

Article

Investigating Post-Disaster Reconstruction since the 2011 Great East Japan Earthquake: A Study on the Ōtsuchi-chō, Iwate Prefecture through Timelines

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Abstract: Since the 2011 Great East Japan Earthquake, 13 years have passed, and many areas have completed post-disaster reconstruction. Therefore, it is necessary to further summarise and analyse the experiences gained from this post-disaster reconstruction. This study conducted door-to-door interviews with residents of Ōtsuchi-chō, Iwate Prefecture, in the 13 years following the earthquake. It recorded the residents' perspectives on post-disaster reconstruction and its shortcomings. By collecting locally published materials like newspapers, and local government records and integrating them with interview records, the first "Great East Japan Earthquake Timeline" for Ōtsuchi-chō was compiled. We primarily divided this timeline into the following three phases: the disaster and early reconstruction period (2011), the mid-reconstruction period (2012–2015), and the late reconstruction period (2016–Present). This timeline has yielded the following results: firstly, some issues have arisen during this prolonged reconstruction process. For example, continuous relocation hinders community rebuilding, especially in the context of an ageing society. Secondly, the "Ōtsuchi-chō Reconstruction Timeline" was created, which can be used for post-disaster reconstruction in contemporary Japanese villages facing severe ageing. This timeline provides a clear understanding of how disaster-affected areas can rebuild housing and infrastructure, and recover economically. It offers guidance for the reconstruction of Japanese villages after a disaster. Therefore, post-disaster reconstruction in the region should accelerate infrastructure development and continuously listen to residents' voices, providing corresponding services to make reconstruction comprehensive and specific. At the same time, it also contributes to the post-disaster reconstruction of villages in other developed countries.

Keywords: reconstruction; 2011 Great East Japan Earthquake; timeline; door-to-door interviews; Japanese village



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1. Introduction

On 11 March 2011, a severe earthquake and tsunami disaster occurred at 14:46:18.1 local time in Japan [1]. The epicentre of the earthquake was 130 kilometres off the east-southeast coast of the Oshika Peninsula in Miyagi Prefecture (38.322° N, 142.369° E, 24 km in depth), and the magnitude of the earthquake was a moment magnitude of 9.0, which is the largest in the history of observations in the vicinity of Japan. At the same time, the tsunami caused by the earthquake caused a nuclear leak at the Fukushima Daiichi nuclear power plant that was even more serious and caused enormous damage to society [2]. In the aftermath of the earthquake, approximately 470,000 individuals were evacuated, over 8 million households experienced power outages, and 1.8 million households faced water supply disruptions. As of 1 March 2023, 22,318 people were officially confirmed dead or missing, and a total of 406,067 buildings had been washed away or half destroyed. As reported by the Reconstruction Agency, by 1 August 2023, the prolonged aftermath of the disaster had left 30,115 people either evacuated or displaced [3–6]. These records indicate that the 2011 Great East Japan Earthquake had a significant impact on Japanese society.

Among the affected areas, Ōtsuchi-chō, located in the Tohoku region of Japan, suffered extensive damage.

Ōtsuchi-chō is situated in Iwate Prefecture (Figure 1) and is a coastal rural area with a population of approximately 10,000. A tsunami warning was issued immediately following the earthquake, urging residents to evacuate promptly. The earthquake triggered a tsunami with a height of approximately 12.9 m, causing considerable destruction in the area. According to reports from the Ōtsuchi Town Government, there were 873 fatalities, 413 missing persons, and 3717 buildings collapsed or damaged (Table 1). Moreover, the population decreased sharply after the disaster in 2011, and since then, the population of the entire region has remained at around 10,000 (Figure 2).

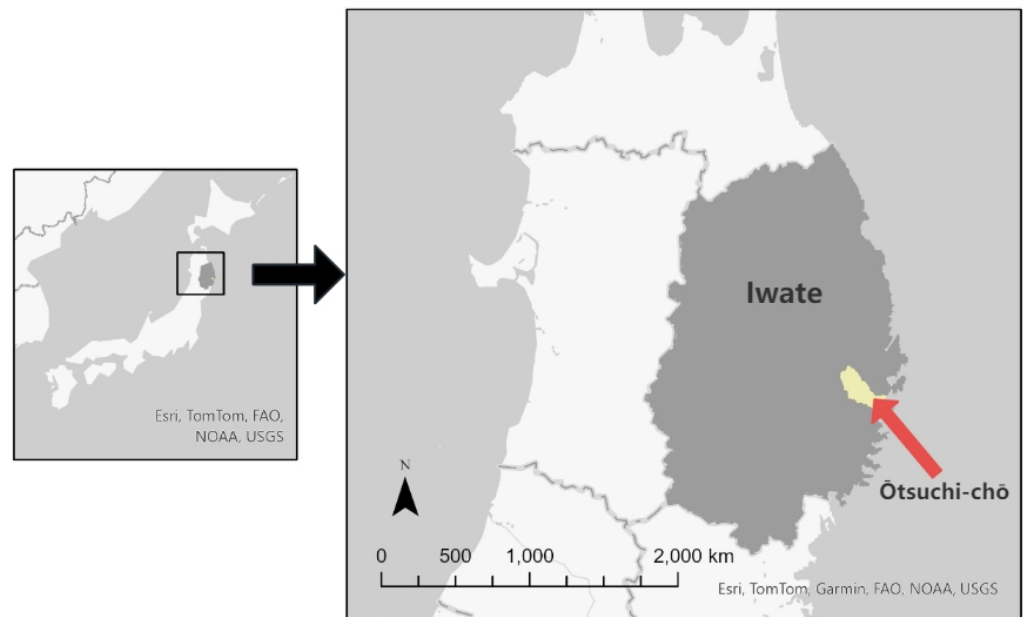


Figure 1. Location of Ōtsuchi-chō, Iwate Prefecture.

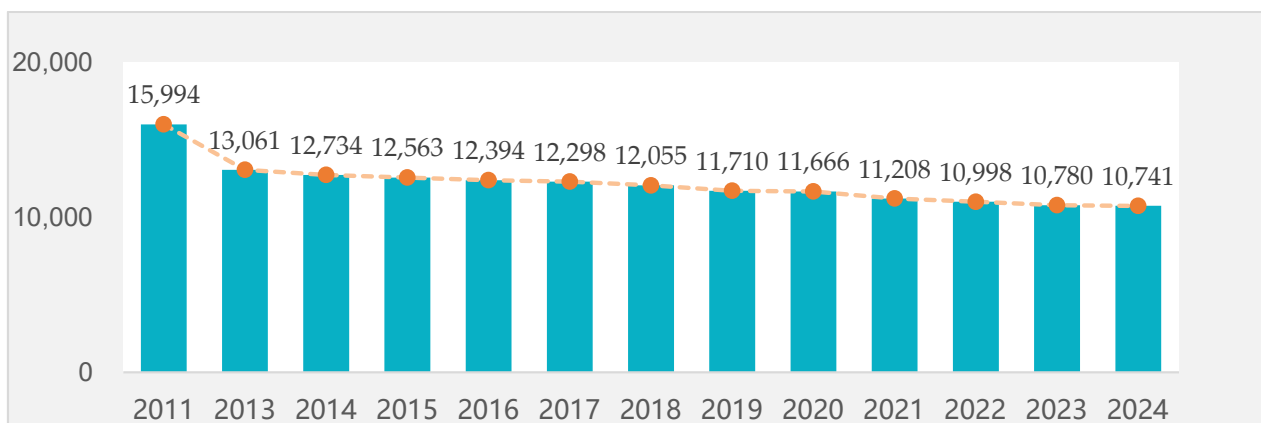


Figure 2. Population changes in Ōtsuchi-chō.

Created based on records from the official website of the Iwate Prefectural Government [7].

Table 1. Damage in Ōtsuchi-chō.

Earthquake/Tsunami		Human Casualties		Collapsed Building	
Magnitude	9.0	Deaths	874	collapsed or damaged	3717
Tsunami height	12.9 m (Average)	Missing persons	412		
		Total	1286		

The table was created by the author based on data from the Ōtsuchi-chō Hall website. Source: <https://www.town.otsuchi.iwate.jp/gyosei/docs/447034.html> (accessed on 5 December 2023) [8].

Following the 2011 Great East Japan Earthquake, Ōtsuchi-chō in Iwate Prefecture underwent a prolonged period of reconstruction, which included the rebuilding of infrastructure, the reconstruction of residents' housing, and the recovery of the economy. According to the Japan Reconstruction Agency's "Efforts toward Reconstruction of Tohoku" (2023 edition), for the reconstruction of the lives of disaster victims and the building of reconstruction communities, it is necessary to provide seamless support according to the prolonged evacuation and the transition from temporary housing to permanent housing, while continuing to look after the elderly, care for their physical and mental health, support community building, and support the healthy growth of children [9]. Therefore, this study looked at the effects of 13 years of reconstruction in Ōtsuchi-chō. To be more specific, it created a more organised and complete reconstruction timeline by combining the progress of the reconstruction work with the residents' points of view. This made it possible to study the features of reconstruction after a disaster in Japanese coastal rural areas. Earthquakes and tsunamis are unpredictable natural disasters that have caused destruction and continue to expand, not only in Japan but also in other regions of the world. The findings of this study may aid in the post-disaster reconstruction of rural areas in other parts of the world.

This paper is divided into the two following main parts: the first half explored some perspectives in current post-disaster reconstruction research, while the second half combined the views of Ōtsuchi-chō residents on post-disaster reconstruction to study whether reconstruction had been completed and its characteristics.

This study aimed to summarise the reconstruction process in regions following large-scale natural disasters, incorporating the voices of residents to discuss the effectiveness of reconstruction and analyse the elements and general process of post-disaster reconstruction in rural societies. Hence, this study, through door-to-door surveys in Ōtsuchi-chō, Iwate Prefecture, affected by the tsunami during the March 2011 Great East Japan Earthquake, recorded the changes in the area over 13 years and the residents' views on post-disaster reconstruction.

2. Literature Review

2.1. Impact of the Disaster on Society

Disasters profoundly affect human societies, often necessitating prolonged and complex post-disaster reconstruction. Effective recovery hinges on understanding the underlying causes of increased vulnerability and the comprehensive impacts of such events. For instance, studies on Hurricane Mitch's aftermath emphasised the importance of socio-economic considerations in disaster research [10]. Similarly, the environmental changes observed in Greenland highlight the direct impacts of climate warming on societal structures and stress the need for multidisciplinary research that includes local communities [11]. Analysis of recovery efforts after Haiti's 2010 earthquake revealed persistently low activity levels, highlighting ongoing reconstruction challenges [12]. Nepal's susceptibility to various natural hazards underscored the critical role of preparedness and risk management in mitigating disaster impacts [13]. Furthermore, studies on the fundamental challenges and management opportunities in post-disaster reconstruction projects emphasised the importance of addressing the root causes of delays and the role of decision-makers in identifying the best opportunities to overcome reconstruction obstacles [14]. Innovative recovery strategies, such as utilising ISO shipping containers for sustainable housing, demonstrated potential efficiencies in rebuilding processes [15]. Moreover, the noted research gap in psy-

chological preparedness for disasters suggested an avenue for future investigation [16]. A comprehensive bibliometric analysis of the post-disaster reconstruction literature provided a clear picture of recent research trends, highlighting significant topics such as resilience, building back better, and project management as vital subjects in the field, offering the potential for future research [17]. This section of the literature review collectively advocated for a multidisciplinary approach and robust community engagement in post-disaster reconstruction to address the broad spectrum of challenges and vulnerabilities associated with such catastrophic events.

2.2. Post-Disaster Reconstruction of the 2011 Great East Japan Earthquake

The 2011 Great East Japan Earthquake prompted significant reconstruction efforts focused on revitalising affected communities, infrastructure, and the local economy. Matanle (2011) [18] viewed the disaster as a potential turning point for regional revitalisation and energy strategies in Japan, advocating for governance reforms and a vision for a resilient society. Kato (2020) [19] explored resilience in sustainable tourism, emphasising its role in the recovery of rural communities in Iwate Prefecture. Harrison (2011) [20] and Andô (2013) [21] discussed the social impacts of the disaster, including the need for inclusive dialogue and the gender dynamics in the Fukushima crisis. Lin et al. (2021) [22] and Tashiro (2021) [23] examined the contributions of educational and environmental initiatives to community resilience. Hori et al. (2021) [24] highlighted mental health challenges post-disaster, and Dourdour and Murayama (2020) [25] analysed economic impacts such as land price disparities in Fukushima. Kimura et al. (2014) [26] and Cho (2014) [27] addressed the long-term recovery processes and the role of community governance in reconstruction efforts. The extensive reconstruction efforts following the 2011 Great East Japan Earthquake have underscored the importance of a multifaceted approach involving governance reform, community resilience, and economic revitalisation. The array of studies discussed highlights how disaster recovery transcends mere physical rebuilding, requiring attention to governance, social dynamics, and economic strategies to foster a sustainable and resilient recovery.

2.3. Literature Review Summary

Building upon the foundational insights from the comprehensive reviews of disaster impacts and post-disaster reconstruction efforts, the case of Ōtsuchi-chō, which endured significant damage from the 2011 Great East Japan Earthquake, provides a focused lens through which the dynamics of community engagement in reconstruction can be explored. This segment highlights the pivotal role of community participation in effective recovery and sustainable rebuilding efforts. Delving deeper, this research examined how local engagement contributes to these efforts, especially in contexts marked by significant challenges and robust community-driven initiatives. The reconstruction of Ōtsuchi-chō illustrates the complex interaction between governmental strategies and community responses. The literature suggested that the synergy between these approaches significantly influences the trajectory of recovery and resilience building. This study aimed to contribute to a nuanced understanding of the factors that facilitate or hinder effective community participation in similar contexts. Furthermore, it considered how demographic shifts such as ageing and population decline affect community dynamics and the sustainability of recovery efforts, thereby enhancing the overall resilience of communities affected by disasters.

3. Research Methods

This study conducted an in-depth investigation by recording changes in the area before and after the disaster and by interviewing residents of the area. Firstly, Ōtsuchi-chō is a coastal village in northeastern Japan with limited external communication. Therefore, it is challenging to frequently enter the area, establish good interpersonal relationships with residents, and integrate into such a society, which is the difficulty of this research. Since

October 2018, I have been regularly visiting Ōtsuchi, striving to build good interpersonal relationships and lay the foundation for subsequent research. Secondly, in December 2023, the local literature was searched to record changes in post-disaster reconstruction. Thirdly, interview surveys were conducted based on “establishing good interpersonal relationships” and “recording changes after reconstruction”. The aim was to record and discuss the satisfaction and shortcomings of local post-disaster reconstruction from the perspective of the affected residents.

This study primarily collected data from two sources. Firstly, a survey was conducted on 103 residents of Ōtsuchi-chō (Table 2). The survey covered several topics, including basic information about the respondents (age and gender), changes in neighbourhood interactions before and after the earthquake, views and evaluations of local post-disaster reconstruction, and changes in Ōtsuchi-chō over the past 13 years. Among these respondents, members of the Livelihood Committee were specifically interviewed. Secondly, additional information was obtained through interactions with Ōtsuchi-chō government officials and records from local libraries. By integrating these two aspects, an in-depth study was conducted. In this series of investigations, all personal information and interview records of the respondents were protected. The research was conducted strictly according to research ethics.

Table 2. Door-to-door interviews.

Procedure for Disseminating a Survey	Elements of the Survey
Data collection technique	Door-to-door interviews
Sample	103
Interview survey	Basic information (gender and age) Changes in daily life before and after the disaster Reconstruction of new communities Changes in neighbourhood relations before and after the disaster Changes before and after the disaster (housing, infrastructure, local economy, etc.)
Collection period	6–23 December 2023
Targeted areas	Ōtsuchi-chō

Through this interview survey, the records were examined and categorised, summarising the serious post-disaster reconstruction and changes experienced by residents over the 13 years. This is elaborated on in the next section of this paper.

4. Results of the Analysis and Discussion

4.1. Basic Information

The basic information of the respondents and key statements in the interview records were analysed and interpreted. This included items based on general personal characteristics, such as gender and age; communication among neighbours in the community before and after the disaster, including frequency and whether it had an impact; and views on the changes brought about by post-disaster reconstruction, such as living environment, infrastructure, etc.

The population of Ōtsuchi-chō is undergoing a significant ageing process. According to Figure 3, a substantial 74.7% (11.7% + 41.7% + 19.4% + 1.9%) of respondents were aged 60 and above, indicating a high proportion of elderly residents. In terms of gender, over half of the respondents were female (70%), with 69% being over 60. Interviews revealed that many elderly women live alone, facing numerous challenges in their daily lives due to age and health reasons. These issues are explored in detail later in the study.

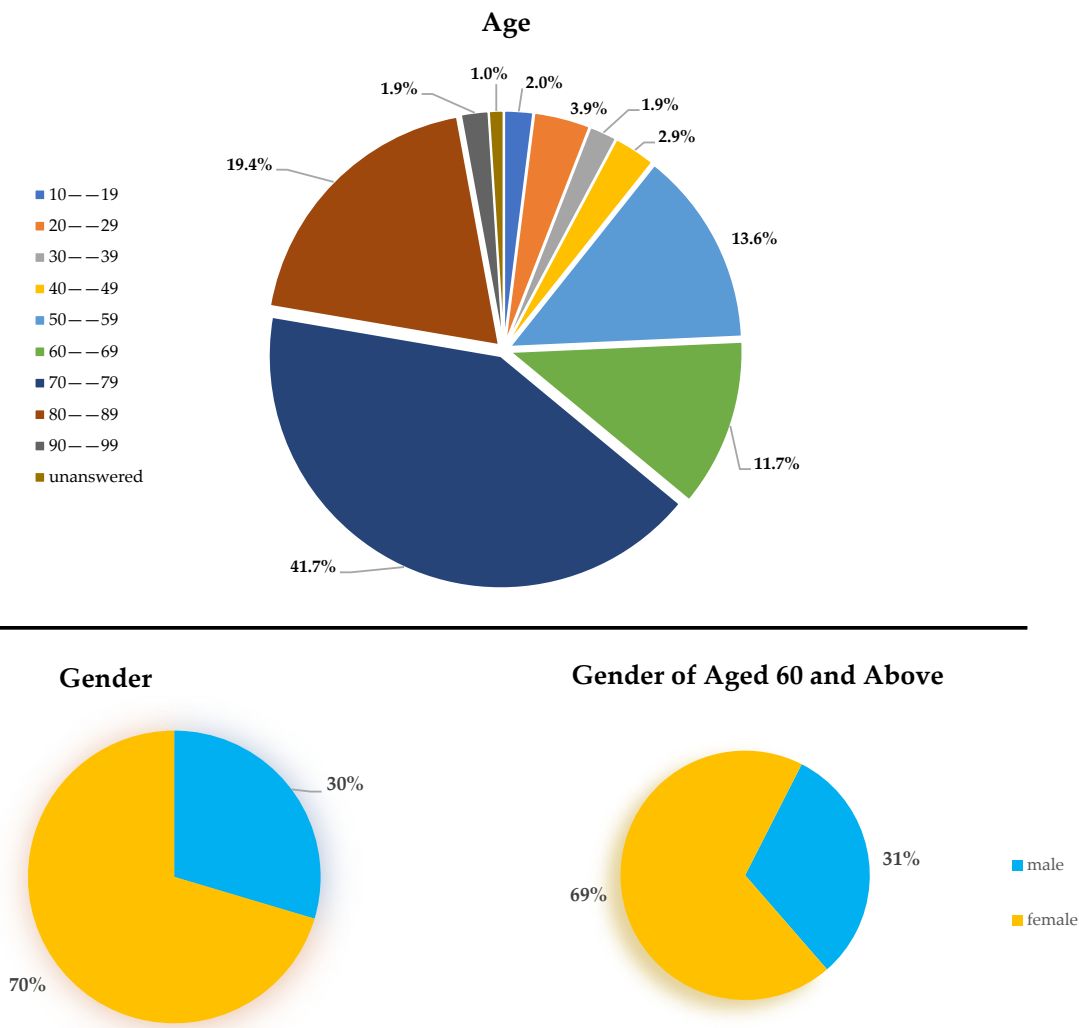


Figure 3. Basic information of interviewees (n = 103).

4.2. Reconstruction Timeline

This study aimed to understand the reconstruction process better and changes in Ōtsuchi-chō over the 13 years since the 2011 Great East Japan Earthquake. By combining records from interview surveys and various local publications, a “Reconstruction Timeline of Ōtsuchi-chō” was compiled [28–45]. This timeline is divided into the following three periods: “2011”, “2012–2015”, and “2016–Present”. Within these timelines (T), records obtained from the literature (L) are indicated in blue, while those derived from door-to-door interviews (D) are marked in yellow (Figure 4).

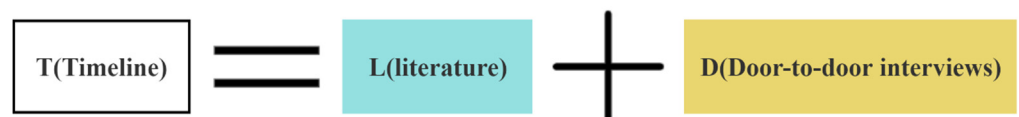


Figure 4. Method for Creating a Timeline.

4.2.1. Disaster and Early Reconstruction Period (2011)

The diagram above illustrates the initial phase of post-disaster reconstruction in Ōtsuchi-chō (Figure 5). Following the earthquake, residents engaged in self-rescue efforts, and three days later, the Japan Self-Defense Forces initiated rescue operations, providing temporary bathhouses, and establishing various local shelters. The Ōtsuchi Town Government resumed administrative work at a former elementary school two months after the

earthquake, while the first batch of emergency housing was completed on 4 May in the Kiri-kiri area. Schools resumed classes in temporary classrooms on 20 September, restoring regular education. Economic recovery efforts included the construction of temporary commercial facilities and the reopening of the seafood market to serve residents and revive the fishing industry.

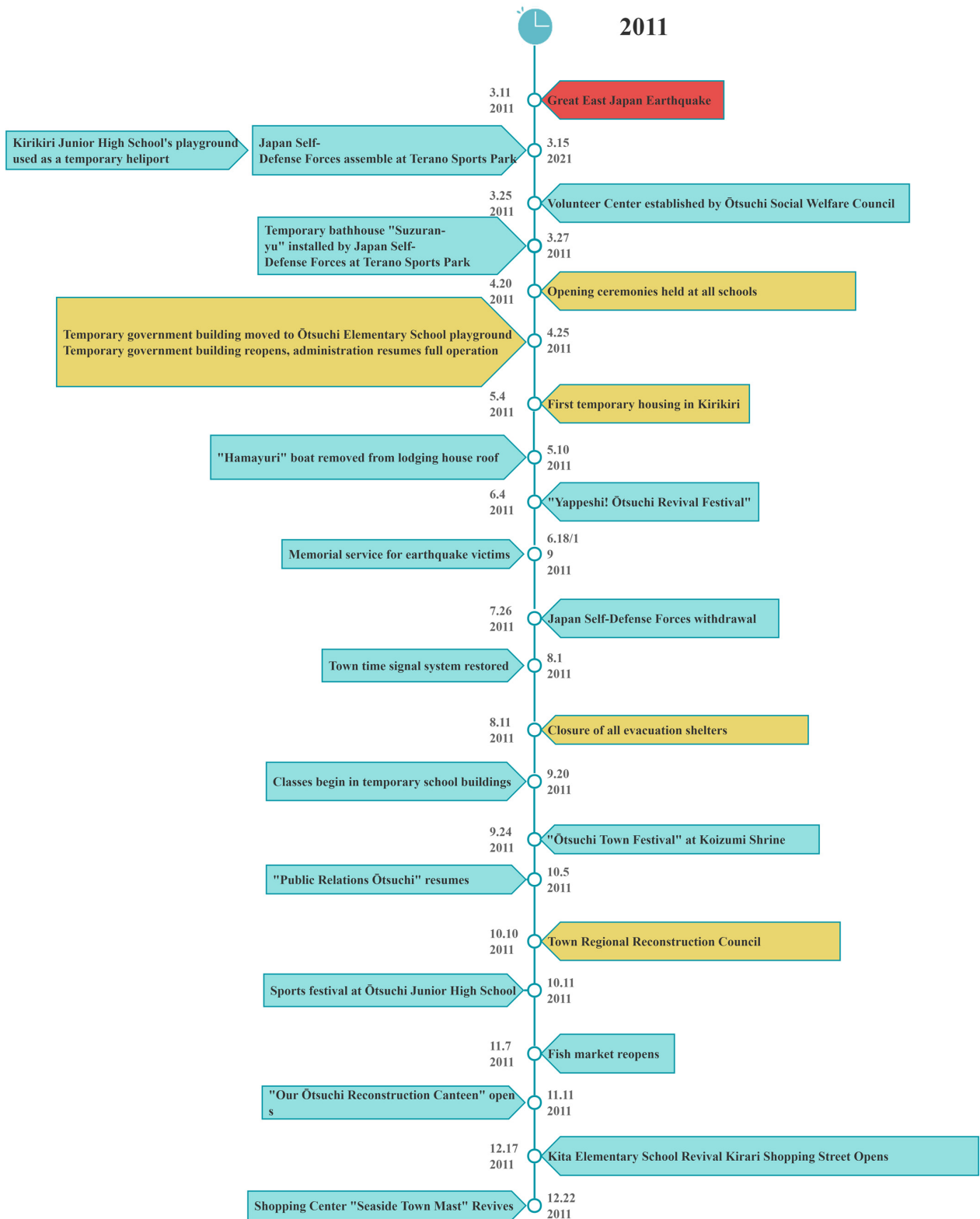


Figure 5. Timeline for 2011.

The earthquake and tsunami in 2011 caused tremendous casualties and economic losses in Ōtsuchi-chō. Since then, the initial recovery of residents' lives through internal self-help and external rescue has laid the foundation for future reconstruction efforts in various aspects. Moreover, from the distinction in colours, it was evident that the residents of Ōtsuchi-chō were more concerned about when their emergency-style life after the disaster would change, hence they were more concerned about the restoration of housing and local administration. It is not difficult to see that, in the immediate aftermath of the disaster, the affected individuals were more concerned about their safety and the recovery of their daily lives, which was reflected throughout the entire reconstruction process.

4.2.2. Mid-Reconstruction Period (2012–2015)

In the first year after the disaster (Figure 6), 2012, a large-scale memorial service was held for the first time on 11 March, establishing the "March 11 Memorial Service" as an annual event. On 31 March, local radio broadcasting resumed, signifying the recovery of local wireless media. From April to June, a variety of cultural and entertainment activities were organised for the residents of Ōtsuchi-chō, accelerating the pace of reconstruction of residents' lives.

In terms of infrastructure reconstruction, on 6 August, the government's temporary office permanently moved into the teaching building of the former Ōtsuchi-chō Elementary School which has been in use ever since. On 30 August, the first batch of public housing was completed and put into use, marking a new phase in housing reconstruction. Subsequently, on 10 December 2014, construction began on a comprehensive school, "Ōtsuchi-chō Academy", which combines elementary and junior high schools. The school was completed and put into use on 7 April 2015, playing a vital role in local education.

In economic recovery, from 2012, the fishing industry in Ōtsuchi-chō began to recover, with the establishment of the new "Ōtsuchi-chō Fisheries Association" and the resumption of various fishing activities. Additionally, the "Hou-rai Island", a symbol of Ōtsuchi-chō's reconstruction, was designated as a cultural heritage site, promoting the subsequent rise of the tourism industry.

From 2013 to 2015, the reconstruction of residents' housing entered the public housing phase. The reconstruction of the Ōtsuchi-chō government and schools was gradually completed, and the infrastructure reconstruction entered the mid-term phase. In terms of economic recovery, the local fishing industry quickly restarted. On the other hand, the timeline also shows that the reconstruction concerns of residents (yellow) focused on daily life, such as housing, education, and everyday cultural and entertainment activities.

4.2.3. Late Reconstruction Period (2016–Present)

The diagram above represents the final phase of the post-disaster reconstruction timeline (Figure 7). In terms of housing reconstruction and the restoration of daily life, not only were various cultural festivals held to enrich the cultural life of residents, but several community centres were also constructed, such as the Kiri-kiri Community Centre and the Aka-Hama Community Centre, which promoted the formation of new communities. Furthermore, on 31 October 2019, all public housing was completed and occupied, totalling 876 households, thus resolving the housing issue for residents.

Moreover, the reconstruction of infrastructure entered its final phase. On 9 May 2016, the Ōtsuchi Town Public Hospital opened. Subsequently, the train station was completed and opened for service (completed on 19 March 2018, and opened on 23 March 2019), followed by the continuous construction, and opening of new roads and bridges.

Thirdly, the economic recovery during this period entered a new phase. Not only had the local fishing industry fully recovered, but the tourism industry also began to develop. As Ōtsuchi-chō has experienced four tsunamis in modern times (including the 2011 Great East Japan Earthquake), the area has retained many sites of post-disaster reconstruction experience and has published three memoirs (2017, 2018, and 2019 editions) about the Great East Japan Earthquake, which are important resources for tourism and education.

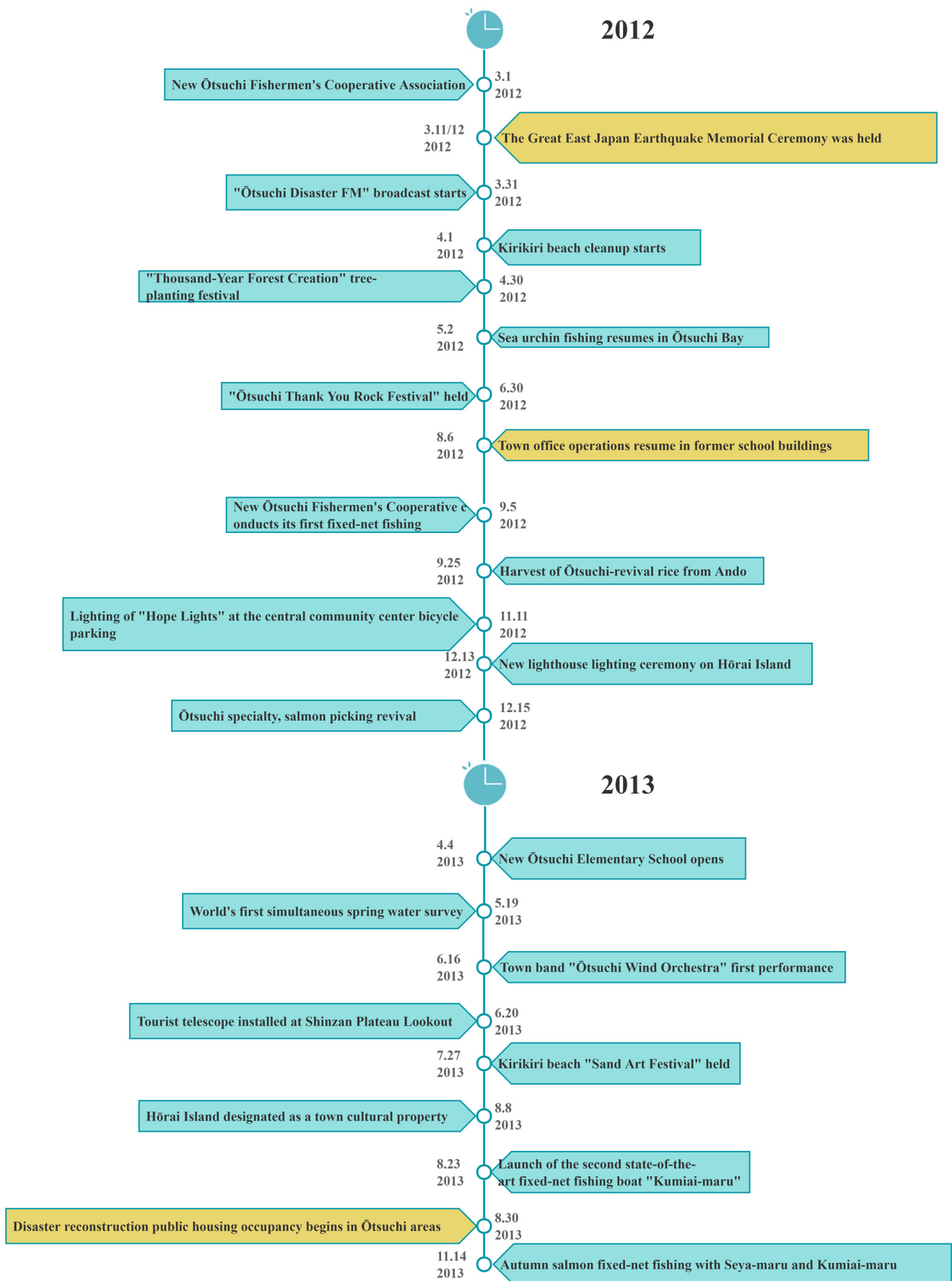


Figure 6. Cont.

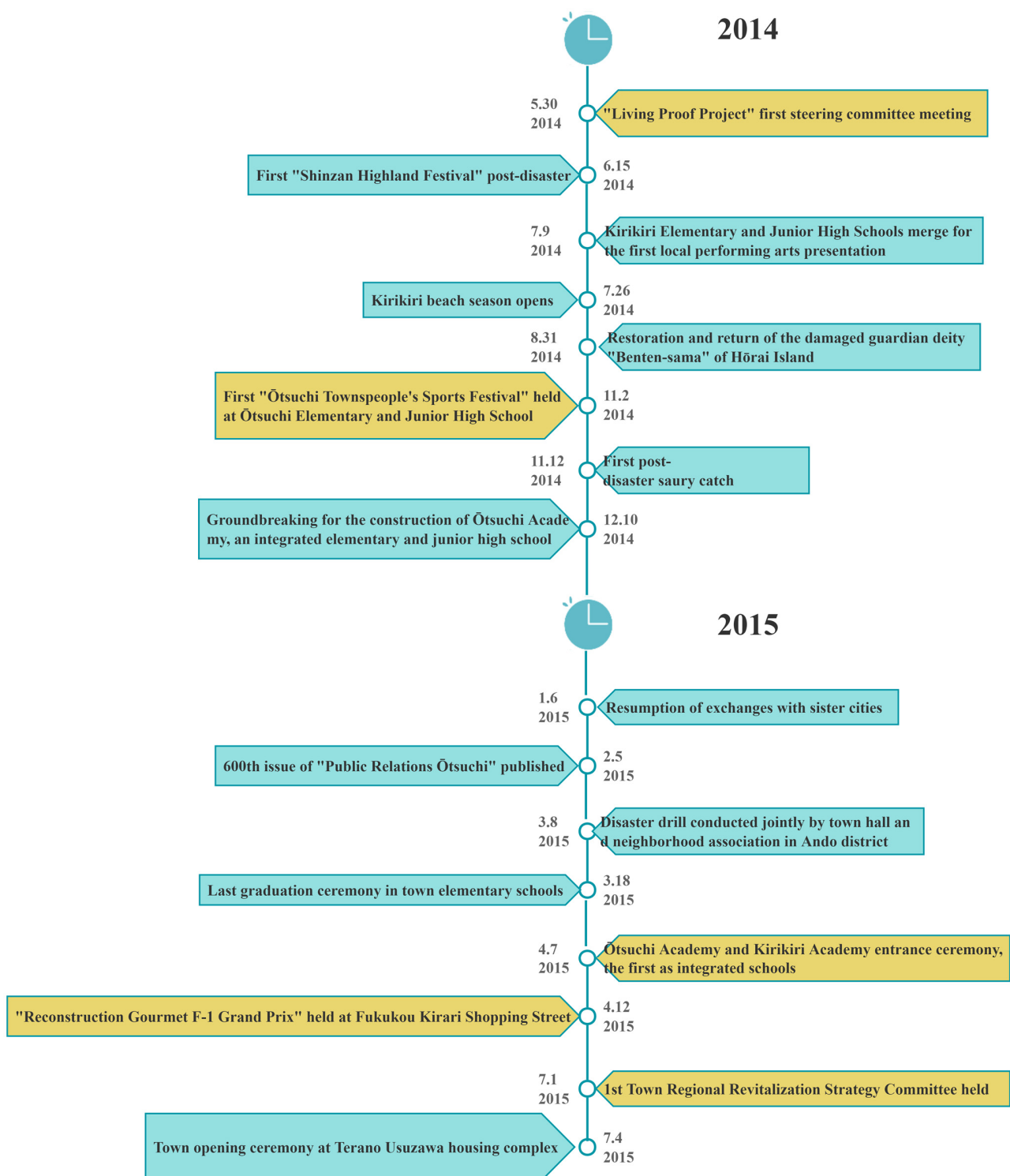


Figure 6. Timeline for 2012–2015.

This phase marks the later stage of post-disaster reconstruction in Ōtsuchi-chō. The reconstruction of housing and infrastructure has been largely completed, and while the economy has recovered, it has also driven the development of the tourism industry. Combining the recorded interviews with residents, although residents' daily lives have returned to normal, the establishment of new communities has always been a problem, which is explored in detail in the conclusion section. Furthermore, from the reconstruction timeline of this phase, residents were not only focused on restoring daily life but also hoped for an

improvement in the quality of life. From the yellow part of Figure 8, they were beginning to consider the experience of post-disaster reconstruction and were also concerned about the construction of various infrastructures.

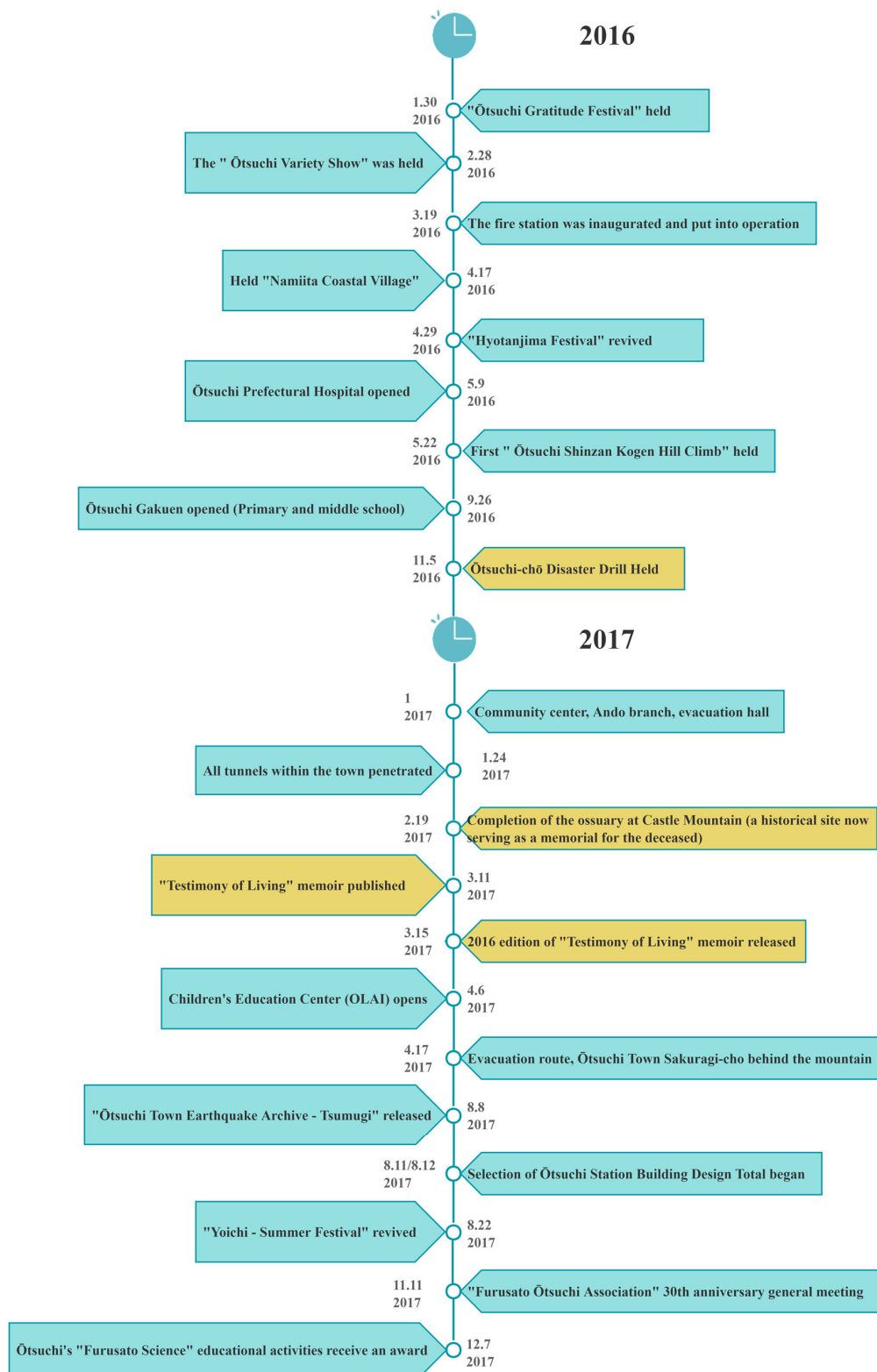


Figure 7. Cont.

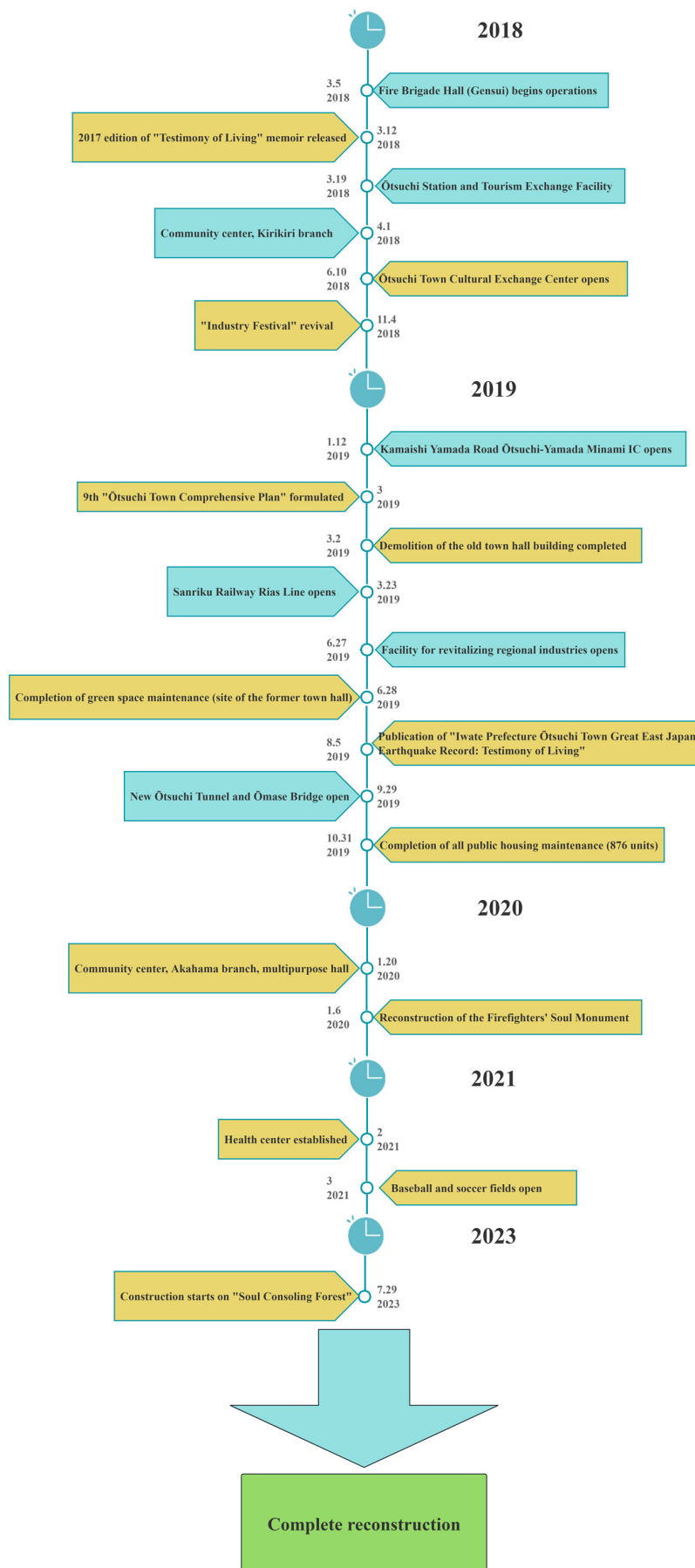


Figure 7. Timeline for 2016–Present.

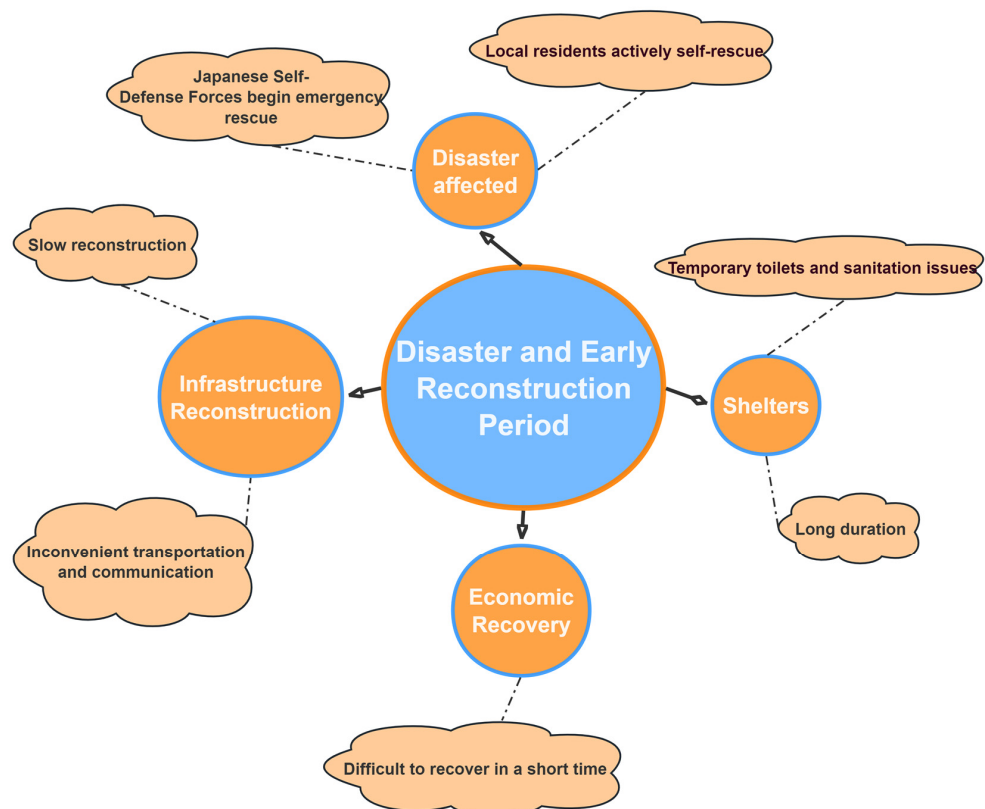


Figure 8. Interview records: disaster and early reconstruction period.

4.3. Post-Disaster Reconstruction from the Perspective of the Victims

Field surveys documented the catastrophe and the subsequent rescue efforts, revealing significant destruction wrought by the earthquake-triggered tsunami and fires in the area (Figure 8).

Infrastructure in Ōtsuchi-chō was devastated, with transport and communications completely disrupted, severing contact with the external world. Concurrently, many residents sought immediate refuge in shelters, commencing an extended period of displacement. The Japan Self-Defense Forces, directed by the central government, provided urgent assistance, including the search for survivors. Nonetheless, there was discontent amongst the populace regarding the protracted duration of shelter habitation and recurring issues with temporary sanitation facilities.

In the face of disaster, Japanese society often leans towards self-help measures, prioritising personal safety. Ōtsuchi-chō, historically besieged by tsunamis (the Meiji Sanriku tsunami of 1897, the Shōwa Sanriku tsunami of 1933, and the 1960 Chilean tsunami) [46], has a populace well-versed in self-rescue. However, the prolonged stay in shelters and the associated sanitary challenges reflected the inadequacies of the emergency response measures.

Furthermore, the survey documented what residents perceive as the “second phase of post-disaster reconstruction” (Figure 9). Most residents transitioned to temporary housing during this period and encountered mixed experiences. While elementary and junior high schools resumed on temporary campuses—symbolising a step toward normalcy—and the fishing industry began to recover, significant challenges remained.

Residents noted improvements in infrastructure as debris from disaster-affected buildings was cleared, facilitating the construction of temporary hospitals, and enabling the gradual resumption of economic activities with the reopening of local businesses such as shops and restaurants. However, this phase also introduced substantial social challenges. The relocation to temporary housing disrupted established community bonds, leading to unfamiliarity among neighbours and occasionally resulting in conflicts. Moreover, a

recurring theme in resident feedback highlighted their dissatisfaction with the extended duration of temporary accommodations and the overall slow pace of the broader city reconstruction efforts.

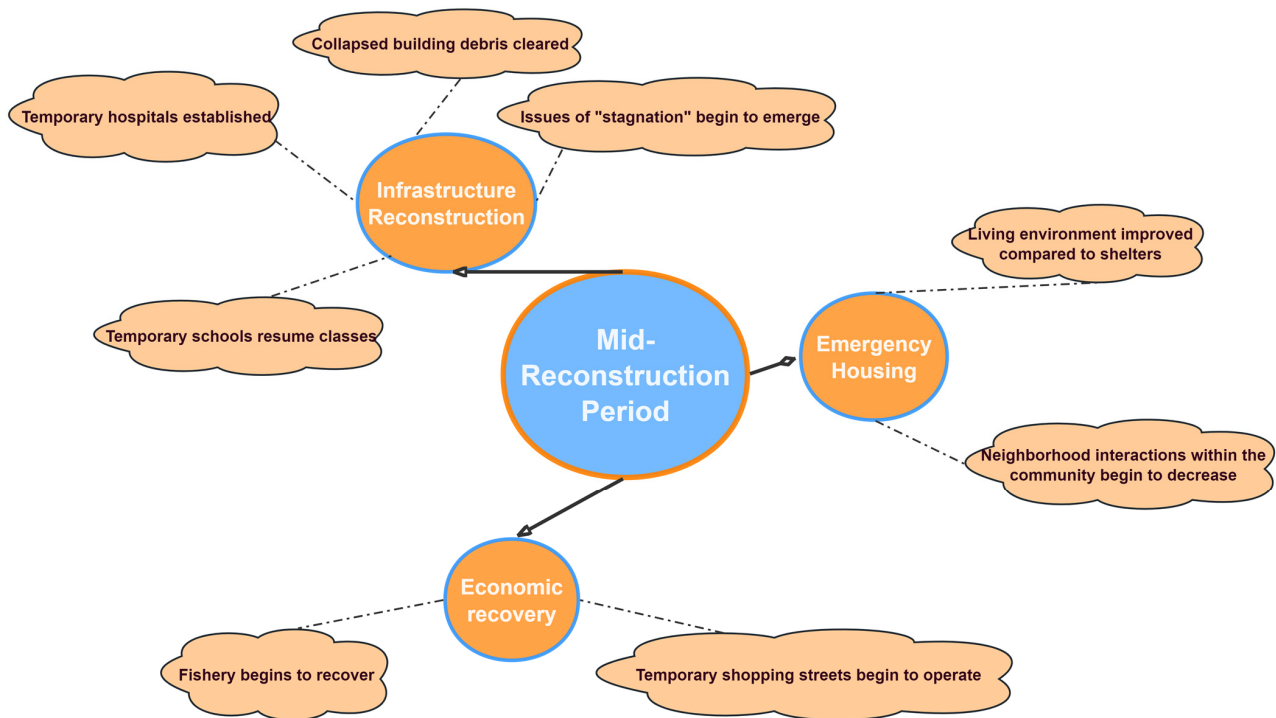


Figure 9. Interview records: mid-reconstruction period.

In this phase of post-disaster reconstruction (Figure 10), significant progress was evident as efforts neared completion. Many residents transitioned from temporary shelters to public housing, while others acquired new homes, enhancing their living conditions. Infrastructure reconstruction was finalised, with roads and railways reopening, thereby improving accessibility and convenience. New recreational facilities such as football fields, baseball grounds, and community parks were established, and the new public hospital began operations. Additionally, the full recovery of Ōtsuchi-chō's commerce and fishing industries restored routine economic activities to pre-earthquake levels, and the burgeoning tourism sector further bolstered regional economic development.

Despite these advancements, challenges persisted in fostering community interactions. As residents relocated to new environments, whether public housing or newly established communities, their interactions remained sparse. "I don't know the face of my neighbour", and "The environment in public housing is nice, but I don't know the people around me", were common sentiments reflecting this isolation. Furthermore, although the physical reconstruction of infrastructure such as roads and railways was completed, residents faced increased living costs and transportation expenses, which strained their daily lives. The insights gathered from these field surveys are instrumental in shaping future recovery frameworks and addressing community integration and economic challenges more effectively.

On the other hand, since 2011, the population of Ōtsuchi-chō has remained at around 10,000, with the ageing population continuously increasing (Figure 2). In the interview survey, many respondents were elderly, expressing that Ōtsuchi-chō now resembles a "huge nursing home", posing significant challenges to local healthcare and infrastructure development. Moreover, from the perspective of community reconstruction, the constant relocation of residents has also hindered the establishment of new communities. To further explore the interviewees' views on post-disaster community reconstruction, we conducted interviews on the frequency of neighbourhood interactions before and after the earthquake. The frequency was divided into the following five levels: none, not much, unclear, occasionally, and often.

As shown in Figure 11, neighbourhood and community interactions were greatly affected before and after the earthquake. Before the earthquake, the proportion of “no interaction at all” was 0, while after the earthquake, it reached 35%. According to the interview records, many respondents also said that the area they now live in was different from before the earthquake, so they do not know their neighbours at all. A common phrase among elderly respondents was “The atmosphere of this community is very indifferent”, “There is little communication”, etc. This has brought great difficulties to community reconstruction.

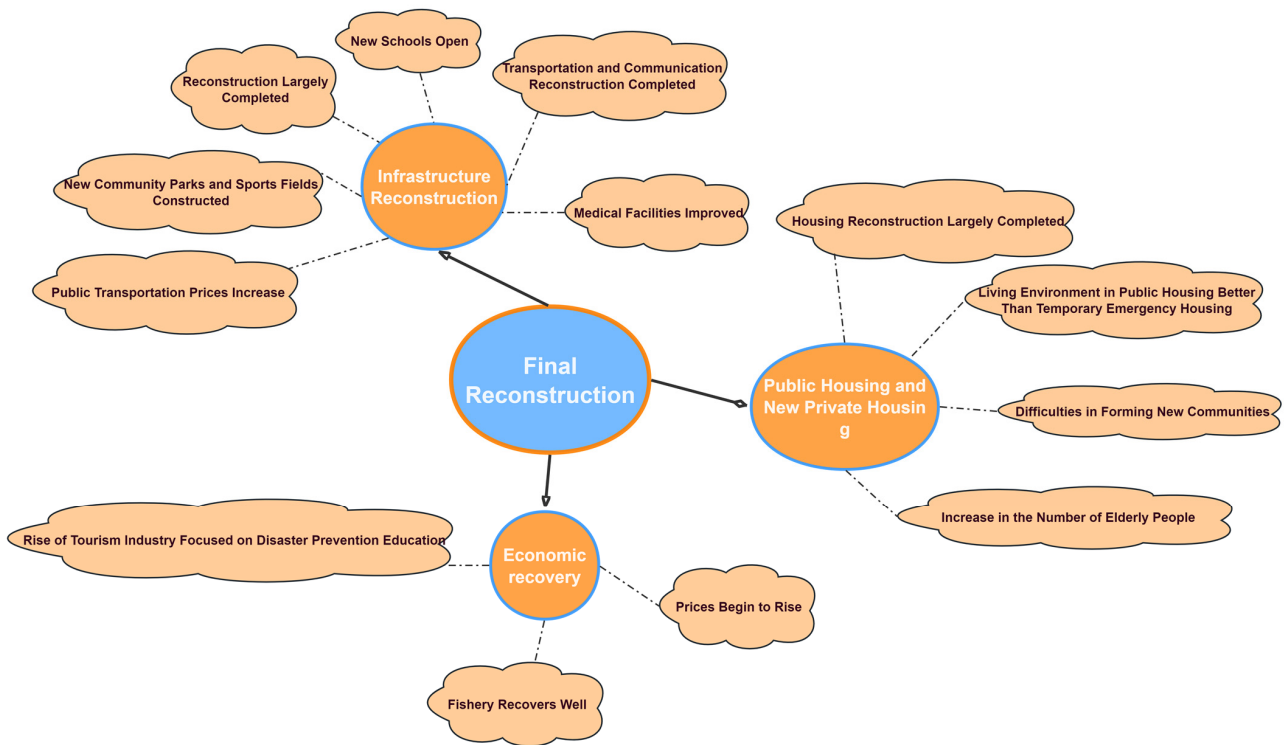


Figure 10. Interview records: late reconstruction period.

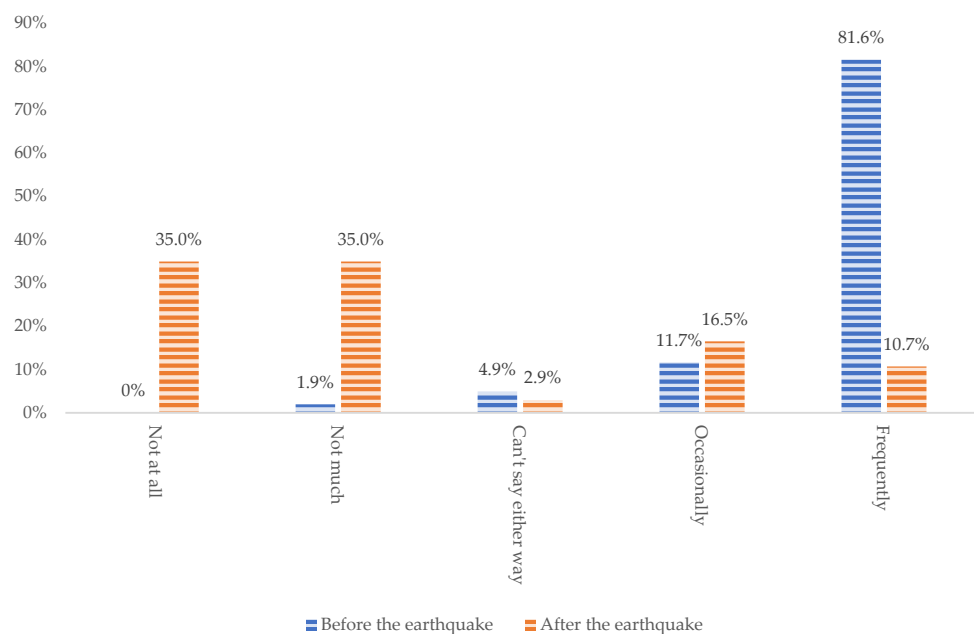


Figure 11. Frequency of neighbourhood interactions within the community before and after the disaster (n = 103).

4.4. Reconstruction of Ōtsuchi-chō

13 years after the 2011 earthquake, significant progress has been made in the reconstruction of Ōtsuchi-chō [28,45]. Table 3 was created based on the timeline and results of resident interviews, as well as from the literature. Firstly, in terms of housing reconstruction, the construction of public housing has been completed (876), and residents have been continuously building their new homes. Furthermore, the reconstruction of infrastructure has been completed. For example, 5.2 km of railway and 12.8 km of the expressway have been constructed, along with the establishment of a public hospital, 10 community centres (one of which is the main centre), and educational institutions. Residents' daily lives have been restored, and the living environment has been improved. Thirdly, the local economy has revived. The fishing industry has not only resumed its regular activities, but the post-disaster reconstruction experience and some memorial facilities have also promoted the development of the tourism industry.

Table 3. Reconstruction achievements in Ōtsuchi-chō.

Residential Reconstruction	Infrastructure Reconstruction	Economic Recovery
Public housing: 876	Roads: 12.8 km Sanriku Railway Riss Line: 5.2 km	Fisheries recovery
New housing reconstruction	Ōtsuchi-chō Academy (elementary and junior high school) Ōtsuchi-chō Public Hospital Community centres: 1 (main) and 9 (district)	Tourism

5. Conclusions

5.1. Significance for Post-Disaster Reconstruction in Other Regions

Finally, through the analysis of the 13-year reconstruction timeline of Ōtsuchi-chō, the characteristics of post-disaster reconstruction in the context of an ageing society in a Japanese village were summarised (Figure 12). The reconstruction of Ōtsuchi-chō was structured into the following three phases: “Reconstruction of Housing”, “Infrastructure Reconstruction”, and “Economic Recovery”, each corresponding to the early, middle, and late stages of the process. Initially, efforts concentrated on emergency measures to ensure resident’s safety. The middle stage, however, was marked by prolonged reconstruction activities, with residents noting the slow pace of infrastructure and housing development. By the late stage, while structural projects were completed, challenges shifted towards addressing social issues, such as stimulating economic growth in an ageing society and fostering genuine community development beyond mere physical reconstruction.

To address identified challenges in post-disaster recovery, this study proposes several strategic interventions: firstly, the enhancement of welfare facilities to better accommodate the needs of the ageing population. Secondly, the modification of public transportation systems based on user feedback may include fare reductions and increased service frequencies. Thirdly, the attraction of new residents through incentives such as housing and educational opportunities. Fourthly, the activation of community centres with varied activities designed to enhance social interaction among residents. Demonstrably effective in Ōtsuchi-chō, these strategies are recommended for similar disaster-impacted regions. Notably, the January 2024 earthquake in Ishikawa Prefecture [47], which experienced similar tsunami impacts and demographic challenges as Ōtsuchi-chō, could derive significant advantages from these approaches. This parallel underscores the relevance of Ōtsuchi-chō’s reconstruction initiatives as a robust model for rural areas navigating the complexities of post-disaster recovery, especially those with comparable socio-demographic profiles.

In conclusion, the case study of Ōtsuchi-chō provides valuable insights for post-disaster recovery that are applicable universally. The community-centric strategies implemented here provide a valuable blueprint for rural areas in Japan and other developed countries, particularly those with ageing populations. These regions commonly encounter challenges related to demographic shifts and resource allocation, making the lessons from

Ōtsuchi-chō highly relevant. The need for flexible and empathetic reconstruction policies that reflect socio-economic and demographic realities is essential globally. As ageing populations become more common, disaster recovery approaches must adapt to effectively meet these challenges.

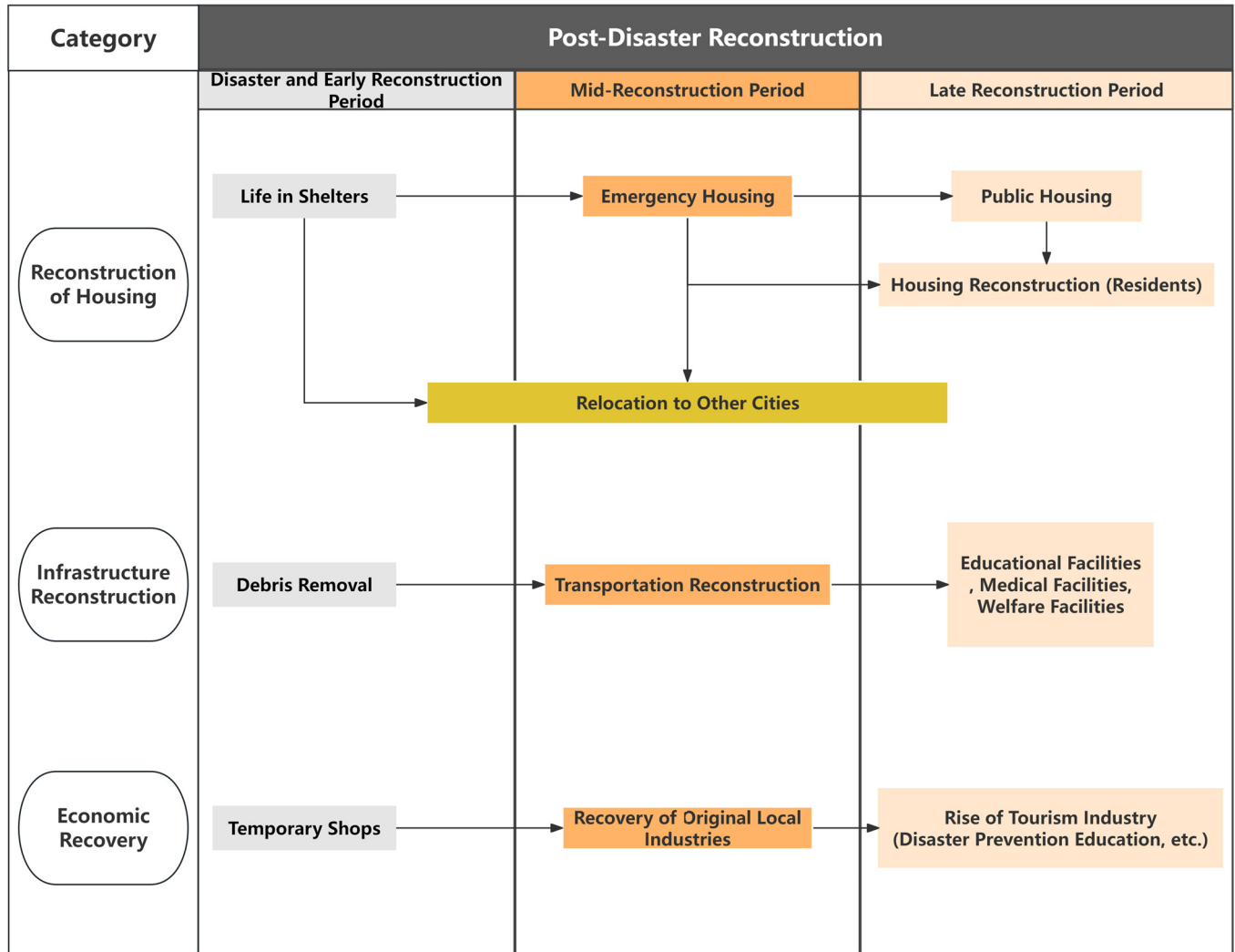


Figure 12. Three stages and aspects of post-disaster reconstruction in Japanese villages.

5.2. Unforeseen Findings and Limitations

This study, grounded in the literature and interviews, uncovered several notable findings. Despite the completion of infrastructure reconstruction in Ōtsuchi-chō, public transportation has deteriorated post-disaster, with reduced services and increased fares, diverging from expected welfare support enhancements and causing resident inconvenience. Additionally, this research pioneered a timeline approach to document reconstruction efforts, compensating for the lack of comprehensive local government records with synthesised data from diverse sources. This methodological innovation marks a distinct contribution to the field.

The limitations of this study include its focus on the relatively isolated coastal village of Ōtsuchi-chō in northeastern Japan, which may have led to an incomplete interview survey. Future research should collaborate more closely with local government to continuously refine the reconstruction timeline. Additionally, while this study has established a comprehensive initial timeline, ongoing changes in reconstruction projects, such as the incomplete

“Soul Consoling Forest”, highlight the need for continuous updates and research to reflect evolving realities.

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