

# Rikuzentakata City Great East Japan Earthquake Analysis Report

## Digest Version

August 2014

Rikuzentakata City

This digest version was compiled to summarize findings in our Great East Japan Earthquake Analysis Report to convey particularly important messages to many people, including the citizens of our city, in an easy-to-understand way.

# In Commemoration of the Publication of the Rikuzentakata City Great East Japan Earthquake Analysis Report

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Rikuzentakata City has frequently suffered serious damage from tsunami in the past. Our forefathers tried to convey their experience to posterity each time they were struck by tsunami. We have learned many lessons from their experience and have made efforts to prevent and mitigate damage from disasters. However, the tsunami generated by the 2011 off the Pacific coast of Tohoku Earthquake that occurred on March 11, 2011, far exceeded our imagination, revealing the destructive power of Mother Nature and causing more than 1,750 casualties (combined total of the dead and missing). In particular, our city suffered the largest number of tsunami casualties since the Meiji period.

Based on a tsunami inundation simulation model developed by Iwate Prefecture in FY2004 in anticipation of a Miyagi off-coast earthquake, which was said to occur with a high probability at the time, Rikuzentakata City reviewed its Local Disaster Management Plan in FY2006 to prepare for an earthquake and tsunami through disaster management training and education. We deeply regret that despite such efforts, we were unable to prevent such serious damage from the earthquake. As mayor of the city, I hereby express my apologies once again.

What we survivors can do for those who lost their lives is to accurately analyze damage from the earthquake and to organize and review reflections and issues revealed through the analysis. This is the most important objective and meaning of publishing the analysis report.

When performing analysis, we requested representatives of various groups and evacuation shelters, including ward community promotion councils, elementary and junior high school principals associations and women organization councils, to serve as committee members. We also requested Professor Motoyuki Ushiyama, of Shizuoka University's Center for Integrated Research and Education of Natural Hazards, to participate in discussions as an expert member of the committee.

In addition, we enlisted the cooperation of many citizens in questionnaire surveys and interviews to gather information on their conditions subsequent to the earthquake. We also solicited for public comments from among citizens twice. I hereby express my heartfelt gratitude for their many valuable comments.

Along with the development of communities based on our city's earthquake recovery plan, we will work with citizens to create a disaster-resilient, safe community in the future based on the results of analysis in the report, including preparing an Initial Response Manual for city officials, an Evacuation Manual that specifies appropriate evacuation procedures for citizens and an Evacuation Shelter Management Manual for evacuees and voluntary disaster reduction organizations.

We would be pleased if the results of our analysis could bring benefits to local governments that are preparing for a great Nankai trough earthquake as well as cities around the world that are in similar environments to help them prevent and mitigate disaster damage.

Finally, I would like to express my deepest condolences to those who lost their lives in the earthquake. At the same time, I would like to thank not only the Analysis Committee members, but also all individuals and organizations that cooperated with us in publishing our report.

July 2014

**Futoshi Toba**, Mayor of Rikuzentakata City

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## Damage Overview

### 1. Earthquake status

<b>Time of occurrence</b>	2:46 p.m., Friday, March 11, 2011	<b>Size of the earthquake</b>	9.0 in magnitude
<b>Seismic center</b>	Off the coast of Iwate and Ibaraki prefectures	<b>Seismic intensity on the Japanese scale in Rikuzentakata City</b>	6 lower (estimated)
<b>Depth of the seismic center</b>	Approx. 24 km		

### 2. Tsunami data

<b>Depth of tsunami inundation (maximum)</b>	17.6 m (in Takatacho Horyo)	<b>Tsunami inundation area</b>	13 km <sup>2</sup>
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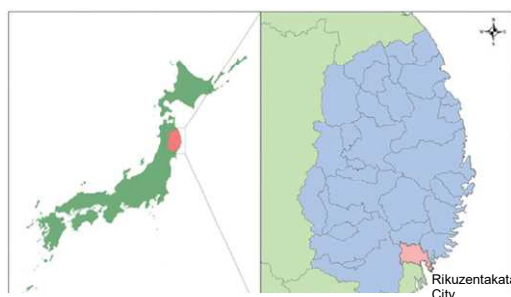
### 3. Casualty status

<b>Population</b>	24,246	As of February 28, 2011 (based on the basic resident register)
<b>Number of deaths</b>	1,550 (including 42 indirectly related deaths)	As of June 30, 2014 (number of persons that were reported dead)
<b>Number of missing persons</b>	207 (203)	As of June 30, 2014 (the number in the parentheses is the number of missing persons who were reported dead)

### 4. House damage from tsunami

<b>Number of households</b>	8,069	As of February 28, 2011, based on the basic resident register
<b>Totally destroyed houses</b>	3,805	As of June 30, 2014
<b>Half-destroyed houses</b>	236	As of June 30, 2014
<b>Total</b>	4,041	As of June 30, 2014

### Location of Rikuzentakata City



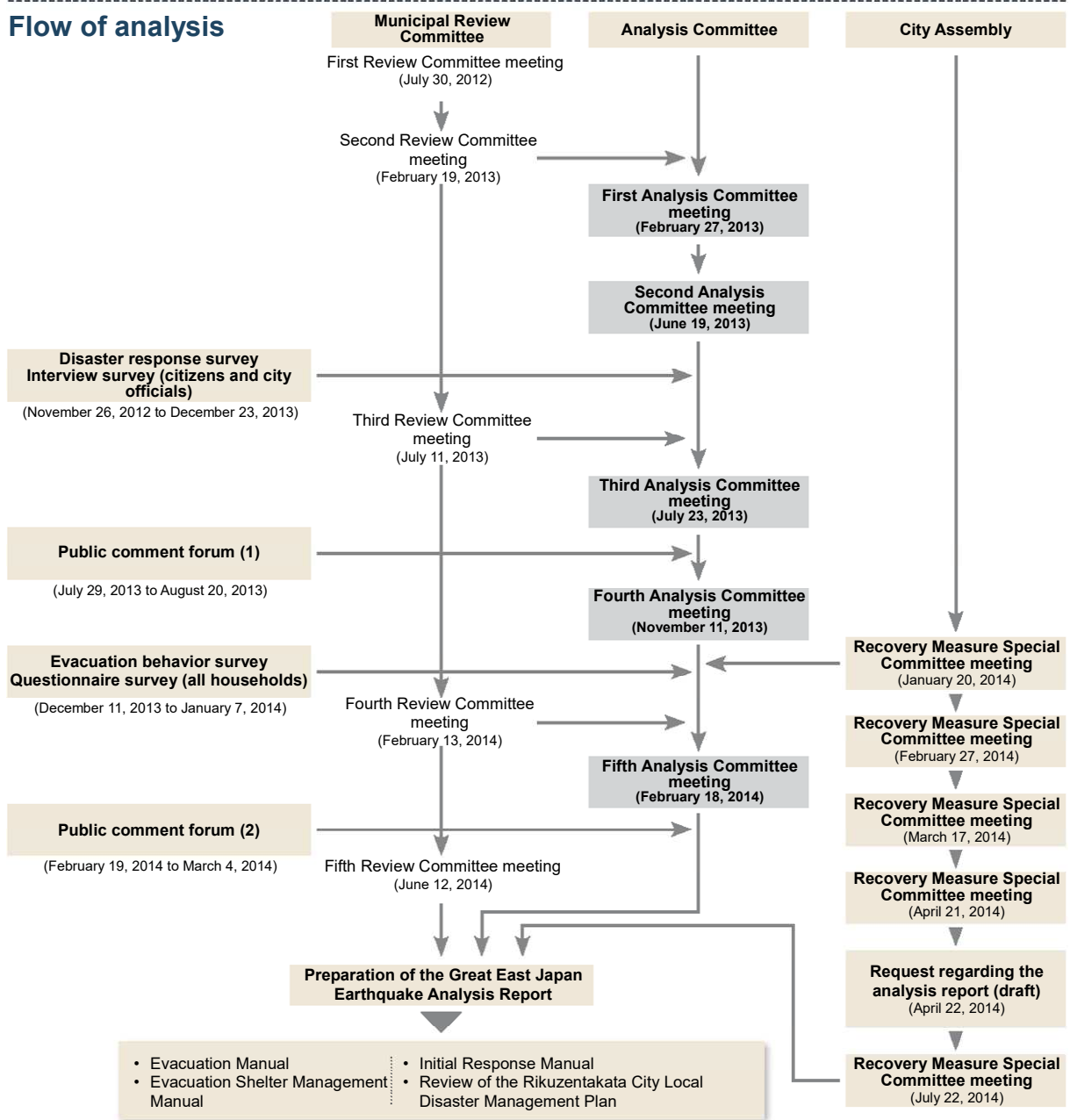
# Research Objective and Flow of Analysis

Many valuable lives were lost as a result of the 2011 off the Pacific coast of Tohoku Earthquake and the tsunami caused by the earthquake on March 11, 2011.

Also, due to damage to city buildings and other facilities that should have served as disaster response centers and also as a result of city officials and firefighters who should have played major roles in emergency response themselves having been affected by the disaster, we had difficulty in providing effective initial response to the disaster.

Based on lessons learned from our experience, we conducted this research in order to analyze factors that caused such serious damage and loss of lives. At the same time, to organize lessons regarding disaster response and to provide useful information for local governments across Japan to develop disaster management plans for a great Nankai trough earthquake and a Tokyo epicentral earthquake that are predicted to occur in the near future, we decided to compile an analysis report on the effects of the Great East Japan Earthquake in Rikuzentakata City.

## Flow of analysis



# Analysis Committee

## Rikuzentakata City Great East Japan Earthquake Analysis Committee Roster

Institution/affiliation	Managerial position	Name	Institution/affiliation	Managerial position	Name
Rikuzentakata City	副市長	委員長 久保田 崇	Takekoma Ward Community Promotion Council	会長	委員 上部 修一
Ofunato Police Station Takata Executive Officer Police Box	所長	委員 岩淵 健一	Kesen Ward Community Promotion Council	会長	委員 村上 孝嘉
Rikuzentakata City Firefighting Team	団長	委員 大坂 淳	Osabe Ward Community Promotion Council	会長	委員 菅野 征一
Rikuzentakata City Social Welfare Council	会長	委員 熊谷 光人	Takata Ward Community Promotion Council*	副会長	委員 菅野 富歳
Takatacho Commissioned Welfare and Child Welfare Council	委員	委員 鈴木 正春		会長	委員 熊谷 七五三男
Kesencho Yogai Community Center	館長	委員 武蔵 省悦	Yonesaki Ward Community Promotion Council	会長	委員 熊谷 光人
Special Nursing Home Kojuen	園長	委員 柴田 宏一	Otomo Ward Community Promotion Council	会長	委員 吉田 豊司
Takatacho Koizumi Ward Voluntary Disaster Management Association	会長	委員 馬場 次雄	Hirota Ward Community Promotion Council*	会長	委員 黄川田 富八
Oide Ward Community Promotion Council*	会長	委員 佐々木 英一		会長	委員 齋藤 篤志
	会長	委員 菅野 征一郎	Rikuzentakata City Local Women Organization Council	会長	委員 佐々木 美代子
Yahagi Ward Community Promotion Council	会長	委員 佐々木 公一		会長	委員 伊藤 清子
Shimoyahagi Ward Community Promotion Council	会長	委員 村上 誠治	Rikuzentakata City School Principal Council*	会長	委員 佐々木 保伸
Yokota Ward Community Promotion Council	会長	委員 松田 恒雄	Shizuoka University's Center for Integrated Research and Education of Natural Hazards	教授	委員 牛山 素行

\* Two persons' names are provided due to replacement of committee members.

## Public Comments

We solicited for public comments about the analysis report twice.

### First time: July 29 to August 20, 2013

(26

comments)

We received many comments that requested surveys and additions regarding the following items:

- ▶ How evacuation shelters were set inside the inundation area
- ▶ Persons who were affected at evacuation shelters
- ▶ Behavior of city officials on the day of the earthquake
- ▶ How to use analysis results for recovery plans for the future

### Second time: February 19 to March 4, 2014 (22 comments)

We received many comments that requested surveys and additions regarding the following items:

- ▶ Re-survey on the number of persons affected at evacuation shelters
- ▶ Descriptions in the analysis committee roster
- ▶ Continuation of the analysis
- ▶ Compilation of a digest version of the report to distribute it to all families

Also, all households in our city, along with residents of temporary and quasi-temporary housing facilities in Sumitacho, cooperated with us in conducting a questionnaire survey. Results of the survey are presented on pages 5, 6 and 11 of this report, as well as in the Analysis Report and the Appendix.

- ▶ Title: Survey on the Behavior of All Households in Rikuzentakata City during the Earthquake
- ▶ Survey period: December 11, 2013 to January 7, 2014

- ▶ Number of households targeted: 7,204 (of which 79 were outside the city)
- ▶ Number of effective responses: 3,352
- ▶ Response rate: 46.5%

# Major Reflections and Lessons Learned from the Analysis

## 1 Evacuation above all else

The number of casualties (the dead [including indirectly related deaths] and missing) caused by the Great East Japan Earthquake in Rikuzentakata City was 1,757\*, the largest in Iwate prefecture, accounting for 10.64% of the population living inside the city's tsunami inundation area at the time. This casualty rate was the largest among the 37 municipalities bordered by the ocean in the three tsunami-affected prefectures (Iwate, Miyagi and Fukushima) (our city's casualty rate in the Meiji Sanriku Tsunami was 19.2%).

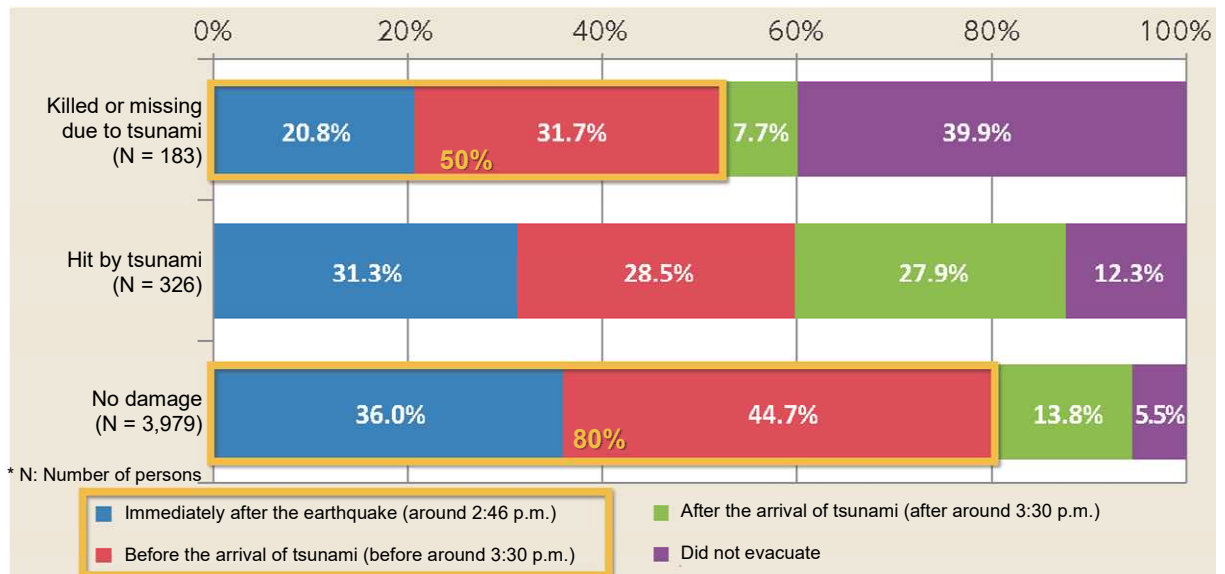
The results of a questionnaire survey targeted at all households shows the following: Among those who were in the tsunami inundation area at the time of the earthquake whose behavior on the day of the earthquake is known, 80% of those who were not affected by the tsunami had evacuated to shelters

before the arrival of tsunami. In contrast, only 50% of those who lost their lives had evacuated, with 40% not evacuating to shelters. Among the students of Kesen Elementary School (94 students), Kesen Junior High School (93 students) and other elementary and junior high schools located on the Kesen River estuary whose school buildings were inundated by tsunami waves, those who evacuated with the school faculty under their supervision started evacuation quickly. As a result, none of them lost their lives. These results clearly show that evacuation is more important than anything else in protecting human lives.

Based on these results, we will provide disaster mitigation education and training focused on proactive evacuation in order to prevent casualties

\* As of June 30, 2014, 1,550 persons were dead (including 42 indirectly related deaths) and 207 persons missing. The number of deaths (including indirectly related deaths) is the number of deaths reported.

### Evacuation timing and damage status (regarding those whose behavior on the day of the earthquake is known)



## 2 Evacuation is not the end

Among 67 primary evacuation centers that had been designated as tsunami shelters, 38 were damaged during the Great East Japan Earthquake, with an estimated 303 to 411 valuable lives being lost at 9 shelters.

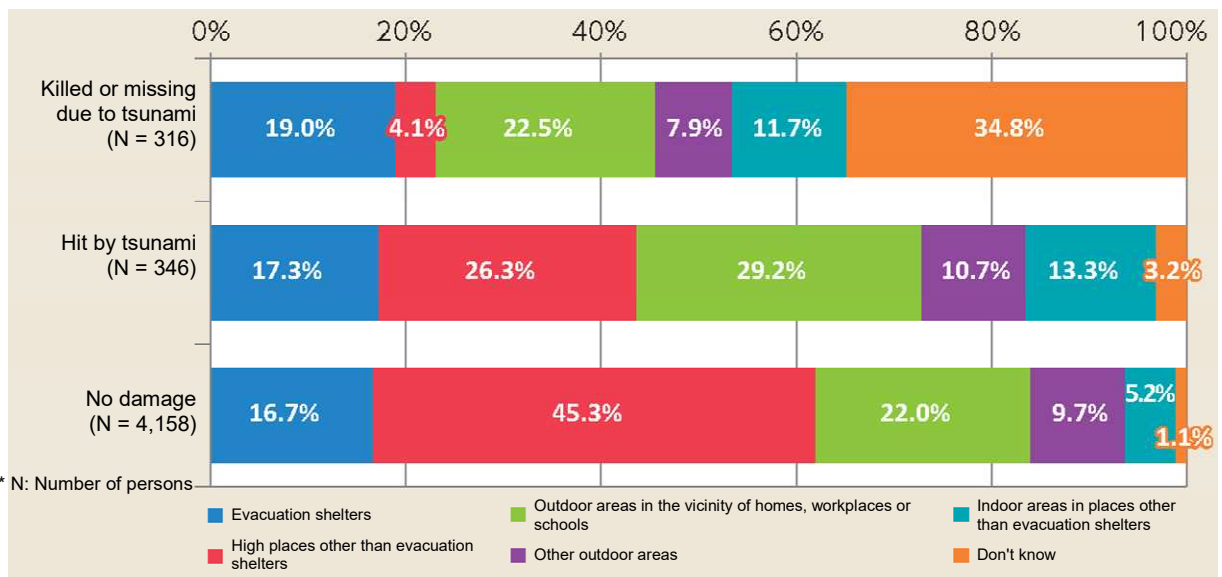
The 67 primary evacuation centers were designated in accordance with a local disaster management plan reviewed before FY2006 based on a tsunami inundation forecast map announced by Iwate prefecture in FY2004. At the time, the City Community Center, the City Gymnasium and the Iwate Prefectural Takata Hospital were located inside the area expected to be inundated by tsunami waves. However, the expected tsunami height was between 50 cm to 1 m for the City Community Center, between 1 and 2 m for the City Gymnasium and less than 50 cm for the Iwate Prefectural Takata Hospital. These facilities were therefore designated as primary evacuation shelters through discussions with community promotion councils and voluntary disaster management organizations in coastal wards based on the concept of tsunami evacuation buildings.

As a result, we lost many lives at evacuation shelters. Putting absolute faith in the tsunami forecast by the prefecture and assuming that there would be no tsunami waves higher than the forecast, we neglected to further evaluate the shelters. We need to seriously reflect on these facts.

Facilities that are currently designated as primary evacuation shelters are all located in places that were not reached by tsunami waves caused by the Great East Japan Earthquake. Even if they should be reached by tsunami, evacuees are still able to evacuate to higher grounds.

Even after having evacuated to a primary evacuation shelter, evacuees must remain careful about tsunami waves that repeatedly come and go and be always prepared to evacuate to higher grounds without sticking to past experiences or memories.

### Whereabouts of respondents at the time of the arrival of tsunami and damage status





# Damage status and number of casualties at primary evacuation shelters (1)

Kesencho (Imaizumi ward)	1	Senzoji Temple premises	神崎、中井の一部		
	2	Nakai Community Center	荒川、中井の一部	Inundated	3~7
	3	Imaizumi Tenmangu Shrine	中井	Inundated	
	4	Kongoji Temple premises	荒町	Inundated	
	5	Nakamachi Community Center	仲町	Inundated	22~27
	6	Suwa Shrine	上・下八日町		
	7	Kesen Elementary School	上・下八日町、鉄砲町の一部	Inundated	20~50
	8	Ryusenji Temple premises	小淵、鉄砲町の一部、的場	Inundated	
	9	Former Municipal Museum	川口、田の浜の一部	Inundated	
	10	Iwate Prefectural Takata Hospital	大通り	Inundated	26
Kesencho (Osabe ward)	1	Choenji Temple parking area	二日市の一部		
	2	Kiyoshi Yoshida's home garden	二日市の一部、湊の一部		
	3	Road below Ofutsukaichi's home	二日市の一部、湊の一部	Inundated	
	4	Vicinity of former Yukio Hitokabe's home	湊の一部	Inundated	
	5	Road below Highway 45	湊の一部		
	6	Vacant lot below Minoru Ito's home	湊の一部	Inundated	
	7	Road beside Toshi Ito's home	湊の一部	Inundated	
	8	Koya Community Center	古谷の一部		
	9	Koya Ward hill	古谷の一部		
	10	Sugoroku Ward hill	双六の一部		
	11	Sugoroku Community Center	双六の一部		
	12	Yogai Community Center	要谷		
	13	Fuppushi Ward hill	福伏		
Takatacho	1	Oishi Community Center	板ヶ沢、大石の一部、森の前の一部、大石沖の一部	Inundated	
	2	First Junior High School	大石の一部、森の前の一部、大石沖の一部		
	3	Vicinity of the Fudo god statue	馬場前の一部、森の前の一部	Inundated	
	4	City Community Center	館の沖の一部、馬場前の一部、並杉の一部	Inundated	130~170
	5	Takata Elementary School	大町の一部、荒町の一部、館の沖の一部	Inundated	
	6	Kawara Community Center	寒風の一部、裏田の一部	Inundated	
	7	City Gymnasium	砂畑、曲松、本宿の一部、館の沖の一部	Inundated	80~100
	8	13 Ward Community Center	長砂の一部、本宿の一部	Inundated	10~15
	9	Takata High School	長砂の一部、本宿の一部、中長砂の一部、中宿	Inundated	
	10	Nagasuka hill	中長砂の一部		
	11	Yasaka Shrine	下宿	Inundated	

## Damage status and number of casualties at primary evacuation shelters

(2)

Yonesakicho	1	In front of the Employment Promotion Housing Complex	地竹沢	Inundated	
	2	In front of Suzuo Sugawara's home	沼田の一部	Inundated	
	3	In front of Yoshio Kumagai's home	沼田の一部	Inundated	
	4	In front of Hideo Yoshida's home	沼田の一部		
	5	Matsumine Community Center	脇の沢の一部		
	6	In front of Matsumine Shrine	脇の沢の一部		
	7	Matsugami Community Center	脇の沢の一部	Inundated	
	8	Tate Community Center	館	Inundated	7~10
	9	In front of the Konno Direct Sale Center	川西、堂の前の一部	Inundated	
	10	In front of the Tachiyama Kannon Chapel	堂の前の一部	Inundated	
	11	Donomae Central Hall	堂の前の一部		
Otomochi	1	Vicinity of Zenji Owada's home	両替の一部、金浜	Inundated	
	2	Ryogae Community Center	両替の一部	Inundated	
	3	Ryogae Hachiman Shrine	両替の一部	Inundated	
	4	Mikkaichi Community Center	三日市の一部、茶立場	Inundated	5~6
	5	Vicinity of Koichi Yamato's home	三日市の一部	Inundated	
	6	Vicinity of Kokichi Toba's home	泉田、谷地前の一部		
	7	Vicinity of Kiminobu Saito's home	唯出の一部		
	8	Vicinity of Gisuke Toba's home	唯出の一部、谷地館の一部		
	9	Vicinity of Masayo Shibata's home	泉田の一部、谷地館の一部	Inundated	
	10	Yamanokami Shrine	茂里花		
	11	Koyashiki Community Center	小屋敷		
	12	Shioya Community Center	塩谷	Inundated	
	13	Vicinity of Marusho Industries	鳥嶋		
	14	Vicinity of the Yanoura broadcasting tower	矢の浦	Inundated	
	15	Usozawa Community Center	瀬沢		
Hirotacho	1	Oyo Community Center	大陽一部		
	2	Jionji Temple	泊、後浜	Inundated	
	3	Nakazawahama Community Center	中沢		
	4	Donomae Community Center	根岬、集		
	5	Hirota Junior High School	天王前、六ヶ浦	Inundated	
	6	Hirota Elementary School	前花貝、後花貝		
	7	Kosode Community Center	袖野		
<b>Total</b>					<b>303~411</b>

\* The numbers of casualties in the above table are based on the testimonies of multiple survivors. However, they are not guaranteed to be correct. No casualties have been confirmed at evacuation shelters with no numbers.

### 3 Ensuring the safety of people with public roles

Many people who played public roles in leading the evacuation of citizens lost their lives in the Great East Japan Earthquake. In addition to leading the evacuation, city officials gathered information on the earthquake and tsunami under the leadership of staff in charge of disaster management, with other staff members standing by to prepare for relocation to the Ward Headquarters and for disaster response. Firefighters in coastal wards were engaged in closing water gates and floodwall gates. Ward directors and many commissioned social and child welfare volunteers were checking the safety of those needing care.

As a result of these activities, 111 city officials (including part-time and temporary employees), 51 firefighters, 11 ward directors, and 11 commissioned social and child welfare volunteers lost their lives.

One of the reasons why so many lives were lost is that there were no clear evacuation standards.

Based on lessons learned from this experience, we will ensure protecting the lives of persons with public roles by compiling an Initial Response Manual for city officials and an Earthquake Disaster Activity Manual for firefighters in order to complete activities and evacuation before the arrival of tsunami.

#### Casualties among city officials, firefighters, ward directors and commissioned social and child welfare volunteers

Organization	No. of casualties (persons)	Casualty rate (%)
City officials	111	25.1
Firefighters	51	6.8
Ward directors	11	10.5
Commissioned social and child welfare volunteers	11	13.3

#### Whereabouts of city officials during the tsunami attack

Whereabouts	Total number of persons	Number of survivors	Number of casualties
City Hall and its vicinity	88	77	11
Evacuation shelters (excluding the City Community Center and the City Gymnasium)	88	88	0
City Community Center	66	5	61
On the move to work sites and ward headquarters	54	43	11
Offices (outside city buildings)	41	41	0
City Gymnasium (Takata ward headquarters)	24	1	23
Firefighter working sites	13	10	3
Ward headquarters (excluding the Takata ward headquarters)	12	12	0
Fire station buildings	10	10	0
Other (on business trip, off work, etc.)	47	45	2
<b>Total</b>	<b>443</b>	<b>332</b>	<b>111</b>

\* Estimated based on information obtained from an interview survey for city officials.

## 4 Development of a disaster-resilient, safe community

The urban area of Rikuzentakata City was developed in the plane and gradually expanded toward the ocean as a result of the opening of the Takata bypass to Highway 45 and other circumstances. This development is said to have increased the tsunami damage.

Based on lessons regarding the prevention and mitigation of tsunami disaster learned from the frightening experience of the tsunami, we will bring together all available resources to develop a city where all citizens can live with a sense of security.

To that end, we formulated the Rikuzentakata City Earthquake Recovery Plan in December 2011 with the aim of regenerating and revitalizing our city. The plan is designed for the eight years from FY2011 to FY2018. The first of the six basic policies for community development is how to develop a disaster-resilient, safe community.

In accordance with the recovery plan, we will develop urban and residential areas on high or raised grounds to protect them from inundation caused by tsunami.

Also, we aim to develop a disaster-resilient city, including constructing coastal security facilities, such as seawalls and water gates, and evacuation roads (Symbol Road, etc.).

In particular, benefiting from lessons learned from the experience of disaster management functions being paralyzed, we will construct city hall buildings where the disaster response headquarters will be installed and the fire station building that will serve as the center for firefighting emergency activities on high grounds outside the area inundated by tsunami in the Great East Japan Earthquake.



Coastal security facility (Kesen River Water Gate Image Photo)



Evacuation road (Symbol Road Image Photo)

## 5 Realization of a society where the socially weak can live safely

It has been reported<sup>\*1</sup> that the casualty rate of disabled people (people who have disability certificates) in Iwate, Miyagi, and Fukushima prefectures was approximately twice the casualty rate of all residents (1.3 times in our city).

Also, those who lost their lives to tsunami were more likely to have accompanied persons needing care—e.g., supporters who lost their lives as a result of providing support for the evacuation of the socially weak (those needing care<sup>\*2</sup>).

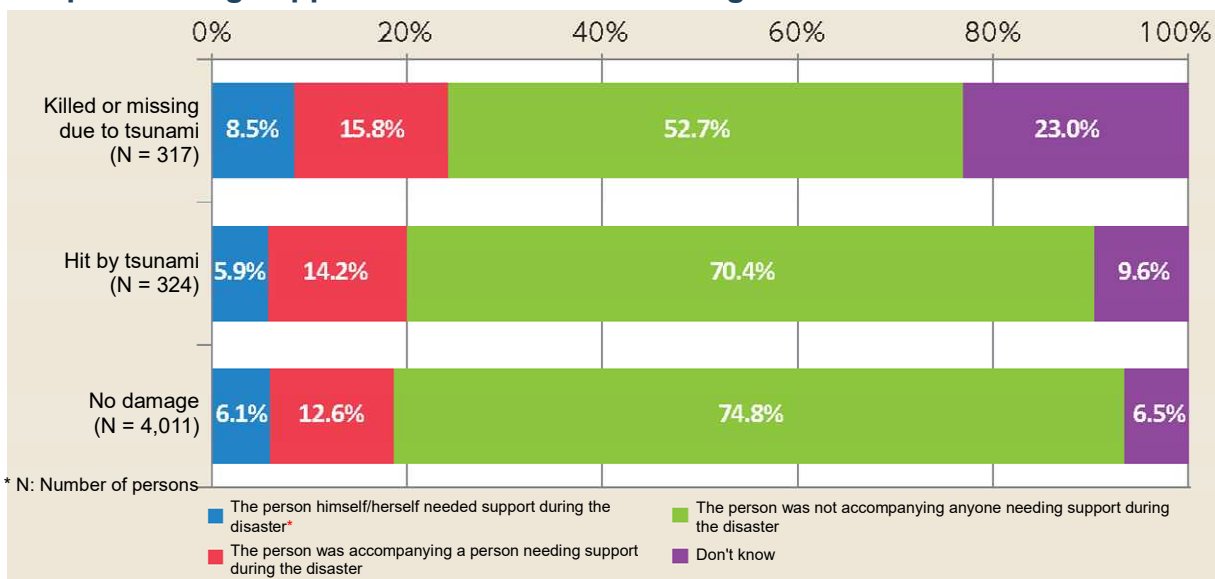
Based on the above results, we aim to create a city that does not require the word normalization<sup>\*3</sup> and is friendly to all people, including the socially weak, by sharing information with those needing care and by providing support for them.

\*1: Interview survey conducted by NHK (responses were obtained from 27 coastal municipalities in the three affected prefectures [Iwate, Miyagi, and Fukushima])

\*2: People who need special care at disaster management facilities, such as senior citizens, disabled people, and infants

\*3: Idea that all people, including those with disabilities, can live social life equally

### People needing support in a disaster and damage status



\* Such people are called "those needing care" recently. However, the term "those needing support" was used at the time of the questionnaire survey for this report.

## 6 In conclusion

Three years have passed since the occurrence of the Great East Japan Earthquake, with recovery being made day by day. Nevertheless, we are still unable to forget the sorrow and pain of the earthquake damage. We must make sure that no one, including the citizens of Rikuzentakata City, will ever experience such feelings again.

While it is impossible to fully prevent natural disasters, it is possible to mitigate damage by making preparation for disasters. To that end, we need to think what type of disasters can occur around us in our daily lives and to be prepared to protect our lives on our own.

It is necessary to reconstruct and enhance voluntary disaster management organizations in accordance with the reorganization of communities and to take an active part in passing down knowledge of the terrible power of tsunami along with our evacuation culture (e.g., "tsunami tendenko" education) through disaster mitigation education.

There is a need to develop a disaster-resilient, safe community by benefiting from the sacrifice of those who lost their lives in the Great East Japan Earthquake in order to realize a community designed to protect all human lives.

We will organize problems and issues revealed through the analysis to reflect them in our Local Disaster Management Plan and Earthquake Recovery Plan. At the same time, we will develop an Evacuation Manual and an Evacuation Shelter Management Manual for citizens as well as an Initial Response Manual for city officials in order to develop a community where residents can live with a sense of security.



## 陸前高田市東日本大震災検証報告書 概要版

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