EXCELLENCIA
INTERNATIONAL MULTI-DISCIPLINARY JOURNAL OF EDUCATION

SPECIAL ISSUE ON "SCIENTIFIC-PRACTICAL INNOVATIVE FOUNDATIONS OF FIRE SAFETY AND PREVENTION OF SERIOUS CONSEQUENCES"

Analysis Of The Earthquakes That Has Happened In The World Today and Their Consequences

Ph.D., professor B.T.Ibragimov (Academy of the Ministry of Emergency Situations of the Republic of Uzbekistan)
S.Jabbarov (Navoi Region Mining and Metallurgical Combine Joint-Stock Company and Navoi Uranium State Enterprise)

Introduction

Nowadays, it is important to build buildings that are convenient for people and seismically safe, energy-efficient, and earthquake-resistant, which is considered the most important factor in seismically active areas, based on innovative technologies. Today, ensuring seismic and fire safety of buildings and structures is one of the most important issues. According to the World Center for Fire Statistics ("CTIF"), more than 7-8 million fires occur annually in the world, and 85-90 thousand people die as a result. The total amount of material damage caused by fires was 150 billion US dollars per year. In this regard, there is a need to improve the development of new types of passive and active seismic protection systems for the prevention of unexpected earthquakes and fires. In this regard, it is important to increase the durability of buildings and structures in general, to pay special attention to issues of earthquake resistance, to predict earthquakes in advance, to improve new types of active and passive seismic protection systems.

In the scientific research conducted in the world to predict earthquakes in advance, to create new types of active and passive seismic protection systems, large-scale research is also being conducted to improve new types of rubber-metal-based damper device samples of active seismic isolation devices in order to ensure fire and seismic safety of buildings and structures. In this regard, special attention is paid to conducting scientific research on researching the optimal options for the development of new types of passive and active seismic protection systems for the prevention of sudden earthquakes and fires.

Currently, in order to accelerate the work of ensuring seismic safety in our republic, to introduce modern approaches to the field, to prevent various earthquake losses caused by the ongoing strong earthquakes and tectonic shifts of the earth's plates, within the framework of the organization of the work to ensure the seismic safety of the regions, including involving project organizations methods of seismic protection of buildings and structures, organizing the development of new structural solutions, developing scientifically based measures to assess seismic risk of different levels in seismically active zones and reduce earthquake losses, vibrodynamic, as well as modern, buildings and structures being built in seismically active zones organization of tests and inspections with the help of digitized instrumental equipment is gaining importance.

In recent years, the number of earthquakes around the world has been increasing. The reason for this is that as a result of the warming of the planet, the amount of energy in the subsurface mantle layer is increasing, and this energy moves the subsurface tectonic plates and causes vibrations on the surface. Ensuring the seismic resistance of buildings and structures is gaining importance in the scientific research conducted in the world to predict earthquakes in advance, to create new types of active and passive seismic protection systems. It is predicted that earthquakes with a magnitude of up to 7.5 on the Richter scale may occur in the territory of Uzbekistan. There are more than 330 settlements and 120 cities are in the seismically dangerous regions of Uzbekistan. All of this means that earthquakes and emergency situations resulting from their damage are not out of the question. According to world statistics, most of the earthquakes that occurred during the years 2012-2022 occurred in the countries of the East, Asia and Oceania (Table 1).

1-table.

The number of earthquakes in the world for 2012-2022

Magnitude	**2012 year**	**2013 year**	**2014 year**	**2015 year**	**2016 year**	**2017 year**	**2018 year**	**2019 year**	**2020 year**	**2021 year**	**2022 year**
8,0–9,9	2	2	1	1	0	1	1	1	0	3	0
7,0–7,9	14	17	11	18	16	6	16	9	9	16	11
6,0–6,9	117	123	143	127	131	104	118	135	111	141	117
5,0–5,9	1546	1460	1580	1413	1550	1447	1671	1484	1315	2046	1603
4,0–4,9	10 955	11 877	15 817	13 777	13 700	10 544	12 782	11 897	12,135	14 643	13 707
Total	**12 635**	**13 480**	**17 552**	**15 336**	**15 397**	**12102**	**14 589**	**13 530**	**13 572**	**16 849**	**15 438**

As can be seen from the table, the number of earthquakes occurred in years with high temperatures throughout the year. Earthquakes during this period set moderately active tectonic forces in motion (Figure 1).

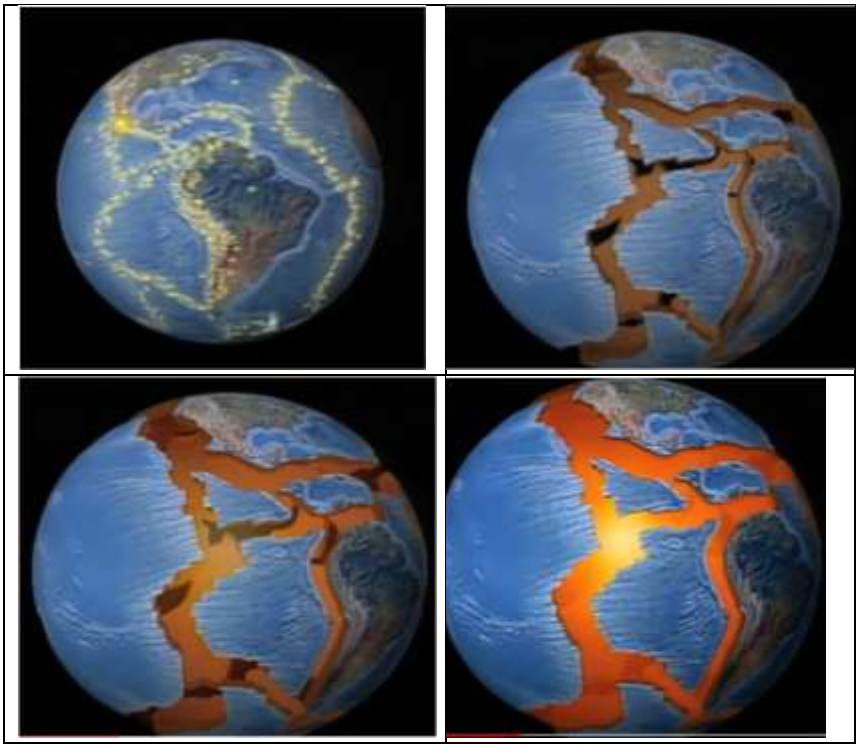

Fig. 2. A picture of tectonic movements around the globe.

Earthquakes in 2022 are moderately active tectonic forces, most of which are magnitude 6 or higher (Figure 3). All dates are in UTC time, and maximum intensity is based on the modified Mercalli intensity scale.

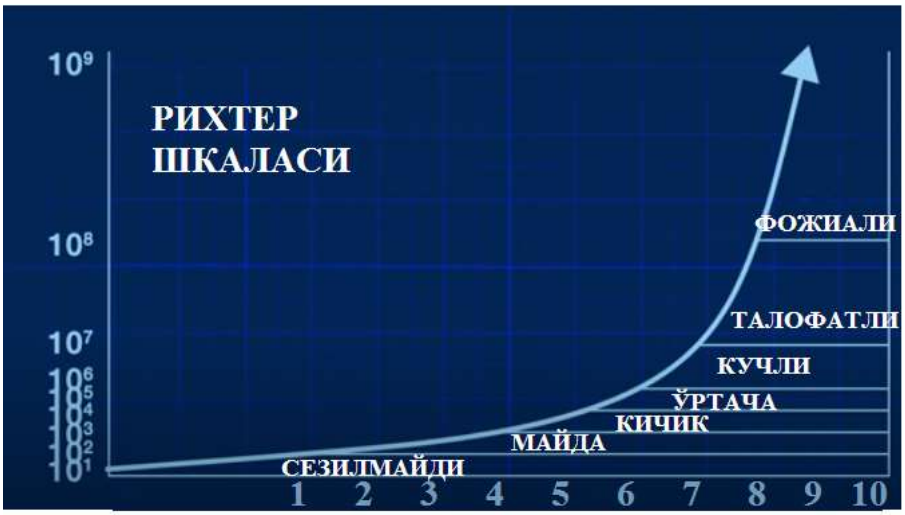

Figure 3. A graph of increasing magnitude on the Richter scale.

In 2022, eleven major earthquakes of magnitude 7.0-7.9 occurred, most of them in Oceania. On June 22, 2022, three deadly earthquakes (magnitude 6.5) occurred in Afghanistan, and the deadliest of the year occurred near Pakistan in the eastern part of the country. More than 1163 people died as a result. In 2022, the largest earthquakes occurred in Papua New Guinea (7.6 M) and Mexico (7.6 M), both events measuring 7.6 M. The earthquakes that also occurred in Indonesia, China, Papua

New Guinea, the Philippines, and Poland accounted for the highest number of deaths at 1,775–2,075 (Figure 4).

When we analyzed the consequences of earthquakes observed during 2022, it was found that 2114 people died and 18928 people were injured. On November 21 of this year, an earthquake in West Java, Indonesia, with a magnitude of 8 on the MSC scale occurred, killing 635 people. On September 5, 2022, an earthquake in the Sichuan province of China was 9 points on the CEC scale and caused the death of 93 people.

Fig. 4. The epicenter of the earthquakes that occurred in 2022.

On January 17, 2022, an earthquake in the Bodghis region of Afghanistan had a magnitude of MSK-6 and killed 30 people. On February 25, 27 people died in an earthquake with a magnitude of MSK-8 in the West Sumatra region of Indonesia. In Papua New Guinea, the September 10 MSK-8 earthquake killed 21 people (Table 2). On September 4, 2022, 18 people died in the MSK-7 earthquake in the Kunar region of Afghanistan. On July 27, 2022, a magnitude 8 earthquake struck the Cordillera region of the Philippines, killing 11 people. On April 23 of this year, a 5 M earthquake occurred in Poland's Silesian Voivodeship, killing 10 people. On March 16, 2022, 3 sailors were killed in the MSK-8 earthquake that occurred off the coast of Fukushima, Japan. The consequences of these earthquakes are described in Figure 5.

2-table.

Analysis of earthquakes in 2022

№	The number of dead	Magnitude (Richter scale)	The area where the earthquake occurred	MSC scales	Epicenter (km)	The event
1	1163	6.0	Afghanistan, Khost	VIII (strong)	4.0	**Earthquake in Afghanistan on June 22, 2022**

№	The number of dead	Magnitude (Richter scale)	The area where the earthquake occurred	MSC scales	Epicenter (km)	The event
2	335–635	5.6	Indonesia, West Java	VIII (strong)	10.0	**On November 21, 2022, the West Java earthquake**
3	93	6.6	China, Sichuan	IX (destructive)	12.0	**September 5, 2022 Luding Earthquake**
4	30	5.3	Afghanistan, Bodghis	VI (strong)	11.4	**Earthquakes in Afghanistan on January 17, 2022**
5	27	6.1	Indonesia, West Sumatra	VIII(strong)	4.9	**February 25, 2022 Sumatra earthquake**
6	21	7.6	Papua Yangi Guinea, Morobe	VIII (strong)	116,0	**September 10, 2022 Earthquake in Papua New Guinea**
7	18	5.1	Afghanistan, Kunar	VII (very strong)	10.0	**Earthquake in Afghanistan on September 4, 2022**
8	11	7.0	Philippines, Cordillera	VIII (strong)	10.0	**July 27, 2022 Luzon Earthquake**
9	10	2.7	Poland, Silesia Voivodeliga	V (medium)	5.0	**2022, 23 April**
10	3	7.3	Japan, Fukushima Sea	VIII (strong)	63.1	**Sea of Fukushima, Japan on March 16, 2022**
11	2	7.6	Mexico, Michoasan	VIII (strong)	15.1	**September 19, 2022 Michoacan earthquake**

Consequences of the earthquake in Papua New Guinea

Japan's Fukushima earthquake

Mexico, Michoacán earthquake	China, Sichuan Luding earthquake
	
Afghanistan, Kunar earthquake consequences	Cordillera Luzon earthquake, Philippines
	
Afghanistan, Khost earthquake	Индонезия, Ғарбий Жава зилзиласи

Figure 5. The consequences of the earthquakes that caused the most casualties in 2022 are described.

As can be seen from Figure 5, the construction of earthquake-resistant buildings and structures is one of the most urgent needs in the current period, when the number of earthquakes is increasing. To date, the world development of the theory and operation of earthquake-resistant construction has reached a high level. The results of the engineering analysis of the consequences of many earthquakes indicate that the buildings and structures built on the basis of the current standards for earthquake-resistant construction can withstand the seismic effects satisfactorily. At the same time, the catastrophic consequences of a number of earthquakes in different countries, the massive collapse of buildings built in different periods, have revealed a number of problems that require urgent solutions. Taking into account the scale of destruction and casualties, it is of particular importance to ensure the seismic resistance of buildings and structures in seismically active areas, including Uzbekistan, as well as to spend material and labor resources in an economically appropriate manner to strengthen them against seismic effects.

Currently, in order to effectively integrate into the international system of regional seismic risk assessment, risk prediction and reduction of damage caused by earthquakes, with the condition of involving local and foreign international experience in this regard, it is necessary to carry out experimental and it is necessary to conduct theoretical research. At the same time, there is a need for research to improve, develop and standardize building norms and standards, especially to determine the intensity of seismic effects and to improve the seismic safety of buildings and structures, which are important in the field of anti-seismic strengthening of buildings.

References:

1. "M 6.5 - Kermadec Islands region". earthquake.usgs.gov. Archived from the original on 29 January 2022. Retrieved 29 January 2022.
2. "Earthquake Kermadec Islands 6.5M". ioc-sealevelmonitoring.org. Archived from the original on 15 February 2022. Retrieved 15 February 2022.
3. Nelson Quiroz (28 July 2022). "Alcaldesa de Tocopilla tras sismo: "No se reportaron mayores daños, pero sí el pánico colectivo"". adnradio.cl (in Spanish). Retrieved 4 August 2022.
4. "M 4.6 - 16 km NNW of Baikunthpur, India". earthquake.usgs.gov. 29 July 2022. Retrieved 29 July 2022.
5. "Reportan daños en escuela de Coatepec tras sismo". palabrasclaras.mx (in Mexican Spanish). 2 March 2022. Archived from the original on 5 March 2022. Retrieved 4 March 2022.
6. "گذاشت برجای زخمی ۴۲ و کشته ۹ افغانستان شرق در زلزله" [The earthquake in eastern Afghanistan left 9 dead and 42 injured]. Tasnim News Agency (in Persian). 6 September 2022. Retrieved 6 September 2022
7. "M 6.5 - 111 km SSW of Tarauacá, Brazil". earthquake.usgs.gov. United States Geological Survey. 8 June 2022.