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CONSEQUENCES OF EARTHQUAKES AND PREVENTIVE MEASURES BASED ON FOREIGN EXPERIENCES

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Abstract: This article delves into the analysis of powerful earthquakes that have occurred in foreign countries and explores the challenges in ensuring seismic safety in our own country. By examining long-term forecasts of powerful earthquakes, the article aims to provide solutions and recommendations to address these challenges. The consequences of powerful earthquakes, including their impact on states, are thoroughly examined. Furthermore, the article proposes and recommends effective strategies for protecting both the population and territories from the primary and secondary severe consequences of powerful earthquakes. These strategies are based on utilizing seismic forecast data specific to our country. By studying the experiences and research conducted in foreign countries, this article seeks to enhance our understanding of seismic safety and contribute to the development of effective measures to mitigate the risks associated with powerful earthquakes in our country.

Keywords: Mercalli intensity, Aftershocks, Hypothermia, Magnitude, Powerful earthquakes, Seismic safety, Foreign countries, Challenges, Long-term forecasts, Solutions, Recommendations, Consequences, Impact, Strategies, Population, Territories, Seismic forecast data, Experiences, Research, Mitigation risks.

Introduction. In recent years, comprehensive and large-scale measures have been taken in our country to develop seismology, ensure the seismic stability of buildings, and improve the effectiveness of the activities of organizations in the field of seismic safety.

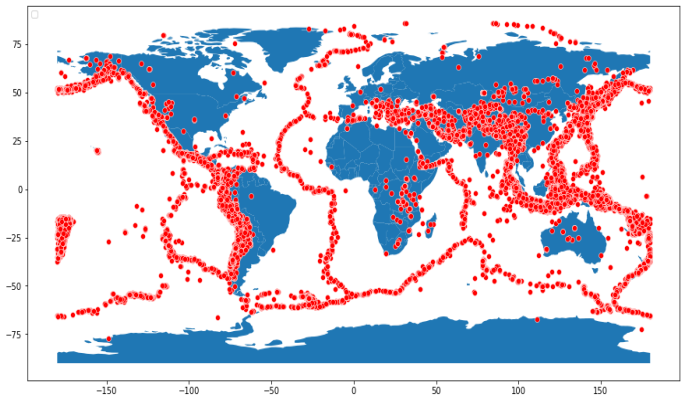

Photo 1. Mapping seismic zone identification points.

Currently, it is of great importance to continue the ongoing reforms in these areas and introduce new methods to ensure the seismic safety of the population.

Due to the high degree of seismic activity, these points are of significant importance in analyzing seismic risks. These points play a crucial role in adopting measures to mitigate seismic risks and ensure seismic safety due to the high level of seismic activity.

A number of government decisions have been developed to develop seismology, ensure the seismic stability of buildings, and ensure seismic safety, including the Concept for Improving the System of Ensuring Seismic Safety of the Population and Territories of the Republic of Uzbekistan until 2025, developed in accordance with the Decree of the President of the Republic of Uzbekistan dated May 30, 2022 No. PF-144 [1].

The main purpose of the Concept is to ensure the implementation of the Law of the Republic of Uzbekistan "On Ensuring Seismic Safety of the Population and Territories of the Republic of Uzbekistan" and the Resolution of the President of the Republic of Uzbekistan dated July 30, 2020 No. PQ-4794 "On Measures to Fundamentally Improve the System of Ensuring Seismic Safety of the Population and Territories of the Republic of Uzbekistan" [2].

At the same time, due to the location of the territory of our country in seismically active zones, there is a need to prevent seismic risks, protect the population and territories from seismic hazards, improve the training system in this area, as well as constantly implement targeted programs and scientific research in the field.

Methodology discussion. On February 6, 2023, an earthquake occurred in the southern and central parts of Turkey and the western part of Syria [3]. The main earthquake, with a magnitude of at least 7.8 and a maximum Mercalli intensity of XI (extreme), occurred at 04:17 local time (UTC 01:17) 34 km (21 mi) west of Gaziantep [4].

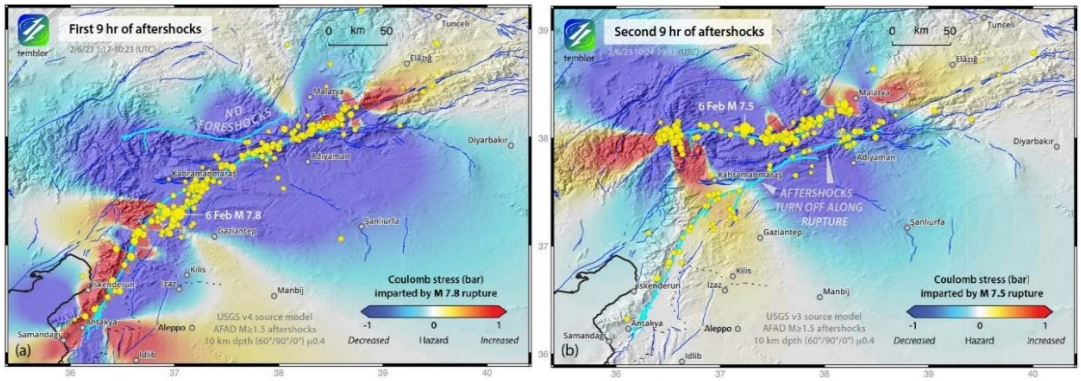

Photo 2. The emergence of strong seismic zones during an earthquake signifies areas experiencing intense shaking and potential structural damage.

The epicenter of the earthquake was located 95 km (59 mi) northeast of Kahramanmaras province [4]. The earthquake caused widespread devastation and thousands of casualties. It is the strongest earthquake in Turkey's history, surpassing the 1939 Erzincan earthquake [5].

A similarly magnituded earthquake occurred in 1668 as the North Anatolian earthquake [6]. The earthquake is also the deadliest earthquake in Syria since 1822 [7]. It is the deadliest earthquake globally since the 2010 Haiti earthquake and one of the

strongest earthquakes recorded in the Levant. The earthquake caused approximately $84.1 billion in damage, making it one of the most expensive natural disasters in history.

After the main earthquake, more than 2,109 aftershocks were recorded. The seismic sequence was caused by the shallow slip of faults. As of February 18, a total of 47,100 deaths have been recorded, with 40,600 in Turkey and 6,400 in Syria [9][10].

The winter storm hindered rescue operations. The snowfall buried the rubble, and the temperature dropped sharply. The cold weather in the region posed a significant risk of hypothermia, especially for those trapped under the rubble. The earthquake became one of the most devastating natural disasters in history.

On January 1, 2024, a series of strong earthquakes occurred off the western coast of Japan. The Japan Meteorological Agency (JMA) reported a total of 20 earthquakes, starting with a 5.7 magnitude earthquake at 16:06 local time (UTC +9) in the Noto region of Honshu Island [14].

Four minutes later, a strong earthquake with a magnitude of 7.6 occurred, followed by a 6.1 magnitude earthquake at 16:18, a 4.5 magnitude earthquake at 16:23, a 4.6 magnitude earthquake at 16:29, and a 4.8 magnitude earthquake at 16:32.

The natural disaster on New Year's Day resulted in at least 168 deaths in Ishikawa Prefecture, with more than 660 injured and 323 missing. A seven-story building collapsed. A Suzu city temple was completely destroyed. Houses in villages collapsed, and cars were buried in the massive cracks on the road [15][16].

It is evident that the recent earthquakes in the two countries have significantly different impacts and casualties.

In the process of studying foreign experiences, particularly in Japan, the United States, and China, innovative solutions are widely used to educate people on how to respond correctly during emergencies related to earthquakes. In Japan, for example, numerous mobile applications have been developed, including one that provides information on natural disasters such as earthquakes, volcanic eruptions, and tsunamis. The application informs users about the expected natural disasters, their level of danger, and the correct actions to take during such events. Basic phrases and guidelines for proper behavior during emergencies are also taught. Additionally, free Wi-Fi access points have been installed to enable independent learning and preparation for emergencies.

Similarly, in the United States, mobile applications are widely used to educate students, families, and communities on how to respond correctly during earthquakes. Currently, the effectiveness of using SMS audio services to improve learning outcomes is being tested.

Furthermore, in Turkey, Japan, and South Korea, various efforts are being made to prepare the entire population to respond correctly during earthquakes. For example, mobile earthquake simulators are widely used to provide practical training to the population on how to respond correctly during emergencies related to earthquakes.

Photo 3. Instructions for action during an earthquake are vital for ensuring personal safety.

Considering the above, in order to create an effective and efficient mechanism for preparing the entire population in our country to respond correctly during strong earthquakes, several recommendations have been made, including:

- Introducing specific topics on earthquake response procedures in pre-school and general education institutions, using audio-visual materials during theoretical and practical training sessions;

- Using interactive methods, such as presentations, animated videos, and games, to educate the entire population on earthquake preparedness using multimedia tools;

- Providing training on "Saving Yourself, Saving Each Other, and Saving Others" in all educational institutions through training courses to prepare physically and mentally in a systematic manner; and others.

Expected Result. The implementation of a comprehensive set of measures, including government decisions aimed at developing seismology, seismic strengthening of buildings, and ensuring seismic safety, will lead to the following outcomes:

1. Enhanced preparedness of the entire population, including all age groups, for earthquakes and other natural disasters.

2. Establishment of earthquake-related courses in pre-school, school, and higher education institutions, providing comprehensive education on earthquake preparedness and response.

3. Creation of independent platforms and programs that educate citizens on earthquake safety and response, ensuring that everyone has access to the necessary knowledge and skills.

4. Reduction of potential risks and negative consequences associated with earthquakes, such as loss of life, property damage, and psychological trauma.

5. Effective evacuation and rescue of people during unexpected earthquakes, ensuring their safety and well-being.

6. Psychological and emotional preparedness of individuals to cope with the aftermath of earthquakes, reducing the impact on mental health.

Overall, the implementation of these measures will significantly improve the seismic safety and resilience of the population, ensuring that they are well-equipped to face and respond to earthquakes effectively.

Recommendations. This research advocates for a holistic approach to seismic risk management, emphasizing the adaptation of advanced seismic technologies and methodologies tailored to our specific national context. We recommend the implementation of stringent building codes, the establishment of comprehensive educational campaigns on earthquake preparedness, and the deployment of advanced seismic forecasting tools to enhance predictive capabilities and response strategies.

Photo 3. Earthquake and its consequences.

By following these recommendations, we can significantly enhance the seismic resilience of our nation, reducing both the human and economic toll of future seismic events.

Conclusion. Based on the comprehensive analysis presented, it is clear that creating an effective and efficient mechanism to prepare all segments of the population in our country for proper action in emergency situations related to strong earthquakes is essential to improve the existing system and enhance its effectiveness.

These measures will expand the knowledge base of the population, increase their acumen, foster the right attitude towards unfortunate events, and develop alertness and sharpness. As a result, it will be possible to minimize the number of victims, ensure the safety of the population, and prevent the negative consequences arising from natural disasters.

The actions to be undertaken aim to ensure the population's readiness for proper action in emergency situations related to earthquakes through training programs and platforms. This will help ensure the safety of the population, minimize the negative consequences arising from natural disasters, and enhance the seismic safety of our country.

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