Communication

Operational Management and Improvement Strategies of Evacuation Centers during the 2024 Noto Peninsula Earthquake—A Case Study of Wajima City

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Abstract: On 1 January 2024, a large earthquake occurred in Japan’s Noto region. Many buildings collapsed as a result of violent shaking. Electricity and water supplies were cut off, and communications were disrupted. On 5 January, four days after the earthquake, we visited Noto and conducted disaster-relief activities. This report integrates and discusses the results of the site visits, information broadcasts by public institutions, and previous research. Evacuation centers lacked water and proper sanitation, leading to health issues, including infectious diseases. Disaster Medical Assistance Teams (DMAT) were delayed in implementing infection control measures. Isolated evacuation centers faced communication and supply challenges. Infrastructure restoration, power supply, and toilet facilities at evacuation centers were delayed because of geographical challenges. It is important to have a team that can determine and carry out the necessary activities on site, even without instructions from the DMAT. It is believed to be effective to decide in advance how volunteer teams and the private sector will conduct their activities, assuming that they will be unable to contact public institutions during a disaster. In large-scale disasters, evacuees must operate evacuation centers autonomously. To achieve this, it is necessary for residents to regularly come together as a community. Systematically recording and accumulating these experiences will contribute to improved disaster prevention and mitigation planning. We hope that the experiences we obtained through the abovementioned disaster will be useful for preparing for future disasters.

Keywords: disaster; earthquake; seismic emergency; evacuation; seafloor uplift

1. Report Overview and Objective

The primary goal of this research was to analyze the operational management issues and improvement strategies of the shelters during the Noto Peninsula Earthquake in Wajima City. By focusing on shelter management, we aim to identify key challenges and propose actionable recommendations for future disaster preparedness and response.

On 1 January 2024, at 16:10 (Japan Local Time), an earthquake with a magnitude of 7.6 and a maximum seismic intensity of 7 (Japan Meteorological Agency Seismic Intensity Scale) occurred in Japan, with its epicenter on the Noto Peninsula in Ishikawa Prefecture. Ishikawa Prefecture has an elongated topography that stretches from north to south, and the Noto region lies in the northern part of the prefecture (Figure 1). The epicenter depth was shallower at 16 km, and tremors were felt across almost all of Japan. In the Noto...
region, which was the epicenter of the earthquake, many buildings collapsed because of violent shaking.

![Figure 1. Location of the Noto region of Ishikawa Prefecture. The figure was created by overlaying the administrative area data obtained from the National Land Numerical Information Download Site: https://nlftp.mlit.go.jp/ (accessed on 3 July 2024) on Google Satellite Hybrid.](image)

On 5 January, four days after the earthquake, the authors visited Wajima City, one of the disaster areas. We conducted disaster relief activities, including patrolling the city, checking the conditions of the roads and evacuation centers, and observing the health of evacuees. Our team consisted of doctors, nurses, public health nurses, and researchers. Despite belonging to different organizations, we temporarily formed a team to collaborate in the disaster area. We stayed there for one week.

This report integrates and discusses the results of our site visits, information broadcasts by public institutions, and previous research to provide a comprehensive overview of the situation on the ground, focusing particularly on the challenges encountered in assisting disaster victims.

2. Background Information
2.1. Introduction to the Disaster Impact

A timeline of the 10 days after the disaster is summarized in Table 1.

According to an announcement from Ishikawa Prefecture, as of 27 January, 43,369 damaged houses had been confirmed in the Prefecture, and more than 30,000 of these were in the Noto region [1]. The earthquake also triggered a tsunami that damaged at least 160 ha in Suzu City and Noto Town [2]. The tsunami was estimated to be up to 4 m high, flooding fishing ports and buildings along the coast [3]. A large-scale fire occurred in Kawai-machi, Wajima City, destroying 240 buildings including stores and homes. The area destroyed by the fire was 49,000 square meters. According to a report by the Ministry of
Internal Affairs and Communications, it is speculated that the fire was caused by damage to indoor electrical wiring due to the earthquake [4]. Asaichi (morning market) Street in Kawai-machi, the center of the fire, was a famous tourist destination. Starting early in the morning, Wajima Asaichi was lined with stalls selling seafood and vegetables. In addition, Asaichi Street was home to many shops and factories selling Wajimanuri lacquerware, a traditional lacquerware craft. All of them were burned.

This earthquake caused water and sewage outages throughout the Noto region. It took time to restore the water supply, and even 10 days after the disaster, more than 100,000 households in Ishikawa Prefecture still had no water supply. Moreover, large-scale power outages also occurred. Immediately after the disaster, more than 30,000 households lost electricity. Because of the power outage, the Internet was unavailable, making communications difficult. Restoring electricity took time, and as of 11 January, more than 13,000 households were still without power.

More than 1000 aftershocks, including earthquakes with a seismic intensity of 5 or higher, occurred within a week, forcing over 20,000 residents in the Noto region to evacuate [5]. This earthquake was one of the worst disasters in Japan in recent years. Nearly two weeks after the event, the full extent of the damage remained unclear and the search for missing people continued.

According to a damage summary released by the Fire and Disaster Management Agency in March, the earthquake affected 1429 people, with 241 deaths and 1188 injuries in Ishikawa Prefecture. There were 103 deaths in Suzu City, 102 in Wajima City, 20 in Anamizu Town, 8 in Noto Town, 5 in Nanao City, 2 in Shiga Town, and 1 in Hakui City [6].

Table 1. Summary of the situation in the affected area for 11 post-disaster days.

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| 1 January | - At 16:10, an earthquake with a magnitude of 7.6 occurred in the Noto region of the Ishikawa Prefecture at a depth of 16 km. The maximum intensity was 7.  
- At 17:30, the Noto Peninsula Earthquake Specific Disaster Response Headquarters was established.  
- Tsunami warnings or major tsunami warnings were issued for a wide range of areas from Hokkaido to Nagasaki.  
- Widespread water outage occurred in Ishikawa Prefecture, with approximately 32,700 households experiencing power outages. A total of 28,655 people evacuated.  
- A large-scale fire occurred in Wajima City.  
- In response to Ishikawa Prefecture’s request, the Disaster Medical Assistance Teams (DMAT) were dispatched.  |
| 2 January | - Tsunami advisories, which had been in effect since the beginning of the disaster, were all lifted at 10:00.  
- In the Ishikawa Prefecture, 57 fatalities were reported, but the full extent was still unknown.  
- Widespread water and power outages continued in Ishikawa Prefecture, with some areas experiencing communication disruptions.  
- Restoration work for electricity was underway, but extensive road damage was causing delays.  
- Self-Defense Forces initiated water supply activities.  |
| 3 January | - Since the start of the disaster, 455 aftershocks with a seismic intensity of one or higher had been observed.  
- Widespread water outage continued in the Ishikawa Prefecture, with over 30,000 households experiencing power outages.  
- Communication disruptions remained unresolved, and there were reports of expanded damage in some areas.  
- Landslides and retaining wall collapses led to road closures in 40 sections of national and expressways.  |
Table 1. Cont.

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| 4 January | - The number of evacuees exceeded 33,000 in the Ishikawa Prefecture.  
- Train services had been suspended in the Noto region since the beginning of the disaster.  
- Eleven medical facilities in the Ishikawa Prefecture faced difficulties with electricity, water, and medical gas supply.  
- Road-based material transport functions were gradually recovering, and helicopter transportation was used when land transport was not feasible. |
| 5 January | - Since the onset of the disaster, 1035 aftershocks with a seismic intensity of 1 or higher had been observed, including 6 with a seismic intensity of 5 or higher.  
- Self-Defense Forces continued their life-saving activities.  
- Water and power outages continued in most areas, despite partial restoration.  
- Thirty-nine sections of national and expressways and sixty-five sections of prefectural roads remained closed in Ishikawa Prefecture. |
| 6 January | - Ishikawa Prefecture applied the Disaster Victims’ Life Rebuilding Support Act to 19 cities and towns.  
- A total of 165 DMAT teams were active within Ishikawa Prefecture. |
| 7 January | - Noto Airport had a 10 cm crack on its runway and remained closed.  
- Medical helicopter operations, which had been conducted until the 6th, were suspended on the 7th owing to snow. |
| 8 January | - Ishikawa Prefecture reported 161 fatalities and 419 injuries.  
- A total of 40 municipalities offered 1200 vacant public housing units. |
| 9 January | - Severe damage to distribution facilities in Wajima City and Suzu City, Ishikawa Prefecture, was expected to prolong recovery efforts.  
- Nine medical facilities in Ishikawa Prefecture faced issues with electricity, water, and medical gas supply. |
| 10 January | - Rain and snow accompanied by thunder increased the risk of landslides.  
- There were 405 evacuation centers in Ishikawa Prefecture, accommodating over 26,000 evacuees. |
| 11 January | - Ishikawa Prefecture reported 206 fatalities and 422 injuries.  
- Over 106,000 households continued to experience water outages in 12 cities and towns in Ishikawa Prefecture, with over 13,000 households experiencing power outages. |

This table was created by compiling reports from the Cabinet Office [7].

2.2. Recent Major Earthquakes in Japan

In recent years, several major earthquakes have struck Japan, resulting in widespread devastation and significant humanitarian challenges. These seismic events highlight the critical importance of effective disaster preparedness, response, and recovery strategies.

Noto Earthquake, 2007: On 25 March 2007, a seismic event with a magnitude 6.9 hit the Noto Peninsula. This earthquake shook Wajima City, Nanao City, and Anamizu Town, registering a seismic intensity of 6+ on Japan’s Shindo scale. Reports indicated one fatality and at least 356 injuries in Wajima City. This earthquake occurred in the same area as the 2024 Noto Peninsula earthquake. It is believed to have been associated with faults off the western coast of the Noto Peninsula [8].

Tohoku Earthquake and Tsunami, 2011: The Tohoku earthquake, with a magnitude of 9.0, triggered a devastating tsunami that caused extensive damage to coastal areas in Japan, resulting in thousands of casualties and massive economic losses [9]. The Cabinet Office report on the Great East Japan Earthquake mentioned the possibility of evacuation shelters being isolated due to road closures and evacuations being prolonged due to damage to lifelines. In preparation for such cases, the report stated that evacuation shelters should be located in places that are easily accessible to government officials and volunteers [9].
Kumamoto Earthquake, 2016: Earthquakes with magnitudes of 7.0 and 6.2 struck the Kumamoto region of Japan, causing significant loss of life and infrastructure damage. This earthquake further reportedly led to numerous disaster-related deaths attributed to illness and physical strain resulting from living conditions during the evacuation [10]. Suetsu et al. compared the Great East Japan Earthquake and the Kumamoto Earthquake and found that the Kumamoto Earthquake was associated with a higher incidence of mental stress and suicide. They speculate that this was due to the elderly being forced to leave their familiar surroundings and live in evacuation centers for long periods of time [10].

2.3. Plate Tectonics and Earthquake Genesis

The Japanese Islands are situated on four tectonic plates: the Okhotsk (or North American), Eurasian (or Amurian), Pacific, and Philippine Sea plates. The junction of the first two (continental) plates lies under Honshu, Japan’s largest island [11].

Crustal fluid has been suggested to be involved in the Noto Peninsula earthquake. Nakajima performed seismic tomography, revealing a highly heterogeneous crustal structure [12]. He also highlighted the presence of a low-velocity anomaly in the lower crust beneath the Noto earthquake swarm. Water rising from the Pacific Plate accumulated beneath the Noto Peninsula, causing a swarm of earthquakes over the past three years. Yoshioka points out that this fluid was the cause of the 2024 Noto Peninsula earthquake [13].

To illustrate the effects of the earthquakes, a ShakeMap was created (Figure 2). This map, provided by the United States Geological Survey (USGS), shows the spatial distribution of peak ground acceleration (PGA) and also plots the epicenters of past earthquake swarms.

![Figure 2. ShakeMap of the Noto Peninsula earthquake with peak ground acceleration (PGA). Source: United States Geological Survey (USGS). Link: USGS Earthquake Event Page for Noto Peninsula Earthquake. Note: The ShakeMap displays the spatial distribution of peak ground acceleration (PGA) during the Noto Peninsula earthquake.](image-url)
3. Field Survey and Relief Efforts in Wajima City

3.1. Assessment of Earthquake Damage in Wajima City

During our travels through the disaster area, we observed damage to buildings and roads and changes in the topography.

The Noto area, where the Noto Peninsula earthquake occurred, includes three cities and five towns: Wajima City, Suzu City, Hakui City, Noto Town, Nakanoto Town, Anamizu Town, Shiga Town, and Hodatsushimizu Town (Figure 1). The expressway leading into the Noto area was closed, necessitating travel along prefectural roads.

Prefectural roads exhibited undulations and damage in several places. Numerous utility poles had fallen, and buildings were damaged throughout the region. Prefectural Route 1, which connects to Noto, experienced landslides at multiple points, narrowing the width of the road for vehicular traffic. Prefectural Route 1 was hampered by alternating traffic, making it prone to traffic jams. The east–west coastal road leading to Wajima was closed because of landslides and road collapse (Figure 3). To better understand the terrain and the prevalence of landslides, a relief map of the Noto area was created (Figure 4). This map illustrates the varying elevations and steep slopes that contribute to the region’s susceptibility to landslides, especially following seismic activity. The map was created to show the terrain’s undulations and elevation levels, which play a significant role in the occurrence of landslides.

Figure 3. Road conditions in the Noto area and places visited by the authors. ©OpenStreetMap contributors. Satellite Photographs (Orthoimages) provided by the Geospatial Information Authority of Japan (GSI) were used as the background map. The data used as layers were as follows: roads closed owing to road damage and emergently restored road sections provided by the Ministry of Land, Infrastructure, Transport, and Tourism. Icons for roads closed owing to road damage have been modified and are depicted on the map. The locations visited by the authors were drawn manually on a map.
Upon entering Wajima City, we witnessed widespread destruction. Significant numbers of buildings had collapsed (Figure 5), and a large area of Kawai-machi was ravaged by fire (Figure 6).

Figure 4. Relief Map of the Noto Peninsula. Source: Geospatial Information Authority of Japan (GSI). Link: GSI Website for Elevation Data. Note: The relief map highlights the varying elevations and steep slopes in the Noto area, contributing to the frequent occurrence of landslides following the earthquake. This map shows the terrain’s undulations and elevation levels, which are crucial for understanding the area’s geological vulnerabilities.

Figure 5. A collapsed building (Photo by Tomoya Itatani).
3.2. Disaster Response Efforts: The Role of the DMAT and Community Collaboration in Wajima City

We gathered information on road conditions, evacuation center locations, and the number of people at the Disaster Medical Assistant Team (DMAT) headquarters set up at Wajima City Hall.

The DMAT is composed of doctors, nurses, and business coordinators (medical professionals other than doctors and nurses as well as administrative staff). The DMAT works at the scenes of large-scale disasters and accidents where many people are injured and sick in the acute phase (within approximately 48 h) and is a highly mobile, professionally trained medical team [14]. The DMAT’s main activities are medical support activities at local medical institutions, collaboration with other teams and organizations to organize information, and the management of the health of evacuees at evacuation centers. The DMAT managed the activities of professionals who had gathered in Wajima City from all over Japan. (Moreover, not only medical professionals but also caregivers and social workers had gathered in Wajima.) Professionals exchanged information at nightly meetings at the DMAT headquarters.

The role of Wajima City officials included opening evacuation centers, confirming the safety of residents, and guiding evacuations outside the city. At the same time, they also carried out regular duties such as issuing official documents. However, the amount of regular work was severely reduced.

The Self-Defense Forces also used Wajima City Hall as their base of operations. Their main role was to transport water, food, and daily necessities and to convey seriously ill people from evacuation centers to medical institutions. Self-Defense Force helicopters have also been used to evacuate residents from isolated areas that are not accessible by car.

3.3. Challenges Faced by Isolated Evacuation Centers in Wajima City

We visited many evacuation centers and isolated villages. In particular, we focused on Wajima Junior High School, Unyu District, Fukami District, and the Morooka Community Center. The locations of the evacuation centers established after the event in the Noto region are shown in Figure 3. However, Figure 3 does not distinguish between public and voluntary evacuation centers, because there was a mix of publicly established centers and
those set up voluntarily by residents. Particularly in the early stages of a disaster, many centers were initially established by residents and later received public assistance.

We spoke with the evacuees and learned about the situation at the evacuation centers. As both researchers and medical staff, we also provided direct support at evacuation centers, including transporting supplies, running soup kitchens, and providing information. The information we provided was important to evacuees, as communications networks were destroyed and there was no Internet access in most evacuation centers. We also worked as medical professionals, measuring the blood pressure and body temperature of the evacuees, assessing their physical condition, and providing necessary advice according to the physical condition of the evacuees. Infection control measures are important at evacuation centers. We advised evacuees on ventilation and how to maintain hygiene in toilets to prevent the spread of infectious diseases. We asked the evacuees about their lives and the operations at the evacuation center. As we were particularly concerned about the evacuees’ physical conditions, we asked about the support from medical staff, especially DMATs, who had been working in the disaster area since the day after the disaster. Furthermore, we asked whether sufficient food and other relief supplies had been delivered. According to evacuees, the Self-Defense Forces brought water, food, and other daily necessities. However, they said that there had been no visits from the DMAT or other medical professionals.

The evacuation center was without water. They cooked with water brought in by the Self-Defense Forces. As water could not be flushed down toilets, human excreta were solidified with a coagulant before disposal. The evacuation center was managed by evacuees. The evacuation center leader, who was also an evacuee, took command, and the evacuees worked together to sort and cook the relief supplies. As Noto’s population is aging, many people who gathered at the evacuation centers were older adults. At the evacuation center, the amount of exercise among the evacuees decreased. The sanitary environment at the evacuation center could not be considered adequate, and some evacuees became ill. However, there were no regular rounds by medical professionals. Moreover, infectious diseases were prevalent in many evacuation centers, of which influenza and new coronavirus infections were particularly common. Infection control is one of the functions of the DMAT. However, due to the widespread damage caused by this earthquake, infection control measures had been delayed.

This earthquake caused many areas to be closed to vehicular traffic owing to slope collapse and road damage. Roads were cut off in many places, especially along the coastline; consequently, numerous villages were isolated. We visited an isolated evacuation center in the Ōnya and Fukami Districts on foot on 10 January (Figure 7). Village residents had gathered at the evacuation center, most of them older adults. The power outage continued, and communications, such as mobile phones and the Internet, were unavailable, and the evacuees at the isolated evacuation center did not know exactly what the conditions in the Noto area were. The Self-Defense Forces transported necessary supplies to isolated evacuation centers, and the evacuees said that there was no intervention by medical professionals. We suggested to the residents of the isolated village that they could evacuate using Self-Defense Force helicopters. However, they expressed anxiety about living in unfamiliar evacuation centers away from their homes. They said that they intended to stay because the roads might soon be restored.

Additionally, rises in the sea floor were observed on the north coast of the Noto Peninsula [15], resulting in the unavailability of several ports. The port in the isolated area that we visited had also become unusable because of uplift. Perhaps for this reason, Self-Defense Force ships were anchored slightly offshore and Self-Defense Force members transported supplies in rubber boats. We observed seafloor uplift at Sodegahama Beach and at the Kuroshima Fishing Port in Wajima City (Figures 8 and 9).
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**Figure 7.** Crossing a road blocked by landslide while going toward the isolated area (Photo by Tomoya Itatani).

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**Figure 8.** Sodegahama Beach. The coast of Wajima where the seabed has risen; (a) coast in 2023; (b) coast after the 2024 earthquake. Red arrows in (a,b) point to the same location. (Photo by Tomoya Itatani.)

**Figure 9.** Kuroshima fishing port, where the sea floor has risen. (Photo by Tomoya Itatani).
4. Discussion

4.1. Characteristics of Disaster

4.1.1. Delays in Infrastructure Recovery and Response to Evacuees

In this earthquake, the recovery of infrastructure and the response to evacuees tended to be slower than in previous earthquakes. During the 2011 Great East Japan Earthquake, there was a large-scale power outage in the Tohoku Electric Power Company, yet three days after the disaster, power had been restored to approximately 80% of the area, except for the Miyagi Prefecture [16]. Conversely, restoration work for the power outage caused by this earthquake continued in most areas even 10 days after the disaster, and there was no hope of complete restoration. Temporary toilets were available at evacuation centers three days after the Great East Japan Earthquake. However, even after one week, the installation of temporary toilets at the evacuation center was incomplete.

4.1.2. Geographic Barriers Hindering Recovery Efforts

The delay in restoration was due to the geographical characteristics of Ishikawa Prefecture. When the Great East Japan Earthquake occurred in 2011, rapid recovery efforts were undertaken by sending support units into the affected area in a comb-like pattern from the north–south road [17]. The Ishikawa Prefecture has a long and narrow topography running north to south, and only a few major roads connect the northern and southern parts of the Noto area. This earthquake not only caused major damage to the main roads but also heavy traffic congestion. In addition, roads from the east and west coasts of Wajima were closed because of widespread landslides.
4.1.3. Transportation Challenges and Supply Difficulties

Consequently, disaster relief and construction vehicles for infrastructure restoration were unable to enter the area, causing recovery delays. In addition, most of Noto is mountainous. This earthquake isolated many villages because of large-scale landslides over wide areas that made it difficult to transport supplies to isolated villages. Communications were cut off due to a power outage, and the incredible phenomenon of seafloor uplift prevented ships from approaching areas where roads had been cut off, potentially delaying their recovery.

4.2. Enhancing Autonomous Disaster Relief Efforts

4.2.1. Role of Support Teams in DMAT Operations

The damage caused by this disaster was so extensive that it was difficult for the DMATs or local governments to understand the entire situation. Presumably, the delay in infection control measures and the lack of intervention by medical professionals in evacuation centers in remote areas were due to DMATs being forced to invest manpower in rescue operations. Therefore, in such a situation, we believe that team activities supporting DMATs are crucial. These support teams were primarily composed of volunteers from various organizations, including local communities, nonprofit organizations, and other civic groups. It is important to have a team that can determine and carry out the necessary activities on site, even without instructions from the DMAT. After receiving general information from the DMAT, they go to the site, perform activities based on their own judgment, and then share the results with the DMAT. For example, a volunteer team composed of doctors and nurses could patrol the evacuation centers that the DMAT is unable to visit, check the health status of the evacuees, and report the results to the DMAT. We believe that if such activities were implemented, the burden on DMATs would be reduced and detailed support could be provided at evacuation centers.

4.2.2. Nonmedical Support and the Role of Volunteers and Private Sector

The same applies to nonmedical support. Immediately after the disaster, DMATs provided medical support; simultaneously, Wajima City, a local government, was responsible for managing the transportation of food and relief supplies. Many Wajima City employees were also disaster victims, and as a result, many were unable to perform their duties. This made it difficult for Wajima City to manage the evacuation centers. Additionally, there were numerous areas that Wajima City staff could not visit, leading to the establishment of several voluntary evacuation centers. However, the disaster was on a large scale and there were numerous evacuation centers, making management extremely difficult. Some volunteers worked effectively in transporting supplies to the evacuation centers. The teams collaborated in Wajima. However, rather than waiting for instructions from Wajima City, they made their own decisions and took action based on the situation. The results were fed back to Wajima City. These volunteer teams were not the only ones effective in assisting evacuees. Immediately after the disaster, some stores opened and sold supplies. Victims were not necessarily located in the evacuation centers; some people were living as evacuees in homes that had survived the collapse. The fact that the stores remained open under difficult circumstances immediately after the disaster must have greatly helped residents of the disaster area. Ishiwatari highlighted the importance of the private sector, stating that in large-scale disasters, the private sector is important in transporting supplies and selling food and medicine [18]. These points apply to the Noto Peninsula earthquake.

4.2.3. Pre-Disaster Planning and Autonomous Response Strategies

In addition, we believe that it would be effective for DMATs and local governments to conduct planning with support teams about what to do in case of an emergency before a disaster occurs so that disaster support can be implemented autonomously without detailed instructions after the disaster occurs. Indeed, it is not possible to anticipate and prepare for every disaster situation. However, by discussing who will take what actions
immediately after a disaster, it should lead to swift action immediately after one occurs. Particularly during large-scale disasters like this one, where communication is cut off, it would be a good idea for those involved in discussions to assume that communication will be impossible immediately after the disaster occurs.

This is not limited to disasters in Japan. The framework released by the United Nations also emphasizes the role of volunteers and the private sector in making recommendations on disaster losses [19]. On the other hand, a previous study identified several challenges associated with the spontaneous activities of volunteer groups, including a lack of coordination with official disaster response agencies, difficulties in effectively managing and distributing resources, insufficient information sharing among volunteers and official agencies, and a lack of mechanisms to ensure the sustainability of volunteer efforts over the long term [20]. It has been noted that the informal nature of volunteer groups can be seen as an obstacle to management, and public authorities may be reluctant to involve them. To promote proactive discussions between public authorities and volunteer groups, it is necessary to summarize and analyze the activities of volunteers during this disaster.

4.2.4. Comprehensive Training Programs for Disaster Volunteers in Japan

In Japan, the development and training of disaster volunteers are comprehensive and multifaceted, reflecting the country’s high risk of natural disasters like earthquakes and tsunamis. One of the primary avenues for volunteer training is through organizations like Peace Boat, which offers a variety of training programs [21]. These include basic disaster relief volunteer training seminars, advanced leadership courses, and specialized “Skill-up” workshops aimed at enhancing specific disaster response skills. Peace Boat also emphasizes community engagement and preparedness, offering household disaster preparedness training to help families create effective disaster plans specific to their communities.

4.2.5. Challenges and Needs in Training Young Disaster Volunteers

However, we think that there are issues in the training of young disaster volunteers. Milad et al. pointed out that it is important for public institutions to provide training programs for natural disasters [22], suggesting the important role of universities and schools in such programs. In the 1995 Great Hanshin-Awaji Earthquake, volunteers from all over Japan gathered in the affected areas to carry out their activities. To continue the efforts initiated after the disaster, the Kobe Action Plan was created, and various disaster scenarios were examined. Since the Great Hanshin-Awaji Earthquake, disaster volunteer activities have become more common in Japan [23]. However, it should be noted that while some universities and schools in Japan engage in disaster volunteer training, the overall percentage remains low. There is a significant need to expand these efforts to cultivate more student disaster volunteers across more educational institutions to better prepare them for future emergencies.

4.3. The Importance of Autonomy in Evacuation Center Management

4.3.1. Unplanned Evacuation Centers and the Absence of Professionals

Araki et al. highlighted that in large-scale disasters, people may evacuate to places other than designated evacuation centers, and there may be a discrepancy between predetermined plans and the actual situation [24]. For example, in the 2007 Chuetsu Earthquake, 42 voluntary evacuation centers were established in addition to the pre-planned evacuation centers [25]. Local governments needed 12 days to track down all evacuation centers. Many voluntary evacuation centers were established during the Noto Peninsula earthquake. It took time for the DMAT headquarters to determine where the voluntary evacuation centers were set up. At voluntary evacuation centers, supplies were transported by the Self-Defense Forces, but the centers were not operated by DMATs or professionals. The Self-Defense Forces’ mission is to transport supplies, and they are basically not involved in the operation of evacuation centers. Naturally, the evacuees themselves had to run the evacuation center.
4.3.2. Importance of Self-Governed Evacuation Centers and Experience Sharing

In the wake of the Great East Japan Earthquake, one study compared evacuation centers with professional public health nurses on duty and evacuation centers without them. According to Mori et al., having a public health nurse permanently present is advantageous in building relationships with evacuees [26]. It is believed that having a public health nurse permanently stationed at a facility was advantageous in managing the health of evacuees and making use of their expertise. On the other hand, Mori et al. highlighted that having them stationed full-time increases the burden on public health nurses. During the Noto Peninsula Earthquake, many villages were isolated and voluntary evacuation centers were created because of broken roads. Therefore, it was practically impossible to station public health nurses and other professionals full-time at these locations, and even if it were possible, the burden on the professionals would have been heavy. Operating evacuation centers based on evacuees’ autonomy would reduce the burden on professionals. In the self-governed evacuation centers and isolated villages visited by the authors, decisions were made regarding the evacuees’ living spaces, food management, hygiene management, and evacuation rules. The evacuation center management was not sufficient. However, compared to the evacuation centers frequently visited by the DMAT in central Wajima City, the management was no worse. Why were evacuation centers so well managed despite the absence of professionals? Recently, Japan has experienced several disasters. Each time, information is shared with the public through the media. This is thought to have affected the independent management of evacuation centers. During the 2011 Great East Japan Earthquake, toilets at evacuation centers became severely contaminated. Based on this experience, the government established guidelines that are available online for securing and managing sanitation facilities at these centers [27]. The issue of toilet conditions in evacuation centers has also been highlighted in news programs. Compared with the Great East Japan Earthquake, the sanitary conditions of the toilets at the evacuation centers were better in Wajima City. Lessons from past experiences have evidently been applied. To utilize the experiences of this disaster in preparations for the next, it is important to maintain some sort of record. Ideally, all residents should be able to evacuate to centers managed by public authorities. However, in an emergency, it may be necessary to rely on voluntary evacuation centers. To prepare for such a situation, local residents should engage in regular preparations.

4.3.3. Community Cohesion and the Importance of Autonomy in Evacuation Centers

In addition, the authors occasionally heard from the evacuees that local residents had become closer to each other. It is believed that cohesion among residents was strengthened by cooperation in operating the evacuation centers. As discussions among residents are a prerequisite for independent evacuation center management, daily communication among the residents is important. Thus, coming together as a tight-knit community on a daily basis is one form of disaster prevention. A previous study has highlighted the importance of community networks in reconstruction. In the case of Rikuzentakata’s recovery from the Great East Japan Earthquake, connections within the community were crucial in addition to financial and governmental support [28].

In essence, the autonomy of evacuation centers has the effect of responding to unplanned situations and reducing the burden on local governments, DMATs, and professionals. Compared to regular evacuation centers, voluntary evacuation centers strengthen the bonds among evacuees.

However, there is one negative point. Mori et al. also highlighted that in evacuation centers where public health nurses are not permanently stationed, evacuees become more cohesive and exclusive. In fact, in the 2024 Noto Peninsula Earthquake, there were cases where local government officials urged residents of isolated villages to evacuate to prevent secondary disasters, but they were slow to listen.
5. Summary and Recommendations for Future Recovery and Reconstruction

This earthquake was characterized by transportation being blocked due to geographical factors, which made infrastructure restoration and support activities difficult. Under such circumstances, it is important for disaster victims to manage their own evacuation centers. In addition, support teams that can operate independently are required in evacuation centers in remote areas, where the support of DMATs cannot reach sufficient levels. To prepare for a disaster, administrative agencies and support teams need to plan in advance what they will do in the event of a disaster. It is believed to be effective to decide in advance how volunteer teams and the private sector will carry out their activities, assuming that they will be unable to contact public institutions during a disaster. It is also necessary to train disaster volunteers to work independently, and universities and schools have a major role to play in training them. In large-scale disasters, evacuees must operate evacuation centers autonomously. To achieve this, it is necessary for residents to regularly come together as a community.

Therefore, it is important to document our experiences of this earthquake. Japan has faced many large-scale disasters, and the lessons learned have been applied in managing evacuation centers during this recent event. Of course, each disaster is unique, and not all past experiences may be applicable. Nonetheless, systematically recording and accumulating these experiences will contribute to improved disaster prevention and mitigation planning.

Given the extensive damage caused by this disaster, recovery will take time. In the future, we will need to monitor the development of infrastructure, the health of evacuees, and the recovery of the town and provide appropriate support. Another serious disaster may soon occur in Japan [29]. We hope that the experience of this disaster will be useful in preparing for future disasters.

Funding: This work was supported by JSPS KAKENHI Grant Number 20K19239, 21K18454, 21K10325.

Data Availability Statement: The raw data supporting the conclusions of this article will be made available by the authors upon request.

Conflicts of Interest: The authors declare no conflicts of interest.

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