Sendai City Current State of Reconstruction
Emiko Okuyama, Mayor, City of Sendai

Earthquake Summary

Date
Friday, March 11, 2011 at 14:46

Epicenter location
Off the Sanriku Coast (38.1 degrees north, 142.9 degrees east)

Magnitude
9.0

Seismic Intensity within Sendai
Seismic Intensity 6-high : Miyagino-ku
Earthquake Summary

Tsunami Warning
March 11, 14:49
Issued for the Pacific Coast of Tohoku region
Sendai Port 7.2m (estimated scale)
(The first tsunami wave arrived about 1 hour after the earthquake occurred.)

Areas Flooded by the Tsunami
- Population: 21,966
- Households: 8,086
- Area (㎡): 4,633
- Flooded Buildings: 12,277

Areas Flooded by the Tsunami

Damage in Sendai

Death Toll / Missing / Injured (as of Nov. 30, 2013)

<table>
<thead>
<tr>
<th>In Sendai</th>
<th>Sendai Residents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death Toll</td>
<td>899</td>
</tr>
<tr>
<td>Missing</td>
<td>30</td>
</tr>
<tr>
<td>Injured</td>
<td>2,271</td>
</tr>
</tbody>
</table>

※Sendai residents who died in the disaster: 979
(Sendai residents who died outside of Sendai: 174)

Building Damage (as of Nov. 25, 2013)

<table>
<thead>
<tr>
<th>In Sendai</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completely collapsed</td>
</tr>
<tr>
<td>Severely damaged</td>
</tr>
<tr>
<td>Partially damaged</td>
</tr>
<tr>
<td>Minor damage</td>
</tr>
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</table>

Overall damage in Sendai (as of Jan. 29, 2013)

Estimated amount of damage: 1.37 trillion JPY
Damage caused by the Tsunami

Villages swept away by tsunami (Near Sumishin, Wakabayashi district)

Trees for disaster prevention were completely washed away by tsunami

(Arahama, Wakabayashi district before the disaster)

(Arahama, Wakabayashi district after the disaster)
Damage caused by the Tsunami

Town where only the foundation of houses remain.

(Arahama, Wakabayashi district before the disaster)

(Arahama, Wakabayashi district after the disaster)

Damage caused by the Tsunami

(Sewage plant struck by tsunami (Minami-Gamo Filtration Plant))

(House hit Nakano Elementary School)

(Search for missing persons)

(Cars washed away by tsunami)
Damage of residential districts in hilly areas

(Otoya, Taihaku-ku)
(Matsumorijingahara, Izumi-ku)
(Oritate, Aoba-ku)
(Midorigaoka, Taihaku-ku)

Areas Flooded by the Tsunami and Residential Area Damaged by Earthquake

Flooded Area: 4,633ha
Damaged Residential Land: 5,080

Severely damaged residential areas
Problems resulting from the decline of city functions

- Increase of evacuees due to those who had difficulty returning home
- Food shortage due to the damage to stores and distribution systems
- Damaged infrastructure (electricity, water, gas, etc.)
- Fuel shortage (gasoline, kerosene, heavy oil, etc.)

Source: Kahoku Shinpo Newspaper, Sankei Newspaper, Jiji Tsushin newspaper

Resident Efforts (Examples of Community Projects)

- Tsunami-ravaged Arahama in Wakabayashi
  - Evacuated for 2010 Chili earthquake
  - Reduced impact in 2011 Great East Japan Earthquake
  - (Experienced directly the difficulty of elderly people to evacuate inland)
  - Rerouted evacuation from inland to Arahama Elementary School
  - Increased emergency supplies 1.5x
    - (Enough for 800 persons to survive for 3 days)
    - Moved blankets and other supplies from gym to 3rd floor

- Neighborhood association in Fukuzumi-cho, Miyagino
  - Agreement on bilateral cooperation with districts and organizations inside and outside the prefecture (As preparation for earthquakes off the coast of Miyagi Prefecture)
  - Fukuzumi cho → Other districts/organizations
    - Aid to areas stricken by Chuetsu earthquakes in Niigata Pref. and inland earthquakes in Iwate/Miyagi Pref.
    - Snow removal in Tsuruko, Obanazawa City, etc.
  - Other districts/organizations → Fukuzumi-cho
    - Providing supplies and donations for Great East Japan Earthquake
Support from inside and outside the country

Restoration of Lifelines

Electricity | Water | Gas | Sewerage
---|---|---|---
11-Mar | 16-Mar | 21-Mar | 26-Mar | 31-Mar | 5-Apr | 10-Apr | 15-Apr
60% | 70% | 80% | 90% | 100% | 60% | 70% | 80% | 90% | 100%

Gas restored to entire city except some areas stricken by tsunami (18 April)

Power restored to most areas of city (19 Mar)

Water fully restored (11 April)

※Power restoration is given for all Miyagi Prefecture.

【Full restoration of lifelines】
- Electricity: 3/18
- Water: 4/11
- Gas: 4/16
- Sewerage

※Excluding areas damaged by tsunami

【Restoration of public transportation】
- City buses: Service started on about 70% of lines across city on 3/12. Normal service resumed on 4/18.
避難者数の推移

One tenth of the population moved to shelters (105,947 as of 12 March)

Earthquake occurred at 14:46

Reduced by half from its peak

Construction of prefabricated temporary housing started (28 Mar.)

Application for temporary housing started (11 April)

All shelters closed (31 July)

Transition of the number of the evacuees

Estimated population of Sendai City 1,063,024 (as of December 2012)

Construction of Temporary Housing

【Number of households】

<table>
<thead>
<tr>
<th></th>
<th>30 Mar.</th>
<th>1 Dec.</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prefabricated temporary housing</td>
<td>1,346</td>
<td>1,236</td>
<td>11.3%</td>
</tr>
<tr>
<td>Private rental housing</td>
<td>9,838</td>
<td>8,890</td>
<td>81.6%</td>
</tr>
<tr>
<td>Public rental housing, etc.</td>
<td>825</td>
<td>774</td>
<td>7.1%</td>
</tr>
<tr>
<td>Total</td>
<td>2,009</td>
<td>10,900</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Place of residence before the disaster (as of 1 Dec.2012)

Total (N=10,900)

- Sendai City 7,216 (66.2%)
- Sendai St.
- Sendai Nanbu Road
- Sendai City Office
- Other cities In Miyagi Pref. 2,799 (25.7%)
- Fukushima Pref. 796 (7.3%)
- Iwate Pref. 52 (0.5%)
- Others and Unknown 37 (0.3%)

1/3 is from outside Sendai City (Nearly 10% from Fukushima Pref.)
Life support in temporary housing

[Improvement of housing environments]

Meeting place of temporary housing "Home for Everybody" (Won the gold prize of the Good Design Award 2012)

Slope installation

Heat insulator installation

Comprehensive learning class of an elementary school (inside "Home for Everybody")

Live support in temporary housing

Continued support to temporary housing residents by the local government, related organizations, support groups, etc.

Life Support

Health support and observation through individual visits, gathering the community through social events, employment support and provision of support information

Life support system for aged single persons, etc.

Support system for The victims

Recovery periodicals
Debris Removal

Estimated debris generated in Sendai City

About 1.35 million ton

About 4 years worth of city’s treatment capacity

- December 2011 Demolition completed
- July 2012 100,000 ton of combustible material received from Ishinomaki site
- March 2014 Planned completion of treatment
  (Including restoration of dump site to original state)
- As of 11/30/2012 21,000 ton received
- As of 11/30/2012 49% treated
- 50% or more of debris targeted for recycling
  - As of 11/30/2012 65% recycled

Sendai approach
(Self-containment)

Source
- Roughly classified into Combustible Non-combustible Recyclable

Dump site
- Secured 3 dump sites (100 ha total) and treatment facilities in eastern coastal area
- Subdivided into 10-plus categories of article, i.e., concrete, home appliances, wood, etc.

Sendai City Earthquake Disaster Reconstruction Plan

◆ Period of the plan

Basic Vision (presenting the ideal vision of Sendai City)

Fiscal 2011-2015 (5 years)

Long-term issues to be addressed (psychological care for the victims, disaster-prevention education, etc.)

◆ For Reconstruction

“A disaster-resistant, environmental city of new level”
Building a resilient and stronger city

Four directions for Reconstruction

◆ Reconstruction projects for the one million citizens of Sendai

1. Tsunami reduction and housing reconstruction project to “protect lives from a tsunami”
2. Residential area rebuilding project to “build the foundation for safe homes”
3. Life recovery project to “support individual livelihoods”
4. Agricultural and food frontier project to “strongly revitalize agriculture”
5. Seaside exchange and revitalization project to “restore the beautiful coast”
6. Model development project for a disaster-proof Sendai to “learn from the past disasters for the future”
7. Energy-saving and new energy projects for a “sustainable energy supply”
8. Sendai economy development project to “improve urban vitality and the quality of life”
9. Exchange promotion project to “promote the features of the city and its reconstruction efforts”
10. Earthquake disaster memorial project to “convey the memory of the earthquake disaster to future generations”
Reconstruction Planning and Adoption Process

Great East Japan Earthquake (11 Mar.)
- Restoration roundtable (6 meetings)

Adoption of basic restoration policy by Sendai City (1 April)
- Adoption of restoration vision by Sendai City (30 May)
- Opinion exchanges on restoration and redevelopment (7 meetings)

Adoption of restoration plan (interim draft) by Sendai City (30 Nov.)
- 1st explanation of east sector redevelopment
- Explanation of interim draft of restoration plan (7 meetings)
- 2nd explanation of east sector redevelopment
- Review of public comments and expert opinions
- Explanation of tsunami flooding simulation (5 meetings)

Meetings of Restoration Promotion Headquarters (11 meetings)
- Sendai restoration review meetings (6 meetings)
- Review meetings of east sector working group (4 meetings)

Sendai restoration review meetings

Sendai Tobu Road which worked as an embankment
(Agricultural lands were restored on the left from the road)

Disaster-prevention facilities against a tsunami (plan view) (cross-section view)
As a basis for future predictions

Reoccurring at spring high tide
If the same 3/11 tsunami occurred at spring high tide (T.P.+0.76 m), water would be about 1.2 m higher than tides on 3/11.

Levee heights and locations from 3/11/2011

Based on restoration plans

1. Coastal and river levees as planned by Japan and prefecture.
2. Raised roadbeds laid over original location of prefectural roads, but changes were made in Okada and Minami Gamo to downsize disaster risk zones.

†Elevation data: Immediately after earthquake struck on 3/11/2012 (in consideration of land subsidence)
†Applied tsunami scale: Modeled and simulated on 3/11/2012 tsunami (historical largest class) by Tohoku University.

Building of Tsunami Evacuation Infrastructure

Thoughts on locations of evacuation infrastructure (Provisory)

◆ Use existing city infrastructure as evacuation infrastructure.
◆ Build evacuation infrastructure on city land. Prioritize over other infrastructure.

Safe house built by private sector in cooperation with Sendai City

Thoughts on evacuation routes (Provisory)

◆ Ensure road width to enable smooth evacuation even with stopped cars along shoulder, etc.
◆ Build intersections to enable smooth merging.
◆ Build earthquake-resistant roads, etc.

Photo courtesy of Yomiuri Newspaper
Disaster prevention collective relocation

(Image of group relocation)

Support for Relocation Promoted Areas (Disaster Risk Areas)

Support to moving expenses

Removers buy or lease lands

Relocation promoted area

New housing

Purchase of affected lands (not mandatory) (including the relocation cost, etc.)

Support for housing reconstruction and purchase of lands (interest subsidies)

Disaster Risk Areas

about 1,560 households

Conceptual View and Schedule for New Housing for Relocated Neighborhoods

Example 1 of new housing

New housing (Planned)

Planned area of land usage

(※Future land usage plans may change locations of new housing.)

Conceptual view

Example site for new housing

<table>
<thead>
<tr>
<th>Year</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquire and prepare land for new housing. Please land for home construction as soon as it is prepared.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Developed area of Arai public zone

Arai

Area adjacent to Tagonishi, Hanatamakura, Kami-Satada, Shimizu, Kita-ku

Area behind Sendai Port, Gamo-zatsukofuku
Rebuilding and Aiding Damaged Residential Areas

Because of the amount of damage incurred, 5,080 homes in Sendai City were assessed as “dangerous” or “caution required.”

(As of 5/31/2012)

Rebuilding as public project managed by Sendai City (About 50%)

Construction is paid for with national rebuilding grants, etc. Owners pay partially to maintain private property.

Rebuilding by owner under Sendai City assistance program (About 50%)

90% of expenses above 1 million JPY provided in assistance to owners who rebuild retaining walls, etc., when certain conditions are met.

(Conceptual view of slope collapse and landslide prevention work)

Targeted number of units 3,000

Areas built directly by Sendai City 1,449

Areas built by public offering/purchase 1,380

Areas built to relocate neighborhoods, etc. 171

Households that lived in flooded areas and households with handicapped or elderly persons are being recruited with the intention of forming future communities.
Construction of Public Housing

Subject area for purchase of houses (1380 houses)

A Subway North-South Line : Northern area (Izumi-chuo, Yotome, Asahigaoka, etc)
B JR Line : Eastern area 1 (Tosho-gu, Higashi-Sendai, Nigatake, etc.)
C JR Line : Eastern area 2 (Rikuzen-takasago, area around Fukuda-cho Sta.)
D Subway East-West Line : Eastern area (Arai, Rokuchonome, Oroshi-cho, etc.)
E Subway North-South Line : Southern area (Kawara-machi, Naga-machi, etc.)

Population Shift before and after the Disaster

(Increase and decrease from the pervious month)

<table>
<thead>
<tr>
<th>Month</th>
<th>Miyagi</th>
<th>Iwate</th>
<th>Fukushima</th>
<th>Sendai</th>
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<tbody>
<tr>
<td>Jan 2011</td>
<td>-103</td>
<td>-671</td>
<td>-105</td>
<td>141</td>
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<tr>
<td>Feb 2011</td>
<td>-12,709</td>
<td>-6,905</td>
<td>-13,852</td>
<td>-3,804</td>
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<tr>
<td>Mar 2011</td>
<td>-5,479</td>
<td>-4,907</td>
<td>-2,312</td>
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<td>Apr 2011</td>
<td>-775</td>
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<td>-980</td>
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<td>May 2011</td>
<td>-1,615</td>
<td>-502</td>
<td>-2,616</td>
<td>1,405</td>
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<tr>
<td>Jun 2011</td>
<td>-68</td>
<td>-528</td>
<td>-2,210</td>
<td>1,029</td>
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<tr>
<td>Jul 2011</td>
<td>-98</td>
<td>-571</td>
<td>-2,994</td>
<td>1,337</td>
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<tr>
<td>Sep 2011</td>
<td>-392</td>
<td>-489</td>
<td>-2,900</td>
<td>701</td>
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<tr>
<td>Oct 2011</td>
<td>-2,828</td>
<td>-871</td>
<td>-2,305</td>
<td>1,117</td>
</tr>
<tr>
<td>Nov 2011</td>
<td>-770</td>
<td>-523</td>
<td>-1,217</td>
<td>437</td>
</tr>
<tr>
<td>Dec 2011</td>
<td>-9,479</td>
<td>-716</td>
<td>-1,196</td>
<td>610</td>
</tr>
<tr>
<td>Jan 2012</td>
<td>-12,791</td>
<td>-4,607</td>
<td>-1,098</td>
<td>731</td>
</tr>
<tr>
<td>Feb 2012</td>
<td>-777</td>
<td>-716</td>
<td>-920</td>
<td>502</td>
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<tr>
<td>Mar 2012</td>
<td>-1,615</td>
<td>-423</td>
<td>-639</td>
<td>502</td>
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<tr>
<td>Apr 2012</td>
<td>-68</td>
<td>-489</td>
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<tr>
<td>Aug 2012</td>
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<td>-523</td>
<td>-3,553</td>
<td>2,108</td>
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</tbody>
</table>
Population Shift before and after the Disaster

(Population Shift between Sendai and other areas)

<table>
<thead>
<tr>
<th>Area</th>
<th>2010</th>
<th>2011</th>
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</thead>
<tbody>
<tr>
<td>Other Cities in Miyagi Pref.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aomori Pref.</td>
<td>624</td>
<td>537</td>
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<tr>
<td>Iwate Pref.</td>
<td>774</td>
<td>543</td>
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<td>Akita Pref.</td>
<td>470</td>
<td>270</td>
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<td>Yamagata Pref.</td>
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<td>442</td>
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<td>Fukushima Pref.</td>
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<td>Tokyo Area</td>
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<td>Others</td>
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<tr>
<td></td>
<td>-6,000</td>
<td>-3,860</td>
</tr>
</tbody>
</table>

Source: “Population Trend of Sendai City in 2011” (Published in March 2012)

In Preparation for an Increase in Visitors

▼ Crowd-drawing events

4 ~ 6/2012  Sendai–Miyagi 【Travel to Date】 spring campaign
4 ~ 6/2013  Sendai–Miyagi destination campaign
5/2013  Sendai International Half-Marathon

▼ Large-scale events in Sendai City in 2012

- 12th WTTC (World Tourism and Travel Council)/Global Summit (April)
- High-level international conference on large-scale natural disasters (July)
- Nenrin Pic Miyagi–Sendai 2012 (October)
- Japan Women’s Conference in Sendai 2012 (October)
- Sendai Dialogue on Disaster Risk Reduction concurrent to Annual Meeting of the IMF and World Bank (October)

▼ Attracting international conventions

Attracting the “2015 World Conference on Disaster Reduction”
Sendai City was the 2nd city in Japan (after Hyogo Prefecture) and 35th worldwide to be recognized as a "Role Model City for Disaster Management" under the UN’s "Making Cities Resilient’ World Disaster Reduction Campaign."

**Reason for recognition**
- Programs that involve resident participation and “resident efforts”, with regard to pre-event disaster mitigation programs and redevelopment of a disaster-resilient, environment-friendly city of a new dimension from the lessons learned from the earthquake were highly rated in particular.

**Role model theme**
- A role model for promoting community based DRR and empowering the people to act on DRR

**Moving forward as a role model city for disaster management**
- Tell the world about the lessons of the Great East Japan Earthquake and the city’s disaster reduction and reconstruction efforts, and work with the UN to help develop a culture of disaster risk reduction around the world.

**Sendai’s Future Role as an International Center for Disaster Risk Reduction**

Sendai is working to attract the 3rd World Conference on Disaster Reduction to Sendai/Tohoku so as to tell the world about the reconstruction going on in Tohoku and the experiences and lessons learned from the Great East Japan Earthquake. Sendai wants to contribute to the development of a disaster risk reduction culture around the world and the crafting of the UN’s strategy on disaster reduction.

**Telling the world about the lessons learned from the Great East Japan Earthquake**
- Tell the world about the lessons learned in Sendai and Tohoku as a role model city at international conferences.
  - World Ministerial Meeting on Disaster Reduction in Tohoku (Sendai City)
  - Special events planned for the Annual Meeting of the IMF and World Bank
  - Sendai Dialogue on Disaster Risk Management (Sendai City)
  - 5th Asia Ministerial Conference on Disaster Risk Reduction (Indonesia)

**Participating in crafting a new disaster reduction strategy post the Hyogo Framework for Action**
- The UN’s Hyogo Framework for Action disaster reduction strategy greatly contributed to the development of a culture of disaster reduction around the world over these past 10 years. Given the new circumstances, Sendai wants to participate in discussions on a “Post-Hyogo Framework of Action” through the UN and elsewhere.
  - Perspectives of development and disaster reduction (importance of investing in disaster prevention)
  - Limits to public aid and the importance of helping oneself and others
  - Importance of collaborating with and participating in various sectors toward building disaster prevention strength on the local level, etc.

**In hosting the 3rd World Conference on Disaster Reduction in Sendai/Tohoku in 2015, Sendai wants to take disaster reduction onto a new stage with a “Sendai Framework of Action” that can effectively take the place of the “Hyogo Framework for Action.”**
Thank you.