Enhancing Citizens’ Disaster Resilience through an International Transdisciplinary Research Project in Mongolia

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Abstract As emphasized in the Sendai Framework for Disaster Risk Reduction (DRR) 2015–2030, an important key for enhancing citizens’ resilience is cooperation, in which universities and academic organizations may bear the burden of connecting people. Recently, some universities have conducted various DRR education programs together with local governments and citizens in Japan. In this report, we introduce the progress of our three international cooperative projects between Japan and Mongolia conducted between 2014 and 2018: 1) establishment of the Cooperative Center for Resilience Research (CCRR) by the National University of Mongolia and Nagoya University; 2) the Public Symposium for Earthquake DRR with the Mongolian Government; and 3) the Grass-Roots Joint Project of the Japan International Cooperation Agency (JICA) for disaster awareness in Khovd Province (Aimag), Mongolia. Through these transdisciplinary research projects, we intended to identify the essential conditions for an effective enhancement of citizens’ resilience. As a result, we found the following key aspects to be considered in international DRR cooperation framework: 1) transfer the spirit of DRR rather than simply its components, 2) customize DRR to match the climate and residents’ temperament in the target area, 3) consider whether the project is consistent with the public policy of the target area, and 4) involve regional organizations and residents to ensure continuity for DRR activity.

Key words disaster resilience, disaster risk reduction, awareness and preparedness, Mongolia-Japan international cooperation

Introduction

This paper discusses Disaster risk reduction (DRR) cooperation between Mongolia and Japan, which the authors have been coordinating since 2014, to explore how we can improve citizens’ resilience. Moreover, using this as a case study, the purpose of this paper is to discuss the conditions required in international collaboration to enhance citizens’ resilience based on the experiences of the Mongolian and Japanese project. Even in the summary of the international concept of DRR in the Sendai Disaster Prevention Framework, the importance of improving citizens’ resilience is recognized and the need for collaboration is emphasized. Under such international circumstances, Mongolia’s expectations of Japan’s contribution toward enhancing resilience have increased, and it is necessary to consider how universities and academia can respond to these demands.

Since the 1990s, there have been frequent large earthquakes in Asia: the 1995 Kobe earthquake, the 1999 Taiwan earthquake, the 1999 Izmit earthquake in Turkey, the 2004 Sumatra earthquake, the 2011 Great East Japan earthquake, etc. DRR against such low-frequency severe catastrophes is a serious issue that has not been adequately implemented. Although Japan has taken considerable countermeasures since the 1995 Kobe earthquake, it suffered tremendous damage again with the Great East Japan earthquake of 2011. There is an apparent limitation...
to the measures that can be taken by government, and therefore, the need for a new methodology is being discussed domestically and internationally.

Among such discussion, enhancement of resilience that could increase the ability to recover from severe damage has attracted attention, in addition to promoting structural measures. The Japanese government focuses on the national crisis in disasters and emphasizes the importance of national resilience, although the author has argued that the government should instead focus on improving the resilience of citizens (Suzuki et al. 2016). In countries with increased risks of large earthquakes, it is essential for each citizen to take responsibility for strengthening their homes or consider living in locations with good ground conditions. However, interest in DRR decreases soon after a disaster, and citizens are liable to repeat past mistakes. How to enhance citizens' disaster resilience is an important aspect of DRR that must be discussed.

Recently, Japan has emphasized the role of academia in DRR. Universities with expert knowledge on disasters and risk reduction are possibly able to play the role of linking the administration and citizens; they can also support the collaboration of many related agencies. Based on this recognition, Nagoya University has actively built a framework for collaborating with Mongolian National University and the National Emergency Management Agency (NEMA) since 2016. Together with the Open University of Japan, they intend to introduce Japan's experience on "how to raise citizens' disaster resilience" from an academic perspective.

Earthquakes and meteorological disasters as well as fires in the field sometimes occur in Mongolia. According to a list compiled by the National Emergency Management Agency (NEMA) (Ariunaa 2017), the annual average number of disasters between 2004 and 2016 are as follows: steppe and forest fire: 180.7, earthquake: 25.4, heavy rain and flood: 22.6, severe storm: 21.5, thunderstorm: 11.7, and cold disaster (dzud): 0.8. Dzud is a Mongolian term for harsh winter in which livestock die in large numbers primarily due to starvation/being unable to graze, especially between winter and early spring, which can undermine the sustainability of the nomadic society. This happens nationwide and is the most serious disaster in Mongolia, although rarely counted in the above list. It is not simply caused by heavy snowfall but is caused by a combination of natural and socio-economic factors (Morinaga and Shinoda 2003).

Earthquake is also problematic because in the first half of the 20th century, several M8 earthquakes occurred in western Mongolia, and recently, M4–5 earthquakes have been observed frequently around Ulaanbaatar. There is public concern about the possibility of future earthquakes that may hit Ulaanbaatar. Moreover, in recent years, floods due to torrential rain have become frequent, and attention has been focused on the effects of global warming.

Review of International DRR Activities in Mongolia

In Mongolia, the Law on Disaster Protection was enacted in June 2003 based on the Constitution of Mongolia. In 2004, NEMA was established to manage national disaster prevention policies and conduct special disaster prevention activities throughout Mongolia. The National Security Concept and State Policy on Disaster Protection, and the National Program for Strengthening DRR Capacity were enacted in 2010 and 2011, respectively. In 2017, the Amended Law on Disaster Protection was enacted, which regulated the organization, structure, and activities of emergency and disaster management organizations to rapidly and effectively organize DRR activities.

Under these circumstances, NEMA has been implementing 20 projects or programs with financing from foreign and international organizations since 2012, according to the "2017 White paper on disaster risk reduction in Mongolia (NEMA and JICA 2018)."

The United Nations Office for Disaster Risk Reduction (UNISDR), Asian Disaster Preparedness Center, and United Nations Educational, Scientific and Cultural Organization (UNESCO) built the Disaster Loss Database in Mongolia. Projects for DRR in Mongolia have been conducted by the United Nations Development Programme (UNDP) from 2013 to 2016, World Bank [2014–2016], Asian Development Bank [2018], and Japan Fund for Poverty Reduction [2017–2020]. International NGOs such as Mercy Corps [2013–2014, 2015–2018], World Vision [2014–2015, 2015–2016], and ChildFund Japan [2014–2016] have performed DRR support activities as well. The Swiss Agency for Development and Cooperation [2015–2018, 2017–2018], Australian Government and its Red Cross [2012–2016], Mongolian Red Cross Society, European Union (EU), and Finnish Red Cross Society [2016–2017] also conducted projects to strengthen the capacities of "Urban Search and Rescue Activities," "Forest and Wildland Firefighting," and "DRR in Ulaanbaatar City."

Moreover, Japan International Cooperation Agency
(JICA) conducted the “Project to Strengthen the Capacity for Earthquake Disaster Prevention in Mongolian and Ulaanbaatar [2012–2013],” “Project to Supply Equipment to Firefighting Vehicles of the Capital City [2015–2017] (JICA Expert Team 2018),” and “Project for Strengthening the National Capacity of Earthquake Disaster Protection and Prevention in Mongolia, Phase II [2016–2019].” Finally, Nagoya University started the “Disaster Awareness Enlightenment Project for Large-Scale Natural Disaster Caused by Global Environmental Change in Khovd Province, Mongolia” (which will be discussed in further detail later), associated with the Open University of Japan and the National University of Mongolia, and with the support of JICA.

Many humanitarian assistance and technical cooperation projects have been carried out in this decade, but most of them were practical, mainly focusing on specific actions. Of course, at the time of implementation, the ideals of international cooperation in Mongolia should have been discussed, but such discussion was rarely included in project documents. Our project is the first to be carried out by academic institutions; therefore, we are tasked with discussing the methodology of international cooperation.

Recently, the term “participatory” has attracted much attention in DRR research aimed at improving the resilience of citizens (Inamura et al. 2017; Miles 2018; Nara 2015; Okada et al. 2018; Reichel and Frömming 2014; Wachinger et al. 2018), which is an essential condition for disaster awareness raising among residents. Examples of successful practices in some countries and regions are introduced, while generalization of methodology to improve civic resilience is discussed. Consideration is also given to the relationship between DRR awareness and cultural background (Inamura 2016; Ishii 2016; Hoffmann and Muttarak 2017; Vicente et al. 2014; Appleby-Arnold et al. 2018).

Under the Amended Law on Disaster Protection of Mongolia, the generating of responsible citizens and improvement of self-help and mutual assistance through citizen participation are regarded as important topics.

“Future Earth”, a research initiative on global environmental change and sustainability has stared since 2015. This aims to solve the related problems through a trans-disciplinary citizen-based approach. The present paper is oriented in the same direction with the “Future Earth” project, and is significant not only from an academic perspective but also in consideration of the social demands facing Mongolia.

Practical International Cooperation to Enhance Citizens’ Resilience

To advance international comparative resilience study in Mongolia, we have developed a cooperative research center where we can discuss on various problems with many stakeholders. The establishment of this center is based on the Japanese experience, and it has attracted attention as a unique initiative in Mongolia. After the center’s establishment, we conducted cooperative research on disasters with NEMA and the Mongolian Academy of Sciences (MAS). In response to a request of the government of Mongolia, we jointly organized a civil DRR symposium. Finally, we started a project to develop regional disaster reduction in Mongolia. We summarize the history of these activities below.

Establishment of the Cooperative Center for Resilience Research (CCRR)

The National University of Mongolia and Nagoya University established the CCRR as a base of transdisciplinary actions in 2016 (Figure 1). The CCRR studies natural disasters, environmental and urban issues in Mongolia, and discusses solutions with related organizations, such as NEMA, MAS, and the Ministry of the Environment and Tourism of Mongolia (MET) (Figure 2).

In 2016, we conducted a joint field survey on the 1967 earthquake that occurred at Mogod in Bulgan Province, central Mongolia (Figure 3, Inamura et al. 2016). We followed the traces of the earthquake faults, photographed them with a drone, and interviewed local residents about their experiences. They informed us that there were local legends of previous earthquakes to the 1967 earthquake. They also said that “the damage was not so severe because of living in traditional ger (houses) at that time, but if the present cities are hit, we would suffer serious damage.” This was the first interview of its kind recorded in

Figure 1. Opening ceremony of the Center for Cooperative Resilience Research. University of Mongolia and Nagoya University, February 2016.
Mongolia (Figure 4).

In 2018, Suzuki et al. (2019a) conducted active fault research in Ulaanbaatar and discovered a previously unrecognized extensive active fault in the city center. The activity of the fault was geologically confirmed and analyzed through a joint excavation study with NEMA and MAS (Figure 5). Although the earthquake resistance standards for buildings have already stipulated by the law, the discovery of this active fault may require revision of those standards. Finally, we recommended the Mongolian government to reconsider their disaster prevention plan at the international symposium in Ulaanbaatar on 27 September, 2019 (Suzuki et al. 2019b).

Public symposium for Earthquake Disaster Risk Reduction Organized by the Mongolian Government and CCRR

The CCRR and the Mongolian government jointly organized earthquake risk reduction symposiums in March 2017 and March 2018. These were cooperative projects based on a request from the Mongolian government. The themes of the 2017 and 2018 symposiums were “Learning About Natural Disasters from the Experience of Mongolia and Japan” and “Responsible Citizens for Disaster Prevention,” respectively.

At the 2017 symposium, Deputy Prime Minister Ukhnaa Khrelsukh (Prime Minister since October 2017) and the authors (Suzuki and Battulga) presented lectures on the realities of earthquake disasters and the importance of DRR. After explaining the damage from the most recent major earthquake in Japan, Suzuki noted his appreciation for the assistance received from Mongolia after the disaster. Moreover, focusing on reflections and regrets, he introduced Japanese people’s thoughts and feelings on disasters. Battulga discussed how he felt as a Mongolian when he visited the disaster area after the 2016 Kumamoto earthquake. Then, on behalf of the government, Khrelsukh described Mongolia’s basic earthquake disaster prevention policy. The host of the symposium was one of the authors, Badral, the chief of NEMA (Figure 6).

At the 2018 symposium, one of the authors (Nara) provided a lecture on the perceived importance of citizens’ DRR in Japan. She explained that disaster reduction is everyone’s responsibility and highlighted the particular importance of the school principals. As the principals from all elementary and junior high schools in Ulaanbaatar city had attended the symposium, the lecture attracted a lot of attention (Figure 7).

Generally, at events involving international cooperation on DRR, best practices tend to be introduced, but honest reflections and deep regrets are rarely conveyed. At both symposiums, we presented not only scientific knowledge but also personal regrets and hopes based on our own experiences, which seemed to resonate in the hearts of the Mongolian participants.

These symposiums were video recorded and broadcast nationwide by the Mongolian National Broadcast, and
have been uploaded and distributed on NEMA’s website.

**JICA Grass-Roots Joint Project: “Disaster Awareness Enlightenment Project for Large-Scale Natural Disasters Caused by Global Environmental Change in Khovd Province, Mongolia”**

Since 2017, we have embarked on a collaborative project for disaster awareness and preparedness in Khovd Province with the support of JICA, which aims to enhance citizens’ resilience against comprehensive natural disasters caused by global environmental changes (Inamura et al. 2017; Ishii et al. 2018). This is a cutting-edge awareness project for regional DRR in Mongolia (Figure 8, 9).

According to the Mongolian Ministry of Environment and Tourism¹, Khovd Province, located in western Mongolia is evaluated as one of the most vulnerable provinces to be greatly affected by global warming in the near future. Therefore, it is necessary for local residents to understand the current environmental situation and take action.

Khovd Province has a great regional diversity in natural environment (Mongolian Academy of Science et al. 2019). In the north, there are plains and relatively lower mountains with altitudes of about 1200 to 3000 m, and large lakes are located where the Khovd River and Buyant River flow. The most populated Khovd City is located along the Buyant River. It is an arid area with an annual precipitation of about 200 to 300 mm. The central part is a mountainous area consisting of the Altai Mountains trending NW to SE, where glaciers exist on the peaks over 4000 m altitude. The southern part is a flat area located along the foot of the Altai Mountains at an altitude of about 1000 to 1800 m, with several towns located along the rivers flowing down from the mountains. The southernmost part is a flat desert area with an annual precipitation of less than 100 mm, which borders China.

There is nomadic pasture on the limited spread grassland and vegetable and fruit farming along the rivers in Khovd Province. Therefore, as a natural disaster, drought, dzud, and storms are likely to occur. Moreover, because there are many active faults in the Altai Mountains, earthquakes sometimes occur. In recent years, floods have occurred frequently due to the possible effects of global warming, and glaciers have started to melt in mountainous areas.

The main activities of this project are: 1) establishing...
a framework for collaboration among government, academia, and citizens for regional DRR; 2) creating educational content for DRR suitable for the target area; and 3) enhancing community leaders’ understanding and ability to advise residents.

In this project, local community leaders first learn about disaster science and risk reduction so that they can provide disaster education to rural residents. Through this process, it is expected that knowledge will be widely disseminated and maintained. We must create teaching materials on DRR that regional leaders can easily use. Our project aims to find suitable DRR methods for Mongolia through discussions with Mongolian stakeholders, rather than imposing Japanese methods onto Mongolia.

This project also seeks to convey good Japanese practices of community DRR to Mongolia, which have raised the citizens’ resilience. From the Japanese experience, we have learned the following lessons. First, to raise the resilience of citizens, bottom-up DRR that promotes voluntary activities of citizens is important, and top-down measures that force DRR measures on citizens are less effective. Second, it is important not to simply apply the best practices of other regions, but rather configure them in consideration of local characteristics and residents’ temperament. Therefore, it is necessary to know the area well and consult with residents (Figure 10).

We have conducted multiple workshops in the city of Khovd. In November 2017, the heads of each soum in Khovd Province participated in the workshop, and we explained the purpose of the five-year project and requested their cooperation (Figure 11). They promised active cooperation and reported on the current state of disaster risk in Khovd Province. We informed them that DRR enacted by local governments is thriving in Japan, and we introduced a DRR card game that is popular in Japan. The heads indicated that they have no similar card game, but suggested that students in Khovd City could assist in making one.

In March 2018, we held workshops at a high school...
and the Khovd University in Khovd City. In the workshops, we introduced how to enjoy the DRR card game and raised interest in local DRR activity (Figure 12).

In August and October 2018, we exchanged opinions at workshops with bug (district) leaders and social workers in the city of Khovd. We confirmed the importance of residents’ recognition of their own risks within bugs, sharing that information, and discussing what we can do to enhance disaster management capabilities at the citizen level. Then we conducted a questionnaire survey with each resident with the support of bug leaders and social workers. These activities are also cutting edge in Mongolia.

Discussion: Conditions for Improving Citizens’ Disaster Resilience through International Cooperation

Transfer the spirit of DRR, not only its components

Although sharing early warning systems for earthquakes or earthquake-proofing technology is significant in international cooperation, it is necessary to convince the people of the target area of the importance of self-help and cooperation to improve the resilience of citizens. At the symposiums organized by the Mongolian government mentioned above, we emphasized the importance of the spirit of DRR learned from our experiences with the Kobe earthquake and Great East Japan earthquake. We set the same goal in the DRR project in Khovd Province.

If residents feel a deep connection to DRR and are eager to improve their resilience, we can easily support their initiatives in the framework of international cooperation. In Mongolia, self-help and mutual assistance traditionally serve as the basis of DRR, although there are also considerable expectations for public assistance (Nara and Battulga 2019). Therefore, autonomy in disaster response in Mongolia seems to be much higher than in Japan. Although they are actively responding after disasters, they are not conscious of advanced disaster preparedness. Natural disaster hazards are relatively high, and the impact of global warming is also becoming noticeable in Mongolia; however, it is difficult to recognize the need for preparedness against such catastrophes that occur with low frequency. Thus, there is a need to carefully raise residents’ awareness of the importance of DRR.

Customize DRR to match the climate and residents’ temperament of the target area

When promoting regional DRR through international collaboration, it is necessary to investigate first the natural environment and traditional culture of the area. The climate and way of thinking in Mongolia differ significantly from Japan. Because Japan is located in a wet, plate boundary region, floods and earthquakes frequently occur there. By contrast, Mongolia is located in a cold, dry, and continental area, and therefore its citizens are sensitive to climate disasters, but unconscious of other disaster risks such as large earthquakes or floods. However, recently, the risk of earthquakes and floods has increased. Additionally, the rapid urbanization of Ulaanbaatar has also increased disaster vulnerability.

Mongolians traditionally had resilient nomadic lives with high flexibility, mobility, and cooperation (Ishii et al. 2015), and they are familiar with nature and its recent changes. Therefore, it is important to customize the DRR methodology for Mongolia through consultation with residents. For example, at the workshops in Mongolia, regional leaders demonstrate strong leadership, and participants offer their opinions much more actively than Japanese. Therefore, it is important to respect independence and creativity, and consensus building over time may be the point for promoting DRR in Mongolia.

Consider whether the project is consistent with the policy of the target area

Mongolia began its full-scale disaster management policy in the 2000s after its transition from socialism to capitalism in the 1990s. NEMA has actively introduced international DRR strategies since 2004. JICA has started several projects that engaged in earthquake assessment and introduced Japanese DRR drills and various DRR educational materials.

In 2017, the Amended Law of Disaster Prevention strengthened earthquake resistance policy and encouraged regional DRR to enhance citizens’ resilience. Especially in Ulaanbaatar, building resistance and urban redevelopment are serious concerns, whereas promotion
of region-led DRR is an important issue in rural areas.

Developing initiatives consistent with these national needs should be important considerations in international collaboration.

**Involve regional organizations and residents to ensure continuity for DRR**

International collaboration often ends after a short period of time, and thus, continuity becomes an issue. To maintain the sustainability of regional DRR, it is important to establish a framework in which the key stakeholders in the area can cooperate each other. In Khovd Province, organizations such as Khovd Emergency Management Department, the Aimag government, the soum government, and schools and universities should share the role of DRR. It is expected that the governor, soum leaders, bug managers, teachers, and social workers will work together as key stakeholders in Mongolia.

In our project, we will have the opportunity to visit every soum in Khovd Province and talk to local people. High school and university students previously have not been given a role in DRR. Involving young people in the project is an important aspect for sustainability. The development of a close relationship within the project period is critical to international cooperative activities.

**Conclusion**

In order to enhance the disaster resilience of citizens, it is important to utilize the research from various sciences, and to understand that solutions for DRR should develop through collaboration with stakeholders in society. International cooperation on DRR is strongly demanded in developing countries. That should aim to seek appropriate methods for the target area, considering its characteristics of climate, society, and culture, rather than imposing ready-made methods from overseas. Academia has the potential and responsibility to contribute to that realization.

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