JOURNAL OF ENGINEERING SCIENCES
ISSN(Online): 2984-6714
SIR Publishers CENTER FOR INTERNATIONAL SCIENTIFIC PUBLICATIONS Volume-9, Issue-02, Published |21-11-2026|

EARTHQUAKE, ITS CAUSES AND METHODS OF REDUCING DAMAGE CONSEQUENCES

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The Central Asian region is distinguished from other regions by its underground and surface resources, nature of production capacity and climate. In the region where we live, we can see 4 seasons at the same time. Therefore, all kinds of emergencies can occur, depending on the description of natural and man-made emergencies.

For example, mudslides and floods in Tajikistan and Shakhimordon, earthquakes in Afghanistan and Dzhigaristan, in addition, our region is located in the Mediterranean-Asian seismic belt, which is currently the most active. Therefore, earthquakes, one of the natural disasters that can cause a huge amount of destruction in a few seconds, disrupt the infrastructure of an entire country, and shake all of humanity, are also occurring.

This also shows how important seismic risk is.

Among natural disasters, earthquakes stand out for their tragic consequences. This disaster, which does not discriminate between time and place, can kill thousands of people in a matter of seconds and cause significant material damage to the economy of a given country.

What exactly is an earthquake, and how does it occur?

An earthquake is a shaking of the Earth's surface that occurs as a result of sudden shifts and changes in the Earth's crust or upper mantle, and propagates over long distances as elastic waves.

On average, more than 20 major earthquakes occur on Earth each year. On average, 10,000 people die worldwide each year. Some catastrophic earthquakes can kill hundreds of thousands of people at once.

The place where the earthquake occurs is the epicenter, and its center is called the hypocenter. The projection of the hypocenter on the surface of the earth is called the epicenter. The distance between the hypocenter and the epicenter is called the depth of the earthquake.

Since there are mainly tectonic earthquakes in Central Asia, I would like to draw your attention to the factors of its origin.

Tectonic earthquakes, according to the theory of tectonic plates, occur as a result of their movement, colliding with each other. As a result, a tremor is created in

the earth's crust, that is, an earthquake occurs. In this case, the surface of the earth becomes visible as a result of lifting or cracking.

In addition, complex chemical and physical processes are constantly going on in the earth's layer. In particular, heavy rocks are constantly moving down and light rocks are moving up.

Secondly, there is a lot of pressure and heat energy in the deep layers of the Earth. This situation is caused by the radioactivity of chemical elements, which causes one type of rock to change into another. As a result, energy is released. The energy produced sets in motion a very large volume of rocks underground. In turn, these rocks move the upper layer of the Earth, the crust. As a result, an earthquake occurs.

Earthquakes occur mainly in three seismic belts of the earth. They are: Pacific, Mid-Atlantic submarine ridges and Mediterranean-Asian seismic belts.

If we look back at history, a number of destructive earthquakes have occurred within the territory of our republic. These include, for instance, earthquakes in Fergana in 838–839, Bukhara in 942, Urgench in 1208–1209, Samarkand in 1490, Namangan in 1494, Akhsikent in 1620, and near Bukhara and Samarkand in 1821–1822.

The territory of the Republic of Uzbekistan is located within the Mediterranean-Asian seismic belt. Specialists from the Institute of Seismology of the Academy of Sciences have predicted that a period of seismic activity, which began in 1998, would continue through 2015–2017. Consequently, any major earthquake occurring in this region could be felt with varying degrees of intensity across the territory of our republic.

For example, on April 20, 2000, an earthquake with a magnitude of M=5.4 occurred in the Kamashi district of our region, causing significant damage to residential buildings, schools, and hospitals. The material damage amounted to six billion soums. In the same area, an earthquake with a magnitude of M=5.3 that occurred on January 18, 2001, damaged many homes, schools, kindergartens, hospitals, and other buildings in the Kamashi, Guzar, and Dehkanabad districts of our region, and the total economic damage exceeded 14 billion soums.

Therefore, due to the correct and rational policies of the leadership of our republic, a number of important legal and regulatory documents have been developed in the field of effective protection of the population and territories from possible natural and man-made emergency situations.

Within the framework of the State System for the Prevention and Response to Emergency Situations of the Republic of Uzbekistan (hereinafter referred to as the State Seismic Service), the Academy of Sciences of the Republic of Uzbekistan is directly responsible for developing scientific foundations and methods for earthquake forecasting and seismic zoning, implementing comprehensive monitoring of seismic

events in the territory of the republic, and providing the State Seismic Service management bodies and the population with information about earthquakes.

No matter how much seismology has developed worldwide in recent years, it is impossible to prevent earthquakes. It is only possible to minimize their consequences. In order to reduce the devastating consequences that may arise from earthquakes, it is very important to create detailed seismic zoning and microdistricting maps that show where and with what force the earthquake will occur, to build earthquake-resistant buildings and structures, and to predict earthquakes.

Seismic zoning is divided into three general seismic zoning, perfect seismic zoning, and seismic microzoning depending on the methods and scale used.

It is known that construction works in seismically active areas are carried out on the basis of official regulatory documents - "Construction norms and rules" approved by official state agencies. A general seismic zoning map is a component of this regulatory document.

Detailed seismic zoning is conducted for relatively smaller areas, such as Tashkent and the Fergana Valley. Furthermore, in the creation of such detailed maps, the vibration parameters of significant and strong earthquakes are precisely recorded using seismic sensors and then incorporated into the mapping process. The map indicates where earthquakes may occur and the intensity with which they might strike.

In order to accurately account for the seismic activity of places, in addition to general and comprehensive seismic zoning, it is necessary to draw up seismic microzonation maps for each city and large settlements. These maps show how many points the earthquake intensity in each place differs from the average. This depends on the geological and tectonic structure of the places, the physical properties and composition of the rocks there, the depth of groundwater below the surface, and others. Seismic microzonation is also drawn up for individual cities, districts, reservoirs, large construction sites, areas with nuclear reactors, and other places.

Forecasting earthquakes in seismically active zones is monitored by seismologists using special measuring devices. Dozens of earthquake detectors are currently known. They are changes in the earth's magnetic, electric, and gravitational fields, changes in the ionosphere, the level of the ground, the level of underground water, the amount of microelements in their composition, changes in the speed of seismic waves, etc. The distance that can usually be observed by seismographs depends on their location, time, and strength of the earthquake. The stronger the earthquake, the longer and farther it is observed.

It should be emphasized that only by combining advanced methods that monitor all the signals can a direct path to earthquake forecasting be opened. Work in this direction is constantly being carried out by the Institute of Seismology of the Academy of Sciences of the Republic of Uzbekistan.

The tragic consequences of powerful earthquakes that have occurred globally in recent years demonstrate that minimizing the impact of such events requires more

than just long-, medium-, and short-term forecasting or the construction of earthquake-resistant buildings and structures. It is equally essential to systematically enhance the earthquake preparedness of the population living in seismically hazardous areas. This involves ensuring that all segments of the public know exactly how to act—before, during, and after an earthquake—and developing the skills to respond promptly and effectively, without succumbing to panic or fear.