

SENDAI

Towards a Disaster-Resilient and
Environmentally-Friendly City





Aiming to Make Sendai a 'Disaster-Resilient and Environmentally-Friendly City'

Having experienced the Great East Japan Earthquake, we realized once again that cities are exposed to a variety of disaster threats. Based on the lessons learned from this disaster, Sendai City is proceeding to build a 'Disaster-Resilient and Environmentally-Friendly City,' which will be prepared for threats from future disasters and climate changes.

With the affluent environment of Sendai - the City of Trees as our base, we are promoting 'urban development' by improving the resilience of infrastructure and energy supplies as well as promoting 'human capacity building' that will help support disaster prevention activities in local communities. We focus on 'mainstreaming disaster risk reduction' while incorporating disaster prevention and environmental considerations into every policy, and maintaining a high level of security and safety in the lives of our residents and in our economic activities, in addition to maintaining the city's comfortable living environment.

While passing on our experiences and lessons learned from the Great East Japan Earthquake to future generations and nurturing our residents' disaster prevention culture, we will continue to share information on our various efforts. We will communicate efforts carried out by local communities, NPOs, businesses and research institutions by making use of the domestic and international networks that were created through hosting the Third United Nations World Conference on Disaster Risk Reduction in Sendai in March 2015.

We will focus on contributing to the world's disaster prevention culture and establishing a city brand for a comfortable living environment and a high level of disaster preparedness.

Experiences and lessons learned from post-disaster recovery

History of building an environmental city of Sendai - the City of Trees

Disaster resilience

Disaster-Resilient and Environmentally-Friendly city for a secure future

Low Carbon
Global environment

Sharing information throughout Japan and the world

Contributing to world's disaster prevention and establishing a city brand

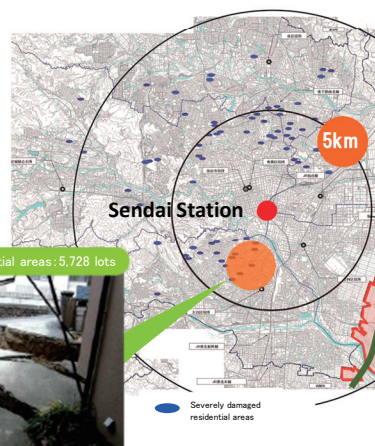
Outline of the Great East Japan Earthquake and the Damage Sustained

On March 11, 2011, Sendai City was struck by a tremendous earthquake with a magnitude of 9.0 that occurred off the Sanriku coast of northern Japan. The event recorded a maximum of 6 upper (on the Japan Meteorological Agency seismic intensity scale) in Sendai. The tsunami devastated the coastal areas of eastern Sendai. The city's hilly northwestern areas and their surroundings suffered significant landslides that damaged residential areas.

On the other hand, central Sendai did not suffer major damage such as that from the collapse of buildings or widespread fires; however, within the total municipal area, about 140,000 houses were either severely or partially damaged, or totally collapsed.

The disaster led us to face re-emerging challenges specific to urban areas, which include operation of the evacuation centers where, at a maximum, more than 100,000 people accounting for 10% of the city population stayed after the earthquake, providing short-term accommodation for stranded commuters who could not return home after the disaster, and responding to the needs of the elderly and people with disabilities.

| | |
|----------------------------|--|
| Casualties | :906 deceased, 27 missing, 2,275 injured (as of September 30, 2015) |
| Damage to buildings | : 30,034 totally destroyed, 27,016 severely damaged, 82,593 partially damaged, 116,046 minor damage (as of September 22, 2013) |
| Tsunami flooding | : 8,110 households affected (including 1,160 farming households) |



Damage to residential areas: 5,728 lots



-Resilient



The Third United Nations World Conference on Disaster Risk Reduction (WCDRR)

In May 2011, two months after the disaster, Sendai City announced their hope to host the United Nations World Conference on Disaster Risk Reduction to convey their experiences of the disaster and the recovery of the disaster-affected areas. In December 2013, the United Nations General Assembly passed a resolution to hold the conference in Sendai, and it was held from 14 to 18 March 2015.



Visitors at the Tohoku Reconstruction and DRR Pavilion (Sendai Mediatheque)



Study tour (Soma City, Fukushima Prefecture)



Closing ceremony (Sendai International Center)

The main conference of the WCDRR was attended by over 6,500 participants, including 25 heads of state, over 100 ministerial-level delegates and the Secretary-General of the United Nations, representing government delegations from 185 countries, 49 intergovernmental organizations, 188 non-governmental organizations, and 38 international organizations. The public forum events, such as symposiums and exhibitions, were attended by a total of over 150,000 participants. The WCDRR in Sendai was one of the largest international conferences of the United Nations held in Japan. Other events were held including study tours of the disaster-affected areas, excursions and receptions in cooperation with the six prefectures of the Tohoku Region.

The Sendai Framework for Disaster Risk Reduction 2015-2030

The Sendai Framework is the outcome document of the WCDRR and a successor to the Hyogo Framework for Action 2005-2015 that was adopted at the Second United Nations World Conference on Disaster Risk Reduction held in Hyogo Prefecture in 2005. Many countries have started to implement measures for disaster risk reduction based on the Sendai Framework for Disaster Risk Reduction, an international guideline up to 2030.

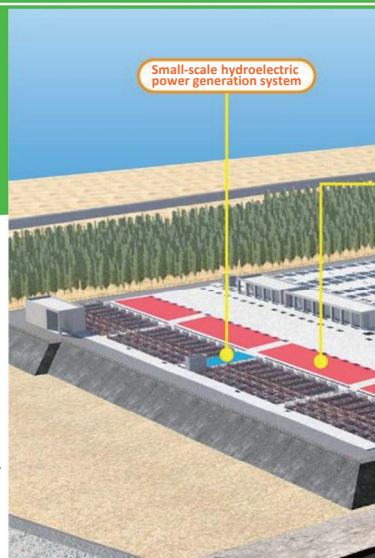
As a city where this framework was adopted, we are improving tangibles such as essential utilities and other infrastructure as well as promoting disaster prevention and disaster risk reduction on the community level where a variety of residents, including children, elderly people, women and those with disabilities, play a main role in the efforts.

Features of the Sendai Framework

- ① Global targets such as reducing the mortality rate from global disasters were agreed upon for the first time
- ② New ideas, such as mainstreaming disaster prevention, pre-disaster investment to be used in measures for disaster prevention and disaster risk reduction, and the concept of "Build Back Better" were presented
- ③ Emphasis on roles of various relevant stakeholders (refer to page 12), including women, children and the private sector to take a preventive approach to prevent disaster and reduce disaster risk

Addressing ‘Build Back Better’ in Urban Infrastructure that Supports Everyday Life

Sendai City is implementing disaster prevention and disaster risk reduction measures for a variety of urban utility systems, both in terms of knowledge and know-how, and in terms of equipment and facilities. These projects include restoration of the wastewater treatment facilities that suffered damage from the Great East Japan Earthquake and providing support for improving the earthquake resistance of detached houses and condominiums. In addition, along with making urban utilities resilient, we are promoting programs for energy-saving measures and wider use of renewable energy. From both the aspects of disaster prevention and environment protection, we aim to contribute to advancing the establishment of a sustainable society.



1 Restoration of Minami-Gamo Wastewater Treatment Plant

Before the disaster, the Minami-Gamo Wastewater Treatment Plant had been treating about 70% of Sendai's sewage. On March 11, 2011, a tsunami of over 10 meters in height hit the plant and caused catastrophic damage with building structures broken, its machinery and electrical facilities submerged or swept away, and transmission towers collapsed, resulting in the shutdown of sewage treatment functions. It was imperative to restore the plant promptly, since it was an indispensable utility in the everyday lives of the residents in Sendai. Along with removing debris from the tsunami and restoring the facilities and equipment at the plant, we held discussions on how to implement quick recovery. In September 2011, a restoration policy was decided to restore the plant with better functions than it had previously. It took one year to complete the design of a new plant. The plant was constructed in around three years while successfully reducing construction time from the average of ten years that are usually required to complete such projects.



Minami-Gamo Wastewater Treatment Plant flooded by the tsunami on March 11, 2011



A new plant with energy saving features and low environmental impact

The primary and final sedimentation tanks are a two-tray system and the compact reactor tanks are installed underground. The plant is elevated to handle tsunamis of Tokyo Peil* (T. P.) plus 10.4 meters in height and the building doors are water-tight so that the plant is able to resist a tsunami the size of the one that hit Sendai after the Great East Japan Earthquake. A wastewater treatment and discharge line is secured to allow treatment and discharging of the minimum amount of necessary wastewater without using a pump in the event of a blackout. A solar power generation system is installed. In addition, to reduce the use of commercial

power supply, a small-scale hydroelectric power generation system is also installed at the plant.

An approach of ‘Build Back Better’ is brought to the Sendai Framework. With this approach, recovery from the disaster does not simply involve rebuilding the damaged facilities and equipment to pre-disaster standards but includes both restoration and improvements to them to cope with future disasters.

The Minami-Gamo Wastewater Treatment Plant has been reconstructed based on this approach.

*Tokyo Peil (T. P.) refers to the average sea level of Tokyo Bay, which sets the standard for sea level height in Japan.

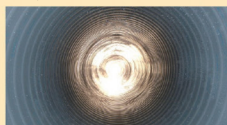
Efforts to improve earthquake resistance

- Improving the earthquake resistance of sewage pipelines in the combined sewer system area.
- Construction of the Third Minami-Gamo Main Line
- Improving the earthquake resistance of wastewater treatment plants and pumping stations

Sewage pipeline



Pre-improvement



Post-improvement

Inquiries

Minami-Gamo Wastewater Treatment Plant,
Construction Bureau kos011170@city.sendai.jp

2 Improvement in Earthquake Resistance of Underground Sewage Facilities

With the aging and deterioration of the facilities, road collapses have occurred due to faulty sewage pipes in addition to equipment failures occurring at wastewater treatment plants and pumping stations. The total length of the sewage pipeline in Sendai is 4,655 km, and about 200 km of the pipeline has exceeded its service life, and such cases are expected to increase in the future.

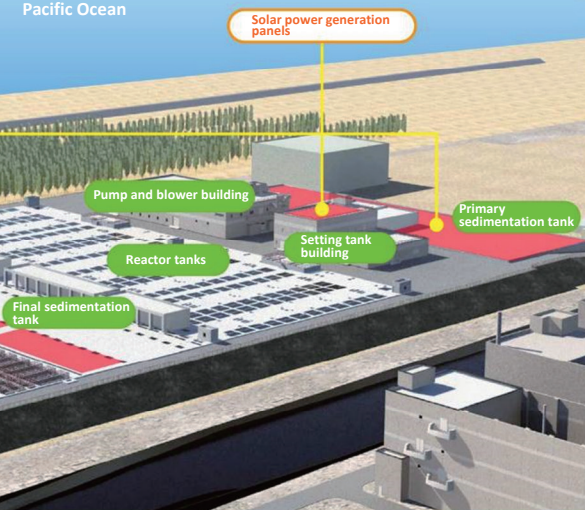
Improving the earthquake resistance of the sewage pipeline is an effective way to delay deterioration due to aging. Also, improving the earthquake resistance of the wastewater treatment plants and pumping stations together with their renewal contributes to reducing costs. In this way, scheduled improvements of the earthquake resistance of facilities have been undertaking.

Inquiries

Sewerage Planning Section, Construction Bureau ges011210@city.sendai.jp



Pacific Ocean



Conceptual drawing of the completed wastewater treatment plant

3 Sewerage Business Continuity Plan

This business continuity plan consists of two parts, namely "Earthquakes and Tsunamis" and "Heavy Rainstorms." The plan was formulated to mitigate the damage and recover quickly from such disasters. It predetermines responses and actions that staff members should take when a disaster occurs. When the 2011 disaster occurred, quick initial response were available. This was due to the fact that sewage disaster response manual had been created in FY 2006 and development of sewerage business continuity plan had been started since 2010.

Inquiries

Sewerage and Pipeline Coordination

Section, Construction Bureau ges011120@city.sendai.jp

4 Asset Management of Sewerage Business

What is asset management?

Asset management is a process of planning, managing and implementing construction and maintenance operations to gain the maximum effect from assets (facilities) that are owned by organizations. When creating this scheme, an understanding of the present status of service and an estimate of potential operational risks are required. This is then followed by determining the standards for establishing the target objective and priorities of operations. The final step is implementation of continued improvements.



The recovery of Minami-Gamo Wastewater Treatment Plant is almost complete

Japan's first ISO 55001 asset management system certification

The pipeline division of Sendai City's sewerage department received Japan's first international standard ISO 55001 Asset Management System Certification in FY 2013. Improvement of most of the sewage facilities in Sendai had been completed by FY 2008. In future, it will be necessary to promote measures against disasters such as earthquakes and inundation in addition to facility maintenance and renovation. In spite of limitations on budget and personnel resources, we are running projects steadily and efficiently, and

ensuring the safety of the facilities by prioritizing the most important projects and estimating costs over the long term using the asset management system. Investigations so far indicate that sewage pipes can be used for about 1.5 times beyond their standard service life and sewage facilities about 1.5–2 times beyond theirs. We predict that reducing the number of renewals will lead to a reduction in costs. Immediately after the disaster, we were able to efficiently survey the damage using the asset management system.



Presentation at the international seminar on disaster recovery held in Lima, Peru

Conveying experiences and lessons learned to the world

With the cooperation of the Ministry of Land, Infrastructure, Transport and Tourism and the Japan International Cooperation Agency (JICA), Sendai City has conveyed its valuable experiences and lessons learned to the world through

technical cooperation with Turkey and Latin American countries by accepting trainees and implementing other programs relating to disaster prevention, disaster risk reduction and asset management.

Inquiries

Business Planning Section, Construction Bureau ken010020@city.sendai.jp

Improvements in the Earthquake Resistance of Wooden Houses and Condominiums

At the Great Hanshin Earthquake in 1995, wooden houses that had been built before 1981 when stricter earthquake-resistant building codes were introduced were seriously damaged and many people were killed as a result. Learning from this disaster, Sendai City has been improving the earthquake resistance of city-owned buildings (about 99% completed as of the end of 2015), as well

as subsidizing the fee for earthquake resistance inspection and the renovation of wooden houses and condominiums. In addition, the city is providing advice based on the results of the inspection. This program has improved the earthquake resistance of 2,122 wooden houses and 2 condominiums in total over eleven years from 2004 to 2014.

Improvements in the disaster preparedness of condominiums

In 2013, Sendai City set up a "Certification program for condominium buildings with improved disaster preparedness in Sendai – the City of Trees." The city also formulated "Guidelines for creating a disaster preparedness manual for condominiums," which is used as reference when a condominium association of owners makes rules for disaster preparedness and prevention.



"Condominium Building with Improved Disaster Preparedness in Sendai – the City of Trees" Certificate

Inquiries

Improvements in the earthquake resistance of wooden houses: Construction Guidance Section, Urban Planning Bureau tos009420@city.sendai.jp
Improvements in the earthquake resistance and disaster preparedness of condominiums: Housing Policies Section, Urban Planning Bureau tos009430@city.sendai.jp

Multiple Defenses to Minimize Tsunami Damage

Sendai City suffered tremendous damage from the tsunami during the Great East Japan Earthquake. Based on our experiences, we are making efforts to support the recovery of the eastern coastal areas from the tsunami damage and build more resilient communities. To achieve this goal, we are developing measures to ensure safety and security in case of a 'once-in-several-hundred-years' tsunami by combining three approaches. Said approaches involve creating multiple defenses at a number of facilities to prevent tsunami damage, evacuation from a tsunami, and the relocation of residents to safer areas.

1 Elevated Road

Aiming to complete the project by the end of FY 2018, we are doing construction work to elevate one of the prefectural roads by about six meters, which runs about ten kilometers north to south along the coastal areas. We are doing so by using tsunami sediments and earthquake debris. The road will act as an embankment protecting against tsunamis together with the coastal embankments and the coastal disaster prevention forests. We are expecting expecting to significantly reduce the damage from floods even if a tsunami with the intensity of the Great East Japan Earthquake occurs.



Inquiries Southern Road Construction

Section, Construction Bureau
ken010180@city.sendai.jp

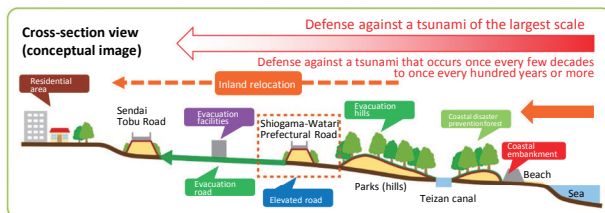
2 Coastal Embankment

To firstly prepare for a tsunami that may occur frequently (once every several decades to once every hundred years or more), we are constructing a coastal embankment of around 9 km in length and a height of T.P. plus 7.2 m, jointly with the central government and Miyagi Prefectural government. The embankment is designed so that, even in the event of a tsunami that exceeds our expectations, its breakdown or collapse time can be extended or the possibility of its total collapse is reduced. Completion is scheduled for FY 2016.



Inquiries Agricultural Administration Planning

Section, Economic Affairs Bureau kei008110@city.sendai.jp



Bird's-eye view map



3 Coastal Disaster Prevention Forest and Evacuation Hills

We are restoring the coastal disaster prevention forests and improving the seaside parks to restore the natural environment and the landscape around the seaside, in addition to revitalizing the coastal areas to make them new spots for people to interact.

The project to improve seaside parks will include the construction of a 'sports zone' in the Gamo area, a 'recreation zone' in the Arahama area, a 'play zone' in the Ido area, and a 'nature zone' in the Fujitsuka area. A hill 10–15 m in height designed for short-time evacuation will be built in each of these zones, allowing for the evacuation of nearby residents and visitors up to the hills when a tsunami strikes. Completion is scheduled for FY 2017.

Inquiries

Park Management Section,
Construction Bureau ken010220@city.sendai.jp



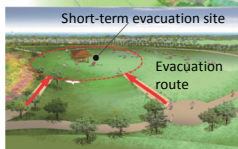
Tsunami evacuation tower at Nakano 5-chome



Outdoor tsunami evacuation stairs at Okada Elementary School



Sendai Tobu Road evacuation stairs



Conceptual image of a 'vacuation hills'

Sports zone in Gamo area

4 Evacuation Roads

Construction of the three main roads in the evacuation route from the elevated road to the Sendai Tobu Road will be completed by the end of FY 2018, allowing people and cars to smoothly evacuate from a

tsunami. Other city roads will be improved to function as evacuation routes by installing evacuation guide signposts, partially widening roads at crossing points, and implementing other measures.

Inquiries

Southern Road Construction Section, Construction Bureau
ken010180@city.sendai.jp

5 Evacuation Facilities

In areas which may be flooded by a tsunami, we are constructing 13 evacuation facilities in total including six towers, and five buildings with fire station, and two sets of outdoor evacuation stairs for existing elementary and junior high schools. The evacuation tower at Nakano 5-chome is a two-story steel framed structure over six meters above ground, allowing 300 people to evacuate at any given time. All the facilities are scheduled to be completed by the end of FY 2016.

Easy-to-use structures and emergency supplies for evacuees

With the lessons learned from the Great East Japan Earthquake, we are offering various emergency services that include

preparing indoor spaces to protect evacuees from cold weather and hypothermia as well as installing slopes for wheelchairs and strollers to provide easy access for the elderly and those with walking disabilities. We have stockpiled electric generators, blankets, water, foodstuffs, portable toilets, etc. with the expectation that evacuees would stay at the evacuation centers for around 24 hours.

Cooperation with the private sector

Sendai City has concluded an 'Agreement for use of temporary tsunami evacuation shelters' with the private sector. East Nippon Expressway Company Limited has constructed evacuation stairs at five locations providing access to Sendai Tobu Road.

Inquiries

Disaster Prevention Planning Section, Crisis Management
Department kks000120@city.sendai.jp

Inland Relocation (Disaster Prevention Collective Relocation Promotion Project)

In addition to constructing or improving a variety of facilities to prevent damage from tsunamis, we are implementing a relocation promotion project for 1,540 households to move from designated disaster risk areas where the land is expected to be inundated over two

meters during a tsunami. Sendai City is acquiring land and developing residential areas at relocated sites as well as subsidizing residents' relocation and purchasing their land after they have moved out.



Rokugo district



Near the Tago-nishi district area

Inquiries

Post-disaster Reconstruction and City Planning Section, Urban Planning Bureau tos009140@city.sendai.jp

Aiming to Produce Energy Locally for Local Consumption

Conventional large, centralized energy systems were shown to be vulnerable during the Great East Japan Earthquake. Sendai City is actively creating a base for disaster-resistant, energy-efficient decentralized energy sources and introducing renewable energy sources, as well as promoting cutting-edge research and development of next-generation energy sources with low environmental impact.



1 Disaster Prevention Photovoltaic System

Introduction of the system to designated evacuation centers

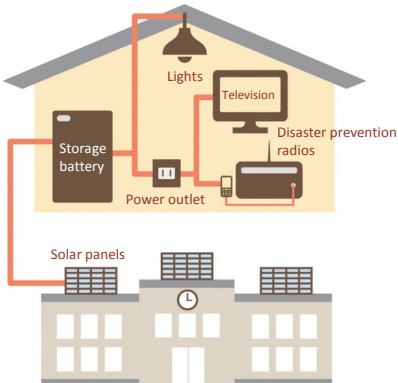
Immediately after the disaster, electricity, gas and gasoline supplies were suspended, causing various problems during the initial disaster response such as the operation of evacuation centers. By FY 2015, based on our experiences of the disaster, we had introduced a solar power generation system combined with a storage battery to 194 facilities, including elementary and junior high school buildings, which are used as designated evacuation centers during a disaster. With

this system, a stand-alone power supply is secured when a disaster occurs while reducing CO2 emissions in normal circumstances. During power outages, electricity is supplied from the system during the day and from the storage battery during the night. This allows operation of information communications equipment such as disaster prevention radios and televisions as well as lamps.

System features

| |  Daytime |  Night-time |
|----------------------|--|--|
| Normal circumstances | Electricity generated by solar power is supplied and contributes to the reduction of CO2 emissions. | When the storage battery is in a state of discharge, it is charged overnight. |
| During power outages | Electricity generated by solar power is supplied while concurrently storing it in a storage battery. | Electricity charged during the day is supplied. |

Conceptual image of the system



Lithium ion battery (SRG Takamiya Sports Park Asuto Nagamachi)

Introduction to private facilities

Sendai City is subsidizing half of the cost required to install systems for renewable energy sources in private facilities that can be used as regional disaster response centers during a disaster according to the designation under the Sendai City Regional Disaster Prevention Plan.



Solar panels on the roof of a junior high school building

Research on a Groundbreaking, Next-Generation Energy Source Produced from Algae

An algae biomass project which produces petroleum from household wastewater

With the collaboration of the University of Tsukuba and Tohoku University, Sendai City is promoting research on 'algae biomass' that produces petroleum components from household wastewater. Two algae used in the research project are *Aurantiochytrium* and *Botryococcus braunii*. By combining the culturing of these algae and treating of wastewater, energy is produced while reducing

the environmental load during the wastewater treatment process. This 'circulation model of a sewerage system' uses energy produced from these algae to treat wastewater. The results of this research project are expected to be domestically and internationally publicized as a 'Sendai model' which will contribute to our recovery from the disaster and help provide a solution to energy issues.



Inside the Sendai Minami-Gamo Biomass Technological Development Laboratory



Tago-nishi district
Disaster reconstruction municipal housing
and Meeting hall

2 Eco Model Town Project

The 'Eco Model Town Project' addresses the issue of developing a town where the needed energy is self-produced in an efficient manner without excessively depending on specific energy sources. An energy management system has been introduced in disaster reconstruction municipal housing units for people affected by the disaster in the Tago-nishi and Arai-higashi land readjustment project areas, as well as detached houses in the aforementioned Tago-nishi area.

This system efficiently combines different energy sources and supplies electricity sent from solar panels, storage batteries, and gas co-generation systems (producing electricity and hot water from city gas, only in Tago-nishi). Based on data of both the amount of electricity generated and electricity consumed, a peak shaving operation and the efficient use of various energy sources are performed in cooperation with residents.

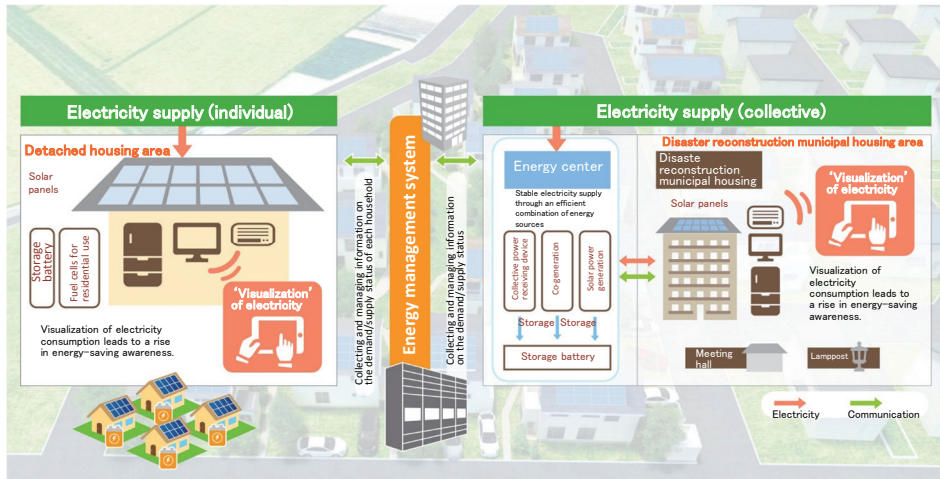
■ Features

- 1 A private business is implementing a ten-year town management project which supplies electricity and water* and also provides a service to visualize the amounts of electricity generated and consumed.
*water supply is only in Tago-nishi
- 2 Even in the event of a blackout, electricity is supplied to a meeting hall for residents located on the premises. The meeting hall is used as a place for residents to gather and also as a short-term evacuation area during disasters.

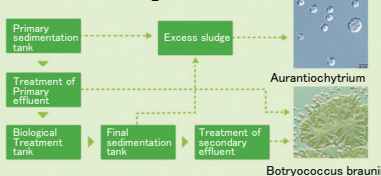
■ Advantages for residents

- Putting a model of energy-saving activity into practice through visualization
→ **Reducing utility costs**
- Supplying electricity to the meeting hall during a disaster
→ **Securing a disaster response center**
- Raising disaster prevention awareness at the local community level
→ **Mutual support between members of the local community**

Conceptual image of the Eco Model Town (Tago-nishi district)



Aiming to develop a system model from oil production to sewage treatment



Subsidy Program for Projects Promoting the Creation of New Energy

Sendai City subsidizes operators that produce/supply clean and stable energy or private business operators that build new or additional facilities where they conduct research and development and/or conduct demonstration tests on next-generation energy or other energy-related issues. We subsidize an amount that corresponds to their fixed asset taxes for 3-5 years. In addition, if such operators hire five or more new, full-time employees, the subsidy is increased by 600,000 yen per new employee. Along with this subsidy program, Sendai City is actively implementing research focused on energy issues jointly with private business operators, and is providing support to those who are considering launching an energy supply business or research and development in Sendai.

Tackling Community Disaster Prevention through Self-Help, Mutual Aid, and Public Assistance

Disasters cannot be prevented only by tangible measures such as the construction and improvement of facilities. Individual residents' preparations for disasters in their daily lives as well as mutual support between members of the community played an important role in reducing damage from the Great East Japan Earthquake.

'Self-help' by individuals to secure safety for ourselves and our families, 'mutual aid' by members of the local communities to support one another, and 'public assistance' from the government are integrated in a coordinated way to support disaster prevention and disaster risk reduction.

Self-Help

Individual residents will take action to secure safety for ourselves and our families during a disaster.

Mutual Aid

Local community organizations, neighborhood associations, and other groups will take action to secure safety for our community during a disaster.

Public Assistance

The government will work to improve tangible aspects of disaster prevention such as infrastructure and facilities as well as intangible aspects such as 'self-help,' 'mutual aid.'

1 Sendai City Disaster Prevention Plan

In 2013, two years after the disaster, this plan was revised by incorporating additional policies, including 'disaster risk reduction,' to minimize damage from a disaster, focusing attention on the needs of people requiring assistance during a disaster, and the promotion of gender equality, into the basic policy. To promote 'mutual aid' activities undertaken

in local communities, the plan was divided into 'Self-help and Mutual Aid' and 'Public Assistance' to specifically envisage what kind of activity is required for each party.

In this plan, 'Self-help and Mutual Aid' describes activities by individual residents and neighborhood associations, and 'Public Assistance' describes Sendai city programs.

Inquiries

Disaster Prevention Planning Section, Crisis Management Department
kks000120@city.sendai.jp

2 Community Initiatives for Prior Preparations

Community-based evacuation center operation manual

The disaster brought to light various problems in the evacuation center operation system. Thus, when reviewing the Sendai City Disaster Prevention Plan, we created an Evacuation Center Operation Manual based on feedback from local residents, who participated in the operation of evacuation centers at the time of the disaster, and from facility operators.

Using this manual, three parties, namely, community organizations, Sendai City and facility operators, are working together to create a tailored manual for each community.

Of 193 designated evacuation centers, 171 centers (89%) created their own operation manual as of the end of January 2016, which led to enhanced awareness of disaster prevention in each community.

Inquiries

Disaster Prevention Planning Section, Crisis Management Department
kks000120@city.sendai.jp

Comprehensive emergency drills to improve the capacity of residents and communities to deal with disasters

Sendai City aims to achieve 'self-help' 'mutual aid' and 'public assistance' and to strengthen coordination between them, and will continue to carry out comprehensive emergency drills to help do so.

On or around the Citizens Disaster Prevention Day on June 12 every year, emergency disaster drills take place throughout Sendai. They include 'voluntary disaster prevention drills' to check preparations for a disaster in the home or workplace, 'disaster response drills' for each community to confirm the safety of its residents, to conduct initial fire extinguishing exercises and first aid drills after a disaster occurs, and 'evacuation center management drills' to confirm the

flow of operations from the time an evacuation center opens. In some areas, the drills are sometimes conducted at night to simulate a disaster occurring in the dark.

The 'evacuation center operation drills' allow each community-specific Evacuation Center Operation Manual to be put into practice and verified. In addition, various drills are held throughout the year. These include 'drills for victims unable to return home after a disaster' around JR Sendai Station, and 'tsunami evacuation drills' mainly conducted in the eastern coastal areas. Sendai City aims to realize 'disaster prevention with the collective strength of its 1,080,000 residents.'



Junior high school students help set up temporary lavatories



Fire drills using thick smoke

Inquiries

Disaster Risk Reduction Promotion Section, Crisis Management Department
kks000130@city.sendai.jp

3 Development of Leaders for Sendai City Community Disaster Preparedness

In order to improve voluntary disaster prevention organizations and the disaster prevention capacity of the entire Sendai area, Sendai City started an independent training program in FY 2012 to develop Sendai City Community Disaster Preparedness Leaders (SBL).^{*} About five SBLs will take a central role in each 'Alliance of Neighborhood Associations' in the city. 584 participants (including 144 women) have attended the training during the four years up to FY 2015. In the future, we will raise the name recognition of SBL, involving more women and youth in this program, and enhance mutual cooperation between SBLs in

addition to developing new leaders and holding 'back-up' training sessions.

^{*}The abbreviation is for Sendai Bosai (meaning disaster prevention) Leader



Disaster Imagination Training



Drill to rescue people from a collapsed building



Lecture on the basics of evacuation center operation

Inquiries

Disaster Risk Reduction Promotion Section, Crisis Management Department kks000130@city.sendai.jp

4 The Local Community Helps Residents in Need

Registration system for people requiring assistance during a disaster

This registration system provides local community organizations with information on people who require assistance such as confirmation of their safety or the need for help in evacuating. It allows each community to create their own evacuation support system. People who require assistance during a disaster must apply for registration. About 13,200 persons were registered as of March 2016.

Inquiries

Social Affairs Section, Public Health and Welfare Bureau
fuk005320@city.sendai.jp

Help card

A 'Help Card' is available for persons with disabilities to make it easier for them to ask

for attention or help when a disaster or problem occurs or in an emergency. It is the size of a business card with information on their emergency contact(s), which medical facility they are registered at, and their required support, etc. We encourage people requiring assistance during a disaster to use the help card and to apply for the registration system.



Help card

Inquiries

Disabled Planning Section, Public Health and Welfare Bureau
fuk005330@city.sendai.jp

Welfare evacuation center

To cope with the difficulty of living in designated evacuation centers, the welfare evacuation center is a secondary evacuation center made available for the elderly, people with disabilities or other people who require assistance during a disaster.

Sendai City is developing a system to respond to the individual needs of people requiring assistance. This is being done by increasing the number of welfare facilities that contract with the city to allow their facility to be used as welfare evacuation centers, as well as providing necessary materials and equipment, and stockpile supplies. There were 110 welfare evacuation centers in Sendai as of the end of March 2016.

Inquiries

General Affairs Section, Public Health and Welfare Bureau
fuk005010@city.sendai.jp

5 Substantial Stockpiling of Emergency Supplies

Sendai City encourages each household to stock a minimum of a weeks' worth of food items, drinking water, and daily commodities as well as medical supplies. We are also stockpiling supplies for the public as part of our disaster preparedness policy.

Sendai City has stockpiled food (6 meals) and drinking water (2 liters) for two days for a maximum of 106,000 evacuees.

The city also has items used by women, elderly people, and babies and infants

such as powdered milk, disposable diapers, and tent-style private rooms stored in evacuation centers and ward offices. Also, we have 101 Community Disaster Prevention Centers with warehouses of disaster prevention materials and equipment.

Simplified disaster prevention materials and equipment are provided for areas without centers. When a disaster occurs, people can use the stockpile of various types of equipment for voluntary disaster prevention activities.



Community Disaster Prevention Center's warehouse

Use of distribution stocks

In 2010, Sendai City introduced a 'running stock system' to stockpile goods for disasters: the first case that this system was introduced in an ordinance-designated city. Under this system, the goods that the city has purchased, such

as disposable diapers, sanitary items, and toilet paper are put in the distribution route of sales companies and stored in their warehouses as part of distribution stocks, and, in times of disaster, the goods are sent to evacuation centers. This system

has the advantages of saving costs and not needing a warehouse to store goods. Immediately after the Great East Japan Earthquake, these stockpiled goods were provided to each evacuation center according to this system.

Inquiries

Disaster Risk Reduction Promotion Section, Crisis Management Department kks000130@city.sendai.jp

Disaster Prevention and Disaster Risk Reduction Initiatives by Various Stakeholders*

To effectively promote disaster prevention and disaster risk reduction measures, it is necessary for all concerned persons and agencies such as governments, businesses, community-based organizations, and research institutes, to actively work together. We are promoting disaster prevention and disaster risk reduction measures by ‘stakeholders*’ that include all residents from children to the elderly, irrespective of gender or nationality, the presence or absence of disabilities, so that they can live in safety and security.

* ‘Stakeholders’ refer to concerned parties that cover a wide range of individuals and groups such as civil society, local communities, academic organizations, and businesses. The Sendai Framework adopted at the WCDRR, newly indicates the importance of empowering women, youth, and having them take a leading role in disaster prevention and disaster risk reduction.



1 Promotion of Sendai's Disaster Prevention Education

In order to convey lessons learned from the Great East Japan Earthquake to children in the present and future generations, Sendai has striven, since soon after the disaster, to nurture children's capacity to think, judge, and act in times of disaster so that they will have the capacity to take action to help themselves and others.



Creating a disaster prevention map

Inquiries

Educational Supervision Section, Educational Bureau
kyo019120@city.sendai.jp

2 Sendai Workshop on Disaster Risk Reduction, 'Shelters for Everyone'

The various problems women faced in evacuation centers at the time of the disaster were often due to the fact that there were only a small number of women participating in the decision making process with regard to the operation of evacuation centers. Thus, in collaboration with residents, the Sendai Gender Equal Opportunity Foundation created a workshop program called ‘Shelters for Everyone’ that employs the female viewpoint in the operations of evacuation centers. This

program has been implemented at civic centers and adult education classes so that various persons, especially women, can take part in local disaster prevention activities on a routine basis. In the program, participants discuss solutions using actual problems that occurred in the evacuation centers. They realize that others have viewpoints and thoughts that would not occur to them. As a result, they will realize that solutions that suit everybody can be produced by sharing each other's knowledge.

Inquiries

Gender Equal Opportunity Section, Community Affairs Bureau
sim004180@city.sendai.jp

Supplementary Reading Material for Disaster Prevention Education

This reading material was created to raise children's awareness about disaster prevention and disaster risk reduction and develop their ability to judge and act.

The material contains stories of children who experienced the disaster as well as questions about what to do in an emergency that will lead children to develop their independence.

It consists of three separate volumes, one for 1st to 3rd year elementary school students, one for 4th to 6th year elementary school students, and the third for junior high school students, so as to deepen their understanding according to their developmental stage.



Disaster prevention workshop

3 Measures for Stranded Commuters with Cooperation from Businesses

At the time of the Great East Japan Earthquake, public transportation was suspended and many people could not return to their homes.

Confusion resulted from non-residents who rushed to nearby evacuation centers, making it impossible for local residents to get into their designated centers.

Using this as a lesson, Sendai City plans to collaborate with organizations and businesses to use train stations, hotels, commercial facilities, and university campuses as temporary lodgings when a disaster occurs. It is expected that, around transport hubs such as JR Sendai Station,

about 14,000 people will be unable to return home during a major disaster in the future. The city will cater for these people at the sites.

A ‘Liaison Council’ was established by concerned parties located around JR Sendai Station. In May 2014, they drew up policies to cope with stranded commuters.

They include stopping commuters from going home all at once and specifying the measures that people must take, and roles and responsibilities during a disaster, as well as holding disaster drills on a regular basis.



Drills for stranded commuters

Inquiries

Disaster Risk Reduction Promotion Section, Crisis Management Department kks000130@city.sendai.jp

4 Investigation and Research Conducted by the International Research Institute of Disaster Science (IRIDeS), Tohoku University



IRIDeS building



Emergency survey for Kanto-Tohoku heavy rain flood (Osaki City, Miyagi Prefecture)

The International Research Institute of Disaster Science (IRIDeS) at Tohoku University was established in April 2012, one year after the disaster. It was established as a new field of interdisciplinary research to respond to low-probability 'mega disasters' that cannot be handled effectively with a traditional disaster prevention or disaster risk reduction system. IRIDeS is made up of researchers working in various fields that include literature, science, engineering, information technology, and medicine. It conducts a wide range of activities such as explaining the outbreak mechanism of a massive earthquake and tsunami, archiving

lessons learned from the Great East Japan Earthquake, and distributing 'Disaster Prevention Notebooks.' IRIDeS also has carried out emergency surveys such as those at the time of 2013 Haiyan Typhoon in Philippines, the Central Nepal Earthquake and the Kanto-Tohoku heavy rain in 2015. Based on an agreement with Sendai City, IRIDeS has drawn up a disaster prevention plan for the Sendai area, developed tsunami evacuation measures such as the creation of hazard maps, made improvements to evacuation centers, and continues to hold workshops to help residents make evacuation maps.

Established the Global Centre for Disaster Statistics

Tohoku University established the Global Centre for Disaster Statistics in March 2015, with the cooperation of the United Nations Development Programme (UNDP). This organization aims to utilize disaster statistics gathered from countries around the world. IRIDeS analyzes the acquired data and shares the results globally to contribute to disaster prevention and development policies. These disaster statistics will be indispensable in managing and following up implementation of the Sendai Framework.

Inquiries

Public Relations Office, IRIDeS koho-office@irides.tohoku.ac.jp

5 Assistance to Foreign Residents and Visitors during a Disaster

Setting up the Sendai Disaster Multilingual Support Center and foreign language volunteers for disaster response

When a large scale disaster occurs, Sendai City sets up the Disaster Multilingual Support Center to support foreign residents and visitors who may be unable to obtain sufficient information due to language difficulties or differences in customs. Its operation is managed by the Sendai Tourism, Convention and

International Association. Also, the center has a registry of foreign language volunteers who provide assistance during a disaster. As part of their training, volunteers participate in community disaster drills and play the role of an interpreter for foreign residents.

Disaster prevention education for foreign residents

In order to raise foreign residents' awareness of disaster preparedness and to provide smooth support to them during a disaster, Sendai City sends out disaster prevention information through the distribution of disaster prevention pamphlets and DVDs in different languages, and provides disaster preparedness drills and training for newly arrived foreign residents. In addition, we broadcast programs of disaster preparedness talks featuring foreign residents and disaster prevention bite size advice in different languages through collaboration with an FM radio station.



Disaster prevention video in 12 languages (produced by Sendai Tourism, Convention and International Association)



Sendai Disaster Multilingual Support Center immediately after the disaster (March 2011)



Volunteers interpreting how to perform CPR at a community disaster prevention drill

Inquiries

International Relations and Planning Section, Culture and Tourism Bureau kik002040@city.sendai.jp

Information Courtesy of Sendai Disaster Multilingual Support Center

Immediately after the Great East Japan Earthquake, Sendai City set up the Disaster Multilingual Support Center on March 11 until April 30 while providing information and visiting evacuation centers in addition to receiving

1,112 requests for advice in 51 days. During heavy rain disasters, we provide information through social media such as Facebook and Twitter.



Sending out information via Twitter

Our Experiences and Memories of the Great East Japan Earthquake to the Future and the World

As the number of Sendai residents who have not experienced the Great East Japan Earthquake increases, we need to remember our experiences

and the lessons learned from the disaster so that we can prepare ourselves for future disasters.

Therefore, we must keep our memories, knowledge, and the grief we felt in a form that can be handed down to future generations.

Sendai City aims to pass on memories of the disaster through the establishment of a memorial center and the archiving of videos and photographs in collaboration with residents and community groups.

As a city where the Sendai Framework was adapted at the Third UN World Conference on Disaster Risk Reduction, we are committed to passing on our experiences and lessons learned from the disaster, thus contributing to disaster prevention and disaster risk reduction in the world.

1 Sendai 3/11 Memorial Community Center

Located on the premises of Arai Station, the eastern terminal of the Tozai Subway Line, the opening for the center was held in February 2016. The 1st floor is a 'communication space' that provides information on the eastern coastal areas affected by the tsunami using maps and slides. On the 2nd floor, there are exhibits that describe memories of the coastal areas as well as the progress of our restoration and reconstruction efforts in the disaster areas. There is also a studio to hold workshops and residents' group activities. The rooftop is utilized as a lounge. This Community Center, which acts as a base for passing on the experiences and lessons learned from the disaster, is not only a facility for showing exhibits but also a place where people from all walks of life, including nearby residents, residents' groups and NPOs, are able to gather and take part in various activities and build new relationships.

Inquiries

Disaster-Resilient and Environmentally-Friendly City Promotion Office, City Planning Policy Bureau
mac001605@city.sendai.jp



せんだい3.11メモリアル交流館
Sendai 3/11 Memorial Community Center



Kahoku and Kobe: The 5th and 21st Anniversaries of Our Disasters (February 21, 2016)

2 Remember 3/11 Center

In May 2011, the 'Remember 3/11 Center' (also known as 'Wasurent') was established at Sendai Mediatheque as a base for recording information about the disaster and the recovery and reconstruction process from it, with the collaboration of residents, experts, artists, and center staff.

Videos, photos, and sound clips of what was seen and heard by people in various disaster situations are organized and kept as a 'Chronicles of Disaster: Residents' Collaborative Archive' after

properly managing the information rights. The records can be viewed on the center website or borrowed from libraries, and are sometimes exhibited or screened. In addition, meetings to discuss the disaster using videos, photos, and sound clips are held. A total of 474 videos, 2,180 photos, and 41 sound clips have been released on the website, some of which have been translated into English, by the end of December 2015.

Inquiries

Activity Support Department, Sendai Mediatheque
office@smt.city.sendai.jp



Report on the activities of
the 'Remember 3/11 Center'
(Sendai Mediatheque)

Photo exhibition 'March 12: Hajimari no Gohan(Meals that Mark a New Start)'
(in cooperation with NPO 20th Century Archive Sendai)

3 Lessons in 'Communication'

With the fieldwork program, residents who participate in the program learn ways to convey and hand down their memories and experiences of the disaster through actual practice. In FY 2015, the following four programs were held: (1) Connecting the World Through Art, where participants discussed what kind of art projects could be held in the disaster areas on the road to recovery, (2) 3/11 Memory Tour, where participants took part in a walking tour of

the Arahama district and held a slide show of the area, (3) Re: Project, which conveyed the memories of local communities affected by the disaster through storytelling by residents, and (4) Downtown Message Board, which collected messages of experiences from people affected by the disaster in the central Sendai area. The project started in August 2013 and a total of 1,671 persons had participated in this program by the end of December 2015.



Center Kickoff Meeting
(December 6, 2015)



Downtown message board



Lessons in 'Communication' program presentation

Inquiries

Citizen Cooperation Promotion Section, Community Affairs Bureau
sim004100@city.sendai.jp

4 Preservation of Disaster Remains

Sendai City has decided to preserve the damaged Arahama Elementary School building to show the devastation caused by the tsunami. The city hopes it will act as a lesson to future generations to ensure that disasters do not produce such casualties again. Sendai City is preserving the damaged school building as is, without making alterations.



Arahama Elementary School

Inquiries

Post-disaster Reconstruction and City Planning Section,
Urban Planning Bureau
tos009140@city.sendai.jp



Exhibition room, 2nd floor



3/11 Disaster Library

Sending Out Information through Presentations at International Conferences and Hosting Study Tours

By passing on our experiences of the disaster and lessons learned from it, in addition to our efforts towards recovery and reconstruction, we believe we can contribute to disaster prevention and disaster risk reduction. In addition to making presentations at international and domestic conferences and hosting symposiums, Sendai City has actively arranged study tours for domestic and international government officials and private sector.



2016 Forum on Reconstruction and Disaster Risk Reduction (Nishinomiya City, Hyogo Prefecture)
Photo courtesy of Kansai Gakuin University



The Second ISDR Asia Partnership Meeting of 2015 (New Delhi, India)



Follow-up event to the Third UN World Conference on Disaster Risk Reduction: Sendai Framework and the Women's Leadership (L-Park Sendai)



Study tour by JICA trainees to the Arahama Elementary School
Photo courtesy of Kochi University

City of Sendai

Disaster-Resilient and Environmentally-Friendly City Promotion Office

3-7-1 Kokubuncho, Aoba-ku, Sendai City, Miyagi, 980-8671 Japan

Tel: +81-(0)22-214-8098

Fax: +81-(0)22-214-8497

E-mail: mac001605@city.sendai.jp

Issued in March 2016

