**Disaster Risk Reduction**
Methods, Approaches and Practices

Rajib Shaw *Editor*

# Tohoku Recovery

## Challenges, Potentials and Future

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# Disaster Risk Reduction

## Methods, Approaches and Practices

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Disaster risk reduction is a process, which leads to the safety of community and nations. After the 2005 World Conference on Disaster Reduction, held in Kobe, Japan, the Hyogo Framework for Action (HFA) was adopted as a framework of risk reduction. The academic research and higher education in disaster risk reduction has made/is making gradual shift from pure basic research to applied, implementation oriented research. More emphasis is given on the multi-stakeholder collaboration and multi-disciplinary research. Emerging university networks in Asia, Europe, Africa and Americas have urged for the process-oriented research in disaster risk reduction field. Keeping this in mind, this new series will promote the outputs of action research on disaster risk reduction, which will be useful for a wider range of stakeholders including academicians, professionals, practitioners, and students and researchers in the related field. The series will focus on some of emerging needs in the risk reduction field, starting from climate change adaptation, urban ecosystem, coastal risk reduction, education for sustainable development, community based practices, risk communication, human security etc. Through academic review, this series will encourage young researchers and practitioners to analyze field practices, and link it to theory and policies with logic, data and evidences. Thus, the series emphasizes evidence based risk reduction methods, approaches and practices.

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ISSN 2196-4106 ISSN 2196-4114 (electronic)
ISBN 978-4-431-55135-5 ISBN 978-4-431-55136-2 (eBook)
DOI 10.1007/978-4-431-55136-2
Springer Tokyo Heidelberg New York Dordrecht London

Library of Congress Control Number: 2014950358



Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

# Preface

It has been more than 3 years since the devastating earthquake and tsunami (East Japan Earthquake and Tsunami: EJET) of March 11, 2011. Three years can be viewed as a short or long duration depending on the nature of the disaster. It can be a crucial time when the physical process of recovery is completed, or has just started—again, based on the scale and nature of the devastation. For the EJET, based on its scale and the nature of the damages, it is just the start of the recovery process. It is just the start when people in temporary shelter have formed their new communities, when people in small and medium enterprises are gradually getting back to their livelihoods, when the surroundings of the affected areas are changing from seawall construction to renewal of seaside areas, and so on.

Tohoku is undergoing a dynamic change. This is not just a physical change but a strong socioeconomic and social transformation, which we have not seen for a long time in Japan. People's resilience, capacities of local governments, leadership of local mayors' strong role in civil society, and voices from the field are some of the changes that we have not experienced in Japan before. Thus, this disaster is bringing about several transformations, and it is important that we recognize and appreciate these changes in a positive way.

There has been wide range of lessons learned over the past 3 years with more to come in the future. This book attempts to document some of these lessons through participatory field-based research and implementation in the affected areas. The book has two parts: the first part provides some lessons from different sectors, and the second part provides case studies. Needless to say, there are many lessons not included in this book. However, I hope that the compilation provides a good analytical overview of some of the emerging issues of the recovery process in Tohoku. I also hope that this book will provide some thoughts for the future direction of post-disaster recovery.

The book is written for students and young researchers aspiring to a career in disaster risk reduction and environmental studies including sustainable development, risk reduction, and disaster recovery. I hope that they will find the book useful and relevant to their work.

Kyoto, Japan Rajib Shaw

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**Part II Lessons from Case Studies**

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# Part I
# Sector Lessons

# Chapter 1
# Tohoku Recovery: Reflections on Some Key Lessons

**Rajib Shaw**

**Abstract** In case of mega event like the east Japan Earthquake and Tsunami [EJET], 3 years is possibly the time when the communities get a bit time to think of the future recovery, and the actual recovery would be a long ranging process. The EJET has posed different problems, due to scale of disasters, level of devastations, human and economic impacts, damages to local governments, economic slowdown, large number of evacuees, amount of debris and its removal, lack of open flat spaces etc. The economy is getting back gradually, with small and medium enterprises starting their business. The fishing industry is not yet recovered fully, but gradually recovering. However, the key point remains is the social and psychological recovery. The social network of the affected areas still remains a key question, especially in the temporary housing, where the community formation took several months after the disaster. The chapter covers the key learning, starting from social transformation to new definition of community resilience, and social connectivity.

**Keywords** Tohoku recovery • Social transformation • Social network • Connectivity • Dissemination

## 1.1 Introduction

Three years have been often considered as a key turning point of a recovery process. In a relatively small scale disaster, 3 year is a time when most of the physical recovery part is completed. However, in case of mega event like the east Japan Earthquake and Tsunami [EJET], 3 years is possibly the time when the communities get a bit time to think of the future recovery, and the actual recovery would be a long ranging process. The EJET has posed different problems, due to scale of disasters, level of devastations, human and economic impacts, damages to local governments, economic slowdown, large number of evacuees, amount of debris and its removal, lack of open flat spaces etc. (Shaw and Takeuchi 2012). The nuclear issue has added more complexity to this problem. The recovery of the non-nuclear area has started with debris removal almost complete in most cases, temporary

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R. Shaw (ed.), *Tohoku Recovery*, Disaster Risk Reduction,
DOI 10.1007/978-4-431-55136-2_1

shelter already in place, and recovery plans prepared. The discussion for sea wall has been made in different cities and communities with different levels of agreements and disagreements. However, the constructions have been started in many places. The land readjustment process has been done, and construction in the sea-side area with land uplift has been started and completed in some cities.

The economy is getting back gradually, with small and medium enterprises starting their business. The fishing industry is not yet recovered fully, but gradually recovering. However, the key point remains is the social and psychological recovery. The social network of the affected areas still remains a key question, especially in the temporary housing, where the community formation took several months after the disaster. The relation between the affected and non-affected people is gradually becoming better although there are several tensions exist at different levels. The psychological recovery becomes a still major challenge, and will take more time, as observed in the Kobe earthquake also. The old age problem remains a major issue, where this group still remains as the most vulnerable group to recover lives and livelihoods.

At this junction, this chapter reviews some of the key changes observed in the affected areas, the key lessons and its implications to larger context of Japan and abroad.

## 1.2 Transitional Time

Over last 20 years, Japan experienced two major events, which changed the course of disaster risk reduction in Japan. Close to 20 years back, in 1995, the city of Kobe was hit by a major earthquake, killing 6,432 people and causing tremendous economic and social losses. The Kobe earthquake was a significant transitional event to many issues in Japan. The concept of disaster management changed significantly from government driven to government civil society cooperation. The research and education has changed from engineering based to social based solutions. Global risk reduction has also identified the importance of community based disaster management. The disaster has influenced the national disaster management law, and implementation of infrastructure related projects, retrofitting of buildings, development of micro-zonation maps at local government level, and community based disaster management maps at neighborhood level. Post Kobe has also influenced the preparation for other disasters, including typhoon, landslides and tsunami. In case of tsunami, construction of sea walls, early warning system, preparation of evacuation centers, evacuation routes, disaster drills, disaster education in school and community, community hazard maps were some of the activities conducted at different levels by different groups of stakeholders. Activities in Japan have widely contributed to disaster risk reduction agenda globally. Japan hosted two world conferences, one in 1994, and another one in 2005. The third world conference would be in 2015 in Sendai.

After 16 years of Kobe earthquake, the East Japan Earthquake and Tsunami [EJET] of 2011 gave another major blow to Japan, causing 15,667 death, 4,862 missing, and unprecedented damages to lives and properties. Five most affected prefectures of Iwate, Miyagi, Fukushima, Ibaraki and Chiba have the maximum burnt of the event. For the first time, in post World War II Japan, there has been internally displaced persons [IDP], especially from Fukushima, who went to as far as Okinawa islands. The official estimate of physical cost of the disaster was put at 16.9 trillion JPY, more than ten trillion yen in buildings and nearly four trillion yen in power, communications and transport infrastructures (Samuels 2013). However, this is just a direct cost, there has ben tremendous amount of business losses, which are not accounted in many cases. Business interruptions include the loss of jobs at individual level, for small and medium enterprises, and also for the large corporate sectors. Trade was hard hit, and the regional economy was affected very strongly. Sendai and other regional airports were swamped by tsunami waves, 14 international ports were shut or washed away, and 260 smaller fishing harbors were destroyed.

The EJET has given a strong blow to already slowing Japanese economy. The political condition was also not that stable. Added to the disaster was the nuclear meltdown in Fukushima, which caused significant challenges at the initial stage, and also still after 3 years form the disaster. A mentioned earlier, the large number of evacuees from Fukushima, the amount of nuclear debris, soil, and food contamination, compensation to the affected people, were some of the issues which made significant challenges. The formation of Reconstruction Agency was one of the key steps to address the recovery process in comprehensive way, but the leadership in the Reconstruction agency, its links to the other existing ministries, initial financial issues were some of the problems.

In case of both post Kobe and post EJET, political changes were observed, and the change brought the economy back to track. After the EJET, with the initial slow down and problems in the decision-making, leadership and management, the new government has taken specific measures to fix the economy with large amount of economic revitalizations packages and spending. There are already several changes observed in the field, and it will be interesting to see what are new transitions the EJET brings to Japan and outside.

## 1.3 Social Transformation

EJET brought important social transformation, in terms of people's participation, redefined role of civil society, and role of social media. The Great Hanshin Awaji Earthquake of 1995 triggered the spirit of voluntarism profusely in Japan. 1995 is often called the "*The Year Zero*" of voluntarism. The earthquake occurred during the winter vacation in schools, and many students volunteers from all over Japan went to Kobe to serve the victims, which caused different problems and issues: like lack of coordination of volunteers, difference between supply and needs, pressure

on the local resources since most of the volunteers were not prepared properly, and need of technical volunteers etc. These lessons were instrumental to develop the national volunteer coordination center, where during pre-disaster time, one can enroll him/herself in the volunteer roster with the details of offered services, time frame etc. After the EJET, volunteer coordination center was established with government, non-government and corporate sector collaboration in Tokyo, and organized voluntarism was performed for a long time after the disaster. In contrast, the soft voluntarism is a rather new concept, which emerged on recent years, and has been informally developed through experiences (Shaw and Takeuchi 2012). Also, the concept of sending students from educational universities to support the education in emergency is another new concept emerging out of this disaster. It is of extreme importance to see how these concepts grow in future, and how these lessons are applied to the future disaster risk reduction as well as response activities. "*Ganbaro Nippon*", "*Ganbaro Tohoku*" [Try your best, Japan, Tohoku] have been popular slogan to revitalize the national spirit to help each other in case of disaster. The "*Kizuna Project*" has become the key flagship project to link people and communities in the affected areas, across the countries and globally.

The other major change has been the role of civil society. Post Kobe civil society activities has been explained, documented and analyzed by several people (Shaw 2014 and references therein). After the utopia of volunteerism and civil society activities, the sustainability issues became the key problem of concern. There were several civil society models developed, where, the residents' association provided an important interface between community and administration with the help of professional and non-professional organizations like NGOs, NPOs and CBOs. The scheme of cooperation generates its own resources within itself, the process is found to be sustainable. The association is also found to be effective in collective decision-making, and to represent the voice of the community. During the disaster events, this scheme is found to be useful, as exemplified by experience from other areas with different disasters in Japan, including flood and typhoon. In case of EJET, the civil society played an important role from the beginning, starting from evacuation center, where it severed required resources to the affected people. It then continued to the community based recovery-planning phase, where the civil society facilitated community needs, and also facilitated community reorganization process in the temporary housing. Both these activities need strong involvement, trust and cooperation with the local communities, as well as local governments. The long term recovery process has seen a decrease in the number of civil society activities in the field, however, the local non-profit bodies, which are rooted in the affected areas have found innovative mechanism to continue their support to the communities, and developed local development models which incorporates community businesses in many cases. Aldrich (2013) in his analysis of state and civil society organization with special reference to nuclear accident, has pointed out that "voices within civil society are, perhaps for the first time in modern Japanese history, penetrating the insulated nuclear village and prompting a reconsideration of nuclear-power policy among the country's elites".

Social media has also contributed significantly to the social transformation in the Post EJET. Social media use in disasters is a new phenomenon that is constantly changing, evolving and likely to grow. The unique set of circumstances that existed when the 2011 East Japan Earthquake and Tsunami occurred gives insight into this new phenomena and provides a model for how to understand social media use in disaster and a roadmap for future developments at a depth that was not possible in earlier disasters due to immaturity of the related technologies or lack of popularity of the services. A research by Peary et al. (2012) has demonstrated the scale and variety of innovative responses to the disaster performed with these newly popular social networks, services and software. The research also measured the experiences and opinions of those who have first hand experience using social media in and outside of the disaster as receivers and senders of information. This has made it possible to understand the role social media played in the disaster, the type of information exchanged through it, the challenges associated with its use, the value of it to its users and its potential role in the future. It has also identified problems associated with its use in disaster such as the spread of misinformation and digital divide issues and propose recommendations for pre- and post-disaster scenarios for the public, civil society, and government organizations, so to identified entry points to utilization of the new models of relief communication for NPOs and local and national governments for future utilization.

## 1.4 Redefining Resilience

Many victims have lost hopes for future. This mental devastation makes people physically weak; sometimes people who had needed only a little assistance became unable to walk. The past experience of recovery steps and reconstruction needs to be shown to the victims, so that they can have some visions for future. Hopelessness sometimes comes from lacks of information. Local governments are in difficult positions to show the steps until things are confirmed. However, precedent cases like Kobe, Nigata are shared by the disaster experienced and non-governmental organizations, which have expertise in disaster recovery and reconstruction.

People in Tohoku (North East) region, especially Iwate Prefecture are known for reserved characters. Right after the devastated Tsunami, when evacuees who lost houses and properties, have no foods and water, they are saying to the TV camera that “there are other victims who may be worse than me, or I can survive such situation because I have experienced wars”. People in the Tohoku tend not to talk much but they have firm determined idea inside. You may find them exclusiveness and cautiousness to others. This also means they have very tight relationship among themselves. Victims are helping victims. Student victims are helping the elderly. Many of those who lost parents seem to be raised by relatives, which has clear distinction from urban communities like in Kobe. The tight relationship within the relatives and communities, the silent and strong inner spirit of Tohoku need to be respected and the way of assistance from outside need to be somehow reserved and

stepped back. The whole recovery process depends on the people's power, its networking, neighborhood tie, and resilience. People of Japan are known for its resilience and to cope with the natural disasters. This disaster recovery will also show people's power through strengthening the resilience among the affected.

Japan is known not only for its devastating disaster experiences, but also innovations in disaster risk reduction. The author still remembers a story of an old grandfather in Kesennuma city in April 2011. Old grandfather told the survey team that there were bottle of juice scattered from the convenience stores after the Tsunami. His grandchildren wanted to drink the bottle of juice, because it has been for a while water supply stopped and they have survived with water in the mountain stream. The grandfather firmly told them to bear with the water, because the bottles obviously belong to the shop. This is possibly the culture and discipline he wanted to hand over to the next generation. This, in my view is the strong pillar of community resilience in Tohoku region.

## 1.5 The Connectivity

One of the key points of the recovery process is the connectivity. Several of earlier literatures focused on role of social network in enhancing recovery. The social capital, bond among the community members, linkage between the neighborhoods, internal and external linkages are important aspects of disaster recovery. Studies also showed, that the balance between the internal and external network is important to facilitate the recovery process. The EJET also shows the connectivity issue is one of key to the success of recovery. Oikawa (2013) has mentioned this as "N-help", or network help, which, in addition to the self-help, mutual help and public help [the three types of help, often talked after the Kobe earthquake] has facilitated the recovery process. The network help has brought different types of resources, including, financial, human, technical and knowledge resources, which helped the local communities and local governments in different ways in different phases of recovery. For example, the network brought volunteers to the region at aftermath of the disaster, it also brought different technical resources in the recovery planning and temporary shelter community rebuilding process. It also connected the affected regions to the other parts of Japan and abroad, which had past experiences of disasters, and which have undertaken innovative approaches of risk reduction. Thus, to reflect the lessons of the disasters spread the information widely, learn from the past disasters and link to future is the key essence of connectivity.

## 1.6 About the Book

This book is designed with 13 chapters. There are two parts of the book: the first part (with seven chapters) provides a set of lessons from different sectors. The second part (with six chapters) provides some case studies from different parts of Tohoku. Six specific issues are addressed in part 1: role of international agencies, livelihood recovery [fisheries], temporary housing, health, heritage and lessons sharing. Chapter 2 [role of international agencies] has reviewed the role of INGOs [international NGOs] and pointed put that, understanding Japanese working culture, specific challenges of Japanese NGOs, and specific cultural uniqueness of Tohoku region in Japan are pre-conditions for INGOs to operate effectively, and such understanding should be based on the right attitude in partnership that reduces weakness and enhances strength. By doing so, INGOs become enablers for Japanese NGOs, and a true global partner.

Chapter 3 [fishing sector recovery] provided an overview of the damage in fishery industry in coastal area, the policies and methods of fishery industry recovery in the master plan for recovery of Iwate prefecture and Miyagi prefecture where have seriously damaged by the Earthquake and Tsunami. In the master plan for Tsunami recovery in Iwate prefecture and Miyagi prefecture, the middle-to-long term target is to reform the fishery management system, but they take different approaches. The fishing sector aims to implement: (1) Restructuring of fishery and related industries complex areas and fishery hub city, (2) Introduction of new operation and management system, and (3) Building competitive and attractive fishery industry.

Chapter 4 [temporary housing] firstly presents how temporary housing has been constructed in Iwate, Miyagi, and Fukushima since March 2011, then discusses the associated problems, and finally presents the results of a comparative study on contemporary housing construction in the affected areas using recovery curves. The analysis clarified that the speed of the construction was the fastest in Iwate, and the slowest in Fukushima.

Chapter 5 [health sector recovery] points out that the health sector recovery should go beyond reconstruction and rehabilitation. EJET has shown us with necessity and importance for public health and hygiene issues. The role of a disaster medical and health coordinator is essential, and medical personnel should act according to disaster resilience frameworks to achieve a seamless flow of activities from the acute phase to the reconstruction phase. To prevent disaster-related deaths and health damage, the intervention of appropriate public health measures are vital from the acute phase after a disaster.

Chapter 6 [heritage] pointed out that in EJET, most of historic local cultural heritages as temples and shrines survived and utilized as temporally local evacuation bases. These historic buildings had been experienced many Tsunamis in their long history and survived. For this reason, they are still alive as local heritages and have much potency for local evacuation bases. This chapter introduces research for practical space utilization and operation method that was implemented in some

cases of local heritage buildings used as evacuation bases. The chapter found useful expertise for disaster risk management planning in other areas where tsunami disasters would happen in the future.

Chapter 7 [lesson sharing] reviewed the World Bank project "Learning from Mega disaster", and found that there are obvious contrasts between these programs of the WB [World Bank] and Japan International Cooperation Agency in approach, targeted audience, and duration. The WB programs were designed to assist the developing countries in mainstreaming DRM [disaster risk management] and targeted a wide range of audience including policy makers, decision makers, and politicians. The WB efficiently conducted training activities by blending various tools, in particular advanced information and communication technologies. Japan International Cooperation Agency invites practitioners of government organizations from developing countries to Japan on a large scale to transfer Japanese practical technology on the ground. Through comparing these programs conducted by two organizations the chapter further proposes practical methods of exchanging knowledge among practitioners and decision makers in the world to mainstream DRM in development.

In the second part [case studies], Chap. 8 clarifies that the relocation of housing to higher lands after the 1896 Tsunami decreased the damage sustained by the 1933 Tsunami in some districts, while other areas that failed to relocate housing were severely damaged again. Secondly, focusing on seven districts, chronological aerial photographs provided by the Geospatial Information Authority of Japan demonstrate that the number of houses had gradually increased since 1934 in areas where construction was restricted by the 1934 Post-Tsunami Recovery Plan. The reasons why residents started living in the coastal areas are then presented along with residents' tsunami risk recognition based on interview surveys. Finally, the damage situation in the seven districts due to the 2011 Great East Japan Earthquake and Tsunami is presented.

Chapter 9 focuses on case study of education sector in Kamaishi, and looked into some of the key components and implementing mechanisms for school based community recovery and building. In detail, the components that will be discussed here are: (1) strengthening of school as community hub, (2) provision of education for sustainable recovery and community building and (3) school based network building. The discussions will place emphasis on such issues as school – community linkage, community based disaster risk reduction (CBDRR) and community decision making, drawing several examples from the experiences of EJET affected cities in the Tohoku Region as well as cities in other regions.

Chapter 10 focuses on Kesennuma. In some tsunami-affected areas, reconstruction of houses has been restricted since the disaster happened until reconstruction projects for safety finish because sea walls were destroyed and high risk of a future tsunami remains. These areas were designated as two separated zones; prohibited area of housing reconstruction and land leveling area. Survivors who lived in either zone can also choose to move out from the area they lived and to reconstruct their house by themselves. Therefore, community recovery plan makes an impact for affected people to decide where they reconstruct, consequently, it is considered to

make an effect on community recovery process. For this reason, this chapter attempts to analyze problems of community recovery plan and characteristics of residents who have a will to reconstruct their house in tsunami-affected area in case of Minami-Kesennuma, a devastated area by the tsunami. From the analysis, lessons of community recovery is emphasized as following; early concept-making and consensus-building for recovery, housing reconstruction support in terms of re-building community and resilience building in the recovery process by involvement of multi-stakeholders.

Chapter 11 analyzed the FM radio and its role of recovery. The role changed from providing information in times of emergency to soothing the traumatized minds of the victims, and then acting as media, which provided a bridge between residents to revitalize their communities. Although the necessity of disaster radio stations broadcasting information during the emergency support period has been discussed up to the present, with the Great East Japan Earthquake and Tsunami disaster the actual role the disaster radio stations played at each point in time from the time the disaster struck is revealed when viewed in time phases. In this research, using the example of temporary disaster radio stations in the Great East Japan Earthquake and Tsunami, the necessary conditions for the setting up and continuation of activities of disaster radio stations are identified, and the outstanding points and problems of the institutionalized temporary disaster radio stations in Japan are discovered. Also, by comparing disaster radio stations in Asian countries where there are many disasters, it derives points to improve so that the institutionalization of temporary disaster radio stations will meet the needs of the disaster area.

In Chapter 12, the experiences of Fukushima are discussed. Because of mass evacuation, local communities, and many families too, were forced to be divided. Society and culture, which had been cultivated through long history started to fade out. There have been various conflicts among residents over perception of radiation risk and compensation. Stress caused by long-term evacuation and changes in living environment are affecting victims' mental and physical health to a great extent. There are residents who wish to but cannot return, not only because of concerns about exposure to radiation, but loss of social service, commercial activities and employment. There are an increasing number of people who give up on returning because of unclear future of evacuation life and fear of radiation exposure. Fukushima University has supported, in various ways, the victims in Fukushima who are facing these different types of difficulties from other affected areas. Knowledge which has been obtained throughout the experience can potentially be applied, not only in the context of nuclear disaster, but also in recovery of disaster-affected area in general and conflict-affected area as well.

Chapter 13 focuses on economy recovery in Fukushima, focusing on small-medium cardboard manufacturer's production and transportation systems. Statistical analyses were made to investigate changes in the cargo flow originating at the firm and shipped to devastated/non-devastated destinations. The results indicated that the disaster affected cargo flow only to the coastal area devastated by the tsunami or contaminated by nuclear radioactivity. Since the demand for cardboard is a "derived demand" of agriculture and relatively light industries, this finding

suggests that these industries were not unduly impacted by the disasters, and that the disaster's effects may be overemphasized.

**Acknowledgements** I acknowledge all the supports provided by the people, communities, local government in the affected region, always indebted for this learning. I also acknowledge the generous support of CWS Asia Pacific and MERCY Malaysia over past 2.5 years for the recovery lessons project.

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# Chapter 2
# Role of International NGO in an Unprecedented Disaster in Japan

**Takeshi Komino**

**Abstract** Devastating 9.0 earthquake and tsunami, and consequent nuclear accident in Fukushima posed unprecedented challenge for Japan. International NGOs (INGOs), including CWS-Asia/Pacific, has set-up relief and recovery programs in Japan. Utilizing this 3 year experience in operating as INGO in Japan, the chapter summarizes challenges Japanese NGOs faced, strength of Japanese NGOs, and challenges and lessons for future operations from INGO perspective. Understanding Japanese working culture, specific challenges of Japanese NGOs, and specific cultural uniqueness of Tohoku region in Japan are pre-conditions for INGOs to operate effectively, and such understanding should be based on the right attitude in partnership that reduces weakness and enhances strength. By doing so, INGOs become enablers for Japanese NGOs, and a true global partner. The chapter also introduces some operational lessons CWS-Asia/Pacific has learnt through its relief and recovery program for survivors of quadruple disaster in Japan in 2011. These lessons include the need to engage with local NGOs, adhering to quality and accountability, the importance of contextualization of Sphere Standard and HAP, the importance of volunteers' role and psychosocial care of the survivors, identifying lapses in Japan's disaster preparedness measures, importance of investment in disaster risk reduction, the need to meet psychological need of aid workers, division of communities with invisible threat of radiation in Fukushima, varying information on radiation safety, and awareness playing a key role in integrating children evacuation program into school curriculum.

**Keywords** EJET • INGO • Challenges • Partnership

## 2.1 Introduction

On March 11, 2011, a devastating 9.0-magnitude earthquake struck the northeastern coast of Japan, triggering a massive tsunami that washed away several coastal cities, destroyed critical infrastructure, crippled thousands of businesses and

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R. Shaw (ed.), *Tohoku Recovery*, Disaster Risk Reduction,
DOI 10.1007/978-4-431-55136-2_2

caused the death of nearly 20,000 people. It also destabilized the Fukushima Daiichi Nuclear Power Plant, causing reactors to overheat and leak radiation with the explosion at the power plant.

This disaster has brought clearly unexpected damage level. It is far beyond what Japan experienced in the last large-scale disaster, the Kobe earthquake back in 1995. The EJET has caused wide-spread confusion and fear across the nation especially due to risk of wide spread radiation exposure, and many vulnerable community members, such as the ones who couldn't access evacuation centers, were left out of "mainstream" assistance provided by the Self-Defense Force and other government agencies, and this is where civil society assistance and international assistance played a critical role.

## 2.2 Challenges Faced by Japanese NGOs

As EJET was truly an unprecedented disaster for Japan, there were so many challenges including access and logistics, information and coordination, and availability of relief supplies to be provided to the most vulnerable. However, these seem to be the usual challenges disaster affected countries face; in Typhoon Haiyan in Philippines, massive flood in Pakistan, cyclone Nargis in Myanmar, similar points are usually discussed as challenges.

From INGO perspective, there were five challenges that were Japanese context specific. The first challenge was slow speed in initial response. Despite some exceptions, Japanese society tend to take quite some time until general consensus is achieved. And when this consensus is achieved, things pick up with unimaginable speed, but until then, things tend to be moving slowly. This was apparent in how radiation affected communities were evacuated and such slowness in response led to public anger as well. JCIE/USA's director Jim Gannon writes in his trip report on June 17th 2011 as "it is clear that the level of public disgust with political maneuvering and the Kan administration's perceived lack of decisiveness in responding to the disaster is extraordinarily high, even if it is difficult to envision how much more the leaders of any other developed country might have done" (Japan Center for International Exchange 2011).

The second context specific challenge for Japan was that there were very few funding opportunities within Japan that support advocacy work. Clearly, public advocacy plays a key role in monitoring the government's spending and investment patterns, as well as energy policies that determine reliance level of Japan on nuclear power. However, Japanese funding environment doesn't allow funding for such public advocacy. Only a few Japanese NGOs have substantial support from the public, and therefore, without relying on the government or private sector, activities such as advocacy against nuclear risks cannot be conducted.

The third challenge was on availability of personnel who can coordinate INGOs. Japan, as very domestic cultured island nation, doesn't put its emphasis in producing personnel who can compete in global settings, and therefore, it was difficult to

find enough personnel to coordinate foreign assistance during the start-up phase. On March 21st 2011, both JANIC and Japan Platform (JPF) has issued an appeal to foreign organizations which called for properly coordinating with Social Welfare Council (SWC) of Japan as official coordination structure, but at the same time calling for understanding that many are about to be set-up and patience is required. The letter also emphasized that any coordination with SWC's branches should be done in Japanese language (JPF 2011). Although it is understandable after seeing how chaotic things were at the initial phase, there was also a sense that how Japan is not fully utilizing foreign assistance to its fullest extent. This was also evident when UN Disaster Assessment and Coordination (UNDAC) was informed by the Cabinet office (who was coordinating overall response from Japanese government side) that UN could be helpful in producing sitreps (situation reports) but not expecting any major coordination activities. There was clearly a sense of Japan being a capable sovereign nation and outside assistance was not required. However, in the initial coordination meetings, there were some NGOs who claimed otherwise (JPF 2011), and CWS-Asia/Pacific was one of them.

The fourth challenge on experience level of staff of Japanese NGOs in hands-on work such as assessment, relief planning and implementation, and monitoring and evaluation. Prior to EJET, many NGOs have been working with local implementing partners in developing nations, and the role of staff of head office in Japan were usually limited to communication with partners, writing grant proposals, preparation of reports to the donors (usually Ministry of Foreign Affairs), and to visit the project sites from time to time to conduct monitoring. For many Japanese NGO staff, EJET was the first time that disastrous situation is happening in their backyard, thus forcing them to be the implementers instead of resource challengers that they used to be. Although it is commendable how Japanese NGOs managed this transition, it was clearly a challenge for many. Such experience level can be said to domestic donors as well. There were many partners who expressed gratitude to decision making speed of CWS-Asia/Pacific when domestic donors were taking so much time to approve funding for emergency relief proposals.

On top of this, there is a working culture in Japan that doesn't allow 'occasional time-off'. There is tendency in Japanese working culture that annual leaves are not to be taken fully, time off in lieu is not acceptable, and overtime is normal phenomenon. Although it is true that such working culture produced very detailed outputs, which are by far top notch as compared to what other aid communities globally produce, but often it pushes staff to the extent of 'burn-outs' if staff care is not properly managed. 'Good enough' is not an option for many in Japan.

The last challenge was low extend of exposure to international standards. One senior official from one of the key Ministries in Japan has communicated to the author in the past that the international frameworks are for developing nations and not for Japan. Such attitude is observed in many areas. For example, cluster meetings have been tried in the initial phase but people were not really used to such coordination mechanism, therefore concrete actions usually were not the outcome. Further to this, UN Office for Coordination of Humanitarian Assistance (OCHA)'s role was limited to producing sitreps as indicated earlier. On quality and

accountability (Q&A), such as Humanitarian Accountability Partnership (HAP) and Sphere Project, there were very few agencies involved in such global Q&A activities in prior to EJET; thus many lessons from EJET response relate to principles and standards already indicated in such Q&A tools. In CWS-Asia/Pacific's Q&A events, the participants often felt a great need to increase the capacity of humanitarian actors to attain high levels of quality and accountability while responding to human suffering (CWS-Asia/Pacific 2012b).

## 2.3 Partnership Principles of International NGOs

Probably the most significant role of INGOs globally is to build relationship with local organizations (partners) to ensure that appropriate capacity is built on the foundation of already existing strength of such partners. The Principles of Partnership (PoP, Global Humanitarian Platform 2007) calls for five key principles in establishing such principles:

- **Equality**: Equality requires mutual respect between members of the partnership irrespective of size and power. The participants must respect each other's mandates, obligations and independence and recognize each other's constraints and commitments. Mutual respect must not preclude organizations from engaging in constructive dissent.
- **Transparency**: Transparency is achieved through dialogue (on equal footing), with an emphasis on early consultations and early sharing of information. Communications and transparency, including financial transparency, increase the level of trust among organizations.
- **Result-oriented approach**: Effective humanitarian action must be reality-based and action-oriented. This requires result-oriented coordination based on effective capabilities and concrete operational capacities.
- **Responsibility**: Humanitarian organizations have an ethical obligation to each other to accomplish their tasks responsibly, with integrity and in a relevant and appropriate way. They must make sure they commit to activities only when they have the means, competencies, skills, and capacity to deliver on their commitments. Decisive and robust prevention of abuses committed by humanitarians must also be a constant effort.
- **Complementarity**: The diversity of the humanitarian community is an asset if we build on our comparative advantages and complement each other's contributions. Local capacity is one of the main assets to enhance and on which to build. Whenever possible, humanitarian organizations should strive to make it an integral part in emergency response. Language and cultural barriers must be overcome.

As a result of these principles CWS-Asia/Pacific adheres to, the evaluation on partnership commissioned by CWS-Asia/Pacific in 2012 for its operation covering from March 2011 to December 2011 highlighted that "many of the partners had not

heard of the Principles of Partnership before they were mentioned in the workshop or the questionnaire. Nonetheless, CWS was given top marks on upholding the PoP. CWS was seen as a very complementary, transparent, and equitable organisation by several partners." (Thomas 2012) The report also highlighted that "the flexibility of CWS was seen as an indicator that CWS is result-oriented because of their willingness to modify projects in order to achieve better results".

## 2.4 Challenges Faced by International NGOs

Obviously, there were also the challenges for INGOs for establishing operation in Japan. Such challenges include staffing, understanding labor laws and necessary permit issues.

For staffing, it is always optimal to identify and hire those individuals who understanding Japanese working culture as well as INGO's organizational cultures. INGO's organizational cultures tend to be more result driven, as compared to process driven which is common in Japanese corporate cultures. INGOs focus on individual responsibility, whereas Japanese organizations focus on responsibility-chain extending from top management to middle management. Both working cultures have both positive and negative sides, and it is important to balance both in a way that creates optimal working environment for both staff from Japanese and INGOS.

Additionally, Japanese labor laws and permit related issues need careful attention from managers in INGOs. Usually, Japanese organizations hire staff for long term. It is quite rare for Japanese to have short term contract which is mainstream contract in INGOs, and some social insurance (such as workmen's compensation, health and employment insurance, and welfare pension) are obligatory for employers in Japan. Without such compensations equipped in the organization, it is also rare for competent personnel to apply for vacant position in INGOs as well. In order to abide by the national law, as well as to attract competent individuals, INGOs need to think about introducing these benefits within the system of the organization, and to manage necessary budget to allow this to happen.

Another challenge for INGOs would be dealing with Tohoku ('Northeast' in Japanese language) culture and dialect. As in the case of many rural communities in Japan, Tohoku region tend to be more conservative than people in Tokyo, and unique cultural behaviors are observed in this region. Historically, Tohoku region was always a major part of Japanese history with famous leaders who left many legacies. Such respect for its culture, as well as its scenic beauty and wide variety of products of nature (including fantastic cuisine, hot springs, and beautiful coast line) are amazing experience for INGO staff in EJET response. However, this conservative part of Japan also possesses male dominated culture which was also apparent in EJET response. For example, almost all leaders in evacuation centers were male, and gender specific needs in each evacuation center were up for such leaders to address. As a consequence, some requests by female evacuees were not taken up

seriously, leaving a space for improvement as per international standard; but conveying international standard should be contextualized in order to gain understanding in such conservative community. For example, there was one evacuation center which didn't have any partition in the open space, and one female evacuee has requested the male leader to place partition to establish a place where they can change their clothes, but this request was turned down as it was seen as an act that 'divides the community members'.

## 2.5 Case of CWS: An International NGO's Intervention

### *2.5.1 History of CWS in Japan*

CWS' relationship in Japan goes back almost 70 years. Right after the ending of World War II, CWS was among the agencies provided relief items to war devastated Asian countries. This assistance is called Licensed Agencies Relief for Asia (LARA). LARA was operational from 1946 to 1952, and after the phasing out of this, Japan branch of CWS has become Japan CWS (JCWS) which still now exists as legal entity but as separate and independent organization from CWS international.

After EJET in March 2011, CWS-Asia/Pacific regional office in Bangkok quickly mobilized emergency operation with rapid assessment, emergency appeals which now has been revised with the latest being 5th revised version of the appeal totaling to approximately USD 9 million (CWS-Asia/Pacific 2012a). CWS-Asia/Pacific's objective in providing the assistance was to help identify and meet the humanitarian needs of survivors of the March 11 earthquake and tsunami in Japan, and hasten their physical and psychosocial recovery, as well as Japan's needs to improve local disaster response mechanisms. This emergency operation now has partnership with 12 agencies in Japan, who jointly implement 20 relief and recovery projects related to EJET. On December 28th 2012, CWS Japan branch was officially registered as Non-Profit Organization in Japan. This newly established country office is supported by the regional office in Bangkok in its start-up and operation as part of CWS-Asia/Pacific network.

### *2.5.2 Post Tohoku Activities and Partners*

Based on the principles of partnership described earlier, CWS-Asia/Pacific considers the important elements in partnership approach (Fig. 2.1).

The diagram represents that the highest priority (top of pyramid) tier is for communities and partners. This top tier is the area where aid agencies need to maximize its impact, and this should be the sole interest in providing value for the

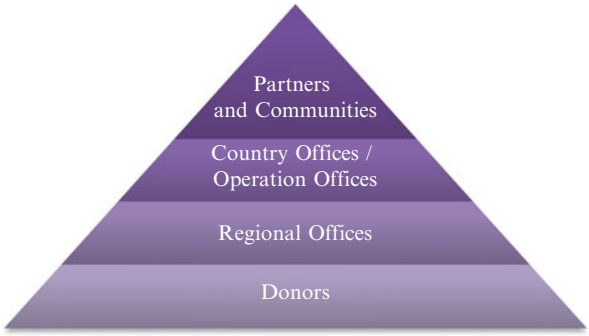


**Fig. 2.1** CWS-Asia/Pacific's partnership pyramid

agencies. After this top tier comes second tier and third tier which are internal functions of the organization. Donors are at the bottom tier in this diagram, but this doesn't indicate that the donors are the least important. The pyramid shows areas where values need to maximize in aid operation, and responsibility of accountability and transparency should not be overlooked (which are both important part of donor management).

CWS-Asia/Pacific's partnership model was fully utilized to ensure that challenges faced by Japanese NGOs are overcome with appropriate resources and approach. It also helped that the author who led the organization's response was Japanese national with overseas experience which enabled to bridge overseas norm and Japanese context. This has helped tremendously in forming partnership with local organizations in Japan. The most important criteria derived from this partnership model was whether the partnership which is going to be built maximizes the value for affected communities it tries to serve.

The 20 projects CWS-Asia/Pacific formulated with its partners range from emergency relief distribution, meeting specific needs of vulnerable groups such as women and children, psychosocial support, community revitalization, advocacy, capacity building, quality and accountability, disaster risk reduction, and protection from radiation. The project list is as follows (partners' names are indicated in prentices):

- Support for Ishinomaki city's Disaster Recovery Support Council (Peace Boat)
- Provision of hot meals to survivors (Peace Boat)
- Debris clearance of tsunami-affected homes, businesses and public spaces (Peace Boat)
- Pest control and sanitation (Nippon International Cooperation for Community Development)
- Hotline for single mothers (OXFAM Japan)
- Hotline for violence against women (OXFAM Japan)
- Day-care spaces for children and livelihoods for nursery teachers (Caring for Young Refugees)
- Fukushima children evacuation retreat program (Shalom)
- Community mobilization and livelihoods (SEEDS Asia)

- Psychosocial seminars (CWS)
- Enhancing public knowledge of radiation issues relating to Fukushima (Japan NGO Center for International Cooperation)
- Fukushima Awareness Raising Campaign (Peace Boat)
- Capacity building for NGOs to improve service delivery to survivors (Japan NGO Center for International Cooperation)
- National/regional lessons learnt and advocacy for recovery (Kyoto University)
- Disaster relief volunteers and leaders' training (Peace Boat)
- Capacity building of NCCJ members and strengthening coordination mechanism (CWS)
- Promoting quality and accountability in humanitarian operations in Japan (CWS)
- Promote enhanced DRR initiatives and knowledge dissemination with linking Japanese civil society to global DRR initiatives (CWS)
- Citizen-scientist international symposium on radiation protection (Citizens' Radioactivity Measuring Station)
- Project for Regeneration of Agriculture in Fukushima through Preparation of Radioactive Material Distribution map and data sharing (Institute for Cooperative Networks, Fukushima University)

CWS-Asia/Pacific was of course not only foreign NGOs who came to provide assistance for EJET. In all, 163 countries and 43 international organizations offered official assistance to the Japanese government (JCIE). There are broadly two categories of foreign agencies who came to provide humanitarian assistance; one being donors who donated financial contribution, and the other being agencies who established joint projects with Japanese NGOs. CWS-Asia/Pacific was among the latter category of agencies, and such approach enabled strong partnership to be built with Japanese NGOs. According to the recent report by Japan Center for International Exchange (JCIE), over 1 billion dollars was given for EJET assistance program from overseas, and 0.7 billion was contribution from the United States (JCIE 2013).

This chapter utilizes an experience of approximately 3 years of emergency operation in Japan as an international NGO, and it aims to provide some lessons learnt as well as recommendations for foreign International NGOs (INGOs) in Japan. Usually in Japan, the term 'NGO' refers to organizations who provide international assistance, and for organizations providing domestic activities only, the term 'NPO' (Non Profit Organization) is used. However, for the sake of consistency, the author will use 'NGOs' to cover both types of organizations in Japan.

### 2.5.3 Key Lessons

EJET was one of the most complex and difficult to manage disaster for the author in his career as an aid worker. Additionally, it was the first time for the author to respond to a disaster in his home country; up till now, the author had always been a 'foreigner' in disaster management team. The most important lesson derived from this experience was, even for a country like Japan with top notch technology and infrastructure, there is always a risk for unprecedented disaster. Some of the risk reduction measures undertaken by Japan such as tsunami protection wall and hazard maps have led to over-confidence among the coastal communities, which also led to delay in evacuation which obviously resulted in more casualties.

At the same time, EJET has provided important lessons for aid operation of CWS-Asia/Pacific in Japan and in future disasters in similar context. These operational lessons so far are:

- *The need to engage with local NGOs.* Local NGOs (the ones so called NPOs in Japan) formed from the community members themselves often lack the outreach to attend recovery strategy meetings being held in Tokyo. They are, therefore, quite often invisible or unrepresented at decision-making meetings in the capital from where much relief is being coordinated. However, it is important for agencies like CWS-Asia/Pacific and its partners to collaborate with these NPOs both to ensure immediate needs are being met and for longer-term sustainability.
- *Quality and accountability*. The Sphere standards for quality and accountability in humanitarian assistance were introduced in Japan some years ago by the Japanese branches of international NGOs, as well as Japanese NGOs working on international relief work. However, accountability towards program beneficiaries as advocated by HAP is not so common. In Japan, the accountability of NGOs is usually limited to financial accountability and the responsibilities for the disclosure of organizational information. CWS-Asia/Pacific hopes to fill this gap through its Q&A component.
- *The importance of contextualization of Sphere Standard and HAP*. CWS-Asia/Pacific has organized ToT and workshops on Quality and Accountability and published Japanese translation of HAP2010. It is important to contextualize the content of Sphere Standard and HAP to make people, who have worked in the emergency situation only inside Japan, understand and apply it in daily operation. Developing tools which fit in Japanese context are also important.
- *The importance of volunteers' role and psychosocial care of the survivors*. It is difficult for survivors themselves to speak about their grief with each other, so the presence of outsiders helps to listen to their stories (which are the first step to recovery from trauma). Existence of volunteers was not only to offer hands in labor-intensive work, but have played immense role in this current response in terms of psychosocial care of the survivors. CWS-Asia/Pacific made one documentary covering this change in people's mind through interacting with volunteers.

- *Identifying lapses in Japan's disaster preparedness measures*. Through interviews with survivors and partner organizations on the ground, lapses in current disaster preparedness measures have been identified, such as:
  - Large early warning speakers don't function optimally in mountainous areas. The placement of a greater number of smaller speakers will allow for better hearing and understanding of early warning messages (especially for elderly who have hearing difficulties).
  - Having a tsunami protection wall (which protects people against a tsunami of up to 3–5 m high) gave a false sense of security, especially amongst the elderly, which led to delays in evacuation (some stayed behind because of this confidence, and as a consequence were washed away).
  - Land use in such emergency has not been adequately thought through. The building of temporary shelters is being delayed due to lack of suitable land.
  - Many nuclear facilities in Japan are as old as the Fukushima Daiichi Nuclear Plant, and pose a risk of a similar meltdown in other parts of Japan in cases of similar disasters.
- *Importance of investment in disaster risk reduction*. This disaster was caused by a magnitude 9.0 earthquake, but the damage by the earthquake itself was minimal. The majority of damage was caused by the secondary disasters of the tsunami and nuclear meltdown. Although Japan is one of the biggest economies in the world, and probably the most equipped in terms of disaster preparedness in the region, it could still not handle the process of relief and recovery adequately. Gaps in disaster contingency plans and delays and their execution have mounted people's frustration towards the central government, which led to the resignation of key cabinet personnel. However, it is worth mentioning the need for continuous disaster risk reduction activities in disaster-prone countries. If Japan can be affected to this level, the possibility of larger damage is not hard to imagine in other countries in the region. This emergency in Japan, along with other disasters, once again emphasizes the need for further investment in disaster risk reduction.
- *The need to meet psychological need of aid workers*. The psychological need of aid workers in the field is very high. CWS-Asia/Pacific is supporting some local NGOs through our partner agencies and most of staff from these local NGOs are survivors from earthquake and tsunami. They need to be cared too as their stress level is as high as other survivors'.
- *Division of communities with invisible threat of radiation in Fukushima*. As compared to disaster losses by earthquake and tsunami, radiation threat from Fukushima Daiichi Nuclear Plant is hard to grasp, and much of it is relied upon each individuals' sense of risk management. Availability of compensation to specific communities (such as by distance from the nuclear plant) makes this issue more complicated. The government has announced standard for radiation contamination (limit levels) on daily food consumption just recently, and until then, people had to rely on their best judgment. Rapid dissemination of reliable information plays a key to how much division of communities occur.

- *Information on radiation safety varies.* Involvement of scientists from non-political sphere is important to determine the real risks which can only be determined in longer term approach (10–20 years). International Commission on Radiological Protection (ICRP) as well as UN Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) both say that "no detrimental effects have ever been observed below a dose of 100 mSv" (Feuerhake 2012). However, researches in last and current century show even the relations between health effects and low-level radiation exposure. "Safe" in such circumstance (as the one in Japan) often becomes a political language and there needs to be careful analysis and proactive observation on health effects; the role civil society can play is immense in this regard.
- *Awareness plays a key role in integrating children evacuation program into school curriculum.* Japanese school system is governed by having education committee at city/prefecture level who would determine whether schools are doing well or not. These are representatives from community and their willingness or unwillingness determines whether retreat program for children to avoid exposure to radiation becomes possible or not. Understanding such system and who the decision makers are a key factor in running a program like this.

## 2.6 Strength of Japanese Civil Society

Despite the challenges outlined in previous section, there were also significant strength observed with Japanese NGO sector and it is well worth noting them as well.

Although Japanese working culture is a bit workaholic in nature, they show tremendous commitment and dedication in their focused approach. The outputs produced by Japanese work force tend to be very detailed and well thought-out, and as Japan Today article truly articulate, often "a delay in reaching a decision is a not a reflection of a Japanese person's inefficiency" (Japan Today 2013). Thoughtfulness and true pursuit for result is characteristic of Japanese business culture, and such characteristic surely contributed to Japan becoming one of the top economies in the world.

Japan possesses official coordination system for volunteer management called Councils of Social Welfare (CSW). CSW are prescribed in the Social Welfare Law (enacted in June 2000 in order to amend the Social Welfare Service Law), in Article 109 'Municipal Councils of Social Welfare and Ward Councils of Social Welfare', Article 110 "Prefectural Councils of Social Welfare" and Article 111 'The Japan National Council of Social Welfare' (Nozaki 2010). CSWs are meant to be a platform with official back-up for local population to gather and work together for their communal social welfare activities. Such system is definitely strength in conducting contextualized aid operation.

Furthermore, there are various networks that exist in Japan that have been actively engaged in emergency and international cooperation before EJET. One

notable network is Japan NGO Center for International Cooperation (JANIC) as well as Japan Platform (JPF). JANIC is a non-profit, non-partisan networking NGO founded in 1987 by a group of NGO leaders who saw the need to better coordinate activities in Japanese society and facilitate communication with groups overseas (JANIC), on the other hand JPF provides a platform to conduct international aid with a tripartite cooperation system where NGOs, business community, and government of Japan work in close cooperation, based on equal partnership, making the most of the respective sectors' characteristics and resources (JPF).

In addition to these networks, there are vast volunteer network Peace Boat Disaster Volunteer Center (PBV) has established which coordinated more than 80,000 volunteer work days for EJET (PBV 2013). Existence of such vast volunteer base in Japanese society is definitely an asset, but mobilization should be done with care and expertise. For example, the coordination effort made by Peace Boat and Ishinomaki Disaster Relief Assistance Council (IDRAC) was one of the best examples of successful coordination of stakeholders especially the volunteers. Many agencies are implementing similar activities in the same area without effective coordination. Even they have inter-agency meetings quite often their agenda of such meeting is limited to the exchange of information and real coordination is not happening. The agencies were able to fill the coordination gap and strengthen the such effort in the field not only to avoid the duplication of services but to maximize the effort of each agency makes.

PBV also formulated a network with business sector in Japan to look at enhancing disaster preparedness of both sectors anticipating future disasters in Japan. Such NGO-Business sector collaboration is also in action with the network called Partnership between NGOs and Companies which JANIC plays a role of secretariat for (JANIC). This network was founded in March, 2008, and it holds regular dialogue for member between NGOs and Companies in order to identify issues possible to be addressed in cooperation between NGOs and Companies. There are about 40 NGOs as well as more than 20 major corporations involved in this network. Clearly, the coordination foundations established with these existing networks is what INGOs can utilize fully in relating and working together with Japanese NGOs.

## 2.7 Conclusion

As described above, Japanese civil society possesses significant strength as well as challenges. The role of INGOs should solely be that Japanese organizations' strengths are enhanced, and challenges are lessened. At CWS-Asia/Pacific, there is one equation we use to describe such partnership.

$$1+1=3$$
$$(INGO + Japanese\ Organization = Additional\ Value)$$

If the relationship is $1+1=2$, then it is same as contractor relationship. In other words, there is no further value added in such type of partnership. In order for the result to be 3, instead of 2, there is 1 additional value added in the partnership, and this is where this equation becomes important in building this attitude among the staff. From the experience of CWS-Asia/Pacific in Japan, if staff of INGOs possesses this attitude of always being proactive to add additional value for partners and communities, the relationship will most probably function well. Indeed, such relationship will end up in utilizing each other's strength to the maximum level, thus establishing unbeatable partnership. Principles of partnership, described earlier, is an important tool in creating this awareness, and managers in INGOs should always communicate to their staff the five key principles of partnership: equality, transparency, result-oriented approach, responsibility, and complementarity.

In addition to just introducing attitudinal partnership concept, there should be a way to measure how the partnership is functioning. At CWS-Asia/Pacific, we have introduced partnership evaluation scheme where partners become the evaluators of CWS-Asia/Pacific's performance. Out of this, many lessons and suggestions are shared, and these improvement points should be put in practice as soon as possible.

Through such engagement with partners, CWS-Asia/Pacific in Japan through CWS Japan has established strong partnership in Japan that lead to successful implementation of relief and recovery programs. Such partnership also extend to advocacy area, and recently a network that brings most NGO networks in Japan on nuclear and DRR advocacy was formed in December 2013 called Japan CSO Coalition for 2015 WCDRR (JCC2015). In addition to this, Q&A working group in Japan remains as one of the most active Q&A working groups in the region.

Success is an outcome of right processes, and for CWS-Asia/Pacific, any success in its program in Japan is a product from its attitudinal approach to establishing an effective partnership.

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# Chapter 3
# The Situation and Challenges of Recovery of Fishing Industries in Tohoku Region

**Nozomi Hishida and Rajib Shaw**

**Abstract** After the Great East Japan Earthquake and Tsunami, one of the big challenges of those devastated cities and towns toward recovery has been industrial recovery and regeneration of economic opportunity. This chapter shows the overview of the damage in fishery industry in coastal area, the policies and methods of fishery industry recovery in the master plan for recovery of Iwate prefecture and Miyagi prefecture where have seriously damaged by the Earthquake and Tsunami. In the master plan for Tsunami recovery in Iwate prefecture and Miyagi prefecture, the middle-to-long term target is to reform the fishery management system, but they take different approaches. At this point, monitoring on two different policies and measures of Iwate and Miyagi prefecture and other local challenge would be a good record that will bring an idea for future policy discussion for fishery system development in Japan.

**Keywords** Fishery industry • Local industry • Recovery and regeneration • Reform of fishery operation • Fisheries cooperative association • Master plan for recovery

## 3.1 Introduction

On March 11th 2011, Tohoku region (North-East part of Japan) was hit by a tremendous disaster. After the Earthquake and Tsunami, one of the big challenges of those devastated cities and towns toward recovery has been not only reconstruction of buildings and houses but also industrial recovery and regeneration of economic opportunity toward re-establishment of local society and community to support the living of the people who lives in.

This chapter will show the overview of the damages in fishery industry in coastal area in Tohoku region. Besides, it focuses on the recovery and reform policies in Miyagi prefecture and Iwate prefecture, which have taken different approaches to fisheries cooperative association toward regeneration of fishery industry.

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R. Shaw (ed.), *Tohoku Recovery*, Disaster Risk Reduction,
DOI 10.1007/978-4-431-55136-2_3

## 3.2 Overview of the Damage in the Marine Products Industry

### *3.2.1 Overview*

The Great East Japan Earthquake and Tsunami which has hit in Tohoku region on March 11th 2011 recorded magnitude 9.0, the greatest magnitude in recorded history in Japan. The pacific coasts in Tohoku region have got tremendous damages by seismic shaking and Tsunami waves. The most affected area was inshore area where have directly hit by giant tsunami (Katsukawa 2012).

According to Ministry of agriculture, Forestry and Fisheries' report, financial damage of The Great East Japan Earthquake and Tsunami in the agriculture, forestry and fisheries industry is about 23.4 billion US $ (1$ = 100 Yen) as of November 24th 2011. The damage is 26 times of that brought by the Great Hanshin-Awaji Earthquake in 1995, and 17.6 times of Niigata Chuetsu earthquake in 2004 (Table 3.1). It shows how the damage by The Great East Japan Earthquake and Tsunami is enormous and outstanding (MAFF 2011).

Financial damage of only fisheries industry including the damage in fishery boats, fishery harbors, aqua farms and shared use facilities is about 12.49 billion US $ which over 50 % of the total 23.4 billion US $ (for breakdown, see Table 3.2) (MAFF 2011).

### *3.2.2 Damage in Fishing Boats and Fishery Harbors*

In The Great East Japan Earthquake and Tsunami, after massive earthquake hit, giant Tsunami waves crashed ashore more than once and it has wreaked enormous damages to fishery harbors and fishery villages on the Pacific coast, which were the basis of livelihood and industry for people there. Important facilities for fishery industry such as fishery boats, aqua farms, fish markets and seafood processing factories have been seriously damaged, and not only these facilities but also fishery

**Table 3.1** Comparison of damages by recent earthquake over seismic intensity 7

| Earthquake | Year and month | Death and missing toll | Financial damage in the agriculture, forestry and fisheries industry |
|---|---|---|---|
| The Great East Japan earthquake and tsunami | 2011.3 | Death: 15,840 | 23.41 billion US $ |
| | | Missing: 3,611 | |
| Niigata Chuetsu earthquake | 2004.10 | Death: 68 | 1.33 billion US $ |
| | | Missing:– | |
| The Great Hanshin-Awaji earthquake | 1995.1 | Death: 6,434 | 0.9 billion US $ |
| | | Missing: 3 | |

(As of 2011,11,24, 1$ = 100 Yen)
Source: MAFF edited by author

**Table 3.2** Financial damage by The Great East Japan Earthquake in fishery industry

| Section | Damage (1$ = 100 Yen) |
|---|---|
| Fishery boats (25,014 boats) | 1.70 billion US $ |
| Fishery harbors and related facilities (319 harbors) | 8.23 billion US $ |
| Aqua farms | 1.31 billion US $ |
| (facilities) | (0.74 billion US $) |
| (products) | (0.57 billion US $) |
| Shared use facilities | 1.25 billion US $ |

(As of 2011, 11, 24)
Source: MAFF edited by author

related industries such as the dock industry have impacted on a scale previously unseen.

According to MAFF, the damages by Tsunami on fishery boats can be classified basically four types.

1. Fishing boats mooring in harbors got stranded on quays
2. Drifted towards land (quay, downtown etc.)
3. Drifted towards off shore and lost
4. Clashed with delis and be broken while drifting

In one case, an about 80 m-long big fishing ship had brought to inland where were 1 km away from the port (Fig. 3.1).

Most of fishing harbors in Iwate and Miyagi prefectures have been seriously affected by Tsunami, for example, clashed and broken quays, liquefaction and ground sinking.

### *3.2.3 Damage in Aqua Farm*

Same as fishing harbors, aqua farm facilities have also devastated. The financial damage of aqua farm sector is 1.31 billion US $ in total and the damage of facilities is 0.74 billion US $ and that of products is 0.57 billion US $ as of November 24th 2011. Figure 3.2 shows that rafts for oyster farming destroyed by tsunami.

According to MAFF, mainly three types of damages by Tsunami on aqua farm facilities and products can be found.

1. Drift and loss of rafts and buoys
2. Ropes were entangled and became unusable
3. Preserves were broken and fish is there were lost

Aqua farms are located in calm marina areas, for instance, setting a rafts and preserves in a bay. It is based on the premise the marina areas that would not be affected by strong ocean waves. Therefore, generally speaking, aqua farm industry is vulnerable to the damage caused by ocean waves and Tsunami.

**Fig. 3.1** A fishing ships has drifted from harbor towards inland by Tsunami (Source: MAFF)

**Fig. 3.2** Rafts for Oyster farming has been destroyed by Tsunami (Source: MAFF)

In aqua farming, it will take one to several years from seeding to get product. Aqua farm in Tohoku area has already re-started, but it took several years to archive stable production.

### *3.2.4 Damage in Marine Product Industry*

Not only primary industry but also seafood processing industry has got severe impacts. Seafood processing industry takes a big role in fishery related industry.

Even though fishermen could get seafood somehow, without recovery and re-open of seafood processing factories and markets, the seafood would never have delivered to consumers.

After the earthquake and Tsunami, seafood processing factories in Tohoku and Kanto coastal regions, ground sink is one of the most serious problems to overcome towards re-start their operation. Figure 3.3 shows a destroyed ice works facility near a fishery harbor.

Many of seafood processing factories locate coastal areas including backland of fishery harbors. In many case, factories' ground was widely sunk and got damage from sea water flood by high tide water etc. In order to re-start factory operation, firstly they need to inflate ground level before building new facilities. In addition, some factory areas have been specifies as building restrictions area, so factories locates in these areas are not allowed to start reconstruction of their factories until the restriction is dissolved.

Business operators have been struggled in this hard situation. Some of them decided relocate their factories for early re-start due to difficulty to reconstruct the factories on their original site. In other case, a company outsource manufacturing of their original bland products to other company to maintain their sales channel.

## 3.3 Recovery and Regeneration Policy

### *3.3.1 Declining of Fishery and Counter Measures*

Before The Great East Japan Earthquake and Tsunami, the declining of fishery was already pointed out. Especially in inshore fishery have many serious problems including successor problem, insufficient natural resource management, marketing methods etc. (Shibata and Miyasone 2013). The damage of the Earthquake and Tsunami including human loss, financial loss, facilities loss and other difficulties have accelerated these problem which fishery industry in Japan have kept from the past.

In fishery industry in Japan, especially the coastal fishing that usually operated by the unit of a family, fisheries cooperative association have played an important

**Fig. 3.3** Destroyed ice works facility near a fishery harbor (Source: MAFF)

role for years. Fisheries cooperative association has functions of sales, purchasing, finance, resource management and mutual aid, which are necessary for fishery industry (Ariji 2008; Shibata and Miyasone 2013).

After the Earthquake and Tsunami, there are discussions how we should tackle with challenges toward recovery and regenerating of fishery. We should take advantage of centralized functions of fisheries cooperative associations and make it sophisticated to be an engine of recovery of local engines. Or, we should take innovative new fishery management systems toward regeneration of fishery.

Iwate prefecture and Miyagi prefecture; both prefecture have big shares in fishery industry and have enormous damage from the earth quake and Tsunami. However, interestingly, the policy of master plans for Tsunami recovery is quite different from each other. It seems that their approach toward recovery and regenerating.

In this section, we review some part master plan for Tsunami recovery of both prefectures, which mention about fishery.

### *3.3.2 Policy of Iwate Prefecture*

Iwate prefecture have a plan to regenerate local industries by supporting producers to work with hope and motivation, supporting by creation and implementation of construction of the production system, infrastructure development, and institutional and financial support systems. Moreover, Iwate prefecture plan to activate local economy by supporting high-value added productions and works, and unique product, which reflect the characteristic of the region.

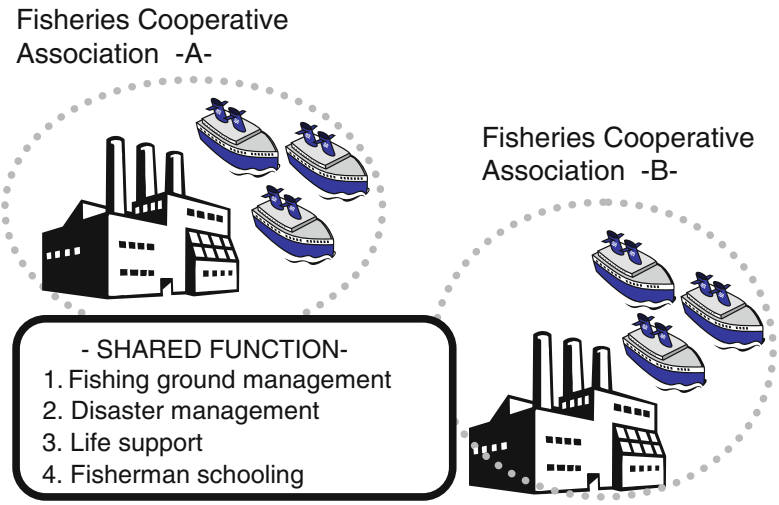


**Fig. 3.4** Image of share use system for community-based fishery industry proposed by Iwate Prefecture

Regarding fishery, Iwate prefecture aims to regenerate community-based fishery industry. They plan to implement two objectives in a same time:

1. Formulation of fishery and aqua farming industry with fisheries cooperative association as the core of these industries (Fig. 3.4).

In particular, this idea is to formulate the fisheries cooperative association oriented share and use system for members of the association. Fisheries cooperative association will maintain boats, tools and aqua farms etc. and association member will share them.

2. Formulation of processing and distributing system with local central fish market (Fig. 3.5).

In addition, they will promote the restoration and maintenance of shore protection facilities, infrastructures for fishery harbors, fish farms and others based on community disaster prevention plan.

This policy focuses on the link between local fish markets and food processing facilities including refrigeration facilities. It is necessary to reconstruct these market and sea food processing facilities for re-starting and stable operation. They mention the financial support from the government and recovery support funds (Iwate Prefecture 2011; Demura 2011).

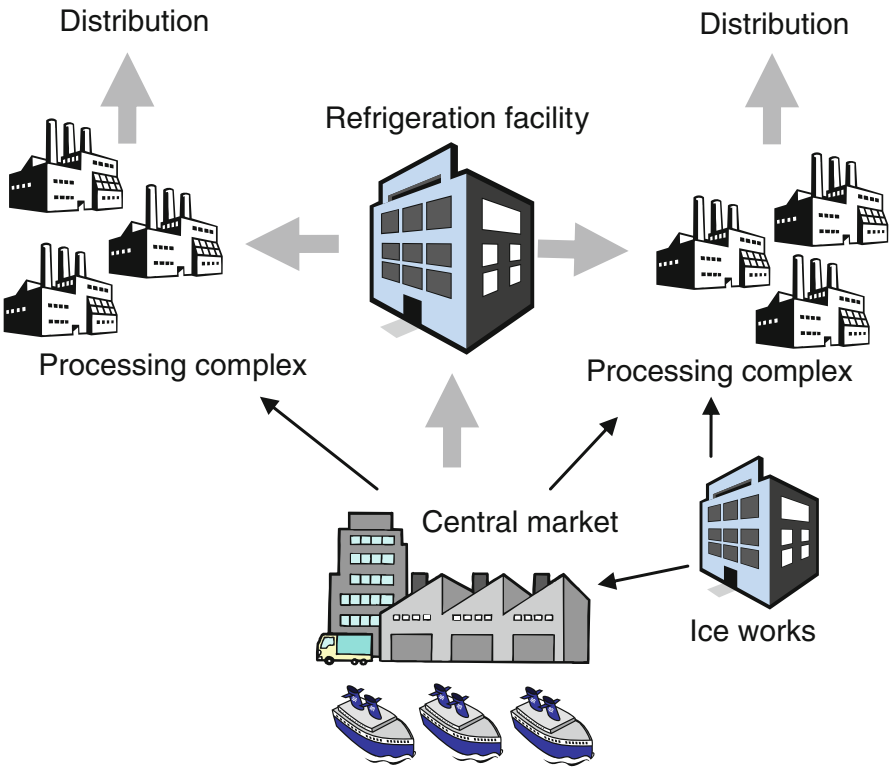


**Fig. 3.5** Formulation of processing and distributing system with local central fish market proposed by Iwate Prefecture

### *3.3.3 Policy of Miyagi Prefecture*

On the other hand, Miyagi prefecture's policy is put more focus on promoting "reform" of fishery industry. Their policy is to review fishery related law system, operation form and operation of fish harbors, and work toward creation of new fishery industry and reforming of fishing towns and cities.

Precisely, they plan to implement

1. Restructuring of fishery and related industries complex areas and fishery hub city.
2. Introduction of new operation and management system.
3. Building competitive and attractive fishery industry

In terms of (1) Restructuring of fishery and related industries complex areas and fishery hub city, Miyagi prefecture selected five cities: Kesennuma, Ishinomaki, Shiogama, Onagawa and Shidsukawa as "fishery and related industries complex harbors", and promote its function recovery at the earliest timing. As to other fishery harbors, Miyagi prefecture intend to consider their productivity and

efficiency in order to select "inshore fishery hub harbors" and make it as prefecture owned in principle, and develop and maintain them intensively (Miyagi Prefecture 2011).

Regarding (2) Introduction of new operation and management system, Miyagi prefecture aims to introduce private capital to fishery operation and points out that consultation and negotiation with fisheries cooperative association as a big challenge, because emergence of private capital will directly affect the matter of fishery right which fisheries cooperative association has exclusively managed.

In fact, fisheries cooperative association expresses their concern about this idea and some groups require recall of the plan (Demura 2011).

## 3.4 Current Situation and Future Challenge

It has been 3 years since 2011.3.11, and conditions among fishery industry in Tohoku region seem gradually recovered on the surface.

Some visible recovery areas are:

- The catch of fish has recovered about 70 % of that in 2010.
- About 50 % of damaged harbors have been maintained.
- Recovery of fishing boats has archived about 85 % of its target.
- In aqua farming, brown seaweed farming has recovered about 90 % of it before the Earthquake and Tsunami.
- About 80 % of seafood processing facilities has re-started operation.
- Almost all of debris in coastal area has been removed (MAFF, Fishery Agency 2014).

These numbers show that even it takes years, the physical conditions has been maintained and recovered. However, numbers of problems still exist before and such as successor problem, effective management of fishery and harmful rumors etc.

In addition, as it shows in the master plan for Tsunami recovery in Iwate prefecture and Miyagi prefecture, the middle-to-long term target is to reform the fishery management system.

Which approach brings us to regeneration and sustainable development of fishery industry in Tsunami damaged area? If it is an approach to introduce new function to traditional management system to promote structural reform of local industry, or it is approach to bring new function to traditional local fishery community which support the foundation of local industry? It may be necessary to take both ideas?

"Recovery" of fishery from physical damage of The Great East Japan Earthquake and Tsunami may archive in a certain level in near future. However, it may take years to confirm "Regeneration" as local major industries after "recovery". In this point, monitoring on two different policies and measures of Iwate and Miyagi

prefecture and other local challenge would be a good record that will bring an idea for future policy discussion for fishery system development in Japan.

**Acknowledgements** The authors would like to express their appreciation to SEEDS Asia for providing extensive support for research activities for this chapter.

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# Chapter 4
# Regional Comparison of Temporary Housing Construction Processes After the 2011 Great East Japan Earthquake and Tsunami

**Osamu Murao**

**Abstract** The Great East Japan Earthquake and Tsunami struck on March 11, 2011, and severely damaged to eastern regions of Japan, especially the coastal areas of the Tohoku region. As of September 2013, the number of dead was 18,703, with 2,674 people still considered missing (FDMA 2013). Nearly 400,000 buildings were heavily or moderately destroyed. Post-tsunami urban recovery has progressed according to local governments' situations in areas affected by the disaster. One of the important activities in the early stages of the urban recovery process is construction of temporary housing for the victims. The author was provided temporary housing construction data after the disaster by the Ministry of Land, Infrastructure, Transport and Tourism in order to construct recovery curves, which are a quantitative tool for comparing regional recovery processes. This chapter firstly presents how temporary housing has been constructed in Iwate, Miyagi, and Fukushima since March 2011, then discusses the associated problems, and finally presents the results of a comparative study on contemporary housing construction in the affected areas using recovery curves. The analysis clarified that the speed of the construction was the fastest in Iwate, and the slowest in Fukushima.

**Keywords** Temporary housing • Recovery process • Building recovery curve • Iwate • Miyagi • Fukushima

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R. Shaw (ed.), *Tohoku Recovery*, Disaster Risk Reduction,
DOI 10.1007/978-4-431-55136-2_4

## 4.1 Construction of Temporary Housing as an Important Element in the Early Stages of the Post-disaster Urban Recovery Process

### *4.1.1 Importance of Temporary Housing for Resettlement*

The Great East Japan Earthquake, which struck on March 11, 2011, catastrophically devastated the eastern part of Japan. It damaged to more than one million houses: heavily 129,914, moderately 258,591, and slightly 711,376 (National Police Agency 2012). Iwate, Miyagi, and Fukushima were the three prefectures most seriously damaged by the resulting tsunami, with the overall decimation making a swift recovery next to impossible.

After the emergency response stage, which lasts several weeks for large-scale disasters, as seen after the 1995 Great Kobe Earthquake, the main concern becomes recovery. While there are various aspects to the recovery stage, how and where the affected residents resettle are two of the most significant concerns. Construction of temporary housing for the victims is an important element during the early phase of the recovery stage. People who move to temporary housing from one area meet others and a new community develops. Others may open a business at the temporary housing site to make a living. Temporary housing thus can be a foundation on which to build a new life following a disaster.

### *4.1.2 Looking Back on the Temporary Housing Provision in Japan*

Let's see the context of Japanese temporary housing provision in the twentieth century.

Following to the 1923 Great Kanto Earthquake, which seriously damaged to buildings and people in Tokyo and Kanagawa, the victims constructed self-build wooden temporary houses on the devastated space. After World War II, Disaster Relief Act passed in 1947, in which Prefectures are to provide temporary housing to the victims in the jurisdiction.

Since then, we Japanese had experienced several serious disasters such as Unzen-Fugendake Volcanic Eruption in the early 1990s, the 1995 Great Kobe Earthquake, and the 2004 Niigata-ken Chuetsu Earthquake. According to the characteristics of disasters and the change of society, new problems about temporary housing construction appeared in each case. Kariya and Murao (2003) listed several related problems based on the precious research: (1) to take a considerable time for construction, (2) difficulty to find the construction sites, (3) shortage of construction machinery, (4) supply system of construction material, (5) environmental quality of the house, (6) cost to level the ground before the construction and

to demolish the houses after the construction of permanent houses, (7) unsustainable recycle system of the used material, and (8) enormous industrial wastes. They point out that a comprehensive strategy should be discussed for future disaster management.

### *4.1.3 Modeling of Post-disaster Recovery Process*

Construction of temporary housing is one of the most important recovery activities in the early stages of the recovery process. However, construction differs according to the damage that areas sustain. It will be helpful for future research on post-disaster urban recovery to examine these differences. The question is how can these differences be compared quantitatively.

The idea of modeling post-disaster recovery processes blossomed in the 1970s. Haas et al. (1977) modeled the urban recovery process after the 1906 San Francisco Earthquake using four stages: (1) emergency response, (2) restoration of the restorable, (3) reconstruction of the destroyed for functional replacement, and (4) reconstruction for commemoration, betterment and development. Vale (2005) referred to the significance of comparative studies of post-disaster urban recovery processes and highlighted the importance of not disregarding the social context of the process.

Based on these previous studies, the authors proposed a recovery curve method using data set of post-disaster housing construction. A recovery curve is a measure to quantitatively compare the long-term recovery processes of areas affected by disasters. Murao et al. (2007) presented, for the first time, these types of curves for the recovery process of Chi-Chi Township in Nanto County damaged by the 1999 Taiwan Earthquake. Expanding on this idea, Murao and Nakazato (2010) improved the method and clarified the regional differences in the reconstruction process in terms of temporary housing and permanent housing in Sri Lanka after the 2004 Indian Ocean Tsunami. The method was then applied to the post-tsunami recovery condition of Thailand (Murao et al. 2008) and Indonesia (Sugiyasu and Murao 2010). Finally, Murao et al. (2011) compared the post-tsunami urban recovery processes of all three countries.

Focusing on temporary housing construction, this chapter aims to clarify the differences in temporary housing construction processes between the three prefectures most affected by the 2011 Great East Japan Earthquake: Iwate, Miyagi, and Fukushima.

## 4.2 Method

To construct the recovery curves for temporary housing, the authors used the temporary housing dataset provided by the Ministry of Land, Infrastructure, Transport and Tourism (hereinafter MLIT). The dataset had been updated weekly since April 11, 2011, and the author obtained the monthly data for Iwate, Miyagi, and Fukushima as of August 2012.

To plot recovery curves, it is necessary to normalize the recovery condition of damaged areas that vary in size. This was done by comparing the recovery ratio of the number of buildings constructed per month to the total number of constructed buildings as of August 2012.

Covering a period of 17 months, the cumulative ratio of building completion is assumed to be fitted to a sigmoid curve such as the cumulative normal distribution curve, logistic curve, or Gompertz curve. A curve showing the highest correlation with the observed data is considered to represent the optimal recovery curve for the temporary housing.

After the optimal curve is determined, curves are constructed for each prefecture. Finally, the construction conditions of temporary housing for the three prefectures are quantitatively compared with the developed recovery curves and probability density functions.

## 4.3 Situation Analysis

### *4.3.1 Evacuation from the Damaged Area*

The number of people evacuated from the areas damaged by the disaster was approximately 470,000 as of March 14, 2011. It decreased to 341,000, including 254 people in shelters, by May 10, 2011 (CAO 2012). At this point, the number of evacuees living outside of the damaged prefectures included 1,600 from Iwate, 8,400 from Miyagi, and 62,000 from Fukushima.

After disasters in Japan, temporary housing is usually constructed by the Japan Prefabricated Construction Suppliers and Manufactures Association or local construction companies according to orders received from local governments of the damaged areas, or at the request of MLIT. Soon after the 2011 Earthquake, the Japanese Government dispatched MLIT staff to the damaged areas to support the local governments in obtaining land for the construction of temporary housing. The areas considered contained national demesne lands, which can be loaned to local governments for free. One remarkable thing following the 2011 Earthquake was that public housing or rented apartments managed by private companies were used for the victims instead of “temporary housing” to save on construction fees (Reconstruction Agency, 2012).

As a result, the number of households living in public housing, such as apartment housing for government workers, was 19,000, those in rented apartments totaled

68,000, and 49,000 people were living in temporary housing as of May 15, 2011 (CAO 2012). Most of the evacuees were living in temporary houses by September 2011.

### *4.3.2 Problems Concerning Temporary Housing Construction*

There were several problems with the construction of temporary housing after the 2011 Great East Japan Earthquake and Tsunami. The first problem was difficulty in estimating the number of temporary houses needed. Apartments managed by private companies became available for use as "temporary houses," which made it difficult to determine the number of buildings to be constructed. Moreover, the arrival of evacuees from outside the prefectures compounded the problem.

One of the critical problems was shortage of available land for the construction. Because the huge tsunami following the earthquake on March 11 inundated an area totaling 561 $km^2$ (GSI 2011), a vast number of temporary houses was required. Nevertheless, it was difficult for some local governments to prepare sites for temporary housing within the damaged areas because of the geographical conditions, especially in the mountainous areas along the Sanriku Rias Coastline. Local governments dealt with the problem by using outer lands or farmlands, but delays in construction of the temporary housing ensued as officials spent much time to grasp the victims' intention and to properly allocate the provided lands.

Another problem was difficulty in obtaining the necessary construction materials. The supply chain was broken; production facilities or manufacturers located in the damaged areas were devastated by the earthquake or tsunami. Consequently, they imported building materials and relied on the support of other local governments, but faced difficulties of transportation and arrangements of available companies.

Among the three prefectures, the gravest situation arose in Fukushima. The Fukushima Daiichi nuclear disaster forced residents in the area to be evacuated from the emergency evacuation preparation zone surrounding the Fukushima Daiichi nuclear power plant. This complicated situation delayed the construction of temporary housing in some municipalities within the prefecture.

## 4.4 Prefectural Comparison of Temporary Housing Construction

Figure 4.1 presents the number of temporary housing sites constructed for local governments as of August 2012. The highest number of constructed houses is in Ishinomaki City in Miyagi Prefecture, with 7,297 houses, followed by Kesennuma

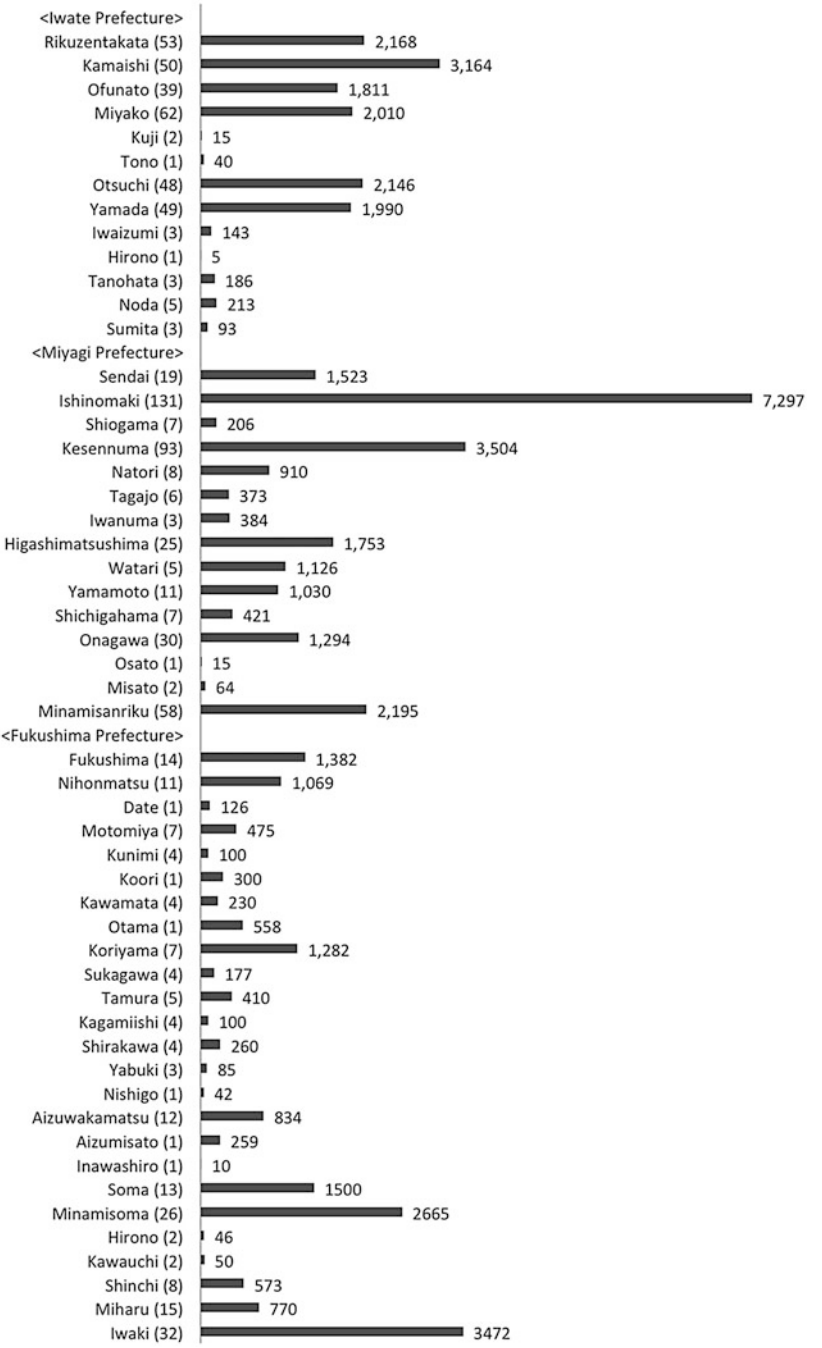


**Fig. 4.1** The number of constructed temporary housing units for local governments as of August 2012 (the number in parentheses indicates the number of construction sites)

**Table 4.1** The monthly completed construction of temporary housing in Iwate, Miyagi, and Fukushima prefectures

| Month | Iwate | Miyagi | Fukushima | Total |
|---|---|---|---|---|
| March 2011 | 0 | 0 | 0 | 0 |
| April 2011 | 533 | 1,426 | 437 | 2,396 |
| May 2011 | 6,869 | 10,294 | 6,332 | 23,495 |
| June 2011 | 9,694 | 14,160 | 9,021 | 32,875 |
| July 2011 | 13,112 | 16,988 | 11,181 | 41,281 |
| Aug. 2011 | 13,983 | 21,189 | 13,573 | 48,745 |
| Sep. 2011 | 13,984 | 21,826 | 14,284 | 50,094 |
| Oct. 2011 | 13,984 | 21,899 | 15,514 | 51,397 |
| Nov. 2011 | 13,984 | 22,042 | 15,700 | 51,726 |
| Dec. 2011 | 13,984 | 22,095 | 15,788 | 51,867 |
| Jan. 2012 | 13,984 | 22,095 | 15,788 | 51,867 |
| Feb. 2012 | 13,984 | 22,095 | 16,226 | 52,305 |
| March 2012 | 13,984 | 22,095 | 16,418 | 52,497 |
| April 2012 | 13,984 | 22,095 | 16,464 | 52,543 |
| May 2012 | 13,984 | 22,095 | 16,464 | 52,543 |
| June 2012 | 13,984 | 22,095 | 16,527 | 52,606 |
| July 2012 | 13,984 | 22,095 | 16,589 | 52,668 |
| Aug. 2012 | 13,984 | 22,095 | 16,775 | 52,854 |
| Required unites | 13,984 | 22,095 | 17,872 | 53,951 |

City and Kamaishi City in Iwate, and Iwaki City in Fukushima, with more than 3,000 houses for each city. Basically, the number of necessary houses is related to the damage sustained by each municipality, but there is another reason for the situation in Iwaki City. Iwaki City is the biggest city along the coast in Fukushima Prefecture, which has been seriously affected by the Fukushima Daiichi nuclear disaster. Thus, Iwaki City required more construction for the victims who had lived in the neighboring cities and towns.

The monthly completed construction of temporary housing in Iwate, Miyagi, and Fukushima based on the dataset provided by MLIT is shown in Table 4.1 and Fig. 4.2. The prefecture with the largest number of completed temporary housing units is Miyagi, whereas the prefecture with the smallest number is Iwate.

In April 2011, former Prime Minister Naoto Kan announced that all temporary housing would be constructed by mid-August. Further, Iwate Prefecture announced that all units would be completed before September 11, 2011, a half year after the disaster. This timeline can be used to evaluate the recovery process.

Iwate first estimated the number of required units to be 18,000. The number was eventually decreased to 13,984, and the construction effort almost achieved its goal in August 2011. In Miyagi, 95.9 % of the necessary houses were completed by August 2011, and all construction had been finished by December of that year.

On the other hand, Fukushima remained in a difficult situation even by August 2012. Created on April 22, 2011, around the Fukushima Daiichi nuclear power plant, the emergency evacuation preparation zone was eliminated on September 30, 2001, which lifted the ban on the construction of temporary housing

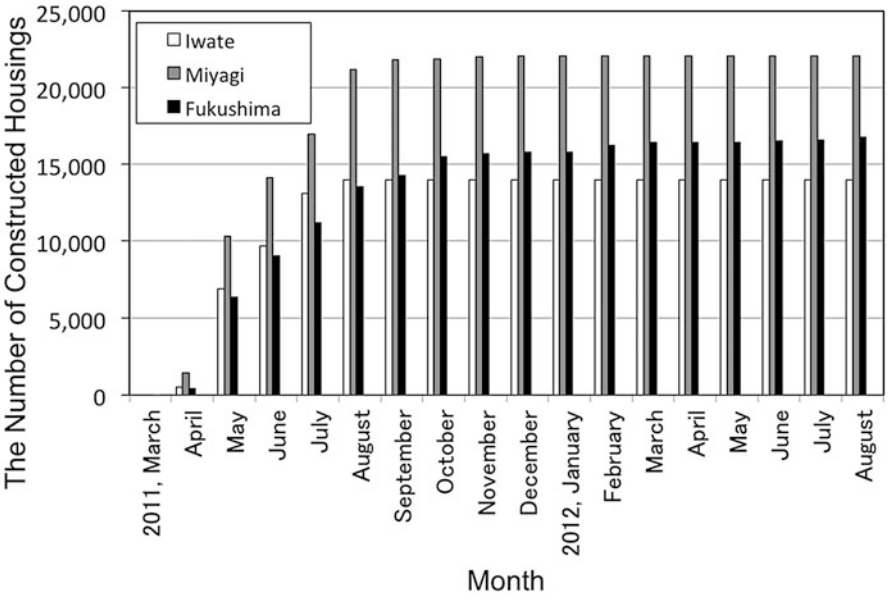


**Fig. 4.2** Completed construction situation of temporary housing in Iwate, Miyagi, and Fukushima prefectures

construction in the area. Although the construction ratio was 93.9 % as of August 2012, the number of required houses was still increasing.

## 4.5 Construction of Recovery Curves for Temporary Housing

In order to acquire the recovery curves, optimal recovery curves should be selected for the temporary housing construction. Assuming that the relationship between elapsed time and the recovery ratio of buildings closely fits an s-shaped curve, we considered three kinds of sigmoid curves: cumulative normal distribution curve, logistic curve, and Gompertz curve.

The Gompertz distribution was found to exhibit the best fit among the three for the temporary housing data, which was also the case in the previous research on Sri Lanka by Murao and Nakazato (2010). Thus, the Gompertz distribution is used for constructing the recovery curves for the three prefectures.

The factors of time (months) and the ratio of building completion are used to construct the recovery curves. The time period starts in March 2011, with April 2011 being regarded as month "1", and extends over 17 months until August 2012, when the construction was almost completed. The ratio of building completion for a given time period is calculated based on the total amount of completed buildings.

For a time period of $t$ (months), the cumulative ratio of building completion $R(t)$ can be described by the Gompertz curves, using the following equation:

$$R(t) = a^{b^t} \tag{4.1}$$

where $a$ and $b$ are coefficients.

Recovery curves for the prefectures can be plotted using the regional construction data. However, it should be noted that the number of buildings constructed in Fukushima was less than the required amount as of August 2012. Since the recovery curves can thus be considered to closely reflect the actual situation, a parameter, $K$, reflecting the completion realization ratio for each prefecture can be combined with Eq. 4.1 to give Eq. 4.2 for the temporary housing, as the function expressing the final building recovery. Equation 4.3 is the probability density function of the Gompertz curve.

$$R(t) = Ka^{b^t} \tag{4.2}$$

$$P(t) = Ka^{b^t} b^t \cdot \log a \cdot \log b \tag{4.3}$$

Thus, the recovery curves and the probability density functions for temporary housing were obtained, as shown in Table 4.2, Figs. 4.3 and 4.4.

High correlations, greater than 0.96, were observed between the curves developed in this study and the observed data, so the curves are considered to properly reflect each recovery condition. The average number of months for 50 % completion is 2.2 (early May 2011) in Iwate, 2.5 (mid-May 2011) in Miyagi, and 3.5 (mid-June 2011) in Fukushima. The difference between Iwate and Fukushima is 1.3 months. As for the mode, the value that occurs most frequently, the end of May or the beginning of June, was the peak of the construction in Iwate and Miyagi, which occurred 0.7 months later in Fukushima compared to Miyagi.

## 4.6 Brief On-site Report

Finally I would like to briefly report some on-site situation about temporary housing constructed after the Great East Japan Earthquake and Tsunami.

Based on the dataset, more than 50,000 temporary housing units were constructed after the event, most of which were constructed with support from the Japan Prefabricated Construction Suppliers and Manufactures Association, as shown in Fig. 4.5. However, there were some cases in which local resources were utilized. For example, the temporary housing for Naraha Town constructed in Iwaki City, Fukushima was made using local wooden material and designed like log houses (Fig. 4.6). The wooden temporary houses make life for residents more comfortable, and the construction system accelerates the re-establishment of the industries and supply chains damaged by the disaster.

**Table 4.2** Recovery curve parameters for temporary housing in Iwate, Miyagi, and Fukushima prefectures

| Month | *a* | *b* | $R^2$ | *K* | Mode | Average |
|---|---|---|---|---|---|---|
| Iwate | 0.0000432 | 0.30 | 0.99 | 1.00 | 1.9 | 2.2 |
| Miyagi | 0.000247 | 0.37 | 0.97 | 1.00 | 2.1 | 2.5 |
| Fukushima | 0.00243 | 0.52 | 0.96 | 0.94 | 2.8 | 3.5 |
| Total | 0.000274 | 0.39 | 0.98 | 0.98 | 2.3 | 2.7 |

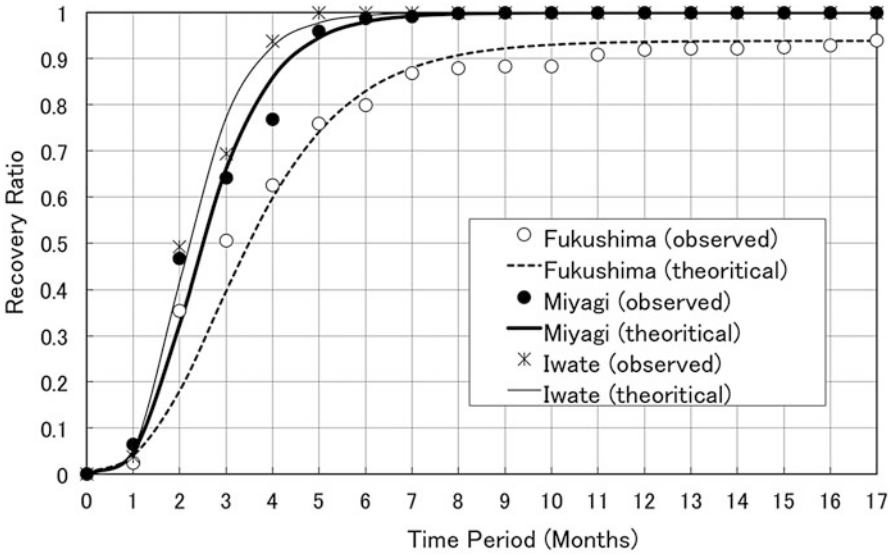


**Fig. 4.3** Recovery curves for temporary housing in Iwate, Miyagi, and Fukushima prefectures

Apart from functioning as living spaces, other facilities have sprung up in temporary housing, such as shops or clinics (Fig. 4.7). These facilities cater to the elderly evacuees or people without means of transportation. Figure 4.8 shows a temporary shopping lot in Kesennuma. While not technically housing, it does provide some insight into how victims quickly adapted to life as an evacuee by opening a much-needed restaurant or store in the early recovery phase after the disaster.

## 4.7 Conclusions

In this study, recovery curves for temporary housing in Iwate, Miyagi, and Fukushima, the three prefectures most seriously damaged by the 2011 Great East Japan Earthquake, were developed using a temporary housing construction dataset provided by MLIT. The differences in the construction processes between the three

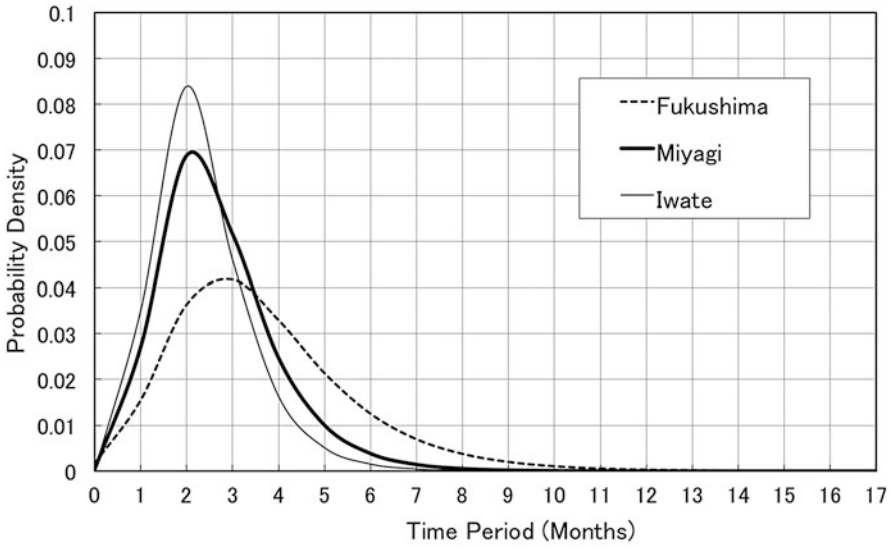


**Fig. 4.4** Probability density functions for temporary housing in Iwate, Miyagi, and Fukushima prefectures

**Fig. 4.5** Typical temporary housing in Iwaki city

prefectures were then quantitatively clarified. The speed of the construction was the fastest in Iwate, and the slowest in Fukushima. The difference between them was an average of 1.3 months.

**Fig. 4.6** Wooden temporary housing constructed using local materials in Iwaki city


**Fig. 4.7** Shopping area in a temporary housing unit in Kamaishi city

This chapter also discussed the situation of temporary housing construction after the disaster and the related problems. Estimation of the number of necessary temporary houses, preparation of temporary housing sites, and a shortage of

**Fig. 4.8** Temporary shopping lot in Kesennuma city

construction materials are the most important factors related to delays in construction. Moreover, especially in Fukushima, the Fukushima Daiichi nuclear disaster seriously affected the evacuation of the victims and construction of temporary housing.

As before-mentioned in Sect. 4.1.2, there have been several problems on the temporary housing construction: (1) to take a considerable time for construction, (2) difficulty to find the construction sites, (3) shortage of construction machinery, (4) supply system of construction material, (5) environmental quality of the house, (6) cost to level the ground before the construction and to demolish the houses after the construction of permanent houses, (7) unsustainable recycle system of the used material, and (8) enormous industrial wastes. Although we found a new supply system using local material in the affected areas such as the case in Fukushima, which was a good practice learnt from the past disastrous experiences, other problems still remains.

We can suggest that the local governments had better prepare some construction sites for temporary housing before future disaster for example. However, we can learn more and more from the experiences. It is necessary to examine the relationship between the speed of construction and its context. The recovery curves introduced in this chapter will be helpful for future research.

**Acknowledgments** This research is supported by the Japan Society for the Promotion of Science (JSPS), Grant-in-Aid for Scientific Research No. 25242036 "Resilience of the Urban Recovery System after the 2011 Great East Japan Earthquake and Regional Vulnerability Assessment to Tsunami." Collection of data and information was supported by Kazetaka Kotoku and Nobuko

Fukushima, previous staff members of the Urban Recovery and Disaster Mitigation Design Laboratory at the University of Tsukuba.

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# Chapter 5
# Lessons of Health Sector Recovery on Tohoku Disaster

**Kenji Isayama and Rajib Shaw**

**Abstract** The 2011 Great East Japan Earthquake and Tsunami (GEJET) devastated health sector in Tohoku region. Health sector recovery should go beyond reconstruction and rehabilitation. GEJET has shown us with necessity and importance for public health and hygiene issues. The role of a disaster medical and health coordinator is essential, and medical personnel should act according to disaster resilience frameworks to achieve a seamless flow of activities from the acute phase to the reconstruction phase. To prevent disaster-related deaths and health damage, the intervention of appropriate public health measures are vital from the acute phase after a disaster.

**Keywords** Health sector • Public health • Disaster medical and health coordinator • Seamless flow of activities • Disaster-related deaths

## 5.1 Introduction

The 2011 Great East Japan Earthquake and Tsunami (GEJET) devastated human lives and health in Tohoku region, brought about catastrophic damage to the three prefectures of Fukushima, Miyagi and Iwate in particular. Tohoku's population is aging, economically often marginalized, and dispersed across many small communities. The GEJET highlighted and compounded challenges already facing Japan such as a rapidly aging society, shortage of medical personnel continues to be a challenge in Japan, even in the absence of a disaster (CSIS 2011). The damage to the health sector by the tsunami was significant with losses to both infrastructure and personnel. These losses and that of health personnel caused a total breakdown of health services in the affected areas.

WHO defines the health sector as a system which consists of all organizations, people and actions whose primary intent is to promote, restore or maintain health.

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R. Shaw (ed.), *Tohoku Recovery*, Disaster Risk Reduction,
DOI 10.1007/978-4-431-55136-2_5

This includes efforts to influence determinants of health as well as more direct health improving activities (WHO 2000). The GEJET destroyed the medical and public health buildings and the telecommunication systems vital to the public health system. The public health workforce was also severely affected; many public health workers were victims of the disaster, and those who could work did so under extremely difficult conditions (Arima et al. 2011).

Although the response of the rescue activities was prompt, it sometimes failed to meet the on-site needs due to the lack of communication and coordination (Nakamura 2013). Many subacute symptoms were attributed to the contaminated sludge of the tsunamis and the poor living environment at the evacuation centers. Particularly vulnerable groups were identified as the elderly, those with mental health illnesses and the disabled. Regarding health care needs, chronic conditions such as hypertension and diabetes were reported to be the greatest burden from the early stages of the disaster. Loss of medication and medical records appeared to worsen the situation. The lessons identified from this mega-disaster highlighted the specific health needs of the vulnerable populations, particularly the elderly and those with non-communicable diseases.

In the case of GEJET, the hard and prolonged situation of the refugee shelters jeopardized their lives in the subacute phase after the attack. A great number of people were suffering from exhaustion and passed away in the shelter because of the inferior environment and/or poor nutrition. And some people took their own lives. This can be termed "preventable shelter death". Few teams were involved in disaster related deaths and health disturbances from the viewpoint of public health and/or preventive medicine. From the GEJET, precious lessons are learned. For example, Disaster Public Health Assistance Team (DPHAT), experts with the skills to monitor the health and living environment of shelters, should be trained and ready to act in the next disaster. A system that can be quickly implemented during a catastrophic event should be established (Nakamura 2013). The GEJET has shown us the necessity and importance for public health and the ability to address hygiene issues in the process of moving toward recovery and reconstruction after a large disaster.

This paper focus on the health sector impacts at the time of the GEJET in Tohoku regions and summarizes lesson of health sector recovery. Although the effect of the GEJET impacted on the accident at the Fukushima-Daiichi nuclear power plant, this detail is specifically excluded in this literature review. This is because the health needs and health impacts related to the radiation exposure is very different from those related to the earthquake and tsunamis.

## 5.2 Impact of Damage of Health Care Facilities

The GEJET caused total collapse of 11 and partial collapse of more than 200, hospitals in three prefectures (Iwate, Miyagi, and Fukushima). The GEJET impacts on hospitals and social welfare services were massive. In Fukushima, Miyagi, and

Iwate Prefectures around 80 % of a medical facility (i.e. hospital, clinic) were either destroyed or severely damaged (World Bank 2012). Furthermore, many welfare facilities for the elderly and home-care nursing headquarters were damaged, and medical infrastructures were lost throughout the region (Inoue 2012).

### 5.2.1 *The Damage of Facilities for the Elderly in Tohoku Three Prefectures*

Fifty-two facilities for the elderly, such as specialized nursing homes, health centers, and group homes, suffered serious damage Thirty-eight (73 %) of these facilities were located in Miyagi. The total number of dead and missing in Tohoku reached 485; 309 (64 %) victims were from Miyagi. As of September 2013, 90 % of medical facilities damaged by the GEJET have been repaired or reconstructed along with 83 % of nursing facilities (Reconstruction Agency 2013b).

### 5.2.2 *Hospital Evacuation/Medical Evacuation*

Many hospitals were evacuated owing to the damage caused by the GEJET (Inoue 2012). In Iwate, a hospital located directly on the coastline had to be evacuated because of the damage it sustained from the earthquake and tsunami. On March 12, hospital patients were transferred inland to areas where little damage occurred. The Hanamaki Airport Staging Care Unit (SCU; a temporary medical facility for emergency medical evaluation outside of affected areas) was established, transporting patients from hospitals in coastal areas to safer inland facilities within the region as well as outside Tohoku, beyond the disaster area. In Miyagi, Ishinomaki City Hospital was evacuated by helicopter on March 13. However, a number of deaths resulted from the transportation of very ill patients as it was impossible to provide adequate medical care during transfer; transport-related deaths became a major problem in the wake of the GEJET. Because there was not a huge demand for medical services for mass causalities in the acute phase after the tsunami, it meant that the focus could turn to hospital evacuation (Atake 2013). In terms of preparedness for future disasters, it should be recognized that hospital evacuation is an important area of disaster medical care.

### 5.2.3 *Medical Records*

It was not only hard-copy medical records that were swept away in the GEJET, but also local government information on individuals. Therefore, doctors treating

patients after the tsunami did so by guesswork because the medical history of newly transferred patient was unknown. In shelters, pharmacists elicited the actual shape and color of medicine taken by patients, and then had to guess at the appropriate medicines and prescribe them. It was difficult to determine a patient's medicine for chronic conditions, and who may receive many medicines. There were still hospitals 10 months after the GEJET that did not possess accurate medical histories for elderly dementia patients. Many outpatients were left untreated because of loss of medical records, loss of patients' family members who had cared for them, and the disruption of transportation (Ochi et al. 2013). The GEJET revealed the grave consequences for vulnerable individuals when there is no system of transferable, electronic medical records. Several groups are actively promoting telemedicine and cloud computing in Tohoku. An important opportunity now exists for Tohoku to be regional model for the introduction of new information technology (IT)-based models of health care, including electronic medical health records. To be successful, national policies, possibly legislative action, and practical implementation measures will be needed to ensure that enduring privacy concerns are adequately addressed (CSIS 2011).

## 5.3 Causalities

GEJET devastated the northeast area of Japan, resulting in 15,883 deaths and 2,654 missing people according to the Japanese government as of September 2013 (Reconstruction Agency 2013b).

### *5.3.1 Death and Missing/Injuries*

The total death toll from the GEJET was 15,816: 4,673 in Iwate, 9,537 in Miyagi, and in 1,606 in Fukushima. More than 99 % of all deaths in Japan from the GEJET occurred in these three prefectures (NPA 2013). There were few victims who needed lifesaving treatment in the acute phase of the GEJET. The ratio (death and missing/injuries) was 6.8 in the Great Hanshin-Awaji Earthquake and 0.33 in the GEJET (Table 5.1). The human cost of the tsunami has been characterized as being all or nothing (i.e., death or escaping with no injuries); still, it was surprising how few injuries there were (Reconstruction Agency 2013b).

In the first few days after the GEJET there was little call for medical assistance; however, this increased rapidly after the third day. This increase arose because there was no way to transport seriously injured victims. The need for medical services increased between the third and fourth days of the disaster. As there were so few medical supplies during the first few days in many hospitals and ongoing medical treatment was impossible, the transfer of inpatients was necessary at those hospitals

**Table 5.1** The ratio of death and missing/injuries

| | Death and missing (a) | Injuries (b) | Ratio (b)/(a) |
|---|---|---|---|
| The Great Hanshin-Awaji Earthquake | 6,433 | 43,800 | 6.8 |
| GEJET | 18,537 | 6,146 | 0.33 |

Source: Reconstruction Agency (2013b)

isolated by the disaster and unable to operate fully as before. In addition, hypothermia and the spread of chronic disease and infections occurred in shelters.

### *5.3.2 Disaster Related Deaths*

Disaster-related deaths in the Hanshin-Awaji earthquake were > 10 % of the number of deaths reported (6,400) due to overwork and deterioration from chronic diseases after the disaster (Hygo Prefecture 2005). The number of disaster-related deaths due to GEJET, including the deterioration of underlying diseases because of evacuation and "disuse syndromes" has been reported at 2,688 in 10 prefectures (Fig. 5.1). The highest number of disaster-related deaths in any one prefecture was 1,383 in Fukushima, followed by 862 in Miyagi, and 389 in Iwate. The total death toll for the three prefectures was 2,634, representing 98 % of the total death toll (Reconstruction Agency 2013a).

The disaster-related death toll in Fukushima was slower to peak than in Miyagi and Iwate. One reason for this is thought to be that residents stayed in shelters for a longer period than residents from other prefectures (because of the Fukushima Daiichi Nuclear Power Plant accident). The physical and mental fatigue resulting from life in a shelter was the most likely cause, representing one-third of all disaster-related deaths (Nakamura 2013).

### *5.3.3 Mental Health and Stress*

In the aftermath of March 11, the Ministry of Health, Labour and Welfare (MHLW) dispatched mental health teams, composed of psychiatrists, nurses, and social workers, to assess needs. Mental health disorders continue to carry a strong stigma in Tohoku and the quality and scope of services available is often inadequate (CSIS 2011). As a chronic or delayed type of risks, long term evacuation has produced such post-traumatic stress disorder (PTSD), deteriorated health problems in the elderly and handicapped, and loss of jobs or business opportunities for youngsters and employed people. The most critical issue as an uncertain type of risks is the deep anxiety about the health implications resulting from both external and internal exposure to radioactive fallouts through contaminated soil, water, agricultural and marine products. Many patients with psychiatric disorders were under continuous

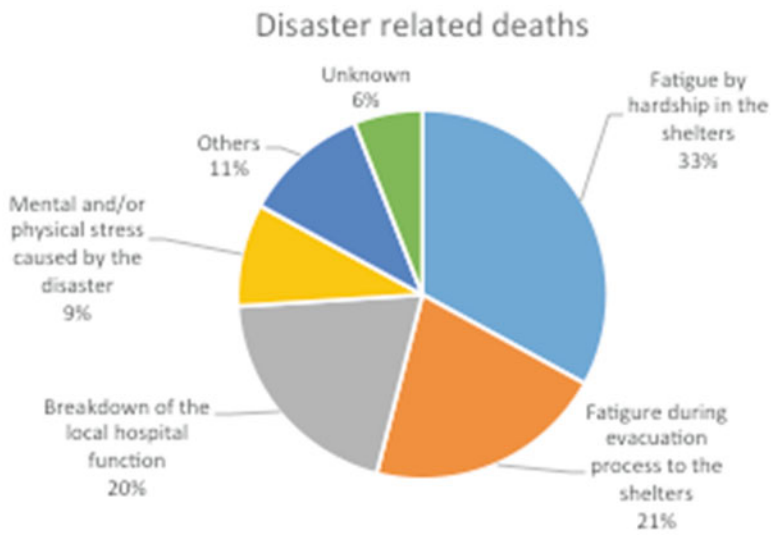


**Fig. 5.1** Disaster related death

"mental health care" and their conditions were relatively stable. However, this period of time was a turning point where acute stress disorder could have improved or developed into PTSD. There will likely be many difficulties and anxiety in rebuilding the lives of the disaster victims (Umezaki and Shinchi 2012). The establishment of a system for continuous and long term activities until creative restoration of the survivors and the disaster areas are also very important.

### *5.3.4 Preventable Disability*

Concerning care at the time of a disaster, the prevention and improvement of "preventable disabilities" must be a key focus. The mental and physical decline of victims because of inactivity after a disaster, often termed "disuse syndrome" is a serious concern. Since the Great Hanshin-Awaji Earthquake, the importance of reducing the rates of "preventable deaths" has been highlighted in disaster medicine. Furthermore, the prevention of "preventable disabilities" will again be an important issue in future events (Ookawa 2013).

## 5.4 The Characteristics of GEJET on Health Sector Recovery

As the characteristics of tsunami damage, the main cause of death is drowning with people which states that approximately 65 % of casualty was in the age groups higher than 60 years old (Cabinet office, Government of Japan 2011). Health administration personnel were also victims as the buildings in which they worked, such as public health centers and health welfare centers, suffered extensive damage. Therefore, the health administration sector fell into disarray, and this sector required much support.

### *5.4.1 The Elderly in Tohoku Regions*

Prior to March 11, over 30 % of the regional population in Tohoku regions was over 65 years of age, greater than the national average of 20 %, with the aging of the population continuing to progress (Nohara 2011). It is anticipated that a significant share of younger individuals from Tohoku will now relocate outside the region will need, in addition to meeting the immediate post-disaster mental and medical needs of the population, to have a greater capacity in the future to provide geriatric care. Long-term care services will need to be adapted to the special physical needs of these populations (CSIS 2011).

### *5.4.2 Medical Phase*

The chronology of impacts is described by the documented effects within 48 h, 1 week, 1 month, and more than 1 month. Table 5.2 summarizes the changes in the patients' needs over time (Ochi et al. 2013).

#### 5.4.2.1 Acute Phase

Disaster Medical Assistance Team (DMAT) aimed at deploying medical rescue teams to a disaster area within 48 h, were established in 2005, based on the lessons from the Great Hanshin-Awaji Earthquake (1995). Their response was prompt, and 15,000 professionals in total were dispatched to Tohoku area within 2 days of the quake. Other Japanese medical teams were also dispatched as rescue teams in the early stage of the disaster. A total of 128 DMATs, consisting of one to two physicians, one to two nurses and one support staff, came to the assistance of Iwate Prefecture for a 9-day period beginning 11 March 2011, engaging in emergency medical care and patient transportation activities and other duties. It must be

**Table 5.2** Chronology of the major health impacts

| Days from the disaster | Main health care issue |
|---|---|
| Within 48 h | Few injuries |
| 1 week | Hypothermia, endogenous diseases, burning, 'tsunami-lung' psychiatric shock, cardio-pulmonary arrest (CPA), coronary syndrome, cerebro-vascular diseases, 'drug-refugees' |
| <1 month | Respiratory diseases, gastritis, pressure ulcers, exacerbation of chronic conditions, allergic reactions to tsunami debris |
| >1 month | Children with allergy, musculoskeletal disease, deep venous thrombosis (DVT) and pulmonary embolism |
| Throughout | Non-communicable diseases (hypertension, diabetes, chronic renal failure, cancer, etc.), pregnancy hypertension, oxygen-dependent management, insomnia, skin-related disorders |

Source: Ochi et al. (2013), modified by author

able to quickly respond to disasters and move to disaster-affected areas within 48 h after a disaster or emergency. These teams provided transportation via helicopter to inland areas and established a wide-area distribution center and SCU, at Hanamaki Airport further inland from where they provided wide-area transportation and distribution services via aircraft to medical facilities both inside and outside Iwate Prefecture. Through 18 March 2011, a total of 191 patients were airlifted to Hanamaki Airport in Iwate Prefecture, and 16 were transferred to medical facilities outside the prefecture (Nohara 2011).

#### 5.4.2.2 Subacute Phase

The Japan Medical Association Team (JMAT) concept had been building up since 2010. Going on the basic assumption of providing support for about 400,000 evacuees in the afflicted area stretching 500 km across Iwate, Miyagi, Fukushima, and Ibaraki, JMAT initially estimated sending out teams consisting of one doctor, two nurses, and one coordination staff for a period of 3 days to 1 week with about 100 teams in action simultaneously for 1 month. Basically, the purpose of JMATs would be to take over the roles of DMATs, which start to withdraw 48 h after the occurrence of a disaster, and to provide support until afflicted hospitals and clinics reestablish their function as the bearers of community health (Ishii 2011). However, there were significant medical needs in the subacute and chronic phases of care in evacuation centers, with great demand for medical treatment and public health, sanitation assistance for general disorders, measures to counteract infection and mental health care (Nohara 2011).

#### 5.4.2.3 Chronic Phase

Public Health and Sanitation-Related Activities

Public health is vital in offering essential health services in disaster-affected areas. There were numerous cases of dehydration in various shelters. In addition, blood circulation disorders such as economy class syndrome were widely reported. Such disorders occurred at a higher rate than typically found in long-distance air passengers. Generally, under such circumstances, infection control becomes a major issue in disaster-affected areas; however, there were no infectious disease epidemics after the GEJET (Yamamoto et al. 2011).

In addition to medical teams, many public health and sanitation teams engaged in activities in the disaster areas. These included health maintenance activities by public health nurses, mental care from psychiatrists and clinical psychologists, oral care by dentists, as well as support from pharmacists, certified nurses, occupational therapists and physiotherapists. There are many residents who continue to require assistance in the form of mental health care, and as there are few local human resources who can provide mental health care, it is expected that external assistance will be required in the long term (Nohara 2011).

## 5.5 Public Health Center and Public Health Nurse

### *5.5.1 The Role of Public Health Center*

Ordinarily, a public health center has a strong connection with the prefectures and municipalities that it serves. The role of a public health center in a disaster area is to determine the disaster situation, victim status, and information collection as an organization responsible for health, medical care, welfare, and care. In addition, it is expected that a public health center would undertake a coordinating function to organize external medical support groups. However, it was impossible for the health centers in the GEJET areas to coordinate assistance with reduced manpower. In future crises, public health centers will require external professional support to operate successfully (Kurihara 2012).

### *5.5.2 The Role of Public Health Nurse*

The role of public health nurses is to obtain information regarding the region and individuals by caring for both health and life, and thereby they are in a position to support the region's inhabitants. Therefore, support teams should look to an area's public health nurse for advice. Even if medical teams from outside a region can treat

disease and injury, they do not possess an intimate knowledge of the area. It was regional public health nurses who were able to provide accurate evacuation information in the various disaster areas. In one shelter, the medical care team, mental care team and public health nurse team met daily. This meant that as a whole they were able to perform continuous care, and that effort provided more effective on-going support. Information sharing and coordination with various medical teams are important; however, despite the important role of public health nurses, they are not members of the disaster prevention teams that act in the aftermath of disasters. Most disaster medicine experts still specialize in acute phase responses (Masaki 2012). Expert human resource personnel should be selected as members to coordinate chronic diseases, shelter management, and public health.

## 5.6 Disaster Support Coordinator

At the Ishinomaki medical care region of the GEJET, executive hospital doctors took charge, placing headquarters in the hospital, while hospital personnel and Red Cross support teams from nationwide provided support. While placing headquarters in the hospital enabled smooth cooperation, hospital personnel, who were also victims, were worked to exhaustion. Regarding medical coordination of disaster areas, flexible response to changing medical needs through cooperation between the government and medical associations is essential. Regardless of who takes this on, it is desirable to be considerate about not forcing excessive burdens on hospitals. In many disaster areas, problems occurred because there were no mechanisms in place for long-term support and there was little coordination among teams (Nakakuri 2012). Appropriate coordination systems are essential to ensure effectiveness in times of disaster.

## 5.7 Challenge

Many preventable disaster-related deaths occurred after the GEJET. Before the catastrophe, there were a number of issues surrounding nursing care and these have been further exposed by the extreme conditions of the disaster. There were existing issues surrounding self-support in nursing. Typically, elderly individuals received assistance when there was a decline in their ability to perform activities of daily living; however, these measures were only temporary. Since the disaster, there has been a shortage of manpower and nursing care services have been reduced in facilities.

The majority of medical teams entered the disaster areas on the days immediately following the disaster. Thus, gaps appeared between medical team support and patient needs because it was not until the third and fourth days that the number of patients requiring medical treatment peaked (Inoue 2012). Medical adjustment

was a major burden for disaster area sites receiving various medical teams. In addition, there were few medical relief squads to monitor hygiene and nourishment levels at the shelters. Four Legionella outbreaks occurred after the GEJET because there were few medical relief squads to offer guidance and advice about the handling of contaminated waste and measures to prevent disuse syndromes. In addition, hygiene routines such as hand washing were not possible owing to a shortage of water, and vomiting and diarrhea were prevalent in some shelters (Nakamura 2013).

To reduce the rates of preventable shelter deaths and preventable disability, a support system that can immediately respond in the acute phase of a disaster regarding public health and environmental hygiene is essential. It is necessary to quickly assemble a DPHAT to enter the disaster area in the acute phase after a disaster, to offer support in areas of public health and health (Nakamura 2013). In addition, it was a challenge to coordinate the various support teams in a short period of time after the GEJET. Medical teams of several thousand must be ready to act when the next catastrophe strikes. The appointment of a disaster medical coordinator to cover public health is essential.

## 5.8 Toward Resilience

The objective for recovery and reconstruction should be building the health sector back better. This means the system will have safer infrastructure, be prepared for key public health hazards and future disasters, and provide equitable and affordable services to all. The recovery framework should ensure an appropriate, sustainable health system, and strengthen disaster preparedness and management capacity to deal with future crises, and instituting vulnerability and risk reduction measures. Health sector should be addressed in medium and long term recovery and reconstruction phase.

### *5.8.1 Chain of Medical Disaster Relief and DPHAT*

Disaster medical care support in Japan still places too much emphasis on the acute phase. It is necessary to promote true reconstruction support during the chronic phase, to focus on seamless relief and coordination (Fig. 5.2). The essence of disaster response is not only lifesaving activities, but also to provide consistent, long-term support. The development of active outreach activities by medical and health care providers is essential to decrease the number of disaster-related deaths. These services should no longer be provided from temporary clinics but rather teams need to visit the shelters to offer medical examinations and treatments.

Ideally, DPHAT should be based at the local public health nurses because they there have a good understanding of the health status of local residents (Sakamoto

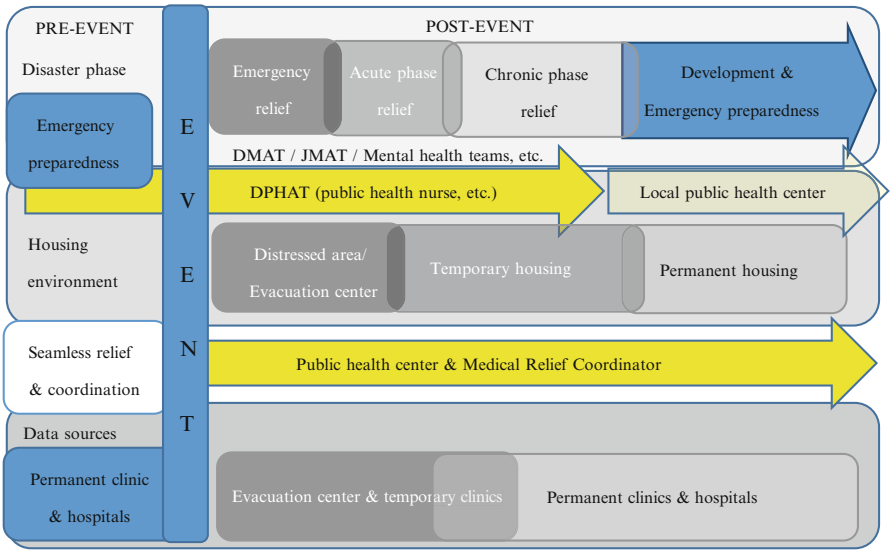


**Fig. 5.2** An example of seamless activities on pre-event and post-event (Source: Arima et al. 2011, modified by author)

et al. 2012). Medical teams from other regions are temporary, and healthcare activities should really be led by public health nurses.

### *5.8.2 Pre-disaster Health Sector Recovery Preparedness*

The role of a disaster medical and health coordinator is essential to achieve a seamless flow of activities from the acute phase to the reconstruction phase. In particular, the public health center is responsible for coordinating public health measures; it is appropriate that the public health center director take on all the responsibility. The government has promoted to strengthen the plan by conducting disaster and health risk management activities in local areas, mainly through public health centers. Furthermore, it improves the effectiveness of the effort when other support teams work together with public health nurses in disaster areas.

Whether it is possible to prepare a practical and effective cooperation system between organizations in peacetime will determine the success or failure of efforts in acute and reconstruction phases after a disaster. It is extremely difficult to realize on the spot whether one is prepared in the confusion immediately after a disaster. Thus, the following disaster preparedness in peacetime is of utmost importance. The traditional focus of the health sector has been on the response to emergencies. The ongoing challenge is to broaden the focus of disaster risk management for health from that of response and recovery to prevention and mitigation (WHO 2013).

To enhance health sector preparedness for disasters, several initiatives have been launched around the world, such as the Hyogo Framework for Action 2005–2015 (UNISDR 2005) and CSCATTT. CSCATTT is concept, which stands for "Command, Safety, Communication, Assessment, Triage, Treatment, and Transport", derived from the Major Incident Medical Management System (MIMMS 2002). Disaster medical personnel should act according to these frameworks. If individual teams perform without following these frameworks, a seamless relief effort will not be realized. It is also strongly recommended that future plans should place a greater emphasis on the interventions of appropriate public health efforts from the acute phase following a disaster, to enhance and upgrade health sector capacities and capabilities, and building back better in order to reduce the impacts of future disasters.

## 5.9 Conclusion

GEJET provided us with experiences and lessons that would be critical in strengthening our capacities to drive complex health sector recovery processes. GEJET has shown us with necessity and importance for public health and hygiene issues in the process of moving toward recovery and reconstruction after disaster. As a result, we have obtained lessons pertaining not only to the short term medical response, but also long term efforts within the public health system.

An unexpected consequence of the GEJET was the death toll and decline in health that occurred *after* the subacute phase of the disaster, and as such this posed a new challenge to the already stricken Japan. Victims were exhausted from life in shelters, and often in inferior environments. This led to a decline in health, death, suicide and disuse syndromes. The role of a disaster medical and health coordinator is essential, and medical personnel are highly encouraged to move according to disaster resilience frameworks to achieve a seamless flow of activities from the acute phase to the reconstruction phase. To prevent such disaster-related deaths and health damage, the intervention of appropriate public health measures are vital from the acute phase after a disaster.

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# Chapter 6
# Temples and Shrines as Temporary Shelters That Support Evacuees

## The Great East Japan Earthquake and Regional Heritage Grounded in the Local Environment

**Takeyuki Okubo**

**Abstract** In the case of 311 Tsunami Disaster in Tohoku, Japan, most of historic local cultural heritages as temples and shrines survived and utilized as temporary local evacuation bases. These historic buildings had been experienced many Tsunamis in their long history and survived. For this reason, they are still alive as local heritages and have much potency for local evacuation bases. This chapter introduces research for practical space utilization and operation method that was implemented in some cases of local heritage buildings used as evacuation bases. We found useful expertise for disaster risk management planning in other areas where tsunami disasters would happen in the future.

**Keywords** Tsunami disaster mitigation • Local cultural heritage • Temples and shrines • Evacuation base • Disaster risk management plan

## 6.1 Introduction

Numerous public facilities designated as evacuation shelters were damaged due to the tsunami of unforeseen magnitude created by the Great East Japan Earthquake on March 11, 2011. Therefore, regional heritage sites in the disaster area such as temples and shrines were utilized as evacuation areas (regardless of prior designation) and have supported many disaster victims over an extended period.

Figure 6.1 is a partial map of the areas of Ishinomaki City damaged by the tsunami superimposed with the locations of temples and shrines. Strangely enough, however, while a number of these temples and shrines are located right next to the disaster area, they were spared the tsunami's destruction.

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R. Shaw (ed.), *Tohoku Recovery*, Disaster Risk Reduction,
DOI 10.1007/978-4-431-55136-2_6

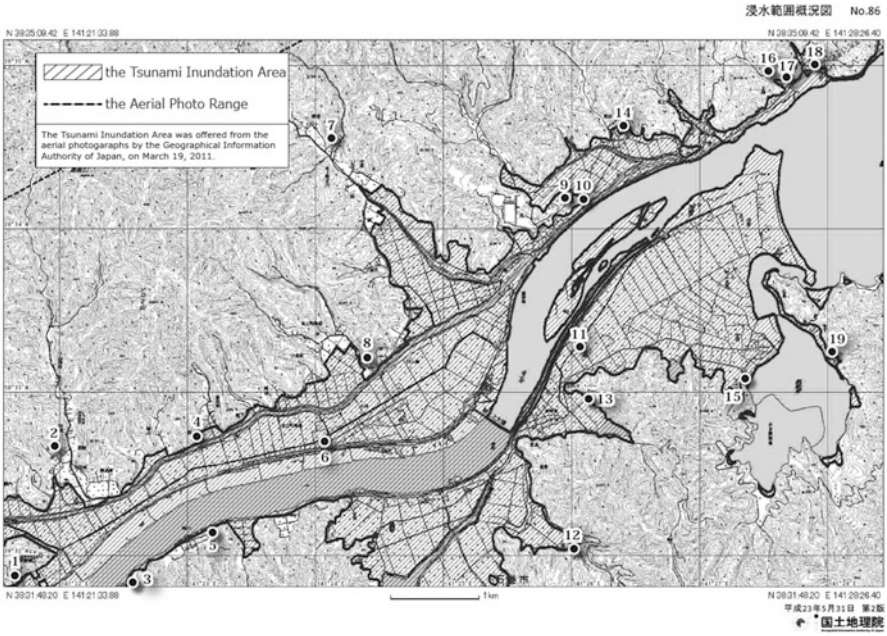


**Fig. 6.1** Temples and shrines in Ishinomaki City and the tsunami inundation area

Taking a closer look, many of the historic shrines and temples have been present from long before this last tsunami, and have been a continuous presence in locations which endured the numerous tsunamis such as in 1896 and 1933. Therefore, they exist before us as regional heritage sites even now, so they can be considered to have truly served as "temporary shelters."

## 6.2 Historical Utilization of Temples and Shrines as Evacuation Sites

Traditional temples and shrines in Japan have been used as bases not only for religious activities but also for local community activities. In addition, they have also used as disaster mitigation bases through the history. When documentary sources are actually examined, descriptions of temples and shrines being used as evacuation sites during the Meiji Sanriku Tsunami of 1896 can be seen in *Fūzoku Gahō* (*Fūzoku Gahō Special Expanded Edition on Ocean Swells* Nos. 118, 119 and 120, published by Yumani Shobou). Descriptions such as "We removed many Buddhist flags from the building serving as the temple office and wrapped ourselves in them to temporarily stave away the cold" and "A hermitage that remained on high ground near the temple was made into a makeshift office, and regional, police and town officials took turns manning it day and night to provide money and


**Fig. 6.2** Image of a makeshift relief office

supplies to support those affected by the disaster. Women gathered with rice bowls in hand, and they were given two rice balls each. The sight of them leaving in joy and gratitude was sad beyond words." These descriptions show that the supplies stored at temples and shrines were used for disaster relief, and that these facilities were used as temporary regional emergency centers, akin to a contemporary branch of a municipal office (Fig. 6.2).

## 6.3 Utilization Status as a Contemporary Evacuation Center

In light of these documentary descriptions, on-site investigations were conducted between 2011 and 2012 to learn in greater detail how these facilities actually functioned, and what types of issues arose during the modern post-disaster situation where the historical background and social structure were completely different.

The targets of this investigation were the cities of Ishinomaki and Higashi-matsushima, and the town of Onagawa, which are all in the greater Ishinomaki area. This area was one of the areas which received the greatest damage from the tsunami generated by the Great East Japan Earthquake, and where numerous undesignated evacuation centers have been established. The greater Ishinomaki area includes diverse local communities – from urban centers to

fishing villages – and the types of evacuation centers can also be assumed to be diverse. Twenty-one temples and shrines were identified through a series of interview surveys of three municipalities as having been converted into evacuation centers (excluding facilities that were difficult to ascertain, such as those belonging to New Religions and those which were closed several days after opening). Since two of them were utilized only as supply distribution points, out of the 19 remaining centers 17 of them agreed to participate in an overview study. Based on these results, seven facilities were excluded (since they either only had several evacuees at their peak, they were open for less than 2 weeks, or only served to partially supplement the functions of another evacuation center), and the remaining ten agreed to participate in a detailed interview survey regarding their evacuation center management, and six (only temples) agreed to allow their actual buildings to be surveyed.

## *6.3.1 Usage Conditions of Facility Space as an Evacuation Center*

### 6.3.1.1 Primary Space Usage Conditions

First, the primary space usage tendencies for the 17 facilities which took part in the overview survey are sorted out. Most of the facilities (sixteen) converted indoor space into sleeping areas. Regarding toilet facilities, in ten cases, existing facilities were already ready to be used, and in four cases, new outdoor facilities were constructed. There were only two examples of facilities where preexisting bathing facilities (the private bathing area in the facility manager's residence) were used. However, over two-thirds of the facilities (eleven) had preexisting indoor areas for providing meals to evacuees, with five facilities also constructing outdoor facilities to handle meals for a large number of people. Taking a closer look at the six facilities where on-site surveying was performed, while all of them had indoor sleeping and toilet facilities (including two which also had outdoor facilities), two of them were unable to provide bathing facilities, and one of them lacked laundry facilities. Management staff members were flexible and did not have their work areas in a fixed location, and supply deliveries, distribution, and storage all used indoor space.

The above shows that the availability of space needed as living space for the evacuees or facility management was mostly provided, with the exception of bathing and laundry facilities at some temples and shrines, and the minimum required space could be secured by using preexisting indoor facilities and newly-built outdoor facilities.

Therefore, the question is what types of locations were specifically used for what purposes (Figs. 6.3 and 6.4).

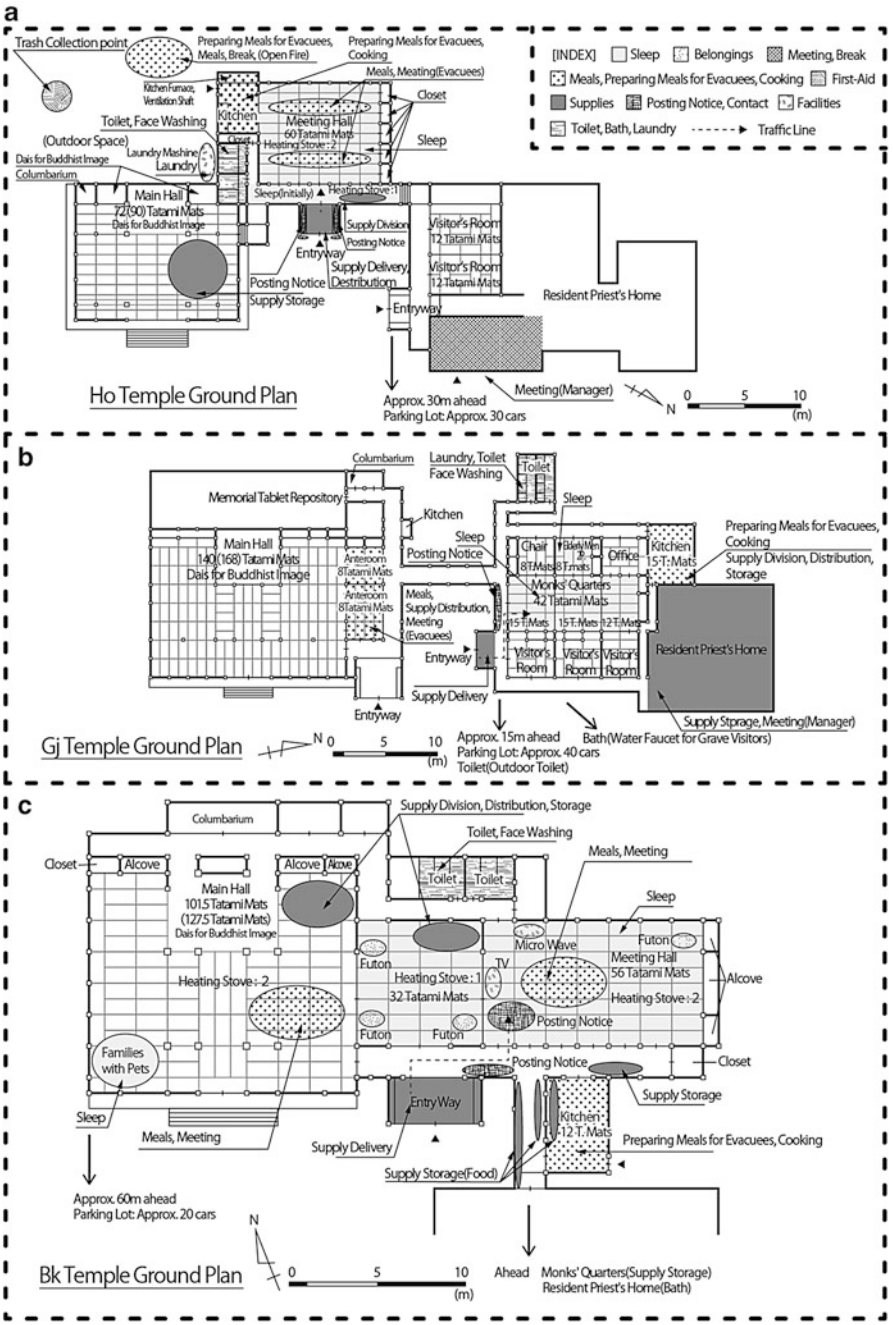


**Fig. 6.3** Examples of space usage in temples utilized as an evacuation center

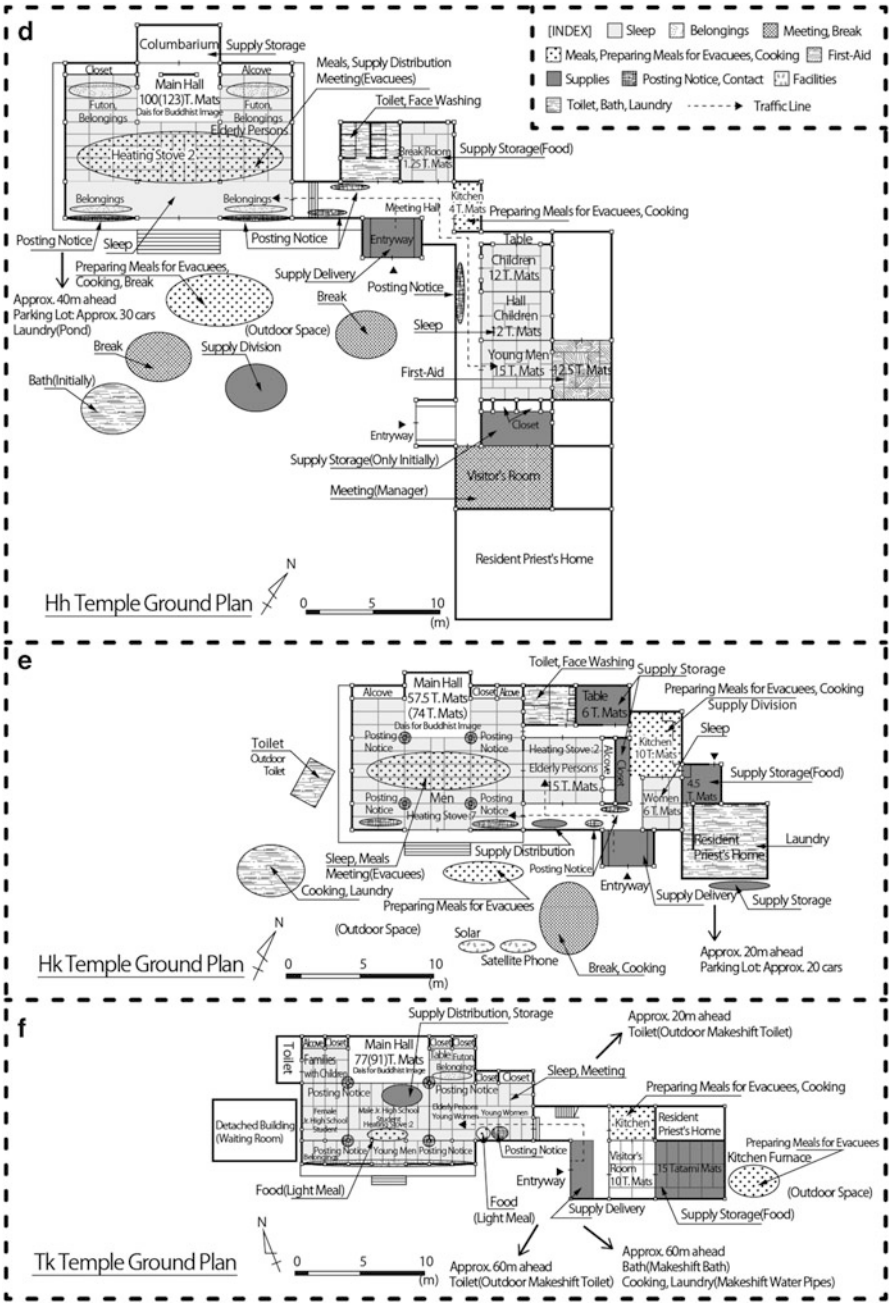


**Fig. 6.4** Examples of space usage in temples utilized as an evacuation center

#### 6.3.1.2 Usage Conditions for Space and Facilities for Sleeping

First of all, sleeping areas are of the utmost importance when living in an evacuation center, and even looking at the 17 facilities in the overall survey, in all cases sleeping areas were created in main halls of the facilities, meeting halls, or monks' quarters, which were lined with tatami (traditional Japanese straw floor) mats, and two of them even had carpets, so some said that they were warm and comfortable compared to many of the wooden-floored gymnasiums designated as official evacuation centers. Furthermore, regarding protecting privacy – an issue when evacuating to a gymnasium – in six of the facilities surveyed in detail, when the main hall, meeting hall and monks' quarters were separate buildings, there were examples where families with children and persons concerned with privacy were separated from the other evacuees, and families with pets were specifically asked to live in the main hall. Partitions were used so that the elderly were kept away from the windows so they could spend their time in as warm of an environment as possible, strong young men slept next to the windows, and young women slept in the same area as the elderly so they could more easily attend to their needs. People also reported that they were able to change their clothing without being conscious of the eyes of others in cases where the living areas were segregated by age group. Thus, sleeping areas were split across multiple buildings, existing *fusuma* (sliding doors) were used as partitions, resulting in the utilization of the character of traditional Japanese architecture.

As far as facilities, there were some temples which had lodging facilities (such as bedding) had been prepared in advance at the Zen temples for the practicing monks, and even when there was no bedding, *zabuton* (floor cushions) were available for Buddhist ceremonies, etc., so these were used as bedding. There were also several cases seen where bedding given to the temple as a gift during an event was unpacked and provided as bedding.

Also, there were widespread power outages in the target area due to earthquake damage, but the candles required for religions ceremonies kept in storage were used for light, which aided their nightly activities (with rules such as immediately extinguishing the candles should aftershocks be felt). Therefore, for these types of facilities as well, it can be surmised that supplies unique to temples were put to use.

#### 6.3.1.3 Usage Conditions for Space for Providing Meals to Evacuees and Facilities

Among the six facilities where detailed surveys could be conducted, four of them had kitchen areas about ten Tatami mats (approximately 16 square meter) or greater in area. The remaining two either only had a narrow hot-water preparation area, or used the kitchen in the adjoining resident priest's home. However, in these cases as well outdoor areas on the temple grounds were utilized for cooking. Some may be

curious as to why these temples had kitchen areas ten Tatami mats in size or more, but they were originally equipped with the ability to provide food to the large numbers of people gathered for Buddhist ceremonies or training, and as far as equipment, there were sufficient supplies of cooking implements such as pots, and utensils. Also, for many in this region the heat source required for cooking was provided through deliveries of propane gas, not gas provided by a utility company through pipeline, which remained uninterrupted. Cases were observed where shortages were dealt with by bringing propane gas from disaster-stricken homes or collecting propane tanks set adrift by the tsunami. As far as water prior to the provision of relief supplies, these temples were historically in areas which were not originally connected to a public water system, so as a result local water supplies such as wells, marsh water, and lakes were used. Immediately after the disaster, water from these sources was boiled to secure drinking water. For food as well, aside from what was brought by local residents, stockpiles and offerings stored for Buddhist ceremonies were made available, and characteristics unique to Buddhist temples were utilized for cooking as well.

#### 6.3.1.4 Usage Conditions for Areas and Facilities for Toilet

Functional toilets require both plumbing-related facilities as infrastructure and space where privacy is assured, and shortages in these areas were also a major problem during the Great Hanshin Earthquake. At the 17 facilities covered by this overall survey, seven of them had non-flushing *kumitori-shiki* toilets, and three had toilets which were connected to septic tanks, so at over half of the facilities toilets could be used even if municipal water and sewerage service was interrupted. These also can be considered characteristics unique to historical regional heritage sites which existed prior to the installation of municipal water and sewerage facilities.

#### 6.3.1.5 Space Usage Conditions for Supply Management

When life at an evacuation center is extended, various relief supplies such as water, food, and clothing are delivered on a daily basis. Space to store and manage these supplies is also essential to the functioning of an evacuation center. Cases were seen where water and food tended to be stored in cooking areas and inside the resident priest's home from the standpoint of convenience during cooking, and other supplies, such as clothing, were stored in the main hall or the columbarium, both of which were not suitable as living space due to the extreme cold caused by the high ceilings, etc., or the resident priest's home, taking management issues into consideration.

#### 6.3.1.6 Usage Conditions for Outdoor Space

As many of the temples and shrines have a defined area as its grounds, the outdoor space was also used for a variety of purposes. Among the 17 facilities in the overview survey, as many as ten used open fires for obtaining heat, and ten also used outdoor spaces for providing meals to evacuees, eating, and as outdoor alternative to the indoor rest areas. Five of these set up tents made from blue tarpaulins for protection from wind and rain were made to enhance their livability. Also, 15 of these had visitor parking areas within their grounds, and six of them used these parking areas so that people could sleep in their cars.

#### 6.3.1.7 Other Space/Facility Usage Issues

It is clear that the characteristics of spaces and facilities were successfully utilized in a variety of areas, but conversely it has also become clear that there were elements which could not be adequately covered with temple facilities.

One of these was issues with electricity. In particular, out of the 17 facilities in this overall survey, only one possessed an electrical generation, and its usage was also limited to specific times due to a shortage of gasoline. Also, the owners of these facilities noted that they had covered significant financial costs. This is because in cases where the evacuation centers were open for a prolonged period, after electric and water service was restored, temple facilities needed costs due to utility usage, as well as the facility and equipment repair costs needed after the evacuation center was closed.

Necessary fees due to the provision of energy in the forms of electricity and gasoline, dependence on infrastructure and maintenance management were a non-existent problem in the days that the temples and shrines were supported by the local community, and were also used on a daily basis as a local base. As temples and shrines are being utilized as a regional backup base during modern disasters, this issue requires serious consideration.

### *6.3.2 Operational System as an Evacuation Center*

On the other hand, opening an evacuation center requires personnel to handle the various aspects of its operation, in addition to the facilities to house the evacuees. Generally, when private facilities are used as temporary evacuation centers, the facility managers and evacuees are required to manage the evacuation center under extraordinary circumstances, and independently, and the physical and psychological burden becomes an issue. However, the temples and shrines normally have ties to the local community, and hold a variety of events and activities, so it can be assumed that they were in a more advantageous position compared to other

facilities in terms of management of evacuation center. The management system at the evacuation centers and the assignment of duties at each center will now be examined, targeting the temples and shrines used as evacuation centers during the aforementioned Great East Japan Earthquake.

This study added to, and modified, the details of management operations as an evacuation center as defined in the research by Takita, et al. based on the actual circumstances of evacuation center management at the temples and shrines obtained in the overall survey, and defined 29 new specific tasks required for the management of an evacuation center (Table 6.1). The ten facilities targeted for interviews were asked to respond regarding the presence of these duties, who was responsible for them (Table 6.2), and the number (type) of duties for which each person was responsible, and they were asked to supply their responses (no fixed format).

As in the previous paragraph, the characteristics of their management systems as evacuation centers, and the circumstances in which they were managed will be examined, focusing on the organizations which provided leadership, and the assignment of duties within these organizations for these ten temples and shrines.

"Creation of the actual management system" and "coordination with outside agencies, etc." are examples of major duties in particular need of leadership, but when attention is paid to whom was responsible for these two duties, they can be categorized into four types (models) as seen in Fig. 6.5.

#### 6.3.2.1 Temple/Shrine Manager Model (Four Cases)

At these types of temples and shrines, the management system was one where an organization responsible for the major duties as the representative of evacuation center management is responsible for management, and the proportion in which duties were assigned was the greatest. There were also cases where a representative was chosen from among the evacuees, but they were substantially responsible for few duties, and at all other temples and shrines there was no representative from the evacuees. Opinions from persons connected to the temple or shrine such as "During the day, the evacuees leave the facility, so there was no one we could entrust with tasks" were given as the reason for this type of management structure. On the other hand, there were also opinions such as "Since they were taking care of evacuees, this served as a distraction to their feelings of frustration, and were able to provide moral support," and in continuing to manage an evacuation center over the long-term, it was important to form relationships of trust with the evacuees.

#### 6.3.2.2 Temple/Shrine Manager, Ward Mayor Coordination Model (Two Cases)

In this model, similar to the above the temple or shrine manager assumes the greatest amount of duties, but on the other hand, management duties requiring leadership are assumed by the Ward Mayor, who is the local executive. Also, this

**Table 6.1** Detail of specific duties at evacuation centers

| Period | Primary duties | Specific duties |
|---|---|---|
| Establishment period | Preparations for establishment | 1. Decision to establish an evacuation center |
| | | 2. Secure space for evacuation housing |
| Period | Housing evacuees | 1. Guidance in accepting evacuees |
| | | 2. Preparation of evacuation center facilities and supplies |
| | Relief/aid activities | 3. Relief activities |
| | | 4. Aid activities |
| | | 5. Health maintenance for evacuees |
| | Information gathering | 1. Ascertaining and collection information in the evacuation center |
| | | 2. Information gathering outside the evacuation center |
| | | 3. Create evacuee roster |
| | | 4. Organization of records of life at the evacuation center |
| Management period | Creating management system | 1. Determination of evacuation center management duty assignments |
| | | 2. Managers' meeting |
| | | 3. Meetings with evacuees |
| | | 4. Creation of evacuation center rules |
| | External coordination | 1. Response to government/disaster management center |
| | | 2. Response to volunteers |
| | | 3. Responses to all other external support |
| | Housing environment | 1. Maintenance of order within evacuation center |
| | | 2. Maintenance of a sanitary environment |
| | | 3. Secure potable water |
| | Food/supplies | 1. Preparing meals for evacuees, cooking |
| | | 2. Management/storage of supplies |
| | | 3. Supply procurement |
| | | 4. Supply acceptance/delivery |
| | | 5. Supply sorting |
| | | 6. Supply distribution |
| | | 7. Laundry |
| Closing period | Closing preparations | 1. Decision to close evacuation center |

system is characterized by the fact that the mayor makes the second largest contribution to assuming duties, after the temple or shrine manager. In this case, the temple or shrine has prior recognition as an evacuation center, and during an emergency they are acknowledged as one of the facilities managed at the local level. The Ward Mayor participated in meetings and contributed to the creation of rules for the evacuation center, along with assuming duties that were primarily external in nature, such as supply procurement, distribution, and handling matters with external entities.

**Table 6.2** Managing parties at evacuation centers

| | |
|---|---|
| Persons related to temple/shrine management | Manager |
| | Manager's family |
| | Helpers |
| Locally affiliated persons | Ward Mayor, neighborhood board president |
| | Ward/neighborhood association officers |
| Evacuees | Evacuee representative (other than the Ward Mayor or neighborhood board president) |
| | Evacuees |
| Government | Government |
| External organizations | Self-defense forces |
| | Medical organizations |
| | Volunteer firefighters |
| | Volunteers |

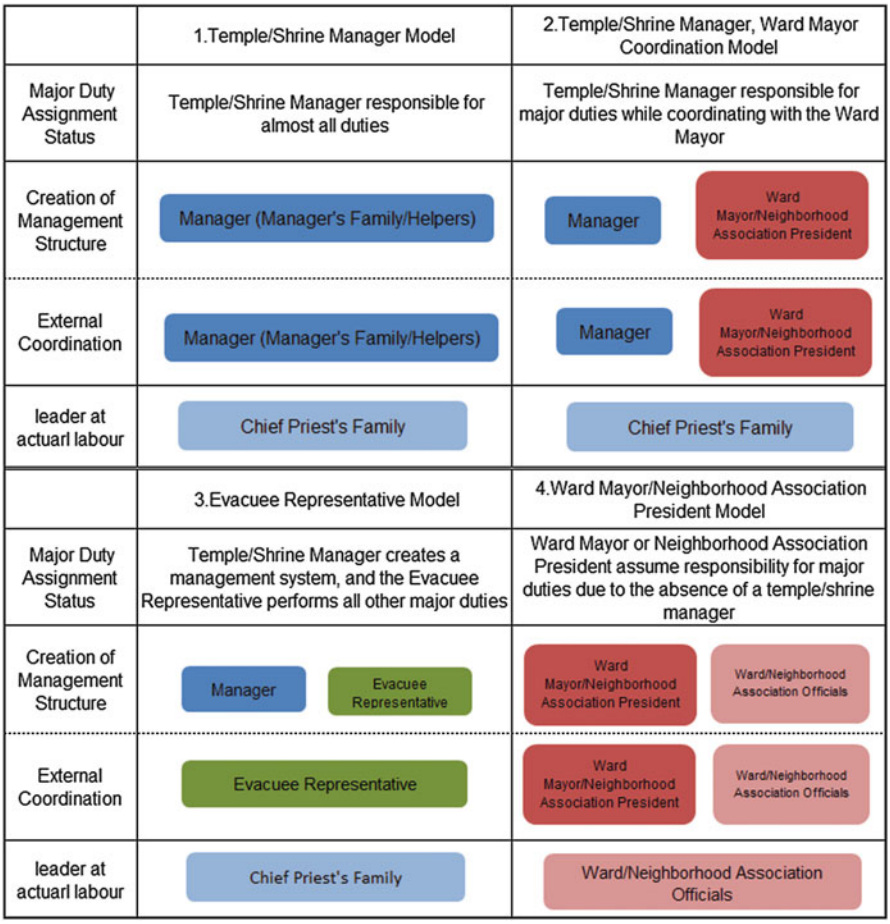


**Fig. 6.5** Four models of evacuation center management systems

#### 6.3.2.3 Evacuee Representative Model (Three Cases)

This model is characterized by a representative of the evacuees assuming duties requiring leadership, along with the evacuee representative assuming the greatest proportion of duties, or an amount on par with that of the temple or shrine manager. Temples or shrines which assumed this model are broadly grouped into two categories: cases where someone among the evacuees was a company president, etc. and had management experience, so the temple or shrine manager asked them to be in charge of evacuation center management, or cases where the temple or shrine manager alone could not assume the amount of work generated by the large number of evacuees they accepted. At Temple/Shrine A, there were more than 600 evacuees at its peak, so the temple or shrine manager requested that the evacuees choose a representative.

#### 6.3.2.4 Ward Mayor/Neighborhood Association President Model (One Case)

Unlike other types, in this one the temple or shrine manager was virtually uninvolved in the management of the evacuation center. Within the scope of the present survey, this was only seen at Temple/Shrine H, where there was no resident temple or shrine manager, so there was no one during the earthquake. In this case, since an evacuation center management system built on the existing local community, with the ward mayor or neighborhood association president at its core, was in place, there was strong unity among the evacuees, and the evacuation center was managed with them assuming the respective tasks.

#### 6.3.2.5 Discussion on Operational Methods for Utilization as Evacuation Bases

Viewed in this light, it is evident that even to this day ample consideration is required regarding management when local temples and shrines are converted into evacuation centers. In cases where a local traditional community functioned, the evacuees provided support by assuming responsibilities and creating a management system in place of the temple or shrine management, where the burden inevitably concentrated. However, on the other hand, in urban areas where a sense of local community is being lost, the burden was concentrated and delegation of duties did not function well. It can be said that normally preserving a defined level of community activity around a temple or shrine through festivals and events is a necessary condition directly linked to providing mutual aid during unexpected emergencies.

## 6.4 Conclusion

An interpretation of the aforementioned cases of temples and shrines supporting life in a local evacuation center after a tsunami is that it is possible for local heritage sites such has shrines and temples, which are rooted in history and in the community, can save communities in the future as well during large-scale disasters where our modern disaster prevention technology does not function by utilizing the value of their experiences – namely, "disaster mitigation knowledge" – nurtured through a long history of surviving disasters.

Particularly in modern society where many cultural heritage sites are synonymous with sightseeing areas, these areas have great significance as an assessable support base for disaster victims not just for local residents, but also for tourists unfamiliar with the local terrain. Many public evacuation centers in places such as elementary and junior high schools may be a familiar presence for local residents, but it is highly doubtful that they are easily accessible to tourists as well.

Reassessing these important regional heritage sites, which certainly exist in any community, as "local disaster management bases" to safeguard human life in accordance with the circumstances, along with protecting these sites from the disasters themselves, is an extremely modern view required to overcome major disasters of unforeseen scale.

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# Chapter 7
# Sharing Lessons from the Great East Japan and Tsunami with the World

**Mikio Ishiwatari**

**Abstract** Mainstreaming disaster risk management (DRM) into development policies and projects is recognized as the key to mitigate disasters, which hamper socio-economic development. However, limited activates have been conducted to support developing countries to enhance capacity of mainstreaming DRM. This chapter aims to propose approaches of capacity building for mainstreaming DRM. The lessons learned from disasters are useful for developing countries to mainstream DRM in development as well as to strengthen governance and practical measures in DRM. Each country can improve DRM by learning lessons from megadisasters inside and outside the country. Various lessons were learned from the Great East Japan Earthquake and Tsunami (GEJE) in 2011, such as importance of preventive investment, preparedness for unexpected disasters, and risk communication. The chapter reviews the practices of (i) a joint research project between Japan and the World Bank (WB) "Learning from Megadisaster", which collected lessons from the GEJE, and shared them with the rest of the world, and (ii) capacity building programs in DRM of Japanese assistance. It was found that there are obvious contrasts between these programs of the WB and Japan International Cooperation Agency in approach, targeted audience, and duration. The WB programs were designed to assist the developing countries in mainstreaming DRM and targeted a wide range of audience including policy makers, decision makers, and politicians. The WB efficiently conducted training activities by blending various tools, in particular advanced information and communication technologies. Japan International Cooperation Agency invites practitioners of government organizations from developing countries to Japan on a large scale to transfer Japanese practical technology on the ground. Through comparing these programs conducted by two organizations the chapter further proposes practical methods of exchanging knowledge among practitioners and decision makers in the world to mainstream DRM in development.

**Keywords** Disaster risk management • Great East Japan Earthquake and Tsunami • Mainstreaming DRM • Capacity building • Knowledge management • Recovery

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R. Shaw (ed.), *Tohoku Recovery*, Disaster Risk Reduction,
DOI 10.1007/978-4-431-55136-2_7

## 7.1 Introduction

Since disasters hamper economic and social development, it is necessary to mainstream disaster risk management (DRM) in development. Mainstreaming DRM is regarded to consider disaster risks in national development policies and strategies as well as in the design of individual projects (Benson and Twigg 2007; Department for International Development 2004; Inoue 2013; Ministry of Finance, Japan 2012). Thus, DRM is a crosscutting issue that needs to be owned by all government agencies rather than by a single department (Arambepola et al. 2010).

One of the principal strategic goals of the Hyogo Framework for Action (HFA), which was adopted at the World Conference on Disaster Reduction in Kobe, 2005, is to effectively integrate disaster risk considerations into sustainable development policies, planning, programming and financing at all levels of government (UNISDR 2005). Each country should put a high priority on DRM at public policies, to ensure adequate governance mechanisms for DRM and to allocate sufficient financial resources to it (Ministry of Foreign Affairs, Japan 2012b). While DRM traditionally has not been a priority on the development agenda, disaster-prone countries initiated promoting DRM in the context of development following mega-disasters (Yodmani 2001). Bangladesh and the Philippines integrated DRM into national development strategies.

DRM requires efforts in a wide range of sectors, such as transportation, water, education and health (Wamsler 2006). For example, the mainstreaming of social protection policies into DRM policies, and vice versa, can reduce vulnerability and increase resilience for households and communities (Siegel and de la Fuente 2010). The practices of the Great East Japan Earthquake and Tsunami (GEJE) in 2011 show that measures of various sectors are essential in managing disaster risks. Earth mounds of a highway protected towns from tsunamis by functioning as tsunami barriers. A famous story of "Kamaishi Miracle" demonstrates that DRM education at school can save students' lives as well as community members' ones. Crucial facilities, such as nuclear power plants, must be protected from unexpected scale of disasters.

The necessity of mainstreaming DRM in development is widely recognized and has been discussed as a core issue at various international conferences. However, the methods of support to developing countries in developing capacities of mainstreaming DRM have remained nonestablished (Tearfund 2003; Wamsler 2008). La Trobe and Davis (2005) point out that six key areas crucial to the process of mainstreaming are: policy, strategy, geographical planning, project cycle management, external relations and institutional capacity.

This chapter reviews capacity building programs in the joint research project "Learning from megadisasters" of the World Bank (WB) and Japan, and DRM programs of "Acceptance of technical training participants" conducted by the Japan International Cooperation Agency (JICA), an implementing agency of Japanese bilateral official development assistance. The chapter aims at proposing the mechanisms of capacity building to mainstream DRM by comparing the programs conducted by JICA and the WB.

## 7.2 Capacity Building in DRM

Capacity building for DRM helps build resilient sustainable society and nation through heightened awareness and experiential learning (Fernandez and Fernandez-Castro 2005, Comfort 2005). The importance of enhancing capacity at a community level has been repeatedly stressed to reduce disaster damages (Allen 2006; Manyena 2006; Yodmani 2001). Since government organizations have limited capacity to protect their citizens in developing countries, communities have to rely on their own knowledge and coping mechanisms (Twigg 1999). Various organizations, in particular, civil society organizations (CSOs), have been supporting the communities develop their capacities of DRM. For example, International Federation of Red Cross and Red Crescent Societies produced Vulnerability and Capacity Assessment to assess people's exposure to and capacity to resist natural disasters (IFRC 2006). Ishiwatari (2012a) stresses the importance of government roles in supporting communities to enhance their capacity in DRM. In particular, local governments play key roles in the mainstreaming process by incorporating information on hazard, vulnerability, capacity and risk in local development plans, and by integrating risk reduction measures into their day-to-day functions and services.

It is also crucial to enhance capacities of the technical community. Risk and hazard awareness and reduction needs to be systematically integrated into the professional training of architects, planners, civil and structural engineers, developers and construction contractors (Bosher et al. 2007).

Various programs have been developed and conducted to enhance capacities in DRM for practitioners, specialists, communities, and government officers. The recent studies have mainly focused on capacity building for communities and DRM experts and practitioners, but have not covered capacity building to mainstream DRM in development.

## 7.3 "Learning from Megadisasters" Supporting Developing Countries in Mainstreaming DRM in Development

The WB and Japan jointly launched the research project "Learning from Megadaisaters" in October 2011 to compile lessons from the GEJE and to share these lessons with the rest of world (Ishiwatari 2013). While the GEJE in 2011 was an enormous misfortune event, various lessons have been learned in DRM and disaster recovery (Ishiwatari 2012b, 2014). These lessons are useful for developing countries to mainstream DRM in development policies and projects as well as to strengthen DRM capacity. Experts, specialists, practitioners, and researchers from a wide range of sectors participated in the project.

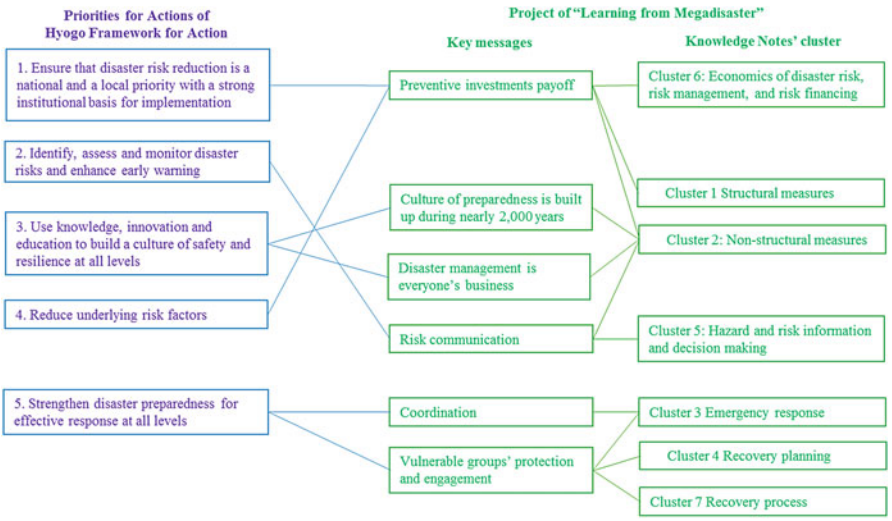


**Fig. 7.1** Correspondence between HFA and outputs of "Learning from megadisasters"

### *7.3.1 Lessons and Key Messages*

Some 50 authors from governments, academia, international organizations, CSOs, private sector, and WB produced 36 knowledge notes in seven clusters by analyzing various studies, and evaluation reports on the GEJE (Fig. 7.1). These notes reflects inputs from practitioners in developing countries, Japanese organizations concerned, and WB specialists (World Bank Institute 2012). The WB organized several workshops through video conference systems connecting and various expert meetings in Tokyo and Kobe to obtain feedbacks. A Japanese advisory board consisting of leading experts and researchers, and international advisory groups reviewed these works to secure quality of these notes (World Bank Tokyo Office 2013).

Through examining lessons from the GEJE, key messages were identified as main recommendations to developing countries. Countermeasures that worked properly at the GEJE is summarized as good practices. Also, issues to be resolved were found. These lessons cover a full cycle of disaster management consisting of preventive, response and recovery activities. The lessons fall in line with the strategic goals of HFA and supplement the priority actions of the framework, such as financial issues and risk communication.

#### 7.3.1.1 Good Practices

Japanese DRM systems successfully reduced damages at the GEJE in 2011. The loss of life and properties must have been far greater if the country had not prepared

for disasters. The good practices of the DRM systems are as follows (World Bank 2012):

(i) **Preventive investments payoff**: Structural measures of building codes and tsunami dykes as well as non-structural measures, such as cutting-edge risk assessments, early-warning systems and hazard mapping, contributed to decrease damages at the GEJE. Building codes effectively functioned to minimize the damage of properties. The number of loss of life by the shakes was less than 200. This is relatively small considering magnitude nine of the earthquake scale. These measures are supported by sophisticated technology for data collection, simulation, information and communication; and by scenario building to assess risks and to prepare emergency responses.

(ii) **Culture of preparedness is built up during nearly 2,000 years**: Japan have experienced natural hazards throughout its history. The Japanese have prepared for disasters through fighting against disasters. For example, training and evacuation drills are systematically practiced at the local and community levels, and in schools and workplaces. Community-based organizations have developed their capacities, and contributed to various important roles in disaster management at the GEJE, such as early warning, evacuation, managing evacuation shelters and recovery planning.

(iii) **Disaster management is everyone's business**: Communities, organizations of a wide range of sectors, local governments, CSOs and the private sector played their own roles. Local construction companies started rehabilitating transport facilities on the day of the earthquake and tsunami, although the companies also suffered from the disaster.

#### 7.3.1.2 Issues to be Resolved

Some counter measures, however, did not function as planned at the GEJE. These are considered as common issues in DRM in the World. Japan and other countries have to improve the following issues:

(i) **Risk communication**: Interactive communication between experts, governments and communities were crucial in managing disasters. Distributing hazard maps and issuing early warnings to the public were not enough to help people's lives. The Japanese Methodological Agency underestimated the magnitude of the tsunami in warning information. Also, tsunami hazard maps distributed before the GEJE indicated much smaller risk areas than actual damage areas on March 11. These may have led people to delay their evacuation and increased losses of human lives. The experts should explain limitation of DRM technology to the communities, and understand through interactive communication how these communities cope with disasters.

(ii) **Coordination**: Coordination mechanisms on the ground are needed to be established before disasters. Coordination among various organizations, such as governments, CSOs, and private organizations, did not function well in the

aftermath of the GEJE. International relief agencies and donors offered assistance on an unprecedented scale. Local governments, which lost facilities and staff by the tsunamis, had little experience of working with other organizations, in particular CSOs. They received insufficient support from the central government in coordination among various organizations.

(iii) **Vulnerable groups' protection and engagement**: Vulnerable groups, such as women, the elderly and handicapped, must have been not only protected from the disasters, but also engaged in disaster management. Privacy of evacuees was not well protected at emergency shelters in Tohoku, which mainly men managed.

#### 7.3.1.3 Comparison with Hyogo Framework for Action

These outputs of the project will be useful for developing countries to promote HFA. The key lessons include DRM policy, institutions, capacity building and response; and match with the strategic goals of the HFA: (i) integration of disaster risk reduction into sustainable development policies and planning; (ii) development and strengthening of institutions, mechanisms and capacities; and (iii) incorporation of risk reduction approaches into preparedness, response and recovery.

The key messages of the project and seven clusters of knowledge notes correspond to priority for actions in HFA as shown in Fig. 7.1. Both the priority actions and key messages cover the similar concepts of culture of preparedness, cross-sectorial involvement, community-based DRM and preparedness for recovery. One of the key messages stress the importance of risk communication, which HFA does not cover well. Priority action 2 requires to identify, assess and monitor risks. In addition it is crucial to properly communicate with communities about risks and technology's limitation of risk assessment. Also, the project lessons include the details of investment, and financial and economic issues. In the project, earthquake insurance, economic-benefit analysis, recovery finance, disruption of supply chain of the private sector were examined. These are important issue in promoting the priority action one of HFA, since governments often do not establish explicit DRM budget mechanisms nor spend enough investments on DRM.

### *7.3.2 Capacity Building Program*

The WB conducted capacity building programs in 2013 by sharing the lessons from the GEJE with the world. The programs targeted a wide range of audience including policy makers, decision makers, practitioners, researchers, staff of CSOs and others.

The bank organized these programs by blending various activities, such as face-to-face workshops in developing countries, a serious of seminars connecting several countries from Tokyo by videoconferencing systems, lectures at universities and

knowledge exchange platform at a website. Some 800 government officials and members of the parliament in eight countries attended capacity building programs. Also, approximately 1,300 practitioners had joined various sessions and the Community of Practice, which is the platform of knowledge exchange at the website (Tokyo Development Learning Center 2013).

Targeting policy makers and development planning officers is a unique feature, since capacity development programs of DRM are usually conducted for the technical community (Ishiwatari 2013). The WB utilized its advantage of a convening power to involve other sectors' staff, policy makers and decision makers in the programs. It is crucial that the policy makers and development planning officers participate in them to mainstream DRM in development policies and projects (Watanabe 2013). It is expected that the policy makers and planners understand the importance of DRM and include it as a crucial issue in development policies and planning as well as projects in other sectors.

The disaster management minister of Uganda and decision makers of DRM in developing countries participated in a study tour for a week in Tohoku and Tokyo in 2013. They visited disaster sites and exchanged views on DRM with Japanese policy makers and decision makers. Also, the WB organized workshops in Uganda, which some 50 parliamentarians attended, to raise politicians' awareness in DRM. The development planning officers of all counties participated in DRM workshops in Kenya. The objective of this program is that the planning officers understood the importance of DRM in the context of development planning. In Kenya, decentralization is undergoing and the county governments will formulate development plans at a county level.

Advanced information and communication technologies (ICTs) are utilized to effectively conduct a serious of seminars. Over 100 practitioners could simultaneously attend each seminar at multiple countries through video conference systems, while the seminars covered only short program of 2–3 hours. The Tokyo Development Learning Center (TDLC), a partnership project of Japan and the WB, arranged these seminars. TDLC was established to facilitate the exchange of knowledge within the development community; and is equipped with video conferencing infrastructure, extensive network of other centers throughout the world, and live web-based video streaming service.

## 7.4 Unique Capacity Building Program of Japanese Assistance

Japan is supporting developing countries in enhancing capacities as one of major operations of official development assistance. JICA takes more pragmatic approach than other development organizations, which is characterized by goal orientation, field orientation, joint work and dynamic capacity development (Ohno 2013). JICA staff and experts conduct more activities on the ground, or "downstream issues",

than “upstream” ones, such as producing policy frameworks, improving governance, providing advice on policy issues and writing reports (JICA and GRIPS 2011). For example in Africa, while Japan has achieved various successful projects in the downstream issues, such as infrastructure construction and teacher training, these success have not been communicated in the policy frameworks (Wild et al. 2011). Training programs also cover mainly transferring Japanese technology in the field, and provide limited support to “upstream issues”, such as policy making.

Among various activities of technology transfer, a unique program is “Acceptance of technical training participants”. The agency receives trainees, mostly government engineers and specialists, from developing countries to Japan on a large scale, nearly 10,000 participants every year. To date, over 280,000 people have participated in the program. The agency recognizes that practitioners from the developing countries can understand much of the knowledge accumulated in Japanese society, “Japanese model”, only by actually visiting Japan (JICA 2012). The participants can directly see Japanese society and organizations that are crucial in developing Japanese technology. The limited number of training courses target decision makers. The evaluation report of the program recommends that JICA should clarify the program objectives, improve quality of the program, and promote the national interests of Japan (Ministry of Foreign Affairs 2012a).

As same as other training courses conduced inside Japan, the courses in disaster management focus on mainly practical technology in the field for practitioners. JICA conducted 18 training courses in disaster management in 2013, in which some 250 practitioners participate in total. Most participants are relatively junior experts of governmental organizations, since the agency requires a few year experience in disaster management for the participants. The training courses cover a wide range of practical technology, including community-based disaster management, firefighting, volcano disaster management, search and rescue, and disaster education. In addition, JICA receives the counterparts of government organizations of implementing technical assistance projects.

The JICA Kansai Center located in Kobe, where the Great Hanshin-Awaji (Kobe) Earthquake struck in 1995, is the main training center in disaster management. Various organizations, such as the Hyogo prefecture government and Kobe University, organize the training courses at the center. The participants visit a disaster museum and receive lectures from experts who experienced the disaster management in the aftermath of the Kobe Earthquake.

The agency started training courses in disaster management and recovery in the Tohoku region following the GEJE (JICA 2013). The objective of these courses is to share lessons learned from the disaster with the developing countries. For example, two staff members of the Banda Aceh City Government in Indonesia, where suffered from the Indian Ocean Tsunami in 2004, stayed at Higashimatsushima City for a year. Higasimatsushima city is one of the most severely damaged cities by the tsunamis in March 2011. The Indonesian officers are exchanging knowledge in recovery from the tsunami disasters with people at Higashimatsushima City.

JICA has supported developing countries to strengthen technical capacity of practitioners by dispatching Japanese experts (Ishiwatari 2012a; Ishiwatari et al. 2013). These experts transfer their technology and share their experience to the practitioners of government agencies on the ground in the developing countries.

## 7.5 Comparison of Capacity Development Programs Conducted by the World Bank and JICA

There are obvious contrasts between the WB and JICA programs in approach, targeted audience and duration (Table 7.1).

(i) **Approach**: The WB program efficiently conducted training activities by blending various tools, in particular advanced ICTs. Using ICTs and distance learning methods, organizers could efficiently reach a wider audience than conventional approaches, such as face-to-face workshops. The JICA programs extensively provide participants with knowledge and technology in Japan. The participants stay for several weeks or months in Japan, and attend various classes and visit fields in disaster management. JICA owns buildings for accommodations and trainings; and covers the cost of travels to and in Japan, training coordinators and lecturers.

(ii) **Targeted audience**: Policy makers and decision makers participated in some WB programs. To support the developing countries to mainstream DRM, it is crucial that the policy makers and decision makers are targeted. The JICA participants are mostly practitioners in disaster management of government organizations in developing countries. They can learn basic knowledge and advanced technology of DRM in Japan.

(iii) **Duration**: The WB program provided introductory trainings for a limited timeframe of a few hours or several days at most. It is expected that tailor-made programs will be followed to enhance capacities in each country. In JICA programs the participants can learn the details of Japanese technologies and experiences during staying in Japan for a few weeks or months.

## 7.6 Conclusion

Lessons from the GEJE are regarded as useful resources that the developing countries can utilize for capacity building in DRM. These lessons cover a full cycle of disaster management consisting of preventive, response, and recovery activities, contributing to capacity building for mainstreaming DRM in development. Also, the lessons fall in line with the strategic goals of HFA and supplement the priority actions of the framework, such as financial issues and risk communication.

The WB and JICA started sharing these lessons with the rest of the world. It was found that there are obvious contrasts in approach, targeted audience, and duration

**Table 7.1** Contrast between JICA and WB programs

| | Japanese assistance "Acceptance of technical training participants" | World Bank "Learning from Megadisaster" |
|---|---|---|
| **Approach** | Face-to-face training courses (classes and site visits) in Japan | Blending: |
| | | Face-to-face workshops in developing countries |
| | Follow-up activities in developing countries | Study tour to Japan |
| | | Knowledge exchange at websites |
| | | Seminar through video conference system |
| **Main target** | Practitioners | Politicians |
| | | Decision makers |
| | | Policy makers |
| | | Practitioners |
| | | Researchers |
| | | CSOs |
| **Duration** | A few weeks to several months or a year | A few days or hours |

of capacity building programs between two organizations. The WB activities target a wide range of people including policy makers and politicians and are conducted for short periods of a few hours or days. To mainstream DRM in development, it is crucial that the policy makers and politicians understand the importance of DRM in the context of development. The project activities demonstrate that ICT and internet are useful tools to effectively exchange knowledge on a large scale.

JICA invites mainly practitioners from the developing countries to Japan to transfer Japanese technology for several weeks or months. These programs contribute to enhance practical capacity for the developing countries, since participants can intensively learn Japanese technology and experience on the ground.

## 7.7 Consideration

The effective programs of enhancing capacities of mainstreaming DRM can be created by combining two approaches of the WB and JICA. These programs of two organizations cover different areas and can complement each other.

While the conventional programmers of capacity building cover the technical community in DRM, capacities of people in various sectors should be enhanced to mainstream DRM. Policy makers and development planners that the WB program covers are in positions to include DRM in development planning and projects in other sectors. Practitioners of government organizations in DRM that the JICA program supports should strengthen their capacities to implement practical activities, and lead and coordinate other organizations concerned.

Each development agency should utilize its advantage as much as possible. The WB can involve various sectors and organizations in the programs by utilizing a convening power. JICA has advantage in technology transfer on the ground. It is expected that there would be synergy effects between these programs. Close coordination among development agencies and developing countries are needed to design effective capacity building programs.

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# Part II
# Lessons from Case Studies

# Chapter 8
# Recovery After Sanriku Tsunamis in 1896 and 1933, and Transition of Housing Location Before the 2011 Great East Japan Earthquake and Tsunami

**Osamu Murao**

**Abstract** We need to formulate future strategies for post-disaster recovery policy and planning based on the lessons of past disasters. The Sanriku Coastal Area, a tsunami-prone region located in the northern part of the main island of Japan, survived catastrophic tsunamis in 1896, 1933, and 1960. Before the 2011 Great East Japan Earthquake, the author examined the transition of housing location in the areas in Iwate Prefecture damaged by the 1896 and 1933 Sanriku Tsunamis to understand the situation after the recovery plans conducted before the Second World War.

Firstly, this chapter clarifies that the relocation of housing to higher lands after the 1896 Tsunami decreased the damage sustained by the 1933 Tsunami in some districts, while other areas that failed to relocate housing were severely damaged again. Secondly, focusing on seven districts, chronological aerial photographs provided by the Geospatial Information Authority of Japan demonstrate that the number of houses had gradually increased since 1934 in areas where construction was restricted by the 1934 Post-Tsunami Recovery Plan. The reasons why residents started living in the coastal areas are then presented along with residents' tsunami risk recognition based on interview surveys. Finally, the damage situation in the seven districts due to the 2011 Great East Japan Earthquake and Tsunami is presented.

**Keywords** 2011 Great East Japan Earthquake and Tsunami • Post-tsunami urban recovery • Relocation to higher land • 1896 Meiji-Sanriku Tsunami • 1933 Showa-Sanriku Tsunami • Risk recognition

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DOI 10.1007/978-4-431-55136-2_8

## 8.1 Introduction

Relocation of housing from the damaged coastal zone to higher lands is one of the most effective post-tsunami strategies to avoid future tsunami danger. This basic strategy has been applied in post-tsunami urban recovery plans in many countries that have experienced tsunamis, such as Papua New Guinea after the 1988 Tsunami, and Indonesia and Sri Lanka after the 2004 Indian Ocean Tsunami. However, it seems difficult to maintain the resettlement condition for a long time. How was the housing location changed after tsunamis? Why did people return to the coastal areas? With these questions in mind, this chapter focuses on long-term changes in housing location in the Sanriku Coastal Area in Iwate Prefecture that were damaged by the previous tsunamis as well as the 2011 Great East Japan Earthquake and Tsunami.

Although the relocation of housing to higher lands is an effective post-tsunami recovery strategy, there is one problem: for some reason, the inhabitants sometimes return to the original coastal sites. For example, the victims affected by the 1992 Flores Tsunami in Indonesia were forced to relocate, but most people, except those who did not have land at the original location, returned to the original site within a few years because of difficultly adapting to the new environment (Maki et al. 2003). Moreover, Nakazato et al. (2009) found that some people in a coastal area in Banda Aceh affected by the 2004 Indian Ocean Tsunami intended to stay in the original location because of occupational reasons and familiarity with the site.

Surrounded by the ocean, Japan and its inhabitants have experienced several great tsunamis before the 2011 Great East Japan Earthquake and Tsunami. In particular, the Sanriku Coastal Area, mainly Iwate and Miyagi prefectures, have been devastated at least four times. The 1896 Meiji-Sanriku Tsunami killed 21,959 people, and the 1933 Showa-Sanriku Tsunami struck almost the same areas, claiming 3,064 lives. In 1960, the Chilean Tsunami arrived to these areas 22 h after the earthquake in Valdivia, Chile, and resulted in 142 deaths. The largest and most recent tsunami struck on March 11, 2011, and its affect on Japanese society is still being felt as of December 2013.

Much like the cases on Flores Island or in Banda Aceh, disasters have repeatedly struck the tsunami-prone Sanriku Coastal Area in Japan, where people had relocated after previous tsunamis, only to eventually return to the original coastal location and be hit by the next deluge. Thus, it is important to understand the vicissitudes of the settlement situation in the areas when considering future tsunami recovery policy. Some Japanese researchers have dealt with this matter already. However, the long-term transition of housing locations in those areas has not been clarified, even though the Japanese post-war social situation has dramatically changed.

To contribute to future post-tsunami urban recovery plans, this chapter examines the long-term situation of post-tsunami housing locations in Iwate Prefecture using aerial photographs, especially focusing on seven districts affected by the tsunamis

in 1896 and 1933, and clarifies the residents' tsunami risk recognition based on interviews conducted before the 2011 Great East Japan Earthquake and Tsunami.

## 8.2 Method

The following procedure is employed to examine the previous living conditions of the coastal areas in Iwate Prefecture before the 2011 Great East Japan Earthquake.

First, the damage in Iwate Prefecture due to the tsunamis in 1896 and 1933 and the recovery policies are chronologically outlined with comparison of tsunami height. Both tsunamis seriously affected the coastal districts. However, the damage to buildings caused by the 1933 Tsunami depended on the districts' relocation situation after the 1896 Tsunami. The effect of relocation after the 1896 Tsunami is clarified based on a comparison of building damage.

Learning from the above experience, the government adopted relocation strategies for each affected district after the 1933 Tsunami, but living situation had changed in the twentieth century. It also influenced the damage conditions when the 2011 Tsunami. Secondly, the transition of housing location after the 1936 Showa-Sanriku Tsunami in seven districts is examined using aerial photographs provided by the Geospatial Information Authority of Japan (GSI 2007).

Why did the residents move their houses to the vulnerable coastal areas? Finally, the reasons why people were living in the coastal areas and residents' recognition of tsunami risk are clarified based on interviews with 100 households in the seven districts. The survey was conducted before the 2011 Great East Japan Earthquake.

In the Sanriku Coastal Area, which is surrounded by mountains and the ocean, a small community called "shuraku" in Japanese jurisdictionally functions as a community unit. A village or township consists of several "shuraku". We define "shuraku" as "district" in English here.

## 8.3 Comparison of the Damage Caused by the 1896 and 1933 Tsunamis and Post-Tsunami Recovery Policies

### *8.3.1 Areas Affected by Two Tsunamis*

Before the 2011 Great East Japan Earthquake and Tsunami, Iwate Prefecture had been hit by devastating tsunamis twice, once in 1896 and again in 1933. Those regional tsunami heights are shown in Fig. 8.1, with the after-mentioned research objective districts. Following each of the tsunamis, the damaged districts mobilized individual post-tsunami recovery efforts. Some of those affected by the tsunamis remained in the damaged areas, while others were relocated to settlements on

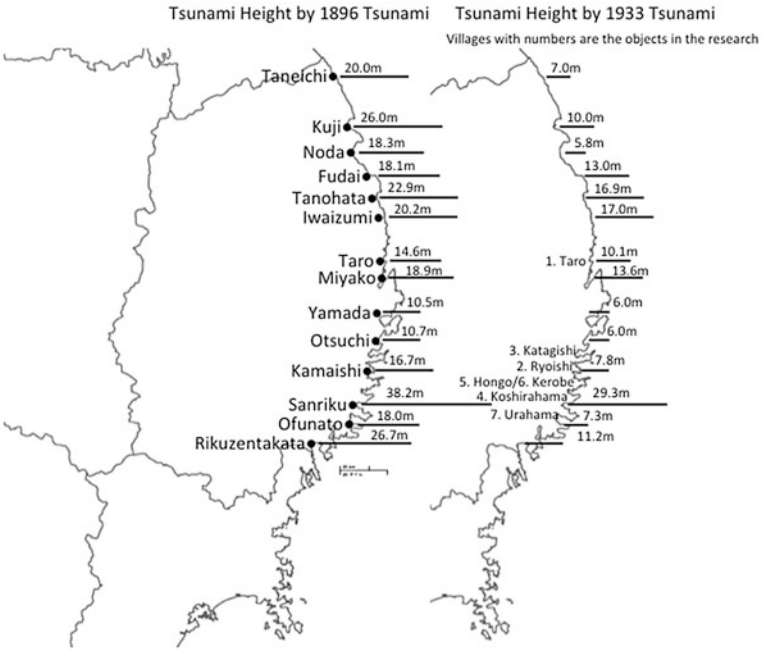


**Fig. 8.1** Tsunami height by Sanriku Tsunamis and seven districts in Iwate Prefecture

higher lands. However, it was difficult for some people to stay in these resettlements. This situation influenced the damage sustained by the 1933 Tsunami. The following sections discuss the damage from and recovery process after the two tsunamis.

### *8.3.2 Damage by the 1896 Meiji-Sanriku Tsunami and Post-Tsunami Recovery Policy*

The 1896 Meiji-Sanriku Tsunami was the most catastrophic tsunami in Japanese contemporary history before 2011. The earthquake of magnitude 7.1 with its epicenter lying around 200 km east of Kamaishi took place at 7:32 (local time) on June 15, 1896, during the Meiji period. It generated tsunamis that struck the Sanriku Coastal Area in Iwate and Miyagi prefectures, and damaged nearly 7,000 houses and killed 21,959 people. In Iwate Prefecture alone, 5,617 houses were damaged and 18,159 people were killed (Earthquake Investigation Committee 1897).

This tsunami took place in an age when the tsunami mechanism was not yet clearly understood and local governments did not systematically function for

collective post-tsunami recovery. Yamashita (1982) was unable to find any example of habitational relocation led by the national or local governments. Most of the relocation was conducted individually or habitationally by local powerful landowners.

However, in many of the districts affected by the 1896 Meiji-Sanriku Tsunami, people relocated to inland areas had returned to the original coastal areas by the time the 1933 Showa-Sanriku Tsunami struck. The Central Disaster Management Council (2005) pointed out that the "long distance from the relocation site to the coast for fisheries," "shortage of drinking water in the higher lands," and "inconvenience of transportation" were among the reasons for returning.

### 8.3.3 Outline of the 1933 Showa-Sanriku Tsunami

The Showa-Sanriku Earthquake and Tsunami of magnitude 8.3 occurred at the east of the 1896 Earthquake epicenter at 2:30 on May 3rd, 1933 in Showa period. It collapsed about 6,000 buildings and killed 3,064 people. The most seriously damaged area was Iwate Prefecture as same as the last one: the number of damaged buildings was 2,713 and the deaths toll was 4,035 (ERI 1934). Although the event happened around midnight, its casualty was not so many compared with the 1896 Tsunami because most of them were able to efficiently evacuate after the shock learning from the previous experiences.

### 8.3.4 Comparison of Building Damage Ratio Due to the 1896 and 1933 Tsunamis in Terms of Relocation Condition

The building damage in each district depends on the relocation condition of the residents. Hereafter, the building damage due to the 1933 Showa-Sanriku Tsunami is discussed in terms of the relocation condition. There are several studies on the damage and recovery conditions related to both the tsunamis. This chapter deals with the dataset by Usami (2003) for building damage and the reports by the Central Disaster Management Council (2005) and Yamaguchi (1972) for the recovery process.

At first, 53 coastal districts in Iwate Prefecture are classified in terms of relocation condition after both tsunamis. Relocation conditions after the 1896 Meiji-Sanriku Tsunami are classified into four categories: (I) recovery on the original site for 9 districts, (II) return to the original site after relocation for 11 districts, (III) relocation to higher land without return for 10 districts, and (IV) unknown for 23 districts, based on the literature survey.

Secondly, the conditions after the 1933 Showa-Sanriku Tsunami are also sorted into three groups: (a) recovery on the original site for 5 districts, (b) relocation to designated higher land for 45 districts, and (c) unknown for 3 districts, based on the literature survey. These classifications are used to select the districts for the following calculation.

Building damage ratio is calculated based on the number of completely damaged buildings and pre-tsunami households. Then, the districts whose number of previous households is unknown in the source materials are omitted from the comparative analysis.

Finally, two figures were acquired as a result of the above procedure. Figure 8.2 shows a comparison of districts' complete building damage ratios due to the 1896 and 1933 Tsunamis in terms of relocation condition. The left-hand figure is for (I) recovery on the original site and (II) return to the original site after relocation, and the right-hand figure is for (III) relocation to higher land without return. The horizontal axis represents the damage ratio for the 1933 Tsunami, and the vertical axis represents the damage ratio for the 1896 Tsunami. Points on the diagonals in both figures indicate that the damage level of a district from the 1933 Tsunami was almost the same as the damage level from the 1896 Tsunami. Points further to the left indicate less damage and vice versa. The right-hand figure shows that the damage ratio of 7 out of the 8 relocated districts decreased drastically for the 1933 Tsunami. On the other hand, the reduction in the damage ratio for the districts reconstructed on the original sites (type I or II) is less than that for type III. In particular, the damage ratio of six districts remains at more than 60 % of the previous ratio. This tendency highlights the effect of the relocation strategy after the 1896 Meiji-Sanriku Tsunami.

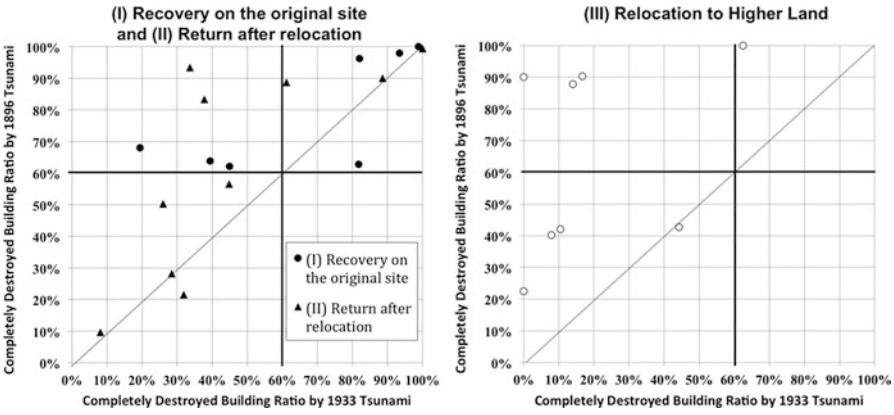


**Fig. 8.2** Comparison of districts' completely destroyed building ratio due to the 1896 and 1933 tsunamis in terms of relocation condition

### 8.3.5 *Outline of Recovery Policy After the 1933 Showa-Sanriku Tsunami*

Three months after the 1933 Showa-Sanriku Tsunami, the Council for Earthquake Disaster Prevention (1933) issued the Advisory Report for Tsunami Disaster Prevention, and the recovery plans for the damaged towns and villages (Prewar Home Ministry 1934) were released based on the report and included the following basic policies: (1) small districts with little damage are to be recovered by the victims' own efforts; (2) fairly sized or seriously stricken areas are to be recovered mostly by treasury or low-interest loans issued by the national government; (3) all houses for fishermen or farmers in the coastal area are to be relocated to higher land; and (4) towns or villages that are regional transportation, economic, or education hubs are to be recovered in the original areas with some tsunami mitigation strategies because it would be difficult to relocate all of the buildings.

Many districts were relocated to higher lands as a result of the government recovery policy. However, the housing location situation had changed over the last 70 years when the authors investigated in 2010.

## 8.4 Transition of Housing Location in Seven Districts After the 1933 Showa-Sanriku Tsunami

### 8.4.1 *Selection of the Seven Districts*

The following conditions were set for selecting districts in the areas affected by the 1933 Tsunami to include in the study.

(a) Districts in which we can assemble the information of the recovery plans after the tsunami

The research aims at understanding the housing location transition from the 1930s, when safer resettlements were prepared for the victims after the 1933 Tsunami, to the present day. Thus, it is necessary to know the exact recovery plans from existing sources.

(b) Districts in which we can understand the exact location of the post-tsunami resettlements based on the recovery plans

To examine the transition of the housing location, tracking the spatial data of the sites is indispensible. Thus, whether the exact relocation sites can be found in the national government's report (Prewar Home Ministry 1934) is an important factor when choosing the areas to be studied.

(c) Districts that sustained immense damage from the 1896 and 1933 Tsunamis

The research focuses on tsunami-prone coastal areas that had been severely damaged by both the 1896 and 1933 Tsunamis, so slightly damaged areas were not included among the districts to be studied.

Based on the above criteria, seven districts were chosen, as shown in Fig. 8.1: (1) Taro, (2) Ryoishi, (3) Katagishi, (4) Koshirahama, (5) Hongo, (6) Kerobe, and (7) Urahama.

### 8.4.2 *Transition of Housing Location Based on Aerial Photographs After the 1933 Showa-Sanriku Tsunami*

According to the above policies of post-tsunami recovery issued by the Council for Earthquake Disaster Prevention (1933), the residents started new lives, but the situation of the housing location had changed by the 2011 Great East Japan Earthquake and Tsunami. Here, the change in the location over a 70-year period is reviewed using aerial photographs provided by GSI (2007).

The available photographs for the seven districts are for the years 1948, 1966, 1968, 1977, 1981, 1991, 1997, and 2000. In addition to these photographs, aerial photographs from Google Maps are used to understand the current situation. Photographs in the report on the recovery plan (Prewar Home Ministry 1934) are also reviewed.

The change in the housing location in the seven districts is illustrated based on the photographs. Figure 8.3 is an example for Ryoishi as of 1948, 1977, and 2010. As shown in this figure, many buildings had been constructed not only in the lots for resettlement, but also in the coastal areas as of 1948. As of 1977, more buildings had been built in the lower area, though a seawall had been erected to reduce the power of tsunamis. By 2010, other buildings had appeared in the east. The increasing trend in the number of houses built in dangerous coastal areas over time can be seen in Fig. 8.4 for Hongo.

Looking at the seven districts, the overall tendencies are summarized as follows: (1) the number of houses increased outside of the recovery-planned districts after the 1960s, (2) houses were constructed around seawalls that had been erected, and (3) houses were gradually constructed along the coastline after the 1980s.

To understand the transition of housing location quantitatively, the number of houses in coastal areas was calculated. Figure 8.5 presents the change in the ratio of the houses located in the coastal area to all the buildings in each district as of 1948, 1977, and 2010. In Taro, they were determined to remain in the areas previously inundated by the tsunamis and erected seawalls, so nearly half the total number of buildings exist in the area as of 1948. However, the number of houses in all areas gradually increased toward the coast even though residents were supposed to move to higher lands as part of the recovery plan.

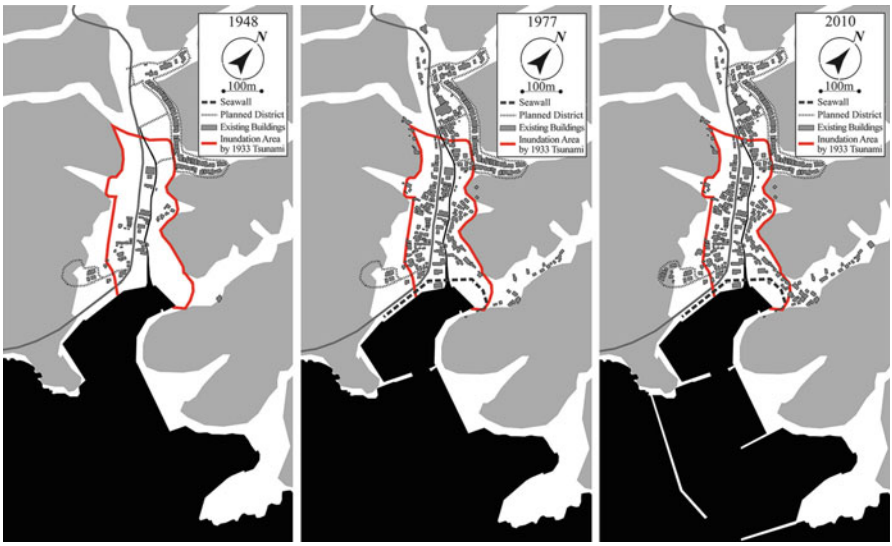


**Fig. 8.3** Change in housing location in Ryoishi, Unosumai village

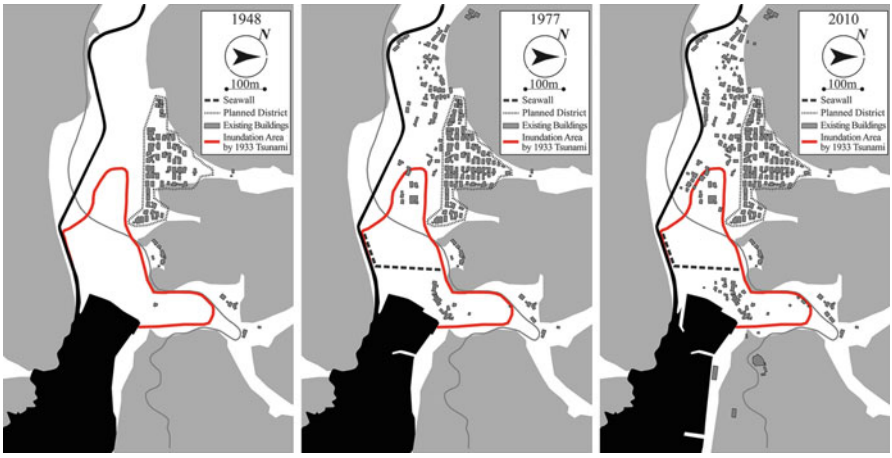


**Fig. 8.4** Change in housing location in Hongo, Touni village

## 8.5 Residents' Tsunami Risk Recognition

The tendency for residents to live in coastal areas or lower lands depends on residents' individual conditions. To clarify the reasons, interview surveys with residents were conducted in the seven districts in December 2010 and January 2011. A total of 100 households were included: 28 in the higher lands, and 72 in the coastal or the lower lands. The survey covered (1) the housing location process,

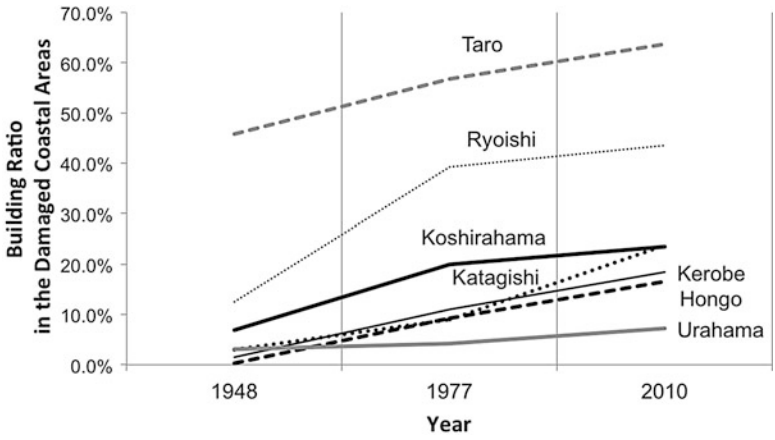


**Fig. 8.5** Change in the ratio of the houses located in the coastal areas to all the buildings in each district

(2) basic reasons for living on or moving to the site, and (3) tsunami risk recognition.

Figure 8.6 illustrates the chronological change in housing location of the 100 households. As a whole, 69 households inherited the lands from their parents, 22 came from outside of town, and 9 had moved from the higher lands as of January 2010. 33 households who had lived in the higher lands until 1940 relocated to the lower lands by 2000.

The reasons for living in the coastal areas are shown in Fig. 8.7. The dominant reason for the people from outside of town is "No reason," and covers both economic and occupational situations. One resident answering "Necessarily" said, "there is a land slide risk in the mountainous area, and there is a tsunami risk in the coastal area. We cannot live in the area without facing risks." As for the residents from higher lands, shown in white in Fig. 8.6, they were born in the higher lands after post-tsunami relocation during their parents' generation, but they moved to the inherited coastal lands to seek more convenient or comfortable lives after getting married.

Figure 8.8 shows the tsunami risk recognition of the people from outside of town at the time they chose the coastal areas. Nineteen out of twenty-seven (70.4%) recognized the risk in the coastal areas. Eleven people among them (57.9%) considered the presence of seawalls. The presence of seawalls was related to the recognition of tsunami risk. Some of them answered that they would not have moved to the coastal areas if the seawalls had not been erected. Two people who had thought of seawalls did not have tsunami risk recognition because they thought that the seawalls could mitigate future tsunami disasters.

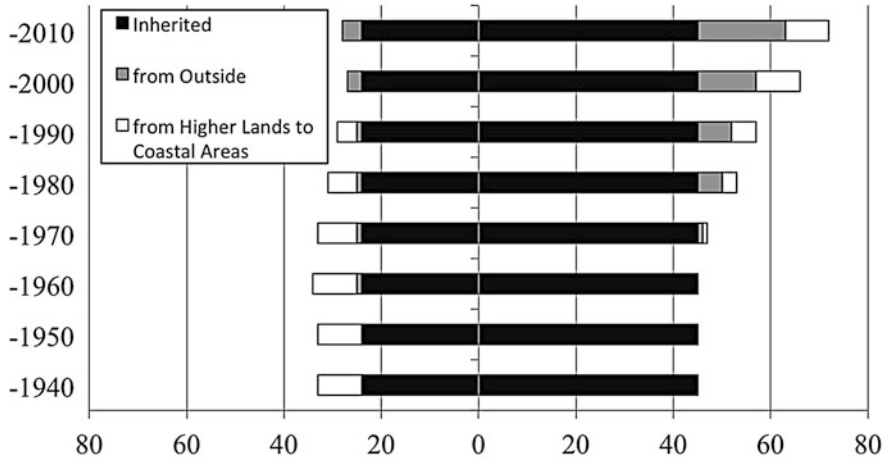


**Fig. 8.6** Change in moving conditions of households in higher lands and coastal areas

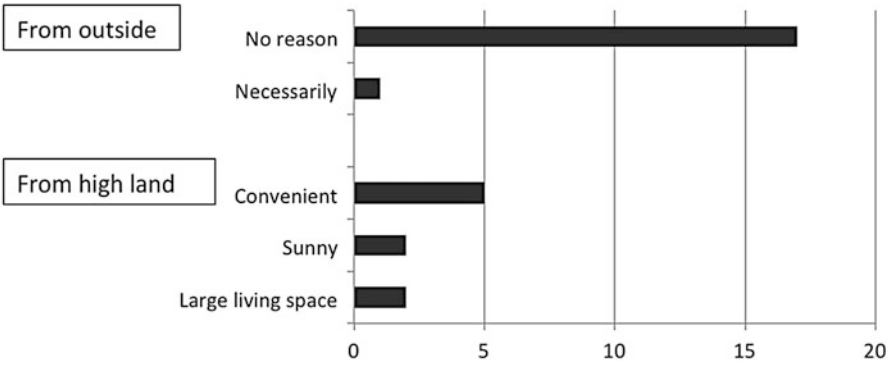


**Fig. 8.7** Reasons for living in the coastal areas

## 8.6 Conclusions

This chapter examined the transition of housing location in seven districts of the Sanriku Coastal Area before the 2011 Great East Japan Earthquake and Tsunami. According to the post-tsunami recovery policy at the time, residents were relocated to safer, higher land from a vulnerable water front residential district after the 1933 Showa-Sanriku Tsunami. However, some of the residents returned to live in the coastal areas during the latter half of the twentieth century. Unfortunately, the houses constructed in the area after the post-tsunami recovery from the 1933 Tsunami were washed away by the 2011 Great East Japan Tsunami, as shown in Fig. 8.9.

Comparison of chronological aerial photographs after the 1933 Tsunami shows that the number of houses had increased in the coastal areas in the seven districts

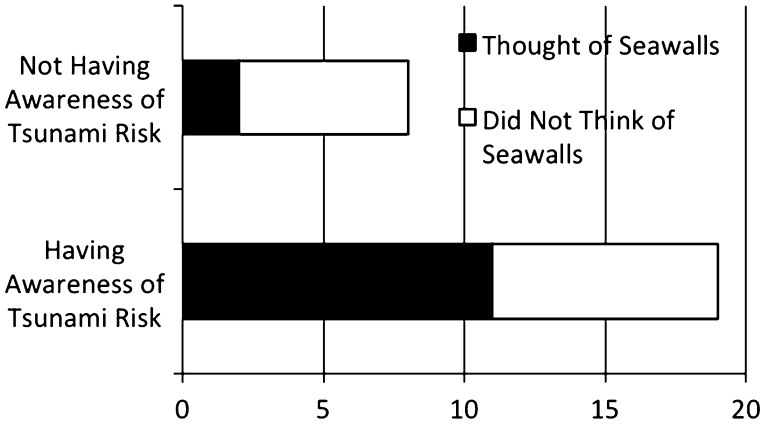


**Fig. 8.8** Tsunami risk recognition at the time the residents chose to live in the coastal areas

**Fig. 8.9** Housing situation before and after the 2011 Great East Japan Earthquake and Tsunami in Hongo, Touni town (See Fig. 8.4) (Source: Geospatial Information Authority of Japan)

included in the study. It also clarifies the reasons why people started living in the coastal areas again based on a field survey and interviews with residents. With the looming possibility of future disasters, we must look to the past if we are to better prepare strategies for post-disaster recovery policy and planning.

We must learn from the past experiences of tsunamis including the 2011 Tsunami. The fact that the resettlement on the higher ground provided by the post-tsunami recovery planning and policy after the 1933 tsunami was not damaged by the latest tsunami evidences the importance of land use mitigation for tsunami disaster reduction. This successful experience in the tsunami-prone coastal area should be come down to the future.

On the other hand, problems still remained there. Although the government developed the safer resettlement for the residents after the 1933 tsunami, many people started living in the vulnerable lower lands or returned to the original tsunami-prone sites until 2011. According to our previous research, this unfavorable situation can be seen not only in Sanriku Coastal Area, but also in the areas in Indonesia, Sri Lanka, or other countries affected by the 2004 Indian Ocean Tsunami. It is because of lack of tsunami risk recognition, convenience, or inherited lands. The recovery planning and policy for the land use regulation was efficient to reduce tsunami risk in a sense, but it was not mandatory strategy to keep people living only in the safe place.

Relocation to higher land from waterfront area as a post-tsunami recovery strategy should be carried out with land acquisition by national/local governments' purchase to avoid future private usage of vulnerable waterfront space.

**Acknowledgments** This research was supported by the Japan Society for the Promotion of Science (JSPS), Grants-in-Aid for Scientific Research No. 25242036 "Resilience of the Urban Recovery System after the 2011 Great East Japan Earthquake and Regional Vulnerability Assessment to Tsunami" and No. 23404019 "Examination of Urban Recovery Plans after the 2004 Indian Ocean Tsunami and Urban Risk Evaluation of Tsunami in Asia Influenced by Global Warming." Some of the investigations were supported by Sei Isoyama, a former graduate school student of the Department of Risk Engineering, the University of Tsukuba.

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# Chapter 9
# Identifying Elements for School Based Recovery and Disaster Resilient Community Building in Japan

**Shohei Matsuura and Rajib Shaw**

**Abstract** When disasters occur and schools are affected, it does not only affect the students and teachers, but also have a significant impact on the whole community. One of the reason is because schools are commonly perceived as a community hub that different generations of community members are much familiar with. Experiences from mega disasters, including the East Japan Earthquake and Tsunami (EJET), which occurred in March 2011, show that when schools lose their principal functions due to disaster damages, pressure is placed on students and their families who are struggling to return to normalcy. During normal times, schools are often utilized by the whole community as venues that provide public services and events, such as disaster drills, sports and culture festivals. Therefore, it can be said that when schools become dysfunctional after disasters, some of the basic functions of the community are also compromised. On the other hand, this may suggest a strong possibility that if schools are promptly and properly recovered, it may facilitate the overall recovery and community building process. This idea, in parts, is reflected in the "School Centered Community Building" concept presented by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) of Japan for school recovery in the aftermath of EJET. In this context, this chapter will look into some of the key components and implementing mechanisms for school based community recovery and building. In detail, the components that will be discussed here are: (1) strengthening of school as community hub, (2) provision of education for sustainable recovery and community building and (3) school based network building. The discussions will place emphasis on such issues as school – community linkage, community based disaster risk reduction (CBDRR) and community decision making, drawing several examples from the experiences of EJET affected cities in the Tohoku Region as well as cities in other regions.

**Keywords** School based recovery • Community based disaster risk reduction (CBDRR) • Disaster education • Community building • East Japan Earthquake and Tsunami (EJET)

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R. Shaw (ed.), *Tohoku Recovery*, Disaster Risk Reduction,
DOI 10.1007/978-4-431-55136-2_9

## 9.1 Introduction

### *9.1.1 Significance of School Based Recovery and Community Building*

When schools are affected by disasters, it does not only affect the lives of students, who belong to the most vulnerable group of communities, but also school teachers, parents and the whole community. For students of affected schools, temporary closing of schools and interruption of educational activities deviates them from their everyday lives. As displaced students from the damaged schools will be transferred to schools that survived the disaster, lives of other students are also affected. In addition, as it is common for temporary housing facilities to be constructed on school grounds after disasters, further prolonging of school recovery can become a concerning problem that can cause possible health and posttraumatic stress disorder (PTSD) of students (Fujiga et al. 2012). While schools are mandated to develop students' academic as well as social skills including networking and building interpersonal relationships skills (Miller 1995) and when students go to schools, that by itself can mean that they are becoming members of the larger society (Osterman 2000), interruption of schooling will hinder their development to become future citizens and workforce of the community. Even worse, these situations may force students with their families to leave their communities for better educational opportunities elsewhere, further aggravating the chronic problem of population decline, especially in rural aging cities (Kobayashi and Saio 2011).

For the community, schools are familiar places for most of its residents because different generations of community members have attended the same schools. Therefore, it can be said that schools are commonly considered as a spiritual center of the community (Takeuchi et al. 2011) and one of the places that have helped teachers, parents and communities carry on the culture and customs of the region (Sakagawa 2004). Schools also function in providing community events, lifelong education programs and other public services that are vital to community life and identify (Miller 1995). As the case, school's incapacity to provide such services and events will affect the school – community linkage, consequently weakening the ties of the whole community that have existed before disasters. From a DRR perspective, as many Japanese schools function as a community hub in providing DRR education, disaster evacuation drills and as evacuation centers during emergencies, communities with non-functioning schools may be at high risk from getting affected by upcoming disasters.

The influence of school disaster extending beyond school premises to families and rest of the community is a convincing fact that schools are central public facilities that are connected with wide range of community stakeholders. Therefore, it is such that when central community hubs like schools are paralyzed by disasters,

a significant part of the community system might also collapse (Allenby and Fink in Norris 2005). Conversely, one can say if proper plans and the prompt actions are taken for school recovery, it could send a strong message to the community that "things are returning to normal" (Provenzo and Fradd 1995). The resumption of school functions can also symbolize community survival (Masten and Obradovic 2007) that will have a high impact in facilitating the overall recovery and community building process. On the other hand, keeping school inactive for too long may lead to their perception of continuing disruption of this process (Ronan and Johnston 2005). While community ties are often weakened by disasters, it is essential to adopt a participatory approach in maintaining people's sense of belonging and attachment to their communities. When affected people are able to share their problems and visions for recovery, it encourages individual and collective efficacy and commitment (Paton and Johnston 2001) empowering them to become actors for recovery from victims of disasters.

### *9.1.2 MEXT's Concept of School Centered Community Building*

The context of the ideas presented in this chapter are primarily based on Ministry of Education, Culture, Sports, Science and Technology (MEXT) Japan's concept of "School Centered Community Building," proposed in October 2011, aimed to accelerate school recovery after the East Japan Earthquake and Tsunami (EJET). The concept is composed of four pillars, which are, (1) Ensuring safety of the school (location and structure), (2) Improving functions as evacuation center during emergencies, (3) Strengthening to function as DRR hub that is energy efficient and sustainable and (4) Developing as multifunctional public facility to become a community hub (MEXT 2011). The significance of the concept lies where the suggestions do not only concern recovery of schools, but also for the recovery of the whole community. By placing the schools at the center of communities and expanding their traditional roles of merely providing education to children, it is expected that schools will become the "connector" in linking different sectors and actors in the community to coordinate and cooperate. In implementing the concept, MEXT has partnered with line agencies including, Ministry of Land, Infrastructure, Transport and Tourism (MLIT), Ministry of Agriculture, Forestry and Fisheries (MAFF) and the Cabinet Office. This line up of these agencies that are responsible for their respective sectors will allow MEXT to better assist local governments and affected communities in taking comprehensive approaches for recovery.

### *9.1.3 Objectives*

This paper will discuss and argue on the validity of School Based Recovery and Disaster Resilient Community Building concept in Japan. At the same time, it looks into possible issues that might arise in actual implementation and suggest mechanisms to resolve those issues. Specifically, the three key components, (1) possibilities of schools as a community hub, (2) schools in providing education for sustainable recovery and community building and (3) building school based network building will be discussed. It is important to mention that these components are all interlinked and would be most effective if they are simultaneously realized, rather than in a fixed sequential order. Also, identifying the key stakeholders and clarifying their roles and benefits are essential in discussing and suggesting tangible actions for these components. Lastly, although the concepts and recommendations in this chapter are applicable in different type of schools in various regional profiles, discussions will focus on public elementary and junior high schools in a rural setting in Japan where the whole community can be better seen as one subject. For each section, a case study from both post and pre disaster cities in Japan will be presented as hints for replication in other disaster prone cities and regions.

## 9.2 Schools as Community Hub

### *9.2.1 Policy Background*

Although the importance of linkage between school and community for the education sector has been understood by many, their roles have been divided for a long time (Ikeda 2001). In recognition to this gap, the revised Basic Act on Education (*Kyoiku Kihonho*, Act No. 120 of 2006) was adopted in stipulating schools, families and the local community to take collective roles and responsibilities for education, staging schools as the hub for realizing this partnership (Fig. 9.1). The law was revised in the midst of efforts in developing a society of lifelong education in the late 1990s, in which the schools would be opened to the regional communities, for all to "learn whenever, wherever and by whomever" (Arizono 2006). This has been a part of the education reform in Japan where issues such as participation of community members in school operation (e.g. community schools), building trust between schools and communities and making schools that are unique to the region was discussed. For years, the Central Education Council of MEXT has also been encouraging schools to open up their facilities to the community for meetings, evening classes and other community events, expanding the role of schools in providing public services in addition to normal school education. For example in DRR, local governments have been tasked by the Disaster Countermeasures Basic Act to designate public facilities to become evacuation centers during emergencies.

**Partnership and Cooperation among Schools, Families, and Local Residents**

(Article 13) Schools, families, local residents, and other relevant persons shall be aware of their respective roles and responsibilities regarding education, and endeavor to develop partnership and cooperation.

**Fig. 9.1** Basic act on education (extracted)

According to surveys, 60 % of these public facilities are public elementary and junior high schools (NIER 2008).

The school district system is another important factor in grouping communities as one. Since the Meiji Era, with the adoption of the School Ordinance (*Shogakko Rei*), each local resident's associations were tasked to build schools in their neighborhoods. This has not only made schools geographically central and accessible by all residents in the district, but also made school districts the basis for providing public service to the community. It is still common today to see community events, such as sports/culture festival and public services, including social welfare, disaster prevention drills and healthcare consultations being conducted on school district basis (Saito 2011; Sakagawa 2004). Even where actual schools do not exist anymore, many communities still function by school district units. This may be because the establishment of school districts had been the starting point for many regional residents, particularly in rural areas, to come together to build a community.

### *9.2.2 Strengthening Schools as Community Hubs for Recovery*

With its accessibility and central role in providing education for students and public services to the community, school can be further strengthened to become a community hub that the whole community can benefit from. Especially in post-disaster situation, school can play an important role in recuperating community ties that had been weakened by disasters and furthermore, facilitate recovery and community building process. Longstaff (2005) underlines that the presence of such hubs can create a tendency for individuals, groups or organizations to come together to resist difficulties. As a cultural and spiritual center as well as an institution to nurture future workforce of the community, school is the ideal platform for people to gather and discuss on recovery and the future of community development. On the other hand, if schools are not able to accommodate the wider community members, it is a clear sign that ties within a community is not strong (Tett 2004), which is disadvantageous to move forward in the recovery process. In building and strengthening schools as community hubs, the following discussion will examine the structural

and non-structural aspects of schools in developing a close and continuing partnership with their communities.

#### 9.2.2.1 Structural Measures for Strengthening Schools as Community Hubs

Since the 1990s, 400 to 500 public schools have been either closed or merged all across Japan per year due to loss of student population caused by low birth rate (MEXT 2012). This trend is unlikely to change, especially for the rural cities (Kobayashi and Saio 2011) and could worsen by population drainage instigated by the prolonged recovery process. Since schools are big facilities for rural communities, it would be more efficient to invest in rehabilitating or reconstructing damaged schools to become multi-functional facilities that can serve the whole community. Although traditionally, the main users of school facilities have been limited to students, teachers and people related to schools, school facilities such as athletic field, gymnasium, classrooms, kitchen and water supply/drainage system can also be utilized for other purposes by various community members (Sakagawa 2004). Moreover, as close to 90 % of the public schools are designated as evacuation centers, it is vital that the schools and the evacuation routes that lead to them are properly equipped to receive evacuees during emergencies (NIER 2008). In this context, the MEXT concept of School Centered Community Building in combining schools with other public facilities such as day care center, public library, social welfare office and evacuation center can be adopted for recovering disaster affected schools. There are already good examples in retrofitting schools to become multi-functional facilities throughout Japan. MEXT's "Project to Connect Abandoned School Buildings for the Future" has shown effective conversion of schools that become DRR centers, healthcare facilities, special needs school and social welfare offices that can serve the community (MEXT 2012). However, there is a remaining issue to maintain the fundamental functions of schools as an education facility and balancing it with the additional function in serving the wider public. To solve this, managerial aspect for opening up the schools to the extended community must be carefully considered.

#### 9.2.2.2 Managerial Measures for Strengthening Schools as Community Hubs

Discussion on how open schools will affect and change the operation and management of schools is important when attempting to strengthen schools as community hubs. For example, when schools are faced with disasters on a school day, the primary responsibility of teachers and school personnel is to secure the safety of the students until official help is available from the local government, namely the Board of Education (BoE). However, as many public schools function as evacuation centers during disasters, schools, under the operational leadership of the school

principle, must also receive and attend to other evacuees from the surrounding neighborhoods (Fujioka 2008) because school become the first key responders in the community (Masten and Obradovic 2007). It is such that during emergencies, organizations must take on-the-spot measures to problems that are not part of their ordinary mandates (Quarantelli 1997). As the case, in order for schools to look after their students and attend to the other evacuees, arrangement should be made prior to emergencies, so that community in turn, will also be able to assist the schools. In order to do so, participation of communities in daily school operations and management could be an effective way to empower schools in becoming such community hubs. For this, initiatives such as MEXT's "Regional Hub for Supporting Schools Project," which aims to coordinate community's involvement in school activities and "Community Schools," which gives community members in the School Management Committee official authority to take part in decision making for school operation and management, can allow communities to take active roles in supporting schools and bridging schools with the outside society (Sasai 2011).

However, in order for school and various stakeholders in the community to work together in a practical manner, there need to be a system where an individual or organization functions as an intermediary in connecting school with the community actors. These mediators can be the PTA members, town associations (Kamei 2012), community based organizations, such as local NGOs (Miller 1995). This kind of participatory management can become critical when communities are faced with emergency situations, as well as for long term community building process in coordinating and facilitating actions among relevant stakeholders.

### *9.2.3 Case Study*

Kamaishi city, Iwate Prefecture is one of the EJET affected cities in the northeast coastal region that has adopted MEXT's School Centered Community Building for school recovery. In Toni District, both elementary school (ES) and junior high school (JHS) were damaged by EJET and the students are now studying in temporary school buildings. In this situation, the city BoE conducted participatory consultative meetings with community representatives to discuss on the possibilities of developing and strengthening schools as a community hub that could revitalize Toni. Through the consultations, it was first proposed that the new ES/JHS would be built on the same premises. Second, it was suggested that some of the other public facilities in Toni, such as community center, preschool and local firefighting volunteer corps station can be merged or built adjacent to the schools. Third, it was confirmed that both school and community would continue to cooperate in the joint Integrated Study Programs as soon as situations will allow.

Figure 9.2 is an image that consolidates the main concepts discussed by the Committee in adopting the School Centered Community Building concept in Toni. Although in actual implementation, close coordination would be required among different departments and community stakeholders, this image is the result of the

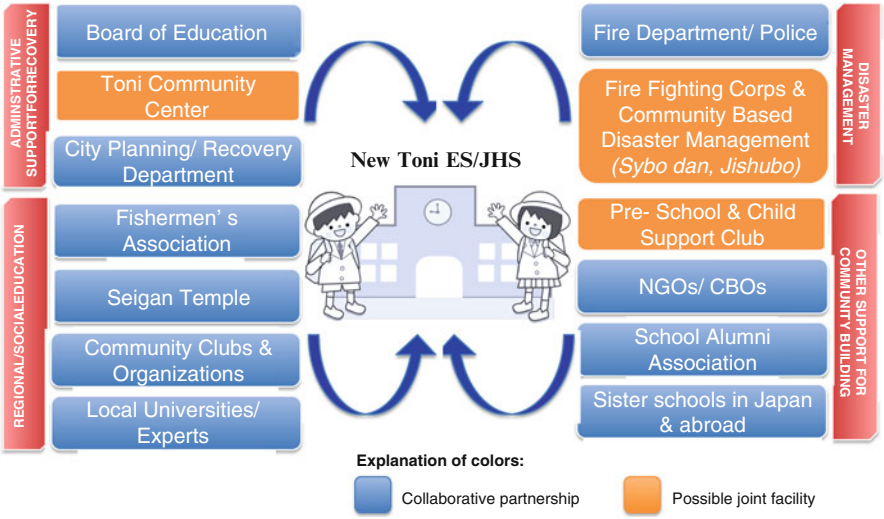


**Fig. 9.2** Image of new Toni ES/JHS as community hub

participatory consultation process, displaying the main stakeholders and other partners, their roles and possibility for joint facility or collaboration. Because the image also reflects the local situation and needs that was collected through consultations with the Committee, it had become a good starting point in discussing and planning detailed actions for school recovery and community building.

## 9.3 Education for Sustainable Recovery and Community Building

### *9.3.1 School: Community Partnership in Education*

Schools provide children with academic knowledge as well as set of social skills that will prepare them to become responsible citizens of their communities. In addition, with the increasing attention to lifelong/adult education that is built on interactions with parents, friends and regional community, the role of schools and school education has been expanding (Sasai 2011). While traditionally, schools have been mostly responsible for the academic school education, there are expectation for communities to take a complimentary role in providing education for students on subjects where experiences of schoolteachers are limited (Tett 2004). Moreover, education experts have repeatedly expressed concerns on the gap between school education with what students actually experience outside of schools and for this, the school – community partnership in education has been suggested as one of the effective ways in solving this problem (Bouillion and Gomez 2001). In

the context of sustainable disaster recovery and community building, DRR education and regional/social education are highlighted below, in which schools can jointly conduct in cooperation with various community stakeholders.

### *9.3.2 DRR Education*

Because most disasters, however the impact might be, are of low probability, non-daily events, even people in disaster prone regions cannot acquire all the knowledge to completely mitigate the risks. For example, as school children need to protect themselves from disasters anywhere and anytime – at school, at their homes and en route to schools – it is not feasible for the schools to shoulder all the responsibilities in DRR education. Moreover, memories of disaster experience usually remain more with the communities rather than with the schools due to regular rotation of teachers and students. Therefore, it is necessary that parents and communities assist the schools in implementing their DRR education and activities by sharing their experiences (Petal and Izadkhah 2008; Katada and Kanai 2008; Sakurai 2013). Also for disaster prone regions, because it is common that the local communities possess many local experiences and lessons from past disasters (Takeuchi et al. 2011) it would be more effective for students to learn about local DRR knowledge directly from their communities for understanding the local perceptions of disaster risks. Ushiyama (2009) claims further that some components of DRR education would be more effective as part of regional or home education rather than education at schools. Although there are arguments that establishing good educational policies for DRR is difficult because disaster effects on schools and communities are unpredictable (Burling and Hyle 1997), the fact still remains firm that school – community partnership and cooperation in disaster education is of great significance when placing efforts to reduce disaster risks for schools and communities.

School DRR education programs can also considerably contribute in enhancing disaster preparedness and resilience of communities (Dufty 2009). In Japan, MEXT has been supporting this standpoint that school DRR education can help DRR capacity building of the whole community (Central Education Committee 2012). Likewise, UNISDR has promoted through its campaign, "Disaster risk reduction starts at school (2006–2007)" on the effectiveness of school based CBDRR at the global level (UNISDR 2006). In communities where schools are functioning as a community hub, it is relatively easy to imagine that DRR knowledge attained by students and teachers would be disseminated to the parents and other members in the community. Furthermore, if school DRR education can be integrated with DRR programs of the community, it would be more efficient than having two separate programs, but more importantly, synergies among DRR activities by schools and communities can be expected. The organizational capacity and educational expertise of school could allow schools to take a central role in promoting the DRR culture to students, teachers, parents and communities. It is also important to note

that the students themselves are effective advocators of DRR knowledge and their involvement in this process with the other actors in the community can bring both short and long term impacts to recovery and disaster preparedness (Ronan and Johnston 2005).

### *9.3.3 Regional and Social Education*

While it is known that schools and children can play active roles in community development (Miller 1995), population migration forced by disasters in addition to the pre-existing problem of low birth rate in Japan, can significantly weaken communities ties to a level that is threatening to their survival. In order to maintain and strengthen communities to continue to move forward in the recovery process, affected people must be provided with reasons and benefits to stay in or return to their communities. Although people of rural communities, especially the elder people, tend to want to continue living in their hometowns, the working age group and children are more inclined to look for better opportunities elsewhere if the recovery process continues to be extended. In this regard, regional and social education can play a considerable part in maintaining and strengthening communities ties that would encourage them to make contributions to recovery and community building process, even under difficult situations.

The purpose of regional education, in this context, is to help students to better understand the historical, cultural and socio-economical qualities of their hometown so that they will be able to build pride for its uniqueness and at the same time, embrace its problems. For social education, it can help students engage more with their communities and to prepare to live in their societies as responsible citizens (Israel et al. 2001). In providing such education, there are numerous regional resources that can be utilized, including human resource, public facilities, local organizations, natural environment and community networks (Toyofuku 2007). For schools, local resources can be beneficial to better understand about their region because schoolteachers may not necessarily be from the locality, thus not experts of the region. Communities are also able to take an instrumental part in assisting schools to provide real life education to students in order for them to imagine their future jobs and life in the larger society (Corter and Pelletier 2005). Senior community members may be able to give students with advice on everyday life, setting social norms, crime prevention and opportunities to interact with people of different age groups (Miller 1995). MEXT has a history of developing participatory school – home – community education policies from the recommendation of Central Education Committee's first report, "Japanese Education in The Perspective of The 21st Century (1996)." In 2002, schools adopted the Integrated Study Program (*Sougotekina Gakushu no Jikan*) in which school – community linkage, experience based study and problem solving study have been established as its principal concepts. Through this program, many of the DRR and regional/social

education, specific to the region have been conducted throughout Japan (Arizono 2006; Sasai 2011).

Where there is good partnership between schools and communities to implement participatory education as discussed above, going to school by itself can mean for the students that they are joining as citizens of their communities (Osterman 2000). Community interactions through school education can develop a sense of unity, belonging and trust among students, teachers and different actors in a community. Building and strengthening such social capital can encourage community to participate, foster mutual help and create incentives to work together in solving a common issue that are much needed and essential for sustainable recovery and community building (Miller 1995; Israel et al. 2001; Mathbor 2007). In actual practice, individuals or organizations, such as local expert, NGOs or universities, may be need as intermediary to coordinate or connect schools with their regional resources (Ikeda 2001), similar to what was discussed in the previous section in strengthening schools as community hubs. However the approach, it would be a reasonable assumption to say that participatory education could transform schools and students from belonging to the vulnerable group and being disaster victims into important DRR actors for recovery and community building.

### *9.3.4 Case Study*

In 2004, Saijo City in Ehime Prefecture was affected by 6 typhoons that landed on Shikoku Island, triggering record rainfalls casing damages to 2,774 public facilities and 29 deaths in the whole prefecture and 5 deaths in the city. Because of this typhoon disaster experience in 2004 and from predictions of Tonankai and Nankai Earthquakes occurring at 60 % probability within the next 30 years, Saijo has revised its DRR plan. The plan is made of four main concepts, which are (1) Making citizens the main actors of DRR, (2) Building mechanisms to save lives of the most vulnerable group, (3) Dissemination of regional DRR culture to all citizens and (4) Inheriting DRR messages to next generation to build disaster resilient society. With these principles, Saijo City has started the implementation of 12-year-old Education Program from 2006. The project aims to build a community based DRR culture through school education by training students to become young DRR leaders through the acquirement of DRR knowledge and skills.

One of the representative activities of this program is Town Watching which is implemented in partnership among schools (students and teachers), community members (town associations, parents and neighbors) and the local government (BoE and Disaster Management Department) (Fig. 9.3). The activity is initially aimed to train students in DRR by acquiring knowledge about DRR in the preparatory stage, then self-discover the danger spots around the school and on the way to the school by actually walking in the neighborhood and interviewing community residents, collecting information about past disasters. However, the practice has an additional effect in providing opportunities for students to connect and to get

**Fig. 9.3** Learning from lecture of DRR experts (*right*), town watching with community members (*left*) (Photos by Saijo City)

familiarized with the community members. This will be beneficial when they are tasked to solve a common problem together, particularly in emergency situations. Therefore, this program has a balanced approach of acquiring desktop DRR knowledge as well as obtaining skills that will induce intuitive actions of students to protect their own lives and help others in the community. In Tamazu School District, for example, the teachers regularly attend the town association meetings of their residency to coordinate and seek assistance for implementing DRR activities to the community representatives. The district also has concluded a MoU with a local private company that established a cooperating relationship to join hands in conducting DRR activities and assist when future disasters occur.

## 9.4 School Based Network Building

In the event of a major disaster, affected communities suddenly get connected with unexpected number of people and organizations from the need to receive assistance for responding and recovering from disasters. For example, the coastal communities affected by EJET have been experiencing an unprecedented range of multi-layered assistance from various local, prefectural, national and global individuals and organizations (Yamamoto 2012). However, as operation to coordinate such broad scale assistance has been beyond the capacity of most local governments, it became one of the major obstacles in facilitating the post-disaster processes. For example, although many relief organizations responded quickly within a few days after EJET to provide assistance to the affected areas, most acted individually without coordination (Liu et al. 2012), inflicting additional burden on the local governments and communities. It is often that the government at different administrative levels also face difficulties and even conflicts due to lack of coordination (Rubin and Barbee 1985). Disparities in receiving relief assistance were observed even among neighborhoods within affected cities, which in parts, depended on their networking capabilities. These cases show that even if individual organizations

have the capacity for taking measures to disasters, their inability to function together can negate their efforts. Heath (1995) describes such situation as a result of deficiencies in inter-organizational coordination and communication that can be seen as a disaster management issue. To resolve this issue, schools and communities can aim to strengthen reciprocal links, regular support interactions, connection among different existing networks and ability to build new ones (Norris et al. 2007). By taking specific actions, there is high potential that communities can utilize the various formal and informal networks that schools possess as community hubs and build new ones that can further enhance disaster recovery and preparedness.

### *9.4.1 Existing School Networks*

Although the degree of intimacy depends on the community profile, schools are usually connected with various stakeholders either bilaterally or multilaterally through networks. First, schools in Japan are deeply connected with the parents of students through such events as open school days, teacher's home visits, class newsletters, report cards and PTA/School Committee activities (Tett 2004). They are also connected with wider range of community members through annual school events, such as sports and culture festivals, where households with no children sometimes participate. More formally, the members of Board of Education (BoE) are appointed from various community residents of different profession and age groups. Under the BoE, some schools establish the School Management Committee, mentioned in the previous section, which further expands the school/community network. From a DRR point of view, local firefighting volunteer corps (*Syobo dan*) and community based disaster management organizations (*Jisyubo*) conduct DRR drills and related activities for the people in the school district on school grounds. As these organizations are mostly composed of members of town associations (*Chonai kai*), the participants become widely connected with different community stakeholders through such events. It is known that the local governments often make use of these organizational networks to transmit information and instructions related to DRR and other issues to their communities (Bajek et al. 2008). In the recent years, various local volunteers and community based organizations have become increasingly active in supporting schools and teachers of their locality. For example, the MEXT program, "Regional Hub for Supporting Schools Project (2008-)," mentioned earlier, has been effective in assisting volunteers create sustaining networks among community members, community with teachers and schools with local organizations (Sasai 2011). Such networks and relationships that are built from normal times are the keys for rapidly mobilizing emergency support as well as creating continuous working partnerships for community development (Norris et al. 2007).

### 9.4.2 Strengthening and Creating New School Based Networks

In early stage of recovery, there are more opportunities to develop local organizational capacities because of availability of human and financial resource that concentrates during this phase (Berke et al. 1993). Disasters, especially those of high impact, can expand individual and organization connections that have previously not been seen through disaster management (McEntire et al. 2002). In network building, the schools could have opportunities to either strengthen existing networks or build new ones while the attention of the society is still high on school recovery. First, through the BoE, the schools can get linked with the local emergency management organizations (Ronan and Johnston 2005), if such cooperating relationship is still limited. Some elementary schools have established Student DRR Clubs, which can efficiently link DRR activities among schools, local authorities and communities. There are also countless informal networks connected with the schools that may not necessarily be connected by DRR (Takeuchi et al. 2011) or with any other objectives. These may include community based groups, such as women's associations, seniors' club, gathering of fathers of PTA members (called *Oyajino-kai*) and local festival groups. Because these groups are involved with the schools through volunteering activities or have been jointly conducting community activities with the school children, the connections can also be applied for disaster recovery and community building. Forming networks with the private sector is another area that the schools can explore. Stewart et al. (2009) points out that the private sector companies can respond efficiently and effectively to the needs of impacted areas and this capacity is becoming more apparent. Local companies may have financial and material resources as well as disaster response plans that can help communities that are facing disasters. Although their intentions might be that of company – consumer relationship, corporations can also show good will in supporting troubled communities. Network building in partnerships with the media should also be considered as a significant measure to enhance information collection and dissemination (Quarantelli 1997) where conventional communication system is unlikely to be functioning, especially in the immediate post-disaster stage.

With regards to networks extending outside of the city or region, many schools have "sister schools" that are under the same management body or shares the same educational policies and programs. Some schools may be connected with other schools internationally by belonging to such framework as UNESCO Associated Schools. There are also possibilities of looking into the school alumni network where former graduates currently living in other cities and countries can take initiatives, such as fund raising and awareness building, to support the affected schools in their hometowns. These informal networks can compliment formal networks and be prominently valuable if the recovering schools have some sort of networks within and outside of their regions. Such network help may allow delivery of aid in supporting local organizations, including schools, to undertake sustainable

recovery initiatives (Berke et al. 1993). The various networks described above can indeed be effective in bonding communities, bridging different communities and linking them with financial and public institutions (Mathbor 2007).

### *9.4.3 Case Study*

Kesennuma is another coastal city in northeast Japan that was devastated by the EJET, damaging four ES and one JHS either due to the effects of tsunami and earthquake. In resuming school DRR activities, BoE and the schools have been taking initiatives to renew the school DRR education program by strengthening linkage with their respective communities. It has already been mentioned that identification of an intermediary, whether individual or organizational, will be the key in building networks between schools with the community stakeholders. In this view, the Miyagi Prefectural BoE has appointed schoolteachers to function as coordinators in materializing this initiative. In 2012, DRR Advising Teachers (*Bosai syunin*) have been appointed in every school in every city. In addition, Chief DRR Teachers (*Bosai tantou syukan kyoyu*), who are senior level teachers, have been appointed to key schools in every city, solely to implement school DRR activities and to function as a coordinator in connecting schools with their communities. Education Researchers have been assigned by the Kesennuma city government to conduct research on Education for Sustainable Development (ESD) that has been well established in the city before EJET. Since EJET, their topic has been focusing on renewing school DRR education program that is integrated with the core concepts of ESD, emphasizing on cooperation between school and communities in solving common social issues.

Adopting the efforts of the city in enhancing school DRR education through school – community linkage, a suggestive measure to further expand the network by establishing a DRR Education Promotion Committee in Kesennuma is presented in Fig. 9.4. The main objective of this proposal is to expand the existing networks with stakeholders who are not currently connected through school education or DRR, even though they might already have their individual DRR agendas. It is important that when such committee is established, it should be institutionalized for sustaining the structure. For this, it is suggested that the roles and the benefits of each stakeholder are clarified and periodical activities are conducted from normal times. In a much smaller scale, the Hashikami District has established a similar committee with ES/JHS, parents, neighborhood association and BoE with aims to (1) Strengthen "self-help" capacities through DRR education, (2) Enhance "mutual-help" capacities through joint DRR drills and (3) Learn about natural environment and disaster risks in the district. Although on a voluntary basis, regular DRR programs have been implemented by neighborhoods, which consist of joint school – community DRR drill in the morning and DRR education program and handover drill at school in the afternoon.

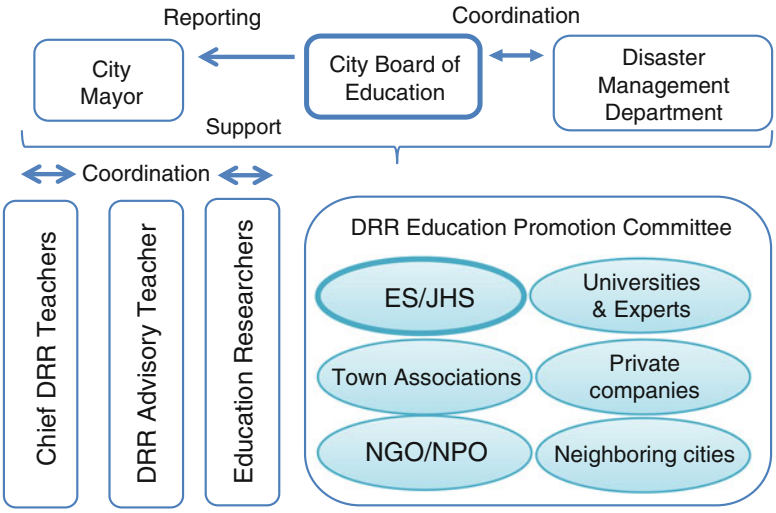


**Fig. 9.4** Suggestive measure for establishing DRR Education Promotion Committee in Kesennuma

## 9.5 Mechanisms for Implementation

It is still common that the post-disaster process concentrate on short term relief objectives and less on the long term development (Berke et al. 1993). However, it is a hard fact that schools and schoolteachers are under great pressure to set short term targets and achieve results during the tenure in their assigned schools. Although it may be the responsibility of BoE to develop a seamless plan that reflects both short and long term needs to recover schools, it is usual to observe a breakdown in the decision making process of local governments due to changes in authority relationships with other departments, information flow channels, and extended responsibilities (Berke et al. 1993; Quarantelli 1997). For this, it is vital that community planners and disaster managers work together, involving the BoE and schools, in sharing a common goal in reviving the cultural heritage, safety and security to improve lives of the community (Pearce 2003). On this, the Central Education Committee of MEXT (2012) has also emphasized that schools need to strengthen their partnerships with disaster management and other related departments. It is also advantageous for schools and local governments to make use of expertise of external resources, such as NGOs, universities and research institutions for the technical aspects, in conducting surveys and facilitating consultations for better decision making. Under the situation of uncertainty and problem complexity in post-disaster situation, coordination among local governmental departments and community stakeholders is essential and would be an important determining factor for the future of affected communities (Rubin and Barbee 1985). In this context, another case study from Toni District in Kamaishi is presented below as a reference to develop a mechanism for participatory decision making for school recovery.

### 9.5.1 *Decision Making Process for School Recovery in Toni District, Kamaishi*

In implementing the school recovery plan for Toni District, Kamaishi, BoE established the School Reconstruction Consultative Committee in December 2011, approximately nine month after EJET (Fig. 9.5). The consultations were joined by community representatives that included (1) Principles of ES and JHS, (2) Community leaders, including heads of town associations, (3) BoE and related local government departments and (4) Local and external experts. The sessions were chaired and observed by external experts of Kyoto University and Tohoku University, which provided technical backstopping to the discussions. The Committee's primary task was to conduct a participatory consultation among community representatives to propose the location and design concept of the new school, discuss on the possibility for joint ES/JHS and improving safety and DRR functions of the schools. However, when the consultations touched upon implementing the School Centered Recovery and Community Building concept, the BoE and schools faced difficulties in taking the responsibility to handle such broad issues as they were beyond their normal mandates and expertise. Under this circumstance, Kyoto University was tasked to assist the BoE to conduct a survey targeting the community, schoolteachers/students and local government departments to grasp their perceptions on the School Based Recovery and Community Building concept and to provide evidence based policy advice to the city government.

Although the Committee was dissolved only a year after its establishment, it was one of the first sectoral consultations that were initiated by the city in an organized and participatory approach. Because of the extensity of community building, BoE and schools remained passive in the discussions. However, many beneficial comments were actively raised by the community representatives, because they felt more ownership to the issues. In addition, the consultations were able to encompass detailed and substantial subjects on school recovery due to inputs from internal and

**Fig. 9.5** School reconstruction consultative committee of Toni District (*left*), Reporting decision of the Committee to Mayor Noda of Kamaishi (*right*)

external experts from various fields. Although in the end, it will be the efforts of the city and the communities who will realize the outputs from the Committee, the experience of such participatory consultations and decision making process could be used as a reference for other sectors and communities that are going through similar situations.

### 9.5.2 *Tool for Evaluating and Monitoring School Centered Community Building*

Three components, (1) Strengthening of school as community hub, (2) Provision of education for sustainable recovery and community building and (3) Establishing school based network building have been discussed in this chapter. In order to sustain the efforts in building and strengthening these components throughout the recovery and community building process, it suggested that a methodology is developed to monitor, evaluate and reflect the outcome in future plans (Miller 1995). With such methodology, stakeholders will have a better understanding of the situation that their community is in. This will be important in ensuring accountability, participation and transparency of their efforts that they are engaged in the process (Ahrens and Rudolph 2006). For this, a checklist (Table 9.1) is adopted from the work of Ikeda (2001) in developing a "Participatory Education Community" and modified by the author to be used as an assessment tool to confirm the potentials and identify gaps in materializing School Based Recovery and Community Building concept. Although the checklist displayed here is basic and only for purpose for discussion, users may further customize and expand this checklist in their respective context for detailed planning to enhance implementation of the concept. This tool also has the flexibility for applying to other public facilities that may function as community hub in other areas and countries.

Aside from listing items to make schools an effective community hub, it is also important that the checklist clarifies who are responsible to implement and monitor the activities are clarified in the checklist. While the primarily responsibility for this process lies with city BoE, there are some items that would require support from specialized departments. For example, in improving safety of school facilities and locations, technical support from Disaster Management or City Planning Division might be necessary. In implementing community DRR programs, cooperation and coordination with town associations and local DRR groups (e.g. local firefighting volunteer corps) could be jointly administered. In network building, for example with the private sector, business associations could play a vital part in helping schools get associated with stakeholders that are usually not connected with the education sector. For monitoring, relevant local government departments together with organizations such as DRR Education Promotion Committee (suggested in Fig. 9.4) can conduct periodical exercises to evaluate and provide feedbacks to identify required actions to further enhance the items on the checklist. Monitoring

**Table 9.1** Checklist for school centered community building (Adopted from Ikeda 2001)

| Items | Evaluation | Gaps | Required actions | Responsible organization(s) | Priority |
|---|---|---|---|---|---|
| **1. Function as community hub (structural)** | | | | | |
| Safety location from multiple hazards | Low – Mid – High | | | | Short – Mid – Long |
| Sufficiently equipped as evacuation center | Low – Mid – High | | | | Short – Mid – Long |
| Space is available for community activities | Low – Mid – High | | | | Short – Mid – Long |
| School used for giving other public service | Low – Mid – High | | | | Short – Mid – Long |
| **2. Function as community hub (managerial)** | | | | | |
| Emergency response plan with community | Low – Mid – High | | | | Short – Mid – Long |
| Joint DRR program with community | Low – Mid – High | | | | Short – Mid – Long |
| School Management committee | Low – Mid – High | | | | Short – Mid – Long |
| # of school organized community events | Low – Mid – High | | | | Short – Mid – Long |
| **3. Education (involvement of community)** | | | | | |
| DRR programs with community help | Low – Mid – High | | | | Short – Mid – Long |
| # of students joining community DRR drills | Low – Mid – High | | | | Short – Mid – Long |
| Integrated study program w/ community | Low – Mid – High | | | | Short – Mid – Long |
| Education program with NGOs/CBOs | Low – Mid – High | | | | Short – Mid – Long |
| **4. School based networks** | | | | | |
| Meeting with BoE and other departments | Low – Mid – High | | | | Short – Mid – Long |
| # of informal networks institutionalized | Low – Mid – High | | | | Short – Mid – Long |
| ToR signed with private companies | Low – Mid – High | | | | Short – Mid – Long |
| Connected with schools outside city | Low – Mid – High | | | | Short – Mid – Long |

from higher administrative levels (prefectural, regional and central) may also be relevant depending on the issues. Their support would also be valuable in institutionalizing the monitoring and evaluation system in ensuring sustainability of this process.

## 9.6 Conclusion

Recovery is a complex and dynamic process in which social systems, such as public services, roles of organizations and decision making process get compromised. When no emergency service is available, especially in the early stages of disaster response, community has to rely on neighborly assistance (King 2000). This paper has argued that by strengthening schools as community hubs, in both structural and managerial aspects, communities will be able to depend on the schools as a platform to receive and give such assistance. Recovery also requires both speed and quality in returning people's lives back to normal (Ingram et al. 2006). Although this is an extremely difficult task, the pressure can be eased with good preparedness in which school education can take a significant role with the help from communities. Because schools are institutions that nurture future human resources of the community, the importance of sharing visions for community development with schools is well understood by many (Kobayashi and Saio 2011). This indicates the fact that school education, including DRR education, can contribute in enhancing and sustaining efforts in all stages of disaster management. For communities affected by large scale disasters like EJET, it would be impossible just to count on neighborly assistance because the effects can exceed their capacities even if they are well prepared. On this, Berke et al. (1993) mention on two types of networks in which horizontal integration connects different stakeholders within communities and vertical integration extends to the network outside of communities. As schools are known to own diverse connections, utilizing and further expanding these networks will considerably multiply the local resilience level. This chapter again emphasize on the sound assumption that school recovery will have a strong impact that encourages facilitation of the overall recovery and community building process. Simple reopening of the school itself can send a strong message that recovery is moving forward (Chamlee-Wright 2010) and will persuade affected people to return to their communities and contribute to the process. The more communities become competent in this manner, the better they will be able to make collective decisions and actions, even under difficult situations. Building such ties and trust among actors within and outside of communities is the main objective for School Based Recovery and Disaster Resilient Community Building.

**Acknowledgements** The authors would like to express their appreciation to the city of Kamaishi, Kesennuma and Saijo for their support in conducting the surveys and Church World Service (CWS) Asia-Pacific and MERCY Malaysia for funding the research.

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# Chapter 10
# Community Recovery in Tsunami-Affected Area: Lessons from Minami-Kesennuma

**Yasutaka Ueda and Rajib Shaw**

**Abstract** Many people who lived in affected areas by the Great East Japan Earthquake and Tsunami have been forced to live separately after the event. In some tsunami-affected areas, reconstruction of houses has been restricted since the disaster happened until reconstruction projects for safety finish because sea walls were destroyed and high risk of a future tsunami remains. These areas were designated as two separated zones; prohibited area of housing reconstruction and land leveling area. Survivors who lived in either zone can also choose to move out from the area they lived and to reconstruct their house by themselves. Therefore, community recovery plan makes an impact for affected people to decide where they reconstruct, consequently, it is considered to make an effect on community recovery process. For this reason, this chapter attempts to analyze problems of community recovery plan and characteristics of residents who have a will to reconstruct their house in tsunami-affected area in case of Minami-Kesennuma, a devastated area by the tsunami. From the analysis, lessons of community recovery is emphasized as following; early concept-making and consensus-building for recovery, housing reconstruction support in terms of re-building community and resilience building in the recovery process by involvement of multi-stakeholders.

**Keywords** Community recovery • Housing reconstruction • Tsunami-affected area • The Great East Japan Earthquake and Tsunami (EJET)

## 10.1 Introduction

In general, housing reconstruction has four process; (1) emergency sheltering. (2) temporary sheltering. (3) temporary housing. (4) permanent housing (Quarantelli 1995). In particular, construction of temporary housing in or near affected community was proposed by scholars. Johnson (2007) proved that

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R. Shaw (ed.), *Tohoku Recovery*, Disaster Risk Reduction,
DOI 10.1007/978-4-431-55136-2_10

communities were able to take a larger role in reconstruction activities since temporary housing was located in or near the areas where rebuilding was taking place from case study in Mexico and some of the projects in Italy. It was also clarified by Haiti case that to minimize the distance from former homes and minimize the duration of displacement allows people to better maintain their livelihoods and protect their land, property, and possessions (Jones et al. 2012).

On the other hand, there are some difficulties to construct temporary housing in or near affected areas due to land shortage in case catastrophic disasters happen in urban area. Even there was a case number of temporary housing did not reach the one required (Comerio 1997). Disaster survivors had to move in temporary housing where there were no or few friends and relatives in the after math of Hurricane Andrew in Florida, the Friuli earthquake in Italy, and the Great-Hanshin Awaji (Kobe) earthquake in Japan of 1995 (Quarantelli 1995). City of Kobe indicated that reconstruction work would be delay due to land shortage if temporary housing was constructed in urban affected area (Takahashi and Fujita 1999). In addition, some case were shown that tsunami-affected area was designated as prohibited housing reconstruction area, for example after the tsunami struck Sri Lanka in 2004 (Ingram et al. 2006). Under these condition, it will be a big issue for land owners and communities to choose where construction site is – either on the same site they lived before the disaster or not.

In the Great East Japan Earthquake and Tsunami (EJET) of 2011, Ministry of Health, Labor and Welfare (MHLW) issued a statement that consideration not to break relation of affected communities should be made at selection of residents of temporary housing (MHLW 2011). However, to be fair to everyone, lottery was adopted to select its residents in some cities (Ueda and Shaw 2014).

In some tsunami-affected areas, reconstruction of houses has been restricted since the disaster happened until reconstruction projects for safety finish because sea walls were destroyed and high risk of a future tsunami remains. These areas were designated as two separated zones; (1) prohibited area of housing reconstruction where group relocation is promoted and (2) possible re-settlement area where protection against tsunamis is secured by land leveling or reconstruction of sea walls. Survivors who lived in either zone can also choose to move out from the area they lived and to reconstruct their house by themselves. Therefore, community recovery plan makes an impact for affected people to decide where they reconstruct, consequently, it is considered to make an effect on community recovery process.

A key to the success of any long-term rehabilitation and risk mitigation plan is the involvement of the affected persons and communities in the redevelopment and rebuilding efforts (Pardasani 2006). Additionally three basic elements of community recovery is pointed out as leadership, ability to act and knowledge (Rubin 1985). Thus, participation of affected local people who have the basic elements to community recovery activities is important. Besides, it is emphasized that much work and support was needed for community recovery so that this should be achieved through the cooperation of people, city officials and NGOs/NPOs (Shaw and Goda 2004).

In consideration of above, this chapter attempts to analyze problems of community recovery plan and characteristics of residents who have a will to reconstruct their house in tsunami-affected area in case of Minami-Kesennuma, Kesennuma City, a devastated area by the tsunami. From the analysis, this chapter discusses lessons on community recovery in tsunami-affected area.

## 10.2 Methodology

Target area of this study is Minami-Kesennuma consisted of 17 neighborhood associations where most houses were devastated by the tsunami. This area is one of the typical settlements of Japan developed on the coast in the high economic growth period after the world war II. This chapter considers issues of community recovery in the case of Minami-Kesennuma from two point of views; one is community recovery plan, another is characteristics of residents who have a will to reconstruct their house in Minami-Kesennuma. Therefore, this paper proceeds to make discussion with the methodology such as below; (1) clarify the process of making recovery plan for the target area and its contents to grasp what recovery plan has problems regarding community recovery. (2) conduct a questionnaire survey to residents who lived in Minami-Kesennuma before the EJET to prove characteristics of residents who have a will for resettlement in Minami-Kesennuma. (3) discuss lessons of community recovery in tsunami-affected area on the basis of the results above (1) and (2).

The questionnaire was distributed by each representative of neighborhood association by post and collected by post. Response rate is 42.8 % (437/1,021). The survey period was from 15 to 30 April 2013, around 2 years after from the occurrence of EJET. As mentioned later, right before the survey, the city office proposed process and schedule of reconstruction of the area to citizens.

## 10.3 Damages and Community Recovery Plan of Minami-Kesennuma

### *10.3.1 About Minami-Kesennuma*

Kesennuma City is located in the north east end of Miyagi Prefecture, along the coast facing the Pacific Ocean. Minami-Kesennuma is the area consisted of 17 neighborhood associations on the coast in the central city (Fig. 10.1). Most of the area was farm before the World War II. Construction of modern fish market soon after the war triggered development of the area. As the backyard of the fish market, large factories and warehouses related to marine industry were constructed on the east side of the area and mixed settlement and market zone were developed

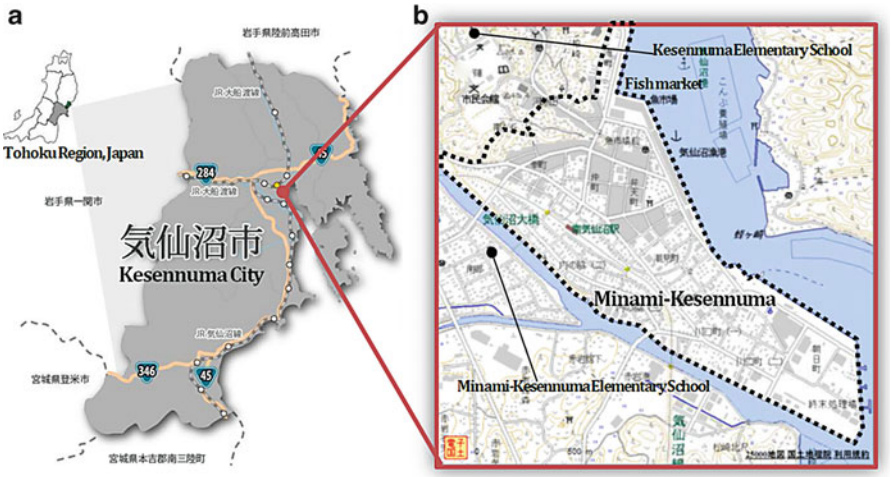


**Fig. 10.1** Location of Minami-Kesennuma. (**a**) Map of Kesennuma City cited from the website of Kesennuma City Office. (**b**) Map of Minami-Kesennuma cited from the website of Geospatial Information Authority of Japan. English explanation was added by the author

on the west side of the area. In 1960, on the process of this development, Chile Earthquake Tsunami was occurred and the area was inundated, however, the development of settlement was continued due to minor damage. Besides the development, Minami-Kesennuma Elementary School (ES) was build neighboring the area in 1967. 13 of 17 neighborhood associations was covered in the school district of the elementary school (Table 10.1).

Figure 10.2 shows shift of population and number of households in Minami-Kesennuma for 40 years from 1970 to 2010 in accordance of the national census. The population in 1970 is around 9,000 and it is decreasing that one in 2010 is around 4,500, almost a half of 1970s. Population of households reaches about 3.5 in 1970, however, decreased by around 2.5 in 2010. In addition, rate of population of 65 year-old and over in central Kesennuma area where Minami-Kesennuma includes in October 2010 is 32 % (6,209/19,591) (Kesennuma City 2012a). This means area of Minami-Kesennuma tends into the aging society. These data indicates that most of residents of Minami-Kesennuma is featured as people who moved in after the development of settlement and fostered their children, then only the residents who became aging have stayed since their children seemed to move out from the area after growing.

**Table 10.1** Status of 17 administrative districts

| District name | Year of establishment*1 | Population (Oct. 2010) *1 | School area (before EJET)*2 | Current status (Apr. 2013) *2 | Zone in recovery plan*2 |
|---|---|---|---|---|---|
| Minato | 1981 | 103 | Kesennnuma ES | Continuation | Lowland |
| Kawarada1 | 1976 | 220 | Kesennnuma ES | Continuation | N/A |
| Kawarada2 | 1980 | 194 | Kesennnuma ES | Continuation | Lowland |
| Minamigaoka | 1973 | 313 | Minami-Kesennuma ES | Continuation | N/A |
| Saiwai1 | 1993 | 317 | Minami-Kesennuma ES | Dissolution | Leveling |
| Saiwai2 | 1997 | 121 | Minami-Kesennuma ES | Dissolution | Leveling |
| Saiwai4 | 1976 | 429 | Minami-Kesennuma ES | Continuation | Leveling |
| Naka | 1977 | 294 | Minami-Kesennuma ES | Continuation | Leveling |
| Uoichibamae | 1975 | 196 | Kesennnuma ES | Continuation | Lowland |
| Benten1 | 1975 | 198 | Minami-Kesennuma ES | Continuation | Lowland |
| Benten2 | 1971 | 230 | Minami-Kesennuma ES | Continuation | Lowland |
| Shiomi1 | 1981 | 109 | Minami-Kesennuma ES | Continuation | Lowland |
| Shiomi2 | 1975 | 218 | Minami-Kesennuma ES | Continuation | Lowland |
| Nainowaki1 | 2003 | 373 | Minami-Kesennuma ES | Continuation | Leveling |
| Nainowaki2 | 1990 | 540 | Minami-Kesennuma ES | Dissolution | Lowland |
| Nainowaki3 | 1976 | 288 | Minami-Kesennuma ES | Continuation | Lowland |

(continued)

**Table 10.1** (continued)

| District name | Year of establishment*1 | Population (Oct. 2010) *1 | School area (before EJET)*2 | Current status (Apr. 2013) *2 | Zone in recovery plan*2 |
|---|---|---|---|---|---|
| Kawaguchi | 1973 | 385 | Minami-Kesennuma ES | Continuation | Lowland |

*1: Data provided by Kesennuma City Office
*2: Data investigated by the author

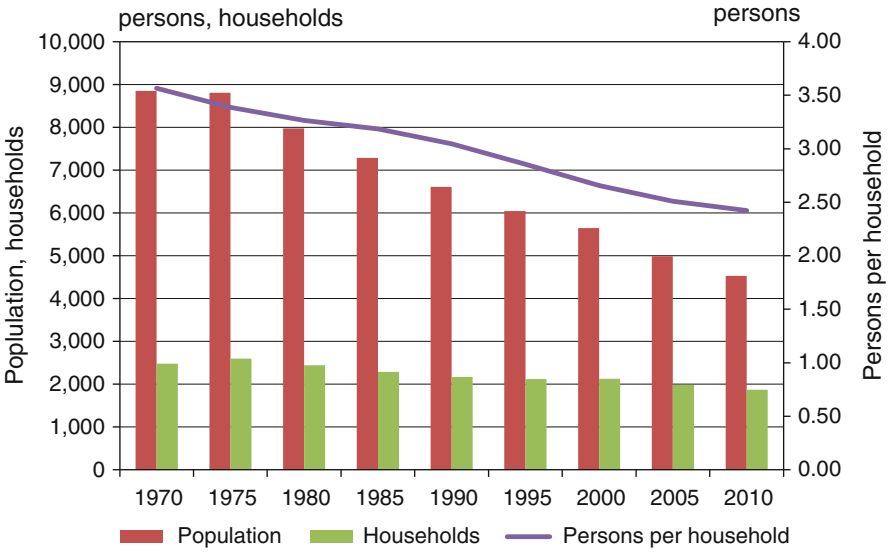


**Fig. 10.2** Shift of population and households in Minami-Kesennuma according to the national census in Japan. The data was provided by Kesennuma City Office

### *10.3.2 Damages of Minami-Kesennuma by the Great East Japan Earthquake and Tsunami*

Kesennuma City was devastated by the EJET. The tragedy of the city is that in addition to the damage caused by the tsunami, the central part of the city Minami-Kesennuma includes where many seafood processing companies were located, was completely destroyed by the massive fire that spread from an oil tank located at the bay entrance. According to the city office, 1,280 died or were missing, with 15,751 losing their homes, affecting 9,500 households (Kesennuma City 2013). There were 26,622 households in the city in 2010. This means that more than one-third of the population were affected. Moreover, out of 4,102 registered business institutions, 3,314 businesses or 80.8 % of the total were considered to be affected, leading to a huge number of unemployed people (Kesennuma City 2011).

In Minami-Kesennuma, the depth of inundation by the tsunami reached maximum 12.0 m. 1,137 houses were totally collapsed and seven was partially collapsed (MLIT 2011). This area had 1,869 households in October 2010, hence, approximately two-third houses (1,244/1,869) were washed out by the tsunami. Minami-Kesennuma ES came to close due to damages by the tsunami and school district of Minami-Kesennuma ES was integrated into the district of Kesennuma ES.

Some survivors of the Minami-Kesennuma moved in temporary housing after stay in evacuation centre. Temporary housing site was located far from the area because the area was designated as prohibited zone of housing construction . To be fair to everyone, lottery was adopted to select residents of temporary housing in Kesennnuma City. As a result, many residents of the area had to move separately with few acquaintances.

Aftermath of the tsunami made an effect on activities of neighbourhood associations. According to the survey conducted by the city office, number of affected neighbourhood associations were 127 as same as 57 % of total 223 neighbourhood associations in the city (Kesennuma City 2012c). As well as Minami-Kesennuma, 3 of 17 neighbourhood associations decided to dissolve by 2 years after the EJET occurred (Table 10.1).

### *10.3.3 Community Recovery Plan of Minami-Kesennnuma*

Master plan for recovery of Minami-Kesennuma was shown on the Kesennuma City Recovery Plan enacted in October 2011, which was made by the administrative initiative (Table 10.2). At this point, a half years past from the EJET had happened. After that, survey on thinking of affected people about reconstruction of their house and possession of their land was conducted citywide in January 2012, then more concrete plan and schedule of reconstruction project was proposed by the authority in April 2012 according to result of the survey. There had been no opportunity to have a consultative process for making the plan with people in Minami-Kesennuma, while 1 year past from the EJET.

According to land use plan disclosed by the authority in April 2012, the area were separately designated as three zones; (1) leveling zone which is expected to use as settlement or commercial area, (2) lowland zone which is expected to use as green-park or factories for marine industry so that housing reconstruction will be prohibited and (3) non-designated zone where damages were a few (Fig. 10.3). 17 neighborhood associations were designated as following; five associations were leveling zone, 10 associations were lowland zone and two associations were non-designated zone (Table 10.1). Options either to purchase a lot for residence developed for group relocation project in the leveling zone or to move in public housing for victims with a small amount of rental fee were prepared for people who lived in lowland zone upon their request. Application for the options prioritized those who had lived in Minami-Kesennuma. Though, the application in March 2013 for group relocation project was 14, which did not reach the fixed number of 40.

**Table 10.2** History and Planning of recovery in Minami-Kesennuma

| Month/year | Events |
|---|---|
| Mar. 2011 | The EJET occurred. Minami-Kesennuma was devastated by the tsunami |
| Oct. 2011 | Kesennuma City Recovery Plan which was developed by initiative of the administrative was enacted |
| Nov. 2011 | The area was designated as urban disaster recovery promotion area where prohibition of housing reconstruction has been continued until completion of reconstruction projects |
| Jan. 2012 | Survey on thinking about reconstruction of their house and possession of their land was conducted citywide to get information for consideration of public housing. It is the first survey to conduct targeting all affected citizens |
| Apr. 2012 | A brief meeting was held to explain more concrete plan and schedule of reconstruction project which was proposed by the authority according to result of the survey |
| Jul. 2012 | Survey on intention of housing reconstruction targeting all affected citizens was conducted by the authority to get information for making detailed plan of public housing and group relocation project |
| Sep. 2012 | Land readjustment project was enacted by the city government |
| Jan. 2013 | A brief meeting was held to explain the detailed plan of land readjustment including project schedule |
| Feb. 2013 | A brief meeting was held to explain group relocation project initiated by the city government |
| Apr. 2013 | The committee consisted of some representatives elected from the land-owners was established |
| Mar. 2013 | The application for group relocation project was accepted. Number of the applicants was 14 of 40, the fixed number, in Minami-Kesennuma |
| Jul. 2013 | The application for public housing project was accepted. Number of the applicants was 186 of 300, the fixed number, in Minami-Kesennuma |
| | Construction of land readjustment project was started |
| FY 2014 | Creation of land for public housing in land readjustment project area will be completed. After that, building public housing will start so that its residents can move within fiscal 2015. Start of their living will be the last of all public housings in the city |
| FY 2014 to FY 2017 | Creation of land for private use in land readjustment project area will be completed. After that, lots of the land will be transferred to its landowners to build their house |
| FY 2017 | Creation of land for group relocation in land readjustment project area will be completed. After that, lot s of the land will be transferred to its landowners to build their house. The transfer will be the last of all group relocation area initiated by the city government |

The table was made by the author from press release documents by Kesennuma City Office

The application in July 2013 for public housing for victims was 186, which also fell the quota of 300.

Land readjustment project adopted for leveling zone and official urban planning decision for this project was enacted by the city government in September 2012. After that city officials held a brief session with landowners in the project site to explain concrete plan in January 2013. Then, a committee consisted of some

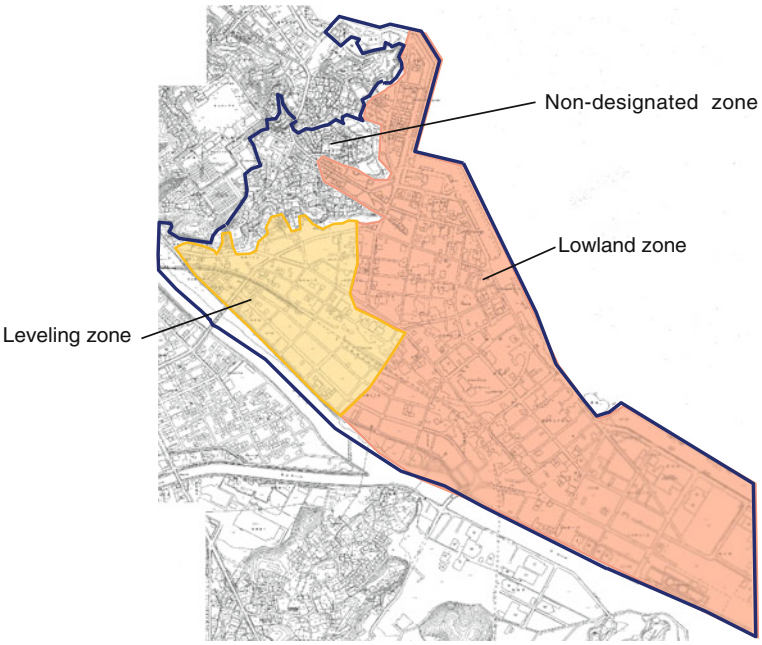


**Fig. 10.3** Zone planning of Minami-Kesennuma for recovery (Kesennuma City 2012b)

representatives elected from the landowners was established and contents of the project was discussed with the committee members and the authority. According to the plan proposed in January 2013, land development for public housing finishes. Subsequently, the public housing will be build, and then people can move in the houses. Lots for the landowners are serially redeveloped from fiscal 2014 to fiscal 2017 by the project, and then the owners can rebuild their house similarly. Development of 14 lots for the group relocation project is expected to finish within fiscal 2017. On the other hand, in the first case in the city, development of lands and construction of public housing are completed in fiscal 2014. Minami-Kesennuma is the last case of completion of such projects in the city because of leveling the land. Thus, the projects needs at least 5 years from the EJET to begin to live in the area.

Although land readjustment project employs land-space exchange system, area for residential normally decreases since area for public is kept more than the previous one. Besides, area of a lot developed by group relocation project is limited by 330 $m^2$. There is not a few that area of a lot for residential after the project is less than the one before the project. Compensation of lands for residential is paid as same as the current price by the government in the lowland zone, however, landowners in the lowland zone have to buy or rent a lot in the group relocation project site if they participate in the project. Furthermore, there is basically no subsidies for housing reconstruction. Thus, every project conducted in the leveling zone has a system that area of a lot for residential decreases than the previous and housing reconstruction has to be paid by victims' own cost.

## 10.4 Result and Analysis of Questionnaire Survey to Residents of Minami-Kesennuma

### *10.4.1 Wish for the Place of Future Settlement*

This part shows result and analysis of questionnaire to those who lived in Minami-Kesennuma before the EJET. Number of the respondents is 437. Result of calculation by designated zone is leveling zone: 139, lowland zone: 234 and non-designated zone: 64. It is considered that many respondents from the non-designated zone were not affected by the EJET. For this reason, hereafter only responses from leveling and lowland zone is used for analysis.

Table 10.3 is a cross table regarding result of the question "Where you wish to live in future?" Designated zone, family structure (presence of children and presence of the elderly) and current housing situation are set up as parameters in the table. Looking at the result by the designated zone, response rate of "In Minami-Kesennuma" is higher in leveling zone, in contrast, one of "Outside of Minami-Kesennuma" is higher in lowland zone. Though, even leveling zone has 32 % (44/139) of respondents who wish to live outside of the area. The answer of its reason was that "I do not want to live near sea." is the most (43 %, 19/44), subsequently "I cannot wait for completion of projects such as land readjustment, group relocation and public housing." ranks second (36 %, 16/44). Looking at the result by presence of children, households, which have any age of children answered wish to live outside of the area with higher rate than households living without a child. Looking at the result by presence of the elderly, number of households which have a wish for living in Minami-Kesennuma reaches 30 % (62/208) in households having 65 and over as well as 29 % (48/165) in ones not having 65 and over. There is almost no difference in both percentage. This means reconstructed affected-community is conjectured to become aging population structure relatively. Lastly, 43 % (47/110) of the respondents who have a wish for living in Minami-Kesennuma has lived in temporary housing since the EJET. This rate is the highest than the others.

### *10.4.2 Motivation to Be Involved in Community Activities*

Figure 10.4 shows a result of asking motivation in cooperating to run future community activities to those who experienced to do before the EJET. Furthermore, it is calculated to be divided into the case whether there is a wish to live in Minami-Kesennuma in future if the answer is yes.

As for general meetings and/or gatherings of neighborhood association, number of respondents who experienced to run such activities is 131, the highest of all choices, and the answer rate that the respondents have a wish to cooperate to run future activities is 27 % (26/131). In addition, the answer rate those who have a

**Table 10.3** Cross table regarding wish for the place of future settlement (N = 373)

| Parameters | In Minami-Kesennuma | Outside of Minami-Kesennuma | The place is unclear | Total |
|---|---|---|---|---|
| **Number of respondent** | 110 | 164 | 99 | 373 |
| **Category of designated zone [SA]** | | | | |
| Leveling zone | 61 | 44 | 34 | 139 |
| Lowland zone | 49 | 120 | 65 | 234 |
| **Family structure 1: Presence of children [MA]** | | | | |
| Pre-school children | 3 | 8 | 7 | 18 |
| Elementary and secondly school | 9 | 19 | 10 | 38 |
| Student 15 and over years old | 6 | 23 | 5 | 34 |
| There is NOT school children | 92 | 114 | 77 | 283 |
| **Family structure 2: Presence of the elderly [SA]** | | | | |
| There is 65 and over | 62 | 91 | 55 | 208 |
| There is NOT 65 and over | 48 | 73 | 44 | 165 |
| **Current housing situation [SA]** | | | | |
| Temporary housing (prefabricated) | 47 | 49 | 19 | 115 |
| Temporary housing (rented apartment) | 22 | 48 | 10 | 80 |
| Relative's house | 3 | 4 | 2 | 9 |
| Acquaintance's house | 1 | 0 | 0 | 1 |
| Same house as before the disaster | 22 | 4 | 10 | 36 |
| Others | 9 | 42 | 36 | 87 |

wish to live in Minami-Kesennuma in future within the respondents is 9 % (12/131). Regarding the other community activities, respondents who answered wish to cooperate to run future activities and to live in Minami-Kesennuma are less than a few. Thus, it is expected that number of people who once experienced to cooperate to run community activities, which is realized by residents' voluntarism, decreases extremely in reconstructed community.

## 10.5 Discussion on Lessons of Community Recovery in Tsunami-Affected Area

From the analysis, lessons of community recovery is summarized as following; early concept-making and consensus-building for recovery, housing reconstruction support in terms of re-building community and resilience building in the recovery process by involvement of multi-stakeholders in community recovery process.

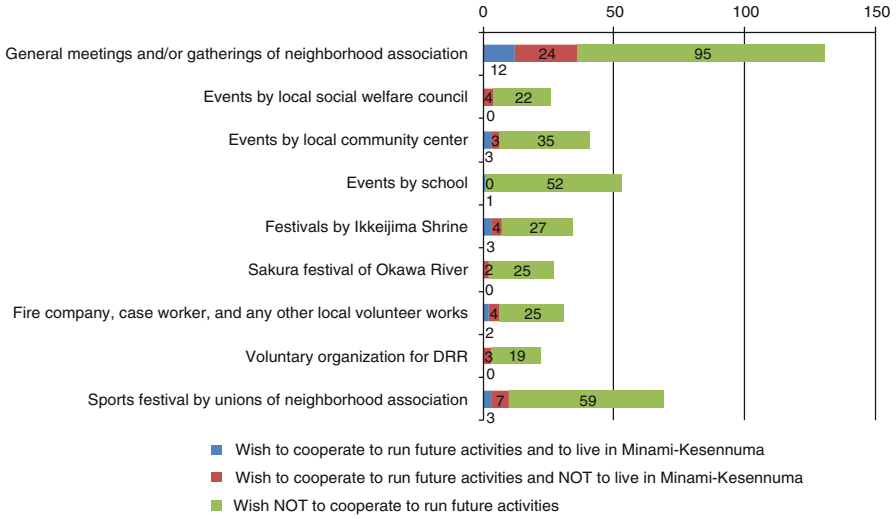


**Fig. 10.4** Motivation in cooperating to run future community activities by those who experienced to do before the tsunami

### *10.5.1 Early Concept-Making and Consensus-Building for Recovery*

Kesennuma City Recovery Plan, which includes basic concept of community recovery in Minami-Kesennuma, this study area, was issued after 7 months from the EJET. Though there was an opportunity for representatives of citizens, not representatives of community leaders from Minami-Kesennuma and others, this plan was developed with rather top-down than bottom-up. Moreover, several intention surveys on housing reconstruction to affected people was conducted as a people participatory method to make community recovery plan, however, they had a lack of chance to take part in the consultation to make their community recovery plan which was developed with the administrative initiative.

In the Kobe Earthquake of 1995, two step planning determination procedure was adopted, which aims to examine issues included in two step planning determination procedure and to grasp flexibility of planning determination in the second step (Shiozaki 1998). There was an argument about it that recovery plan could be developed earlier with the administrative initiative by this method in regards of early recovery (Takayose 1996), in contrast, it was also discussed that this method with people participatory in the second step played a role to fix a plan developed by local government in the first step (Shiozaki 1998). However, recovery plans approved by the administration in the first step were not what people wanted in many local governments and such a gap in understanding between the administration and the people can be seen in unilateral decisions regarding urban planning during the chaos after the earthquake (Shaw and Goda 2004). For this reason, some

researchers stated that it would be effective for early consensus building to develop community recovery plan by consultative meeting consisted of local people in the community from the first step (Kishi et al. 1997). The lack of local community involvement and engagement of affected citizens act as a detriment to any long-term plans for sustainable recovery and change (Pardasani 2006). For making long-term strategies, time is needed to plan and communicate appropriately; hurried policies with long-term implications should be avoided, despite the temptation to restore permanence as soon as possible (Ingram et al. 2006). In the recovery process of Santa Cruz City after the Loma Prieta Earthquake of 1989, for instance, it was suggested to develop a basic concept of recovery as soon as possible and to create the detailed plan with community people slowly over time (Murosaki 2009). The detailed plan was a synthesis of many ideas expressed and refined over the 15 months since the earthquake had happened. To gather the ideas from affected citizens, the City established a working group of broad representation, known as Vision Santa Cruz, immediately after the earthquake (City of Santa Cruz 2009). Moreover, the plan had flexibility to amend. In fact, the plan was issued in 1991 and was updated total seven times until 2009. From two cases of the Kobe Earthquake and the Loma Prieta Earthquake, it is indicated that early concept making, early dialogue with affected community people for consensus building and dynamism to change a plan with flexibility in accordance with the dialogue are vital.

On reconsidering the Minami-Kesennuma case, around one-third of those who lived in the leveling zone and have an intention of moving out from Minami-Kesennuma showed its reason as they cannot wait for completion of reconstruction projects. Applicants for both group relocation project and public housing project in the area did not reach the fixed number. In light of previous research, development of community recovery plan by top-down with a lack of community involvement is considered as its reason. Here, as the refrain why development of the master plan for recovery was slow, it is indicated that creating opportunities for gathering community people who lived separately in temporary housing and others after the EJET would be necessary so that early dialogues among the people to make a concept of community recovery was carried out.

### *10.5.2 Housing Reconstruction Support in Terms of Re-building Community*

In this case, area of the land they could have decreased if landowners selected to possess their land after completion of reconstruction projects in Minami Kesennuma. Besides, public housing that victims could rent reasonably was prepared as a relief for victims who would not be able to reconstruct their house because subsidies for housing reconstruction was basically nothing. In addition, selecting residents of public housing in Minami-Kesennuma from applicants who lived in the same area was prioritized. As a result, those who did not have enough

funds to build their house outside of the area had tendency to choose reconstruction of their house in the area or occupancy of public housing. It is considered this makes reconstructed community aging and vulnerable as shown by the questionnaire survey. Therefore, linkage between community reconstruction program and housing reconstruction program such as subsidies and/or incentive to housing reconstruction for promotion of intergenerational exchange is essential. At Tukiji District in Amagasaki City of Japan, housing improvement program was adopted besides land readjustment as community reconstruction project after the Kobe Earthquake so that many landowners as well as renters who had lived before the earthquake remained in the district (Ando et al. 2001). Hiwaki and Matsuyuki (2013) discussed on the basis of their research that cause of high intention to settle down in land relocation in Ache after the Indian Ocean Tsunami was complementary housing supply to affected households who lost their house.

### *10.5.3 Resilience Building in the Recovery Process by Involvement of Multi-stakeholders*

The analysis of this survey showed those who were young generation or had experienced community management possibly decreased in the reconstructed community. Generally, community whose member is high rate of the elderly and low of experienced people on community management is vulnerable to disasters.

As mentioned already, many researchers emphasized that one of the keys for community recovery was involvement of multi-stakeholders. For this reason, resilience building for reconstructed community with various stakeholders in the recovery process is a challenge.

Concretely, it is considered to take measures at two stages in the community recovery process; planning and temporary housing. At the planning stage, problem in Minami-Kesennuma case is pointed out as consultation with the authority on reconstruction program for the leveling zone was carried out by only some representatives of landowners. In view of life stage at young generation, however, a lot of young people without their own land live with their parent(s) who own their land or live in rented house so that participation of young generation can be hardly gained if condition of participation has a limit of land owners as this case. Additionally, various stakeholders such as not only landowners but also renters and merchants were involved in community management before the EJET, however, opinions from such stakeholders except land owners are not reflected on community recovery if target to participate in the consultation limits only landowners. Involving local citizen groups in coalition with government and private disaster organizations will improve the effectiveness of a program (Bolin and Stanford 1991). It is needed to make reconstructed community resilient by involvement of multi-stakeholders at the stage of making community recovery plan and by being conducted as actors or supporters of the plan.

Another is the stage of temporary housing. In general, people who had experience to be a board member of neighborhood association have good means so that the people probably considered to select relocation from early on rather than temporary housing which is smaller than the average size of houses in Japan (Ueda and Shaw 2014). This results in decrease of the experienced people in reconstructed community. Therefore, it is important to have a view of capacity building for newly experienced people in reconstructed community who enable to manage neighborhood association in the process of community recovery from plan-making to reconstruction. This study showed that rate of residents in temporary housing who would resettle in affected area was higher. This means, capacity building for organizing community with various stakeholders in temporary housing can be preparedness and training for reconstructed community where experienced people are expected to decrease. Consequently, support for re-building community in temporary housing should be made actively as a measure in reconstructed community to be built resiliently.

**Acknowledgements** This chapter is written on the basis of knowledge gained from activities by SEEDS Asia supported from Church World Service and many other related organizations. The authors thank for relevant stakeholders to cooperate its activities.

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# Chapter 11
# Establishment and Sustainability of Emergency Radio in Tohoku: Implications and Key Lessons

**Jun'ichi Hibino and Rajib Shaw**

**Abstract** In the disaster-hit area of the Great East Japan Earthquake and Tsunami, 30 temporary disaster radio stations where set up during the period from immediately after the disaster until 1 year after it and provided detailed information needed by the victims to live through disaster. And, 3 years from the disaster, half of these stations where operating as revitalization radio stations. The role changed from providing information in times of emergency to soothing the traumatized minds of the victims, and then acting as media which provided a bridge between residents to revitalize their communities. Although the necessity of emergency radio stations broadcasting information during the emergency support period has been discussed up to the present, with the Great East Japan Earthquake and Tsunami disaster the actual role the emergency radio stations played at each point in time from the time the disaster struck is revealed when viewed in time phases.

In this research, using the example of temporary emergency radio stations in the Great East Japan Earthquake and Tsunami, the necessary conditions for the setting up and continuation of activities of emergency radio stations are identified, and the outstanding points and problems of the institutionalized temporary emergency radio stations in Japan are discovered. Also, by comparing emergency radio stations in Asian countries where there are many disasters, it derives points to improve so that the institutionalization of temporary emergency radio stations will meet the needs of the disaster area.

**Keywords** Emergency radio • Community radio • Broadcasting • Local government • Residents

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R. Shaw (ed.), *Tohoku Recovery*, Disaster Risk Reduction,
DOI 10.1007/978-4-431-55136-2_11

## 11.1 Introduction

In the Great East Japan Earthquake and Tsunami, buildings and houses collapsed, huge damages were caused by fissures in the ground and landslides. On top of this, buildings and people were washed away in an unprecedented tsunami that hit an unimaginably wide area. Cities and towns such as Otsuchi Town and Rikuzentakata City in Iwate Prefecture as well as other cities and towns along the Pacific coastline were practically wiped out by the tsunami. In such circumstances, people had to face the cold, insecurity, fear and sadness. They wanted to know what will happen, if family and friends are safe, where and how relief will come and how they are going to live in the future. Here, 'information needed for living' is as important as relief aid.

When disasters occur, it is usually the local government that is depended on to disseminate information, however, in the Great East Japan Earthquake and Tsunami, those local government agencies that were depended on were victims themselves resulting in the paralysis of disseminating emergency information. Because of the unprecedented scale of the disaster, it became very difficult for local governments to quickly resume functioning as normal (Ichikawa 2012).

It would have been very meaningful if local media could have taken on the role of disseminating information instead of the local authorities that found themselves in the situation they were in. Unfortunately, there were few disaster hit areas that had local media, especially, in the coastline area of the Tohoku region at the time of the earthquake. No such media existed that could respond to such circumstances.

On the other hand, local media at the prefecture level and mass media at the national level continued to broadcast news day and night on the Great East Japan Earthquake and Tsunami. Taking into account the scale and enormity of the disaster, it was impossible for media that covered such a wide area to broadcast information from every disaster-hit area (Murakami 2012). Circumstances were extremely difficult for victims to obtain 'information necessary for living' and 'information that made victims want to live' from the mass media.

It is only reasonable that the residents of the town or community that needs disaster information and recovery/revitalization information disseminates that town or community's information. In such circumstances in the disaster-hit area, temporary disaster radio stations were set up one after another to with the goal to disseminate community disaster and recovery/revitalization information.

After the Great East Japan Earthquake and Tsunami, 10 temporary emergency radio stations used existing community radio station in three prefectures in the Tohoku area and the north coastline area of Kanto, and 20 stations were newly started, making a total of 30 temporary emergency radio stations starting off, a number previously unheard of. Two years and 9 months after the disaster occurred, half of these, 15 stations are still broadcasting (Kanayama 2012).

There are no examples of such a number of emergency radio stations being set up and continuing broadcasting through the revitalization period since that in Indonesia when the tsunami in the Indian Ocean struck. This chapter, using the

Great East Japan Earthquake and Tsunami as an example, examines the required conditions for the setting up and continuation of activities of such emergency radio stations.

## 11.2 Required Conditions for Setting Up Emergency Radio Stations

On November 8, 2013, the super typhoon Haiyan struck the Philippines. According to a United Nations Office for Coordinating Humanitarian Affairs (UNOCHA) report (Dec. 16), the devastating damage resulted in 14,100,000 victims, 4,100,000 people still living in evacuation and damage to 1,100,000 houses. And according to the UNOCHA report, 14,100,000 victims were still unable to receive adequate information on relief aid and recovery 1 month after the disaster (UNOCHA 2013).

UNOCHA pointed out the necessity of providing information through emergency radio stations and distributing radio receivers as has been done in previous disasters (UNOCHA 2013). The international NGO Internews and First Response Radio with the cooperation of The Philippine Information Agency set up a number of portable (suitcase-type) radio stations in Tacloban on Leyte Island. In the Philippines, it takes 1 year to obtain a community radio broadcasting license, however, a mobile radio station can obtain a license in 1 month (Internews 2013).

Access for overseas media is easy in areas such as Tacloban on Leyte Island and Cebu Island as well as Manila. These are regarded as 'major' disaster areas where the media originally covered. In these areas, existent large radio stations have resumed broadcasting.

However, the typhoon disaster was widespread and information from radio stations did not reach residents in what might be called 'minor' disaster areas in the west and north (FMYY 2013). World Association of Community Radio Broadcasters (AMARC) in cooperation with the local NGO Kodao Productions is working to set up radio stations in areas, which are been neglected in relief support (AMARC 2014).

When comparing the setting up conditions of these emergency radio stations in the Philippines and those of emergency radio stations after the Great East Japan Earthquake and Tsunami, Table 11.1 shows how quickly and over a wide area emergency radio stations were set up after the Great East Japan Earthquake and Tsunami. Two weeks after March 11, 2011 when the disaster struck, 5 radio stations had been set up, 1 month after, a total of 9 stations had been set up. Together with the existing community radio stations that changed their licenses to emergency radio stations which greatly increased the range of output, a total to 19 emergency radio stations were broadcasting within 1 month after the disaster.

In disasters, communications infrastructures are destroyed leaving victims without a means of information communication. Also, when a disaster occurs there are

**Table 11.1** View of temporary emergency radio stations in Great East Japan Earthquake and Tsunami

| | | | As of March 31, 2014 | |
|---|---|---|---|---|
| Prefecture | Municipality | Established date | Closed date | Type |
| Iwate | Miyako City | 19 March, 2011 | 31 March, 2014 | New establishment |
| | Otsuchi Town | 28 March, 2012 | Continuing | New establishment |
| | Kamaishi City | 7 April, 2011 | Continuing | New establishment |
| | Ofunato City | 28 March, 2011 | 31 March, 2013 | New establishment |
| | Rikuzentakata City | 10 December, 2011 | Continuing | New establishment |
| | Hanamaki City | 11 March, 2011 | 3 April, 2011 | Existing community radio |
| | Oshu City | 12 March, 2011 | 29 March, 2011 | Existing community radio |
| Miyagi | Kesennuma City | 22 March, 2011 | Continuing | New establishment |
| | Minami Sanriku Town | 17 March, 2011 | 31 March, 2013 | New establishment |
| | Tome City | 16 March, 2011 | 25 March, 2013 | Existing community radio |
| | Osaki City | 15 March, 2011 | 14 May, 2011 | New establishment |
| | Onagawa Town | 21 April, 2011 | Continuing | New establishment |
| | Ishinomaki City | 16 March, 2011 | Continuing | Existing community radio |
| | Shiogama City | 18 March, 2011 | 30 September, 2013 | Existing community radio |
| | Natori City | 7 April, 2011 | Continuing | New establishment |
| | Iwanuma City | 20 March, 2011 | 31 March, 2014 | Existing community radio |
| | Watari Town | 24 March, 2011 | Continuing | New establishment |
| | Yamamoto Town | 21 March, 2011 | Continuing | New establishment |
| Fukusima | Soma City | 30 March, 2011 | 31 March, 2014 | New establishment |
| | Minami Soma City | 16 April, 2011 | Continuing | New establishment |
| | Fukushima City | 16 March, 2011 | 25 March, 2011 | Existing community radio |
| | Tomioka Town | 11 March, 2012 | Continuing | New establishment |
| | Sukagawa City | 7 April, 2011 | 7 June, 2011 | New establishment |
| | Iwaki | 28 March, 2011 | 27 May, 2911 | Existing community radio |
| Ibaragi | Kashima City | 13 March, 2011 | 1 June , 2011 | Existing community radio |
| | Tsukuba City | 14 March, 2011 | 15 April, 2011 | Existing community radio |
| | Takahagi City | 8 June, 2011 | 31 March, 2013 | New establishment |
| | Toride City | 1 August, 2012 | 31 January, 2013 | New establishment |

**Table 11.2** Who supported setting up the emergency radio station (hardware side)?

| Group | Group 1 | Group 2 | Group 3 | Group 4 | Group 5 |
|---|---|---|---|---|---|
| Supporter | Community Radio | Mass Media(or person in Mass Media) | Community Radio + Mass Media | NGO | Self-setting |
| Name of radio station | -Otsuchi<br>-Ofunato<br>-Kesennuma<br>-Watari<br>-Yamamoto<br>-Soma | -Kamaishi<br>-Onagawa<br>-Natori<br>-Tomioka | -Minami Sanriku | -Rikuzen Takata | -Miyako<br>-Osaki<br>-Minami<br>-Sukagawa |
| Percentage figure | 37.75% | 25% | 6.25% | 6.25% | 25% |
| | 68.75% | | | | |

large-scale blackouts. The radio is disaster resilient and not affected by blackouts and even if its equipment is damaged in the disaster and can be relatively easily resumed or set up again. This is not necessarily radio broadcasting that covers a wide area. Low output radio stations set up in disaster areas where victims can gather, communicate and share detailed information relevant to each area play an important role. After a disaster, how quickly a emergency radio station can be set up and information passed on to victims is essential for relief activities for every disaster area.

Tables 11.2, 11.3, and 11.4, show the conditions required for the quick setting up of emergency radio stations over a wide area after the Great East Japan Earthquake and Tsunami; (1) broadcasting license, (2) broadcasting facilities, broadcasting equipment, (3) skills, human resources, (5) funding (financing), (6) cooperation between government offices and radio stations, (7) networking with the outside. One can see that these seven conditions must be met. Below, these seven conditions will be examined. Three-fourths of the emergency radio stations were set up with outside assistances. Remaining radio stations which were launched without outside assistances had human resources who had the knowledge and the experience to set up the radio station as it happened.

More than two-third of the emergency radio stations were set up with outside assistances. Meanwhile, five emergency radio stations which were set up by themselves had local human resources to operate the broadcasting equipment. Three of the four radio stations that only local government had the initiative (Group 1) and all the two radio stations that only community people had the initiative have been already closed, whereas all the ten radio stations that have a

**Table 11.3** Who supported the emergency radio station at first (human resources)?

| | Group 1 | Group 2 | Group 3 | Group 4 | Group 5 |
|---|---|---|---|---|---|
| Supporter | Community Radio | Mass Media (or person in Mass Media) | Community Radio + Mass Media | NGO | Self-setting |
| Name of radio station | -Otsuchi<br>-Ofunato<br>-Kesennuma<br>-Minami Sanriku<br>-Soma | -Kamaishi<br>-Onagawa<br>-Natori<br>-Tomioka | -Miyako | -Minami Soma | -Rikuzen Takata<br>-Osaki<br>-Watari<br>-Yamamoto<br>-Sukagawa |
| Percentage figure | 31.25% | 25% | 6.25% | 6.25% | 31.25% |
| | 62.5% | | | | |

**Table 11.4** Who has the initiative to set up and to run the emergency radio station?

| | Group 1 | Group 2 | Group 2 |
|---|---|---|---|
| | Local Government | Local government and community people collaboratively | Community people |
| Name of radio station | -Kamaishi<br>-Ofunato<br>-Minami Sanriku<br>-Soma | -Miyako<br>-Otsuchi<br>-RikuzenTakata<br>-Kesennuma<br>-Onagawa<br>-Natori<br>-Watari<br>-Yamamoto<br>-Minami Soma<br>-Tomioka | -Osaki<br>-Sukagawa |
| Percentage figures | 25% | 62.5% | 12.5% |

partnership between local government and community people (Group 2) sustain their broadcasting activities. It shows that the emergency radio station does not sustain the activity without partnership between local government and community people is required.

### *11.2.1 Broadcasting License*

To meet the needs of disaster areas, it is necessary to obtain either a community broadcasting license or a special license for emergency radio broadcasting as quickly as possible from authorities that control radio wave communications.

With one telephone call from the local government authorities The Ministry for Internal Affairs and Communications' Tohoku General Communications Bureau took swift and flexible action issuing broadcasting licenses (MIC 2013). Also, there were no limits on emergency radio's wavelength output provided they 'do not interfere with other ultra-shortwave broadcasting stations' as stated in Wireless Radio Act. In Japan, although existing community radio stations operate with a 20 W output, there are stations that broadcast using an output of up to 150 W (Ichikawa 2012).

### *11.2.2 Broadcasting Facilities/Broadcasting Equipment*

To set up emergency radio station transmission facilities, broadcasting studio, broadcasting equipment, etc., in other words necessary broadcasting facilities and equipment must be urgently acquired. Also, it is meaningless if there are no radio receivers even if broadcasting begins. In disasters such as tsunami, typhoons, earthquakes or fires, in most cases, radio receivers that residents formerly had are lost. Immediately after a disaster occurs, if the government, NGOs, the media and private companies supply a large number of radio receivers to disaster areas, victims can obtain information. Since electricity supply is often cut off in disaster areas, radios that can be charged by a hand-rotating charger or by attached solar panels and which batteries are not needed are particularly useful immediately after a disaster.

68.75 % of emergency radio stations were able to set up stations by receiving support from existing community radio stations or commercial radio stations. One station was able to set up a station by receiving support from an international NGO. 25 % set up broadcasting stations without outside assistance. These stations were in areas which had accumulated knowledge and experience because preparation had been made prior to the disaster to set up community radio stations in the area or had previously had radio broadcasting for a limited period.

Though radio receivers are essential to listen to radio broadcasts, in reality many disaster victims did not have radios. There were many areas where people weren't

accustomed to listening the radio. Most people listen to the radio while only when driving and didn't have a radio in the house, or if they had, in most cases it was lost in the tsunami. There was a great shortage of radios in the disaster areas. To cope with this situation, tens of thousands of radios were sent to the disaster areas by the Japan Community Broadcasters Association (JCBA), electrical appliance manufacturers like Sony and Panasonic, as well as domestic and foreign NPOs, NGOs and ordinary residents (Murakami 2012). OXFAM Japan supplied 20,000 radio receivers with hand-rotating chargers or solar panel chargers as well as radios, which could charge mobile phones (Oxfam 2011).

### *11.2.3 Skills*

The most fundamental skill for community radio broadcasting is the correct setting up of the transmitter and antenna to ensure radio waves reach as wide an area as possible. Next is ensuring a supply of electricity. These skills can be optioned from outside. For gathering information to be broadcast, a variety of information communication skills are used. Information networks; the Internet, telephone (fixed & mobile), amateur wireless, etc. which can be utilized to obtain information to meet the needs of the disaster are required.

Community radio stations, commercial radio stations, international NGOs and private companies which have the basic broadcasting skills supported the setting up of emergency radio stations over a wide area of the disaster region. Financial support came from the Japan Foundation and other private foundations. Regarding electricity supply, there were blackouts over a wide area in the disaster region immediately after the disaster. Though existing community radio stations switched over to emergency electricity supply to broadcast, the supply of fuel (gasoline, light oil) was tight and follow-up supplies could not be obtained causing some stations to have to stop broadcasting. On the other hand, new emergency radio stations, the earliest set up 5 days after the disaster, were not affected because by that time electricity supply had resumed (Murakami 2012). However, in some areas, the Internet network took time to recover.

### *11.2.4 Human Resources*

For broadcasting, while personnel with broadcasting experience and personnel with information transmission experience are necessary, it is not easy to secure such experienced people in the disaster area. In such circumstances, people with experience in broadcasting from outside enter the disaster area and engage in broadcasting activities when the radio station is set up. However, since there is a limit to how long these outsiders can continue their activities, it is necessary to train insiders (local people) as quickly as possible.

Experienced people from outside community radio stations, commercial radio stations and NGOs were involved in 68.75 % of the newly set up emergency radio stations in broadcasting activities and training local people at the same time, also, some individuals who had experience also supported as volunteers. On the other hand, the other 32.25 % did not depend on outside human resources. Local people got engaged in broadcasting activities from when the emergency radio stations were set up. In this case, starting broadcasting without outside human resources help was possible for the following reasons; in the area (1) there was someone who was previously involved in the preparation of setting up a community radio station, (2) someone who had experience in mini-FM broadcasting or experiments, (3) someone who had been involved in other radio programs, (4) someone had an acquaintance who was involved in community radio or radio, (5) there was someone who had a talent in information transmission or acoustics.

It is also very important to secure personnel in the area who can work with equipment and in broadcasting activities. There are many difficulties encountered when opening a new temporary radio station, nobody has experience, staff are gathered from evacuation shelters or are introduced by acquaintances. It is necessary to think about the number of people required for broadcasting activities and the roles they will play and then gather them and provide the necessary training to those who have been assembled.

Regarding these points, in areas that previously had mini-FM experience or preparation for community radio broadcasting assembling personnel went relatively smoothly.

### *11.2.5 Funding (Financing)*

It is not an easy task to set up a emergency radio station immediately after a disaster without outside support. It is necessary to secure the hardware required; transmitting facilities, broadcasting studio, and broadcasting equipment as well as personnel as quickly as possible. However, financing for such activities is necessary. In the situation of past emergency radio stations, in many cases, direct financial support came from private funding associations, international aid agencies, etc, and indirect support came through NGOs who entered the disaster areas (especially NGOs specializing in information transmission) and radio stations, etc.

The Nippon Foundation provided between 6.5 million yen and 8.5 million yen per station to all emergency radio stations (Ichikawa 2012). Each station used this funding for broadcasting facilities, and the cost of equipment, staff training and staff pay. Financial support for running emergency radio stations came from the Central Community Chest of Japan and private companies (Kanayama 2012). The largest funding that helped the continuation of emergency radio activities came from the central government's emergency employment funding. Through this, emergency radio stations were able to employ local personnel. Two years and nine months after the outbreak of the disaster, though funding from the private

sector is tapering off, the continuation of broadcasting activities is made possible through this (central government) funding.

However, on the other hand, this means that if funds to pay for staff labor costs cannot be secured, the continuation of broadcasting activities is difficult. Furthermore, it can also be a factor impeding participation in volunteer activities. Though funds to pay staff labor costs are required for stable broadcasting to continue for a long period, to continue broadcasting for a long time without adequate funding, the participation of a larger number of citizen will be required.

### *11.2.6 Cooperative Relationship Between Local Government Offices and Residents*

To provide residents with accurate disaster information, emergency life-saving information, evacuation shelter information, safety and contacts of individuals, as well as other information required for everyday living electricity supply and telephone, a close relationship between governmental disaster prevention/mitigation agencies and emergency radios is essential.

Immediately after a disaster, licenses for temporary emergency radio station to be set up were given to heads of local governments. There are cases when local governments actually undertake the running emergency radio stations and cases where the actual running of the stations is commissioned to local NGOs or private groups. However, generally speaking, a distinction is made between community radio stations and public (government run) radio stations, and even in times of disaster, community radio stations should not be under the control of the authorities. An example, in the case of the accident at the Fukushima Nuclear Power Plant where there was radiation damage because the government, disaster prevention agencies and the electricity supply company intentionally did not release information, residents were unnecessarily exposed to radiation.

Though the government took the initiative in setting up emergency radio stations, of the four in operation, two were shut down and it was decided that the other two would be shut down in March 2014 (referring to Tables 11.1 and 11.4). Tables 11.2 and 11.3 show support of emergency radio in terms of financial and human resources. The two stations that were shut down were not permitted to broadcast information other than that from the authorities, and broadcast content was strictly checked by the authorities. The authorities had complete control of editing information. In other words, they were radio stations run by the authorities. Regarding the other two stations, resident participation in broadcasting activities never progressed (Matsuura 2012). Meanwhile, emergency radio stations that were set up through the cooperation of the authorities and residents and are still being run have the intention of continuing their activities as disaster revitalization radio stations (referring to Tables 11.1 and 11.4).

Although cooperation with authorities responsible for disaster management is essential in times of disaster, emergency radio stations are not government run stations. What is necessary is that a system is needed where people with interests based in the community (community stakeholders) are involved in the radio station's activities and support each other based on trusting relationship, and if necessary check each other.

Government authorities have their positions, residents have their expectations, and broadcasters their ideas. It is not an easy task to broadcast balancing these three parties. However, there are many cases that the better the communication between the people in charge in the local government and broadcasting staff is and the more each respect each other's roles and positions, the better broadcasting content and management become.

### *11.2.7 Networking with the Outside*

For emergency radio stations to be set up and continue broadcasting, various kinds of support from the outside are essential. Through funding, materials, knowledge and experience from outside radio stations, NGOs, private companies and individuals, facilities and equipment needed to set a station can be obtained and necessary staff assembled. If networks with outside people prior to a disaster exist, setting up a radio station can be achieved very quickly.

There was a difference in how long it took to set up a emergency radio station depending on if a network with the outside existed or not. Areas which had connections with people in radio broadcasting or other such people prior to the disaster were able to set up a emergency radio station within 1 week from when the disaster struck even if there was a lack of resources within the area. On the other hand, areas that did not have radio broadcasting knowledge or experience, nor equipment or useful personal connections took up to 1 month after the disaster to set up a station.

Though there was a difference in how quickly a emergency radio station was set up depending on whether a network with the outside existed, diverse support in the form of materials, funding, broadcasting facilities, broadcasting equipment, program contents, staff and application procedures, etc. came from outside community radio stations, commercial radio stations, NGOs, and residents.

Emergency radio station activities in the disaster area were frequently covered in various media such as newspapers, television, radio and Internet, etc. In this way, the existence, activities and usefulness of emergency radio stations became known throughout the nation and resulted in support coming from all over the country.

## 11.3 A Comparison with Asian Region

More than 40 days after the disaster of the devastating typhoon Haiyan, 1,410,000 victims are not receiving relief aid information or recovery information. One reason is that there is no progress being made in the setting up of emergency radio stations. Though a number of mobile-type (suitcase radio station) stations have been set up in Tacloban on Leyte Island through the cooperation of Internews and First Response Radio and the Philippine Information Agency, as in the case of the Great East Japan Earthquake and Tsunami where the scale of damage covered a wide area, this has been found to be inadequate (UNOCHA 2014).

Also, in July 2013, the great disaster caused by flooding in the north of India mainly in Uttarakhand State left close to 1,000 confirmed deaths and 100,000 people having to evacuate. Though international relief agencies and local NGOs pointed out the need for setting up emergency radio stations, as of December, 2013, no emergency radio stations or radio stations for revitalization had been set up (AMARC 2014).

Looking back, though the following major disasters struck in Asia – major flooding in Pakistan in 2010, Cyclone Nargis in Myanmar in 2008 and the major earthquake in Sichuan, China – no emergency radio stations were set up (AMARC 2010).

There are community radio systems in both the Philippines and India, and especially in the Philippines there is a system for issuing licenses for mobile radio stations for a limited period. Nevertheless, the setting up of emergency radio stations is making no progress. The reason for this is seven necessary conditions are not met.

There are no community radio station systems in Pakistan, Myanmar or China, and there are no temporary measures for setting up emergency radio stations.

In Asia, examples of temporary emergency radio stations being set as are done in Japan after major disasters can be found in Indonesia and Thailand after the Indian Ocean tsunami in December 2004.

In Aceh, Indonesia, local NGOs received funding support from the Japan Social Development Fund for the setting up and running of 45 emergency radio stations between 2005 and 2006. Depending on the NGO, broadcasting facilities, equipment and the training of broadcasting personnel was provided (Prakoso 2008). Also, regarding the important condition of broadcasting licensing for setting up a station, in 2001, in Indonesia, community radio was institutionalized. Although it usually takes a few years to obtain a broadcasting license from the time an application until it is issued, if an application is made, a radio station can continue broadcasting on a trial basis. Trial broadcasting is stopped only when a problem occurs (Prakoso and Nugent 2006). Emergency radio stations were set up using this flexible broadcasting licensing system. And with NGOs as coordinators, close cooperation was built with local government authorities.

As in the case of the Great East Japan Earthquake and Tsunami, Indonesia met the seven required conditions; (1) broadcasting license, (2) broadcasting facilities,

broadcasting equipment, (3) skills, human resources, (5) funding (financing), (6) cooperation between government offices and radio stations, (7) networking with the outside. However, the problem is that the setting up of emergency radio stations for the Indian Ocean Earthquake and Tsunami (2004), West Sumatra Earthquake (2009), was led by the local NGO named COMBINE Resource Institution which is based in Yogyakarta. Because COMBINE Resource Institution was not involved in supporting the setting up of emergency radio stations in other disasters, emergency radio stations were not set up. The problem in Indonesia is that a system for emergency radio stations has not been established.

In the latter part of January 2014, a representative of the Indonesia Community Radio Network and two people in Indonesian community radio visited Japan and conducted a field survey on Great East Japan Earthquake and Tsunami temporary emergency radio stations. In Indonesia there is a community radio station system, but no system for temporary emergency radio stations. The Indonesia Community Radio Network has decided to appeal to the Indonesian Ministry for Communication and Information for the institutionalization of temporary emergency radio stations. On the day prior to the delegation's return to Indonesia, 16 people were killed in the large eruption on Mt. Sinabung in the northern region of Sumatra Island where eruptions have continued since September 2013 (BNPB 2014). After their return to Indonesia, the delegation applied to the Ministry for Communication and Information for the issuance of emergency radio licenses for the disaster area of Mt. Sinabung.

On the other hand, in Thailand immediately after Indian Ocean tsunami, seven emergency radio stations were set up in evacuation camps. In the construction period, 1½ years to 2 years after the disaster eight community radio stations were set up in disaster-hit areas. This was done with the support of the Thai Community Radio Association and domestic and foreign NGOs. Also, private companies donated funds through the Thai Community Radio Association for the purchase of equipment. Regarding broadcasting licensing, Thai was more flexible than Indonesia. When the Indian Ocean tsunami happened, the government and society were working towards systemizing community radio, and in November 2004, as a special governmental measure, prior to the Indian Ocean tsunami, if community radio stations paid 4,000 baht (about 189 US dollars), they could broadcast until December 2015. Regarding the relationship with local government, the Thai Community Radio Association working as a regional coordinator built good relationships and as a result emergency radio stations were set up and run. Here, the seven conditions were met (FMYY 2007).

## 11.4 Temporary Emergency Radio Stations

By examining a number of examples in Asia, it can be seen that the temporary emergency radio stations set up after the Great East Japan Earthquake and Tsunami were supported by a much firmer system.

The regulation of the temporary emergency radio station was instigated by the Great Hanshin-Awaji Earthquake in January 1995. On February 10, immediately after the Hanshin-Awaji Earthquake, the Ministry of Post and Telecommunications began a system whereby information required for living and relief information could be provided within a limited area when a major disaster, etc. occurs. With this, Hyogo Prefecture temporary emergency radio station (FM 796 Phoenix) broadcast by Hyogo Prefectural Government was set up. This emergency radio station broadcast information for living and information from the authorities (local government) from the Prefectural Office to disaster victims for 1½ months from 1 month after the earthquake (Murakami 2012). At the time, this was an extraordinary and temporary system. However, it was highly appraised and in 2001 the broadcasting law was changed as follows: [broadcasting for extraordinary and temporary purposes] [to assist the mitigation of damage when violent winds, heavy rain, flooding, earthquakes, large-scale fires or other such disasters occur] (MIC 2013).

With such a character, unlike community broadcasting, the main holders of (emergency radio station) licenses are public organizations (local government authorities, etc.) in the disaster-hit area. The period of the license is considered to be [if it should be primarily considered as; as measures to deal with the disaster in the disaster progress, the period it takes for disaster victims' everyday living to stabilize], [for relevant local governments, the dissolution of temporary housing for victims; for local governments, the consideration of the conditions to secure the means for information dissemination to disaster area residents; that the goals of expectations have been achieved, and the need for the radio station's operation no longer exists] (MIC 2013). There is no specified period. Also, regarding wavelength output, compared to community broadcasting which has 20 W output, temporary emergency radio stations are allowed to broadcast 'provided they do not interfere with the range of other ultra-shortwave broadcasting stations'. There are no limits if it is within this range. In other words, it is effective for normal community radio stations to increase their output as temporary emergency radio stations so broadcasts can reach all disaster affected areas when a major disaster occurs. The temporary emergency radio station system of which 'FM 796 Phoenix' after the Great Hanshin-Awaji Earthquake was the first example has proved very effective in disasters after that. In the March 2003 when Mt. Usu eruption in Hokkaido, Abuta Town temporary emergency radio station (FM Laketopia) broadcast information on essential utilities and information for revitalization to residents. Also, after the October 2004 Chuetsu Earthquake in Niigata Prefecture, 'FM Nagaoka' (Nagaoka City) converted into a temporary emergency radio station which covered both of Nagaoka City and Kotani City, 'FM Yukiguni' (Minami-uonuma City) set up one in Toka Town with local governments being the holders of licenses and began to provide information to the regions' residents. Temporary emergency radio stations also proved effective when the July 2003 Niigata-Chuetsu Offshore Earthquake occurred, and when the January 2011 heavy snowfall disaster in Akita Prefecture and Shinmoe-dake Volcano Eruption occurred in the same period (MIC 2013).

### *11.4.1 Licenses Issued Only to Local Public Organizations*

However, this does not mean that this system is without problems. The biggest problem is that licenses are issued to local public organizations. However, from the Great Hanshin-Awaji Earthquake to the Great East Japan Earthquake and Tsunami most temporary emergency radio stations were set up and run by existing community radio stations or local residents. And in the history of Japanese temporary emergency radio stations, only two stations have been run only by local government staff. These broadcasting stations, of which the holders of the licenses were local authorities who controlled editing of broadcasting content, could not provide information that met the needs of the residents. As far as the Great East Japan Earthquake and Tsunami is concerned, it was possible for temporary emergency radio stations which were set up and run through the cooperation of local authorities and residents but which the local authorities held the license and controlled editing to be closed down by the decision of the local authorities alone. Sukagawa Temporary Emergency FM in Fukushima Prefecture which served the area around the nuclear power station where many residents had evacuated after the Fukushima Daiichi Nuclear Power Station accident was shut down in June 2014 only two months after it had been set up.

Temporary emergency radio stations should be used to support victims of major disasters and the recovery of local communities that were destroyed. Cooperation and collaboration between local authorities and residents is essential. If there is communication between the two parties in normal times, this can be used in times of emergency. From now on, it is an issue for society as a whole to think about the role and responsibility of emergency radio stations in times of emergency and how collaboration and cooperation between local authorities and residents should proceed, including the design of the system.

Preparation for support policies for the setting up and running of emergency radio stations is also necessary. If large scale funding for the setting up and running of emergency radio stations had not come from The Nippon Foundation, 30 emergency radio stations would probably not have existed. Also, if the government's emergency employment policy did not exist, employment of staff would not have been possible. Continuing broadcasting for 3 years through the changing phases – support, recovery and revitalization – from when the disaster occurred has not been an easy task. To prepare for the next disaster, both the government and people need to consider how to support what is needed when it is needed.

## 11.5 From Emergency Radio to Community Revitalization Radio

Three years and one month have passed since the Great East Japan Earthquake and Tsunami, and 11 temporary emergency radio stations still continue their broadcasting activities. Many of the temporary emergency radio stations are located in small cities

and towns along the coastline which were destroyed by the earthquake, tsunami and nuclear plant accident. In these areas, reconstruction of communities is a major issue. There is no other purpose for temporary emergency radio stations continuing to broadcast other than for the rehabilitation and regeneration of the communities.

In spring of 2013, a staff of Rikuzentakata Temporary Emergency FM received her first postcard since the station started broadcasting from a listener living in temporary housing for victims. On the card, the listener wrote that they listened to the radio station every day and wrote about some of their favorite programs and that they looked forward to listening to the programs in future. She said, 'At last victims' feelings have now reached a level that allows them to write such postcards'. She also added, 'It takes time for the recovery of people's feelings and that she and those on the radio now feel sure that what they have been doing has been close to those victims' feelings'.

When deciding whether a temporary emergency radio station is needed or not, it is very important to consider whether broadcasts are being listened to and if it is being useful. However, it is very difficult for a small radio station in a disaster hit area to conduct a survey. Regarding listener response, taking the emotional condition of victims into consideration, it is difficult to expect them to take the initiative to send messages to the station by telephone, FAX, or e-mail.

As in the case of Rikuzentakata Temporary Emergency FM, like reconstruction, it takes time for the feelings of listeners to be voiced and come out. This is not something that can be known by measuring numbers or volume.

Under such circumstances, the government responded by extending Rikuzentakata Temporary Emergency FM's broadcasting license from its expiry date of December 10, 2013 to March 2015. Following Rikuzentakata Temporary Emergency FM, other 13 emergency radio stations' license expired at the end of March 2014. However, except one local authority-led emergency radio station, one community radio run emergency radio stations and one station that switched to a community radio station, the remaining ten stations renewed their licenses for 1 year.

While on the one hand these stations are extending the period of their service, support from the government's reconstruction budget and from society is decreasing, and funding from local authorities cannot be depended on. How activities can be continued proceeds to be a case of stumbling ahead. Temporary emergency radio stations exist in the communities that are sustaining recovery and reconstruction and should be supported within the communities.

With the prolonging of the reconstruction period and the reduction of support from society, for broadcasting activities to continue, there is a need to study such a system.

## 11.6 Conclusion

Broadcasting licenses, equipment and facilities and personnel are essential for the setting up of emergency radio stations and continuing broadcasting detailed information to disaster victims from immediately after the disaster, the support period,

the recovery period and revitalization period. And to support these personnel, equipment and facilities, funding, skills and outside networks are required. Furthermore, for emergency radio stations to reflect the needs of the disaster area communities, cooperation between the local authorities and residents is essential.

The Japanese temporary emergency radio station system is the only emergency radio system in the world. As was shown in the example of the Great East Japan Earthquake and Tsunami, a broadcasting license was obtained with just one phone call to the Ministry of the Internal Affairs and Communications. Therefore, if personnel, equipment and facilities are available, an emergency radio station can be set up immediately after a disaster. Also, existing community radio stations can, by using the temporary emergency radio station system, broadcast over a wider output.

However, through this research, a major problem with the temporary emergency radio station system was brought to light. That is, broadcasting licenses can only be issued to local public authorities. In reality, many temporary emergency radio stations are run through the cooperation of local public authorities and residents. However, some are, as public authority-run radio stations, one-sidedly closed down by the local authority, and some stations have their broadcast content censored. For emergency radio stations to exist as supporters of disaster victims from the time the disaster occurs to the revitalization of the community, the ownership, management and participation of various stakeholders needs to be guaranteed.

The possible role of local authorities immediately after a disaster, during the support, recovery and reconstruction is enormous. However, it is clear that without the work of residents groups, NGOs, volunteers, etc. disasters cannot be coped with. And the radio stations that are set up to use public wavelengths in the disaster area are public activities for disaster-area support. That the ownership of these radio stations be limited to local authorities needs to be reconsidered.

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# Chapter 12
# Recovery in Fukushima from Integrated Disasters

**Satoru Mimura**

**Abstract** Not only did the 3.11 earthquake and tsunami severely damage the coastal area of Fukushima, affecting its people and economy, it also caused meltdown and hydrogen explosion of Fukushima Daiichi power plant. As a result, more than 160,000 residents had no choice but to evacuate, living with uncertain future plans.

Because of evacuation, local communities, and many families too, were forced to be divided. Society and culture which had been cultivated through long history started to fade out. There have been various conflicts among residents over perception of radiation risk and compensation. Stress caused by long-term evacuation and changes in living environment are affecting victims' mental and physical health to a great extent.

There are residents who wish to but cannot return, not only because of concerns about exposure to radiation, but loss of social service, commercial activities and employment. There are an increasing number of people who give up on returning because of unclear future of evacuation life and fear of radiation exposure.

Fukushima University has supported, in various ways, the victims in Fukushima who are facing these different types of difficulties from other affected areas. Knowledge which has been obtained throughout the experience can potentially be applied, not only in the context of nuclear disaster, but also in recovery of disaster-affected area in general and conflict-affected area as well.

**Keywords** Nuclear disaster • Evacuation • Migration • Social issues • Livelihood

## 12.1 Introduction

The nuclear disaster in Fukushima Dai-ichi nuclear power plant was the world's first case of a massive "complex disaster" in which natural disaster triggered a tragic nuclear accident. On 11th March, 2011, Mw9.0 earthquake from off the Pacific coast of East Japan caused a massive tsunami, damaging Fukushima Dai-ichi nuclear power plant of TEPCO, causing power loss and ending up in

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R. Shaw (ed.), *Tohoku Recovery*, Disaster Risk Reduction,
DOI 10.1007/978-4-431-55136-2_12

meltdown and hydrogen explosion. Emitted radioactive substances, taking the form of atomic plume, flowed toward the North West direction from the NPP and later descended with snow and rain.

On 12th of March, evacuation was ordered to residents living within 10 km radius from the NPP. The order was soon changed to 20 km radius on the same day, and the residents living between 20–30 km radius from the NPP were ordered to stay inside the house. Later, area within 20 km radius from the NPP became "restricted area". There were high radiation spots scattered outside of restricted area, and those places were designated as "deliberate evacuation areas". Even in regions outside of those designated areas, such as Fukushima city or Koriyama city which were actually accepting evacuees from coastal region, residents who fear low level radiation exposure voluntarily evacuated from Fukushima.

As a result, the range of events gave a huge damage to society and economy. As many as 160,000 people were forced to evacuate from the affected area, many of which were concerned about health problem from the accident. On top of that, the accident triggered contamination in the surrounding environment. Thus the rehabilitation process from the disasters in Fukushima shows different aspects compared to other disaster affected regions.

To date, the affected people do not have a clear vision of when they can return to their original communities even to those areas where living restrictions have been lifted. Because of the lack of job opportunities, education, medical and other social services in their original communities, people cannot return. In addition, fear for radiation has not been wiped away yet.

After the disasters, Fukushima has been suffering from loss of "vigorousness" caused by depopulation mixed with deterioration of regional economy which is regarded by affections of nuclear contamination. However, many of the issues in Fukushima had been observed before the disasters.

## 12.2 Damages and Adverse Impact by the Disasters

The statistical data of direct damages in Fukushima by the earth quake and tsunami were relatively small compare to Miyagi and Iwate Prefectures. However, adverse impact by the nuclear accident is enormous and still continuing.

Due to the nuclear accident of Fukushima Dai-ichi nuclear power plant, radioactive substances have been widely diffused around the site. It raised various problems such as influence to citizens' health, contamination and reputational risk to agricultural and marine products, residential and entry restriction due to high contamination, and conflict between family and community members, hindering revitalization of the region to a great extent. In order for life of residents in Fukushima, local economy and industry to be reconstructed, what the problems stemming from radiation and radioactive contamination are should be revealed and it is necessary to find out solutions to them.

**Fig. 12.1** Life in temporary house after 3 years from the disaster

### *12.2.1 Victims and Evacuees*

One thousand six hundred and seven were killed and 207 are missing by the earthquake and tsunami in Fukushima Prefecture (as of December 2013). More than 160,000 or approximately 8 % of the total population of the prefecture were forced to evacuate, and as of March 2014, still nearly 140,000 are evacuating in and out of the prefecture (Fukushima Prefecture 2013a). Among this group around 100 thousands are from restricted area, mainly Futaba County where the nuclear power plant is located, while others are voluntarily evacuating, though they lived outside of the restricted area, mainly due to the fear for radiation.

About 90 thousands people are living in temporal housing in Fukushima Prefecture, and 50 thousands are staying outside of Fukushima. The number of evacuees outside the prefecture continues decreasing in line with the termination of housing support by host municipalities. Figure 12.1 is a picture related to the life in temporary houses.

Most of the evacuees have moved multiple times, some of them exceed 10 times, to places where they think they can have more secure life as the condition of the NPP changed by time. An enormous number of affected people are still spending their daily lives in the difficult environment of evacuation. Up until March 2014, 1,664 people had died in Fukushima identified as disaster related death, due to physical and mental exhaustion caused by the disasters. This figure is approaching the total number of direct casualties (1,607 people) and missing (207 people) from the quake and tsunami in Fukushima and it is still on the rise. After March 2012, more than a year after the accident, about 500 people have died, and the number is still increasing. Mortality risk for the elderly increased during evacuation, as the mortality ratio among residents evacuated

from nursing home in Futaba County is 2.7 times higher than other areas (Nomura et al 2013). The disasters still continue.

### 12.2.2 Dissolve of Families and Communities

According to the survey by Fukushima City one year after the disasters, over 80 % of its residents answered they felt fear for radiation (Fukushima City 2012). Particularly families with children were trying to avoid radiation dose by checking contamination level of foods, hanging laundry inside houses to dry, buying bottled water, and avoid staying in highly contaminated areas.

Because of the fear of radiation in conjunction with housing problem (smallness and inconvenience of temporary housing) most families in the restricted areas were broken up. Most typically, fathers continue to stay in Fukushima for livelihoods, and mothers and children live outside Fukushima to avoid radiation risks. As sensitivity for radiation exposure is polarized by generation, gender and living condition, it causes division of opinion for their life plan in families and communities.

The people in the affected area used to have strong relationships inside communities from helping each other before the accident. Strong relationship in the rural communities had worked as safety net in the aging society. However, their life was changed eternally on March 11, 2011. Due to the sudden advisory of evacuation, people lived restricted zone around the nuclear power plant escaped to scattering locations in and outside of Fukushima. Many of them changed their evacuation shelters several times, and were separated from neighbors and community members.

### 12.2.3 Return or Migrate

In the tsunami affected area, preparation of moving and constructing public housings on high ground (non-tsunami-prone areas) is starting to begin. On the other hand, in areas affected by the nuclear accident, three categories of hazard zoning have been set according to radiation dose of each area (Japan Atomic Industrial Forum 2013) (Fig. 12.2). Under this system, returning within the next 10 years is estimated to be impossible in some areas.

There is always a problem of "lack of indication of relievable radiation value and access to information", enhancing evacuees' concerns about current situation. In other words, they are hesitant about returning. Evacuees have distrust in how the government deal with the problem and are aware of difference in perception of the government among them for there is nothing that indicates and tells citizens about radiation value at which one does not have to be concerned about health.

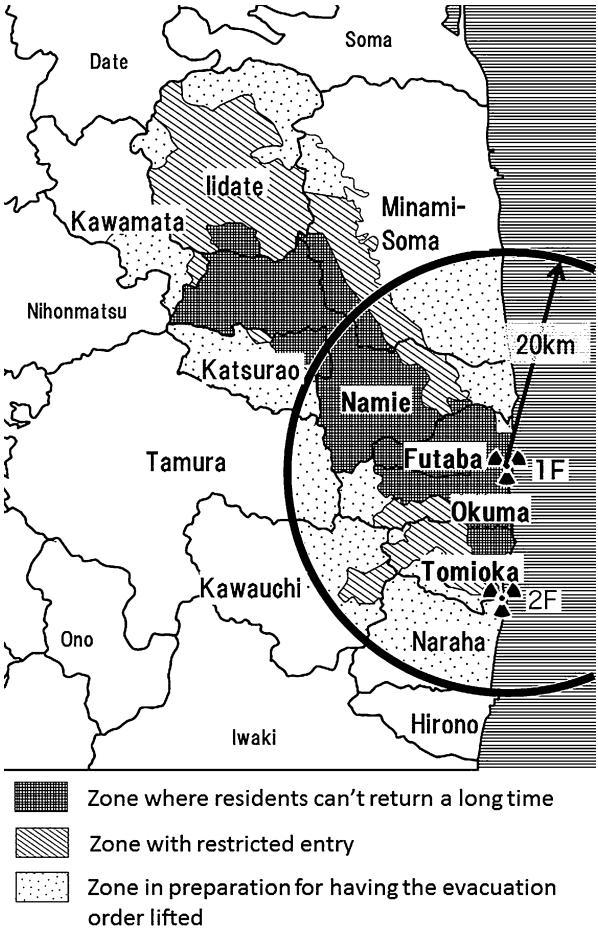


**Fig. 12.2** Revision of hazard zoning

Evacuees will have to choose from returning or joining outside-of-town community or not returning. As for problems in returning, having done decontamination will not simply allow evacuees to return because their hometowns experienced a "blank" for a period of time caused by radiation. Evacuees will compare living environment between their hometowns and the place they temporarily reside. They compare not just infrastructure such as electricity, gas, water service and food but medical care, social welfare, education, shopping, culture and employment as well. In case of families with school age kids, they tend to remain in the evacuated places, as their kids are already settled in new environments especially schools. Also many of the evacuees prefer to stay in urban areas where they can easily access social services and shopping malls, rather than returning inconvenient rural hometowns. They can't determine return or not return only by radiation level.

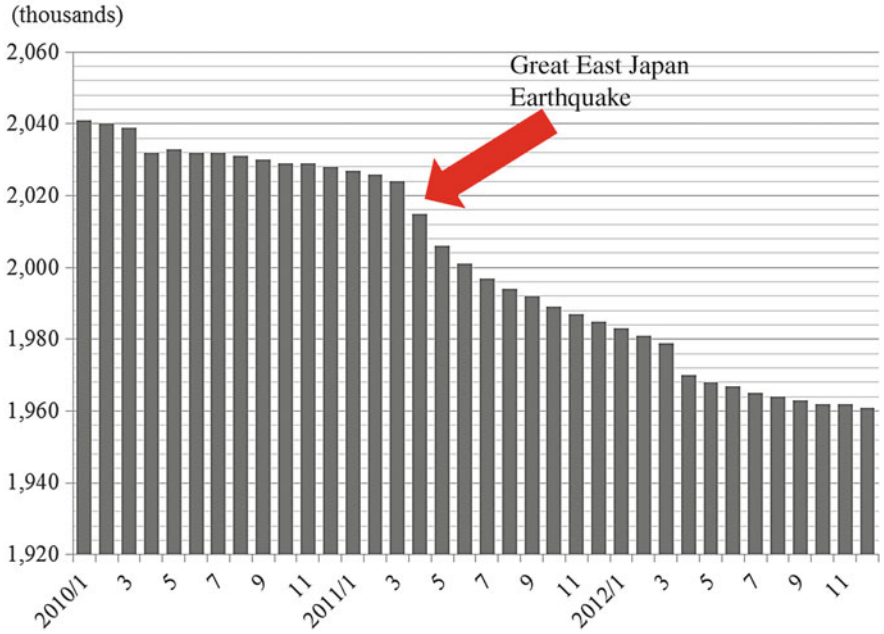


**Fig. 12.3** Population of Fukushima

### *12.2.4 Social Situation Before the Disasters*

Three prefectures in Tohoku area affected by the tsunami and earthquake had been faced with problems relating depopulation and aging which are common to other places in countryside Japan before the disaster. In society where many of young members of the community left their hometown for better opportunities for employment and education which resulted in population aging, inheritance of local culture is difficult. It also faces negative spiral which is to become incapable of providing good opportunity of employment as local economy shrinks. In order to solve these regional problems, there have been various types of methods tried out. The disaster occurred in the middle of this process.

Population in Fukushima Prefecture has decreased by 60,000 since the disasters. Most of them had left Fukushima within few months after the accident, but even in the year 2012, 13,348 residents left Fukushima, while 3,009 were children less than 14 years old, and 4,030 were aged 25–44.

As Fig. 12.3 suggests, there had been a decline in population before the disaster. The disaster and nuclear accident further promoted rapid depopulation. It should be noted that values presented in the figure are based on the number of moving-out notification submitted to the local government and there can be more who left Fukushima without submission.

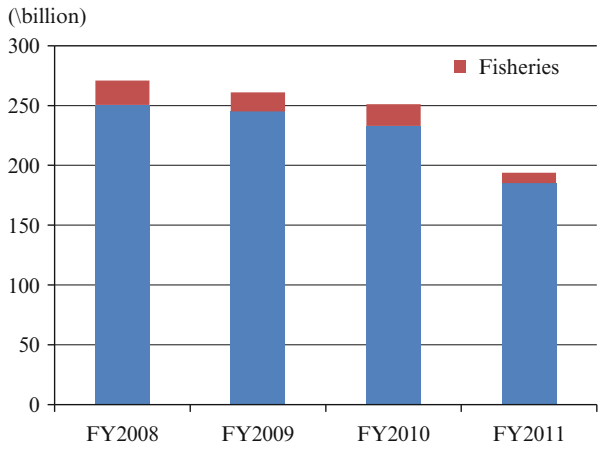


**Fig. 12.4** Agriculture and fisheries production of Fukushima

Because of long-term evacuation caused by the nuclear accident and self-evacuation in fear of exposure to radiation, Fukushima experiences remarkable decrease in population of young generation. It can be said that the problem in Fukushima is that depopulation, aging society, declining in local economy and ties within the community which are common to other local societies in Japan have been further exacerbated by the disasters.

### *12.2.5 Adverse Impact on Agriculture*

Fukushima was the seventh largest agricultural producer in Japan (2009). Production amount of agriculture and marine products in Fukushima decreased after the disaster and nuclear accident as Fig. 12.4 suggests.

As for marine products, this is due to the damage to fishing ports by tsunami and fishing-restriction area set in the offshore of Fukushima, and because of discarded contaminated water from Fukushima Dai-ichi power plant and recovery of damaged fishing ports still has a long way to go, it might take a long period of time to be completely revitalized.

As for agricultural products, it happened because farmers with rice field and orchard within high radioactive areas refrained from plantation and shipping out. As decontamination, precise radiation measurement of farming yards and a study of process in which radioactive substances affect crops proceeds, recovery can be expected.

### *12.2.6 Jobless and Gaps Between Offers and Seekers*

The ratio of job offers to job seekers in Fukushima Prefecture is 1.18, which is the highest among all the prefectures in Japan. An increase in the construction sector including decontamination works and nursing elders is significant.

There is, however, a mismatch between demands and needs. The affected people prefer permanent job in a service industry, while most job offers are temporary manual labor. The ratio of permanent job offers to job seekers is merely 0.72. The number of job offers in the construction sector was 3,616, but only 1,037 were taken up. In the manufacturing industry, 6,249 people looked for jobs while there were 3,776 job offers. Job seekers who receive compensation by TEPCO tend to be selective about salary and job conditions. The main job opportunities in the affected areas before the accident were related to electric power industry including nuclear plants. Some people, who worked in these areas, did not lose their jobs as the industry remained in the areas, or they could find opportunities in other power plants.

## 12.3 Case Study: Reconstruction Support Programs by Fukushima University

Fukushima University, the only national university in the prefecture, established Fukushima Future Center for Regional Revitalization (FURE) in April, 2011. The center aims to conduct research works on scientific facts and damages caused by the GEJE and consequent nuclear accident. In addition to these research works, the center assists rehabilitation and revitalization of Fukushima by supporting formulating action plans of local governments, implementing recovery programs and consultation service to the affected communities.

FURE suggests five essential elements for Fukushima recovery as follows; (Yamakawa 2013)

1. Making a detailed map of radioactivity with precise measurement, as the essential factor for effective decontamination and minimization of risk of radiation exposure
2. Reconstruction and reform of social infrastructures in the disaster affected area
3. Enhancement of social ties for community reconstruction
4. Mental and physical health care for the affected people, especially the vulnerable
5. Creation of employment opportunities in new industries in order to make the regional economy sustainable

### *12.3.1 Accurate and Detailed Data of Radiation Level of Farm Land*

Accurate and scientific data on radiation is essential for rehabilitating agriculture by reducing radiation risks, conducting decontamination works, and resuming agricultural activities. The government organizations and academia lost credibility because of inappropriate communication with the public during the accident.


**Fig. 12.5** Detailed contamination map

Uncertain and unscientific information that flooded the internet also accelerated decreasing confidence in these organizations.

FURE is conducting community-based monitoring activities with farmers and agricultural cooperatives to accumulate credible data and to produce detailed maps (Fig. 12.5) of 100 m mesh size, which are useful for rehabilitating their agricultural activities and daily lives. Through joint monitoring on a community scale by experts and farmers, stakeholders share important information. By taking part in the measurement process, farmers and residents become convinced.

They also support farmers to promote safe agricultural products and processed foods. They conducts growing tests of paddy rice to measure amounts of absorption and transfer mechanisms of cesium 134 and 137 from soils, water and surroundings, and give guidance to farmers about transition mechanisms of radioactivity to plant bodies.

In order to revitalize agriculture and recover food safety, FURE is working with stakeholders in four stages (Fukushima University 2013):

Stage 1: Investigating actual situation of radioactive contamination

- Radiation mapping of farmlands and residential lands

Stage 2: Countermeasures at a production stage

- Test cultivation at paddy and upland fields
- Clarifying absorption mechanisms of cesium transfer
- Provision of guidance for farming

Stage 3: Countermeasures at a marketing stage

- Improving radiation measurement systems and facilities
- Developing capacity of measurement technicians

Stage 4: Countermeasures at a consumption stage

- Providing opportunities for communication between producers and consumers
- Conducting questionnaire surveys on consumers

Students of Fukushima University have organized Fukko (Revitalization) Marche in Fukushima City and Tokyo working with farmers associations, women's groups, NGOs and local agencies to promote agro related industries. Though Fukushima was famous for its agricultural products such as fruits, vegetables, mushrooms, rice and rice wines, all those products were badly affected by harmful rumors caused by the nuclear accident. In the Fukko Marche, various products of Fukushima are on sale, while they demonstrate radiation measurements of the products.

### *12.3.2 Support for Evacuating Communities*

Residents around the nuclear plant were forced to leave their home towns and live in temporary places without perspective for their future. Due to turbid process of evacuation consequent on the nuclear accident, they were dispersed during the evacuation. Also as many families were forced to be resolved due to condition of temporary housing, schools and work places, cases of elderly living alone increased. As the affected region used to have strong relationships inside communities and it worked as a safety net for elders, restoration of relationship is a crucial issue for the affected people.

FURE supports a community center for evacuees from the nuclear disaster. "Odagaisama Center" or Life Rebuilding Mutual Support Center is in operation at a temporary housing complex in Koriyama city (Fig. 12.6). This center provides support to daily live and a place for evacuees to communicate and interact. The center also operates a traditional handy craft workshop which provides training opportunities for the residents that lost their jobs due to the accident.

FURE also support Tomioka town to compile a telephone directory of evacuees from which the residents can get contacts for their neighbors and friends of the original community.

As the evacuees are dispersed in and out Fukushima Prefecture, it is critical for the municipality to address their various needs in a timely way. In order to support the social workers, municipality of Tomioka established an information system utilizing tablet PCs which integrates and accumulates welfare and medical information. This helps their activities to care the residents, especially vulnerable elders.

**Fig. 12.6** Activity of Odagaisama Center

### *12.3.3 Support for the Vulnerable*

Children and their parents who remain in Fukushima face difficulties in daily life due to stress caused by the accident. A Fukushima Prefecture survey found that 30 % of children in evacuation areas of the nuclear accident were adversely affected in mental health, as compared with 9.5 % in other areas in Japan. The prefecture government conducted mental care support to a high risk group, 7 % of the children (Fukushima Prefecture 2013b).

Children are showing stress signs, such as fear, anxiety, or regression (McCurry 2012). Physical inactivity causes obesity in children, since they are restricted from playing outside. The obesity ratios of the children in Fukushima Prefecture became the highest in Japan in 2012.

"Children Campus" program has been conducted in Fukushima University which provides children lived in different temporary housing can gather again, play with university students, and receive study support.

They also provide opportunities for children and parents evacuating from their home towns to reunion. Summer and winter camps for them are organized by FURE with support from private companies. Those programs aim to give mental supports for both children and parents (Fig. 12.7).

**Fig. 12.7** Summer camp for Fukushima kids

### *12.3.4 Job, New Business and Networking*

Abukua is a mountainous region neighboring to the coastal area. Though they were not affected by the tsunami and accepting evacuees from coastal region immediately after the earthquake, their land were contaminated because of the radioactive plume from the nuclear reactor after hydrogen explosion tracked along the valley. Thus the residents of highly contaminated areas were forced to abandon their house and farming lands.

The women who had been engaged in agri-business in Abukuma region established a women organization, "Ka-tyan no Chikara Project (Power of Moms Project)" in October 2011, 7 months after the disasters, at Fukushima city where they have been staying temporarily. The objectives of the project are: contributing to the recovery of nuclear affected Abukuma region; building a network among women from the region; creating employment; demonstrating the safety of products of Fukushima, and building and sustaining communities including the evacuees and residents. A major part of Abukuma region in the central and eastern part of Fukushima Prefecture is now a restricted area in agricultural production due to the nuclear accident. They produce various kinds of processed foods such as rice cakes, pickles, sweets and lunch boxes. With supports from Fukushima University and other agencies, all of their products are examined for radioactivity and are sold with certification that guarantees the safe level of radioactivity.

## 12.4 Lessons Learned

What Fukushima has experienced was "complex disaster" in which nuclear accident was caused by an earthquake and tsunami and this type of disaster is known to be the first time ever in human history. "Complex disaster" including a nuclear disaster might be extremely unique as a disaster. However, other than those that are radiation-related, lessons learnt from this event are those that can be widely applied in recovery of disaster-affected area and conflict-affected area, such as recovery of victims' livelihood and issues in communities.

### *12.4.1 Accurate Data of Radiation and Rebuilding Credibility*

There is always a problem of "lack of indication of relievable radiation value and access to information", enhancing evacuees' concerns about current situation. In other words, they are hesitant about returning. Evacuees have distrust in how the government deal with the problem and are aware of difference in perception of the government among them for there is nothing that indicates and tells citizens about radiation value at which one does not have to be concerned about health. Accurate and scientific data on radiation is essential for rehabilitating agriculture by reducing radiation risks, conducting decontamination works, and resuming agricultural activities.

Radiation measurement and monitoring activities involving various stake holders such as landowners, consumers, farmers, governments, and community-based organizations suggest a breakthrough for rebuilding relationship of mutual trust among stakeholders.

### *12.4.2 Community Restoration with the Initiative of Affected Residents*

What Fukushima now experiences is reconstruction of communities which were once lost, and simultaneously construction of new communities. There are many challenges we face in constructing communities as these are naturally formed through long history. There have been many supports to promote self-governance by residents, although in many cases they face difficulties. However, there are cases in which operation by local residents is on track.

Management of "Odagaisama Center" is under the responsibility of residents of temporary housing compound. In case of a big disaster, donors and volunteers sometimes spoils initiatives and motivations of affected people by over helping. They were victims but not totally powerless.

Activities of the center started in an emergency shelter at Koriyama with initiative of evacuees. They voluntarily started to provide opportunities for communication and collaborative works with other evacuees. They need helps from outside but there are many things they can manage by themselves.

### *12.4.3 Support for Children and Their Mothers*

The experience of disaster has left wounds on many children's heart. On top of that, concerns about radiation exposure and conflicts among those with different thoughts are mentally affecting mothers and their children. Also life in evacuation shelter provides children with poor learning environment. Fukushima University provides learning support to children in those situations by students and staff, and holds a camp where separated class mates and their parents can get together.

Since children are the most vulnerable to disasters, supports in mental health and education are needed. Children are very sensitive to anxiety and uneasiness of their parents, so they sometimes regard their parents' anxiety and uneasiness as their own problem and tend to hesitate about expressing their feelings. It is recommended to organize parents care program, especially for mothers, simultaneously with child care activities.

### *12.4.4 Decent Work Opportunities*

Many of the disaster victims, because of the tsunami and nuclear accident, were incapable of continuing their work. While compensation from TEPCO depriving people's will to work, construction, decontamination and elder care services are the main industries recruiting, majority of them being short-term employment. For recovery of victims' livelihood, jobs that are not merely a source of income, but giving them a meaning of life and enable them to consider future plans are required. It is necessary to invite firms and encourage enterprises in the region. In Fukushima, renewable energy as a new industry is a hot topic and investment has already started flow in. However, it is not contributing well to employment in the region and the influence to local economy is limited. Setting aside whether residents will return or not, the importance of creating more jobs increases as time passes.

### *12.4.5 Complex of Natural and Human Induced Disasters*

What Fukushima has experienced was the complex of natural and human induced disasters. Not only NPP that is highly risky in the event of natural disaster, but also industrial facilities such as petrol, chemical plants and railway/roads (especially

bridges, elevated parts and tunnels). They are even riskier if they are old. People in charge of managing these facilities must be aware of their responsibility to prepare for secondary disaster in case when a natural disaster occurs. They must be required to have risk-communication with residents on the influence it might have to the surrounding area in the event of secondary disaster and practice disaster drill including evacuation.

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# Chapter 13
# Impacts of East-Japan's Disaster on Production of a Small-Medium Cardboard Manufacturer in Fukushima

**Hideki Murakami and Akiko Yanagida**

**Abstract** This chapter analyzed the impact of the earthquake, tsunami, and explosion-disaster at the Fukushima nuclear power plant in March 2011 on a small-medium cardboard manufacturer's production and transportation systems. We first estimated the Cobb-Douglas production function to determine the change pre- and post-disaster using time-series monthly data from January 2010–December 2012 (35 months); we found few structural changes to the input ratio in the company's production system. We then performed statistical analyses to investigate changes in the cargo flow originating at the firm and shipped to devastated/non-devastated destinations. The results indicated that the disaster affected cargo flow only to the coastal area devastated by the tsunami or contaminated by nuclear radioactivity. Since the demand for cardboard is a "derived demand" of agriculture and relatively light industries, this finding suggests that these industries were not unduly impacted by the disasters, and that the disaster's effects may be overemphasized.

**Keywords** East-Japan earthquake • Small-medium firm • Production function

## 13.1 Introduction

East Japan experienced a historical disaster in March of 2011. The Asahi newspaper reported in 2011 that about 16,000 people were dead and 3,000 are still missing.

In addition to these human disasters, many industries and infrastructures were damaged. These disasters are classified into three categories depending on the cause of the damage. The first is the earthquake itself, the second is the tsunami that caused the greatest damage along the coast, and the third is the radioactive disaster generated by the explosion of the nuclear electric plants. Damaged infrastructure

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R. Shaw (ed.), *Tohoku Recovery*, Disaster Risk Reduction,
DOI 10.1007/978-4-431-55136-2_13

was restored in accordance with its importance and necessity, and individual industry has also been revived. However, people are still forbidden from entering or staying in the areas contaminated by radioactivity. While these areas comprise only a part of the Fukushima prefecture, it seems that many people in other areas of Japan and outside in other countries still have misconceptions about the nuclear contamination. The contamination spread only to limited areas in the Fukushima prefecture, and economic activities were quickly restored immediately following the earthquake.

There have been many studies and reports on issues related to the Fukushima disaster (Kushida 2012; Holt et al. 2012; Conferences Proceedings of the STS Forum on the 2011 Fukushima/East Japan Disaster, UC Berkeley, May 11–14, 2013). However, all of them have dealt with the disaster itself, for example, scientific analyses of radioactive contamination, or time-series reports about political and institutional responses. Few studies have conducted economic analyses, since many businesses in Fukushima closed down operations, and there was insufficient data for a rigid analysis using economics or statistics.

This paper is the first to do an economic analysis highlighting a small-medium manufacturer of cardboard in the Fukushima area. The purpose of this study was to investigate whether the production activities of a manufacturer in the Fukushima prefecture was changed after the disaster by estimating (1) the production function and change in the ratio of input share, and (2) regional-area specific logistics activities of the firm by time-series analyses. The methodology combined microeconomics and econometrics, using 35 months of data. In the next section, we demonstrate the impact of East-Japan's disaster on regional small-medium enterprises and discuss the remedies enacted by the Japanese public sector, such as national and regional government to alleviate the effects on companies. In Sect. 13.3, we present an overview of the demographic issues and the damage to Fukushima Prefecture. Section 13.4 presents the empirical models and dataset. In Sect. 13.5 we show and discuss the empirical results, followed by future perspectives in Sect. 13.6.

## 13.2 Government's Response to the Disaster and Descriptive Statistics of Revival of Small-Medium Firms in Tohoku Afterwards

In this section we survey the Japanese government's actions to relieve the effects of the disaster on small-medium firms in the Tohoku district. According to Japan's Small-Medium Enterprise Agency, the following financial plans were announced to assist all small-medium companies in the immediate aftermath of the disaster on March 13th 2011. Actions included granting loans as high as 80 million yen without collateral, extending the period of redemption from 7 to 9 years, lowering the bid rate by 0.9 %, and offering indirect subsidies from national government to

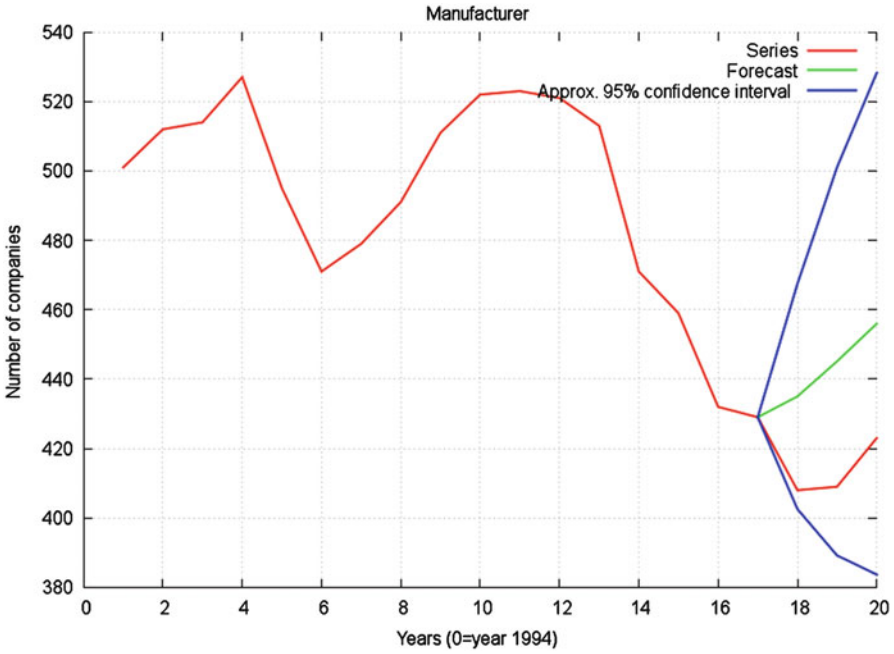


**Fig. 13.1** Time-series changes in the number of small-medium manufacturers in Tohoku. Note: the *vertical axis* shows the number of manufacturers and on the *horizontal axis*, zero represents 1994 and 20, 2013

small-medium companies via local government.[1] These financial remedies have been revised and updated, and may now be granted to those who restart their businesses either in their original location, or where they had to move due to the high density of radioactivity.

Having received this aid from national and local governments, small-medium companies have shown slight signs of recovery according to the statistics officially published by the Organization for Small & Medium Enterprises and Regional Innovation, Japan. Using these statistics, we analyzed whether and to what extent the small-medium companies of Tohoku had been revived as of 2013.

Figure 13.1 shows the time-series changes in the number of small-medium manufacturers in the pre- and post-disaster period. The data are from the second quarter (April-June) of each year.

According to Fig. 13.1, the number of small-medium manufacturers showed a downward trend in each business cycle. "Series" refers to data that were actually observed. These manufacturers produced high-quality, high-price goods for export from Narita worldwide, especially to East and Southeast Asia. As can be seen in the

[1] Information from the home page of the Small Medium Enterprise Agency, accessed 3rd April, 2014. http://www.chusho.meti.go.jp/keiei/antei/2011/110313TohokuGekijinShitei.htm

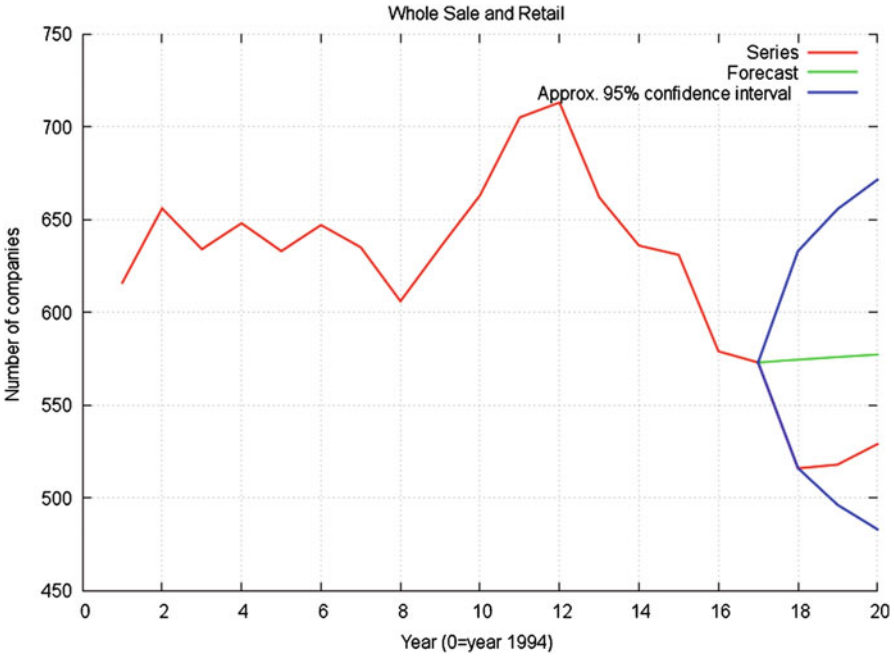


**Fig. 13.2** Time series changes in the number of small-medium wholesalers and retailers in Tohoku. Note: the *vertical axis* shows the number of manufacturers; on the *horizontal axis*, zero represents 1994, and 20, 2013

figure, the recession caused by the 1998 currency crisis in Asia strongly affected export activities (time unit 6). Another bottom was apparently caused by the Tohoku disaster in 2011 (time unit 17). Figure 13.1 reveals that the drop in the number of firms in the year following the disaster was almost in line with the lower bound of the 95 % confidence interval. The curve then began to climb in 2011–2012 (time units 17–18), and indeed the recovery has since accelerated from (2012–2013; time units 19–20), but is still much smaller than the forecasted value for these 20 years.[2]

Figure 13.2 shows the time trend for wholesalers and retailers.[3] The curve looks similar to that for manufacturers, but the degree and speed of the recovery were smaller. This may be because national and local governments offered smaller subsidies and other financial assistance to industries that did not require a lump-sum investment for their recovery, and because the amount of merchandise and

[2] The time-series analysis of the change in the number of manufacturer follows AR(2). We obtained the following result by the Box-Jenkins method. The constant is 75.20 with $t = 1.44$, the parameter of t-1 is -1.41 with $t = 12.87$, that of t-2 is -0.563 with $t = 5.00$, and adjusted R-square is 0.833.

[3] The time-series analysis of the change in the number of wholesalers and retailers follows AR(1). We used the same method as for manufacturers, and obtained the result that the constant is 43.48 with $t = 0.65$, the parameter of t-1 is $-0.927$ with $t = 8.84$, and adjusted R-square is 0.703.

agricultural products decreased significantly, especially in the areas devastated by the tsunami and contaminated by radioactivity from the damaged nuclear power plant.

## 13.3 Outlook for Fukushima, the Disaster, and the Surveyed Firms

Fukushima Prefecture is the third largest prefecture in Japan in terms of width,[4] and has a population of about two million.

Generally, the prefecture is divided into three parts based on demographic and governmental factors (Fig. 13.3).[5] The first is the "Hama-dori" (coastal corridor), the second the "Naka-dori" (central corridor), and the third the "Aizu" district. Of these three districts, Naka-dori is the most thriving, with two large cities – Fukushima city and Koriyama city. Koriyama, the center of business activities, is larger than Fukushima in terms of population. Fukushima Airport is located 20 min from Koriyama, and east–west and north–south bound highways cross in the city. The Hama-dori region, meanwhile, used to be prosperous due to coal mining, and four nuclear power plants are located on the central coast in this area. The international container seaport along Onahama city is connected to Koriyama by a highway and national road No. 49. The Aizu area is far from the pacific coastal area and is full of historical areas called "small Kyoto", where there are many famous temples. Overall, Fukushima prefecture ranks high in terms of producing


**Fig. 13.3** Fukushima Prefecture. Note: *Blue square* denotes Aizu Wakamatsu, the *triangle* Koriyama, the *circle* Fukushima-city, and the *pentagon* Iwaki (Onahama port is in Iwaki city). Area "A" is Aizu, "B" is Naka-dori, and "C" is Hama-dori

[4] For more detail, please access the prefectural official website (accessed 29th March, 2013).

[5] The three prefectures were merged into their current status in 1876. See Fig. 13.5.

high-value products like semi-conductors, which are exported from Narita Airport, as well as farm products such as vegetables, almost all kinds of fruit, and high-quality Japanese rice and rice wine (sake). In a sense, Fukushima is better than any other prefecture in terms of agricultural products.

However, the radioactivity contaminated the land and agricultural products around the power plants and the areas northeast of them. These include the cities and towns along the Pacific coast and the inland areas between the coast and Naka-dori. As of now, it is still forbidden to enter or stay in several towns, and the previous inhabitants are only allowed to pass through to monitor their properties and prevent theft. In terms of traffic routes, national trunk route No. 6, which originates in Tokyo and passes along Hama-dori (coastal aisle), has been shut down around the power plants so that all traffic must use route No. 4 that passes Naka-dori.

The data used in this study was obtained from Tohoku Kogyo Co., Ltd, which mainly provides cardboard and wrapping services. The company was founded in 1972 and is located in Koriyama city. As of April 2012, it employed about 100 people, and its current capital stock is 0.8 million USD (assuming one USD = 100 yen). It obtained ISO9001 in January 2005.

## 13.4 Model for Estimating Structural Change in Production

We investigated the effect of the East Japan disaster on the Tohoku Kogyo Co.'s production structure. In our analysis, we introduced the "post-disaster dummy variable" both on the constant term and slopes of input variables, as well as other "shock dummy variables". The production function of a general form is defined as Eq. 13.1:

$$Q = \mathrm{f}(x_1, x_2, x_3, IIP, time, \Sigma_{\mathrm{t}} D_{\mathrm{t}}, DDis) \tag{13.1}$$

where $Q$ is the amount of final goods, $x_1, x_2, and\, x_3$ are units of input (in-process goods, labor inputs [*extra* hours in addition to fixed hours per month], and utilization of electric power), *IIP* is indices of industrial production of the Fukushima Prefecture, and $D_{\mathrm{t}}$ is a group of dummy variables: t = 2011.3 and 2011.4, and $D_{2011.3}$ and $D_{2011.4}$ are the dummy variables for the disaster month and the next month; *DDis* is a dummy variable that takes 1 for the post-disaster period, and *time* is a variable to remove the time trend. Among the input variables, "in-process (intermediate) goods" (*IPG*) have different characteristics from other inputs. Since *IPG* also require labor, energy inputs, and so on, we had to estimate a production function of *IPG* simultaneously with the production function of final goods. The *IPG* function worked as follows. When estimating this system of production function, we needed to impose the restriction that $\alpha_1 + \alpha_2 = 1\, and\, \alpha_1^{'} + \alpha_2^{'} = 0$, following microeconomic theory.

**Table 13.1** Description of variables

| Variables | Explanations |
|---|---|
| *IPG* | The square meters of containerboards produced in 1 month. These are cut folded and assembled into boxes |
| *FG* | The square meters of final goods (boxes dispatched to customers). Not all the IPGs are assembled into boxes. Defective goods are disposed of, and some containerboard is kept in stock to match supply to demand |
| *Labor* | Extra working hours added to regular working hours. The data are aggregate for all employees in 1 monthly totals |
| *Energy* | Monthly consumption of electric power (kw) |
| *IIP* | Indices of industrial production of Fukushima Prefecture (average = 100) |
| *Transportation* | The number of cargo trucks engaged in carrying final goods |
| *DDis* | The 3.11 disaster dummy variable that takes 1 for 2011.5–2012.12 and 0 for the rest) |
| $D_{2011.3}$ | The dummy variable that takes 1 for March 11, 2011 (to see the month of disaster) |
| $D_{2011.4}$ | The dummy variable that takes 1 for April 11, 2011 (to see the next month's effect) |
| *time* | Time trend in logarithm |

$$\log(\mathrm{IPG}) = \alpha_0 + (\alpha_1 + \alpha_1' DDis)\log(Labor) + (\alpha_2 + \alpha_2' DDis)\log(Energy) + (\alpha_3 + \alpha_3' DDis)\log(IIP) + \alpha_4 DDis + \alpha_5 D_{2011.3} + \alpha_6 D_{2011.4} + \alpha_7 time + \mathrm{e} \tag{13.2}$$

$$\log(\mathrm{FG}) = \beta_0 + (\beta_1 + \beta_1' DDis)\log\left(\widehat{IPG}\right) + (\beta_2 + \beta_2' DDis)\log(Transportation) + \beta_3 DDis + \beta_4 D_{2011.3} + \beta_5 D_{2011.4} + \beta_6 time + \mathrm{u} \tag{13.3}$$

A description of the variables used in Eqs. 13.2 and 13.3 is given in Table 13.1; "e" and "u" are terms of random disturbance.

When we estimate this production function, we need the pre-assumption that the firm operates efficiently under circumstances of perfect competition. This assumption may not be true for our case if we estimate the production function of all (i.e., the aggregate) sections of a firm, but here we could assume efficiency under perfect competition since every single activity of the production-line division was strictly monitored by the production management division. If we admit that the firm operates under imperfect competition, the estimation of production function would still be useful, but the degree of homogeneity would be less than one.[6]

There is a tremendous variety of functional forms for production function according to a survey by Griffin et al. (1987).[7] Among them, the translog function is widely used for the estimation of cost functions in the transportation industry

[6] See Bruno (1978).

[7] Griffin et al.(1987).

**Table 13.2** Descriptive statistics of continuous variables

| Variables | *FG* (squared meter) | *IPG* (squared meter) | *Labor* | *Energy* (kw/month) | *IIP* | *Transp.* |
|---|---|---|---|---|---|---|
| N | 35 | 35 | 35 | 35 | 35 | 35 |
| Average | 1,058,414.2 | 1,152,943.4 | 864.5 | 68,818.9 | 86.6 | 390.7 |
| S.D. | 146,449.3 | 173,053.7 | 331.5 | 10,766.1 | 8.4 | 76.7 |
| Min | 812,604.7 | 908,908.8 | 111.5 | 45,798.2 | 63.2 | 267 |
| Max | 1,395,830.3 | 1,624,970.1 | 1,726.8 | 94,372.0 | 103.2 | 593 |
| Median | 1,047,587.0 | 1,113,479.1 | 862.6 | 68,118.2 | 87.6 | 372 |

(Caves et al. 1984; Fischer and Kamerschen 2003). Indeed, translog production function is flexible enough to approximate the form of function precisely. The drawbacks of the translog function, on the other hand, are that it has so many variables, including squared and cross terms. Therefore, introducing "slope dummy variables" into the translog would make the function very complex. To avoid this problem, we used a simple Cobb-Douglas form for specifying the functional form of production function.

In estimating this system equation, we first carried out the regression of IPG function and obtained the estimate value of in-process goods, $\widehat{IPG}$, by OLS with heteroskedasticity robust standard error. We then let $\widehat{IPG}$ be the instrument variable, and regressed *FG* on $\widehat{IPG}$, *Transportation*, *time*, and other dummy variables. In the estimation, we considered the existence of heteroskedasticity, auto-correlation, and normality of random disturbances' distributions. In order to check the existence of concerns that might cause inefficiency, we carried out the Breusch-Pagan/Godfrey (BPG) test, Durbin Watson test, and Jarque-Bera normality test. Equation 13.2 had no problem with regard to these concerns, but in Eq. 13.3 we detected the existence of auto-correlation by the Durbin-Watson statistic (it was 1.068). Therefore, we estimated Eq. 13.3 using the AR(1) model. In addition, we estimated the manufacturer's cargo dispatching activities from Koriyama to Hama-dori and compared them to those in other regions. The descriptive statistics are shown in Table 13.2.

## 13.5 Empirical Results

### *13.5.1 Production Function*

First, we estimated the system of production functions. The production function of *IPG* is shown in Table 13.3.

Before the disaster, the input ratio[8] of labor and energy was 24:76; after, it changed to 6:94. This result is consistent with the fact that the firm dismissed

[8] If we use the standardized average of inputs, the input share ratio with negative signs is the technical rate of substitution.

**Table 13.3** Production function of in-process goods (paper-sheets)

| Variable name | Coefficient | t-ratio | p-value |
|---|---|---|---|
| Labor input | 0.238 | 3.418 | 0.002 |
| Labor input*post disaster | −0.180 | −1.802 | 0.083 |
| Energy input | 0.762 | 10.950 | 0.000 |
| Energy input*post disaster | 0.180 | 1.802 | 0.083 |
| Indices of Industrial Production (*IIP*) | 0.658 | 3.909 | 0.001 |
| *IIP**post disaster | −1.300 | −3.314 | 0.003 |
| Post disaster dummy for constant | 5.118 | 2.755 | 0.011 |
| Dummy for March 2011 | 0.220 | 2.580 | 0.016 |
| Dummy for April 2011 | 0.789 | 4.995 | 0.000 |
| Time trend | −0.040 | −1.695 | 0.102 |
| CONSTANT | 0.957 | 1.343 | 0.191 |

R-square adjusted = 0.504, F(7,27) = 5.326 (P-Value = 0.001)
Durbin Watson statistics = 1.690
BPG test for heteroskedasticity: Chi-square = 4.023 with d.f = 10, P-Value = 0.946
Jarque-Bera normality test- Chi-square (2 d.f.) = 1.384 P-Value = 0.501

part-time employees and reassigned a number of employees to other firms in the same group (*keiretsu*) after the disaster, and so production became much less labor-intensive. Post-disaster, it appeared that *IIP* no longer affected the production of *IPG* (parameter = 0.658−1.300 = −0.642 with t-ratio = −1.842).

The parameters of the three "disaster dummy variables" were positive and statistically significant. The dummies for March and April 2011 were significant because Tohoku Kogyo increased its production on behalf of other firms that were seriously damaged and unable to produce after the disaster. Despite inter-firm rivalry before disaster, businesses collaborated with each other to restore the industry following the disaster.

The post-disaster dummy was also positive and significant. Tohoku Kogyo and the firms that were not significantly damaged increased production to respond to the increased demand for cardboard for packing rescue-goods needed by people in the devastated regions and those who escaped from places contaminated by radioactivity with the aid of the compensating funds from Tokyo Denryoku (Tokyo Electric Power Company), which was responsible for the management of the nuclear power plant. In other words, both firm's budget and iso-quant curves shifted up, and the input ratio also changed. In addition, Tohoku Kogyo merged with another factory in the adjacent region post-disaster. This means that if we had a "capital-stock variable" in our production function, its parameter would have increased after the disaster. However, each element of a "capital-stock variable" takes the same value before disaster, changes once at the time of disaster, and then takes the same value again. So, it could be expected that the variable would have shown a result similar to the 0/1 binary variable, and the mixed effect of this and the compensation from the Tokyo Denryoku appears in the parameter of the Post disaster dummy in Table 13.3. Considering the evidence of Tohoku Kogyo and the result of Fig. 13.1 in Sect. 13.2 that tells us that the number of firms decreased

**Table 13.4** Production function of final goods

| Variable name | Coefficient | t-ratio | p-value |
|---|---|---|---|
| *IPG* (estimate) | 0.783 | 8.837 | 0.000 |
| *IPG* (estimate)*post disaster | 0.001 | 0.424 | 0.672 |
| Transportation | 0.217 | 2.449 | 0.014 |
| Transportation*post disaster | −0.001 | −0.424 | 0.672 |
| Dummy for March 2011 | 0.102 | 2.429 | 0.015 |
| Time trend | 0.031 | 2.374 | 0.018 |
| CONSTANT | 1.527 | 2.230 | 0.026 |
| R-square adjusted | 0.907 | | |
| Estimation method | Instrument variable | | |

**Table 13.5** Comparison of input shares for the production of final goods

| | Labor | Energy | Transportation |
|---|---|---|---|
| Pre-disaster | 0.186 | 0.597 | 0.217 |
| Post-disaster | 0.045 | 0.739 | 0.216 |

significantly after the disaster, it is inferred that small-medium manufactures that survived the disaster increased production to compensate those which damaged firms would have produced.

The production function of final goods is shown in Table 13.4. The "*DDis*" variable, which was not statistically significant, was dropped to improve the efficiency.

According to Table 13.4, the input ratio of *IPG* and Transportation had been about 78.3:21.7, and was largely unchanged post-disaster (78.4:21.6), and the null hypotheses that $\beta_1 + \beta_1' = 0$ and $\beta_2 + \beta_2' = 0$ were rejected with asymptotic $x^2_{d.f=1} = 78.795$ and 5.966, respectively. Considering the results in Tables 13.3 and 13.4, the shares of exogenous inputs are shown in Table 13.5.

The labor and the energy shares were computed by multiplying their parameters in the *IPG* function by the parameter of $\widehat{IPG}$ in Eq. 13.2. This computation makes sense as long as both *IPG* and *FG* functions are properly estimated. Bruno (1978) stated that both depended on the assumption that the double deflated value-added (*FG*) production functions correctly measured marginal productivities of primary factors as long as intermediate goods (*IPG*) relative to gross output remain constant.[9] Since our model followed the assumption of this proposition, we consider the parameters to show the proper values.

Since our analysis focused on a mostly automated production line, the labor share was extremely small. Post-disaster, the input share of transportation (trucks utilized) was almost unchanged. The firm should have spontaneously reduced the input of logistics since it was forbidden by the government from passing along a few local and thin-density contaminated routes, but there is little evidence it did so.

[9] See Bruno, *op.cit.*

### 13.5.2 Destination-Specific Analysis of Disaster's Effect on the Delivery of Final Goods

We will now investigate how the delivery of final goods was affected by the natural disaster using statistical methods. According to Table 13.5, it appears that the amount of dispatched final goods did not change from pre- to post-disaster. This was supported by the estimate results of Table 13.4 that the "*DDis*" variable was not statistically significant and could be omitted.

To turn to a destination-specific case, Fig. 13.4 depicts the change in traffic flow from Koriyama-city to Hama-dori (Iwaki-city and Naraha-town).

Usually, cargo traffic decreases in winter due to the off-peak demand for vegetables. Despite this fact, cargo traffic had been trending up when the disaster took place. Actually the *IIP* elasticity of cargo traffic had been 0.854 (t statistics = 3.133), but it became −0.146 and statistically insignificant. This implies that before the disaster the traffic to Hama-dori was increasing despite the seasonal change in demand, but after the disaster the traffic had little to do with the economic boom/recession index, i.e., *IIP*.

In addition, although the peak demand was in accordance with the peak of the output of agriculture, the cyclical span was wider and deeper than before the pre-disaster. One of the reasons for this is that rescue and emergency goods were provided in large deliveries with a time lag in between. This implies that goods were not supplied in a timely fashion, i.e., when they were really needed.

Finally, we investigated the traffic flow from Koriyama-city to Aizu Wakamatsu-city, Kitakata-city, and Inawashiro-town pre- and post-disaster.

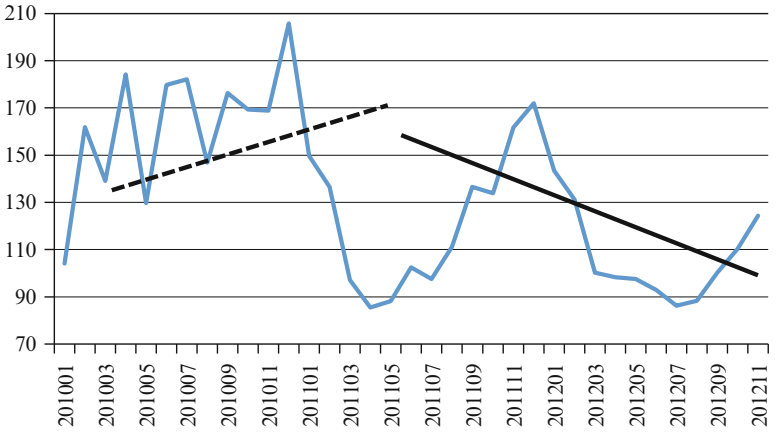


**Fig. 13.4** Traffic flow of final goods to Hama-dori (Iwaki-city and Naraha-cho). Note: The *dotted* and *bold lines* are linear-approximations. The *dotted line* depicts the pre-disaster situation and the bold the post-disaster

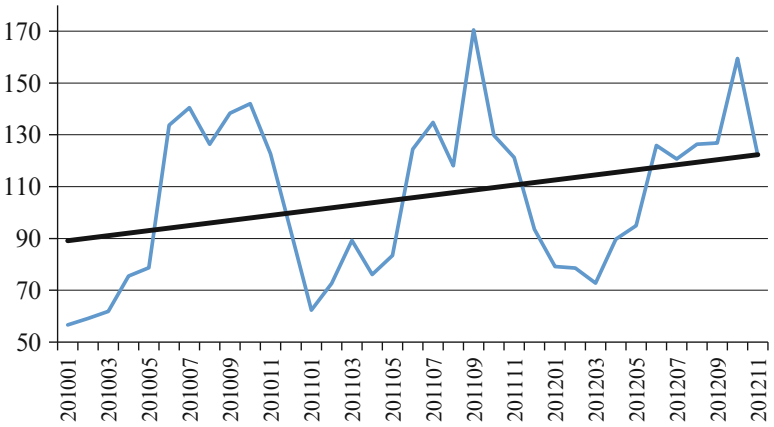


**Fig. 13.5** Traffic flow of final goods for the west (Aizu Wakamatsu, Kitakata, and Inawashiro)

These cities are located to the west of Koriyama-city, within a four-hour drive of Hama-dori.[10]

Figure 13.5 shows the traffic flow with a linear approximate line. There were seasonal cycles based on the harvest of vegetables and fruits from early in summer to autumn, and a weak upward trend over the observed time duration.

The reason for this upward trend was that the firm relocated their fleet of trucks from Hama-dori to the Aizu Wakamatu district, where they could expect more stable demand. In order to investigate the character of traffic fluctuation further, we applied a brief time-series analysis.

If we assume that this fluctuation curve follows an AR(1) model, the parameter is 0.848 with t -value = 5.908. The hypothesis that this parameter equals unity (i.e., the hypothesis of random walk) cannot be rejected (t-value = 1.062) before the disaster. After the disaster, the parameter changed to 0.619, and two hypotheses that the parameter equals zero and one are rejected with t-value = 3.501 (reject at 1 % level) and 2.155 (at 5 % level). This implies that the post-disaster fluctuation was stationary. In the case of the entire time span, the parameter is 0.742 and both hypotheses that the parameter equals zero and one are rejected at 1 % and 5 % levels (t-value = 6.750 and 2.347, respectively). This result is close to that of the post-disaster case. In summary, the fluctuation followed an AR(1) process pre- and post-disaster for the entire duration, and after the disaster, it was converging to stationary. Considering this result, our conclusion is that the fashion of fluctuation has not changed over time. According to the firm's data, the volume of dispatched final goods for the northern area (Sendai-city, Fukushima-city and Nihonmatsu-city etc.) and southern area (Shirakawa-city, Ishikawa-county and Yabuki-town) has not substantially changed, either.

[10] Time for using highways is partially included.

## 13.6 Conclusion

This empirical study of a cardboard manufacturer, Tohoku Kogyo, highlighting the production structure and direction-specific cargo flow before and after the disaster, concludes that the production structure became energy-intensive but did not otherwise change in terms of the transportation input. It is also inferred that Tohoku Kogyo increased its production on behalf of the firms that had been damaged by the disaster. In terms of the direction-specific cargo flow, only the flow to Hama-dori seems to have been affected. Since the demand for cardboard is a "derived demand", mainly from the agriculture sector, this result suggests that the agriculture and other industries that need this firm's cardboard have also been recovering from the disaster. In short, it appears that the degree of the disaster has been partially overemphasized beyond the reality: of course small-medium industry just started to revive only recently, especially, but it appears that undamaged small-medium firms have been active and have tried to produce more than the disaster occurred.

Since our analysis is limited to the case of a single manufacturer, our study can be regarded as a preliminary analysis only. Our next step will be to continue to research other manufacturers that are recovering and prepare to disclose their evidence.

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