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## **Methods for Preventing and Mitigating Emergency Situations Related to the Disruption of Mountain Lakes**

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### **ABSTRACT.**

The article covers methods for preventing and reducing the consequences of mudflows and floods caused by the disturbance of mountain lakes and develops recommendations for the effective practical application of organizational and engineering measures.

**Keywords:** Mountain lake, mudflow, floods, emergencies, warning system, financial resources, training exercises, protective structures.

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### **Introduction.**

The set of measures aimed at reducing the risk of flooding includes engineering-technical and organizational-technical measures. These measures consist of actions that are carried out in the short and long term, depending on their urgency. The implementation of all measures on the basis of accurate data and scientifically based solutions is of great importance from the point of view of effectiveness. Engineering-technical measures, in turn, include methods of reducing the risk, such as the construction of engineering protection structures and forest-ameliorative measures. Organizational-technical measures include active measures, such as the organization of timely notification and evacuation work in order to reduce the impact of the risk through a continuous monitoring system. It is also necessary to increase the awareness of the population of potential risks in order to reduce their vulnerability to the risk of flooding. For this, passive measures, such as legal, institutional and financial resources, are taken.

Currently, all of the above measures are being implemented to a certain extent. However, there are also factors that negatively affect their implementation and the effectiveness of the expected results, including the insufficient practical application of field research and modern information technologies in predicting the location and time of flash floods. As a result, there is a lack of accurate information in this regard. This, in turn, limits the ability to adopt scientifically sound solutions. Therefore, “strengthening scientific cooperation is a key element in enhancing the capabilities of disaster risk reduction”, “mutual openness of scientific data and information is an important issue for countries in effectively solving such multifaceted problems as reducing risks and mitigating their impact”.

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### **Methods of research.**

Measures to reduce the risk of flooding and mitigate its effects or to reduce the vulnerability of the population to its negative effects can be used separately or in a complex manner. There is no standard form for this, but the use of these methods simultaneously or sequentially, in an integrated manner, is more effective. Integrated risk management is a set of mixed measures aimed at preventing natural hazards. This set of measures includes a combination of engineering-technical and organizational-technical actions to plan their use and ensure the optimal cost-benefit ratio. An important aspect of risk management is the development of mitigation measures that reduce the existing risk to an acceptable residual risk level. Mitigation measures can be divided into two types: active measures and passive measures. Active measures are aimed at the hazard, while passive measures are aimed at reducing potential losses.

Passive measures require targeted allocation of financial resources to reduce the vulnerability of the population and territories to risks, to strengthen the existing legal framework, to coordinate the activities of institutional structures, to eliminate emergency situations, and to effectively organize all this. Active measures require the development of hazard maps to determine the level of risk in the territories and to organize evacuation work based on them. Both measures are currently being implemented to a certain extent under the coordination of the Ministry of Emergency Situations.

In particular: Passive measures - the experience of eliminating the consequences of natural disasters shows that, despite the development of planned measures, more extensive efforts are needed to increase the safety of the population, economic facilities, and the environment. Even countries with highly developed economies cannot allocate sufficient funds from the state budget to eliminate natural disasters and compensate for the damage caused.

Early detection of risks and timely notification of them is more effective than saving people in emergency situations and eliminating catastrophic consequences. Therefore, in Uzbekistan, measures aimed at solving the tasks of preventing natural disasters, reducing risks and mitigating their consequences are being implemented at the level of state policy. In order to implement the function of ensuring the defense and national security of Uzbekistan, conceptual legal frameworks have been developed, defining strategic goals, tasks, and areas - the concept of national security, the concept of foreign policy activity, the defense doctrine, and, of course, measures to prevent natural and man-made emergencies of a transboundary nature are included in these legal frameworks as a main component.

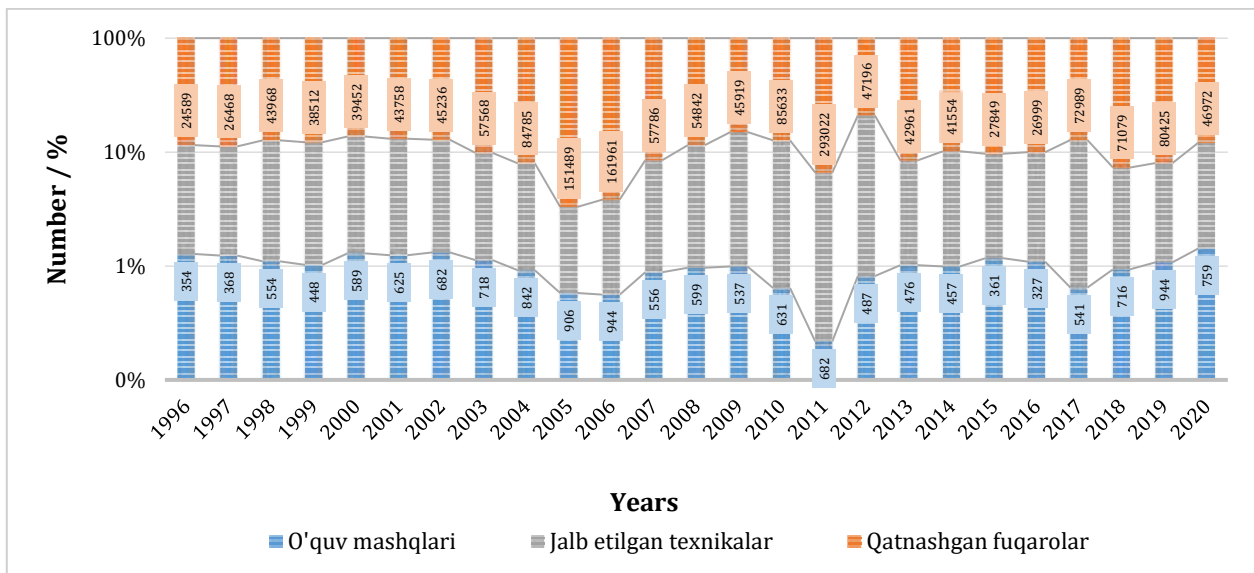
There are international conventions, partnerships and agreements for some mountain regions and transboundary river basins that can support climate change adaptation efforts. These international instruments provide some monitoring and accounting for the impacts and losses resulting from changes in the cryosphere. Over the past three decades, a wide range of institutional mechanisms and practices have emerged that address common global challenges in mountain regions and aim to mitigate their effects. Today, there are opportunities to develop by studying the risks of the cryosphere and adapting to changes. Attention has been paid to monitoring, research and reporting on the implementation of mountain regions in order to achieve the targets and indicators set out in the Sustainable Development Goals (SDGs), the Sendai Framework and the Paris Agreement.

**Results.**

In recent years, Uzbekistan has been undergoing rapid reforms in all areas, and extensive work is being carried out in the field of protecting the population and territories from emergencies, in particular from natural disasters. In particular, the regulatory legal documents regulating the sector have been improved, and annual measures are being planned taking into account the connection of natural disasters with climate change. Today, protecting the population and territories from flood waters and mudflows remains one of the urgent issues. We can see this in the example of emergency situations associated with mudflows, floods and landslides that occurred in a number of countries last year. It is very sad that as a result of these natural disasters, a number of citizens died and were injured, especially among them were vulnerable segments of the population - young children, women and the elderly. As is known, the main goal of the Sendai Framework is to prevent the emergence of new disasters and reduce the risk of known disasters through the implementation of comprehensive and inclusive economic, structural, legal, social, medical and sanitary, cultural, educational, environmental, technological, political and institutional measures.

**Conclusion.**

Today, the State Emergency Management System (SEMS) has been established in this regard, and a certain level of work is being carried out by the EMS. In particular, in order to reduce the impact of emergency situations and their vulnerability, an average of 604 training exercises have been conducted annually to prepare the population for action in such situations. An average of 68,520 representatives of various strata of the population and 6,345 special equipment used to ensure the life of socio-economic objects are involved in these training exercises (Figure 1) .



**Figure 1. 1996-2020 . emergency in situations the population movement to do preparation main indicators**

Potential risks of flash floods caused by the violation of mountain lakes can be prevented by implementing measures to reduce the risk of flash floods. This requires the implementation of short- and long-term emergency actions. These include:

- 1) constant lowering of the critical level of the mountain lake by means of a siphon or pump;
- 2) construction of flood-retaining hydraulic structures;

- 3) construction of horizontal open or closed drainage in the dam body of the lake (in collapsible dams, extraglacial lakes);
- 4) strengthening the dam body of the lake with waterproofing (geomembrane, geotextile) ;
- 5) strengthening the bed and banks along the river by implementing hydraulic, agro-ameliorative and forestry measures. Emergency measures for flood prevention can affect the formation zone, transit zone, and accumulation zone of a flood flow, changing its magnitude and frequency characteristics. This can be achieved by reducing the probability of a flood flow (factor management) or controlling the flood flow itself (event management).

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