

Improving Living Safety Crisis and Emergency Management System in Mongolia: AHP Analysis According to Living Safety Typology

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Abstract

The purpose of this study is to identify the problems of the society of Ulaanbaatar, Mongolia, the perception of life risks, the risk perception of citizens in modern society, and based on the results of expert analysis, it is possible to improve the awareness of the citizens of Ulaanbaatar, Mongolia. Focus on improving management management. The main purpose is to discharge. Since Mongolia transitioned from communism to a democratic market economy in 1990, the population of Ulaanbaatar, the capital of Mongolia, has grown rapidly. Urbanization and industrialization have led to economic growth and material life enrichment, but in today's risky society due to depletion of resources, safety problems in urban life are naturally becoming more serious. Therefore, the content of this study consists of four types of living safety issues in Ulaanbaatar: living disasters, living facilities, and living infrastructure, and conducts an empirical analysis of the risk perception of experts and ordinary citizens.

Key words: Ulaanbaatar City, Mongolia, living safety, living disaster safety, living environment safety, living facility safety, living-based safety, risk awareness, crisis management system

I. Introduction

This paper is a study on improving the living safety crisis management system of citizens in Ulaanbaatar, Mongolia. Through the results of empirical analysis targeting experts, we identify the risk perception and risk perception of living in modern society in Ulaanbaatar, Mongolia. The purpose is to present appropriate implications and derive the direction of a crisis management system suited to the characteristics of Mongolia's modern society.

Since the transition from communism to a democratic market economy in 1990, the population of Ulaanbaatar, the capital of Mongolia, has grown rapidly. As citizens moved from the countryside to the city, causing a shortage of housing, the population of Ulaanbaatar city increased rapidly as more immigrants came from undeveloped areas. Urbanization and industrialization have led to economic growth and material living enrichment, but in today's risky society due to depletion of resources, safety problems in urban life are naturally becoming more serious. Currently, the city of Ulaanbaatar has problems such as

traffic accidents due to increased traffic due to population density, air pollution, soil pollution, and water pollution in underdeveloped ger areas, problems with safety facilities in dense areas, increased crime rates, and safe school life. Problems that can be positively affected by a safe living environment for humans continue to exist, such as pedestrian accidents near schools and the problem of living in a safe environment for the elderly, pregnant women, and vulnerable groups.

In 1992, the period of transition from communism to a new democratic market economy, there were 12,467 cases, and 25 years later, in 2017, it increased 2.6 times (32,259 cases) (Bayanduuren, 2018: 4). As of 2022, there were a total of 35,340 crimes registered at police stations: 24,310(68.8%) in Ulaanbaatar, 11,019(31.1%) in other provinces, and 11(0.1%) in other countries and overseas. This represents a high level of risk in a country with a population of 3.5 million people. According to statistics from 2017, 36,591 traffic accidents were reported nationwide, of which 3,929 (10.7%) occurred on local roads and 32,662 (89.3%) occurred in the capital city of Ulaanbaatar (National Statistics Office, 2023. 01).

As of the first three months of 2020, 772 household fires occurred nation wide, and as of January 2023, 275 fire incidents were reported, an increase of 36(15.1%) from last year. In Mongolia, as of January to March 2021, 42.8% of pedestrian and traffic accident rates are pedestrian accidents, 40.2% are vehicle occupants, 16.9% are drivers, and 0.2% are bicycle riders.

In addition, among environmental pollution problems, the most serious problem is air pollution. Currently, due to outdated heating facilities, use of low-quality fuel, and a basin surrounded by mountains, air pollution is at a serious level in the winter due to exhaust fumes and automobile exhaust gases generated by heating and cooking in ger areas around the city (Battulga, *et. al.*, 2021: 32).

In order to discuss life crisis and crisis management, the AHP analysis method of living safety expert survey is used based on literature analysis and the risk status of modern society in Ulaanbaatar.

Mongolia's experts and citizens analyzed the actual situation based on cases of life crises and risks such as traffic safety, crime safety, fire safety, facility safety, air pollution, and water pollution that occur in daily life in Ulaanbaatar. The analysis is set to the scope of living disaster safety, living environment safety, living facility safety, and living infrastructure safety.

In order to present a living safety risk management system, we analyze the current social risks by four types of living safety and present the current status of the living safety management system. The population of Ulaanbaatar, the capital of Mongolia, is 2,197,970 people living in urban areas, accounting for approximately 65.7% of the total population (Birozan, 2020: 6).

Due to this population increase from the countryside to the city, the number of residents has increased, urbanization and industrialization have grown, the economy has grown, and material life has become abundant, but the depletion of resources, the resulting urban problems, and the urban environment and living safety problems are naturally becoming more serious.

As the population of the ger area increased, various urban problems arose in Ulaanbaatar. In other words, problems such as urban development problems, urban basic planning policy problems, urban environmental problems, air, water quality, soil pollution, and living safety problems have occurred, putting citizens' health at risk (Gerelt-Od, 2010).

Therefore, with respect to living safety in the Ulaanbaatar region of Mongolia, AHP analysis was used to analyze the actual status of living safety in the area of Mongolian experts, and an empirical analysis was conducted on the risk perception of living safety among 150 citizens of Ulaanbaatar, Mongolia.

II. Theoretical Discussions

The dictionary definition of ‘safety’ means “not dangerous, a state of peace of mind and a sound body,” and its general meaning is “a condition of modifying human behavior or creating a physically safe environment to reduce the risk of accidents.” status (Kim, 2020: 9). Then, the concept of ‘living safety’ emerged to overcome safety risk factors and aim for safety (Park, 2014: 416). Living safety is a core element of daily life, and includes life, property, health, harm, danger, and protection, and protects people from harm or danger to life, property, and health in their daily lives. Scholars have diverse opinions on the concept of living safety, and they are summarized and explained in the following <Table 1> (Kang & Yoon, 2016: 110).

Table 1. Living safety concept

Author (year)	Main point
Lee & Yoo (2007)	A state in which people do not suffer harm to life, health, or property in the course of their daily lives.
Kim (2020)	A condition or state of modifying human behavior or creating a physically safe environment to reduce the risk of accidents.
Paek (2017)	Promoting and ensuring safety against accidents that occur due to safety negligence or unsafe environments in the living environment encountered in daily life.
Doo & Yoon (2006) Shin & Shin (2007)	Living safety refers to increasing knowledge, attitude, and behavior regarding safety from risks in everyday living environments such as home, school, and social life, and reducing the risk of physical damage or accidents that occur in daily life.
Kang & Yoon (2016)	Protecting people from harm or danger to life, property, and health in their daily lives.

Then, the scope of the occurrence and damage of the national safety crisis was divided into narrow scope and middle range-wide scope (Lee, 1998). The distinction between narrow scope and medium/broad scope was based on the home, the mood unit of people's live (Lee, 2018: 172).

In the study of Lee & Yoo(2007), for the development of this area, the standards are broadly divided into individuals and society as responsible subjects for national safety, and the scope of occurrence and damage of national safety crises is divided into narrow scope and medium/wide scope. It was presented. Then, the areas where a national life safety crisis can occur include the safety area of vulnerable groups, food safety area, health and medicine/drug safety area, living economy safety area, living security safety area, living environment safety area, and living facility safety area. They can be distinguished(Lee, 2018: 171).

Then, the crisis management stage was divided into a total of 4 stages focusing on the progress by time period to prepare for the occurrence of a crisis (Park, 2016: 10). These are the prevention and preparation stages before a crisis occurs, and the response and recovery stages after a crisis occurs. Each stage presented here has a cyclical nature rather than being mutually disconnected, and each stage must be refluxed while interacting (Kim, 2015: 115).

First, prevention can be defined as the activity of deciding what to do where risks that threaten human

life, property, health, safety, and welfare exist.

Second, preparedness can be defined as a preparatory process to develop the ability to respond quickly and efficiently in the event of a crisis.

Third, response can be said to be an activity process that applies the various duties and functions that crisis management agencies must perform when a crisis actually occurs.

Fourth, recovery refers to a long-term process of activities from immediately after a crisis occurs until the affected area is restored to its pre-crisis state.

In addition, previous research related to the life safety crisis management system was reviewed by type of living safety or studies related to the crisis management system.

III. AHP Analysis and Result

1. Analytic Hierarchical Process(AHP)

AHP is a multi-criteria decision-making method that combines quantitative analysis and qualitative analysis proposed by Saaty in the 1980s (Choi, 2010: 32). Saaty(1980)is the AHP analysis method was proposed based on the fact that when people make a decision, the brain goes through steps such as establishing a hierarchy, estimating relative importance, and ensuring logical consistency (Kim & Kim, 2008).

2. Data Collection and Model

This study is a study on living safety crisis management in Ulaanbaatar, Mongolia. The importance of living safety crises was measured in four factors: living disasters, living environment, living facilities, and living infrastructure. Four measurement elements were set according to the relative importance of each measurement area, and the importance evaluation structure is shown in <Figure 1>.

The expert and citizen awareness survey for Mongolia's life safety crisis management was largely divided into four major categories of operation factors, and evaluation factors were set for each detailed factor.

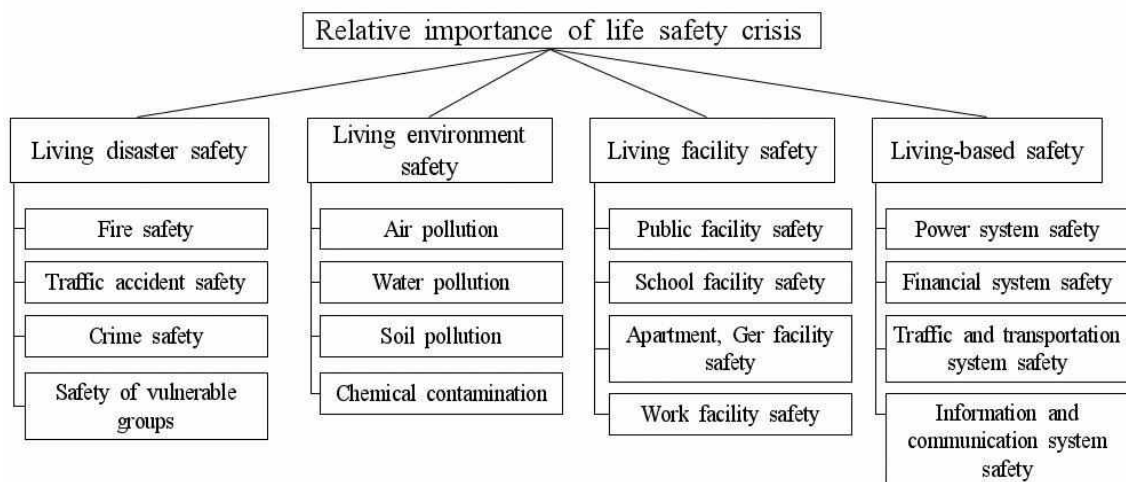


Figure 1. Relative importance structure for life safety crises

3. Result

By using stratification analysis (AHP) to determine which factors are important in the four areas of living safety crisis in Mongolia (living disasters, living environment, living facilities, and living infrastructure), we aim to derive the importance and priority of each factor. As shown in <Table 2>, the results of a stratification analysis of the relative importance of life safety crises between areas showed that the priorities were measured as living environment safety, living disaster safety, living facility safety, and life-based safety. The consistency test (CR) was 0.0446, which is less than the standard value of 0.1, so the analysis results were significant.

Table 2. Importance of living safety crisis

Factor importance	Relative importance	Priority
Living disaster safety	0.2987	2nd
Living environment safety	0.5505	1st
Living facility safety	0.1032	3rd
Living-based safety	0.0476	4th

1) Living Disaster Safety Factors

The results of the analysis measuring the relative importance and priority of each element of daily disaster safety are shown in <Table 3>, and the priorities were measured as crime safety, traffic accident safety, fire safety, and safety of vulnerable groups. The consistency test (CR) was 0.003, which is less than the standard value of 0.1, so the analysis results were significant.

Table 3. Living disaster safety

Factor importance	Relative importance	Priority
Fire safety	0.2395	3rd
Traffic accident safety	0.3385	2nd
Crime safety	0.3614	1st
Safety of vulnerable groups	0.0606	4th

2) Living Environment Safety Factors

The results of the analysis measuring the relative importance and priority of each element of living environment safety are shown in <Table 4>, and the priorities of air pollution, water pollution, soil pollution, and chemical pollution were measured. The consistency test (CR) was 0.052, which is less than the standard value of 0.1, so the analysis results were significant.

Table 4. Living environment safety

Factor importance	Relative importance	Priority
Air pollution	0.6960	1st
Water pollution	0.1178	2nd
Soil pollution	0.0957	3rd
Chemical contamination	0.0905	4th

3) Living Facility Safety Factors

The results of the analysis measuring the relative importance and priority of each element of living facility safety are shown in <Table 5>, and were measured as school facility safety, public facility safety, work facility safety, apartment, and ger facility safety. The consistency test (CR) was 0.0162, which is less than the standard value of 0.1, so the analysis results were significant.

Table 5. Living facility safety

Factor importance	Relative importance	Priority
Public facility safety	0.3036	2nd
School facility safety	0.4762	1st
Apartment, Ger facility safety	0.1029	4th
Work facility safety	0.1174	3rd

4) Living-based safety factors

The results of the analysis measuring the relative importance and priority of each element of life-based safety are shown in <Table 6>, and were measured in traffic and transportation system safety, information and communication system safety, power system safety, and financial system safety. The consistency test (CR) was 0.0056, which is less than the standard value of 0.1, so the analysis results were significant.

Table 6. Living-based safety

Factor importance	Relative importance	Priority
Power system safety	0.1045	3rd
Financial system safety	0.0874	4th
Traffic and transportation system safety	0.6929	1st
Information and communication system safety	0.1152	2nd

5) AHP Analysis Comprehensive Results

AHP analysis was conducted on 22 experts in Mongolia, and the experts' affiliations were firefighters-3, government administration professors-5, emergency management agencies-7, police departments-5, and public

officials with a doctorate in public administration-2. A survey was conducted targeting the subjects. When experts measured the relative importance of each life safety crisis area and combined the results for each element, the priorities were measured as a result of the AHP analysis as shown in <Table 7>.

Table 7. Comprehensive results and priorities for each measurement element

Measuring area	Measurement element	Relative importance	Overall measurement factor priority
Living disaster safety	Fire safety	0.0716	4th
	Traffic accident safety	0.1011	3rd
	Crime safety	0.1080	2nd
	Safety of vulnerable groups	0.0181	11th
Living environment safety	Air pollution	0.3831	1st
	Water pollution	0.0527	6th
	Soil pollution	0.0649	5th
	Chemical contamination	0.0498	7th
Living facility safety	Public facility safety	0.0313	10th
	School facility safety	0.0491	8th
	Apartment, Ger facility safety	0.0106	13th
	Work facility safety	0.0121	12th
Living-based safety	Power system safety	0.0050	15th
	Financial system safety	0.0042	16th
	Traffic and transportation system safety	0.0330	9th
	Information and communication system safety	0.0055	14th

Considering the overall weight between measurement areas and measurement elements in the importance assessment of life safety crises, looking at the priorities of all measurement elements, air pollution was ranked 1st, crime safety in the was ranked 2nd, and traffic accident safety was ranked 3rd. Ranking, fire safety was ranked 4th. In the living environment area, soil pollution ranked 5th, water pollution ranked 6th, and chemical pollution ranked 7th.

Next, in the area of living facilities, school facility safety ranked 8th, traffic and transportation systems in the area of living-based safety ranked 9th, public facility safety ranked 10th, safety of vulnerable groups ranked 11th, work facility safety ranked 12th, and apartments (Ger) facility safety was ranked 13th, information and communication system safety was ranked 14th, power system safety was ranked 15th, and finally, financial system safety was ranked 16th.

In conclusion, looking at the AHP analysis comprehensively, the air pollution factor in the living environment area was ranked first due to the living safety crisis in Mongolia, but the crime safety factor in the living disaster safety area was ranked second, and the traffic accident safety factor was ranked second. is ranked 3rd, and fire safety factor is ranked 4th. It is believed that improvement of crisis management in the areas of living environment safety and disaster safety is needed as a priority.

IV. Crisis and Emergency Management System

According to the results of an analysis conducted on experts focusing on the life safety crisis, there is a serious problem with air pollution, which is a living environment factor, and crime safety, fire safety, and traffic accident safety among life disaster factors were found to have high seriousness values, and according to the analysis results, The overall crisis management system is summarized as follows.

First, the existing coal development project used in ger areas or power plants, which is a major cause of air pollution, needs to be upgraded with highly efficient technology, so as to promote the transition to renewable energy and reduce power demand in industries, households, transportation, etc. A system that can improve overall energy efficiency is needed.

Second, an air pollution monitoring and prediction system is needed. For air pollution monitoring, a system is needed to monitor air quality in real time and check the concentration of pollutants. Alternatively, a system is needed to disclose air pollution concentrations through safety issues, SMS, and apps to provide air pollution information.

Third, to prevent traffic accidents, priority is given to traffic safety education, strengthening and crackdown on laws, rapid accident reporting and emergency measures to improve or respond to road conditions, provision of emergency medical services, traffic control, and accident scene management, and finally, victims for recovery. A comprehensive system for crisis management is needed, including support, insurance processing, and transportation system recovery.

Fourth, Mongolia has a poor fire and safety education system for schools, organization members, and citizens. Therefore, a safety education system is needed, including safety education for fire safety prevention, regular inspection and maintenance, and how to use fire extinguishers. Alternatively, when coal is developed, a fire prevention system is needed, including how to utilize the developed coal.

Fifth, it is necessary to operate a variety of channels (phone, online, mobile app, etc.) and a community network through which citizens can report crimes. There is a need to prepare a preparedness system, such as a system that uses data analysis tools to analyze crime patterns and trends, predict areas and time zones where crime is likely to occur, and prepare in advance.

Sixth, strong punishment and strict enforcement of laws are needed in case of violations such as environmental pollution, traffic accidents, and crimes.

In addition, risk is 'something that has not yet occurred, but still has a close relationship with risky elements,' and a prevention system is important for any incident or disaster.

As urbanization, industrialization, high density, and high-tech trends occur, the occurrence of human disasters and social disasters is increasing. In a strict sense, in order to guarantee the people's safety right, it is necessary to discuss crisis management not only for natural disasters, but also for man-made disasters, social disasters, and life safety crises (Lee, 2018: 36). Then, life safety crisis management is not a problem that can be solved only by experts and the government, but is a problem that requires citizen participation efforts. Although government policies, systems, and guidance are important, individual efforts and active participation by citizens are essential parts for a safe society.

V. Conclusions

Managing all crisis factors that can threaten human live and health or harm safety is the mission of not only the country and community, but also ourselves. Or, only when the right to safety is guaranteed can humans dream of the future and make efforts to achieve it. Crisis management is a process of effort to guarantee the right to safety, which is a basic human right (Lee, 2018: 21). Therefore, the government, private companies and institutions, citizens, and researchers must all work together to manage living safety crises.

In this study, the living safety crisis in Ulaanbaatar, Mongolia was identified as a living safety crisis that requires priority crisis management in modern society through various variables, and the crisis management system was presented from various aspects.

Data related to living safety and living safety crisis management were collected, and based on previous research, factors affecting living safety in Ulaanbaatar, Mongolia were stratified and evaluation factors were presented through analysis of the relative importance of each factor.

Through AHP class analysis for experts and empirical risk perception analysis for citizens, we presented the living safety crisis issues that need to be improved as a top priority for living safety crisis management. Through the analysis results of the study, a crisis management system that can be used in Mongolian society was proposed.

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