

## Fire Safety Risk Status in Mongolia

**Uganbayar Enkhtaivan<sup>1</sup>, Sarantsetseg Bazarvaani<sup>2</sup>, Odbaatar Bibish<sup>3</sup>, Odbayar Tserendagva<sup>4</sup>, Bulgankhangai Lkhagvajav<sup>5</sup>, Badamdorj Dorjgochoo<sup>6</sup>**

<sup>1</sup>Ph.D., University of Internal Affairs, Mongolia Associate Professor, PhD, at the Academy of Management

<sup>2</sup>Ph.D., Associate Professor, University of Internal Affairs, Mongolia <https://orcid.org/0009-0004-7864-8736>

Email: [Sarantsetseg.b@uia.gov.mn](mailto:Sarantsetseg.b@uia.gov.mn) Professor, PhD, and Associate Professor at the Academy of Management, University of Internal Affairs

<sup>3</sup>Ph.D., Associate Professor, Mongolia Professor, Doctor, and Associate Professor at the Academy of Management, University of Internal Affairs

<sup>4</sup>Ph.D, Associate Professor, Director of the Center for Border Protection Studies, Institute of Border Studies, Border Guard

<sup>5</sup>Associate Professor, Department of Fire Fighting Service, School of Emergency Situations, University of Internal Affairs Associate Professor and Doctoral Candidate at the School of Emergency Management, National University of Internal Affairs

<sup>6</sup>Instructor and Doctoral Candidate at the Border Service School, National University of Internal Affairs

### Abstract

Despite the various laws, regulations, and safety measures in place to prevent fires and protect citizens and property, the incidence of fires continues to rise. In Mongolia, there have been 19,668 fire incidents in the past 5 years, resulting in the loss of 258 lives. This equates to an average of 1.3 fatalities per 100 fires. Conducting thorough research and analysis on the different types of fires in Mongolia and implementing the findings will be crucial in reducing fire risks and improving safety measures.

**Keywords:** Fire safety, fire statistics, fire hazards, fire risk, and various types of risks in residential buildings and structures.

**Citation:** Uganbayar Enkhtaivan<sup>1</sup>, Sarantsetseg Bazarvaani<sup>2</sup>, Odbaatar Bibish<sup>3</sup>, Odbayar Tserendagva<sup>4</sup>, Bulgankhangai Lkhagvajav<sup>5</sup>, Badamdorj Dorjgochoo<sup>6</sup>. 2026. Fire Safety Risk Status in Mongolia. FishTaxa 38: 105-113

### Introduction

The National Security Concept of Mongolia addresses security, sustainable development, and disaster risk reduction. It is outlined in Mongolia's Comprehensive National Development Policy, based on the Millennium Development Goals and Vision 2050. Challenges include climate change, natural and man-made hazards, risk prevention, and the need for disaster protection measures. The strategy involves enhancing multilateral relations, increasing investment, implementing science-based protection systems, adopting advanced technologies, strengthening governance, and improving disaster preparedness. Mongolia is committed to implementing the Sendai Framework for Disaster Risk Reduction 2015-2030 and the Sustainable Development Agenda 2030 to enhance national and local disaster resilience.

In compliance with Article 4, Section 4.1.3 of the Mongolian Fire Safety Law, which mandates the creation of a unified fire fund, investigation of fire causes and conditions, and development of preventive strategies through research and analysis, as well as Section 24.2, which designates the state administrative body responsible for emergency situations as the authoritative source for research and analysis for both domestic and international organizations, the Emergency Management Organization has been gathering data on disasters, accidents, and fires within its jurisdiction, conducting thorough research and analysis, and implementing preventative measures to reduce risks.

### Theory and methodology

Fire safety risk is the potential harm that fire can cause to buildings, structures, and individuals. It encompasses the spread of fires that result in significant damage to lives, health, natural resources, and property.

Fire safety risk is determined by assessing the likelihood of various fire hazard scenarios and the potential consequences of these scenarios. ISO16732-1:2012, 3.7 defines fire risk as "a combination of the probability of fire occurrence and a quantitative measure of its consequences."

The definitions above indicate that fire safety risk is a quantitative assessment of the likelihood of fire hazards or consequences resulting from system failure in relation to the evaluation, analysis, and mitigation of potential fire hazards and fire safety control. Prior to the latter half of the 20th century, risk was primarily viewed within the realm of economics, such as insurance, investments,

currency analysis, and business strategies. However, following the Chernobyl nuclear disaster in 1986, the theoretical understanding of fire safety risk saw significant advancements by scientists and researchers in Russia and other countries. Fire safety and risk management, as described by Russian experts in the field, involve the implementation of a range of measures (engineering, technical, economic, social, etc.) to reduce fire safety risk to an acceptable level.

Our nation's scientists have described fire safety risk management as a management process focused on reaching established objectives by setting fire safety goals, organizing and executing fire safety activities efficiently and promptly across all levels, assessing and drawing conclusions on their progress and outcomes, and making timely adjustments as needed, considering current capabilities for development, in accordance with the evolving fire hazard scenario.

The definition above outlines three key components of fire safety risk management: utilizing statistical data to assess the current situation, predicting future fire safety risks and identifying necessary actions, and establishing a framework to achieve the goal of fire safety risk management.

This concept was developed by Doctor of Research Sciences of the Russian Federation, N.N. Brushlinsky, and his students, who created an integrated fire risk system. It includes:

- $R_1$  – fire risk per thousand people per year  $\left[ \frac{\text{fire}}{10^{-3} \text{person.years}} \right]$ ;
- $R_2$  – risk of dying from 100 fires per year  $\left[ \frac{\text{deaths}}{10^{-2} \text{fires}} \right]$ ;
- $R_3$  – risk of dying from fires per 100,000 people per year  $\left[ \frac{\text{deaths}}{10^{-3} \text{person.years}} \right]$ ;
- $R_4$  – risk of damage to buildings due to fire  $\left[ \frac{\text{buildings, structures}}{\text{fire}} \right]$ ;
- $R_5$  – risk of direct material damage from fire  $\left[ \frac{\text{tugrik}}{\text{fire}} \right]$ ;

The fire risks  $R_1$ ,  $R_2$ , and  $R_3$  are interconnected.  $R_3 = R_1 \cdot R_2$  risk  $R_1$  determines the likelihood of a fire hazard, while risks  $R_2$ ,  $R_3$ ,  $R_4$ , and  $R_5$  represent other consequences of a fire hazard.

**INTRODUCTION**

Statistics from the past 5 years in Mongolia reveal that there were 19,668 fire calls, resulting in 258 fatalities. This translates to an average of 1.3 deaths per 100 fires. Table 1 provides a detailed overview of the nationwide fire incidents.

**Table 1.**  
**National survey on fire statistics**

Year	Year Population (million people)			Fires			Deaths			Material damage (billion)		
	Ulaanbaatar city	Province locality	Total	Ulaanbaatar city	Province locality	Total	Ulaanbaatar city	Province locality	Total	Ulaanbaatar city	Province locality	Total
2019	1431,0	1728,0	3159,0	3040	1182	4222	22	15	37	15,2	13,2	28,4
2020	1455,3	1736,3	3191,6	3249	1312	4561	37	17	54	16,3	12,4	28,7
2021	1482,6	1742,5	3225,1	2474	1236	3710	23	35	58	10,8	10,5	21,3
2022	1519,1	1763,6	3282,7	2479	1084	3563	13	32	45	14,6	15,2	29,8
2023	1567,7	1772,7	3340,4	2408	1204	3612	36	28	64	13,2	11,5	24,7
Annual average			3239,7	2730	1203	3933	26,2	25,4	52	14,0	12,5	26,5

The table above displays the average socio-economic indicators, revealing that fires result in an annual average of 52 fatalities and 26.5 billion tugriks in damages, categorized by Mongolia's administrative territorial units. Table 2 presents statistical information on fires in residential buildings and structures over the past 5 years.

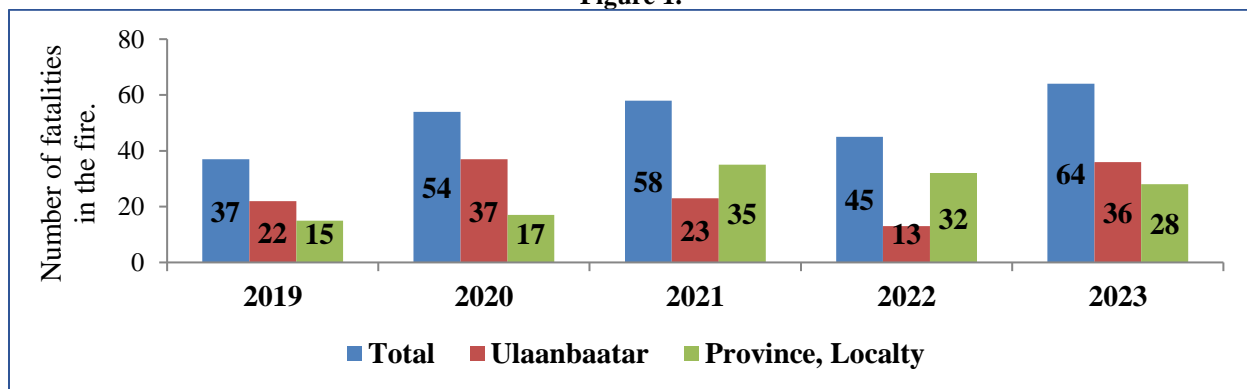
**Table 2.**  
Statistical data on fires that occurred in residential buildings and structures over the past 5 years.

Year	Year Population (million people)			Fires			Deaths		
	Ulaanbaatar city	Province locality	Total	Ulaanbaatar city	Province locality	Total	Ulaanbaatar city	Province locality	Total
2019	1362,9	1633,0	2995,9	1185	844	2029	22	15	37
2020	1396,2	1661,5	3057,7	859	767	1626	37	17	54
2021	1440,4	1679,5	3119,9	986	629	1615	23	35	58
2022	1462,9	1714,9	3177,8	832	765	1597	13	32	45
2023	1491,3	1747,1	3238,4	1083	871	1953	36	28	64
Annual average			3117,9	989	775,2	1764	26,2	25,4	51,6

The table above illustrates that in the last 5 years, 8821 fires (44.8% of all fires) occurred in residential buildings and structures, resulting in 255 fatalities (90% of fire-related deaths).

On average, there were 2.8 deaths per 100 fires. Figure 1 depicts the national trend in fire-related deaths in residential buildings and structures.

**Figure 1.**



**Figure 1. Trends in fatalities from fires in homes and other residential structures across the country.**

Based on the statistical data on fires in residential buildings and structures nationwide over the past 5 years, the fire risk assessment calculated the fire risk level  $R_1$  for every 1,000 people, the death rate for every 100 fires nationwide as  $R_2$ , and the fire risk level  $R_3$  for every 100,000 people. The results are presented in Table 3.

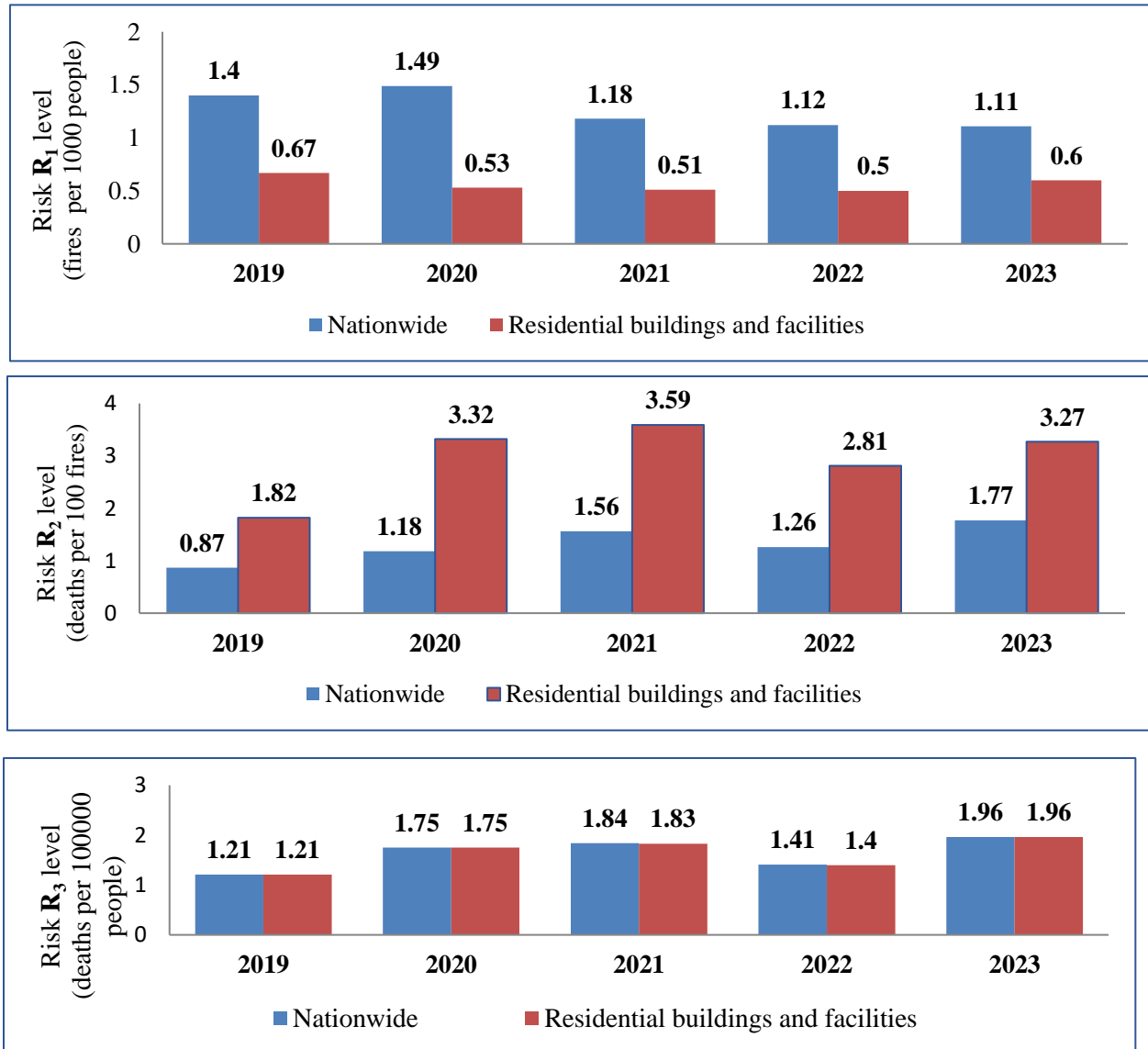
**Table 3.**  
The changes in fire risk dynamics.

Fire risk level	Fire hazard statistics				
	2019	2020	2021	2022	2023
<b>Throughout Mongolia</b>					
Risk $R_1$ level (fires per 1000 people)	1,40	1,49	1,18	1,12	1,11
Risk $R_2$ level (deaths per 100 fires)	0,87	1,18	1,56	1,26	1,77
Risk $R_3$ level (deaths per 100000 people)	1,21	1,75	1,84	1,41	1,96
<b>Residential buildings and structures</b>					

Risk $R_1$ level (fires / per 1000 people)	0.67	0.53	0.51	0.50	0.60
Risk $R_2$ level (deaths per 100 fires)	1.82	3.32	3.59	2.81	3.27
Risk $R_3$ level (deaths per 100000 people)	1.21	1.75	1.84	1.41	1.96

The table above displays the annual fire risk estimates  $R_1$ ,  $R_2$ , and  $R_3$  for residential buildings and structures across Mongolia, as depicted in Figure 2.

**Figure 2.**



**Figure 2. Fluctuations in fire risk levels  $R_1$ ,  $R_2$ , and  $R_3$  in relation to nationwide fires and fires specifically in residential buildings and structures.**

The figure above shows a comparison of the risk indicators  $R_1$ ,  $R_2$ , and  $R_3$  with nationwide fires and fires in residential buildings and structures.

Based on the overall findings of the  $R_1$ ,  $R_2$ , and  $R_3$  fire risk studies conducted in residential buildings and structures across the country and in Ulaanbaatar and provinces, a scenario depicting an average national fire risk value has been formulated and is illustrated in Figure 3.

Figure 3.

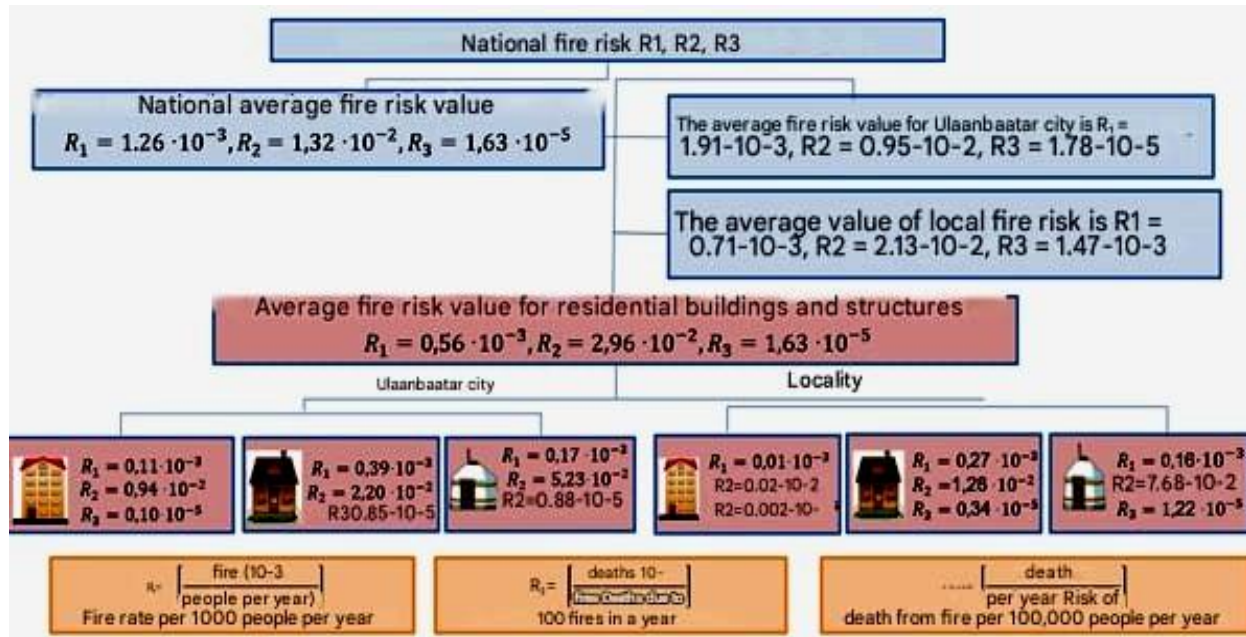


Figure 3. The average values of fire risk R1, R2, and R3.

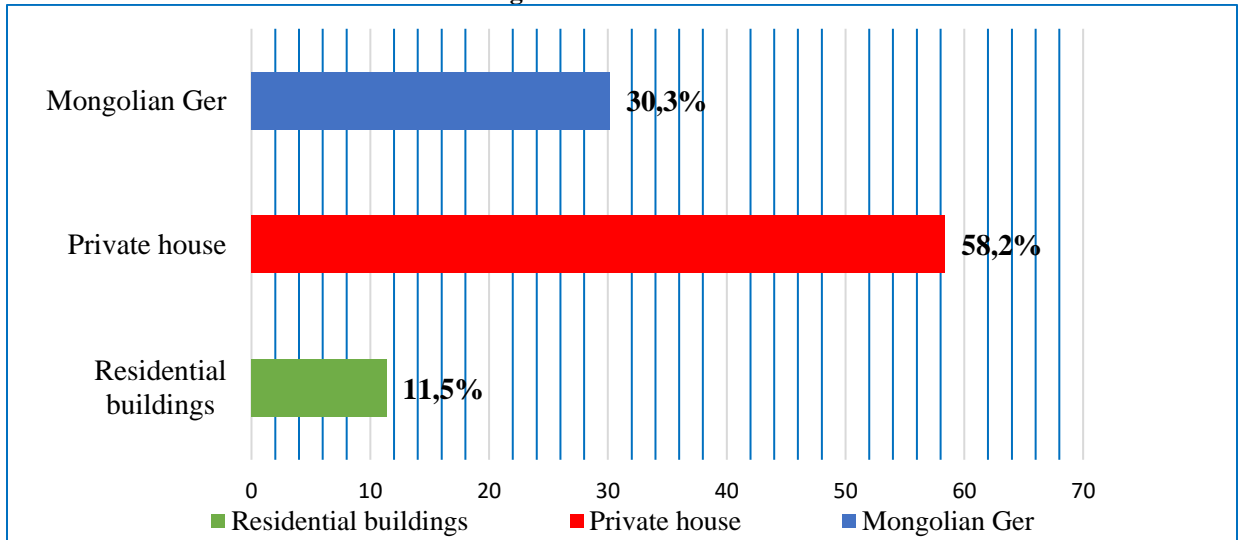
The study's findings indicate that the mortality rate from fires in traditional Mongolian houses is the highest, as evidenced by the risk estimates R1, R2, and R3 based on registered fire data. There is a noticeable downward trend in both the frequency of fires and the resulting fatalities over time. Table 4 presents the analysis of residential buildings and structures categorized by housing type from the national fire statistical survey.

Table 4. Statistical analysis of fire risks in residential buildings and structures categorized by dwelling type.

Year	Total number of fires	Number of fires in residential buildings	%	Number of fires in private house	%	Number of Ger fires	%
2019	2029	236	11,6	1248	61.5	545	26.8
2020	1626	140	8.61	1009	62.1	477	29.3
2021	1615	162	10.1	906	56.1	547	33.8
2022	1597	235	14.7	902	56.4	460	28.8
2023	1953	239	12.2	1076	55.1	638	32.6
Average	1764	202.4	11.5	1028.2	58.2	533.4	30.3

Based on a statistical analysis of fires in residential buildings and structures, 11.5% of fires took place in residential buildings, 58.2% in private homes, and 30.3% in Mongolian homes. This data is illustrated in Figure 5.

**Figure 5.**



**Figure 5. Residential fires in residential buildings.**

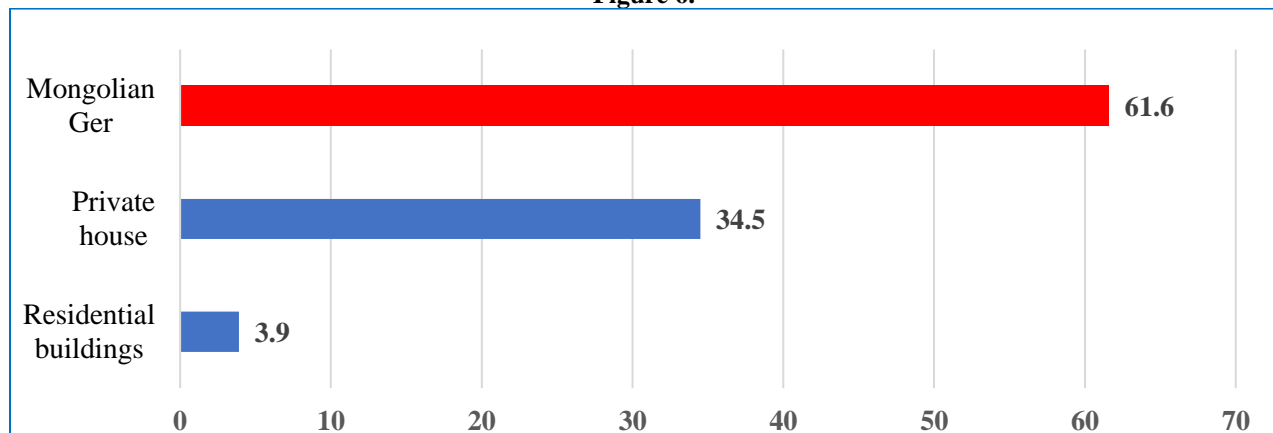
Table 5 displays the statistical data on fatalities resulting from fires in residential buildings and structures for the years 2019 through 2023.

**Table 5.**

**The number of deaths caused by residential fire hazards in residential buildings and structures is categorized by type on a national level.**

Year	Classification of dwelling types for fire deaths						
	Total number of deaths	Residential buildings	Average overall mortality rate, %	Private house	Average overall mortality rate, %	At Ger	Average overall mortality rate, %
2019	37	2	5.4	12	32.4	23	62.1
2020	54	2	3.7	20	37.0	32	59.2
2021	58	3	5.1	18	31.0	37	63.7
2022	45	1	2.2	13	28.8	31	68.8
2023	64	2	3.1	27	42.1	35	54.6
Average	51.6	2	3.9	18	34.5	31.6	61.6

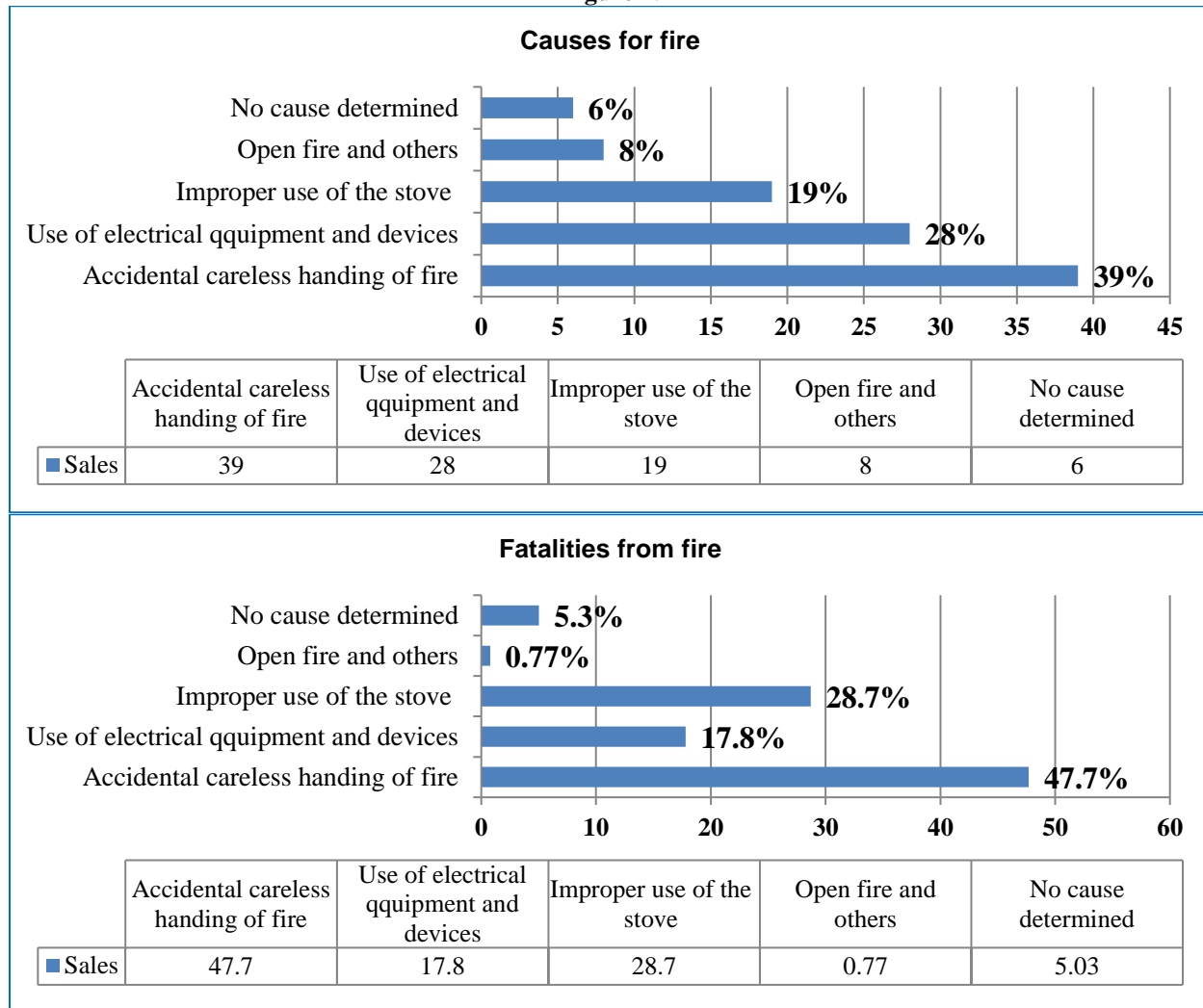
**Figure 6.**



**Figure 6. Death in residential buildings and structures caused by fires.**

The data presented in the figure indicates that 51.6 percent, equivalent to 52 individuals, lost their lives as a result of fire incidents. When categorizing fatalities based on the type of housing, deaths in apartment buildings accounted for 3.9%, deaths in private homes for 34.5%, and deaths in Mongolian homes posed the highest risk at 61.6% of all fatalities. Table 6 and Figure 7 provide statistical insights into the classification of causes and circumstances of fires in residential buildings and structures.

**Figure 7.**



**Figure 7. The frequency of fires in homes and other buildings across the country:**

a) Cause for fires; b) Fatalities from fires.

b)

The figure above shows that 39 percent of all fires were caused by careless handling of fire, leading to 47.7 percent of fire-related deaths. Improper use of the stove accounted for 19 percent of deaths, while 28.7 percent were attributed to this cause. Violation of electrical equipment and electricity usage rules caused 28 percent of fires and 17.8 percent of deaths. The causes of fires in residential buildings and structures are categorized as N-natural, T-technological, and S-social, as indicated in Table 6.

**Table 6.**  
**Causes of fire hazards in residential buildings.**

Reason	Number of fires	Total number of fires, rate	Number of fatalities	total mortality rate	Causal factors of fire hazard
Accidental careless handling of fire	3439.8	39	123	47.7	S
Violation of the rules for the use of electrical equipment and devices	2469.6	28	46	17.8	S, T
Improper use of the stove	1675.8	19	74	28.7	S
Open fire and others	705.6	8	2	0.77	S, T
No cause determined	529.2	6	13	5.03	S
Total	8820	100	258	100	S, T

The table above indicates that the S-social factor and T-technology factor are significant contributors to fire hazards. Table 7 presents an analysis of the factors leading to fatalities in residential fires over the last 5 years using statistical data.

**Table 7.**  
**Causes of fatalities from fires in residential buildings and structures.**

Causes of fatalities	Proportion of total deaths due to fires, %					Average performance, %
	2	2	2	2	2	
	0	0	0	0	0	
	1	2	2	2	2	
	9	0	1	2	3	
High temperature action of fire	8.	9.	6.	8.	7.	8.2
	1	2	8	8	8	
Toxicity of combustion products or smoke from fire	7	7	7	6	7	74.2
	2.	9.	4.	8.	5.	
	9	7	3	9	1	
Cause of death not determined	1	7.	1	1	1	13.8
	6.	4	5.	7.	2.	
	2		5	7	5	
Other reasons	2.	3.	3,	4.	4.	3.8
	8	7	4	6	6	

On average, 74.2 percent of deaths from poisoning by combustion products or smoke are caused by fire, and 8.2 percent of deaths are due to exposure to high temperatures. As a result, it is important for us to investigate ways to decrease the factors contributing to high mortality rates in this study.

## Conclusion

Risk theory is a rapidly evolving field of study that focuses on assessing and analyzing various aspects of safety in complex systems, including technical, social, and economic factors. It also involves protecting people from fires, disasters, and other emergencies, making it a key area of research in risk management and security theory. Fire safety risk encompasses understanding the potential risks associated with failures in fire prevention, protection, and control systems, as well as implementing measures to detect, reduce, transfer, and eliminate fire causes and sources. Identifying causal conditions is crucial in developing an effective fire safety system. The issue of ensuring fire safety and evaluating risks is closely linked to the fire safety system, which includes measures to mitigate fire safety risks. The objective is to identify, reduce, and eliminate fire sources through risk assessment.

Over the past 5 years, Mongolia has experienced 9,668 reported fires, resulting in 258 fatalities, equating to 1.3 deaths per 100 fires. Government and local statistics show an average of 52 fire-related deaths per year, with damages totaling 26.5 billion tugriks, highlighting a significant fire safety risk.

A nationwide survey of fires in residential buildings revealed that 11.5% occurred in residential structures, 58.2% in private homes, and 30.3% in traditional Mongolian dwellings. When categorizing fire-related deaths by dwelling type, 3.9% were in apartment buildings, 34.5% in private residences, and a high overall mortality rate of 61.6% in traditional Mongolian homes. The leading causes of fires were accidental or negligent fire handling, accounting for 39% of all incidents and 47.7% of fire-related deaths.

## References

- Brushlinsky, N. N., & Shebeko, Y. N. (Eds.). (2007). *Fire risks: Dynamics, management, forecasting*. FGU VNIPO.
- Enkhtaivan, U. (2018). Analysis of the fire situation in Mongolia in 2013-2017. In *Proceedings of the International Scientific and Practical Conference "Historical Experience, Modern Problems, and Prospects of Educational and Scientific Activities in the Field of Fire Safety"* (pp. 230-233). Academy of the GPS EMERCOM of Russia.
- Enkhtaivan, U. (2019). Analysis and assessment of fire risks of death and injury in fires in residential buildings and structures (yurts) of Mongolia in 2014-2018. *Fires and Emergencies: Prevention, Liquidation*, (4). <https://doi.org/10.25257/FE.2019>
- Enkhtaivan, U. (2025). *Effective methods for improving the quality of education in rural areas* [Doctoral dissertation].
- Law on disaster prevention*. (2017). State Information Bulletin, (7).
- Law on fire safety of Mongolia*. (2015). State Information Bulletin, (28).
- National Statistical Office of Mongolia. (2023.-a). *Annual average population*. [https://www.1212.mn/tables.aspx?tbl\\_id=DT\\_NSO\\_0300\\_002V1&SOUM\\_select\\_all=0&SOUMSingleSelect= 5\\_0&YearY\\_select\\_all=0&YearYSingleSelect= 2023\\_2022\\_2021\\_2020\\_2019&viewtype=table](https://www.1212.mn/tables.aspx?tbl_id=DT_NSO_0300_002V1&SOUM_select_all=0&SOUMSingleSelect= 5_0&YearY_select_all=0&YearYSingleSelect= 2023_2022_2021_2020_2019&viewtype=table)
- National Statistical Office of Mongolia. (2020.-b). *Centralized and survey of households living in completely furnished housing of independent engineering*. [https://www.1212.mn/tables.aspx?tbl\\_id=DT\\_NSO\\_3500\\_005V1&13999001\\_select\\_all=0&13999001SingleSelect= T1\\_T2\\_T3&SOUM\\_select\\_all=0&SOUMSingleSelect= 5&YearF\\_select\\_all=0&YearFSingleSelect= 2020\\_2010&viewtype=table#](https://www.1212.mn/tables.aspx?tbl_id=DT_NSO_3500_005V1&13999001_select_all=0&13999001SingleSelect= T1_T2_T3&SOUM_select_all=0&SOUMSingleSelect= 5&YearF_select_all=0&YearFSingleSelect= 2020_2010&viewtype=table#)
- National Statistical Office of Mongolia. (2023.-c). *Ulaanbaatar city household survey*. [https://www.1212.mn/tables.aspx?tbl\\_id=DT\\_NSO\\_0300\\_033V1&SOUM\\_select\\_all=0&SOUMSingleSelect= 511&YearY\\_select\\_all=0&YearYSingleSelect= 2023\\_2022\\_2021\\_2020\\_2019&viewtype=table](https://www.1212.mn/tables.aspx?tbl_id=DT_NSO_0300_033V1&SOUM_select_all=0&SOUMSingleSelect= 511&YearY_select_all=0&YearYSingleSelect= 2023_2022_2021_2020_2019&viewtype=table)
- Prisyazhnyuk, N. L. (Ed.). (2016). *Economics of fire safety: Study guide*. Academy of the GPS EMERCOM of Russia.
- Prisyazhnyuk, N. L., & Enkhtaivan, U. (2019). Results of the analysis of fire statistics and the integral socio-economic indicator of fire risk in residential buildings and structures of Mongolia. *Fires and Emergencies: Prevention, Liquidation*, (2), 57-62. <https://doi.org/10.25257/FE.2019.1.57-62>
- Uuganbayar, E., Odkhoo, U., & Bazarvaani, S. (2025). The fire risk analysis of Mongolia. *International Journal of Innovative Technologies in Social Science*, 1(45). [https://doi.org/10.31435/ijitss.1\(45\).2025.3127](https://doi.org/10.31435/ijitss.1(45).2025.3127)