Proceedings of 2022 Asian Conference on Crisisonomy
(20 ~ 23 July, 2022; Jeju National University; Asian Association for Crisisonomy)

Current Status Analysis and Crisis Management for Effective Disaster Management

- Focused on earthquake occurrence in Mongolia

Bat-Erdene Ganchimeg[1+], Jae Eun Lee[2#]

[1] Department of Public Administration student, Chungbuk National University, 1 Chungdae-ro, Seowon-Gu, Cheongju, Chungbuk, Korea
[2]Department of Public Administration, Chungbuk National University, 1 Chungdae-ro, Seowon-Gu, Cheongju, Chungbuk, Korea

A B S T R A C T

In Mongolia, the occurrence of strong earthquakes has been increasing since 2000. Because of its relatively low population density, the damage seems to be less than that of other countries. However, in Ulaanbaatar, a magnitude 3.5 earthquake has increased eightfold in the past decade, and it is time to focus on earthquakes due to the high population density and the large number of buildings. Therefore, the main purpose of this study is to improve citizens' knowledge and education about earthquakes, and to propose crisis management that individuals, hospitals, schools, and other public institutions can do before and after the crisis in the event of an earthquake. In Mongolia, the average number of earthquakes has increased by 5.7 times and the number of sensitive earthquakes by 6 times over the past decade, so an integrated disaster response is needed to respond effectively. Therefore, it will build seismic registry and warning systems, certify homes, hospitals, schools and kindergartens, demolish defective buildings, assess disaster risk in high-seismic and high-seismic areas, and assist in disaster preparedness, training and publicity. Advice on the need to carry out appropriate disaster management.

Key words: Mongolia Ulaanbaatar City; Disaster; Earthquake Status; Crisis Managment

1. Introduction

1.1. Disaster Management Discussion

Disaster management refers to all activities to prevent and prepare in advance to minimize damage caused by disasters, and to respond to and recover from disasters when disasters occur, that is, all activities performed for the prevention, response, preparation, and recovery of disasters(Jin, 2022: 8).

A “disaster” is a term that can damage or cause damage to people’s lives, bodies, property, and the country, and a typhoon, flood, heavy rain, strong wind, storm, tsunami, heavy snow, cold wave, lightning strike, drought, heat wave, earthquake, yellow sand, and current outbreak. Natural disasters, fires, collapses, explosions, and traffic accidents (including air accidents and maritime accidents), which are disasters caused by natural phenomena such as tidal currents, volcanic activity, asteroids and meteoroids, and other natural phenomena equivalent thereto.) · Damages beyond the scale prescribed by Presidential Decree caused by CBRN accidents · environmental pollution accidents, etc.; It is defined as a social disaster that is damage caused by infectious diseases or spread of livestock contagious diseases according to the 「Livestock Infectious Disease Prevention Act」, and fine dust under the「Special Act on the Reduction and Management of Fine Dust」.

1.2. Earthquake Related Discussion

Earthquake is defined from various viewpoints according to researchers, scholars, and earthquake-related organizations or organizations.

<Table 1> Definition of Previous Studies Related to Earthquakes

Researcher	Contents
Choi (2019)	Earthquake refers to a phenomenon in which the earth's internal energy is concentrated in one place and then comes out for a moment, causing the earth to shake. Most earthquakes occur along the boundary where several plates forming the earth's surface meet.
Koo (2019)	It is a natural phenomenon in which energy accumulated for a long time in the earth's crust is momentarily released and part of the energy is propagated in the form of seismic waves.
Lee (2020)	An earthquake is a phenomenon in which energy generated by sudden fluctuations in the Earth's interior is propagated in the form of waves in all directions.
Kim (2016)	It shows that some dynamic force acts inside the Earth, and as time increases, geological stress and strain energy accumulate. This refers to a phenomenon in which the accumulated energy is suddenly released and seismic waves are transmitted in all directions, causing the ground to shake.
Kim (2022)	Earth's surface shakes due to natural or artificial causes.
Pak (2019)	A phenomenon in which the earth's surface shakes due to natural causes. According to a phenomenological definition, external forces stored in the crust are converted into elastic seismic energy and rapidly released.

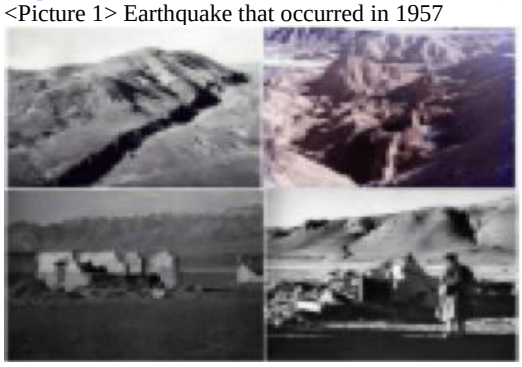
2. The Nature of the COVID-19 Pandemic Economic Crisisd

2.1. Earthquake in Mongolia

The epicenter, magnitude, and date of earthquakes after 1900 are recorded in Mongolia, but the date and record of previous earthquakes are unknown. Except for the earthquakes of 1905 and 1957, there was no information on damage and no organized database.

Globally, earthquakes of magnitude 5 or greater are considered a disaster because of the risk of damage to buildings and structures. Then, an earthquake with a magnitude of 6.5 occurred in the Khankh region in Mongolia, and there was no damage to human life or economy. Facts about the strongest earthquake in Mongolia reached on December 4, 1957, in the region of Ih Bogd in the Gobi-Altai Mountains, at a depth of 30 km and with magnitudes 11-12. Such strong earthquakes rarely occur on land, and the 80 km-long mountain wave shook and moved northward, and the 8.5 m elevation above sea level was the highest recorded in science (https://www.montsame.mn/mn/read/250295).

<Picture 1> Earthquake that occurred in 1957



In the 20th century, there were four major earthquakes recorded in accounts all over the world in Mongolia. In other words, in the 20th century, 4 out of 60 earthquakes of magnitude 8 or larger occurred in Mongolia. For example, the earthquake in Gobi-Altai in 1957 was considered very powerful and killed 13 people. Next, in 1905, the two earthquakes that occurred in Bulnain and Tsesterleg were of magnitude 8.0 and 8.2 (http://itoim.mn/article/FpmTF/20639).

<Picture 2> Earthquakes in the last 10 years registered in Mongolia

Mongolia's territory of 75% is known to be prone to earthquakes with a magnitude of 7-8 or larger. Between 1900 and 2000, it was recorded that there were more than 30 earthquakes of magnitude 7 or greater and 4 earthquakes of magnitude 8 or greater in Korea. Also, from 2010 to 2016, an average of 44 earthquakes with a magnitude of 3.5 or greater occurred nationwide nationwide.

<Table 2> Recent Earthquake of Mongolia

Date	Area	Scale(M)	Height(Km)
2022.06.13. 04:29:00	Russia	3.8	10
2022.06.08. 12:24:21	Russia	6	4.3
2022.06.07. 02:17:44	Khuvsgul, Khankh 44km	3.8	10
2022.06.05. 10:00:49	Gobi-Altai, Bugat 45km	3.6	10
2022.06.02. 21:15:03	Khovd, Zereg 17km	3.9	10
2022.06.02. 21:15:03	Khuvsgul, Khankh 38km	3.7	10
2022.05.21. 11:27:30	Khuvsgul, Tunel 61km	3.7	10
2022.05.19. 17:57:32	Selenge, Yruu 52km	4	10

2.2. Overseas earthquake

Earthquakes of magnitude 4.0 or greater have occurred on average 11,605 times a year since 2000, and earthquakes of magnitude 7.0 or greater that can cause serious damage are on average 14 times a year. It is reported that an annual average of 51,480 people lose their lives due to earthquakes. Based on the earthquakes that have occurred so far, the current status of earthquakes that have caused many casualties is as follows(Shin, 2012: 12-15).

<Table 3> Earthquakes by Overseas Fatalities

Date	Country	Dead(Persons)	Scale(M)
1976.07.28	Tangshan, Hebei, China	242,000	7.5
2010.01.12	Haiti	222,570	7.0
1927.05.22	Gansu, China	200,000	8.0
1920.12.16	Haiyuan, China	180,000	7.8
2004.12.26	India Sumatra	165,708	9.0
1923.09.01	Japan, Kanto	143,000	7.9
1948.10.05	Soviet Union/ Turkmenistan	110,000	7.3
2008.05.12	Sichuan, China	87,475	7.9
1908.12.28	Messina, Sicily, Italy	75,000	7.2
2005.10.08	Pakistan Mujaparabad	73,338	7.6

3. Countermeasure Guidance

In the earthquake disaster management, a plan to introduce domestic and overseas earthquake disaster management systems was derived. Therefore, we reviewed the current status of domestic earthquake disaster prevention measures and discussed the overseas earthquake disaster response systems of Korea, Japan, and the United States.

Korea's earthquake disaster response system includes the National Earthquake Disaster Response System, Liquid Fire Disaster Assessment System, and Disaster Situation Analysis and Judgment System of the National Fire and Disaster Prevention Administration, the National Earthquake Information System of the Korea Meteorological Administration, and the National Earthquake Management Monitoring System of the Korea Institute of Geoscience and Mineral Resources. The Korea Earthquake Disaster Response System of the Fire and Disaster Prevention Administration expedites rescue, first aid and initial recovery by effectively arranging limited rescue personnel and resources based on the damage predicted by the damage estimation simulation at the initial stage when it is impossible to understand the situation after the earthquake(Seok, 2015: 28-29).

In Japan, earthquake disaster-related laws and systems have been faithfully strengthened in the wake of the experience of large-scale natural disasters and accidents. Based on the lessons learned from the 1995 Kobe Earthquake, the central government, local public organizations, and public institutions have clearly defined responsibilities for policies, and it is easy to refer to the measures to be taken at each stage, such as prevention, emergency,

recovery, and revival(Kim, 2018: 196). In addition, Japan's Disaster Information System(DIS) is a system that predicts earthquake damage and provides information on countermeasures accordingly so that countermeasures can be quickly and efficiently implemented in the event of a large-scale earthquake. The DIS was developed to assist in quick and accurate decision-making in case of emergency recovery by identifying the damage situation early, and it is still being operated by the Japanese(Kim, 2022: 13).

HAZUS(HAZARD U.S)-earthquake, developed by FEMA (Federal Emergency Management Agency), an American disaster management agency, includes earthquake information (episode, magnitude), building structure and use, population, and geological data to estimate disaster losses due to earthquakes. It is a program that can estimate earthquake damage by region using various input data(Kim, 2022: 16). The main functions of HAZUS include ground disaster assessment, basic data management, primary physical damage assessment, and indirect physical damage assessment.

4. Conclusions

Considering the recent study on the number and magnitude and frequency of earthquakes along the earthquake fault in Ulaanbaatar, it is considered that policy measures to reduce the risk of serious earthquakes are necessary. In particular, there is a need to model and test buildings in real life in the densely populated capital city of Ulaanbaatar, Darhan and Erdenet, to assess seismic hazard risk for construction projects, to evaluate construction standardization, strength and seismic resistance of health and educational facilities.

Earthquake in the city of Ulaanbaatar doubled in 2005 compared to the previous year, but quadrupled in 2012 and tenfold in 2013. Until now, scientists around the world could not predict the time and magnitude of earthquakes. Also, it is impossible to predict strong earthquakes, but it is a time when government policies should focus on reducing the damage caused by earthquakes, including the social and economic risks to human life and the country.

In addition, detailed research is needed to introduce the latest technology, upgrade warning stations, and provide earthquake information to the public as soon as possible. In order to constantly monitor the operation status in a small space such as a low-height space of a seismic isolator and a seismic isolator unit and cable, it is necessary to convert not only small sensors but also devices that receive data and process signals into IoT sensors and process them wirelessly.

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Profile

Bat-Erdene Ganchimeg (smileganaa4372@yahoo.com)

She received her bachelor's degree from Mongolia and her master's degree from Korea National University of Transportation. She completed his PhD in Public Administration at Chungbuk National University. She is currently a researcher at the National Crisis Management Institute while she is studying for her PhD in Public Administration at Chungbuk National University. Her interests include crisis management, health and safety management, and organizational management.

Jae Eun Lee (jeunlee@chungbuk.ac.kr)

He received his B.A., M.A., Ph.D. from Yonsei University, Korea in 2000. He is a Professor of the Department of Public Administration at Chungbuk National University, in which he has taught since 2000. His interesting subject and area of research and education is crsis & emergency management, organizational studies, and policy implementation. He has published 203 articles in journals and written 16 books, including 10 co-author books.