



# Activities and roles of mosques in Japan after the recent major earthquakes: A comprehensive study

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## ABSTRACT

As minority groups, foreign nationals are considered vulnerable because of cultural, linguistic, and religious differences; however, some may work as critical stakeholders in disaster risk reduction (DRR). In Japan, some mosque communities (mainly composed of foreign nationals) were engaged in relief activities immediately after disasters; however, these reports were scattered and did not clarify long-term activities. Therefore, we aimed to summarize the activities and roles of mosques located in areas affected by recent natural hazard-related disasters in the short (that is, response) and long term (that is, recovery and mitigation). We targeted three mosques located in areas affected by the 2011 Great East Japan Earthquake, and the 2016 Kumamoto Earthquake in Japan. We conducted a literature review and interviewed mosque administrators. The results showed that all mosques worked as distribution centers in the short term, receiving relief supplies from Muslims all over Japan and distributing them to affected people. The relief goods included halal foods that fit foreign minorities, but these goods were distributed not only to them but also to other people regardless of religion and nationality. Some mosques also functioned as evacuation shelters, soup kitchens, and accommodations for volunteers. Support for affected people was further facilitated by intermediaries (such as private organizations and key local individuals) between the mosques and local communities or governments. In contrast to the short term, we did not find prominent recovery and mitigation activities by the mosques. These comprehensive findings contribute to the promotion of inclusive and community-based DRR activities.

## 1. Introduction

Foreign nationals are included in minority groups because of their cultural, religious, and linguistic differences from the majority, which potentially increase their vulnerability to disasters [1,2]. For example, in Japan, foreigners without Japanese proficiency tend to experience difficulties in obtaining information related to disasters because they cannot understand the Japanese language [3]. Foreigners practicing certain religions are also more likely to experience difficulties obtaining suitable emergency foods from evacuation shelters, as religious food constraints are rarely considered (such as halal) [4–6]. The percentage of foreigners in the total population of Japan was 2.2% (as of 2020) [7]. Although they are a minority, the foreign population growth rate in 2020 (relative to 2015) was 43.6%, and is rising [7]. As the Sustainable Development Goals (SDGs) [8] suggest, it is vital to include foreigners

and leave no one behind in disaster risk reduction (DRR) activities.

Government sectors are making progress in DRR activities; however, it is difficult for them alone to respond flexibly to minority needs. Therefore, it is important to take advantage of minority resources and networks. Multi-stakeholder partnerships are important for mobilizing and sharing knowledge and expertise [8] and can address detailed needs and promote inclusive and community-based DRR.

Muslim communities centered on mosques (called masjid in Arabic) can be considered a promising group of foreign nationals with resources and networks that could be useful during disasters. A large proportion of Muslims in Japan are thought to have foreign nationalities, with a previous study estimating that the number of foreign nationals was 157,000 in 2018, accounting for 79% of all Muslims [9]. This number is overwhelmingly small compared to Japan's population (including foreign nationals) of approximately 1.30 billion. Mosques have been established

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in various parts of Japan,<sup>1</sup> and are often used and operated by foreign Muslims.<sup>2</sup> They gather at mosques for regular prayers five times a day on weekdays and for mass prayers on Fridays. During Ramadan, they hold special events at the mosques. For holding mass prayers and special events, some mosques have large prayer spaces, toilets, kitchens, and parking lots [4,10,11]. These resources and networks may help not only minority foreign nationals, but also the majority during disasters.

Some responses from mosques after disasters have been reported in Japan. The earliest report was on the response in the aftermath of the 1995 Kobe Earthquake,<sup>3</sup> operated by the Kobe Muslim Mosque, the oldest Japanese mosque, built in 1935 [12]. The Kobe Muslim Mosque reported no damage and became a shelter for Muslim survivors over the course of several months [13,14]. Halal food arrived in quick succession from Muslim groups and individuals across the country, and the evacuees did not have to worry about food shortages; some said that relief goods arrived faster than at the surrounding evacuation shelters and were also shared with their Japanese neighbors.

As the number of mosques has continued to increase since the 1990s,<sup>4</sup> there is a growing number of related reports besides those on the Kobe Muslim Mosque. Representative examples are the 2011 Great East Japan Earthquake<sup>5</sup> and the 2016 Kumamoto Earthquake.<sup>6</sup> However, these reports focus on short-term response actions and are scattered, lacking a general understanding of mosque activities after disasters. Furthermore, during major disasters, the recovery phase follows the response phase [15]. Disaster experiences can also enhance risk perception [16] and lead to a window of opportunity—that is, the opportunity to do things differently, going forward with a stronger-than-usual demand for safety and mitigation measures (that is, to build back better). Therefore, we must compile existing short-term reports and focus on long-term processes, including recovery and mitigation. This enables us to obtain a more comprehensive<sup>7</sup> understanding of the activities and roles of mosques located in areas affected by recent disasters.

This study aimed to summarize the short- and long-term activities and roles of mosques located in areas affected by recent natural hazard-related disasters. To this end, we reviewed the existing literature on three mosques located in areas affected by the 2011 Great East Japan Earthquake and the 2016 Kumamoto Earthquake: (1) Sendai, (2) Iwaki, and (3) Kumamoto Mosques. Interviews were also conducted with the administrators of these mosques. Short-term and long-term activities were summarized mainly based on a literature review and through interviews, respectively.

The findings of this study have several potential contributions. First,

<sup>1</sup> There existed 80 mosques in 2014 [12], which increased to 96 in 2017, and if those under construction are included, the number reaches 100 [49].

<sup>2</sup> There are Muslims with Japanese citizenship, often categorized in two groups [11]: (1) people, mainly men, who converted to Islam, for example, through the study of Islam or Arabic and (2) people, generally women, who converted to Islam by getting married to foreign Muslims and children from these marriages (referred to as “born Muslims”). Their roles might be different from those of foreign Muslims in mosques and are worth exploring in detail in the future.

<sup>3</sup> It is also referred to as the “1995 Great Hanshin-Awaji Earthquake” (GLIDE number, EQ-1995-000003-JPN, at <https://glidenumber.net/glide/public/search/search.jsp>).

<sup>4</sup> This increase is due to the economic boom after the 1980s with a massive influx of Muslims as foreign workers [12].

<sup>5</sup> It is also known as the “2011 Tohoku earthquake and tsunami” and its GLIDE number is EQ-2011-000028-JPN at <https://glidenumber.net/glide/public/search/search.jsp>.

<sup>6</sup> It is identified as GLIDE number, EQ-2016-000033-JPN, at <https://glidenumber.net/glide/public/search/search.jsp>.

<sup>7</sup> Here, we used the term “comprehensive” in terms of sample size and time length. That is, as we describe in Section 2, we targeted (1) all the mosques located in the areas significantly affected by recent major earthquakes and (2) the short and long term.

the findings may help other stakeholders, including the government sector, to consider how to work with mosques. Second, these findings may empower other mosques and religious minorities. Third, our findings from a Muslim-minority country contribute to revealing the international diversity of mosque activities after disasters. Many previous studies have discussed the activities and roles of not only religious or faith-based organizations [17–20], but also mosques in Muslim-majority countries [21–24] in the short and long term after disasters; however, those from Muslim-minority countries are missing. The current study fills this gap. Fourth, the findings may be applicable to other (religious) minorities in other regions and countries if adjusted to local contexts.

## 2. Method

### 2.1. Target mosques

We focused on (1) Sendai, (2) Iwaki, and (3) Kumamoto Mosques (Fig. 1a, Fig. 1b, and Fig. 1c, respectively). We targeted the 2011 Great East Japan Earthquake, and the 2016 Kumamoto Earthquake, as they are representative of recent major earthquakes in Japan. The 2011 Great East Japan Earthquake occurred on March 11, 2011, with a magnitude of Mw. 9.0. It caused tsunami waves, leading to extensive damage, mainly to the Tohoku region [25], leaving approximately 22,000 people dead or missing [26]. It also caused the Fukushima Daiichi nuclear disaster. The 2016 Kumamoto Earthquake occurred with a pre-earthquake (Mw. 6.2) on April 14, 2016, and a main earthquake (Mw. 7.0) on April 16, 2016 [27]. It caused extensive property damage, mainly in Kumamoto Prefecture, resulting in approximately 270 deaths (including 50 direct fatalities) [28]. According to a study showing a list of mosques in Japan (as of 2014) [12], Sendai and Iwaki Mosques (located in Miyagi and Fukushima Prefectures, respectively) are the only mosques located in the Tohoku region<sup>8</sup>; only the Kumamoto Mosque is located in Kumamoto Prefecture. In other words, the three targeted mosques covered all mosques located in areas significantly affected by the target earthquakes.

The basic characteristics of these mosques are listed in Table 1. The main users of each mosque are international students or foreign workers from South and Southeast Asia (for example, Indonesia, Pakistan, Bangladesh, and Malaysia). User demographics did not change significantly since the earthquakes.

### 2.2. Outline of surveys

We conducted a literature review of the three mosques and interviewed the mosque administrators to identify the mosques’ activities and roles in both the short and long term. Here, we refer to Alexander (2002) [15] for short- and long-term definitions. In other words, we defined “short-term” as the phase in the disaster cycle that requires response actions, such as safeguarding human lives and attending to survivors’ immediate needs, which includes the early provision of food and shelters. Meanwhile, we defined “long-term” as phases requiring (1) recovery, such as repairing damage and restoring services, and (2) mitigation, such as actions designed to reduce the impact of future disasters.

#### 2.2.1. Literature review

As the existing literature is on the short term, we summarized short-term activities mainly through a literature review. In 2022, we searched for Japanese or English literature via Google and Google Scholar using the keywords as mosque (or its corporation) and earthquake names. We also used the authors’ knowledge (that is, personal knowledge and networks) [29] to collect literature from outside Google Database. As

<sup>8</sup> Tohoku region generally includes the following six prefectures: Aomori, Akita, Iwate, Yamagata, Miyagi, and Fukushima Prefectures.

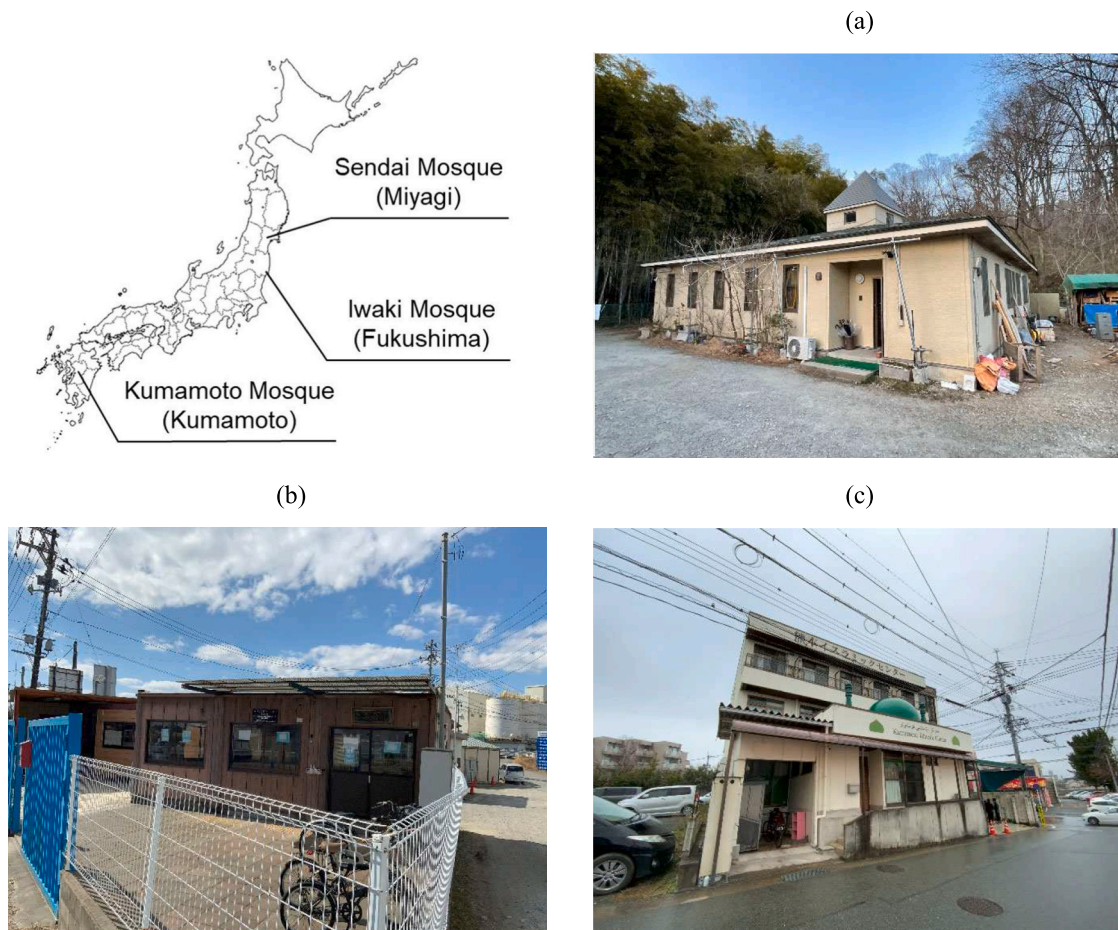


Fig. 1. Locations and exteriors of target mosques: (a) Sendai, (b) Iwaki, and (c) Kumamoto Mosques.

Table 1

Mosque characteristics (based on [12] and our interviews).

Mosque	Year of construction	Building type	Corporation	Main users
Sendai Mosque	2007	Detached house with one floor	Islamic Cultural Center of Sendai (Religious corporation approved in 2016; before it, general incorporated association)	International students at Tohoku University Both male and female
Iwaki Mosque	2005	Prefabricated house with one floor	N/A	Foreign workers Male only
Kumamoto Mosque	2013	Detached house with three floors	Kumamoto Islamic Center (Religious corporation approved in approx. 2017; before it, general incorporated association)	International students at Kumamoto University Both male and female

reliable sources, we included peer-reviewed journal papers, gray literature (that is, technical reports and conference proceedings) [30,31], books, and private papers written by mosque managers but not other website information provided by third persons/organizations (such as

blogs, Facebook, and Twitter).

### 2.2.2. Interviews

Interviews were conducted (Table 2) to identify long-term activities as no literature exists on them. We visited each mosque between February and March 2023 and conducted face-to-face semi-structured interviews with the mosque administrator and/or imams (that is, those responsible for the mosques' operation and management). All of them had experienced the target earthquakes and were aware of the mosque's response in the aftermath, which made them appropriate interviewees.

In the interviews, we inquired about the long-term activities after the onset of earthquakes as well as the basic attributes of the interviewees and the mosques (such as, interviewees' age and duration of stay in Japan, year of construction of the mosques, demography of daily users, and the status of daily worship at the mosques), immediate damage, and short-term activities (to confirm the short-term activities identified from the literature review). In the interviews, to make it easier for the interviewees to answer, we defined the long term as the period after the municipalities where the mosques were located closed all evacuation shelters (that is, approximately four to five months after the earthquake occurred). Generally, in such a period, the provision of food and shelters for survivors, which are included in short-term activities, ends, whereas activities included in recovery and mitigation begin.

Regarding recovery, we asked the interviewees whether their mosques undertook the following activities:

- Counseling and financial support for foreign nationals associated with (1) housing reconstruction and domestic relocation, (2)



**Table 2**  
Outline of interviews.

Mosque	Date in 2023	Interviewees (nationalities, gender, age, and duration of stay in Japan, as of 2023)	Languages	Interviewers	Amount of time
Sendai Mosque	March 10	Administrator (Japanese, male, 80s, since birth)	Japanese	All authors	3.0 h
Iwaki Mosque	March 3	Administrator (Pakistani, male, 40s, nearly 30 years)	Japanese	First and second authors	1.5 h
Kumamoto Mosque	February 10	Imam (Bangladeshi, male, 30s, seven years) One of the first administrators (Bangladeshi, male, 70s, 30 years)	English and Japanese	First author and an assistant (Kyoto University undergraduate student)	2.0 h

livelihood reconstruction, and (3) returning to their own country or re-entering Japan.

- Mental health counseling
- Donations to the government and Red Cross
- Providing meals at temporary housing and mass-relocation sites

These topics were based on the literature that reported actions taken by mosques and religious organizations in Muslim-majority countries, such as support for livelihoods, psychosocial support, spiritual healing, and direct assistance to individuals and families through donation or counseling [19,21].

Regarding mitigation, we asked whether they implemented the following actions after the earthquakes:

- Earthquake-proofing of mosque building
- Stockpiling emergency supplies
- Strengthening cooperation with other organizations/groups
- Formulating disaster action plans
- Conducting disaster drills and education

The interviews were audio recorded after obtaining permission. The audio-recorded interviews were summarized in the text. Field notes and interview texts were used for analysis.

### 2.3. Ethical consideration

Ethics approval was obtained from the Ethics Committee of the Graduate School of Engineering at Kyoto University, Japan (No. 202203). The research purpose and procedures were explained to the interviewees prior to the interviews, and written informed consent was obtained.

## 3. Results

### 3.1. Short term: response

As a result of the literature review, one private Japanese paper written by a representative and one English academic paper [32,33] were collected for Sendai Mosque, two books (Japanese and English) [34,35] for Iwaki Mosque, and three academic papers (two English and one Japanese) [6,36,37] for Kumamoto Mosque.<sup>9</sup> Given the primary information from the literature and supplementary information from the interviews, the activities and roles of each mosque in the short term are summarized in Table 3. The following subsections provide details.

#### 3.1.1. Sendai Mosque

Sendai Mosque suffered only minor damage from the 2011 Great East Japan Earthquake. According to the literature [33] and interviewee, there was no major damage to the building itself, although some

<sup>9</sup> Literature on Sendai and Kumamoto Mosques [6,32,33,36,37] was collected from Google and Google Scholar, while that on Iwaki Mosque was from the authors' knowledge and networks [34,35].

**Table 3**  
Summary of functions of mosques after the earthquakes.

Mosques	Short term	Long term	
	Response	Recovery	Mitigation
Sendai Mosque	Evacuation shelter Distribution center Local guide Rest area for volunteers	None	Seismic strengthening by DIY
Iwaki Mosque	Distribution center Soup kitchen Accommodation for volunteers	None	None
Kumamoto Mosque	Evacuation shelter Distribution center Soup kitchen	None	Rolling stockpile Strengthening cooperation with another organization Disaster education

bookshelves and cupboards fell and were slightly broken, and the water piping on the premises was damaged because of cracks in the ground. As the mosque is approximately 15 km from the coast, 70 m above sea level, it was not inundated by the tsunami. There were also no casualties among the mosque users.

The Sendai Mosque served as an evacuation shelter on the day of the earthquake. According to the literature [33] and interviewee, a few Indonesian students stayed at the mosque on the night of the earthquake because they were afraid of returning to their apartments. In addition, a Maldivian Muslim who visited Sendai spent the night in a car parked in the parking lot of the mosque.

The Sendai Mosque also served as a distribution center for disaster relief supplies, local guides, and a rest area for volunteers after the earthquake. According to the literature [33] and the interviewee, the interviewee and a British Muslim stayed overnight at Sendai Mosque for approximately 2.5 months, while another Pakistani Muslim went to and from between his home and the mosque to respond to the emergency. Three days after the earthquake, a Pakistani ambassador's car carrying rice, juice, cooking oil, and other items arrived at the mosque from the Embassy and requested that the mosque staff distribute the goods to the affected Pakistanis and other citizens [33]. Soon after, the Otsuka Mosque in Tokyo launched a large-scale relief operation that brought cars filled with food, water, and diapers. The Sendai Mosque administrator and staff guided the cars and assisted with distribution [33]. From the end of March to mid-May 2011, Islamic organizations throughout Japan continued to send or bring various relief goods. The administrator and staff guided them to various coastal areas<sup>10</sup> and transported and distributed relief supplies to relief collection points set up at the local

<sup>10</sup> According to the interviewee, they visited towns located on the border with Fukushima and Miyagi (e.g., Shinchi Town, Fukushima Prefecture, and Yamamoto Town, Miyagi Prefecture) immediately after the earthquake, but they expanded their activities later, eventually reaching Minamisoma City, Fukushima Prefecture, to the south and Otsuchi Town, Iwate Prefecture, to the north.

response headquarters of each municipality whose aid targets included non-Muslim Japanese people. For example, in early April 2011, a Malaysian relief organization suddenly sent two truckloads of supplies (food and blankets): one in a 10-t truck and the other in a 5- or 6-t truck [33]. Such large quantities of delivered goods could not be stored in the mosque building; thus, they were stored outside the building and later distributed to the affected people, which was greatly welcomed [33]. In another example, when the Gyotoku Hira Mosque in Chiba Prefecture, which is adjacent to Tokyo, came to Sendai for relief supplies and food distribution activities, they asked the Sendai Mosque to guide them, and the administrator accompanied them or drove them to coastal areas [33]. The relief distribution and local guide activities were conducted in collaboration with other Muslim organizations, and the Sendai Mosque did not work alone, nor did it collaborate with government agencies or politicians [32].

### 3.1.2. Iwaki Mosque

The Iwaki Mosque was not damaged by the earthquake. The interviewee stated that the lifelines (water, electricity, and cell phone connections) had stopped, but the building was not damaged. There were no casualties among the mosque users. The mosque is located approximately 2 km from the coast at an elevation of 5 m. Although the coastal area near the mosque was inundated by the tsunami, the mosque was not.

After the earthquake, Iwaki Mosque functioned as a distribution center, soup kitchen, and accommodation. According to reference [34] and interviewee, the Iwaki Mosque began to provide support one or two weeks after the earthquake, when mosque users began to settle. The interviewee stated that he was scared of radiation caused by the Fukushima Daiichi nuclear disaster, but he wanted to do something for Japan. The mosque also began to cooperate with the Otsuka Mosque in May 2011 (Otsuka and Iwaki Mosques did not interact before the disaster). Foodstuffs were delivered from the Otsuka Mosque to the Iwaki Mosque, and Muslim and non-Muslim Japanese volunteers (who had come from neighboring prefectures) cooked them at the Iwaki Mosque and delivered warm food to evacuation shelters in Iwaki City [34,35]. They also brought water, bedding, and fans to evacuation shelters [34]. Volunteers from the Otsuka Mosque and non-Muslim volunteers who joined the soup kitchen sometimes stayed overnight at the Iwaki Mosque. According to the interviewee, a school principal who volunteered in Iwaki City served as an intermediary between the mosque and local government. Intermediation facilitated response activities at evacuation shelters. In addition, according to the interviewee, the mosque administrator interpreted and conveyed Japanese information about the disaster to daily mosque users.

### 3.1.3. Kumamoto Mosque

The Kumamoto Mosque was damaged by the 2016 Kumamoto Earthquake. According to the interviewees, lifelines (water, electricity, and cell phone connections) were stopped, and the walls of the mosque building were cracked. They reported that the damage was repaired approximately three months later. There were no direct casualties due to the earthquake.<sup>11</sup>

Kumamoto Mosque functioned as a distribution center and soup kitchen after the earthquake. Specifically, a vehicle from the Indonesian Embassy in Tokyo arrived a day or two after the main earthquake with halal food, medicine, water, and diapers to help the affected Indonesians [6,37]. The mosque attempted to distribute food to Indonesians who had been evacuated to shelters at the Kumamoto University campus and a community center, but shelter managers refused it because they could not distribute it only to specific people [37]. The Kumamoto Mosque

decided to put food into the mosque building, which was opened as a shelter as more Muslims returned from other evacuation shelters [37]. Subsequently, relief supplies arrived at the mosque from Muslims all over Japan [6]. The 10 people in charge stayed in the mosque and offered information on foreign languages, goods, and meals appropriate to believers' religious customs [36]. Daily mosque users started assisting non-Muslims two days after the main earthquake [6]. They cooked food at a mosque, served it to non-Muslim international students, and went around Kumamoto City and neighboring municipalities that were heavily damaged, handing out supplies to Japanese people evacuated to shelters and their cars [6]. They left food and water in front of the Kumamoto Mosque and posted a sign in Japanese indicating that people were free to consume food and water with them. The mosque also visited evacuation shelters with volunteers from the Toyama Islamic Center and other organizations to provide them with rice balls and curry (Fig. 2). As people's needs for relief goods changed from food and water to hygiene products, Kumamoto Mosque communicated those needs to Fukuoka Mosque in Fukuoka Prefecture, which is adjacent to Kumamoto Prefecture, and had Fukuoka Mosque send supplies that met those needs to Kumamoto [37]. These response activities continued for approximately one month [37].

Some of the relief activities of Kumamoto Mosque were promoted and aided by other non-Muslim groups and individuals. One representative example is that when the mosque offered assistance to an evacuation shelter—where the mosque volunteers heard that it lacked water and food—in Kumamoto City, the mosque received a curt reply, “We have enough of them,” which made the mosque volunteers experience prejudice against Muslims, thereby failing in assistance [6]. However, after the Kumamoto International Foundation (that is, a general incorporated foundation promoting international exchange between Japanese and foreign citizens), Japanese volunteers, and police acted as intermediaries between the mosque and shelter managers, the mosque could implement activities without major troubles [6,37].

## 3.2. Long term: recovery and mitigation

The long-term activities of each mosque, based on information collected from the interviews, are summarized in Table 3. Details are presented in the following subsections.

### 3.2.1. Sendai Mosque

According to the interviewee, the Sendai Mosque did not engage in any of the recovery activities asked by the authors in Section 2.2.2 long after the earthquake (that is, after all the evacuation shelters in Sendai City were closed). Specifically, they did not provide counseling or



Fig. 2. Soup kitchen organized by Kumamoto Mosque (photo was provided by one of the interviewees).

<sup>11</sup> As an exception, the interviewees stated that one of the Muslims who lived on the third floor of the mosque at that time was surprised by the earthquake and jumped from the third floor, resulting in breaking a bone.

financial support for housing reconstruction, domestic relocation, livelihood reconstruction, or the return/re-entry of foreign nationals. They did not provide mental health counseling, donate to the government or Red Cross, or supply food at temporary housing or mass-relocation sites.

We did not confirm any significant mitigation activities. In other words, there was no stockpiling of emergency supplies, strengthening cooperation with other organizations, or conducting disaster drills. However, there were some DIY activities, such as reinforcing the pillars of the mosque building and creating bookshelves with slanted shelves to prevent books from popping out in an earthquake (Fig. 3a), which, although small, will contribute to mitigating the damage from the next earthquake.

### 3.2.2. Iwaki Mosque

We confirmed that the Iwaki Mosque undertook no recovery activity. According to the interviewee, no mosque users suffered damage to their homes or wanted to return to their home countries after the earthquake and the resultant nuclear disaster; thus, no counseling or financial support was provided to them. In addition, some mosque users reduced their wages after the earthquake,<sup>12</sup> but the mosques did not provide them with counseling or financial support. No soup kitchens were set up in temporary housing or mass-relocation sites. The mosque asked the local government about the necessity of a long-term soup kitchen, but they were told that it was not necessary because other support groups provided sufficient support. The interviewee could not confirm if the mosque had undertaken communication about radiation risk.

We also confirmed that no mitigation measures were in place. Although the interviewee was planning to construct a new mosque near the current mosque (he had just purchased the land) and was willing to consider earthquake-proofing the new mosque and stockpiling emergency supplies there, the current mosque had neither been earthquake-proofed nor stockpiled emergency goods.

### 3.2.3. Kumamoto Mosque

We did not observe remarkable recovery activities in the Kumamoto Mosque. According to the interviewees, although they provided counseling for mosque users who tried to re-enter Japan after the earthquake, they provided no financial support. They did not provide mental health counseling, donations, or soup kitchens at temporary housing sites. The interviewees stated that no mosque users suffered mental health problems caused by the disaster; thus, they did not have to provide counseling.

However, some mitigation activities were observed. The mosque had a rolling stockpile of food (such as, chicken and naan in refrigerators, rice, and seasonings) (Fig. 3b). The interviewees noted that the mosque continued cooperation with the Kumamoto International Foundation after the earthquake, with an imam participating in disaster education seminars and events (to learn what to do when an earthquake or flood occurs) and delivering the information obtained from these events to mosque users.

## 4. Discussion

Foreign minorities are typically regarded as vulnerable during disasters; however, some may work as key stakeholders by utilizing their resources and networks. Among these, we focused on Muslim communities centered on mosques in Japan. This study summarizes the short- and long-term activities and roles of mosques in disaster-affected areas. We targeted three mosques located in areas hit by the 2011 Great East Japan Earthquake and the 2016 Kumamoto Earthquake—(1) Sendai, (2)

<sup>12</sup> The interviewee is the president of a company in Iwaki that sells and exports cars. Due to restrictions imposed by radiation from the Fukushima Daiichi nuclear disaster, he could not export his products and had to reduce his business.

Iwaki, and (3) Kumamoto Mosques—and conducted a literature review and interviews with mosque administrators. Sections 4.1 and 4.2 summarize the short- and long-term results in Section 3, respectively, and discuss the reasons for these results. Section 4.3 presents policy and practical implications based on Sections 4.1 and 4.2. Section 4.4 shows the limitations and future directions of this study.

### 4.1. Short term: response

As discussed in Section 3.1 (Table 3), the most prominent short-term role of mosques was to serve as the distribution centers of relief goods. This role can be explained in terms of social and physical capital. Specifically, the mosques in the affected areas could quickly receive many relief goods such as food and water through Muslim networks<sup>13</sup>—from Muslims and mosques all over Japan and embassies of Muslim-majority countries. These collected relief goods could be distributed by the mosque community, considered to have strong bonding social capital [38,39] formed through daily activities at mosques [40]. Moreover, as introduced in Section 1, mosques often have large prayer spaces and parking lots [4,10,11], enabling them to store many relief goods. In a Muslim-majority country, mosques were places for undertaking response operations and for providing food for affected people (for example, the 2005 earthquake in Pakistan) [21]. Therefore, our findings that mosques have become relief suppliers (for example, serving as distribution centers) are common to both Muslim-majority and minority countries.

As relief suppliers, mosques could support religious and linguistic minorities as well as the majority. As seen in the Kumamoto Mosque example (Section 3.1.3), the relief goods received were halal and included religious minorities. Furthermore, as seen in all the mosques, these goods were distributed not only to religious minorities (or foreign nationals) but also to others, regardless of their religion and nationality. Similar results were confirmed at the Kobe Muslim Mosque during the 1995 Kobe Earthquake, as described in Section 1; thus, the results are considered robust. In addition, Iwaki and Kumamoto Mosques (Sections 3.1.2 and 3.1.3, respectively) translated Japanese information and communicated it to their daily mosque users, which could care for those with language barriers. In providing goods and information, mosques were different from general distribution centers in Japan in that they were able to include foreign nationals who needed to be taken into consideration because of religious and linguistic differences from the majority. In a Muslim-majority country (such as Pakistan), mosques were reported to have included the poor and vulnerable such as children, women, and older people during the response phase [21]. However, the previous study did not mention the inclusion of foreign minorities, one of our findings. Because of our focus on mosques in a Muslim-minority country, we could reveal the international diversity of inclusive relief work undertaken by mosques.

Some mosques functioned as evacuation shelters, soup kitchens, rest areas, and accommodation (Table 3). Section 1 stated that some mosques have kitchens, toilets, and showers [4,10,11]. Such equipment can contribute to the functioning of mosques following disasters. In a hypothetical case study in Japan, Kotani et al. [4] proposed the use of mosques as shelters for neighboring (Muslim) people. Their results and the current results suggest that mosques are highly likely to be used by neighbors in future disasters. Based on Islamic teaching, mosques are

<sup>13</sup> This Muslim network cannot be easily categorized into one of (1) bonding and (2) bridging social capital [38], which is often referred in social capital research. Bonding social capital is horizontal ties between individuals who are quite similar to each other and may live within walking distance. Bridging social capital refers to extra-local networks, crossing ethnic, racial, and religious cleavages. Muslim networks are the networks of affected mosques with those who share with religious beliefs, but who are not users of the mosques or who are located in distant areas and do not know each other.





Fig. 3. Mitigation measures: (a) bookshelves with slanted shelves at Sendai Mosque and (b) stockpiled food at Kumamoto Mosque.

central to mutual aid activities under normal circumstances. However, in the aftermath of disasters, mosques are used for local communities beyond the normal scope of usage [41].

It should be noted that when mosques functioned as distribution centers, intermediaries between the mosques and local communities or governments enabled them to distribute relief goods smoothly. A specific local individual in the case of the Iwaki Mosque (Section 3.1.2), and a private organization, Japanese volunteers, and the police (Section 3.1.3) in the case of Kumamoto Mosque acted as intermediaries between the mosque and the local community and government. As described in Section 1, Muslims are overwhelmingly a minority in Japan, and most non-Muslim Japanese are unfamiliar with them [11] or have a negative perception, such as “Islam is a radical religion” [12]. Therefore, there may have been significant barriers for local communities and governments in working directly with mosques; however, intermediaries could probably reduce these barriers and facilitate smooth support.

#### 4.2. Long term: recovery and mitigation

According to Section 3.2 (Table 3), the prominent role of mosques in recovery is not evident in most cases. A possible reason for this is that only few people (especially daily mosque users) required long-term support, and the mosques did not have to perform activities during recovery. As the interviewees at Kumamoto Mosque mentioned (Section 3.2.3), no daily users needed housing reconstruction and mental health counseling in the first place. Trust in a community and a sense of belonging to the community (often referred to as cognitive social capital [42]) are considered negatively related to post-disaster mental health problems [43,44]. This implies that daily worship and activities at mosques may have enhanced trust and a sense of belonging to the mosque community or being closer to God, alleviating long-term problems after earthquakes. Another possible reason is that some people required long-term support, but other stakeholders provided it for them instead of the mosques. As stated by the interviewee at the Iwaki Mosque (Section 3.2.2), other supporters built soup kitchens at temporary

housing sites. Although some daily mosque users may have had financial or psychological concerns, other (professional) organizations and individuals may have responded appropriately to their long-term needs. In Muslim-majority countries (such as Pakistan), actual roles of mosques after disasters include support for livelihoods, psychosocial support, and spiritual healing [21,22], whereas those of mosques in Muslim-minority countries (especially in Japan) have rarely been reported. This may be because there were no activities in the first place or there were no reports despite the presence of activities. Our study suggests that the former is highly likely, clarifying which, is a novelty of this study.

Although we confirmed some mitigation activities to prepare for the next disaster, they were not as prominent as those in the short-term (Table 3). One possible reason is that mosque administrators are too occupied with their mosques’ daily operations and the pressing issues of the Muslim community<sup>14</sup> to take action against future disasters.<sup>15</sup> Another possible structural reason is that mosque users generally comprise international students and short-term technical intern trainees (that is, short-term foreign workers) (Table 1), and members who help manage mosques change frequently, hampering long-term initiatives.

#### 4.3. Policy and practical implications

The findings of mosque activities and roles in each phase will help

<sup>14</sup> One the most pressing issues is that of cemeteries [50], as Muslims who immigrated as foreign workers in the 1980s are aging, and their aging and death are attracting attention. While cremation accounts for 99.97% of all funerals in Japan, Muslims are religiously required to be buried in the ground. However, there are almost no cemeteries that allow burial, and securing land for such burials has become a problem. In fact, the interviewees at the Sendai and Kumamoto Mosques mentioned the cemetery issue as one of their top priorities to be tackled.

<sup>15</sup> Needless to say, as seen in Iwaki Mosque, disaster countermeasures such as seismic reinforcement may be taken when new mosques are constructed.

other stakeholders consider collaborating appropriately with mosques. First, according to Section 4.1, in the short term (that is, the response phase), mosques have the potential to care for foreign minorities who need to be considered because of religious and linguistic differences. In other words, mosques can be candidates for collaboration to solve religious and linguistic problems specific to foreign nationals. However, as they undertook few long-term activities, it is unclear whether long-term and stable collaboration can be established, and it is necessary to seek collaboration with careful consideration of the timeframe. Second, intermediaries between mosques and local communities or governments facilitated the smooth implementation of activities. A growing number of local governments in Japan have formed disaster relief agreements with religious institutions and organizations of major religions, such as Buddhism and Shintoism, particularly after the 2011 Great East Japan Earthquake [45]. In contrast, there is almost no agreement with mosques or organizations of minority religions. Our findings suggest that the local government may work more smoothly with mosques if it works through intermediaries of private organizations or key local persons, rather than directly with mosques. The above considerations may help realize a more appropriate multi-stakeholder partnership [8].

Our results also suggest that mosques require support from other stakeholders to enhance their mitigation activities. As discussed in Section 4.2, mosques may not improve disaster preparedness easily. Other stakeholders will be further required to conduct disaster education and drills, such as those conducted by the Kumamoto International Foundation, as mentioned in Section 3.2.3, and encourage mosque managers and users to participate in them.

Furthermore, our findings can empower other mosques and religious minorities. In fact, during the coronavirus disease 2019 (COVID-19) pandemic, which is considered a disaster, two mosques in Japan—(1) Ebina Mosque and (2) Osaka Islamic Center—were used as COVID-19 vaccination sites [46,47] and the Osaka Islamic Center voluntarily planned to use its building as a vaccination site after learning about the use of the Ebina Mosque as a vaccination site [41,48]. Therefore, the use and roles of mosques (for example, serving as distribution centers and shelters) presented here can provide good lessons and examples for communities that have not realized them but have similar characteristics and equipment (such as large spaces, parking lots, kitchens, and shower rooms).

#### 4.4. Limitations and future directions

This study has certain limitations. First, the interviews were conducted in 2023 and asked interviewees to recall events that occurred 12 and seven years ago in the cases of the 2011 Great East Japan Earthquake and the 2016 Kumamoto Earthquake, respectively. Therefore, recall bias cannot be denied. In the future, the short- and long-term activities of mosques should be continuously recorded in real time.

Second, we targeted recent major earthquakes and the subsequent mosque activities. In other words, we dismissed other types of natural hazards (such as floods and heavy snow). In particular, in the case of hazards with long forecasting lead times, activities and roles may be considered not only after the hazard occurs, but also before it (such as, early warning providers and evacuation shelters to meet precautionary evacuation). In the future, including other types of natural hazards will clarify a wider variety of mosque roles.

Third, we focused on mosques located in the significantly affected areas. However, as we demonstrated, they worked with mosques located outside these areas in the short term. For example, the Sendai and Iwaki Mosques were helped by the Otsuka Mosque in Tokyo and the Gytoku Hira Mosque in Chiba, whereas the Kumamoto Mosque was helped by the Fukuoka Mosque in Fukuoka. In addition, Section 4.2 discussed the possible involvement of other stakeholders in the long term (that is, in recovery activities). These stakeholders may have included mosques located outside the affected areas. For example, the Otsuka Mosque has regularly supported the homeless in Tokyo [49], and as part of its

activities, it may have supported the needy Muslims in affected areas. Focusing on the networks among mosques and the role of mosques outside the affected area is also important for assessing the potential of mosques in Japan.

## 5. Conclusion

Although some limitations remain, as described in Section 4.4, we summarized the short- and long-term activities and roles of Japanese mosques located in areas affected by recent major earthquake-related disasters. We clarified the timeframe and contents of activities. Much more prominent activities and roles were observed in the short term (that is, response phase) than in the long term (that is, recovery and mitigation phases). Specifically, in the short term, the distribution centers had representative roles, and they had the potential to include foreign nationals who needed to be taken into consideration because of religious and linguistic differences with the majority when providing relief goods and information. The presence of intermediaries between mosques and local communities or governments facilitated smooth support provision. These comprehensive findings will help realize appropriate collaboration between mosques and other stakeholders and empower mosques and other (religious) minorities, encouraging inclusive and community-based DRR activities.

### CRedit authorship contribution statement

**Hitomu Kotani:** Conceptualization, Methodology, Investigation, Data curation, Writing - Original Draft, Supervision, Project administration, Funding acquisition. **Hirofumi Okai:** Investigation, Writing - Review & Editing, Funding acquisition. **Mari Tamura:** Investigation, Writing - Review & Editing.

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### Declaration of Competing Interest

None.

### Data availability

The interview data are available from the corresponding author upon reasonable request.

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