IMPROVING THE EARTHQUAKE CONSEQUENCES ASSESSMENT SYSTEM

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Annotation. This article analyzes the results of research on improving the system for assessing the consequences of earthquakes. The study focuses on such key areas as the development of seismic monitoring systems, the use of geographic information systems (GIS) and satellite data, the adaptation of infrastructure and construction standards to modern requirements, the organization of rapid information exchange, the strengthening of the preparedness of emergency services, and the introduction of research and innovative technologies. The article extensively discusses the possibilities of modern technologies for early detection of earthquakes, assessment of the level of destruction, strengthening the warning systems of the population, and the effective organization of rescue operations.

Keywords: Earthquake, seismic monitoring, geographic information system (GIS), satellite data, InSAR technology, earthquake-resistant construction, emergency, information exchange, warning system, IoT devices, innovative technologies, rescue operations, infrastructure safety, natural disaster forecasting.

Introduction. Earthquakes are one of the most dangerous natural disasters for human life and social infrastructure. Although it is impossible to prevent them, losses can be significantly reduced by reducing their consequences and improving assessment systems. Currently, the possibilities for assessing and preparing for seismic hazards are expanding with the help of modern technologies, scientific approaches and integrated information systems. The results of the research, having studied the earthquake assessment system, recommended the following work: developing a seismic monitoring system, using GAT and satellite data, improving infrastructure and construction standards, organizing rapid information exchange, increasing the readiness of emergency services, introducing research and innovative technologies.

Development of a seismic monitoring system. The development of a seismic monitoring system is of great importance for early detection of earthquakes and minimizing their consequences. By expanding the network of high-precision seismic stations based on modern technologies, the possibility of real-time monitoring of ground movements will increase. Such stations will help to quickly determine the magnitude, depth and epicenter of earthquakes. Systems consisting of seismic sensors

and accelerometers continuously measure the amplitude and acceleration of ground vibrations and send data to central servers. This data is then used to assess the risk of earthquakes and predict their consequences.

In addition, the process of analyzing seismic signals can be automated using algorithms. These technologies accurately distinguish earthquake waves, provide information about their nature, and enable rapid analysis. This will further improve the earthquake forecasting system. Seismic monitoring systems are also being strengthened through the use of IoT devices. Smart sensors and mobile applications connected to them will allow for rapid warning of earthquakes to the population.

Using GIS and satellite data. The use of GIS (Geographic Information Systems) and satellite data can significantly improve the process of assessing the consequences of earthquakes. These technologies play an important role in quickly identifying areas affected by earthquakes, assessing infrastructure damage, and effectively organizing rescue operations. Satellite images can be used to compare the state of the area before and after the earthquake, which makes it possible to determine the extent of damage. In particular, the level of damage to buildings, roads, and other important infrastructure is assessed by analyzing high-resolution radar and optical images.

In addition, InSAR (Interferometric Synthetic Aperture Radar) technology measures deformations of the earth's surface and accurately calculates displacements around the epicenter of an earthquake. This method accurately measures the movement of tectonic plates, the formation of faults, and the vertical and horizontal displacements caused by an earthquake. InSAR technology is also an effective tool for early detection of areas with high earthquake risk, as it allows for the recording of ground deformations resulting from seismic activity at an early stage.

Improving infrastructure and building standards. Improving infrastructure and building standards is essential to reduce the destructive effects of earthquakes and protect human life. In areas with high seismic risk, one of the main tasks is to increase the strength of buildings and structures, improve the quality of building materials, and bring engineering standards up to modern requirements. The widespread introduction of earthquake-resistant construction technologies can minimize damage to infrastructure.

First of all, designing earthquake-resistant structures is of great importance. When choosing building materials, their elasticity, resistance to deformation during an earthquake, and energy absorption properties should be taken into account. For example, concrete structures reinforced with steel and reinforcement have high earthquake resistance, which allows maintaining the structural integrity of the building. Innovative construction technologies, such as carbon fiber reinforcement, advanced shock absorber systems, and vibration-resistant foundations, are effective in reducing the impact of earthquakes.

Rapid organization of information exchange. Rapid information exchange is essential for minimizing the consequences of natural disasters, including earthquakes, and for effective rescue operations. In emergency situations, real-time information exchange allows for rapid and accurate action between rescue services, government agencies, and the public. Information exchange is necessary not only during an earthquake, but also for early warning, assessment of earthquake consequences, and planning recovery processes.

First of all, the formation of emergency communication systems is of great importance. During an earthquake, ordinary means of communication, such as mobile networks and wireline communication systems, may fail. Therefore, satellite communication systems, emergency radio communication channels and independent data transmission networks should be available as backup. For example, global satellite communication systems such as Inmarsat and Iridium provide the ability to transmit important information in real time during natural disasters. Through such systems, it will be possible to coordinate rescue operations in the earthquake area and correctly allocate the necessary resources.

Mobile applications and emergency notification systems also play an important role. Special applications are developed to quickly warn the population in areas with a high risk of earthquakes and provide necessary instructions. For example, earthquake warning systems developed by FEMA (Federal Emergency Management Agency) in the USA and the Japan Meteorological Agency allow the population to be notified a few seconds or minutes before the onset of an earthquake. These systems record the first seismic waves radiating from the epicenter of the earthquake and warn the population via SMS or mobile applications

Introduction of research and innovative technologies. The introduction of scientific research and innovative technologies plays an important role in preventing, preparing for and mitigating the consequences of emergencies. Modern technologies and scientific research expand the possibilities for identifying, monitoring and effectively managing risks. This process covers the following main areas:

First, it is important to develop systems for forecasting and monitoring natural disasters and emergencies. Earthquakes, floods, fires and other natural disasters are predicted in advance through satellite technologies, seismic sensors, drones and weather modeling systems. For example, in Japan and the United States, highly sensitive seismographic systems are used to detect earthquakes in advance.

Conclusion. Improving the earthquake impact assessment system is one of the most urgent issues in ensuring the safety of human life and social infrastructure today. As a result of the conducted research, it was found that approaches based on modern technologies — including seismic monitoring stations, geographic information systems, satellite observations, earthquake-resistant construction technologies, rapid

information exchange systems and innovative forecasting tools — play an important role in reducing earthquake risk. When these systems are used in an integrated manner, the early detection of natural disasters, rapid assessment of affected areas, the effectiveness of rescue operations and the ability to warn the population will significantly increase. Also, through proposals based on scientific research and experience, the level of preparedness for emergencies will increase and advanced practices for reducing consequences will be introduced. In conclusion, in order to further improve the earthquake impact assessment system, complex approaches based on scientific and technical achievements will be of great importance and they must be included in the national security strategy.

References:

1. Yo‘ldashev, A., & Jalilov, A. (2022). FAVQULODDA VA EKOLOGIK OFAT HOLATLARIDA KORXONALAR BOSHQARUVI. Eurasian Journal of Social Sciences, Philosophy and Culture, 2(13), 269-275.
2. Jalilov, A. (2022). FAVQULODDA VAZIYATLAR VAZIRLIGINING FAVQULODDA VAZIYATLARDA HARAKAT QILISH VA BOSHQARISH MILLIY MARKAZI MANSABDOR SHAXSLARI FAOLIYATIDAGI MUAMMOLI MASALALARNI ANIQLASH VA TAHLIL QILISH MODELI. Science and innovation, 1(C7), 286-294.
3. Jalilov, A. (2023). FVHQ VA BMM TIZIMINI TAKOMILLASHTIRISH MODELI. OOO «МОЯ ПРОФЕССИОНАЛЬНАЯ КАРЬЕРА.
4. Jalilov, A. (2022). MILLIY HARAKAT VA BOSHQARUV MARKAZI MUAMMOLARINING FAOLIYATIDAGI MUAMMOLARNI ANIQLASH VA TAHLIL OLISH NAMUNI. Fan va innovatsiyalar , 1 (7), 286-294.
5. Жалилов, А. (2022). Модель для выявления и анализа проблемных вопросов в деятельности должностных лиц национального центра действий и управления чрезвычайными ситуациями министерства по чрезвычайным ситуациям. in Library, 22(4), 25-32.
6. Jalilov, A. (2021). O’zbekistonda individual ravishda qurilgan binolarning zilzilabardoshligini oshirish yo’llarini takomillashtirish. Scienceweb academic papers collection.
7. Jalilov, A. (2024). TABIIY TUSDAGI FAVQULODDA VAZIYATLARDA TEXNIK TIZIMLAR FAOLIYATINI TAKOMILLASHTIRISH. Nauchno-texnicheskiy jurnal «Matrostroenie» , (2), 20-24.
8. Jalilov, A. (2024). METHODS OF PROTECTION FROM ENVIRONMENTAL EMERGENCIES: A COMPREHENSIVE REVIEW. Web of Discoveries: Journal of Analysis and Inventions, 2(6), 89-94.
9. Jalilov, A. (2024). CONTRIBUTION OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES TO ACHIEVEMENTS IN SCIENCE. Web of Discoveries: Journal of Analysis and Inventions, 2(6), 78-82.
10. Ahmadbek, J. (2024). NEW INNOVATIVE TEACHING METHODS FOR EMERGENCY RESPONSE. AndMI Xalqaro ilmiy-amaliy konferensiyalari, 1(1), 428-431.
11. Makhsudov, M., Karimjonov, D., Abdumalikov, A., Jalilov, A., & Yigitaliyev, M. (2024, November). Method of determination current and power factor based on the output signal. In AIP Conference Proceedings (Vol. 3244, No. 1). AIP Publishing.
12. Jalilov, A. (2024). INTERNATIONAL EXPERIENCES IN THE FIELD OF LABOR PROTECTION: A COMPARATIVE ANALYSIS. Web of Discoveries: Journal of Analysis and Inventions, 2(6), 83-88.