

Chapter 2

Brief Overview of the Tohoku 3.11 Mega Earthquake, Tsunami, and Fukushima NPS Disasters

1 Facts on the 3.11 Earthquake and Tsunami Scale Based on the Mid-June 2011 White Paper on Disaster Reduction

The Pacific coast area of eastern Japan was struck by the Great East Japan Earthquake (Tohoku District—off the Pacific Ocean Earthquake), which occurred at 14:46 on 11 March 2011. This earthquake occurred in an area where the Pacific plate sinks beneath the North American plate, and the magnitude of this earthquake was 9.0, the largest in Japan's recorded history. The seismic source was at latitude 38.1 north, longitude 142.9 east, and at a depth of 23.7 km (Fig. 2.1).

2 Initial Quakes and Tsunami Damages

The crustal movement induced by this earthquake extended over a wide range, from the Tohoku District to the Kanto District. Afterward, tsunamis struck the Tohoku District in a series of seven waves, resulting in the inundation of an area as large as 561 km². Based on the press release by the government Extreme Disaster Management Headquarters as of 26 June 2012, 18,812 people are reported dead or missing. The total number of residential buildings damaged was 1,111,179 including fully destroyed, half-destroyed, partially destroyed, and inundated structures.

- 15,866 deaths and 2,946 missing (more than 90% of deaths were caused by drowning, and 65% of the dead were over 60).
- Housing: 130,436 demolished, 262,975 half destroyed, and 717,768 partially destroyed.
- Direct damage to the stock (social capital, housing, and private corporate facilities): approx. 16.9 trillion yen.
- Inundation area caused by tsunami was 561 km² throughout Japan. Much wider areas were inundated as compared to the prediction of hazard maps.

(Source: Extreme Disaster Management Headquarters 2012)

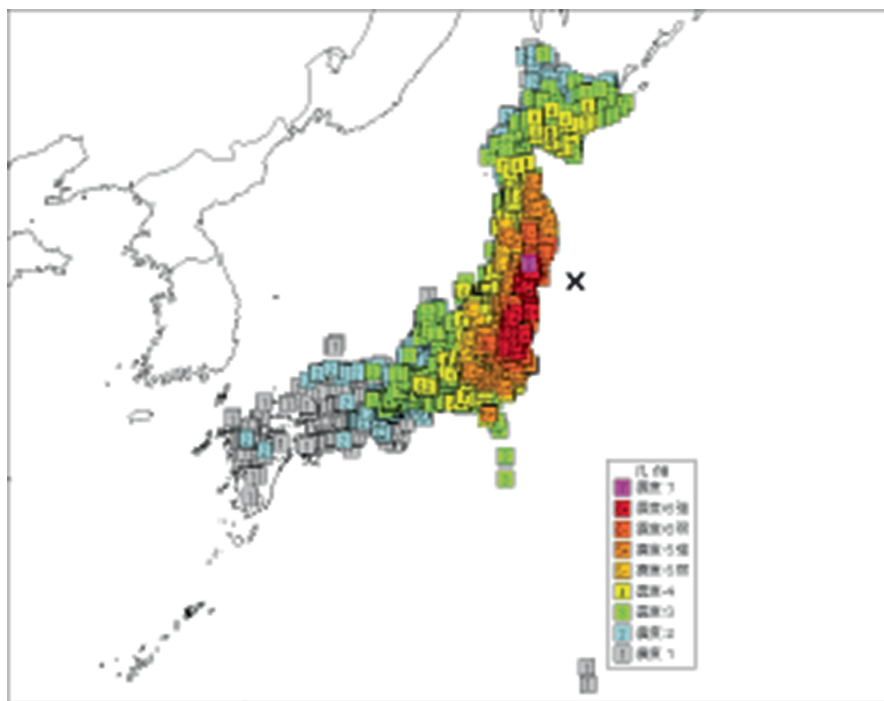


Fig. 2.1 Seismic intensity of the Off the Pacific Coast of Tohoku Earthquake (*Source: Cabinet Office 2011c, p. 1*)

In terms of the area inundated by the tsunami, according to the Geospatial Information Authority of Japan (GSI), Miyagi Prefecture had an area of 327 km² inundated, Fukushima Prefecture had an area of 112 km², and Iwate Prefecture had an area of 58 km² inundated. The total inundated area was up to 561 km² (Geospatial Information Authority of Japan 2011).

Regarding the extent of damage to infrastructural lifelines, there were 4,200 spots of road damage identified and 7,330 spots of damage to railways (including 1,730 spots caused by the tsunamis). In addition, approximately 480,000 households suffered from gas supply stoppages, approximately 2,200,000 households suffered from water supply stoppages, approximately 8,910,000 households were cut off from electricity, and 1,000,000 phone lines were knocked out.

There were over 122 sites of damage from landslides including mudslides, slope failures, and ground deformation. Dams burst, and several people went missing in Fukushima Prefecture. Large-scale ground liquefaction occurred in the coastal areas such as Urayasu City and Makuhari City and on the Kujukuri plain in Chiba Prefecture (Extreme Disaster Management Headquarters 2012; JR East 2012).

3 Initial Nuclear Power Plant Accidents

The Fukushima Dai-ichi Nuclear Power Station (NPS) was hit by the first enormous wave at 15:27 on March 11 (41 min after the earthquake) and the next gigantic wave around 15:35. In terms of the operating status at the Fukushima Dai-ichi NPS before the earthquake on March 11, Unit 1 was under operation at its rated electric power, Units 2 and 3 were under operation at their rated thermal power, and Units 4, 5, and 6 were not under operation at that time under periodic inspection. Units 1 to 3 which were under operation automatically shut down at 14:46 on March 11 due to strong quakes. All six external power supply sources were lost because of the earthquake. This caused the emergency diesel power generators to start up. However, seawater pumps, emergency diesel generators, and distribution boards were submerged because of the tsunami strike, and all emergency diesel power generators stopped except for one generator in Unit 6. For that reason, all AC power supplies were lost except at Unit 6. Since the seawater pumps were submerged by the tsunami, residual heat removal systems to release the residual heat inside the reactor to the seawater and the auxiliary cooling systems to release the heat of various equipments to the seawater lost their functions. This probably led to the meltdown of the reactor core, hydrogen explosion, leakage of cooling water, and lastly a great amount of radioactive materials discharged to the environment. However, the passing of final judgment needs to wait until after the government review committee submits its report. Fukushima NPS has two plant sites. One, Fukushima Dai-ichi that was severely hit this time, and another, Fukushima Dai-ni, also caused severe damage involving the evacuation of residents.

4 Economic Damages by the Great East Japan Earthquake

According to the Cabinet Office's estimates on 24 June (Cabinet Office 2011d), damaged stocks in disaster areas are estimated to be approximately 16.9 trillion yen. This includes the wreckage of buildings, lifeline utilities, and social infrastructure but excludes damages from the Fukushima Dai-ichi Nuclear Power Plant accidents. This 16.9 trillion yen is 1.76 times larger in comparison to the economic damage of the Great Hanshin-Awaji Earthquake.

Now, every effort is being conducted at the Fukushima Dai-ichi Nuclear Power Plant to settle the accident. The government declared on 16 December 2011 that the reactors were brought to a condition equivalent to "cold shutdown" and the Step 2 in the "Roadmap towards Settlement of the Accident at Fukushima Daiichi Nuclear Power Station, TEPCO" was achieved. That means that the release of radioactive materials was under control, and the radiation dose was being significantly held down. However, some specialists and foreign media expressed such declaration was deceiving. Under such circumstance, we are not so sure that the reactors and spent fuel pools have been brought to a stable cooling condition and the release of radioactive materials are mitigated. Contamination of the environment leads to the

contamination of food with radioactive materials. Even if the government inspects radioactive materials in food every day and restricts distribution of food that fails to meet provisional regulation values, sensible citizens do not buy food produced in the areas surrounding the Fukushima Dai-ichi Nuclear Power Plant site. Producers of food products may suffer from the loss of sales. Sightseers avoided the places near the accident site. Although the continued spread of radiation may decrease as time elapses, tourism-related businesses such as hotels and restaurants might suffer. Nobody knows how extensive such economic damages will be.

5 Illustration and Analysis of the Crisis with Socioeconomic Data on the Afflicted Population and Communities

5.1 Introduction: Current Macroeconomic Situation

According to the private sector forecasts prior to the 3.11, Japan's economy was expected to grow in the third and fourth quarters of 2011 after slowing down in the first and second quarters in 2011. The degree of the slowdown was expected to be much less than after the "Lehman Shock." According to "Economic Impact of the Great East Japan Earthquake and Current Status of Recovery" released by the government on August 2011, an adverse impact to the Japanese economy was limited since coastal areas along the Pacific Ocean, which suffered the greatest destruction, accounts for only 2.5% of the total Japanese economy in terms of shipment value and gross value added of manufactures. The government's Monthly Economic Report of September 2011 (Cabinet Office 2012) recognized that concerning short-term prospects, the Japanese economy was expected to continue to pick up, reflecting supply chain reconstruction and the effects of policy measures. Monthly Economic Report of July 2012 (Cabinet Office 2012) assessed that the Japanese economy was on the way to recovery at a moderate pace partly due to reconstruction demand and concerning short-term prospects; movements toward sound economic recovery in the Japanese economy are expected to take hold due to reconstruction demand to some extent.

Thus far, the Japanese economy is recovering from the losses incurred by the Great East Japan Earthquake. Under such circumstances, in this chapter, the social and economic situation of the three prefectures that suffered the majority of the destruction and the municipalities devastated by tsunamis in these three prefectures will be described by making use of statistical data. By analyzing these data, the presentation of priority policy measures may be possible.

More than 99% of the deceased and missing people had lived in three prefectures, namely Iwate, Miyagi, and Fukushima. Here, we would like to describe the social and economic situation of these three prefectures by making use of official statistics and to show what kind of rehabilitation measures are mostly needed in the damaged areas.

Table 2.1 Total population and population by age group

	Total population	Percentage of 14 years old and under population	Percentage of 15–64 years old population	Percentage of 65 years old and over population
Unit	Person	%	%	%
All Japan	128,057,352	13.1	63.3	22.8
Iwate	1,330,147	12.7	59.8	27.1
Miyagi	2,348,165	13.1	63.9	22.2
Fukushima	2,029,064	13.6	60.9	24.9
All three prefectures	5,707,376	13.2	61.9	24.3

Source: Statistics Bureau 2010b

5.2 Situation of the Three Afflicted Prefectures

5.2.1 Population

According to the 2010 Population Census (Statistics Bureau 2011b), about 5.7 million people live in Iwate, Miyagi, and Fukushima (Table 2.1). That accounts for 4.4% of the total population in Japan. The age structure of the population in three prefectures is the following:

Based on the 2010 Population Census, the population aged 65 years old and over accounts for 27.1% in Iwate, 24.9% in Fukushima, and 22.2% in Miyagi. The percentage in Iwate and Fukushima is higher than the national average (22.8%).

5.2.2 Prefectural Economic Accounts, Prefectural Disposable Income

According to the fiscal 2008 prefectural accounts (Cabinet Office 2010), prefectural gross production (nominal value) in Iwate totaled 4,391 billion yen, that in Miyagi 8,193 billion yen, and that in Fukushima 7,667 billion yen. Gross production in these three prefectures accounts for 4.0% of GDP in Japan. Compared with the population, the scale of gross production is not substantial. The economic size of these three prefectures combined is between that of the Czech Republic and that of the Republic of Hungary.

Per capita prefectural disposable incomes are 2.267 million yen for Iwate, 2.473 million yen for Miyagi, and 2.743 million yen for Fukushima. The national rankings for these prefectures are no.40 for Iwate, no.32 for Miyagi, and no.17 for Fukushima.

5.2.3 Value Added by Major Industry

Prefectural economic accounts show the industry structure in each aforementioned prefecture (Table 2.2). The ratios of value added by agriculture, forestry, and fisheries; by food manufacturing; and by construction to the total value added in

Table 2.2 Value added by major industry

Major industry group	Sub industry group	All Japan (%)	Iwate (%)	Miyagi (%)	Fukushima (%)
Agriculture, forestry and fisheries		1.1	3.7	1.7	2.0
Mining		0.1	0.1	0.0	0.1
Manufacturing		18.8	15.5	12.4	24.6
	Food Manufacturing	2.5	4.1	2.8	3.6
	Manufacturing of electrical machinery, equipment and supplies	2.7	2.8	2.7	7.0
Construction		5.0	6.0	5.1	4.4
Electricity, gas, heat supply and water		2.2	2.2	2.1	9.0
Wholesale and retail trade		13.1	9.4	14.0	7.5
Finance and insurance		5.7	4.4	3.9	3.6
Transport and communications		6.6	6.2	8.6	5.1
Services		22.7	21.5	23.2	20.5
Government service producers		11.4	16.8	14.1	12.4

Source: Cabinet Office 2010

Iwate are higher than those of the national average. In Miyagi, the ratio of value added by transport and communications to total value added is higher than the national average. In Fukushima, the ratios of value added by manufacturing (especially food manufacturing and manufacturing of electrical machinery, equipments, and supplies) and by electricity, gas, heat supply, and water are higher than the national average. The ratio of value added by government service producers in the three prefectures is higher than the national average. The extent of the loss of the supply chain of auto and other manufacturing industries due to the major blow dealt to the small- and medium-size manufacturing factories in these prefectures has captured a global audience. This is because of the serious impact on the availability of supplies needed for the parts to construct cars, and also affecting the PC and other manufacturing global factories. However, the recovery was quick, and by the end of July 2011, over two-thirds were restored, and by the end of the summer of 2011, it was reported that all supply chain issues caused by the disaster were resolved.

5.2.4 Persons in Work by Industry

As for the percentage of persons engaged in work by industry, the distinctive features for the three prefectures compared with the national average are as follows (Table 2.3) based on the 2010 Population Census (Statistics Bureau 2011b).

Iwate: The percentage of workers in agriculture, forestry, and fisheries and those in construction is higher than the national average.

Table 2.3 Percentage of persons engaged in work by industry

Major industry group	All Japan (%)	Iwate (%)	Miyagi (%)	Fukushima (%)
Agriculture, forestry and fisheries	4.0	12.0	5.0	7.6
Construction	7.5	8.7	8.9	9.0
Manufacturing	16.1	15.5	13.1	20.1
Electricity, gas, heat supply and water	0.5	0.5	0.7	0.8
Information and communications	2.7	1.0	2.1	0.9
Transport	5.4	5.0	6.3	4.9
Wholesale and retail trade	16.4	15.9	18.7	15.2
Finance and insurance	2.5	2.0	2.4	2.0
Eating and drinking places, accommodations	5.7	5.4	5.9	5.5
Education, learning support	4.4	4.3	5.0	4.2
Medical, health care and welfare	10.3	11.3	10.1	10.2

Source: Statistics Bureau 2011b

Miyagi: The percentage of workers in agriculture, forestry, and fisheries, those in construction, and those in wholesale and retail trade is higher than the national average.

Fukushima: The percentage of workers in agriculture, forestry, and fisheries, those in construction, and those in manufacturing is higher than the national average.

5.2.5 Agriculture and Fisheries Labor Force

Looking at the ratio of persons engaged in agriculture to all persons engaged in work, the ratios for the three prefectures are much higher than the national average (Table 2.4). Especially for Iwate, the ratio is nearly 15%.

As for the ratio of persons engaged in fisheries to all persons engaged in work, the ratios for Iwate and Miyagi are higher than the national average (Table 2.4).

5.2.6 Agricultural Output

Agricultural output in the three prefectures occupies 8.0% of all national output according to the production of agricultural income statistics compiled by the Ministry of Agriculture, Forestry and Fisheries (Table 2.5).

5.2.7 Business Activities

According to the 2009 Economic Census for Business Frame, the ratio of small- and medium-size companies in all three prefectures is noticeably higher than the national average (Table 2.6).

Table 2.4 Agriculture and fisheries labor force

Item	Ratio of persons engaged in agriculture to all persons engaged in work	Ratio of persons engaged in fisheries to all persons engaged in work
Year	2010 (%)	2008/2010 (%)
All Japan	4.4	0.4
Iwate	14.3	1.6
Miyagi	6.7	0.9
Fukushima	11.7	0.2
All three prefectures	10.3	0.8

Source: Ministry of Agriculture, Forestry and Fisheries 2010, 2011b, Statistics Bureau 2011b

Table 2.5 Agriculture output

	All Japan	Iwate	Miyagi	Fukushima
Total agriculture output (unit: 100 million yen)	83,162	2,395	1,824	2,450
Percentage	100.0	2.9	2.2	2.9

Source: Ministry of Agriculture, Forestry and Fisheries 2011a

According to the analysis using the 2005 Interregional Input-Output Table (Source: Ministry of Economy, Trade and Industry 2011), in the Tohoku area, the increase of demand in manufacturing, especially machinery manufacturing, is most effective for inducing overall production. This was evidenced this time when the supply chain issues arose in connection with the auto and other manufacturing industries connected with overseas circulation.

5.2.8 Analyses of Basic Data of the Three Prefectures

Some basic statistics for the three prefectures are to be standardized as the ratios for nationwide data (Table 2.7). By observing these figures, the following can be noted.

The ratios for surface area and surface area by use are high compared with the population ratio. The ratios for the number of farm households and persons engaged in agriculture are high compared with the population ratio.

In Iwate and Miyagi prefectures, the ratios for the number of fishery enterprises and persons engaged in fishery are high, but the ratio for the value of manufactured goods shipments is low compared with the population ratio. On the contrary, in Fukushima, the ratios for the number of fishery enterprises and persons engaged in fishery are low, but the ratio for the value of manufactured goods shipments is high compared with the population ratio.

Table 2.6 Composition of companies by size^a

	Small- and medium-size enterprises ^b (%)	Small enterprises ^c (%)	Big enterprises (%)
All Japan	66.2	21.3	33.8
Iwate	87.8	32.2	12.2
Miyagi	82.5	27.9	17.5
Fukushima	84.8	31.4	15.2

^aCalculated by the Small and Medium Enterprise Agency, Ministry of Economy and Industry using the 2009 Economic Census for Business Frame (Prompt report). Data for privately owned enterprises. Primary industries are excluded

^bDefinition of small- and medium-size companies

(a) A company whose capital or total amount of investment does not exceed 300 million yen, or a company whose regular workforce does not exceed 300 persons except those categories of business mentioned in any of items (b) to (d) below

(b) A company whose capital or total amount of investment does not exceed 100 million yen, or a company whose regular workforce does not exceed 100 persons, and which is principally engaged in the wholesale trade

(c) A company whose capital or total amount of investment does not exceed 50 million yen, or a company whose regular workforce does not exceed 100 persons, and which is principally engaged in the service industry

(d) A company whose capital or total amount of investment does not exceed 50 million yen, or a company whose regular workforce does not exceed 50 persons, and which is principally engaged in the retail trade and the restaurants

^cDefinition of small companies

(a) A company whose regular workforce does not exceed 20 persons except those categories of business mentioned in item (b) below

(b) A company whose regular workforce does not exceed five persons and which is engaged in the wholesale trade or the retail trade or the restaurants or the service industry

The actual extent of the network of roads and highways is vast, and the roles roads have are crucial for social infrastructure. In addition, the number of medical institutions and that of medical doctors is low in proportion to the population.

5.3 Situations of the Municipalities Damaged by Tsunami in the Three Prefectures

There are 37 municipalities in the three prefectures damaged by tsunami. The population of these 37 municipalities totaled 2,510,050, comprising 2.0% of the national population. The characteristics of these 37 municipalities vary greatly, and here some social and economic differences are described based on the statistics (Table 2.8).

As for the percentage of persons 65 years old and over to the overall population, figures for five municipalities (Rikuzen-takata City, Kamaishi City, Iwaizumi town, Onagawa town) are more than 30%, while figures for six municipalities (Sendai City, Natori City, Tagajo City, Iwanuma City, Shichigahama town, and Tomioka

Table 2.7 The ratios in main statistics of the three prefectures to all Japan

	Year	All Japan (%)	Iwate (%)	Miyagi (%)	Fukushima (%)	All three prefectures (%)
Population	2010	100.0	1.0	1.8	1.6	4.5
Surface area	2009	100.0	4.1	2.0	3.7	9.7
Surface area by use	2009	100.0	3.1	2.6	3.5	9.1
No. of establishments	2009	100.0	1.1	1.8	1.7	4.6
No. of employees	2009	100.0	1.0	1.8	1.5	4.2
No. of farm households	2010	100.0	3.0	2.6	3.8	9.4
Persons engaged in agriculture (commercial farm household)	2010	100.0	3.5	2.7	4.2	10.4
Farmland	2009	100.0	3.3	3.0	3.3	9.6
No. of fishery enterprises	2008	100.0	4.6	3.5	0.6	8.7
No. of persons engaged in fisheries	2008	100.0	4.5	4.4	0.8	9.7
Value of manufactured goods shipments	2008	100.0	0.8	1.1	1.8	3.6
Total real length of roads	2009	100.0	2.7	2.0	3.2	8.0
No. of hospitals	2009	100.0	1.1	1.5	1.6	4.2
No. of clinics	2009	100.0	0.9	1.6	1.5	4.0
No. of medical doctors	2009	100.0	0.9	1.8	1.4	4.0

Source: Statistics Bureau 2011a, b, c; Ministry of Agriculture, Forestry and Fisheries 2010, 2011b, Ministry of Economy, Trade and Industry 2010

Table 2.8 Total population, population by age group, establishments, and employees by industry in selected municipalities damaged by tsunami

Item	Year	Population	Percentage of 14 years and old under population		Percentage of 15-64 years old population		Percentage of 65 years old and over population		Percentage of establishments in primary industry		Percentage of establishments in secondary industry		Percentage of establishments in tertiary industry		Percentage of workers in primary industry		Percentage of workers in secondary industry		Percentage of workers in tertiary industry	
			2010	2010 (%)	2010 (%)	2010 (%)	2010 (%)	2010 (%)	2009 (%)	2009 (%)	2009 (%)	2009 (%)	2009 (%)	2009 (%)	2009 (%)	2009 (%)	2009 (%)	2009 (%)	2009 (%)	
All Japan	Iwate	128,057,352	13.1	63.3	22.8	0.6	18.6	80.9	0.6	22.6	76.8									
		40,737	11.9	57.1	30.8	1.2	16.6	82.2	2.7	27.2	70.2									
		23,300	11.7	53.4	34.9	1.4	17.1	81.4	3.0	29.3	67.6									
		39,574	11.2	54.0	34.8	0.8	14.2	85.0	1.7	28.8	69.4									
		10,804	10.4	51.8	37.8	5.7	14.6	79.8	10.4	25.7	63.9									
		3,843	11.8	54.3	33.9	2.9	21.7	75.4	4.2	34.4	61.4									
		3,088	11.5	57.0	31.5	1.6	20.1	78.3	8.6	26.4	64.9									
		4,632	11.4	58.6	30.1	2.3	17.4	80.3	10.8	20.1	69.1									
		17,913	12.8	56.7	30.5	5.1	23.1	71.8	8.2	27.7	64.0									
		1,045,986	13.1	67.2	18.3	0.1	12.0	87.9	0.1	11.7	88.2									
Muyagi	Natori city	73,134	15.2	65.4	19.1	0.1	15.6	84.3	0.1	21.5	78.4									
	Tagajo city	63,060	15.0	66.2	18.3	0.0	14.3	85.7	0.0	18.9	81.1									
	Iwanuma city	44,187	15.1	65.0	19.7	0.3	17.3	82.4	0.3	25.6	74.1									
	Matsushima town	15,085	10.0	59.1	30.9	0.3	15.4	84.3	0.7	12.7	86.6									
	Shichiga-hama town	20,416	14.1	64.3	21.6	0.8	24.5	74.6	1.5	24.6	73.9									
	Rifu town	33,994	16.1	67.5	16.3	0.0	25.3	74.7	0.0	29.5	70.5									
	Onagawa town	10,051	10.5	55.9	33.4	0.8	22.1	77.1	2.1	34.3	63.6									
	Minami-sanriku town	17,429	12.4	57.6	30.1	3.3	21.1	75.6	3.4	32.7	63.9									
	Tomioka town	16,001	14.0	64.0	20.9	1.0	20.5	78.5	1.4	28.7	69.9									
	Shinchi town	8,224	13.6	59.5	26.9	1.4	37.4	61.2	3.7	38.4	57.9									

Source: Statistics Bureau 2011a, b

town) are 15% or so. The figure for Rifu town is 13.8%, less than 14%, which is the key indicator for the aged society (Table 2.8).

Looking at the industry structure, some municipalities have a substantial number of establishments engaged in the primary industry, while other municipalities have an extensive number of establishments engaged in the tertiary industry.

Other statistics show that the ratio of the agricultural workforce to the total workforce is relatively high for some municipalities (Rikuzen-takata City, Iwaizumi town, Tanohata village, Noda village, Hirono town, Watari town, Soma City, Minami-Soma City, Hirono town, Naraha town, Okuma town, Namie town, Shinchi town) and very low for other municipalities (Sendai City, Shiogama City, Tagajo City, Shichigahama town, Onagawa town).

There are seven municipalities where more than 1,000 fishery workers reside. The percentage of the fishery work force relative to the entire work force is significantly higher in tsunami-damaged municipalities, especially 9.6% in Fudai village, 8.1% in Onagawa town and 8.0% in Minami-Sanriku town (Table 2.9).

As shown above, the social and economic situations of tsunami-damaged municipalities vary greatly from one municipality to another. Uniform measures for rehabilitation are not suitable for the effective and efficient development of each unique municipality. Not the national government but the municipal governments, which are the closest government entity to the local residents, should play the central role to reconstruct and develop the local economy and society.

5.4 Social and Economic Situations of the Areas Surrounding the Fukushima Nuclear Power Stations

Soon after the accidents at the Fukushima Dai-ichi and Dai-ni Nuclear Power Stations (NPS), the government issued to the local residents the evacuation instruction from the areas located within 20-km radius from Fukushima Dai-ichi NPS and 10-km radius from Fukushima Dai-ni NPS. The government also issued an instruction to stay in-house in the areas located between 20-km and 30-km radius from Fukushima Dai-ichi NPS. The population of the evacuation area (within 20-km radius from Fukushima Dai-ichi NPS and 10-km radius from Fukushima Dai-ni NPS), where instructions were issued by March 15, was approximately 78,200 and that of “stay in-house” area (between 20-km and 30-km radius from Fukushima Dai-ichi NPS) was approximately 62,400 according to the 2011 White Paper on Disaster Management (Cabinet Office 2011c).

After the accidents of the Fukushima Dai-ichi Nuclear Power Station (NPS), the areas surrounding the NPS were designated as evacuation areas where local residents are required to evacuate outside the areas (designated evacuation areas). There were some municipalities where all surface areas were designated, while there were other municipalities where part of the surface areas were designated.

Table 2.9 Main economic statistics in selected municipalities damaged by tsunami

Item	No. of farm households		No. of persons engaged in agriculture (commercial farm household)		Ratio of persons engaged in agriculture to all persons engaged in work		No. of fishery enterprises		No. of persons engaged in fisheries		Ratio of persons engaged in fisheries to all persons engaged in work		Value of manufactured goods shipments		Total real length of roads	
	Household		Person		%		Enterprise		Person		%		Million yen		km	
	2010	2010	2010	2010	2010	2010	2008	2008	2008	2008	2008/2010	2008/2010	2008	2008	2009	2009
All Japan	2,527,948	2,605,736			4.4		115,196		221,908		0.4		335,578,800		1,196,216.5	
Iwate	1,730	1,816			7.1		1,025		2,048		8.0		95,543		1,046.2	
	1,247	550			2.9		877		1,874		10.0		65,432		752.4	
	1,679	1,175			11.1		489		907		8.5		17,727		664.1	
	455	340			2.0		827		1,554		9.2		136,690		650.5	
	526	482			5.8		544		1,099		13.2		16,572		220.1	
	1,172	997			20.3		130		169		3.4		6,461		537.1	
	359	262			14.8		122		188		10.6		1,715		226.0	
	179	93			6.7		169		322		23.0		2,613		191.8	
	361	304			14.8		115		203		9.9		522		145.1	
	1,281	1,561			20.2		645		805		10.4		4,706		629.4	
	4,050	4,864			1.1		17		61		0.0		574,548		3,413.2	
	5,395	5,485			7.7		1,297		3,363		4.7		414,933		2,366.2	
	68	23			0.1		127		387		1.5		77,874		178.2	
	2,799	2,029			6.2		935		2,166		6.7		117,888		1,322.0	
	334	424			1.4		4		9		0.0		117,548		185.4	
	1,629	2,241			13.8		36		101		0.6		77,008		505.0	
	186	84			0.9		183		349		3.7		2,383		101.7	
	29	4			0.1		390		865		17.5		37,787		145.2	
	1,138	803			9.7		628		1,500		18.2		16,935		369.5	

(continued)

Table 2.9 (continued)

Item	No. of farm households		No. of persons engaged in agriculture (commercial farm household)		Ratio of persons engaged in agriculture to all persons engaged in work		No. of fishery enterprises		No. of persons engaged in fisheries		Ratio of persons engaged in fisheries to all persons engaged in work		Value of manufactured goods shipments		Total real length of roads	
			Household	Person	2010	%	2010	2008	Person	2008	%	2008/2010	2008	Million yen	km	2009
	Year	2010														
Fukushima	Souma city	1,615	1,556		8.8		325		652		3.7		206,808		736.8	
	Minami-souma city	3,969	4,296		12.9		56		110		0.3		103,880		1,513.8	
	Hirono town	360	255		9.8		-		-		-		24,430		122.4	
	Naraha town	625	606		16.9		1	X	X		X		16,318		229.2	
	Okuma town	587	604		10.9		2	X	X		X		23,684		208.5	
	Namie town	1,395	1,443		14.7		74		110		1.1		34,401		659.7	
	Shinchi town	778	844		21.5		42		63		1.6		14,100		213.4	

Source: Statistics Bureau 2011b, d; Ministry of Agriculture, Forestry and Fisheries 2010, 2011b; Ministry of Economy, Trade, and Industry 2010

Table 2.10 Total population and population by age group in 12 municipalities

Item	Population	Percentage of 14 years old and under population	Percentage of 15–64 years old population	Percentage of 65 years old and over population
Year	2010	2010 (%)	2010 (%)	2010 (%)
All Japan	128,057,352	13.1	63.3	22.8
Tamura city	40,422	12.6	58.4	28.9
Minami Soma city	70,878	13.6	59.5	26.5
Kawamata town	15,569	11.3	56.9	31.7
Hirono town	5,418	14.1	62.1	23.8
Naraha town	7,700	13.3	60.8	25.9
Tomioka town	16,001	14.0	64.0	20.9
Kawauchi village	2,820	9.2	55.6	35.2
Okuma town	11,515	16.0	63.0	21.0
Futaba town	6,932	13.4	59.4	27.1
Namie town	20,905	13.0	60.0	26.5
Katsurao village	1,531	11.3	56.5	32.2
Iidate village	6,209	12.8	57.2	30.0
12 municipalities total	205,900	13.2	59.7	26.8

Source: Statistics Bureau 2011b

Here, we would to describe the socioeconomic conditions of the municipalities in which designated evacuation areas existed as materials useful to contemplating municipality reconstruction plans. We pick up 12 municipalities, namely two cities, seven towns, and three villages where evacuation areas were designated by the national government.

According to the 2010 Population Census, 205,900 people live in 12 municipalities (Table 2.10). Population size of each municipality is small; for example, the Katsurao village had only 1,531 populations. The ratio of the population aged 65 years old and over to total population is generally high in these municipalities. Four municipalities out of twelve, the ratios are more than 30% with exception of Tomioka town and Okuma town. As for Tomioka town and Okuma town, the ratio of the population aged 14 years old and under to total population is higher than the national average. This means that there lived relatively younger people in Tomioka town and Okuma town which were located within 20 km from the Fukushima Dai-ichi NPS. Before the accident, there were a lot of jobs in relation to the NPS.

There existed 10,515 establishments in 12 municipalities according to the 2009 Economic Census for Business Frame (Table 2.11). The percentage of secondary industry establishments to total establishments was higher than the national average in every municipality. The percentage of secondary industry employees was even higher in every municipality, and especially in Tamura City, Kawamata town, Hirono town, Futaba town, and Iidate village, the percentage was more than 40% (Table 2.11).

According to the 2010 Census of Agriculture and Forestry, number of persons engaged in agriculture totaled 16,934 in 12 municipalities (Table 2.12). And the

Table 2.11 Number of establishments and employees by industry in 12 municipalities

Item	No. of establishments	Percentage of establishments in primary industry		Percentage of establishments in secondary industry		Percentage of establishments in tertiary industry		No. of employees	Percentage of workers in primary industry		Percentage of workers in secondary industry		Percentage of workers in tertiary industry	
		2009 (%)	2009 (%)	2009 (%)	2009 (%)	2009 (%)	2009 (%)		2009 (%)	2009 (%)	2009 (%)	2009 (%)	2009 (%)	2009 (%)
Year	2009							2009						
All Japan	6,043,300	0.6	18.6	80.9				62,860,514	0.6		22.6			76.8
Tamura city	1,951	0.4	27.5	72.1				15,159	0.7		44.5			54.8
Minami Soma city	3,652	1.0	20.9	78.1				30,629	1.6		30.7			67.6
Kawamata town	812	2.7	27.0	70.3				6,321	1.7		47.3			51.0
Hirono town	289	2.1	31.5	66.4				2,925	1.0		41.4			57.6
Naraha town	372	1.9	30.9	67.2				4,421	1.9		36.4			61.7
Tomioka town	915	1.0	20.5	78.5				8,308	1.4		28.7			69.9
Kawauchi village	139	4.3	25.9	69.8				1,001	4.8		32.3			62.9
Okuma town	582	1.5	32.5	66.0				9,004	1.3		32.3			66.4
Futaba town	345	0.6	28.7	70.7				2,721	0.4		42.0			57.6
Namie town	1,136	1.0	21.6	77.5				8,323	1.2		30.4			68.4
Katsurao village	67	7.5	28.4	64.2				367	9.8		36.5			53.7
Iidate village	255	7.1	35.7	57.3				1,882	11.6		43.5			45.0
12 municipalities total	10,515	1.3	24.6	74.0				91,061	1.6		35.4			63.0

Source: Statistics Bureau 2011a

Table 2.12 Number of persons engaged in agriculture in 12 municipalities

Item	No. of persons engaged in agriculture (commercial farm household)	Ratio of persons engaged in agriculture to all persons engaged in work
Unit	Person	%
Year	2010	2010
All Japan	2,605,736	4.4
Tamura city	5,515	27.7
Minami Soma city	4,296	12.9
Kawamata town	1,037	14.3
Hirono town	255	9.8
Naraha town	606	16.9
Tomioka town	667	8.6
Kawauchi village	469	36.7
Okuma town	604	10.9
Futaba town	499	14.9
Namie town	1,443	14.7
Katsurao village	407	48.3
Iidate village	1,136	36.2
12 municipalities total	16,934	17.2

Source: Statistics Bureau 2011a

Table 2.13 Percentage of persons engaged in work by industry in four municipalities the closest to the Fukushima Dai-ichi NPS

Major Industry Group	All Japan (%)	Naraha town (%)	Tomioka town (%)	Okuma town (%)	Futaba town (%)
Agriculture, forestry and fisheries	4.0	6.8	5.3	6.9	7.9
Construction	7.5	16.4	19.5	20.4	18.7
Manufacturing	16.1	17.2	10.4	10.3	8.5
Electricity, gas, heat supply and water	0.5	4.7	8.2	9.8	9.9
Wholesale and retail trade	16.4	9.8	11.0	9.9	11.4
Medical, health care and welfare	10.3	9.0	8.4	9.4	11.6

Source: Statistics Bureau 2011b

ratio of persons engaged in agriculture to all persons engaged in work is very much higher than the national average. As for the Katsurao village, the ratio was nearly 50%. The ratio was more than 30% in the Kawauchi village and Iidate village.

Looking at the percentage of persons engaged in work by industry in four municipalities which were located closest to the Fukushima Dai-ichi NPS, the percentages for construction, manufacturing, and “electricity, gas, heat supply, and water” were quite higher than the national average. We can clearly see the good economic effects of the NPS to the local economy, such as offering jobs and procuring goods and services needed in the NPS (Table 2.13).

Taking account of these analyses, 12 municipalities more or less received economic merits from the NPS with substantial population engaging agriculture.

Japan's Disaster Governance
How was the 3.11 Crisis Managed?
Suzuki, I.; Kaneko, Y.
2013, VIII, 116 p., Hardcover
ISBN: 978-1-4614-6150-0