor housing structure was damaged, and radioactive materials were released into the air.

Although the amount of released radioactive materials was about ten percent of that in the Chernobyl Accident, the national government tentatively deemed the Fukushima Accident at level seven, the maximum level "major accident" according to the International Nuclear Event Scale, which is at the same level as Chernobyl Accident. Tokyo Electric Power Company (TEPCO) cooled the spent fuel pool, flooded the reactor and continued to cool it. As a result, the reactor reached cold shutdown conditions. Following this, on December 16, the Prime Minister declared the completion of step two of the work progress schedule for resolving the accident. According to the work progress schedule announced on December 21, the reactor is expected to finally and completely be decommission in 30 to 40 years.

On April 22, based on the Act on Special Measures Concerning Nuclear Emergency Preparedness, the national government declared a caution zone; the region within a 20 km radius from the Fukushima Daiichi Nuclear Power Plant. The area outside caution zone, the region outside a 20 km radius from the Fukushima Daiichi Nuclear Power Plant, was declared a planned evacuation zone where the yearly radiation dose could reach 20 mSv; the government requested the residents living in the area to evacuate to another location in a month. Furthermore, the national government established emergency evacuation preparation zones where residents may stay indoors or evacuate in cases of emergency. A lot of residents in Fukushima Prefecture evacuated from areas designated as caution zones and as planned evacuation zones and many of those residents evacuated to Miyagi Prefecture. Municipalities adjoining Fukushima prefecture in the inland area offered evacuation centers.

(Developing Inner Government Systems for Nuclear Accidents)

On March 15, Miyagi Prefecture discussed information sharing and future countermeasures in the prefectural government office. On July 19, the prefecture established the Tokyo Electric Power Company Fukushima Daiichi Nuclear Power Plant Accident Management Headquarters and held its first meeting to promote the examination and implementation of comprehensive and systematic countermeasures. At the second meeting, the prefecture established its fundamental policies for managing of the TEPCO Fukushima Daiichi Nuclear Power Plant Accident and the goals to restore Miyagi to its former secure and safe prefecture. Based on the long goals of the government, Miyagi Prefecture also was determined to reduce the lands yearly dose of radiation is less than 1mSv. At the third meeting, the prefecture established management plans for handling the TEPCO Fukushima Daiichi Nuclear Power Plant Accident, which summarize the efforts and specific projects for implementing goals and fundamental policies.

(Response to Radiation, Radioactive Measurements and Results)

In Miyagi Prefecture, cesium radiation which exceeded temporary regulated values was detected from grass samples in May and also from the beef from the cattle that consumed contaminated rice straw in July. As a result, the national government instructed the restriction of shipping. After these restrictions, shipment of wild mukitake mushrooms was voluntarily restricted in November. From January until March 2012, the instructions were given to restrict the shipment of wild shiitake mushrooms.

For schools, the radiation percentage in the air of school yards and playgrounds were measured at schools, kindergartens, and childcare centers. Also, the radioactive material in school lunches were measured and top soil at school and kindergarten yards were replaced. The Miyagi Board of Education posted a notice that outdoor swimming pools could be used as long as they meet the requirements of a clean pool. Furthermore, with the cooperation of Tohoku University, a water sample study of water in swimming pools at 49 schools was conducted three times from June to August, and the results were released.

From late March, following the request from Ministry of Health, Labor, and Welfare, Miyagi Prefecture measured radioactive materials in agricultural, marine products, and tap water. The result showed that radioactive materials were not detected in most of foods or the figures were far below the temporary regulated value, and thus safety of food from Miyagi Prefecture was confirmed. In addition, the prefecture distributed radioscopies to municipalities and conducted stationary measurements for doses of radiation and also held meetings with mayors of local municipal governments and with staff in charge to discuss information sharing and future counter measures.

From the early stages, Miyagi Prefecture announced measurements and examinations results on the website of each department in charge. In September, the prefecture launched a website called Radiation Information Site Miyagi and posted daily living information regarding decontamination and information for farm producers as well as each type of measured data. The prefecture supported the municipalities by setting up a decontamination team and conducted workshops for counter measures to reduce radiation doses. In addition, the prefecture set up temporary dump sites for contaminated rice straw, decontaminated pastureland, and made requests to the national government.

(Measures Against Harmful Rumors)

The shipment of industrial products, wide area disposal of disaster waste, agricultural and marine products, and the tourism industry were affected by the rumors accompanied with nuclear power plant accident. For this reason, Miyagi Prefecture emphasized the safety and security of Miyagi through various public relation activities and events, including measuring radioactive materials and releasing results to reduce damage done by rumors. The prefecture expects that it will take a considerable amount of time to completely dispel the effect of rumors and until the price of agricultural and marine products and the number of tourists to Miyagi Prefecture will return to its previous levels. It is necessary to continue proactive efforts to dispel these rumors.

(Compensation for Damage)

Regarding the compensations for the nuclear damage accompanied by the Fukushima Nuclear Power Plant Accident, it was decided that TEPCO would compensate all damages caused by the nuclear accident suffered by individuals, corporations, sole proprietors, and agricultural, forestry and fisheries workers. The compensation was enforced under the system of the compensation for nuclear damages, based on the Act on Compensation for

Nuclear Damages. Since October, Miyagi Prefecture has requested that the national government to address in its policies the damages done to the prefecture by rumors. In conjunction, Miyagi Prefecture prepared with the Japanese Agriculture Miyagi Compensation Conference a request for compensation of damages to TEPCO regarding not only actual damages from shipping restrictions etc. but also damages from rumors. In addition, the prefecture held brief sessions on the claim for damage in various places in Miyagi and provided consultations for individual farmers who do not affiliate with groups. The prefecture will continue to demand that TEPCO provide suitable and commensurate compensations for the damages caused by nuclear accident.

Chapter 7: Beginning Restoration

[Actions taken by the National Government]

On April 11, a month after the disaster, the government established the Reconstruction Design Council in Response to the Great East Japan Earthquake, consisting of 13 experts from various fields and the three prefectural governors of Miyagi, Iwate, and Fukushima. At the second Reconstruction Design Council meeting held on April 23, the governor of Miyagi Prefecture explained the damage conditions in the prefecture as well as the direction of reconstruction and prefectural policies based on a draft of the Miyagi Prefecture Basic Disaster Reconstruction Policy. The governor also offered several different proposals for reconstruction, such as establishing the East Japan Special Recovery Zones (tentative name), developing Tohoku as a backup region for crisis management for the national government, and securing public financing. On June 25, the Reconstruction Design Council submitted its report "Towards Reconstruction: Hope Beyond the Disaster" to the Prime Minister.

On June 24, the Basic Act on Reconstruction in Response to the Great East Japan Earthquake was officially announced and implemented. This act established basic principles for reconstruction and determined the responsibilities of the national and local governments. Based on the stipulations of the act the Reconstruction Headquarters in Response to the Great East Japan Earthquake, led by the Prime Minister, were established, and basic policies for reconstruction from the disaster were determined based on proposals from the Reconstruction Design Council. On-site headquarters were set up as local agencies in each of the three prefectures of Miyagi, Iwate and Fukushima. On February 10, 2012, the Reconstruction Agency was established. Together with the cabinet secretariat, the agency holds the authority to comprehensively coordinate government policies regarding disaster recovery from a higher standing than any individual ministry. The agency set up Bureaus of Reconstruction with two branch offices in Miyagi, Iwate and Fukushima, established offices in Aomori and Ibaraki prefectures, and organized a one-stop response system to consult and handle requests from local governments in affected areas.

In an effort to smoothly and promptly move forward from the Great East Japan Earthquake in compliance with the principles outlined in article 2 of the Basic Act on Reconstruction in Response to the Great East Japan Earthquake and to contribute to Japan's recovery, the Law for Special Zones for Reconstruction was implemented on December 26. The target areas of the Law for Special Zones for Reconstruction are 11 prefectures and 227 municipalities, 35 of which are in Miyagi Prefecture.

[Actions taken by Miyagi Prefecture]

On April 22, Miyagi Prefecture set up the Miyagi Prefecture Reconstruction Headquarters, led by the governor

of Miyagi. The headquarters reliably implements various policies for restoration, including promoting the Miyagi Prefecture Earthquake Disaster Recovery Plan. The Miyagi Prefecture Reconstruction Conference, attended by 12 committee members who are experienced academics and experts, was held in order to develop the recovery plan, which was based on a draft of Miyagi Prefecture Basic Disaster Reconstruction Policy adopted on April 11, and the Miyagi Reconstruction Conference examined different ways of thinking and concrete ideas regarding restoration.

Earthquake disaster recovery plans are commonly instituted following the provision of plans and bills by the national government. However, Miyagi Prefecture started formulating the plan ahead of the national government because it was prefectural policy to outline early restoration, determine opinions among disaster-affected areas, and then make proposals to the national government. Based on the proposals made at the Miyagi Reconstruction Conference and opinions sent in by prefectural residents, Miyagi Prefecture worked on formulating the Miyagi Prefecture Earthquake Disaster Recovery Plan. The draft version of the plan was approved at the September Regular Prefectural Assembly held on October 18 and Miyagi Prefecture's 10-year path to recovery was approved.

As an organization in charge of comprehensive planning, communication, and coordination of reconstruction efforts, Miyagi Prefecture rebuilt the existing planning department and set up the disaster reconstruction and planning department to coincide with the establishment of the Miyagi Prefecture Reconstruction Headquarters. Next, the prefecture promoted the restructuring and improvement of necessary organizations and personnel in addition to trying to increase the personnel at inner government department offices as needed.

[Outline of the Miyagi Prefecture Earthquake Disaster Recovery Plan]

The Miyagi Prefecture Earthquake Disaster Recovery Plan outlines the path to recovery for Miyagi Prefecture, which sustained enormous damage as a result of the disaster. As a proposal-based plan, it was formulated based on the idea that it is essential to incorporate drastic measures and new system plans in order to achieve recovery from this unprecedented disaster with cooperation from the prefectural residents.

Miyagi Prefecture estimated that it would take ten years to accomplish recovery, setting 2020 as the target year, and the Miyagi Prefecture Disaster Recovery Plan was divided into three stages: restoration, reconstruction, and development. The "seeds" of recovery were planted during the restoration stages in order to achieve results during the reconstruction and development stages.

To advance the recovery process, it is necessary to carry out a drastic reconstruction that is not limited to restoration and develop advanced communities while making better use of opportunities for government-industry-academia cooperation. To achieve this, the Miyagi Prefecture Earthquake Disaster Recovery Plan has ten recovery points and outlines proposals to the national government along with a request to realize them in addition to encouraging the promotion of joint efforts between prefectural residents and municipalities.

[Formulating Municipal Earthquake Disaster Recovery Plans]

In Miyagi Prefecture, 21 municipalities (15 coastal, 6 inland) had formulated recovery plans as of March 2012. In accordance with actual conditions in regions as well as the residents' wishes, municipalities in coastal areas incorporated multiple tsunami countermeasures and collective relocation in their plans while aiming to develop disaster-resistant communities. Municipalities in inland areas proceeded with formulating plans by making

various adjustments between departments such as establishing cross-department professional teams for each field. They also established investigative commissions with the help of experts and created opportunities for residents to participate by conducting surveys, holding citizen meetings, district social gatherings, and hearing public comments. These were to reflect the intentions of the residents.

When formulating recovery plans, one of the issues involved was incorporating concrete projects that had no sources of income. At resident information sessions, officials were often at a loss as to how to respond regarding the possibility of carrying out certain projects. Additionally, there were situations in which it was difficult to hold briefing sessions for residents due to lack of personnel who could respond to issues. Also, there was some difficulty contacting residents who were dispersed to temporary housing or evacuation centers, and some residents were still not at the stage where they could realistically think about reconstruction efforts. Nevertheless, the municipalities attempted to take into consideration the opinions of as many municipal residents as possible in formulating the recovery plans.

Chapter 8: Lessons of the Great East Japan Earthquake

In this disaster, while some measures and knowledge learned from past disasters were utilized, the damage caused by the large-scale tsunami seriously affected various operations such as rescue operations, support for disaster victims, emergency rehabilitation, and reconstruction. It became clear that the disaster management system that had been in place prior to the disaster was not sufficient.

The Great East Japan Earthquake brought about many important lessons for us, the survivors. In order to avoid coming up against a variety of unanticipated factors and circumstances, as happened during the Great East Japan Earthquake, Miyagi Prefecture has outlined 46 lessons across 13 fields. The lessons focus mostly on the tsunami disaster, the large-scale nature of the disaster, and other knowledge directly related to relevant organizations and people's lives.

1. Disaster Management Systems

	Lesson	Background Information
1	It is necessary to strengthen earthquake and tsunami resistance of equipment and facilities that will be disaster management bases as well as implement preparatory measures in case of long-term disruption of essential utilities.	<ul style="list-style-type: none"> *Disaster management bases such as institutional and government buildings were affected by the disaster, and equipment such as communication equipment and emergency generators was damaged. *There was a shortage of supplies and fuel for long-term power supply disruption. *Inadequacy in anticipating alternate bases and preparing facilities.
2	It is necessary to improve disaster task force's systems and to be able to flexibly respond to various situations	<ul style="list-style-type: none"> *Project numbers for disaster management increased and pre-planned personnel systems could not respond efficiently. *Tasks which were not stipulated in manuals came up. *Information sharing and comprehensive coordination between personnel and support personnel was insufficient.
3	When a disaster occurs, it is important for organization leaders to respond with prompt and appropriate judgment and action. Likewise, it is important to build a system which makes it possible to respond to disasters systematically, even in unanticipated situations.	<ul style="list-style-type: none"> *Prompt and appropriate judgment and actions made by organization leaders played a considerable role in disaster response.

4	It is necessary to have multiple means of communication while securing fuel and alternative means of communication which take into account damage from a disaster and long-term disruption of essential utilities.	<p>*Means of communication were cut off due to communication base stations being damaged or washed away, severed transmission paths, blackouts, etc.</p> <p>*Means of communication that initially functioned became unusable after running out of fuel.</p> <p>*Lines of communication were secured by borrowing communication equipment from the national government and communication carriers.</p>
5	A plan in which each disaster response constituent actively collects information is necessary instead of waiting for information from disaster-affected areas to come in.	<p>*After the disaster occurred, Miyagi Prefecture promptly dispatched personnel to municipalities to gather information and assess requests.</p> <p>*There were areas where dispatching personnel was difficult due to the damaged roads, flooding, etc.</p> <p>*The roles of dispatched personnel were unclear, preventing effective operations.</p> <p>*Miyagi Prefecture utilized meetings such as the Disaster Task Force Conference, in which relevant organizations participated and promoted information exchange.</p>
6	It is necessary to build a system for receiving support that functions effectively even in the case of a large-scale disaster.	<p>*Large-scale support activities were conducted in various fields.</p> <p>*Systems to receive support were underdeveloped. Also, it was difficult for the prefecture to coordinate and understand the needs of municipalities.</p>
7	It is necessary to improve measures to secure the safety of local government personnel, fire brigades, and firefighters who are involved in disaster response activities such as giving evacuation instructions during tsunami warnings.	<p>*Many personnel who gave evacuation announcements and instructions based on prior manuals lost their lives.</p> <p>*The activity guidelines at the time the warnings were issued were unclear. In addition, warnings and other information could not be passed along to the disaster management personnel.</p>
8	In the case of a large-scale disaster, it is necessary to continue to reinforce self-help and mutual-help so that damage can be reduced even in situations in which public-help is not enough.	<p>*There were examples of human casualties being prevented as a result of residents sharing information and evacuation guidance among each other in local communities. Also disaster response through self-help and mutual-help was effective in establishing and operating evacuation centers as well as in supply support.</p> <p>*Administrative agencies were damaged by the disaster and struggled to handle various matters that arose at the same time. The limits of government disaster response through public-help became apparent.</p>
9	It is necessary to improve disaster management skills and raise awareness among relevant personnel through practical training. Also, it is necessary to verify training results and incorporate them into manuals.	<p>*In some cases, response manuals prepared based on experiences from dealing with past disasters as well as practical training came to be utilized in disaster response activities.</p> <p>*On the other hand, there were also cases in which training was not effective because it had either been done for presentation or only involved training to set up and manage a disaster response site.</p>
10	It is necessary to develop disaster-resistant infrastructure and both reinforce and improve disaster countermeasures for early reconstruction.	<p>*While there was very little damage caused by the earthquake due to effective earthquake resistance measures, significant damage was caused by the tsunami.</p> <p>*In situations in which personnel and material resources were limited, rescue routes were secured early in an effort to utilize the resources efficiently.</p>

2. National and Local Government Cooperation and Support

11	It is necessary to review the cooperation and support systems among the national government, prefectural governments, municipalities, and relevant organizations during large-scale disasters.	<p>*Since the national government on-site disaster management headquarters were located at the prefectural government office, decision making, coordination, and problem resolution could be achieved promptly. Additionally, the on-site disaster management headquarters also took on a coordinating role between the prefectural government, municipalities, and the private sector.</p> <p>*Miyagi Prefecture and neighboring communities supported the municipalities and helped reduce their workload.</p>
12	It is necessary to improve disaster management capabilities through cooperation with wide-area local governments.	<p>*In municipalities where administrative functions were lowered, it was impossible to handle the large amount of tasks required for disaster response with the municipalities' own personnel. It was essential to handle situations in cooperation with supporting personnel.</p> <p>*In many prefectures, local governments sustained damage from the disaster at the same time. The agreements with the local governments in distant regions were effective.</p>

13	It is necessary to consider the fields of cooperation in the private sector and to confirm and improve cooperation systems by making agreements and conducting training.	<p>*Private facilities were utilized as evacuation centers and played a large role in supporting disaster victims.</p> <p>*Effective disaster response was done by cooperating with the private sector to procure relief supplies, dispatch experts for investigation, and procure equipment.</p> <p>*Many private companies were also affected by the disaster, resulting in some problems in cooperation between the public and private sector.</p>
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3. Provision of Supplies and Securing Fuel

14	It is necessary to develop emergency reserve, supply, and transport systems for food and fuel that take into account disaster conditions and support from outside the disaster-affected areas.	<p>*Reserve supplies were insufficient due to the large number of evacuees, and procuring supplies became difficult as communication and roads were disrupted.</p> <p>*Relief supplies from outside did not arrive at some evacuation centers for a few days after the disaster.</p> <p>*Sending supplies without waiting for requests from municipalities proved to be effective.</p>
15	It is necessary to build prompt and effective relief supply distribution systems through cooperation among the prefecture, local municipalities, and logistics companies.	<p>*Lack of daily essentials became a serious problem due to the large number of evacuees, damaged warehouses, and distribution being congested by supply chain disruption.</p> <p>*An enormous amount of relief supplies was sent to Miyagi and its municipalities from across the country, but operations at supply collection bases were insufficient and declined in functionality. Also, supply provisions by administrative personnel were inefficient and supplies going to disaster victims were temporarily delayed.</p> <p>*Through cooperation with logistics companies, a prompt supply provisions system was established.</p>
16	It is necessary to build a fuel provisions system that cooperates with related industry groups, in order to minimize impact on residents' lives and operations of organizations lacking fuel.	<p>*All areas of Miyagi experienced serious fuel shortages because Miyagi oil refineries and oil deposit sites as well as related facilities in coastal areas were damaged by the disaster. Even governmental agencies had to wait for oil fuel supplies, and oil supply restrictions were put in place. Difficulties in obtaining fuel continued, hindering disaster relief.</p> <p>*It took approximately one month for the fuel demand to subside.</p>

4. Rescue Operations

17	It is necessary to establish response methods that smoothly and quickly process and evaluate the priority of unreliable and redundant information.	<p>*Many requests for rescue were sent directly to the prefecture since phone calls did not reach police and fire stations.</p> <p>*There was a lot of unreliable and redundant information, including false rumors, resulting in confusion. Judging priority became difficult.</p>
18	In times of large-scale disasters caused by tsunami, it is necessary to conduct evacuee rescue operations in isolated areas and islands by actively using helicopters to assess damage.	<p>*Due to the flooding caused by tsunami, land-based activities were restricted. In many situations, helicopters were required to assess damage conditions, rescue disaster victims in isolated areas, and deliver supplies.</p> <p>*Coordination operations became saturated since so many helicopter dispatch requests were received. Also, in some cases, helicopter operations became difficult due to bad weather.</p>
19	It is necessary to develop standard rules to clarify methods for operation management and sharing information with relevant organizations in operation sites.	<p>*Conducting joint disaster prevention drills with relevant organizations during times of calm led to smooth cooperation. However, full cooperation could not be achieved because there was no agreement regarding languages and rules when working together.</p>
20	It is necessary to consider measures to prevent damage to needed equipment and to improve and upgrade equipment, taking into consideration operation in tsunami-flooded areas.	<p>*Equipment needed in operations was damaged by the tsunami and the counter measures were carried out with limited equipment.</p> <p>*Preparation of equipment necessary for working in tsunami flooded areas was insufficient.</p>

5. Evacuation Systems

21	Based on the actual conditions of local communities, it is necessary to consider and organize various means of transmitting information and reliably transmit information to residents.	<p>*Situations came up in which adequate evacuation announcements could not be given due to traffic congestion, blocked roads, and disrupted means of transmitting information.</p> <p>*There were also cases in which evacuation announcements did not lead to prompt evacuation by residents.</p>
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22	It is necessary to prepare evacuation facilities and evacuation routes that ensure safety. Furthermore, in times of calm, it is necessary to conduct training and spread information so that residents can safely evacuate during disasters.	*As places to evacuate from the dangers of a tsunami disaster, designated evacuation centers did not guarantee the safety of residents. *Some people became victims because disaster training was conducted at places other than proper tsunami evacuation sites or because they evacuated by car.
23	If there is a possibility of a tsunami, heading for higher ground as soon as possible without adhering to past experiences or assumptions is very important.	*There were people who evacuated and went to further higher ground according to tsunami warning announcements, evacuation instructions and guidance, news, etc. *However, there were also people who did not evacuate based on past experiences with tsunami or because their residence was out of the predicted tsunami flood zone.
24	It is necessary for local communities to consider information transmission systems and methods for accepting people who cannot return home through cooperation with business operators.	*Contrary to expectation, there were people who could not return home not only in city centers and tourist spots but also major transportation areas. *People who had difficulty returning home evacuated to designated evacuation centers, government facilities, and private facilities. Designated evacuation centers became chaotic and lacked supplies due to an excess of accepted evacuees.

6. Evacuation Centers and Disaster Victim Support

25	It is necessary to improve the functions of evacuation centers.	*Due to the long-term disruption of essential utilities and large number of evacuees, evacuation centers needed to function as disaster management bases in communities to provide information and distribute supplies to evacuees and stay-at-home evacuees. *Due to means of communication being undeveloped or disrupted as well as a lack of supplies, some designated evacuation sites could not fully function as evacuation centers.
26	It is necessary to develop a system for establishing and managing effective evacuation centers through cooperation with evacuation center facility managers, local residents, and municipalities.	*It was difficult for dispatched municipal personnel to establish and manage evacuation centers according to plans made in advance. The necessity arose for facility managers, school faculty members, and community leaders to manage evacuation centers. *Municipalities were at a loss over how to assess and support undesignated evacuation centers and stay-at-home evacuees. *Various factors had to be taken into consideration when assessing needs and providing support for disaster victims, including: sex, age, disabilities, changing needs depending on the season, etc.
27	It is necessary to promote understanding among local residents in regards to creating a system to smoothly evacuate outside of municipalities. It is also necessary to develop a mutual cooperation system with the evacuees' evacuation centers and the local governments of the areas from which they evacuated.	*There was no prior plan regarding evacuation outside of municipalities, and a limited number of disaster victims did not evacuate based on their emotions regarding leaving their municipalities. *Through cooperation and support from the local governments to which the victims evacuated, management of evacuation centers went along smoothly. *It was difficult to understand the conditions of the people who evacuated voluntarily, so there were cases in which support from the government did not reach evacuees.
28	It is necessary to define the intended use of the evacuee list. Prior consideration is necessary so that information on evacuees' safety can be promptly provided while protecting personal information.	*Miyagi Prefecture and municipalities were requested to provide information on residents' safety due to long-term disruption and congestion of communication means. *Miyagi Prefecture and municipalities put evacuee lists online while making sure to take privacy of personal information into consideration. However, since there was no standard format for the list, it took time and effort to organize the data. Also, there were municipalities that decided not to release a list of evacuees to protect the residents' personal information.
29	Advance preparation and smooth coordination with relevant groups is necessary to secure emergency temporary housing early, as this housing is the first step for disaster victims to rebuild their lives.	*There was a lack of building sites for prefabricated temporary housing. In addition to public property, private property and sites outside of Miyagi Prefecture were secured. Much time was needed to build temporary housing and construction equipment was in short supply. *As supplemental measures, Miyagi Prefecture provided emergency temporary housing by using the privately rented housing leasing system. Since there were more applications for the housing than originally estimated, processing of paperwork was greatly delayed.

30	In addition to effectively increasing public knowledge in regards to the disaster victim support system, it is necessary to improve the support and consultation system while considering the burden placed on disaster victims and work towards rebuilding the lives of disaster victims.	<p>*Necessary information did not fully reach a number of evacuees including stay-at-home evacuees, people who moved into privately leased temporary housing, and those who evacuated outside of their municipalities.</p> <p>*There was confusion and misunderstanding among disaster victims because of publicity for information regarding various support systems was inadequate.</p> <p>*Some municipalities could not secure personnel, and it was difficult to provide consultation services.</p>
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7. People Requiring Assistance in Times of a Disaster

31	It is necessary to promote assessment of people requiring assistance and share information between relevant personnel by means of developing and updating a name list during times of calm. It is also necessary to arrive at an agreement in advance regarding proper handling of the list.	<p>*In communities where information on people requiring assistance in times of a disaster was shared, prompt support was given to them during evacuation and their time as evacuees.</p> <p>*There were cases in which it took time to utilize the list due to concern regarding protection of personal information. Also, there were people whose names were not on the list, requiring extra time to assess their needs for assistance.</p>
32	It is necessary to build a support system enabling cooperation with local communities while preparing means to transmit various information that is needed for people requiring assistance.	<p>*Many lives were lost because people who needed support and protection could not get the necessary information for evacuation and were not able to judge whether they should evacuate or not.</p> <p>*Municipalities, municipal branches of the Council of Social Welfare, firefighters, neighborhood associations, and district welfare officers worked together and gave support to evacuees requiring assistance.</p>
33	It is necessary to develop support systems that take into consideration the variety of people requiring assistance.	<p>*In addition to such inconveniences of facility as some evacuation places not being barrier-free, there was a shortage of evacuation space for various people requiring assistance as well as a lack of provided information.</p> <p>*Advance preparation and systems for support were insufficient.</p>
34	It is necessary to develop a system to establish and manage welfare evacuation centers quickly and smoothly while further promoting agreements and the designation of welfare evacuation centers.	<p>*Many of the facilities designated as welfare evacuation center beforehand and their personnel were affected by the disaster, making it difficult to accept evacuees.</p> <p>*The establishment of welfare evacuation centers capable of accommodating people with disabilities, pregnant women, and infants was insufficient.</p> <p>*Securing supplies and personnel was difficult. Municipalities were at a loss over how to operate welfare evacuation centers due to unclear division of roles.</p>

8. Healthcare

35	It is necessary to improve and enhance the information gathering and sharing system as well as the support system for long-term operations in order to promptly provide appropriate medical care for the sick and wounded in times of a disaster.	<p>*There were situations in which many DMATs (Disaster Medical Assistance Teams) had to wait at gathering bases due to the lack of information, which posed problems for their operations. Miyagi Prefecture was at a loss over how to manage the dispatch of medical relief groups, and sometimes their operations overlapped.</p> <p>*The prefecture needed to extend the operation period of DMAT and dispatch long-term medical relief groups because medical institutions, especially those in coastal areas, lost their medical functions. Constant efforts were required to secure activity bases and personnel.</p>
36	It is necessary to reserve various medical supplies not only for wounds and injuries, but also for chronic diseases. It is also necessary to develop a distribution system for medical supplies.	<p>*There was a large discrepancy between the demand for medical supplies and the emergency medical supplies available, in particular medication for chronic diseases.</p> <p>*Due to shortages of fuel and personnel, it was difficult to deliver medical supplies by land. Furthermore, bad weather and problems on the receiving side posed a problem in providing medical supplies to flooded areas by helicopter.</p>
37	It is necessary to develop a systematic support system according to the steps required for maintenance of good health, public hygiene, and mental health care for the disaster victims. It is also necessary to improve cooperation among the various fields.	<p>*Many disaster victims were forced to live inconvenient lives at evacuation centers or emergency temporary housing for long periods of time. Taking measures to maintain good health and public hygiene became a pressing matter.</p> <p>*There were many disaster victims who needed mental health care. Maintaining good health both physically and mentally became an issue.</p>

9. Volunteer Activities

38	It is necessary to provide effective support by improving the reception system for volunteers and dissolving the mismatches between the demand for supplies and volunteers.	<p>*Time was needed to establish volunteer centers because branches of the Council of Social Welfare, a volunteer reception association, were affected by the disaster. At first, the volunteers' range of activities was limited due to difficulty in securing means of transportation and the effect of the tsunami.</p> <p>*With support from the Council of Social Welfare both within and outside of Miyagi Prefecture and by establishing cooperative volunteer centers with NPOs, the prefecture could accept many more volunteers. However, there were mismatches between volunteer needs on the supporting and the receiving sides.</p>
39	It is necessary to connect the functions of various support groups with providing support for victims during the early stage after the occurrence of a disaster by sharing information and improving cooperation with administrative bodies and NPOs.	<p>*Since administrative bodies cooperated with NPOs and support groups, it became possible to give well-customized support to disaster victims and to respond in areas within which support had not been given.</p>

10. Disposal of Disaster Waste and Hazardous Materials

40	It is necessary to build a disposal system for disaster waste promptly.	<p>*An enormous amount of waste, containing a mixture of various items, was produced as a result of the tsunami. Promptly disposing of these items became an issue since the owners needed to be identified.</p> <p>*Miyagi Prefecture took charge of the disposal from municipalities, disposing of the waste with cooperation from other local public organizations.</p>
41	It is necessary to develop a cooperation system that prepares for the possibility of a tsunami washing away hazardous materials.	<p>*Due to the earthquake and tsunami, various dangerous items and hazardous materials such as high-pressure gas containers and home-use gas (liquefied petroleum gas) were washed away from dangerous materials facilities and general households.</p> <p>*Firefighters, police, hazardous waste management companies, and health and welfare officers worked together to collect washed away containers whose owners were unknown, even though there were no preparations for handling dangerous materials and hazardous waste.</p>

11. Recovery and Restoration

42	To realize an even more effective recovery promptly and smoothly, it is necessary to create a legal framework for recovery in anticipation of a large-scale disaster. It is also necessary to examine measures for recovery and develop means for residents to reach consensus before a disaster.	<p>*Similar to large-scale disasters in the past, the framework for this disaster was drawn by establishing the Act on Special Measures.</p> <p>*Issues such as personnel shortages arose in formulating restoration plans.</p>
43	It is necessary to have support based on the needs in disaster areas rather than previous systems.	<p>*The agriculture, forestry, and fisheries industry, trade and manufacturing, and tourism industry experienced direct and indirect damage not only as a result of the earthquake and tsunami, but as a result of other secondary disasters such as the nuclear power plant accident as well.</p> <p>*The national government expanded support for early recovery and restoration in various areas. However, Miyagi Prefecture and its municipalities conducted their own support for fields in which the national government was not able to provide support.</p>

12. Development and Application of Laws

44	It is necessary to make sure that the national government, prefecture and municipalities can take prompt and smooth action in case of a disaster by establishing and flexibly applying a viable legal system based on this disaster.	<p>*The disaster called for a response beyond the provisions established by laws. In addition, confusion was caused by the flexible application of intermittent laws.</p>
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13. Disaster Prevention Education and Passing Down Lessons

45	It is necessary to further promote disaster prevention education in various settings such as schools, communities, and businesses with the goal of preparing every single person for the occurrence of a disaster and protecting their lives.	<p>*There were people who avoided danger because of what they learned based on past earthquake and tsunami experiences; however, there were some who were giving evacuation instructions and ended up becoming victims of the disaster.</p> <p>*There were examples of disaster preparations done on a routine basis helping not only the residents in those communities, but those in neighboring communities as well.</p>
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<p>46 It is necessary to leave behind varied records of knowledge, experiences, and lessons related to natural disasters and correctly pass them down to the next generation both within Japan and overseas.</p>	<p>* While there were cases in which people's lives were saved as a result of past records and lessons being handed down, there were also cases in which lives were lost because the meaning of those lessons was not correctly understood and preserved.</p>
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Chapter 9: The Current State and Future Direction of Earthquake and Tsunami Research

[The Direction of Japan]

The Headquarters for Earthquake Research Promotion founded after the Great Hanshin-Awaji Earthquake formulated "Promotion of New Earthquake Research: Comprehensive Basic Policies for the Promotion of Earthquake Research through the Observation, Survey, and Research" in April 2009, under which the headquarters has promoted the study and research on earthquakes.

Based on the fact that there were many problems regarding earthquake research study following the Great East Japan Earthquake, the Headquarters decided to review the New Comprehensive Basic Policies so that the performed earthquake study and research could truly contribute to disaster management and disaster risk reduction. The Headquarters held seven policy committee meetings after December 2011. At these meetings, the Headquarters worked to extract issues and topics in the earthquake research study based on the Great East Japan Earthquake. It also examined the state of disaster response and progress in relevant government ministries and research institutions, the current application of earthquake research study at local public organizations and private companies, and problems that arose when using the research study. After careful discussions about the way to study and research earthquakes in the future, the Headquarters revised the New Comprehensive Basic Policies in September 2012 and set basic goals regarding earthquake research studies to be addressed in the next decade.

[Efforts by Tohoku University]

At Tohoku University, disaster research was mainly promoted by the Graduate School of Engineering and Graduate School of Science. By cooperating with public administration (Miyagi Prefecture, Sendai City, etc.), industry (Tohoku Electric Power Co., Inc., NTT EAST, etc.), and the Miyagi Prefecture Medical Association, the researchers at the Tohoku University Disaster Control Research Center, Graduate School of Engineering and the Research Center for Prediction of Earthquakes and Volcanic Eruptions, Graduate School of Science established the Miyagi Earthquake Research Conference in 2003. To further expand disaster research to the whole university, the Tohoku University Research Group on Disaster Prevention and Management was organized in 2007. The following year this group had 20 researchers in 19 fields. As a cross-department research group, it was able to organize unique and multifaceted teams.

The project submitted to the Ministry of Education, Culture, Sports, Science and Technology by the Tohoku University Research Group on Disaster Prevention and Management was adopted as a 5-year project from FY 2010, and cross-department research on disaster prevention started full-force. When not a full year had passed, the Great East Japan Earthquake occurred on March 11, 2011. The members of the group immediately started support activities in disaster-affected areas and began research and study activities.

In April 2011, Tohoku University announced a plan to establish a research institute for disaster science based

on the Research Group on Disaster Prevention and Management. In order for the university to set up the Institute for Disaster Reconstruction and Regeneration Research and contribute to restoration and recovery from the Great East Japan Earthquake, a system to develop seven leading projects from International Research Project on Disaster Science was organized. The mission of Tohoku University is to prevent a large-scale disaster like the Great East Japan Earthquake from happening again. By establishing the system for the Research Group on Disaster Prevention and Management/International Research Project on Disaster Science, the movement to create research institutions was accelerated. Under the cooperation of the university as a whole, the International Research Institute of Disaster Science (IRIDeS) was opened on April 1, 2012.

Based on the experience and lessons of the Great East Japan Earthquake, IRIDeS aims to reform society's way of responding to natural disasters and the national government's measures regarding natural disasters and calamities as well as create a new paradigm to prepare for large-scale disasters. Through this, IRIDeS aims to lay the foundation of practical disaster prevention studies pointing to specific problem-solving to reduce the damage by a large-scale disaster both within Japan and overseas.

Chapter 10. The Promotion of Disaster Prevention Measures Applying Lessons of the Great East Japan Earthquake

The Great East Japan Earthquake pushed Japan to conduct a major review of its disaster prevention measures. Based on this disaster, the national government revised the Disaster Countermeasure Basic Act twice in June 2012 and June 2013. In anticipation of another large-scale disaster, the Reconstruction Headquarter of National Government and the Basic Guidelines for Reconstruction were officially legislated, and with the goal of enabling prompt recovery following a large-scale disaster, a new law was enacted in June 2013 regarding recovery from large-scale disasters.

Based on the amendment of the Disaster Countermeasure Basic Act, Miyagi Prefecture conducted a major review of the Miyagi Regional Disaster Management Plan in FY 2012 and 2013 and included preventive measures, emergency measures, and recovery and reconstruction measures based on the lessons from the disaster. The municipalities in Miyagi Prefecture are also working on amending the municipal regional disaster management plans based on the actions of the national and prefectural governments. The following are the disaster prevention measures that Miyagi Prefecture and its municipalities have been promoting since the disaster.

Section	Efforts being Promoted	Main Related Points of Ch. 8
[Development of Disaster Management Infrastructures]		
Development of Means to Gather and Transmit Information	<p><National Government> Expanding public information commons to utility agencies</p> <p><Prefecture> Renewal of satellite-based disaster management radio systems, maintenance of a portable Very Small Aperture Terminal system (VSAT), cooperation with the public information commons Miyagi Integrated Disaster prevention Online system for Rapid and accurate Information (MIDORI)</p> <p><Municipalities> Start introducing and utilizing emergency mobile phone e-mail services, provision of broadcast and mobile style disaster management radio systems for evacuation centers, introduction of independent power supply for coastal tsunami monitoring systems</p>	1 Disaster Management Systems

Preparing Base Facilities and Making Buildings and Structures Earthquake Resistant	<p><National Government> Construction of the Sendai First Regional Union Office, which act as a disaster prevention base, reconstruction of Ishinomaki Harbor Union Office</p> <p><Prefecture> Development of wide-area disaster prevention base, formulation of a fundamental plan for the maintenance of Ishinomaki and Kesenuma government office complex to secure earthquake and tsunami resistance, subsidizing the expenses for making private school buildings earthquake-resistant, assistance in earthquake retrofitting of wooden houses</p> <p><Municipalities> Development of disaster management centers, assisting seismic diagnosis and seismic retrofitting, earthquake-resistant measures for bridges and buildings, making school facilities earthquake-resistant</p>	2 National and Local Government Cooperation and Support
Disaster-Resistant Town Development	<p><National Government> Legislation Act on Regional Development in Tsunami Disaster and comprehensive tsunami measures</p> <p><Prefecture> Development of tidal embankments/seawalls and multi-level defense facilities, promotion of reconstruction and town development projects, recovery housing</p> <p><Municipalities> Maintenance of evacuation routes, tsunami evacuation buildings, etc.</p>	1 Disaster Management Systems
Development of Evacuation Sites and Centers	<p><Prefecture> Formulation of facility maintenance guidelines for tsunami evacuation</p> <p><Municipalities> Designation of emergency evacuation centers and points, adding evacuation sites and centers to disaster prevention maps, development of tsunami evacuation towers and buildings</p>	1 Disaster Management Systems
[Improve Disaster Management Capabilities]		
Revision of Outlines and Disaster Management Manuals, etc.	<p><Prefecture> Improving and updating Prefectural Disaster Task Force systems by revising outlines and manuals regarding the management of disaster management headquarters, verifying comprehensive disaster drill systems</p> <p><Municipalities> Exchanging opinions with local residents and using their opinions to improve manuals</p>	1 Disaster Management Systems
Improve Efforts for Self-Help and Mutual-help	<p><Prefecture> Improvement of the Miyagi Prefecture Disaster Management Instructors Training course, creation of a new follow-up course, conducting more practical disaster drills</p> <p><Municipalities> Fostering community disaster management leaders and leaders of voluntary disaster management organizations, conducting disaster drills (targeting all residents, emergency relief drills, etc.), distribution of emergency relief manuals and notebooks to all households</p>	1 Disaster Management Systems
Efforts for Reliable Tsunami Evacuation	<p><National Government> Improvement of tsunami warnings</p> <p><Prefecture> Revision of the Miyagi Prefecture Tsunami Countermeasures Guidelines</p> <p><Municipalities> Conducting disaster drills for evacuation by car, investigation of issues occurring during evacuation, conducting evacuation guidance in a commanding manner</p>	5 Evacuation Systems
Disaster Prevention Education	<p><National Government> Issue a guidebook for creating of a school disaster prevention manual, implementation of comprehensive support projects for practical disaster prevention education</p> <p><Prefecture> Formulation of Miyagi school safety basic guidelines, creation of school disaster prevention manual and guide, stationing of disaster reduction managers and head teachers in charge of disaster reduction, creation of supplementary disaster prevention education books</p> <p><Municipalities> Formulation and implementation of the guidelines for disaster prevention education, training for school faculty staff, creation of supplementary books</p>	13 Disaster Prevention Education and Passing Down Lessons
[Wide-Area Cooperation and Agreements]		
Wide-Area Cooperation Systems	<p><National Government> Establish new coordination stipulations, widen the scope of support operations</p> <p><Prefecture> Improvement of Prefectural Disaster Task Force systems, review agreements among Hokkaido and the seven Tohoku prefectures (including Niigata), develop wide-area disaster management bases</p> <p><Municipalities> Make mutual support agreements</p>	2 National and Local Government Cooperation and Support
Cooperation and Agreements Regarding Logistics	<p><National Government> Establishment of councils regarding construction of logistic systems resistant against disasters</p> <p><Prefecture> Make agreements with distributors, participate in training, push delivery policies, assess the list of transportation destination in municipalities</p> <p><Municipalities> Make agreements with transport service providers</p>	3 Provision of Supplies and Securing Fuel

Cooperation and Agreements Regarding Fuel	<p><National Government> Revise of Oil Stockpiling Act, implement promotion of underground emergency gasoline tank storage in case of disaster</p> <p><Prefecture> Complete an important facilities memorandum with the Petroleum Association of Japan, make adjustment with Oil Commerce Partnership, consider use of the stockpiling promotion by the national government</p> <p><Municipalities> Make agreements with business operators</p>	3 Provisions of Supplies and Securing Fuel
Cooperation and Agreements in Other Fields	<p><Prefecture> Conclude agreements with Yahoo and Google, mutual create a support system for industrial water services, coordinate with groups responsible for measures for people unable to return home</p> <p><Municipalities> Government-academia cooperation with Tohoku University, conclude agreements regarding measures for people unable to return home, conclude agreements with building contractors</p>	2 National and Local Government Cooperation and Support
[Initial Response and Emergency Operations]		
Assessing and Judging Situations	<p><Prefecture> Establish initial dispatch procedures to municipalities (clarify division of roles for dispatched personnel, specify necessary equipment), secure satellite cell phones for all municipalities, conduct practical disaster drills, hold seminars to improve leadership ability and skills to take appropriate action in the initial stage for local chief executives</p>	1 Disaster Management Systems
Emergency and Firefighting Operations	<p><National Government> Create new standards for fire brigade equipment, unify markings, start centralized management style for helicopter dynamic management systems</p> <p><Prefecture> Consider the development of disaster management heliports</p> <p><Municipalities> Improve individual equipment at the fire department headquarters, deploy lifesaving boats, improve manuals and bylaws for securing safety of personnel, conduct mutual training with government-related organizations</p>	4 Rescue Operations
Medical Rescue Operations	<p><National Government> Revise Japan DMAT operation outlines</p> <p><Prefecture> Revise medical aid manuals(coordinate dispatch, cooperation, etc.), re-examine and discuss medical supplies, exchange opinions, consider operation of "Doctor-Heli" (air ambulance) with hospitals, DMAT dispatch agreements and training drills</p> <p><Municipalities> Agreements with medical and pharmaceutical associations, distribution of emergency safety kits</p>	8 Healthcare
People Requiring Assistance in Times of a Disaster	<p><National Government> Review support guidelines for people requiring assistance in times of a disaster and formulate action guidelines for people requiring assistance during evacuation</p> <p><Prefecture> Create support guidelines for people requiring assistance during evacuation</p> <p><Municipalities> Consider support based on national or prefectural guidelines, establish and manage welfare evacuation centers, conclude agreements regarding transportation and institutionalization of people requiring assistance</p>	7 People Requiring Assistance in Times of a Disaster
[Evacuation Centers, Disaster Victim Support, Rebuilding Lives]		
Evacuation Centers	<p><National Government> Formulate action guidelines for securing a good living environment in evacuation centers, demonstrate management of safety information</p> <p><Prefecture> Present basic policies regarding use of schools in Miyagi Prefecture as evacuation centers</p> <p><Municipalities> Formulate manuals, review supply reserve plans, conclude agreements with business institutions about supply procurement, utilize renewable energy</p>	<p>5 Evacuation Systems</p> <p>6 Evacuation Centers and Disaster Victim Support</p>
Health and Public Hygiene	<p><Prefecture> Promote measures concerning public hygiene and mental healthcare through public hygiene guidelines, formulate operation manuals, establish health support meetings for disaster victims</p>	8 Healthcare
Gender Equality	<p><National Government> Formulate action guidelines for disaster management and recovery from a gender equality perspective</p> <p><Prefecture> Issue disaster prevention and mitigation guides based on governmental guidelines, hold disaster prevention courses, appoint women to disaster prevention council</p> <p><Municipalities> Promote disaster prevention measures that incorporate women's viewpoints</p>	6 Evacuation Centers and Disaster Victim Support
Development of Living Environments	<p><National Government> Formulate manuals for construction of emergency temporary housing</p> <p><Prefecture> Conclude agreements for provision of privately leased housing, agreements for emergency repair support, problems related to transition to permanent housing, formulate examples of efforts</p> <p><Municipalities> Consider collective relocation, institutionalize interest subsidies and increase in assistance for rebuilding homes</p>	6 Evacuation Centers and Disaster Victim Support

Support for Rebuilding Lives	<p><National Government> Establish new regulations concerning disaster victim registration, implement employment creation projects, etc.</p> <p><Prefecture> Issue guidebooks about livelihood support for disaster victims, support projects for employment and small and medium enterprises</p> <p><Municipalities> Examine disaster victim registration, implement projects for securing employment</p>	6 Evacuation Centers and Disaster Victim Support
Wide-Area Evacuation	<p><National Government> Establish new coordination stipulations for wide-area evacuation</p> <p><Prefecture> Formulate policies concerning return support for those who evacuated outside of Miyagi Prefecture, station support for those who evacuated outside of Miyagi Prefecture in the Tokyo office</p>	6 Evacuation Centers and Disaster Victim Support
Volunteer Activities	<p><Prefecture> Formulate procedures for managing and consulting with relevant groups, hold a Miyagi Prefecture volunteer center support liaison conference</p>	9 Volunteer Activities
Disposal of Disaster Waste and Hazardous Materials	<p><National Government> Formulate guidelines for disaster waste measures</p> <p><Prefecture> Summarize problems and verify overall disaster waste disposal, formulate disaster waste disposal plans</p>	10 Disposal of Disaster Waste and Hazardous Materials
Countermeasures Related to the Tokyo Electric Power Company Fukushima Daiichi Nuclear Power Plant Accident	<p><Prefecture> Send out information through a portal website, inspect food and industrial products, distribute simple radioactivity measuring devices</p> <p><Municipalities> Create new community disaster management plans (nuclear disaster management)</p>	11 Recovery and Restoration
[Recovery and Restoration, Passing Down Lessons to Future Generations]		
Post-Disaster Reconstruction	<p><Prefecture> Measures for handling and improving public bidding</p> <p><Municipalities> Formulate guidelines for town development, make use of construction management method</p>	11 Recovery and Restoration
Recovery of Industry and Tourism	<p><Prefecture> Provide support for special agricultural zones, special fisheries zones, Japan Agricultural Cooperatives, Fisheries Cooperative Association, take measures against harmful rumors, hold campaigns and events to promote recovery of industry and tourism</p> <p><Municipalities> Promote recovery and restoration through special zones</p>	11 Recovery and Restoration
Information on Restoration	<p><Prefecture> Announce recovery conditions, distribute "Miyagi Fukko (Recovery) Press", send out "Miyagi Fukko no Ayumi" ("Miyagi's Steps Towards Recovery")</p>	11 Recovery and Restoration
Establishment of "Miyagi Chinkon no Hi" (Day of Repose for the Souls of the Disaster Victims)	<p><National Government> Hold memorial services</p> <p><Prefecture> Establish ordinances, set up tables for offerings of flowers and signing names, publish announcements in national papers</p> <p><Municipalities> Hold memorial services and related events</p>	13 Disaster Prevention Education and Passing Down Lessons
Passing Down Lessons to Future Generations	<p><Prefecture> Organize projects for passing down lessons and disaster management, construct digital archives in cooperation with municipalities, review disaster remains</p> <p><Municipalities> Conserve and publicize disaster materials, develop memorial parks, train storytellers, build disaster monuments</p>	13 Disaster Prevention Education and Passing Down Lessons

Conclusion

This document focuses on the actions carried out during the disaster by the prefecture, local municipalities, national government, disaster relevant organizations and other parties involved. It serves not only as a valuable lesson on the realities of the disaster response, but also serves as a foundation for creating advanced disaster prevention and reduction policies.

Since the disaster, the prefecture and other organizations have been carrying out infrastructure and system-related efforts and policies including projects to relocate residential communities to higher ground, constructing of seawalls, roads and other infrastructure for the multi-purpose defense system, improving the information communication system and creating evacuation plans that factor in the regional features. It is with the hope that these projects and policies will protect the lives of the people and reduce disaster damage in the event another similar or even greater disaster should occur.

In consideration of Japan's geography, topography and weather conditions, natural disasters can occur at any time and place, even before we start to forget about the recent natural disaster that occurred. Preparation efforts for such natural disasters must be carried out in a meticulous matter and continually be developed.

Based on recent scientific knowledge and historical facts, the efforts carried out will contribute in fostering better judgment in response to disasters and individual actions, which are important factors. While carrying out efforts based on "self-help" (protecting one's own life), efforts on "mutual-help" (protecting families and community members) and "public-help," (the role of the administration) will also be carried out effectively. By doing so, it is believed the disaster prevention and reduction policies can be further developed and the degree of importance will increase on these policies.

Additionally, in order to strengthen the efforts for "self-help," it is important for each person living in Japan to view what happened on that fateful day in the affected areas not as "their problem that happened in a specific place and time," but rather "our problem that can happen in our own area at this very moment." While firmly embedding this mentality, it is necessary to carry out all means of preparation.

For that reason, it is important not to let the lessons of this disaster be forgotten, but to continue sharing the stories with our future generations and to consistently establish the residents and local communities.

It is our duty as survivors of this unprecedented disaster.

Kenji Ishimori

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