Webology (ISSN: 1735-188X)
Volume 19, Number 2, 2022

Innovative Approaches For Further Reduction Of Secondary Consequences Of Strong Earthquakes In Uzbekistan

Bobomurot Kurbanov[1] , Alisher Berdiyev[2]

[1]Associate Professor, PhD Deputy Head of the Institute of Civil Protection at the Academy of the Ministry of Emergency Situations Republic of Uzbekistan.

[2]PhD, Department of Teleradio broadcasting Technologies, Tashkent University ofInformationTechnologiesnamedafterMuhammadAl-Khwarizmi,Tashkent,Uzbekistan.

Abstract

The article discusses the issues of protecting the population and territories of the Republic of Uzbekistan from the secondary consequences of natural disasters, in particular from strong earthquakes of magnitude (M≥5). The author noted that strong earthquakes in most cases cause not only primary destruction, but also cause other secondary types of natural and man-made emergencies. Several examples of secondary consequences of strong earthquakes in Uzbekistan and in the world are given.

The purpose of the article is to develop innovative approaches to further reduce the secondary consequences of strong earthquakes in Uzbekistan. The existing problems in the field of reducing the consequences of strong earthquakes in the republic, as well as the measures taken to reduce the consequences of strong earthquakes are presented. The article examines the advanced experience of foreign countries (Russia, Kazakhstan, Azerbaijan, Japan, South Korea, Turkey, etc.) in the field of ensuring seismic safety, preparing all segments of the population for correct actions during an earthquake in order to further reduce the secondary consequences of strong earthquakes. At the same time, the authors set out the future prospects for the response (correct actions) of the population and functional services to the seismic forecast in Uzbekistan, proposed a number of correct actions of the population and functional services of the State Service for Prevention and Action in Emergency Situations in accordance with urgent seismic forecasts in tabular form.

In the conclusion of the article, in order to further increase the effectiveness of protecting

the population and territories from emergencies associated with earthquakes, based on the study of the best practices of foreign countries, outlined innovative approaches to reduce the secondary consequences of strong earthquakes in Uzbekistan..

Keywords

earthquake, seismicity, seismic safety, forecasting, seismic forecast, mitigation of earthquake consequences.

Introduction

Uzbekistan is located in the Mediterranean - Asian seismic belt. This region accounts for 15% of earthquakes occurring worldwide. The central, eastern and southeastern regions of the republic belong to 8-9 point seismicity zones. Since 1900, only 34 strong earthquakes with a magnitude of M> 5 have occurred on the territory of the Republic of Uzbekistan.

Therefore, protecting the population and territory of our country from natural disasters, in particular from emergencies associated with an earthquake, ensuring seismic safety is one of the priorities of the national state policy, and the republic has adopted and special laws, regulations and other legislative acts are being implemented, which are aimed at predicting, preventing and eliminating the consequences of strong earthquakes (Law of the Republic of Uzbekistan Dated September 13, 2021 “On Ensuring the Seismic Safety of the Population and the Territory of the Republic of Uzbekistan.), (Resolution of the President of the Republic of Uzbekistan No. 4794 of July 30, 2020 “On Measures to Radically Improve the System for Ensuring Seismic Safety of the Population and Territories of the Republic of Uzbekistan”), (Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 71 of April 3, 2007 “On Approval of the State Program on Forecasting and Prevention of Emergency Situations".), (Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 208 of July 19, 2011 “On Approval of a Comprehensive Program to Prepare the Population for Action in Emergency Situations (Natural and Man-Made) Arising from Earthquakes”.), (Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 1027 of December 28, 2017 “On the Creation of a Unified System for Monitoring, Exchange of Information and Forecasting Emergencies of Natural, Man-Made and Ecological Nature”.), (Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 754 of September 9, 2019 “On Improving the Procedure for Preparing the Population for Action in Emergency Situations and in the Field of Civil Protection”.), (Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 515 of August 26, 2020 “On Further Improvement of the State System of Prevention and Actions in Emergency Situations of the Republic of Uzbekistan”).

Main part

Over the past 115-120 years, dozens of strong earthquakes have occurred in our republic,

which are remembered for great destruction and casualties. For example, 8-10 point Andijan in 1902, Namangan in 1927, Chatkal in 1946, Burchmulla in 1959, Tashkent in 1966, Gazliy in 1976 and 1984, Tavaksoy in 1977, Nazarbek in 1980, Chimyon in 1982, Pop in 1984, Izbaskan in 1992, Kamashi in 1999 and 2001, Ferghana in 2011, Marjanbulak in 2013 and other earthquakes (Kurbanov B.Yu., et al., 2019).

It should be noted that an earthquake itself does not kill people, but emergency situations, which are recorded as its secondary factors, can lead to the death or injury of a large number of people, disruption of life, complete destruction or disruption of the stability of buildings and structures, landslides, large fires, etc.

According to statistics, on average, about ten thousand strong (M≥5) and tangible (M≤5) earthquakes occur in the globe every year. Of these, 15-20 are considered tragic and disastrous (K. Abdullabekov & Z. Ilyasova, 2016). The number of weak earthquakes can reach 40-50 thousand per year, and the number of weak ones and those that we do not notice, but which are recorded only by special seismographs, can reach 3-3.5 million (Rakhimov B.N. et al., 2018).

It should be noted that one of the most terrible earthquake on the territory of Uzbekistan occurred at 10:00 on December 16, 1902 in the city of Andijan. The earthquake killed more than 4.5 thousand people. Also, about ten thousand buildings and structures were damaged and destroyed as a result of a strong earthquake that occurred on April 26, 1966 at 5:23 local time in Tashkent. In total, 68 thousand families were left homeless, of which 39 thousand families had their houses completely destroyed. In total, the population of Tashkent was deprived of housing with an area of about two million square meters. In the city, 680 trade and public catering enterprises, 104 administrative buildings, 26 utilities, 181 educational institutions, including schools for 8 thousand places, 36 cultural and educational institutions, 225 kindergartens and 185 medical institutions were completely or partially destroyed. damaged industrial buildings of 245 industrial enterprises (K. Abdullabekov & Z. Ilyasova, 2016).

According to the Institute of Seismology of the Academy of Sciences, in the Southeastern part of the Mediterranean - Asian seismic belt, the next seismic activation began in 1998 (Abdullabekov K.N. & Usmanova M.T., 2003). Over the past time, strong earthquakes have occurred here in India, Pakistan, Turkey, Azerbaijan, Turkmenistan, China (Sichuan), Indonesia (Sumatra, December 26, 2004 with M = 9) and others. Since 1998, a number of strong earthquakes with a magnitude of M≥5 have also been recorded on the territory of Uzbekistan and neighboring republics (Kamashi 1999 and 2000, Sumsar 2007, Jalalabad 2008, Tashkent 2008, Kann 2011, Marjanbulak, Tuyabuguz earthquakes 2013 and etc.).

Here it would be appropriate to note the consequences of the Cannes earthquake on July 20, 2011 with a magnitude of M = 6.3. This earthquake occurred on the border area of

Kyrgyzstan and Uzbekistan. On the territory of Uzbekistan in Andijan, Ferghana, Kokand and Margilan, it was felt with an intensity of 5-6 points, and in Tashkent 4-5 points. Basically, the earthquake affected the southern regions of the Fergana region: Rishtan, Sokh, Baghdad, Chimion, Shakhimardan. The greatest destruction with human casualties occurred in the Rishtan and Sokh regions. As the engineering analysis of the consequences of this earthquake carried out in (Assessment of the Technical Condition of Private Residential Buildings in the Fergana Valley and the Development of Recommendations for Ensuring and Increasing Their Seismic Resistance, 2013), (Rashidov T.R. & Kondrat'ev V.A., 2011) shows, the main cause of casualties among the population was the collapse of the porches (under which there were sleeping people), the joints of the posts and beams, which were made without proper anchoring between themselves and with the walls of the main buildings ... The situation here was aggravated by the presence of clay materials of considerable thickness (in some cases, up to 50 cm and more) on the coverings of porches, accumulated over the period of many years of repairs. No collapse of buildings with blue frames was recorded. This constructive solution is capable of withstanding earthquakes with an intensity of up to 8 points inclusive, which is also regulated by the State Committee of the Republic of Uzbekistan for Architecture and Construction 01.22.03-96 "construction in seismic areas."

According to the Russian researcher M.A. Klyachko (Kurbanov B.Yu. & Mardonov A.A., 2019) from 1850 to 1990, as well as on the basis of data from other researchers until 2010, the number of people who died as a result of powerful earthquakes in the world is approximately 2 million 448 thousand 500 people. According to this indicator, it can be concluded that annually, on average, 115 thousand 500 people died from earthquakes.

In this regard, it should be noted that strong earthquakes in most cases cause not only primary destruction, but also cause other secondary types of emergencies. For example, the Gisarag earthquake in 1984 caused a landslide, in San Francisco in 1906 and in Indonesia in 2004 it caused a tsunami, and the earthquake in Tajikistan in 1911 caused the collapse of the mountainside, which blocked the river bed, which in turn became the reason for the flooding of the village of Sarez and the formation of a large lake, which is named after this village (Lange O.K., 1926). The earthquake at the Fukushima nuclear power plant triggered a radiation emergency.

Also, our scientists have studied the fact that strong earthquakes activate large landslides (R.A. Niyazov, 2009). In particular, a landslide with a volume of 2.5-3 million m3 was recorded at the Khondiza section of the Surkhandarya region, at the Central section of the Tashkent region - 3.5 million m3, in the Kashkadarya region at the Langar section - 22 million m3 , on the Zhovuz section - 2-2.5 million m3, in the Samarkand region on the Soigus and Gus sections - 270-350 thousand m3, between 5 and 72 km of the Angren-Pop railway - 10 - 25 thousand m3, in sections between 112 - 184.3 km. highways "A-373 M-39 - Osh through Gulistan-Buka-Angren-Kokand-Andijan" - 1.5 - 80 thousand m3. As a result of these landslides, 500 farms and the Angren coal mine remained under the earth

mass, and the channels of the Khursand and Langar rivers were blocked, and traffic on the railways and highways connecting the Ferghana Valley with the rest of the republic was suspended.

Considering the above, in order to further reduce the consequences of strong earthquakes leading to emergencies, especially to preserve the life and health of the population, it is necessary to take preventive measures to prevent emergencies and predict their consequences in advance. At present, a number of activities are being carried out in this direction jointly with the relevant ministries and departments of the republic. However, it should be noted that there are certain unresolved issues, in particular:

- non-compliance with the requirements of Building Norms and Rules-96 during the construction of individual private residential buildings by the population;
- the absence of the possibility of providing the state authorities with short-term and operational forecasts about the possibility of strong earthquakes for a specific territory of the republic;
- lack of a systematic inventory of buildings and structures, identification of secondary sources of danger leading to emergencies, primarily in seismically vulnerable regions of the republic;
- not using software based on geographic information systems (Geographic Information System), with the help of which it is possible to estimate, predict and simulate the development of possible emergency situations arising as a result of secondary factors of strong earthquakes;
- scientifically unsubstantiated action plans for the prevention and elimination of the consequences of emergencies associated with strong earthquakes.

The experience of developed countries, according to preliminary estimates, and mitigation of the consequences of strong earthquakes shows (Arustamova E.A., 2006) that in many countries the minimization of the secondary consequences of possible strong earthquakes is achieved through the construction of earthquake-resistant buildings and a gradual increase in the preparedness of the population, taking into account earthquake forecasts.

In particular, in the Russian Federation, in order to create an earthquake warning system, a satellite was launched into orbit, which can give a phased earthquake forecast with a high degree of accuracy (from 30 minutes to 2 days). With the help of this, long-term (for several years) and medium-term (for several months) forecasts are developed, as well as appropriate measures are taken to increase the stability of economic and infrastructure facilities, strengthen residential buildings and structures, prepare the population, raise awareness of the population about earthquakes, ensure sustainable functioning of the public warning system (Arustamova E.A., 2006.).
Also, in the 9-point zone in the Baikal region, Kamchatka and the Kuril Islands of the Russian Federation and the 8-point zone in the southern part of Siberia and the North Caucasus, for the purpose of engineering protection based on earthquake forecasts,

appropriate measures are being taken, such as the development of new effective methods to increase the seismic resistance of buildings and structures. , improving the quality of design in different seismic zones, construction of earthquake-resistant structures, improving the quality of construction, certification (inventory) of social and industrial facilities, as well as anti-landslide measures.

In the countries of the CIS, such as the Russian Federation, Kazakhstan, Azerbaijan, special attention is paid to the creation and improvement of the educational and material base to prepare the population for the correct actions during earthquakes. In particular, in the Russian Federation, at the city (district), regional and republican levels, competitions are regularly held for the best educational and material base, in connection with which the quality of the system of preparing the population for action in emergency situations associated with earthquakes is improving.

In addition, in order to train kindergarten pupils, schoolchildren and students of higher educational institutions on the correct actions during an earthquake, each kindergarten and educational institution has developed separate plans, as well as competent organizations under the Ministry of Emergency Situations develop and distribute cartoons, educational films. interactive tutorials, e-memos and other demonstration materials.

In the Republic of Kazakhstan, in order to prepare the population living in a seismically active zone for the correct actions in case of an earthquake, together with the UN Development Program office, a mobile earthquake simulator was created on the basis of a car trailer, with the help of which field practical classes are regularly conducted at educational institutions, enterprises and organizations, and there is also training of the population not employed in the sphere of production and services (Kurbanov B.Yu. & Mardonov A.A., 2019).

In Japan, South Korea, Turkey and many other developed countries, in preparation for protection from seismic hazards, special attention is paid to physical and mental training in the direction of "Self-rescue, mutual assistance and rescue of others"; mobile devices for simulating earthquakes are also widely used (Kurbanov B.Yu. & Mardonov A.A., 2019). Also, the preparation of the population is carried out every day through television showing cartoons, feature films, games, activities reflecting the correct actions during an earthquake.

In particular, in Japan, special attention is paid to the comprehensive preparation of the population for natural disasters and actions after their occurrence. The main emphasis is on developing and promoting early steps in the event of natural disasters, as well as rules of conduct in a disaster. Exercises are regularly held, which cover almost all segments and groups of the population - from kindergartens to nursing homes; development and application of new construction and other norms aimed at increasing the seismic resistance of buildings and structures, which allows to reduce destruction and damage

from natural disasters; improvement of the system of coordination of the activities of various state and local bodies and services (www. nippon.com), (www.jica.go.jp).

China has adopted the Emergency Response Law in order to prevent and reduce the number of emergencies, including those associated with an earthquake, as well as to control, reduce and eliminate the amount of social damage caused by emergencies, streamline response activities, protect life and property of the population, ensuring state and public security, environmental protection and public order. This law defines the system of preparation and provision of emergency management. It obliges the people's governments at the county level and above to establish and improve the system of education and emergency management. In a timely manner, train the employees of the people's governments and other relevant units responsible for emergency response work. Educational institutions of all levels and categories are obliged to include in the curriculum information about emergencies associated with an earthquake, to teach them, to develop students' skills in providing emergency assistance to themselves and others (www.msu.ru).

It should be noted that in Uzbekistan, in order to minimize the secondary consequences of earthquakes, systemic preparation of social and industrial facilities, the population for the correct actions in an earthquake, a separate regulatory document has been developed and put into practice (Law of the Republic of Uzbekistan Dated September 13, 2021 “On Ensuring the Seismic Safety of the Population and the Territory of the Republic of Uzbekistan.), (Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 71 of April 3, 2007 “On Approval of the State Program on Forecasting and Prevention of Emergency Situations").

This document defines and implements tasks in the field of ensuring seismic safety. These include monitoring and control of the seismic resistance of buildings and structures (existing and commissioned), conducting observations on reservoirs, monitoring their seismic resistance, implementing measures to reduce harm to the health and life of people and property of the population, as well as the risk of losses (material, economic and others), the introduction of modern methods for predicting seismic hazard, seismic risk and the likelihood of earthquakes, as well as strengthening the seismic resistance of structures. It also considers the tasks of increasing the efficiency of the system of preparing all segments of the population for action in emergency situations (natural and man-made) caused by earthquakes, expanding the coverage of the population with training, creating voluntary rescue teams and organizing their activities, reducing the level of seismic risk, improving the skills of the population in assessing the emerging seismic situation, providing conditions for correct actions during earthquakes, developing an integrated system for preparing educational institutions for action in emergency situations.

In addition, a separate decree of the government of the Republic of Uzbekistan defines the main tasks for preparing all segments of the population for the correct actions in

emergency situations and in the field of civil protection (Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 1027 of December 28, 2017 “On the Creation of a Unified System for Monitoring, Exchange of Information and Forecasting Emergencies of Natural, Man-Made and Ecological Nature”). In particular, the obligations to improve knowledge and acquire skills for the prevention and elimination of emergencies associated with a strong earthquake and for the civil protection of managers, employees and employees of government bodies, local executive authorities and other organizations, as well as for the training of rescue services and rescue teams, civil protection units for the elimination of emergencies, training of the population, both employed and not employed in the field of production and services, pupils of preschool education institutions, students of secondary schools, students of secondary specialized education institutions, higher educational institutions for the protection of emergencies, providing first aid to victims, the rules for the use of individual and collective protective equipment.

It should be noted that in the Republic of Uzbekistan, in accordance with the current regulatory legal acts, earthquakes of magnitude M≥5 occurring, which damage buildings and structures, lead to human casualties, cause disruption to the life of the population, and there is also a population that causes damage to buildings and structures, the victim of which is the population, as well as causing significant material damage are recorded as an emergency (Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 754 of September 9, 2019 “On Improving the Procedure for Preparing the Population for Action in Emergency Situations and in the Field of Civil Protection”).

Currently, the Republican Center for Seismic Prognostic Monitoring operates under the Ministry of Emergency Situations of the Republic of Uzbekistan. The results of monitoring seismic processes are weekly analyzed by scientists from the Institute of Seismology of the Academy of Sciences and short-term (weekly) seismic forecasts are prepared. These forecasts are regularly submitted to the National Center for Emergency Response and Management of the Ministry of Emergency Situations for the implementation of appropriate preventive and preventive measures.

Therefore, in the future, earthquake forecasting by the Institute of Seismology of the Academy of Sciences, the development of science in the field of geophysics in general and an increase in the accuracy of the forecasts prepared by specialists serve the planning and timely implementation of correct actions in accordance with such seismic forecasts by the Ministry of Emergency Situations, in particular, planning and timely implementation of preventive measures , given in the following table, serves to increase the preparedness of all layers of the population of functional services in the republic, as well as to minimize, reduce the consequences of possible emergency situations, through correct and prompt actions in such situations.

The international experience of state management of measures to predict emergency

situations associated with an earthquake and reduce their negative consequences shows (Shoigu S.K. Fundamentals of State Regulation of Measures to Ensure Seismic Safety in Russia. Moscow, 1997.64 P.) that pre-developed plans for interaction of the relevant services to respond to earthquake forecast play an important role in reducing its consequences. The effectiveness of the organization of work on the prevention and prophylaxis of possible emergencies associated with earthquakes directly depends on the timeliness of the provision of earthquake forecasts in the long, medium, and short-term periods. At the stage of obtaining a long-term forecast of strong earthquakes (from one year to ten or more years) in potentially dangerous areas (zones), monitoring of seismicity and processes of preparation for earthquakes is activated. Comprehensive measures are being developed and implemented to increase the stability of buildings and structures, data on the assessment of seismic risk are being refined, forces and resources are being redistributed between individual territories of the country to ensure seismic safety. Reserves of financial and material resources are being created and replenished to eliminate the consequences of earthquakes. At the stage of obtaining a mid-term forecast of strong earthquakes (from several months to 1-3 years) in an earthquake-prone area, the forces and means necessary for an adequate response to the expected seismic event are being accumulated, explanatory work among the population is intensified, the preparatory work of rescue services, medical institutions is intensified, preparatory work is being carried out at all enterprises and institutions of the territories, various scenarios for responding to a strong earthquake are being developed. One of the most important elements of the preparatory work for responding to an earthquake at the mid-term stage of forecasting is to conduct demonstrative special exercises and trainings (Raximov T.et al., 2020). Upon receipt of a sufficiently reliable short-term forecast of strong earthquakes (from several days to weeks), the operating mode of various services is switched to an enhanced version, an alarm is given to notify the population and an emergency shutdown of electricity, gas, dangerous technological processes are stopped, mass events are canceled, the population is evacuated from hazardous areas (evacuation time can range from several days to several weeks), etc. Therefore, in seismically active zones, it is usually envisaged to create a tent fund in advance, in which the population could be accommodated, and the necessary supplies of food, drinking water, medicines, etc. are prepared (Kurbanov B.Yu., et al., 2019.).

In general, based on the advanced experience of foreign countries, the author proposes the following algorithm for correct actions to respond to an earthquake forecast in the Republic of Uzbekistan, in particular:

Table 1.The sequence of correct actions to respond to an earthquake forecast in the Republic of Uzbekistan

№	Term	Seismicforecast	Implementedevents
1.	1–10 years	Long-term	Construction of seismic-resistantresidentialbuildings in allseismicallyactivezones, takingmeasures to increase the seismicstrength of oldbuildings, planning a set of

			correct actions for functionalservicesthatdeal with the elimination of secondaryconsequences of strongearthquakes.
2.	1 month - 1 year	Medium-term	In the territorywhere the earthquakeispredicted, fullcoverage of allsegments of the population with theoreticaleducation and practicaltraining, conductingexercises with functionalservicesoncorrect and prompt actions in earthquakes and assessingtheirpractical actions, eliminatingidentifieddeficiencies.
3.	1 day - 1 month	Short-term	Conductingtraining and practicalexerciseson the correct actions in a strongearthquake with the participation of allsegments of the population in the areawhere the earthquakeisexpected, aswellasimproving the level of training, increasing the preparedness of functionalservices for emergenciesrelated to earthquakes, modeling the development of emergency situations and predicting secondaryconsequences, conductingpracticalexercisesaimedatpreparingthem for correct and operational actions during and afterearthquakes.

Therefore, in order to ensure safety and protection in the event of a threat or emergencies, at all facilities there are three levels of the State Emergency Service of the Republic of Uzbekistan, to reduce possible losses and damage, as well as to take measures to increase the stability of the functioning of industrial facilities, life support systems and economic sectors during the period of operation " Everyday Activities ", it is necessary to develop or adjust in advance separate special Action Plans in the event of a threat of strong earthquakes or emergencies associated with them, as well as a calculation method to determine the forces and means to rescue victims in emergencies associated with a strong earthquake. It should be remembered that carrying out emergency measures according to a pre-developed plan and methodology (Altunin A.T., 1976.), (Turaev Z.T. & Kurbanov B.Yu., 2018), (Kurbanov B.Yu. & Salyamova K.D., 2020) especially tested during exercises, can significantly reduce the time before the start of a response, improve coordination of actions, and reduce human and material losses. The plan should provide for:

- the possibility of damage or destruction of office buildings and communication facilities in the event of strong earthquakes;
- preparation of draft directives (orders) required for introduction in the event of an emergency;
- coordination of actions of various services and departments in the three modes of functioning of the State System for Prevention and Action in Emergency Situations and,

first of all, with the services of the Ministry of Emergency Situations, the Ministry of Defense, the Ministry of Internal Affairs and the National Guard;

- clear distribution of responsibilities between members and heads of special commissions and groups, their interaction;
- sources of medicines, disinfectants, food, warm clothing, tents.

At the same time, the methodology should provide for:

- calculation of the volume of rubble, based on the type of buildings and the nature of their destruction;
- rescue teams involved in the elimination of the consequences;
- mechanized groups with the necessary equipment.

And also, in turn, the plan and methodology should be periodically revised and refined, especially after the exercises, taking into account the development of technology and technology, obtaining new information, new material and technical capabilities. In order to avoid industrial accidents and massive fires, measures should be taken to synchronize the power outage system, etc. with a signal about the beginning of an earthquake (V.Sh. Mukhametshinet al., 2021).

It should be noted that at present in many foreign countries, when developing and improving, such a GIS calculation method is used to assess, predict emergencies and their consequences, and develop response scenarios for various natural phenomena and man-made processes (including those associated with a strong earthquake). Among the most significant scientific research and practical developments on seismic risk assessments using GIS technologies, it should be noted the achievements of Russian specialists who have developed a GIS technology for operational forecasting of the volume of destruction and social losses from earthquakes based on data on their magnitude, source depth and coordinates, and also about seismic, engineering-geological, technical, demographic and other conditions of the affected objects (Koff G.L et al., 1992).

For forecast assessment of the consequences of strong earthquakes, one can use as a methodological basis the latest edition of the "Methodology for forecasting the consequences of earthquakes" (Seismological Center IGE RAS, 2000.) developed at the Center for Research of Extreme Situations in conjunction with the seismological center of the Institute of Geoecology of the Russian Academy of Sciences and the ARRI for Civil Defense and Emergency situations and MES of Russia.

With the help of the technique, the main indicators of losses from earthquakes can be determined: the number of people who have received fatal injuries and injuries of varying severity, the number of people left homeless; the number of buildings of different types that received damage of varying degrees as a result of an earthquake (collapses, partial destruction, moderate and light damage). In addition, with its help, auxiliary parameters can be determined that characterize the scale of the earthquake consequences: the volume of rubble, the area of the destroyed part of the settlement.

It should be noted that a pre-calculated possible situation at potentially dangerous facilities and adjacent territories, predicting the possibility of emergencies, their scale and consequences, as well as taking urgent measures to protect the population and the environment, ensuring the sustainable functioning of residential buildings, life support systems , objects and sectors of the economy plays a very important role in bringing the forces and means of the State Emergencies Service into readiness, clarifying their action plans, and advancing, if necessary, to the supposed area of emergency situations associated with strong earthquakes.

Conclusion

In general, due to the timely provision of predictive information about expected earthquakes and their consequences, the prompt response of the emergency services of the State Emergency Service to seismic impacts, the number of victims among the population from earthquakes is minimized, and in the case of timely delivery of a short-term forecast, it is minimized. Based on the above, in order to ensure the seismic safety of the population and territories of the republic, to reduce the secondary consequences of strong earthquakes, it is proposed to use the following innovative approaches:

development of scientific foundations of measures for correct actions before, during and after strong earthquakes of the functional services of the State system for warning and action in emergency situations, the implementation of research results into practice;
introduction of mandatory requirements for seismic resistance and seismic amplification during the construction and overhaul of individual residential buildings among the population living in a seismically active zone;
development of mobile simulation training simulators based on a local specially equipped vehicle to provide full coverage of practical training for correct actions;
development of a new modern effective methodology for preparing all segments of the population (pupils, pupils and students of educational institutions, employees of ministries, departments, enterprises, organizations, institutions, unemployed people in the field of production and services, foreign citizens) for the right actions before, during and after earthquakes;
creation of an interactive mobile application designed to train all segments of the population of the republic, including tourists, with recommendations, instructions and teaching aids, memos, multimedia materials on the correct actions before, during and after earthquakes.

References

Abdullabekov K.N., Usmanova M.T. “Features of the manifestation of strong earthquakes in time and space” Republic of Uzbekistan. 2003, No. 3, 60-64p.
Altunin A.T. “Formation of civil defense in the fight against natural disasters”,

M.Stroyizdat., 1976.

Arustamova E.A. Life safety. //Textbook. Publishing house “Dashkov and K //, 2006. - 20 p.

Assessment of the technical condition of private residential buildings in the Fergana Valley and the development of recommendations for ensuring and increasing their seismic resistance (based on the consequences of past and 2011 earthquakes) / Research report (intermediate for 2013) - Tashkent. ISM 2013 - 202 p.

K. Abdullabekov, Z. Ilyasova “From the history of emergency situations: Earthquake” / IGZ, Institute of seismology named after G.O. Mavlyanov // Tashkent, - 2016, 7-10, 33 p.

Koff G.L., Larionov V.I., Nigmetov G.M. and others. Analysis of seismic risk, rescue and life support of the population during catastrophic earthquakes (seismic, methodological and methodological aspects). M .: ILSAN, 1992. - Ch. 1-2. 295p.

Kurbanov B.Yu., Mardonov A.A. Collection of materials of a scientific and practical seminar on the topic: “Issues of ensuring the safety of the population in emergency situations associated with an earthquake” // IGZ // Tashkent, - 2019, 6, 9-10, 14, 57.

Kurbanov B.Yu., Salyamova K.D., Norkulov M.U. Prospects for the use of calculation methods to determine the forces and means of rescuing victims in emergency and crisis situations associated with a strong earthquake. // Science, protection, security, No. 2 (5), 96-107p.

Kurbanov B.Yu., Salyamova K.D. Scientific basis of the methodology of rescue operations in the event of or in the event of a strong earthquake in Uzbekistan. // Science, protection, security №1 (4) .2020, 107-113 p.

Lange O.K. Expedition to survey the Usoy Dam and Sarzez Lake // National Economy of Central Asia // Tashkent, -1926, No. 10 –78p.

Law of the Republic of Uzbekistan dated September 13, 2021 “On ensuring the seismic safety of the population and the territory of the Republic of Uzbekistan.”

Methods for predicting the consequences of earthquakes. M.: VNII Seismological Center IGE RAS, 2000. - 27p.

R.A. Niyazov Landslides Uzbekistan (development trends at the turn of the XXI century) // State Enterprise “Institute of Hydrogeology and Engineering Geology (GIDROINGEO)” //, Tashkent, - 2009, 25-55 p. http://ci.nii.ac.jp/naid/110007089341/

Rashidov T.R., Kondratev V.A. Fergana earthquake of 20.07.2011. Brief analysis of the consequences, next lessons and some suggestions // Problems of mechanics, No. 2, 2011, 35-41p.

Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 1027 of December 28, 2017 “On the creation of a Unified system for monitoring, exchange of information and forecasting emergencies of natural, man-made and ecological nature”.

Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 208 of July

19, 2011 “On approval of a comprehensive program to prepare the population for action in emergency situations (natural and man-made) arising from earthquakes”.

Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 515 of August 26, 2020 “On further improvement of the state system of prevention and actions in emergency situations of the Republic of Uzbekistan”.

Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 71 of April 3, 2007 “On approval of the State program on forecasting and prevention of emergency situations".

Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 754 of September 9, 2019 “On improving the procedure for preparing the population for action in emergency situations and in the field of civil protection”.

Resolution of the President of the Republic of Uzbekistan No. 4794 of July 30, 2020 “On measures to radically improve the system for ensuring seismic safety of the population and territories of the Republic of Uzbekistan”.

Raximov B.N.,Ibragimov D.B.,Zohidova G., Berdiyev A.A. “Forecasting Dynamic and Statistical Properties of Underground Pipelines under Conditions of "Safe City"”. 2018 14th International Scientific-Technical Conference on Actual Problems of Electronic Instrument Engineering, APEIE 2018 - Proceedings, 2018, pp. 206–209, 8545963

Shoigu S.K. Fundamentals of state regulation of measures to ensure seismic safety in Russia. Moscow, 1997.64 p.

Raximov T.,Mirsagdiyev O.,Begmatov S., Berdiyev A.A. “Development of a model of multifunctional earth soil pre-destruction system”. International Conference on Information Science and Communications Technologies, ICISCT 2020; Tashkent; Uzbekistan; 4 November. DOI:10.1109/ICISCT50599.2020.9351437. –P. 15-22.

Turaev Z.T., Kurbanov B.Yu. Increasing the effectiveness of the actions of the functional services of the State Emergency Service in the event of a threat or the emergence of strong earthquakes. // Science, protection, security №1 (1), 2018, pp. 96-101p.

Mukhametshin Sh.V.,Rakhimov B.N., Berdiev A.A., Andreev A.V.Systems for remote monitoring of earth pre-destruction. 2021.IOP Conf. Ser.: Earth Environ. Sci. 867 012172. doi:10.1088/1755-1315/867/1/012172.

www. jica.go.jp.

www. nippon.com.

www.msu.ru.