



As part of the CAREC project
“Sustainable Landscape Restoration in the Kyrgyz Republic”
(KG RESILAND)

D 3.1. COMPREHENSIVE REVIEW

of policies and measures to mitigate the effects of mudflows
and floods in Central Asia, *with an analysis of gaps*

BRIEF FOREWORD:

The RESILAND CA+ program is an umbrella program that brings together national projects in Kazakhstan, the Kyrgyz Republic, Tajikistan, Uzbekistan, and Turkmenistan. Its goal is to enhance the resilience of regional landscapes in Central Asia by (i) increasing the area under sustainable landscape management in selected locations in the Kyrgyz Republic; and (ii) promoting cooperation among Central Asian countries to restore transboundary landscapes.

To achieve these objectives, RESILAND projects in Kyrgyzstan, Tajikistan, and Uzbekistan fund the development of regional strategies and documents necessary for countries in the region to plan and implement joint efforts addressing transboundary landscapes and climate-related natural disasters of a transboundary nature.

The RESILAND project in the Kyrgyz Republic (hereinafter “KG RESILAND”) supports the development of *a Regional Roadmap for Mitigating the Impacts of Mudflows and Floods* (hereinafter “RRM”), including *an Investment Plan* (hereinafter referred to as the “IP”), which outlines the key steps necessary to mitigate the impacts of mudflows and floods in Central Asia, the estimated costs, and the main sources of funding.

This draft *D 3.1. Comprehensive Review of Policies and Measures for Mitigating the Impacts of Mudflows and Floods*, including a Gap Analysis, has been prepared and is presented as part of the Regional Roadmap for Mitigating the Impacts of Transboundary Mudflows and Floods.

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D 3.1. Comprehensive Overview of Policies and Measures to Mitigate the Impacts of Mudflows and Floods, with an Analysis of Gaps

PART 1:

A Brief Overview of Policies and Measures to Mitigate the Impacts of Mudflows and Floods in the Republic of Kazakhstan

Policies and measures to mitigate the effects *of mudflows and floods* in the Republic of Kazakhstan are implemented on the basis of legislation and other regulatory legal acts, as well as strategic and programmatic documents, within the framework of the State Civil Protection System (SCPS of the Republic of Kazakhstan)

The State Civil Protection System of the Republic of Kazakhstan is a nationwide system that unites the management bodies, forces, and resources of state agencies, local executive bodies, and organizations, designed to prevent and respond to emergencies and to protect the population and territories. This system is designed to perform functions related to the protection of the population, facilities, and territories of the Republic of Kazakhstan in the event of natural and man-made emergencies.

The planning and implementation of measures to mitigate the consequences *of mudflows and floods* are carried out by the Government of the Republic of Kazakhstan, state agencies, local executive bodies, and organizations within the scope of their authority, in accordance with the legislation of the Republic of Kazakhstan, in accordance with approved plans for protective and other urgent measures, as well as plans for the implementation of targeted and sectoral programs in the field of emergency prevention and response.

Funding for measures to mitigate the consequences *of mudflows and floods* is provided from the republican and local budgets within the limits of appropriations approved annually in accordance with the procedure established by law.

Competence of the Government of the Republic of Kazakhstan in the Field of Civil Protection ¹ *(selectively, only with regard to measures to mitigate the effects of mudflows and floods)*

- develops the main directions of state policy in the field of civil protection ...;
- approves concepts, strategies, and state and intersectoral programs ...;
- ensures the formation of state financial and material reserves and determines the procedure for their use ...;
- approves the list of republican civil defense services;
- decides on the deployment of professional emergency rescue services and units to respond to emergencies and their consequences ...;
- makes decisions on the financing of measures from the republican budget ...

The authorized state body in the field of civil defense (Ministry of Emergency Situations of the Republic of Kazakhstan) *(selectively, only with regard to measures to mitigate the consequences of mudflows and floods)*

The Ministry of Emergency Situations of the Republic of Kazakhstan is the central executive body of the Republic of Kazakhstan responsible for overseeing the prevention and response to natural and man-made emergencies, civil defense, fire and industrial safety, the formation and development of the state material reserve, ensuring the functioning and further development of the state civil protection system, and the organization of fire prevention and suppression, including measures to mitigate the consequences of cross-border mudflows and floods.

The functions of the Ministry of Emergency Situations of the Republic of Kazakhstan include **monitoring the mudflow and avalanche situation**² and providing **information on the mudflow and avalanche situation** to the relevant department of the authorized body, the Border Guard Service, and the National Hydrometeorological Service upon their request.

Central executive bodies in the field of civil protection *(selectively, only with regard to measures to mitigate the effects of mudflows and floods)*

Central executive bodies of the Republic of Kazakhstan, within the scope of their authority:

¹<https://adilet.zan.kz/rus/docs/Z1400000188>

²<https://adilet.zan.kz/rus/docs/V2500036244>

- shall develop, approve, and/or coordinate standards, normative technical documents, and regulations; maintain state sectoral records of natural and man-made emergencies; and submit this data to the authorized body;
- manage the services under their jurisdiction that monitor, control the situation, and forecast emergencies;
- develop and approve action plans for responding to global and regional emergencies in consultation with the authorized body;
- plan and provide funding for preventive measures ... within the limits of approved budget programs.

Competence of Local Executive Bodies in the Field of Civil Protection (*selective, limited to measures to mitigate the consequences of mudflows and floods*)

Local executive bodies carry out measures to prevent and respond to local-scale emergencies and their consequences within the territory of the relevant administrative-territorial unit.

The powers of local executive bodies in the field of civil protection include:

- informing the public and organizations about civil defense measures;
- ensuring, in accordance with approved budget allocations, the execution of the local budget for civil defense, the prevention and response to emergencies and their consequences;
- providing for the population's basic needs during emergencies;
- approving action plans for the response to local-scale emergencies and their consequences;
- allocating funds from the emergency reserve of local executive bodies for the prevention and response to natural and man-made emergencies and their consequences;
- developing and implementing measures to prevent emergencies, safeguard human life and health, protect material and cultural assets, and mitigate the consequences and minimize damage during emergencies.

Organizations in the field of Civil Protection: (*selectively, only with regard to measures to mitigate the consequences of mudflows and floods*)

- carry out measures to prevent and reduce the risks of mudflows and floods at designated facilities and in designated areas;
- develop and implement facility-specific civil protection plans and emergency response plans;
- ensure the maintenance and operation of protective and hydraulic structures in accordance with established procedures;
- participate in emergency rescue and urgent response operations during natural disasters;
- ensure the readiness of personnel, forces, and resources to respond to ...

The key strategic and programmatic documents, as well as regulatory and legal acts, pertaining to the mitigation of the consequences of mudflows and floods in the Republic of Kazakhstan are:

- 1) Law of the Republic of Kazakhstan No. 188-V 3PK of April 11, 2014, "On Civil Protection" ³;
- 2) Water Code of the Republic of Kazakhstan No. 178-VIII ZRK of April 9, 2025 ⁴;
- 3) Environmental Code of the Republic of Kazakhstan No. 400-VI ZRK of January 2, 2021 ⁵;
- 4) Resolution of the Government of the Republic of Kazakhstan No. 694 dated August 28, 2024, "On the Approval of the Comprehensive Plan for the Development of the Water Sector of the Republic of Kazakhstan for 2024–2028" ⁶;

³ [On Civil Protection – IPS "Adilet"](#)

⁴ [Water Code of the Republic of Kazakhstan - "Adilet" Legal Information System](#)

⁵ [Environmental Code of the Republic of Kazakhstan - IPS "Adilet"](#)

⁶ [On the Approval of the Comprehensive Plan for the Development of the Water Sector of the Republic of Kazakhstan for 2024–2028 – IPS "Adilet"](#)

- 5) Decree of the Government of the Republic of Kazakhstan No. 66 of February 5, 2024, “On the Approval of the Concept for the Development of the Water Resources Management System of the Republic of Kazakhstan for 2024–2030”⁷;
- 6) Resolution of the Government of the Republic of Kazakhstan No. 486 dated August 16, 2017, “On the Approval of Action Plans for the Response to Global and Regional Emergencies”⁸;
- 7) Order of the Minister of Water Resources and Irrigation of the Republic of Kazakhstan No. 115-NQ dated June 9, 2025 “On the Approval of the Rules for State Monitoring of Water Bodies and Water Resources”⁹;
- 8) Order of the Ministry of Internal Affairs of the Republic of Kazakhstan No. 945 dated December 26, 2014, “On the Approval of the Rules for Organizing the Civil Defense Warning System and Public Alert System...”¹⁰;
- 9) Order of the Ministry of Emergency Situations of the Republic of Kazakhstan No. 381 dated August 29, 2025, “On the Approval of the Rules for the Organization and Conduct of Evacuation Measures in Peacetime”¹¹;
- 10) Order of the Minister of Agriculture of the Republic of Kazakhstan No. 19-1/446 dated May 18, 2015, “On the Approval of the Rules for Establishing Water Protection Zones and Buffer Zones”¹²;
- 11) Order of the Minister of Water Resources and Irrigation of the Republic of Kazakhstan No. 173-NQ dated July 15, 2025, “On the Approval of the Regulations on the Safety of Hydraulic Structures”¹³;
- 12) Order of the Acting Minister of Water Resources and Irrigation of the Republic of Kazakhstan No. 169-NQ dated July 4, 2025 “On the Approval of the Rules for Inspecting the Technical Condition of Water Management and Hydraulic Structures”¹⁴;
- 13) Order of the Acting Minister of Agriculture of the Republic of Kazakhstan No. 746 dated December 5, 2008, “On the Approval of the Rules for the Operation of Water Management Structures Located Directly on Water Bodies”¹⁵;
- 14) Order of the Minister of Water Resources and Irrigation of the Republic of Kazakhstan No. 163-NQ dated June 30, 2025, “On the Approval of Model Rules for the Use of Water Resources in Reservoirs and Rules for the Technical Operation and Improvement of Reservoirs”¹⁶;
- 15) Joint Order of the Ministers of Emergency Situations, Industry and Infrastructure Development, and Ecology, Geology, and Natural Resources of the Republic of Kazakhstan “On the Approval of the ‘Roadmap for Flood Prevention Measures for 2021–2023’.”

The key government agencies responsible for mitigating the effects of mudflows and floods in the Republic of Kazakhstan are:

- 1) The Republican Operational Headquarters for the Response to Global or Regional Emergencies and Their Consequences¹⁷(ROH);
- 2) Ministry of Emergency Situations of the Republic of Kazakhstan¹⁸ (MES of the Republic of Kazakhstan);
- 3) The Emergency Prevention Committee of the Ministry of Emergency Situations of the Republic of Kazakhstan¹⁹ (EPC MES RK);
- 4) State Agency “Kazselezashchita” of the Ministry of Emergency Situations of the Republic of Kazakhstan²⁰;
- 5) Center for Strategic Planning and Operational Management of the Ministry of Emergency Situations of the Republic of Kazakhstan²¹ (CSPOM);
- 6) Ministry of Ecology and Natural Resources of the Republic of Kazakhstan²² (MENR);
- 7) State Enterprise “Kazhydromet” of the Ministry of Ecology and Natural Resources of the Republic of Kazakhstan²³;

⁷<https://adilet.zan.kz/rus/docs/P2400000066>

⁸ On the Approval of Action Plans for the Response to Global and Regional Emergencies – IPS “Adilet”

⁹<https://adilet.zan.kz/rus/docs/V2500036244>

¹⁰ On the Approval of the Rules for Organizing the Civil Defense Warning System and for Alerting the Public and Government Authorities During Emergencies in Peacetime and Wartime — IPS “Adilet”

¹¹ On the Approval of the Rules for Organizing and Conducting Evacuation Operations in Peacetime - IPS “Adilet”

¹² On the Approval of the Rules for Establishing Water Protection Zones and Buffer Zones — IPS “Adilet”

¹³ On the Approval of the Regulations on the Safety of Hydraulic Structures — IPS “Adilet”

¹⁴<https://adilet.zan.kz/rus/docs/V2500036413>

¹⁵ On the Approval of the Rules for the Operation of Water Management Structures Located Directly on Water Bodies — IPS “Adilet”

¹⁶ On the Approval of Model Rules for the Use of Water Resources in Reservoirs and Rules for the Technical Operation and Improvement of Reservoirs - IPS “Adilet”

¹⁷<https://adilet.zan.kz/rus/docs/U2500001062#z42>

¹⁸<https://www.gov.kz/memleket/entities/emer/about?lang=ru>

¹⁹<https://www.gov.kz/memleket/entities/kpchs/about?lang=ru>

²⁰<https://www.gov.kz/memleket/entities/emer/about/structure/organization/leadership/11447/1?lang=ru>

²¹<https://www.gov.kz/memleket/entities/emer/about/structure/departments/leadership/6794/1?lang=ru>

²² Issues of the Ministry of Ecology and Natural Resources of the Republic of Kazakhstan - IPS “Adilet”

²³<https://www.gov.kz/memleket/entities/ecogeo/about/structure/organization/leadership/32175/1?lang=ru>

- 8) Aerospace Committee of the Ministry of Artificial Intelligence and Digital Development of the Republic of Kazakhstan ²⁴ AC MAI-DR);
- 9) Committee on the Regulation, Protection, and Use of Water Resources of the Ministry of Water Resources and Irrigation of the Republic of Kazakhstan ²⁵ (CRPUWR MWRI)
- 10) Local Executive Bodies ²⁶ (hereinafter referred to as “LEBs”) ²⁷.

A brief analysis of existing policies, strategies, technologies, practices, research, and funding, as well as gaps and consequences in the implementation of measures to mitigate the effects of mudflows and floods in the Republic of Kazakhstan:

The Comprehensive Plan for the Development of the Water Sector of the Republic of Kazakhstan for 2024–2028 ⁽²⁸⁾ in the section concerning the mitigation of the effects of mudflows and floods, establishes the following:

Key importance is attached to the implementation of engineering measures, including the construction, reconstruction, and modernization of hydraulic, flood control, bank reinforcement, and mudflow protection structures aimed at protecting settlements, infrastructure facilities, and land resources.

The plan calls for improving the efficiency of water flow regulation and floodwater management by optimizing the operating regimes of water management facilities, thereby reducing peak loads during floods and minimizing potential damage.

Another key priority is the development of a system for monitoring and forecasting floods and mudflows, including the implementation of modern observation and analysis tools, as well as strengthening interagency cooperation in preventing and mitigating the consequences of water-related emergencies.

There are 13,366 hydraulic structures in the republic (of which 6,501 are owned by the republic, 6,306 by municipalities, 528 by private entities, and 31 are ownerless). Of the 1,502 retaining structures, 537 require repairs (52 owned by the republic, 429 by municipalities, 49 privately owned, and 7 abandoned).

Many of these structures were built in the 1960s and 1970s and have been in operation without reconstruction or major repairs for more than 30–50 years, making them high-risk facilities. Additionally, the effects of global climate change are negatively impacting water resources and hydrological cycles.

The comprehensive plan consists of 160 diverse measures, which are to be financed through national and local budgets, as well as extrabudgetary funds (funds from the balance sheet holder and international financial organizations, and private investments).

The total amount for the period 2024–2028 is 3,153,375.7 million tenge, of which 1,428,527.2 million tenge comes from the national budget, 367,650.0 million tenge from local budgets, and 1,357,198.5 million tenge from extrabudgetary sources.

Expected results regarding ...:

- 1) Multifactorial inspection of hydraulic structures (units per year): 2024 – 82 units, 2025 – 105 units, 2026 – 151 units, 2027 – 66 units, 2028 – 153 units;
- 2) Volume of ecological releases (thousand m³ per year): 2024 – 1,513,447.3 thousand m³, 2025 – 1,912,548.9 thousand m³, 2026 – 2,516,047.5 thousand m³, 2027 – 2,465,569.4 thousand m³, 2028 – 1,866,614.5 thousand m³;
- 3) Improvement in the condition of water bodies (units per year): 2024 – 56 units, 2025 – 24 units, 2026 – 6 units, 2027 – 7 units, 2028 – 11 units;
- 4) Number of hydrological stations (units per year): 2027 – 10 units, 2028 – 12 units.

Implementing these measures will reduce the risks and scale of floods and mudflows, minimize damage to populated areas and infrastructure, improve the manageability of water resources, and enhance the ecological condition of water bodies.

The Concept for the Development of the Water Resources Management System of the Republic of Kazakhstan for 2024–2030 ²⁹, in the section concerning the mitigation of the consequences of mudflows and floods, establishes the following:

In the area of national security, the priority areas of state policy under the Concept for the Development of the Water Resources Management System of the Republic of Kazakhstan for 2024–2030

²⁴<https://www.gov.kz/memleket/entities/kazcosmos?lang=ru>

²⁵<https://www.gov.kz/memleket/entities/kroivr-water/about?lang=ru>

²⁶<https://adilet.zan.kz/rus/docs/Z1400000188>

²⁷https://online.zakon.kz/Document/?doc_id=1021546&pos=1117;-46#pos=1117;-46

²⁸<https://adilet.zan.kz/rus/docs/P2400000694>

²⁹<https://adilet.zan.kz/rus/docs/P2400000066>

include improving water resources management, increasing the effectiveness of flood control measures, and strengthening systems for monitoring and forecasting hazardous hydrological processes.

Surface water accounts for the bulk of water resources, with a long-term average volume of 106 km³, of which 55.7% originates within the country's territory, while the remaining 44.3% comes from transboundary rivers flowing from China, Uzbekistan, Russia, and Kyrgyzstan, which significantly increases the importance of regulating transboundary flows for addressing the country's existing and potential water issues.

The Republic of Kazakhstan is highly dependent on transboundary water inflows: 7 out of 8 water management basins originate outside the country, with the Aral-Syr Darya, Zhayyk-Caspian, Shu-Talas, and Balkhash-Alakol basins being the most vulnerable.

Despite the existence of international agreements with Central Asian countries, the People's Republic of China, and the Russian Federation, there continues to be a decline in water flow, an increase in water abstraction in the upper reaches of rivers, and limited enforceability of contractual mechanisms. This leads to a steady decline in water availability and an increased risk of water shortages for the country's economy and population.

In this regard, the most vulnerable are the Aral-Syr Darya (91%), Zhayik-Caspian (82%), Shu-Talas (74%), and Balkhash-Alakol (48%) water management basins; the least vulnerable are the Tobyl-Torgay (12%) and Ertis (20%) water management basins.

Risk Analysis in the Area of Mitigating the Consequences of Mudflows and Floods

Threat	Causes	Possible consequences	Response and Mitigation Measures
<u>Floods</u>	Intense snowmelt and precipitation; insufficient river channel capacity; deterioration of <u>flood control structures</u> ; limited flow regulation	Flooding of settlements and infrastructure; property damage; disruption of aquatic ecosystems	Construction, reconstruction, and modernization of <u>flood control structures</u> ; optimization of reservoir operating regimes; development of monitoring and forecasting systems
<u>Mudflows</u>	Extreme precipitation in mountainous areas; degradation of slopes and riverbeds; absence or deterioration of <u>mudflow control structures</u>	Destruction of infrastructure; threat to human life; damage to water management facilities	Construction and reconstruction of <u>mudflow protection structures</u> ; engineering protection of areas; development of early warning systems
Accidents at Hydraulic Structures	Outdated design parameters; water flow exceeding design capacity; poor technical condition and improper operation	Secondary emergencies; large-scale damage; flooding of areas	Improving the reliability and resilience of hydraulic structures; modernizing spillway structures; strengthening operational oversight
Delayed public alerts	Insufficient density of the hydrological network; lack of automated systems; fragmented data	Increased human and economic losses; limited preparedness for response	Expansion of the observation network; automation of monitoring; implementation of early warning systems
Poor coordination of management	Fragmented departmental functions; lack of a unified digital platform	Delays in management decisions; reduced effectiveness of measures	Strengthening interagency cooperation; creation of a unified digital water risk management system

Implementation of this Concept will ensure a reliable water supply for the population and sectors of the national economy through sustainable and effective water resources management, reduce the risks and negative consequences of hazardous hydrological phenomena, and improve the ecological condition of water bodies.

The Emergency Response Plan for the Republic of Kazakhstan³⁰, in the section concerning the mitigation of the consequences of mudflows and floods, sets forth the procedure and sequence of actions for protection

³⁰<https://adilet.zan.kz/rus/docs/P1700000486>

the population and territories during floods and mudflows, including the monitoring and forecasting of hazardous hydrological and mudflow events, alerting and evacuating the population, mobilizing civil defense forces and resources, conducting emergency rescue and urgent response operations, as well as ensuring priority life-support services for the affected population.

Coordination of the plan's implementation is carried out by the authorized body—the Ministry of Emergency Situations of the Republic of Kazakhstan—in cooperation with central government and local executive bodies.

Prevention of mudflows, floods, and seasonal high water is carried out within the framework of the state civil defense and water resources management system and includes:

- organizing the monitoring and forecasting of hazardous hydrometeorological and mudflow events;
- implementation of engineering measures for the construction, reconstruction, and maintenance of flood control, bank reinforcement, and mudflow protection structures;
- regulation of water flow and reservoir operating regimes during periods of flood risk;
- the implementation and operation of early-warning and local public alert systems;
- coordination of actions by state agencies and local executive bodies in implementing preventive measures.

Measures taken in the event of a threat of or occurrence of mudflows and floods are carried out within the framework of the national civil defense system and include:

- monitoring and rapid forecasting of hydrometeorological and mudflow conditions, and identifying areas of potential impact;
- putting civil defense, emergency rescue, and engineering units on standby;
- alerting the public and government authorities and, if necessary, organizing evacuations from at-risk areas;
- regulating the operating modes of reservoirs and other hydraulic structures to reduce peak water discharge;
- conducting emergency rescue and urgent response operations, including reinforcing levees, clearing riverbeds, and diverting floodwaters;
- providing essential life-sustaining services to the affected population;
- coordinating the actions of central government agencies and local executive bodies under the leadership of the Ministry of Emergency Situations of the Republic of Kazakhstan.

Procedure for State Monitoring of Water Bodies and Water Resources in the Republic of Kazakhstan ³¹:

State monitoring of water bodies and water resources is a comprehensive system, provided by the state, for observation, measurement, collection, accumulation, storage, recording, systematization, summarization, processing, and analysis of data regarding indicators of the condition of water bodies.

General information provided in the event of a threat of or occurrence of floods and mudflows: (at the national level)

No .	Type of Information	Frequency	Organization Providing the information	Organizations – recipients
1	Reports and consultations on the accumulation of water reserves in river basins and forecasts of expected water levels during the flood and growing seasons	Annually (preliminary and main forecasts, with updates as needed)	National Hydrometeorological Service	Authorized civil protection agency, Command Center for Strategic Planning and Operational Management

³¹<https://adilet.zan.kz/rus/docs/V2500036244>

No .	Type of information	Frequency	Organization Providing the information	Organizations – recipients
2	Forecast of the timing of river ice break-up and the formation of ice phenomena	Annually (with updates as needed)	National Hydrometeorological Service	Authorized civil protection agency
3	Forecast of maximum water levels and <u>flood</u> discharge rates	Annually (with updates as needed)	National Hydrometeorological Service	Authorized civil protection agency, water management agencies
4	Daily hydrological data (water level, discharge, water temperature, ice conditions)	Daily (during the <u>flood</u> season and when there is a threat of an emergency)	National Hydrometeorological Service	Authorized civil protection agency, Command Center
5	Daily hydrological bulletins for the Republic of Kazakhstan	Daily (except weekends and holidays)	National Hydrometeorological Service	Authorized civil protection agency
6	Information on water and ice conditions on transboundary and major rivers	During the ice-up period—daily	National Hydrometeorological Service	Authorized civil protection agency
7	Forecasts of water inflow into reservoirs and actual inflow data	Monthly / daily during the <u>flood</u> season	National Hydrometeorological Service	Authorized civil protection agency, water management agencies
8	Information on water levels in major water bodies (including the Caspian Sea)	Monthly / daily in the event of a threat	National Hydrometeorological Service	Authorized civil protection agency

The Regulations on the Safety of Hydraulic Structures ⁽³²⁾ in the section concerning the mitigation of the consequences of mudflows and floods, establish the following:

Among the most significant natural hazards in the Republic of Kazakhstan are floods, mudflows, and the risk of flooding resulting from accidents at hydraulic structures. 400 hydraulic structures pose a potential threat in the event of a possible breach, threatening to flood over 530 settlements where more than 1.3 million people live ³³.

It should be noted that the main causes of accidents at hydraulic structures include their poor technical condition and inadequate maintenance, construction defects, and incorrect assessment of hydrological conditions during flood discharge, among others. In addition, there are unresolved issues regarding the regulatory framework and the provision of qualified personnel for the water management sector.

Evidence of this can be seen in the emergencies that have occurred in recent years at hydraulic structures across the country, namely the flood caused by a dam breach in the village of Kyzylagash (March 11–12, 2010), the erosion of the Kokpekty Reservoir dam in the Bukhar-Zhyrau District of the Karaganda Region (March 30, 2014), and others.

These emergencies highlight the need for systematic monitoring, the establishment of proper oversight to ensure the safety of hydraulic structures, and the improvement of the regulatory framework.

For reference: the largest dam and levee breaches in Kazakhstan:

- **Aktobe Region—1993:** *In the spring of 1993, Kazakhstan faced its largest flood. The dam of the Aktobe Reservoir burst. According to official data, 669 settlements were affected*

³²<https://adilet.zan.kz/rus/docs/V2500036459>

³³https://kaztag.kz/ru/news/400-gidrotekhssooruzheniy-okazalis-potentsialno-opasny-v-kazakhstane-v-zone-riska-i-astana?utm_source=chatgpt.com

localities, including 41 district centers and 11 cities. As a result of the disaster, 10 people died, 12,700 residents were evacuated, and about 30,000 were left homeless. In addition, 875 km of roads, 718 km of power lines, and other infrastructure were damaged.

- **Kyzylagash, Almaty Region – 2010:** On the night of March 12, 2010, a dam burst near the village of Kyzylagash in the Aksu District of the Almaty Region. As a result, 43 people were killed, including eight children, and another 300 were injured. Nearly 80% of the homes in the village were destroyed: a two-meter-high wave almost completely swept away 146 buildings, and 251 homes were severely damaged. The damage was estimated at over 8 billion tenge.
- **Karaganda Region – 2014:** On March 31, 2014, the dam of the Kokpektin Reservoir could not withstand the pressure of the water and collapsed. Five people were killed, and about a hundred homes were flooded. Property damage was estimated at 87.6 million tenge.
- **Akmola Region – 2017:** In the city of Atbasar in the Akmola Region, a dam burst in four places. The flooding was caused by the collapse of an earthen dam near a railroad bridge as a result of snowmelt. Homes in the immediate vicinity of the bridge were submerged.
- **North Kazakhstan Region – 2017:** Heavy rains and snowfall in the fields led to a significant influx of water into the Sergeevskoye Reservoir. The water level over the reservoir's crest reached a record 3 meters 38 centimeters, surpassing all previous records since its construction in 1968. As a result of these natural phenomena, 140 residential buildings and 274 yards in 22 settlements were flooded in the Karaganda Region.
- **Turkistan Region –** On May 1, 2020, one of the dams at the Sardob Reservoir burst, flooding an area of 610 km². As a result of the emergency, several settlements were flooded, roads were destroyed, and 70,000 people were evacuated in Uzbekistan and 30,000 in Kazakhstan. This totaled five villages in the Maktaaral District.
- **Almaty Region – 2024:** On March 30, the dam of the Voroshilov Reservoir in the Almaty Region burst. As a result, the basins of two lakes located downstream along the Jarmukhamet River were filled, and consequently, two settlements—home to over 12,000 people—were threatened with flooding.

Year	Event / Region (Type)	Fatalities	Evacuated / Injured	Comment / Source
2010	Kyzyl-Agash Dam Failure (Zhetysu/Jambyl District) — breach/flood	43	211 people affected, 1,000 evacuated	Details: investigation and reports; see English Wikipedia and media sources. Wikipedia
2011	Flood (West Kazakhstan and others) — <u>flash flood</u>	2	≈16,000 affected (according to regional reports)	Regional reports/overviews. The Astana Times
2014	<u>Floods</u> (Karaganda Region, etc.) — <u>flooding</u>	5	local casualties; damage	Media/historical overviews <u>floods</u> . The Astana Times
2018	Floods (East Kazakhstan and others) — <u>flooding</u>	—	Hundreds left homeless / affected	Regional reports and media. The Astana Times
2023	Local flooding (several regions) — <u>flooding</u>	—	local evacuations / damage	Regional reports / Media. The Astana Times
2024	Widespread spring floods across the country (affecting multiple regions) — <u>floods</u> / dam breaches	-	Tens of thousands of homes damaged; damage amounts to tens to hundreds of billions of tenge	Operational reports from the Ministry of Emergency Situations, Reuters, ReliefWeb, ACAPS, and UN/UNDP overviews. Reuters+2reliefweb.int+2

Areas prone to hazardous hydrological events

No	Name of region, city	River basin
1	Akmola Region	Nura and Esil
2	Aktobe Region	Ilek, Wil, Hobda, Temir, Irgiz, Or, Lake Aike
3	Almaty Region	Ili, Esik, Turgen, Shamalgan, Karatal, Sarkan, Tenteq, Aksu, Lepsy, Burhan, Borokhudzir, Usok
4	Almaty	Bolshaya and Malaya Almatinka, the Esentay River, and the small rivers

		Bedelbay, Batarayka, and Butakovka
5	Astana	Esil
6	Atyrau Region	Ural, Kigach, Sagiz, Uil, Emba
7	East Kazakhstan Region	Arasan, Chernaya Kaba, Bukhtyrma, Maralika, Kurchum, Ulba
8	Jambyl Region	Merkenka, Aspara, Taldy-Bulak, Tuzu-Surat, Molaly, Karakonuz, Rgaiti, Shu, Aksu, Korgaty, Ters, Aksai, Koksai, Karakistak, Kokdonen, Asa, Talas
9	West Kazakhstan Region	Ural, Chagan, Derkul, Olenty, Kaldygyty, Utva, Chizha-1, Chizha-2, Ilek, Shiderty, Bolshoy and Maly Uzen
10	Karaganda Region	Nura, Sarysu, Sherubainura, Ulkenkundyzdy, Akbastau, Matak, Ashchisu, Sokyr, Esen
11	Kostanay Region	Torgay, Karatorgay, Sarytorgay, Zhelkuar,
12	Kyzylorda Region	Syr Darya

To prevent natural disasters, the Regulations on the Safety of Hydraulic Structures establish requirements for ensuring the reliable and safe operation of hydraulic structures, including their classification by hazard level, conducting regular inspections and monitoring their technical condition, assessment and management of accident risks, compliance with operating procedures, as well as the implementation of preventive and protective measures to avert the negative effects of water and minimize the potential consequences of accidents.

Rules for Organizing the Civil Defense and Public Alert System and Notifying the Public and Government Authorities During Emergencies ³⁴

Effective early warning and public alert systems ensure the collection, processing, and analysis of data using modern technologies, including satellite monitoring, hydrometeorological and seismic systems, which enable the real-time identification of potential threats and ensure the timely dissemination of alerts and information regarding threats or the occurrence of emergencies to the public and civil defense authorities.

The Republic of Kazakhstan has established a basic hydrometeorological monitoring system comprising 367 hydrological stations and an extensive network of meteorological stations of various types, which enables the monitoring of major water bodies and atmospheric processes throughout the country.

In mountainous areas, where approximately 970 moraine-glacial lakes are concentrated, a limited automated mudflow monitoring system (31 stations) is in operation; this system has been implemented primarily in the Almaty region and has proven its effectiveness through remote monitoring and real-time assessment of the risk of dam breaches.

At the same time, most other mountainous regions of Kazakhstan lack automated monitoring systems for mudflows, landslides, and avalanche hazards, which reduces the level of early threat detection.

Monitoring and forecasting of hazardous natural phenomena are carried out by specialized scientific and research-production organizations that provide seismic, hydrological, glaciological, and remote observations, including the National Scientific Center for Seismic Observations and Research of the Ministry of Emergency Situations of the Republic of Kazakhstan, the Institute of Geophysical Research under the Ministry of Energy of the Republic of Kazakhstan, Kazvodkhoz, the Central Asian Regional Glaciological Center, the National Center for Space Research and Technologies under the Ministry of Science and Innovation of the Republic of Kazakhstan, and Kazavialesoohrana; however, the current system is fragmented and requires further development, integration, and territorial expansion.

Timely information and alerts to the public are ensured through a set of measures, including the activation of electric sirens and siren-announcement devices, the interception of television and radio broadcasts, sending SMS messages, posting information on government websites and in mobile apps, as well as the use of emergency response vehicles.

The Atlas of Natural and Man-Made Hazards and Emergency Risks, in the section concerning the mitigation of the consequences of mudflows and floods, establishes the following:

- Mudflows and floods are classified as among the most dangerous natural threats, characterized by a high probability of occurrence and significant damage to the population, infrastructure, and economy, especially in the mountainous and foothill regions of the Republic of Kazakhstan;

³⁴<https://adilet.zan.kz/rus/docs/V14C0010151>

- Areas of increased risk *of mudflows and floods* have been identified, taking into account hydrological, climatic, geomorphological, and anthropogenic factors;
- The need to prioritize the implementation of measures for the engineering protection of territories, the development of monitoring and forecasting systems, and the improvement of early warning mechanisms for the population in areas of potential impact has been emphasized.

The atlas is a scientifically grounded tool for spatial risk analysis used to inform management decisions in the field of civil protection and disaster risk reduction:

Tools for spatial risk analysis:

- Comprehensive—combines cartographic data, statistics, and analytical assessments;
- Cartographic — contains thematic maps of hazards and risks across the territory of the Republic of Kazakhstan;
- risk-oriented — reflects not only the types of hazards but also risk levels, taking into account probability and consequences;
- applied — intended for use by government agencies in planning emergency prevention and mitigation measures, spatial planning, and the development of monitoring and warning systems;
- interdisciplinary—covers natural and man-made threats, including *floods, mudflows*, earthquakes, landslides, and accidents at gas transmission systems and industrial facilities.

As part of the implementation of the Republic of Kazakhstan’s conceptual and programmatic documents on protecting the population and territory of the Republic of Kazakhstan from emergencies, the following has been established regarding the mitigation of the consequences *of mudflows and floods*:

To reduce risks, priority measures include the development of monitoring and early warning systems, the modernization and safe operation of hydraulic and protective structures, the implementation of climate-oriented building codes, the restriction of economic activities in high-risk zones, as well as the application of nature-based solutions and the enhancement of the preparedness of government agencies and the public to respond to emergencies.

To mitigate the consequences *of mudflows and floods* and improve the effectiveness of forecasting, the following measures are envisaged as part of the implementation of policy documents:

- the standardization and implementation of uniform regulations, methodologies, and standard forms (formats) for the preparation, processing, and presentation of monitoring and forecast information on natural disasters, including *mudflow and flood hazards*, as well as the risks of breaches in high-altitude and reservoir lakes and hydraulic structures, taking into account forecasting timeframes and methods;
- the conduct by authorized state bodies, agencies, and specialized organizations of comprehensive work to implement unified approaches to the collection, analysis, and exchange of data on the monitoring and forecasting of hazardous natural processes;
- developing a Unified System for Comprehensive Monitoring and Forecasting of Emergencies based on the modernization of observation networks, the introduction of automated and remote observation tools, as well as the integration of digital platforms and geographic information systems.

Implementing these measures will ensure the timely identification of threats, improve the accuracy of forecasts, and enable the prompt notification of government agencies and the public—a key prerequisite for reducing risks and mitigating the consequences of *mudflow and flood* emergencies in the Republic of Kazakhstan.

PART 2:

A Brief Overview of Policies and Measures to Mitigate the Impacts of Mudflows and Floods in the Kyrgyz Republic

Policies and measures to mitigate the effects *of mudflows and floods* in the Kyrgyz Republic are implemented on the basis of legislative and regulatory legal acts, strategic and programmatic documents, and within the framework of the State Civil Protection System (SCPS of the Kyrgyz Republic)

The State Civil Protection System of the Kyrgyz Republic is a nationwide system comprising administrative bodies, forces, and resources of state agencies, local self-government bodies, public associations, and volunteer organizations of the Kyrgyz Republic, which performs functions to protect the population and territory of the Kyrgyz Republic during emergencies.

The planning and implementation of measures to mitigate the consequences *of mudflows and floods* are carried out by state agencies, authorized representatives of the Government of the Kyrgyz Republic in the regions, the city administrations of Bishkek, Osh, local state administrations, local self-government bodies, and organizations in accordance with plans for protective and other urgent measures, plans for the implementation of targeted and scientific-technical programs, and measures to prevent emergencies.

Funding for measures to mitigate the consequences *of mudflows and floods* is provided for in the budgets of state agencies, local state administrations, and local self-government bodies within the limits of the funds allocated in the annually approved budgets.

Organizational and methodological guidance for planning measures to mitigate the effects *of mudflows and floods* is provided by the authorized state body in the field of civil protection—the Ministry of Emergency Situations of the Kyrgyz Republic.

Cabinet of Ministers of the Kyrgyz Republic ³⁵: *(selectively, only with regard to measures to mitigate the effects of mudflows and floods)*

- approves concepts, strategies, and programs...;
- organizes the development and conduct of scientific research and the implementation of special programs...;
- ensures the creation of state financial and material reserves and determines the procedure for their use...;
- resolves issues related to financing from the republican budget...

The authorized state body in the field of civil protection (Ministry of Emergency Situations of the Kyrgyz Republic): *(selectively, only with regard to measures to mitigate the effects of mudflows and floods)*

- collects and processes information in accordance with established procedures..., as well as facilitates the exchange of information;
- coordinates and carries out measures to prevent emergencies and reduce disaster risk;
- organizes the development and implementation of concepts, strategies, and targeted programs in the field of civil protection;
- carries out special preventive and response measures, emergency recovery operations, and other measures to protect the population and territories;
- organizes the operation of a comprehensive system for monitoring and forecasting natural, man-made, and other hazards;
- coordinates and ensures the well-being of the population, as well as the activities of international organizations and participants in the National Platform for Disaster Risk Reduction within the territory of the Kyrgyz Republic;
- establishes and maintains in a state of constant readiness the Unified Information and Management System of the Kyrgyz Republic for emergencies and crisis situations, as well as a warning system regarding the threat of or occurrence of emergencies.

Ministries, state committees, and administrative agencies: *(selectively, only with regard to measures to mitigate the consequences of mudflows and floods)*

- develop and implement plans...;
- develop and implement organizational and engineering-technical measures to enhance the resilience of the sector's operations...;
- provide for the financing, from the national budget and their own funds, of measures to prevent emergencies and to carry out emergency rescue and other urgent operations during emergencies;
- implement measures aimed at preserving facilities necessary for the sustainable functioning of the economy and protecting the population...;

³⁵<https://cbd.minjust.gov.kg/4-2596/edition/1240722/ru>

- carry out activities to monitor and forecast natural and man-made processes in their respective fields...;
- take measures to prevent and mitigate the consequences of emergencies occurring at facilities under their jurisdiction...;
- develop and communicate to organizations industry-specific requirements and regulatory legal acts regarding the prevention and response to emergencies, as well as the protection of employees and the public....

Authorized representative offices of the Government of the Kyrgyz Republic in the regions and local state administrations: *(selectively, only with regard to measures to mitigate the consequences of mudflows and floods)*

- develop and implement plans...;
- carry out activities within their jurisdiction to monitor, forecast, and assess disaster risks and prevent emergencies in coordination with the authorized state body in the field of civil protection;
- ensure the timely notification of the public regarding the threat of or occurrence of emergencies;
- take measures to prevent and mitigate the consequences of emergencies occurring at facilities and within territories under their jurisdiction;
- annually allocate funds in the republican budget

Local government bodies: *(selectively, only with regard to measures to mitigate the effects of mudflows and floods)*

- develop and implement plans...;
- carry out activities within their jurisdiction to forecast and assess disaster risks and prevent emergencies;
- take comprehensive measures in a timely manner to relocate the population from potentially hazardous areas;
- in cooperation with the authorized state agency in the field of civil defense, ensure the timely notification of the population regarding the threat of or the occurrence of emergencies;
- take measures to prevent and mitigate the consequences of emergencies occurring at facilities and in territories under their jurisdiction;
- allocate funds in the local budget for civil protection activities;

Civil Defense Organizations: *(selectively, only with regard to measures to mitigate the effects of mudflows and floods)*

- ✓ develop and implement plans...;
- ✓ at potentially hazardous facilities, carry out activities to monitor, forecast, and assess disaster risks;
- ✓ carry out measures to prevent emergencies and ensure the sustainable operation of organizations;
- ✓ establish warning systems and ensure their reliable operation in the event of emergencies;
- ✓ immediately inform civil defense authorities and the public about the threat of and occurrence of an emergency;
- ✓ take measures to prevent and mitigate the consequences of emergencies on the premises of their facilities;
- ✓ if necessary, upon a decision by the Civil Protection authority, provide vehicles, tools, and equipment owned by the organization to carry out tasks related to protecting the population and territory from emergencies.

The key strategic and programmatic documents, as well as regulatory and legal acts, pertaining to the mitigation of the consequences of *mudflows and floods* in the Kyrgyz Republic are:

- 1) Law of the Kyrgyz Republic “On Civil Protection”³⁶;
- 2) Law of the Kyrgyz Republic “On Hydrometeorological Activities in the Kyrgyz Republic”³⁷;
- 3) National Development Program of the Kyrgyz Republic through 2026³⁸, including the Action Plan for the Implementation of the National Program;
- 4) The National Development Program of the Kyrgyz Republic through 2030³⁹, including the Action Plan for the Implementation of the National Program;
- 5) State Program for the Comprehensive Socio-Economic Development of the Regions of the Kyrgyz Republic for 2025–2030⁴⁰, including the Action Plan for the Implementation of the State Program;
- 6) Concept for the Comprehensive Protection of the Population and Territory of the Kyrgyz Republic from Emergencies for 2018–2030⁴¹, including Action Plans for the implementation of the Concept;
- 7) Resolution of the Government of the Kyrgyz Republic on the Establishment of a Unified System for Comprehensive Monitoring and Forecasting of Emergencies in the Kyrgyz Republic⁴²;
- 8) Procedures for Information Exchange Among Participants in the Unified System for Comprehensive Monitoring and Forecasting of Emergencies in the Kyrgyz Republic⁴³;
- 9) Procedures for the Analysis and Assessment of Risks Associated with Emergencies (Disasters)⁴⁴;
- 10) Concept for the Development of the Unified System for Comprehensive Monitoring and Forecasting of Emergencies in the Kyrgyz Republic through 2030⁴⁵, including the Action Plan for Implementing the Concept;
- 11) Decree of the President of the Kyrgyz Republic “On Urgent Measures to Reduce the Risks of Emergencies in the Kyrgyz Republic for 2025–2030”⁴⁶;
- 12) Action Plan for Reducing the Risks of Emergencies in the Kyrgyz Republic for 2025–2030⁴⁷;
- 13) Procedures for Assessing Damage Caused by Emergencies or Accidents and for Systematizing the Recording of Such Damage⁴⁸;
- 14) Procedures for carrying out measures to mitigate the consequences of emergencies or extraordinary incidents and for recovery work⁴⁹;
- 15) The Kyrgyz Republic’s National Adaptation Plan through 2030, including the Action Plan for Implementing the Kyrgyz Republic’s National Adaptation Plan;

The key government agencies responsible for mitigating the effects of *mudflows and floods* in the Kyrgyz Republic are:

- 1) Ministry of Emergency Situations of the Kyrgyz Republic⁵⁰ (*MES of the Kyrgyz Republic*);
- 2) The Hydrometeorological Service under the Ministry of Emergency Situations of the Kyrgyz Republic⁵¹ (*hereinafter referred to as “Kyrgyzhydromet”*);
- 3) Department for Monitoring and Forecasting of Emergencies⁵² (*hereinafter referred to as the “Department for Monitoring and Forecasting of Emergencies under the Ministry of Emergency Situations of the Kyrgyz Republic”*);
- 4) The “Flood Protection” Service under the Ministry of Emergency Situations of the Kyrgyz Republic⁵³ (*hereinafter referred to as the “Flood Protection Service” under the Ministry of Emergency Situations of the Kyrgyz Republic*);

³⁶<https://cbd.minjust.gov.kg/4-2596/edition/1240722/ru>

³⁷<https://cbd.minjust.gov.kg/1950/edition/1261189/ru>

³⁸<https://cbd.minjust.gov.kg/430700/edition/13462/ru>

³⁹<https://cbd.minjust.gov.kg/5-10884/edition/32868/ru?lang=ru>

⁴⁰<https://cbd.minjust.gov.kg/7-39650/edition/29066/ru?lang=ru>

⁴¹<https://cbd.minjust.gov.kg/11990/edition/1205614/ru>

⁴²<https://cbd.minjust.gov.kg/157218/edition/3488/ru>

⁴³<https://cbd.minjust.gov.kg/157219/edition/3490/ru>

⁴⁴<https://cbd.minjust.gov.kg/157230/edition/3491/ru>

⁴⁵<https://cbd.minjust.gov.kg/230026769/edition/31767/ru>

⁴⁶<https://cbd.minjust.gov.kg/5-10842/edition/27827/ru?lang=ru>

⁴⁷<https://cbd.minjust.gov.kg/44-163/edition/37309/ru?lang=ru>

⁴⁸<https://cbd.minjust.gov.kg/50-522/edition/3358/ru>

⁴⁹<https://cbd.minjust.gov.kg/50-523/edition/3359/ru>

⁵⁰<https://cbd.minjust.gov.kg/158694/edition/35521/ru>

⁵¹<https://cbd.minjust.gov.kg/158705/edition/1123285/ru>

⁵²<https://cbd.minjust.gov.kg/158695/edition/2823/ru>

⁵³<https://cbd.minjust.gov.kg/158698/edition/1123271/ru>

- 5) Crisis Management Center under the Ministry of Emergency Situations of the Kyrgyz Republic ⁵⁴ (hereinafter referred to as the CMC under the Ministry of Emergency Situations of the Kyrgyz Republic)
- 6) Service for the Prevention and Mitigation of the Consequences of Emergencies under the Ministry of Emergency Situations of the Kyrgyz Republic ⁵⁵ (hereinafter referred to as the “Service for the Prevention and Mitigation of the Consequences of Emergencies under the Ministry of Emergency Situations of the Kyrgyz Republic”);
- 7) Ministry of Water Resources, Agriculture, and Processing Industry of the Kyrgyz Republic ⁵⁶ (hereinafter referred to as the “Ministry of Water Resources, Agriculture, and Processing Industry”);
- 8) Water Resources Service under the Ministry of Water Resources, Agriculture, and Processing Industry of the Kyrgyz Republic ⁵⁷ (hereinafter referred to as the “WRS under the MWRAI”);
- 9) Ministry of Natural Resources, Ecology, and Technical Supervision of the Kyrgyz Republic ⁵⁸ (hereinafter referred to as the “MNRESTS of the Kyrgyz Republic”);
- 10) Authorized Representative Offices of the Government of the Kyrgyz Republic in regions and local state administrations ⁵⁹ (hereinafter referred to as “Local State Administrations”);
- 11) Local self-government bodies ⁶⁰ (hereinafter referred to as “LSGBs”).

A brief analysis of existing policies, strategies, technologies, practices, research, and funding, as well as gaps and consequences in the implementation of measures to mitigate the effects of mudflows and floods in the Kyrgyz Republic:

The National Development Program of the Kyrgyz Republic through 2026 ⁶¹, in the section concerning the mitigation of the effects of mudflows and floods, establishes the following:

Addressing disaster risk reduction in the context of a changing climate must be comprehensive, taking into account future threats and hazards, as well as the development of new forecasting and response methods.

Implementation of protective measures in potentially hazardous border areas along the Chu River in the Kyrgyz Republic through the allocation of targeted funds from the national budget for work on 15 sites along the Chu River (3 sites per year). Indicator/expected result: protection of residential buildings, border markers, the Bishkek–Naryn–Torugart highway, and agricultural land along the border with the Republic of Kazakhstan.

Within the framework of the national budget and extrabudgetary funding sources, provisions have been made for emergency restoration work, capital construction, and special preventive and mitigation measures in potentially hazardous areas of the republic. Indicator/Expected Result: Protection of residential buildings/agricultural land (ha): 2022 – 14,700/4,500; 2023 – 15,200/4,760; 2024 – 16,600/5,100; 2025 – 16,900/5,440; 2026 – 17,500/6,720.

Enhancing the resilience of water resources to climate change and natural disasters.

The National Development Program of the Kyrgyz Republic through 2030 ⁶², in the section concerning the mitigation of the effects of mudflows and floods, establishes the following:

In the area of national security: priority areas will include... improving the early warning and rapid response system for emergencies.

State policy on disaster risk reduction will be aimed at strengthening the national disaster risk management system, modernizing infrastructure, and enhancing the resilience of mountainous areas and economic facilities. This will reduce vulnerability to natural disasters and man-made risks.

The targets for disaster risk reduction are defined as follows:

- 1) establishing a national early warning system for natural disasters;
- 2) achieving 100% participation of local authorities in adopting and implementing local disaster risk reduction strategies in accordance with the National Disaster Risk Reduction Strategy;

The key tasks in the areas of disaster risk reduction and emergency response and recovery will be:

- implementation of the Concept for the Development of a Unified System for Comprehensive Monitoring and Forecasting of Emergencies in the Kyrgyz Republic through 2030;

⁵⁴<https://cbd.minjust.gov.kg/158703/edition/19735/ru>

⁵⁵<https://cbd.minjust.gov.kg/158696/edition/2992/ru>

⁵⁶<https://cbd.minjust.gov.kg/230004108/edition/5875/ru>

⁵⁷<https://cbd.minjust.gov.kg/230004109/edition/37629/ru>

⁵⁸<https://cbd.minjust.gov.kg/158727/edition/1642/ru>

⁵⁹<https://cbd.minjust.gov.kg/4-3095/edition/17196/ru>

⁶⁰<https://cbd.minjust.gov.kg/4-3095/edition/17196/ru>

⁶¹<https://cbd.minjust.gov.kg/430700/edition/13462/ru>

⁶²<https://cbd.minjust.gov.kg/230027913/edition/32963/ru>

- improving infrastructure resilience by constructing and reinforcing engineering structures;
- conducting a large-scale inventory of facilities and structures designed to protect against mudflows and floods, as well as revising design and construction standards for water-discharge and water-control structures;
- introducing a mechanism for long-term investment in green forest plantations in the foothills and agroforestry in river floodplains to reduce land degradation and mudflow risk;
- improving the insurance system to cover damages and implementing a mechanism for recovery after natural disasters;
- establishing a monitoring system for hydraulic structures;
- modernizing and expanding observation networks for monitoring and forecasting natural disasters, including through the implementation of the latest technologies and digital platforms;
- developing an early warning system based on the implementation of digital technologies and the automation of public alert systems;
- strengthening cooperation with international organizations and securing grant and donor funding to implement projects aimed at reducing the risks of natural disasters;
- Establishing a monitoring system based on the national climate statistics currently being developed, as well as a national monitoring, reporting, and verification (MRV) system;
- expanding research on climate risks, adaptation, and mitigation of the effects of climate change;

The State Program for the Comprehensive Socio-Economic Development of the Regions of the Kyrgyz Republic for 2025–2030, in the section concerning the mitigation of the effects of mudflows and floods, establishes the following:

Growing demand for water and inefficient water use are placing an increasing burden on existing water resource management.

Between 2013 and 2022, 1,480 emergencies of various kinds were officially recorded in the republic; the number of people killed, missing, and injured reached 3,444 (including 1,356 due to the COVID-19 pandemic); direct economic losses from disasters totaled 13.336 billion som (0.22 percent of GDP).

By type, the emergencies recorded during this period, listed in descending order, are as follows: mudflows and flash floods, avalanches, major fires, strong winds, major traffic accidents, earthquakes, landslides, flooding associated with rising groundwater levels, and others.

Unaccounted-for losses and damage stem from the fact that the Kyrgyz Republic continues to employ a multi-agency approach to studying natural and man-made hazards, and there is no systematic recording and analysis across all sectors, which prevents full coverage of risks.

The problem of recording and analyzing data is particularly acute with regard to hazardous hydrometeorological phenomena and natural processes, as well as man-made and biosocial hazards, which have not actually led to severe emergencies and have not been classified as insured events.

The heterogeneity and independence of information systems from crisis and emergency situations hinder their interoperability and increase the overall financial costs of IT integration and operation.

Operational efficiency is reduced; ultimately, such a “patchwork” approach to the informatization of crisis management is very costly for the state and fails to ensure a further reduction in the level of potential negative socioeconomic and political consequences.

Emergencies must be viewed as a cross-cutting issue that permeates all sectors of the economy and areas of development and touches upon a wide range of issues related to hazardous processes and phenomena of a geophysical, natural, man-made, social, and conflict-related nature.

Strategic development planning and the formulation of corresponding budgets at the local and regional levels must include measures for monitoring, forecasting, prevention, and preparedness for emergency response.

The Kyrgyz Republic’s National Adaptation Plan through 2030, in the section concerning the mitigation of the consequences of mudflows and floods, establishes the following:

Currently, the country is experiencing serious negative consequences of climate change—the number of natural disasters is increasing, soil fertility and agricultural yields are declining, ecosystems—especially pastures—are degrading, glaciers are melting at an accelerated rate, and there are noticeable changes in surface river runoff, leading either to early flooding or to water shortages for drinking water supply and agriculture during the growing season.

Mountainous areas have proven to be particularly vulnerable, primarily due to accelerated glacial melting, water shortages, and an increase in the frequency of natural disasters such as floods, mudflows, and landslides, which destroy infrastructure and threaten human lives.

To prevent soil degradation caused by changes in precipitation patterns, resources should be invested in soil protection, and water-conserving technologies should be developed.

People's livelihoods and the economy have been negatively affected by increased vulnerability to hazards such as droughts, mudflows, and floods, as well as changes in the onset of seasons, timing, and availability of water.

Emergencies and Infrastructure (natural disasters such as floods, mudflows, and hurricane-force winds increase recovery costs and heighten the vulnerability of critical infrastructure, especially in mountainous regions);

Floods and mudflows—risk index: 0.70. Geographic impact: Pose a threat to mountainous areas and the Jalal-Abad, Issyk-Kul, and Osh regions. Priority measures: Strengthening infrastructure, monitoring, and educating the population to minimize damage from floods and mudflows.

Ecosystem degradation and reduced productivity: Threats are associated with a decline in water resources, degradation of pastures, and disruption of ecosystem functions.

Floods and mudflows pose serious climate threats to the Kyrgyz Republic, especially given its mountainous terrain and vulnerability to changes in precipitation patterns and glacial melting.

Torrential rains play a major role in the formation of mudflows in the country—70–80% of mudflows are caused by torrential rains; snowmelt accounts for up to 15% of mudflows; and mudflows resulting from the melting of seasonal snow and glaciers, as well as from the bursting of mountain lakes, account for 10–13%.

Direct and indirect losses from floods and mudflows are significant and include crop losses, infrastructure damage, disruptions to production and trade, as well as increased costs for the recovery and support of those affected.

Over the past 10 years, the country has recorded more than 4,000 emergencies, nearly a third of which were related to mudflows and floods.

Property damage exceeded 15 billion soms. In 2024, compared to 2023, the number of mudflows increased by 500%, and the total losses rose by 803%.

Overall, there are more than 10,000 hazardous areas in the Kyrgyz Republic where mudflows and flash floods may occur.

According to experts' estimates, by 2050, the number of mudflows and floods over the five-year period from 2045 to 2050 will increase by 40 incidents compared to the corresponding figure for the period from 2020 to 2024.

Floods and mudflows damage roads, bridges, and power lines, hindering the movement of people and goods and complicating the delivery of emergency services in flooded areas.

Floods and mudflows threaten human lives, especially in mountainous and riverine areas. To ensure safety, it is often necessary to evacuate the population, which requires significant resources.

Recovery from floods and mudflows is costly and requires both time and financial resources, which can place a significant burden on the country's budget.

Sudden floods and mudflows inundate agricultural land, leading to crop loss, especially in areas with dense agricultural development.

Loss of topsoil: Mudflows erode the soil, washing away the topsoil and leaving behind coarse deposits of rocks and mud, which hinders agricultural recovery, reduces soil fertility, and leads to crop failure.

Following floods and mudflows, there is an increase in infectious diseases, as flooded areas become sources of contaminated water, which contributes to the spread of intestinal infections.

Mudflows and floods increase the risk of injuries among the population, particularly in areas where resources for rapid evacuation and the provision of medical care are limited.

Floods and mudflows overwhelm the healthcare system, requiring an increase in the number of healthcare workers and resources to treat victims and prevent the spread of infections. Preparing healthcare facilities and developing evacuation and victim assistance plans for floods and mudflows will help reduce the risks of negative consequences.

Mudflows and floods destroy the natural landscape, causing soil erosion and the destruction of ecosystems, which leads to a decline in biodiversity. Floods carry large amounts of sediment and debris, which degrades water quality in rivers and lakes, disrupts aquatic ecosystems, and poses a threat to fisheries. Planting trees and restoring natural barriers along slopes and rivers is essential for preventing erosion and reinforcing riverbanks.

Floods and mudflows can force people to relocate, placing a burden on host regions and requiring significant funds to rebuild housing and infrastructure. Restricting construction in high-risk areas and relocating housing and critical infrastructure away from potentially hazardous areas reduces the vulnerability of the population.

The current National Action Plan of the Kyrgyz Republic (NAP KR) states that floods and mudflows require a comprehensive approach to risk management; therefore, the following steps are deemed necessary:

- Establishing and improving monitoring systems for floods and mudflows that will enable the prompt notification of the population about risks.
- Updating construction standards for the construction and modernization of dams, reinforcing riverbanks, and developing infrastructure to contain and divert water flows, taking into account climate change scenarios.
- Conducting specialized training for doctors and medical staff on responding to emergencies and developing telemedicine.

To effectively manage climate change processes, the institutional landscape must have clearly defined functions, including coordination among all stakeholders and levels of participation, as well as the resources and authority necessary to ensure a systematic approach to adaptation and mitigation of climate impacts.

In the Kyrgyz Republic, a successful climate policy requires a well-organized institutional landscape and coordination among all stakeholders.

A comprehensive review of existing building codes and regulations is needed to incorporate climate standards that account for risks specific to the Kyrgyz Republic, such as mudflows, flash floods, landslides, and extreme temperatures.

This will help reduce the vulnerability of new construction projects to natural disasters. As part of this process, it is important to establish fiscal mechanisms, including tax incentives for developers who comply with the new sustainable standards. This will not only encourage the use of energy-efficient and environmentally friendly materials but also set precedents for attracting investment in sustainable infrastructure, which will ultimately provide long-term financial benefits for the state and society as a whole.

Alongside domestic resources, fiscal instruments can be aimed at attracting international investment financing and private-sector participation. Establishing tax incentives and simplified conditions for foreign investors and organizations involved in adaptation projects will help attract international funds and technologies, thereby expanding the overall financial base for implementing adaptation measures.

The Concept for the Comprehensive Protection of the Population and Territory of the Kyrgyz Republic from Emergencies for 2018–2030 ⁶³, in the section concerning the mitigation of the consequences of mudflows and floods, establishes the following:

By type, registered emergencies are ranked in descending order as follows: mudflows and floods, avalanches, major fires, strong winds, major traffic accidents, earthquakes, landslides, flooding associated with rising groundwater levels, and others.

Mudflows and flash floods. Due to their prevalence and frequency, they rank first in terms of damage caused among hazardous natural phenomena in the Kyrgyz Republic. The country has a total of about 3,900 mudflow basins; 200 high-altitude lakes are at high risk of bursting; and 300 settlements are located in areas at risk of catastrophic flooding.

⁶³<https://cbd.minjust.gov.kg/11990/edition/1205614/ru?anchor=p1>

Risks of mudflows and high-altitude lake outbursts: The most likely period for floods resulting from high-altitude lake outbursts is July–August; depending on annual conditions, this period may extend until mid-September.

An increase in mudflows and flooding is possible during periods of intense snowmelt in certain areas, heavy rainfall in the spring and summer, and in the event of high-altitude lake outbursts. The republic's list of lakes at risk of bursting includes 320 lakes, of which 16 are classified as Category 1, 39 as Category 2, 217 as Category 3, and 48 as Category 4.

Hydraulic Structures. There are approximately 450 reservoirs in operation across the country for various economic purposes; of these, 10 are large and medium-sized reservoirs with a total capacity of over 240,000 million cubic meters, the majority of which are used for irrigation.

The stability of dams at reservoirs and hydroelectric power plants tends to decline due to their age and the effects of endogenous and exogenous processes. In the event of an emergency or irrigation- and power-related release of large volumes of water into river channels, processes of erosion and bank collapse may occur, posing a threat of flooding to populated areas and territories.

Land degradation. In the Kyrgyz Republic, significant areas of agricultural land are subject to varying degrees of degradation. Anthropogenic impacts and desertification processes pose a real threat to the biological productivity of the land and contribute to the development of hazardous natural processes.

Combined with unfavorable socioeconomic factors in economic management, land degradation leads to higher production costs per unit of output, low economic productivity of the land, and increased vulnerability of the population to disasters.

In the Emergency Response Plan for the Kyrgyz Republic ⁶⁴, regarding the mitigation of the consequences of mudflows and floods, the following has been established:

Risk No.	Risk	Consequences	Probability
4	<u>Floods and mudflows</u> More than 95% of the republic's settlements and millions of its residents are located in the immediate vicinity of water sources, primarily along riverbeds that are susceptible to <u>mudflows and flash floods</u>. These natural phenomena occur most frequently in the foothills and low-mountain areas of the Fergana Range (Osh and Jalal-Abad regions) and in the foothill zones of the Kungey, Terskey Ala-Too, and Kyrgyz ranges. According to monitoring data, 497 settlements and facilities across the republic are at risk of <u>mudflows and flash floods</u>, including the northern part of the republic, which encompasses the city of Bishkek.	Low	Almost certain

Prevention of mudflows, floods, and seasonal high water:

- bank reinforcement measures on rivers and lakes;
- reinforcement of bridges in areas prone to flooding;
- monitoring of hazardous areas;
- relocation of residents from hazardous areas;
- construction of engineering protective structures to shield settlements and economic facilities from the effects of floods and mudflows;
- monitoring precipitation levels, snowmelt, and changes in water levels in rivers and lakes;
- regulating flood discharge using reservoirs;
- construction of permanent and emergency (temporary) protective dikes and barriers to protect against floods, mudflows, etc.;

⁶⁴<https://cbd.minjust.gov.kg/11990/edition/1205614/ru?anchor=p3>

- preparing excavation pits and constructing artificial channels to divert *floodwaters and mudflows*;
- implementation of enhanced land-use practices and slope stabilization to mitigate the consequences of landslide hazards.

Measures to be taken in the event of a threat or occurrence of *mudflows and floods*:

- alerting the population via electric sirens and radio broadcasts, using departmental communication systems and mobile alerting devices;
- partial relocation and evacuation of the population from areas at risk of *mudflows, floods*, avalanches, and landslides;
- placing monitoring and laboratory control facilities on an enhanced operational footing;
- relocating farm animals from threatened areas and removing valuable equipment;
- preparing vehicles for the evacuation of the population and the removal of valuable property;
- monitoring and controlling the rate of snowmelt and precipitation, and measuring water levels in rivers and lakes;
- organizing work to reinforce riverbanks and bridges and to construct structures to protect settlements and economic facilities;

Composition of monitoring and forecasting information provided by participants in the Unified System for Comprehensive Monitoring and Forecasting of Emergencies in the Kyrgyz Republic:⁶⁵

No.	Name of emergency source Situations	Characteristics of an emergency	Sample Information Content	Responsible Parties
I. Natural Disasters				
2	<i>Mudflow Hazard</i>	A flow with a very high concentration of mineral particles, stones, and rock debris (up to 50–60% of the flow's volume), occurring suddenly in the basins of small mountain rivers and dry ravines and caused, as a rule, by torrential rainfall or rapid snowmelt	Storm Warnings	Kyrgyzhydromet
			Forecast <i>of Mudflow</i> and Ice-Related Hazards	KGS, Institute of Water Problems, SVR, SSVZ, CAIIZ
3	<i>Flood</i>	A phase in a river's hydrological regime characterized by a relatively short-term and non-recurring rise in water level caused by increased snowmelt, glacial melt, or heavy rainfall	Hydrometeorological Information	Kyrgyzhydromet
			Information on <i>flood risk</i>	KGS, SVR, SSVZ, Institute of Water Problems, CAIIZ
4	Breach of Dams on High-Altitude Natural Lakes	A <i>mudflow or flood</i> surge with destructive force that superimposes on the natural phases of the water regime of a river or temporary watercourse as a result of the complete or partial destruction of the dam structure	Hydrometeorological Information	Kyrgyzhydromet
			Overview of the condition of high-altitude lakes	KGS, SSVZ, Institute of Water Problems
			Forecast of the Risk of Breach	KGS, Institute of Water Problems

The Concept for the Development of a Unified System for Comprehensive Monitoring and Forecasting of Emergencies in the Kyrgyz Republic through 2030⁶⁶, in the section concerning the mitigation of the consequences *of mudflows and floods*, establishes the following:

⁶⁵<https://cbd.minjust.gov.kg/157219/edition/3490/ru>

⁶⁶<https://cbd.minjust.gov.kg/230026769/edition/31767/ru>

To date, more than 20% of Kyrgyzstan's glaciers have already melted, and more than 200 of the 2,000 glacial lakes are at risk of bursting. The ongoing melting of glaciers and the increasing frequency of glacial lake outbursts pose a serious threat to the safety of the country's population. The water, energy, agricultural, forestry, infrastructure, and public health sectors are the most vulnerable to climate risks.

Various government agencies, research institutes, departmental units of ministries, educational institutions, and major industrial enterprises have been engaged in studying hazardous natural processes and developing forecasts of their intensification in the Kyrgyz Republic.

However, this did not ensure the completion of the required scope of work or full coverage of the most hazardous natural processes. For example, observations of the condition of high-altitude lakes and glaciers, as well as the monitoring and forecasting of landslide and mudflow hazards, were conducted sporadically and did not cover the entire territory of the country due to the obsolescence and physical deterioration of the observation network used by most government organizations and scientific institutions to monitor hazardous natural processes.

As part of the implementation of the Concept, the following is envisaged:

- ✓ ensuring the standardization and implementation of regulations and standard forms (formats) for the development and presentation of monitoring and forecast information on earthquakes, mudflow and flood hazards, and high-altitude lake dam breaches... depending on the timeframes and forecasting methods used;
- ✓ to carry out work by ministries, administrative agencies, specialized organizations, and services in the relevant field to standardize and implement regulations and standard forms (formats) for the development and provision of monitoring and forecast information on natural disasters, including mudflows, flood hazards, and dam breaches of high-altitude natural lakes.

The Book on Monitoring and Forecasting Hazardous Processes and Phenomena in the Kyrgyz Republic ⁶⁷, in the section concerning the mitigation of the consequences of mudflows and floods, establishes the following:

Mudflows and floods, along with the associated flooding and coastal erosion, account for 85.7% of all recorded emergencies.

The territory of the Kyrgyz Republic is significantly vulnerable to mudflows and flooding.

Settlements (95% of all settlements in the republic are located on the banks or alluvial fans of rivers or temporary watercourses), transportation infrastructure, agricultural land, hydraulic and irrigation structures, and other facilities are vulnerable to mudflow and flood damage.

Most of Kyrgyzstan's rivers originate in the mountains, deriving the bulk of their flow from melting glaciers and snowfields, and to a lesser extent from precipitation and groundwater. River regimes are determined by the elevation of the watersheds, their orientation, and the degree of moisture.

The following types of rivers are generally distinguished:

Virtually the entire territory of the Kyrgyz Republic is at risk of mudflows—there are a total of 3,103 mudflow-prone rivers. The largest numbers are found in the basins of the Chu River (479), the Talas River (254), the Naryn River (789), the Kara-Darya River (666), and Lake Issyk-Kul (375).

Mudflows are characterized by their short duration, high speed, and destructive power, as well as a high concentration of solid material that creates characteristic deposits. Mudflows also have a high erosive capacity, causing riverbeds to deepen and banks to erode, and can lead to flooding on rivers.

In July 2024, mudflows occurred in several districts of the republic's southern regions, in the city of Osh itself, and in the Talas, Chui, and Issyk-Kul regions.

In early August, as a result of record rainfall, repeated mudflows occurred in the city of Cholpon-Ata and nearby villages. Heavy rainfall in mid-August triggered further mudflows that affected virtually the entire resort infrastructure along the northern shore of Lake Issyk-Kul. On the southern shore, many households and agricultural lands were affected; mudflows destroyed transportation routes, bridges, homes, residents' private plots, and infrastructure facilities.

A state of emergency was declared in the city of Osh; the Kara-Sui and Nookat districts of Osh Region; the Leylek, Batken, and Kadamjay districts of Batken Region; the Nookan, Suzak, and Aksy districts of Jalal-Abad Region; and the Talas district of Talas Region.

⁶⁷<https://cbd.minjust.gov.kg/230026769/edition/31767/ru>

Hydrometeorological factors contributing to the formation *of mudflows* include downpours, prolonged rains, heavy snow accumulation, and high air temperatures leading to the melting of snow and ice in mountainous and high-altitude areas—that is, conditions that create a powerful water flow within a relatively short period of time.

Water inflows can also originate from the breaching of high-altitude lakes, reservoirs, and dammed bodies of water formed following landslides, rockfalls, or avalanches.

Torrential rains play a major role as a factor in the formation *of mudflows*—70–80% *of mudflows* are caused by torrential rains. Their recurrence depends on the frequency of downpours and ranges from once every two years in the Kochkor, Zhungal, and Toguz-Torous basins to more than once a year in the foothills of the Kyrgyz and Talas ranges, Teskey and Kungei Ala-Too, and the areas surrounding the Fergana Basin.

Snowmelt, often combined with rain, accounts for up to 15% of cases, ranging from once every 3–10 years to once every 6–10 years.

Mudflows resulting from the melting of seasonal snow and glaciers combined with rainfall in the glacial zone, as well as those caused by the bursting of high-altitude lakes, account for up to 10–13%. Areas prone to glacial *mudflows*—associated with modern glaciation and moraines—are found above 3,000–3,500 meters. Due to conditions that favor the accumulation of large volumes of meltwater (in glacial and moraine lakes, intraglacial and intramoraine reservoirs, etc.) and the presence of water-saturated moraine deposits and steep slopes, the most powerful and potentially catastrophic mudflows can form here.

The most dangerous areas where *mudflows and flash floods* may occur are:

- ✓ in the Chui Region: the Jardy-Kaindy, Tuyuk Issyk-Atinsky, northern Shamshy, Kyzyl-Suu, Sokuluk, Zhlyamysh, Kurumdy, Ala-Archa, Nooruz, Isykata, and Kegety valleys;
- ✓ in the Issyk-Kul Region: the Ak-Terek, Chetyndy-Tossor, Barskoon, Kumtor, Choktal, Zyndan-Ton, Kurumdu-Ton, and Dzher-Ui-Ak-Sai valleys; Ak-Terek, Konur-Olen-Ak-Terek, Karakol, Sary-Jaz, Enilchek, and Chon-Koisu;
- ✓ in the Talas Region: the Chichirkanak, Urmalar, and Kara-Buura valleys;
- ✓ in the Osh Region: the Kichik-Alai-Ak-Buura Valley; - in the Batken Region: the Ak-Suu-Shakhimardan and Isfayram-Say Valleys;
- ✓ in the Naryn Region: the Shamsi-South (Lake Buzulgansu), Anyrty, Ukek, Karakum-Kel-Ukek, and Kara-Kungei-Ukek-East valleys;

The most likely period *for flash floods* resulting from the bursting of high-altitude lakes is July–August; depending on annual conditions, this period may extend until mid-September. The area where snow-rain mudflows (periglacial) form consists of mid-mountain regions (2,600–3,500 m) that are not currently glaciated.

The main conditions for *mudflow formation* are intense snowmelt and heavy rains, as well as the accumulation of *mudflow-forming* sediments, *mudflow hotspots*, the presence of ancient moraine remnants, and solifluction on slopes. In the valleys of this zone, mudflows and sediment-laden *mudflows* may form. The causes of *mudflow* formation include torrential rains, the wetting of sediments by snowmelt, and steep surface gradients.

Snow-and-rain-induced *mudflows* can have high discharge rates and cause *flooding* resulting from the action *of the mudflows*, which are most likely to occur in the Jalal-Abad Region in the valleys of the Kasán-Sai, Mailuu-Suu, Kara-Unkyur, and Kek-Art rivers; in the Osh Region in the valleys of the Yassy, Kara-Kulja, Tar, Gulcha-Kurshab, and Ak-Buura rivers; in the Batken Region (Isfayramsay, Shahimardan, Karavshin-Isfara, Laylak, Aksuu) and the Talas Region (Kyurkyureo-Suu, Sulu-Bakayir, Kyumyushtak, Kolba) regions.

The periods when *mudflows* occur are often associated with the snowmelt season in mountainous areas and heavy rainfall—April through June. The areas where *mudflows* form include foothills, adyrs, and low mountains up to 2,500 m in elevation, dissected by river valleys and dry riverbeds.

The main contributing factors are heavy rains, the presence of large amounts of loose, vegetation-free sediment, and steep slopes. Here, sediment-laden *mudflows* are likely to form primarily during heavy rainfall throughout the warm season, as well as during the spring snowmelt.

The areas *where mudflows* disperse and accumulate are the foothill troughs of intermountain basins and the plains at the base of the mountains. The most powerful mudflows may pass through this area en route, reaching regions that are not prone to *mudflow activity*. An increase in *mudflow and flood activity* is possible during

intense snowmelt in certain areas, heavy rainfall in the spring and summer, and in the event of high-altitude lake outbursts.

Statistics on the number of emergencies and human casualties in the Kyrgyz Republic caused by mudflows and floods over a 25-year period, from 2000 to 2024 ⁶⁸

2 0 0 0	2 0 0 1	2 0 0 2	2 0 0 3	2 0 0 4	2 0 0 5	2 0 0 6	2 0 0 7	2 0 0 8	2 0 0 9	2 0 1 0	2 0 1 1	2 0 1 1	2 0 1 1	2 0 1 1	2 0 1 1	2 0 1 1	2 0 1 1	2 0 2 1	2 0 2 2	2 0 2 2	2 0 2 3	2 0 2 4		
Number of emergencies caused by mudflows and flash floods																								
2 1	1 1	8 4	4 3	4 2	4 0	3 3	7 3	8 4	1 0 2	1 3 4	6 1 7	2 1 7	-	4 2	7 5	1 0 2	8 2	3 0	1 5	1 1	2 0	2 5	9 7	1 1 5
Number of human casualties from mudflows and flash floods																								
-	-	1	2	1	3	-	-	5	-	8	2	3	-	-	-	6	-	1	-	-	1 0	-	-	2 2

PART 3: A Brief Overview of Policies and Measures to Mitigate the Effects of Mudflows and Floods in the Republic of Tajikistan

Policies and measures to mitigate the effects of mudflows and floods in the Republic of Tajikistan are implemented on the basis of legislative and regulatory acts, strategic and programmatic documents, within the framework of the Unified State System for the Prevention and Response to Emergencies, which brings together government agencies, forces, and resources of state authorities and organizations whose responsibilities include protecting the population and territories from emergencies.

The main objectives of the Unified State System for the Prevention and Response to Emergencies are ⁶⁹ (*selectively, only insofar as they relate to measures to mitigate the consequences of mudflows and floods*):

- the development and implementation of legal and economic regulations to ensure the protection of the population and territories...;
- implementation of targeted and scientific-technical programs aimed at preventing... and enhancing the resilience of operations...;
- ensuring readiness for action...;
- collecting, processing, exchanging, and disseminating information....
- forecasting and assessing socioeconomic consequences...;
- creating financial and material reserves for emergency response;
- responding to emergencies;
- international cooperation in the field of protecting the population and territories from emergencies;

In the Republic of Tajikistan, it is established by law⁷⁰ that:

- the following sources of funding are used for the prevention and response to emergencies:
 - the Government of the Republic of Tajikistan's contingency fund, which is allocated annually in the national budget;
 - the financial and material reserves of ministries and agencies;
 - reserves of financial and material resources of local executive bodies of state power in regions, cities, and districts, including the reserve funds of the heads of regions, cities, and districts, local self-government bodies, and organizations.
- Measures to prevent and respond to emergencies are carried out on the basis of the Plan for the Protection of the Population, Economy, and Territory of the Republic of Tajikistan in Natural and Man-Made Emergencies, interregional cooperation plans for regions, cities, and districts, as well as action plans of ministries

⁶⁸<https://cesdrr.org/мониторинг-прогнозирование-кр-2025>

⁶⁹<https://kchs.tj/sites/default/files/pdf/zakon/zashita-nasileniya.pdf>

⁷⁰<https://kchs.tj/sites/default/files/pdf/podzakon/833.pdf>

and agencies, local executive bodies of state power in regions, cities, and districts, local self-government bodies, and organizations;

- Information regarding the protection of the population and territories from emergencies, as well as the activities of state authorities and organizations in this area, is public unless otherwise provided by the legislation of the Republic of Tatarstan;
- State authorities and the administrations of organizations are required to promptly and accurately inform the public through the media and other channels about the status of the protection of the population and territories from emergencies and the measures taken to ensure their safety, about forecasted and actual emergencies, and about methods and means of protecting the population from them;
- The concealment, untimely disclosure, or provision by officials of knowingly false information regarding the protection of the population and territories from emergencies shall entail liability in accordance with the legislation of the Republic of Tajikistan.

The Government of the Republic of Tajikistan⁷¹: *(selectively, only with regard to measures to mitigate the effects of mudflows and floods):*

- adopts, within the limits of its authority, resolutions and orders in the field of protecting the population and territories from emergencies and ensures their implementation;
- organizes scientific research in the field of protecting the population and territories from emergencies;
- organizes the development of and ensures the implementation of state programs in the field of protecting the population and territories from emergencies;
- oversees the unified state system for the prevention and response to emergencies;
- ensures the creation of state reserves of financial and material resources for the response to emergencies;
- makes decisions regarding the direct management of emergency response and the provision of assistance in the event of emergencies;
- oversees the activities of ministries, agencies, and local executive bodies of state authority in the field of protecting the population and territories from emergencies.

The state authority specifically authorized to address issues related to the protection of the population and territories from emergencies *(the Commission on Emergencies and Civil Defense under the Government of the Republic of Tatarstan): (selectively, only with regard to measures to mitigate the consequences of mudflows and floods):*

- develops proposals for state policy in the field of emergency prevention and response;
- exercises state oversight over the readiness of forces and resources to respond to emergencies and over the implementation of measures to protect the population and territories from emergencies;
- develops and implements measures to prevent emergencies, protect the lives and health of the population, as well as material and cultural assets, and to mitigate the consequences and minimize damage during emergencies;
- manages the forces and resources for emergency response, establishes command posts, warning systems, and communication networks;
- organizes the development and implementation of targeted programs and scientific research aimed at preventing and responding to emergencies;
- organizes emergency rescue and other urgent operations during emergencies.

Local executive bodies of state power of the Republic of Tajikistan: *(selectively, only with regard to measures to mitigate the consequences of mudflows and floods):*

- prepare and maintain the necessary forces and resources to protect the population and territories from emergencies;
- carry out evacuation measures during emergencies;
- collect and exchange information, in accordance with established procedures, regarding the protection of the population and territories from emergencies;
- ensure the timely alerting and informing of the population regarding the threat of or occurrence of an emergency;

⁷¹<https://kchs.tj/sites/default/files/pdf/zakon/zashita-nasileniya.pdf>

- organize and carry out emergency rescue and other urgent operations; if their own resources are insufficient, they request assistance from the Government of the Republic of Tajikistan;
- fund measures to protect the population and territories from emergencies;
- establish reserves of financial and material resources for emergency response.

The ministries and agencies of the Republic of Tajikistan are required to: *(selectively, only with regard to measures to mitigate the effects of mudflows and floods):*

- organize efforts to protect the population and territories from emergencies within their sphere of activity and in the economic sectors under their jurisdiction;
- ensure that subordinate enterprises, institutions, and organizations are prepared to respond to emergencies;
- develop and implement organizational and engineering-technical measures to enhance the sector's operational resilience during emergencies;
- approve and issue, in accordance with state requirements, industry-specific requirements and regulatory documents on the prevention and response to emergencies;
- ensure compliance with standards and regulations governing engineering and technical measures during the design, construction, and operation of industrial and public facilities;
- establish local emergency alert systems and maintain them in a state of constant readiness;
- submit, in accordance with established procedures, information on the status of protection of the population and territories against emergencies;
- build up reserves of material and technical resources;
- ensure the organization, financing, and execution of emergency, rescue, and other urgent operations at industrial and social facilities under its jurisdiction and in adjacent territories in accordance with emergency prevention and response plans;
- ensure the establishment, training, and maintenance of readiness of special forces and resources for the prevention and response to emergencies;
- monitor compliance with requirements regarding the protection of the population and territories during the design, construction, and reconstruction of facilities under their jurisdiction.

Organizations responsible for protecting the population and territories from emergencies are required to: *(selectively, only with regard to measures to mitigate the consequences of mudflows and floods)*

- plan and implement the necessary measures to protect organizations and facilities under their jurisdiction—whether industrial or social—from emergencies;
- plan and carry out measures to enhance the operational resilience of organizations during emergencies;
- establish specialized services and units in accordance with established procedures, and staff them with personnel, equipment, and assets;
- ensure the establishment, training, and maintenance of forces and resources for the prevention and response to emergencies;
- establish and maintain local emergency alert systems in a state of constant readiness;
- ensure, when necessary, the timely construction of engineering protective structures and maintain them in a state of constant readiness;
- ensure the organization and conduct of emergency rescue and other urgent operations at industrial and social facilities under its jurisdiction and in adjacent areas in accordance with emergency prevention and response plans;
- fund measures to protect employees of organizations and industrial and social facilities under its jurisdiction from emergencies;
- create reserves of material and technical resources for carrying out urgent emergency response operations.

The key strategic and programmatic documents, as well as regulatory and legal acts, pertaining to the mitigation of the consequences of mudflows and floods in the Republic of Tajikistan are:

- 1) The Law of the Republic of Tajikistan “On the Protection of the Population and Territories from Natural and Man-Made Emergencies”⁷²;
- 2) Law of the Republic of Tajikistan “On Hydrometeorological Activities”;
- 3) National Development Strategy of the Republic of Tajikistan through 2030⁷³, including the Action Plan for the Implementation of the National Program;
- 4) National Strategy of the Republic of Tajikistan for Natural Disaster Risk Reduction for 2019–2034⁷⁴;
- 5) Action Plan for 2023–2025 of the Medium-Term State Program for the Protection of the Population and Territories from Emergencies for 2023–2028⁷⁵;
- 6) National Strategy of the Republic of Tajikistan on Adaptation to Climate Change for the Period up to 2030⁷⁶, including the Action Plan for 2025–2027 under the National Strategy of the Republic of Tajikistan on Adaptation to Climate Change for the Period up to 2030⁷⁷.

The key government agencies responsible for mitigating the effects *of mudflows and floods* in the Republic of Tajikistan are:

- 1) the Committee of Emergency Situations and Civil Defense under the Government of the Republic of Tajikistan⁷⁸ (EMC and CD of the Republic of Tajikistan);
- 2) the Main Directorate for the Protection of the Population and Territories of the Committee of Emergency Situations and Civil Defense of the Republic of Tajikistan⁷⁹ (MDPP&T);
- 3) Crisis Management Center under the Committee of Emergency Situations and Civil Defense of the Republic of Tajikistan⁷⁸ (CMCC);
- 4) Committee on Environmental Protection under the Government of the Republic of Tajikistan⁸¹ (CEP under the Government of the Republic of Tajikistan);
- 5) Agency for Hydrometeorology of the Committee on Environmental Protection under the Government of the Republic of Tajikistan⁸² (Tajikhydromet);
- 6) Ministry of Energy and Water Resources of the Republic of Tajikistan⁸³ (MEWR);
- 7) Agency for Land Reclamation and Irrigation under the Government of the Republic of Tajikistan⁸⁴ (AMI under the Government of the Republic of Tajikistan), State Unitary Enterprise Tajikselezashchita;
- 8) Local Executive Bodies of State Power of the Republic of Tajikistan⁸⁵ (hereinafter referred to as “LEBSP”).

A brief analysis of existing policies, strategies, technologies, practices, research, and funding, as well as gaps and consequences in the implementation of measures to mitigate the effects *of mudflows and floods* in the Republic of Tajikistan:

The National Development Strategy of the Republic of Tajikistan through 2030⁸⁶, in the section concerning the mitigation of the effects *of mudflows and floods*, states the following:

Environmental challenges and vulnerabilities remain significant, particularly in the context of climate change mitigation and adaptation. These challenges have become particularly significant and include issues such as the rational use of water resources, ensuring the resilience of settlements, taking urgent measures to adapt to climate change, protecting terrestrial ecosystems, addressing land degradation, and preventing and mitigating the effects of natural disasters.

For Tajikistan, one of the main challenges is the high risk of natural disasters and vulnerability to the effects of climate change, which pose threats to sustainable development.

⁷²<https://kchs.tj/sites/default/files/pdf/zakon/zashita-nasileniya.pdf>

⁷³<https://faolex.fao.org/docs/pdf/taj170774.pdf>

⁷⁴http://portali-huquqi.tj/publicadliya/view_qonunhovview.php?showdetail=&asosi_id=21626

⁷⁵https://kchs.tj/sites/default/files/Mid-term%20State%20Programme%20%28taj-eng-rus%29_Optimized.pdf

⁷⁶<https://faolex.fao.org/docs/pdf/taj190980.pdf>

⁷⁷<https://www.wis.tj/wp-content/uploads/2025/10/Адаптация-Климата.pdf>

⁷⁸<https://www.kchs.tj/node/1932>

⁷⁹<https://kchs.tj/node/1233>

⁸⁰<https://kchs.tj/node/1240>

⁸¹http://www.portali-huquqi.tj/publicadliya/view_qonunhovview.php?showdetail=&asosi_id=9439

⁸²<https://www.meteo.tj/ru/agency/about-us>

⁸³https://www.mewr.tj/?page_id=2

⁸⁴http://www.portali-huquqi.tj/publicadliya/view_qonunhovview.php?showdetail=&asosi_id=15971

⁸⁵<https://www.kchs.tj/sites/default/files/pdf/zakon/zashita-nasileniya.pdf>

⁸⁶<https://faolex.fao.org/docs/pdf/taj170774.pdf>

Today, natural disasters continue to cause significant damage, undermine well-being, and pose a threat to human safety. On average, 32 people per 1 million of the country's population lose their homes each year as a result of natural disasters.

At least 10 percent of the population lives on degraded land. The issue of disaster risk requires a broader and more people-centered preventive approach.

One of the main challenges to a favorable living environment is the high risk of natural disasters, including those resulting from climate change.

One of the key priority areas of action for creating a comfortable living environment is the development of a natural disaster risk management system.

In the area of developing a natural disaster risk management system, the main areas of action are:

- building national institutional capacity for disaster prevention, preparedness, and mitigation;
- integrating measures to reduce the risk of natural and climate-related disasters into the management of the country's economic sectors;
- developing and implementing mechanisms to reduce social vulnerability resulting from natural disasters;
- developing and implementing a gender-sensitive, systematic information support system and training the population in preventive, protective, and recovery measures related to natural disasters;
- developing a system for incorporating climate change and natural disaster prevention into strategic regional documents;
- strengthening local capacity for managing risks associated with emergencies and natural disasters;
- improving environmental living conditions, including for low-income people in rural and mountainous areas;
- mitigating the consequences of acute environmental risks, and increasing resilience and the capacity to prevent natural disasters.

The 2023–2025 Action Plan of the 2023–2028 Medium-Term State Program for the Protection of the Population and Territories from Emergencies⁸⁷, in the section concerning the mitigation of the consequences *of mudflows and floods*, establishes the following:

- The most dangerous natural phenomena in Tajikistan, due to their widespread occurrence, are *mudflows*, avalanches, rockfalls, earthquakes, *floods*, and landslides.
- Goals, Objectives, and Key Measures/Actions:
 - ✓ improving the organizational and technical framework for monitoring and forecasting emergencies;
 - ✓ Establishing mechanisms for collecting, analyzing, and disseminating information on losses and risks resulting from natural disasters, taking into account disaggregated data by gender, age, and disability;
 - ✓ Reducing vulnerability and strengthening the population's capacity for disaster preparedness and response, taking into account the needs of vulnerable groups;
 - ✓ integrating natural disaster risk management measures into the management of economic sectors and the development process;
 - ✓ improving disaster preparedness to ensure an effective response and integrating mitigation measures into recovery, rehabilitation, and reconstruction efforts;
 - ✓ improving the organizational and technical framework for monitoring and forecasting emergencies;
 - ✓ strengthening the capacity of government authorities at all levels, relevant research institutions, civil society organizations, and the private sector in the field of natural disaster risk reduction;

⁸⁷https://kchs.tj/sites/default/files/Mid-term%20State%20Programme%20%28taj-eng-rus%29_Optimized.pdf

- ✓ Integrating disaster risk reduction issues into sectoral programs and urban and regional development programs;
- ✓ modernizing the early warning system using information and communication technologies;
- ✓ preparing a comprehensive national risk profile and maps for various types of hazards, with a particular focus on the impacts of climate change;
- ✓ engaging international financial institutions, development partners, donors, and other international organizations to provide funding for river and canal bank reinforcement works, as well as the construction of reservoirs and structures to prevent the risk *of mudflows and floods*;
- ✓ allocating the necessary funds in the national budget, within the limits of the state budget's financial capacity, and securing funding from development partners for the operation and maintenance of *flood control* structures;
- ✓ introducing new information and communication technologies into the early warning system, including the development of mobile applications and other communication tools to ensure preparedness and response, taking into account the needs of the most vulnerable population groups;
- ✓ developing a framework and refining relevant methodologies for assessing and determining economic damage and losses, and organizing recovery and reconstruction efforts following natural disasters in accordance with international standards;
- ✓ conducting assessments of technical capacity State Unitary Enterprise "Tajikselezashchita," "Zudamal-1," and "Zudamal-2" and enhancing their material and technical capacity to carry out *shoreline reinforcement* works;
- ✓ taking measures to prevent water-related natural disasters, including planning the construction of reservoirs and *mudflow protection* structures on the republic's streams and small rivers.

The National Strategy for the Republic of Tajikistan's Adaptation to Climate Change for the Period up to 2030⁸⁸, in the section concerning the mitigation of the effects *of mudflows and floods*, establishes the following:

- Annual losses from climate change and extreme weather events are estimated at \$600 million, or 4.8% of Tajikistan's gross domestic product (GDP);
- Losses caused by climate change will increase as temperatures and precipitation levels rise. By 2030, the average temperature is projected to increase by 2.3 °C;
- Ranking of climate-related disasters and natural disasters in descending order of priority: pasture degradation, cold snaps and frost, dust storms, drought, hurricanes, rising temperatures, agricultural pests, *mudflows*, duration of snow cover, heavy precipitation, landslides, floods and seasonal flooding, avalanches, and waterlogging;
- As a result of climate change (for example, the unexpected and rapid melting of glaciers), the risk of floods, *mudflows*, and avalanches is increasing, as these events already occur regularly during the spring snowmelt months.

The Strategy for Financial Protection against Natural Disasters in the Republic of Tajikistan for the Period up to 2037⁸⁹ in the section concerning the mitigation of the effects *of mudflows and floods*, establishes the following:

The most common natural hazards in Tajikistan are floods and *mudflows*, which pose a recurring threat; it is expected that, due to climate change, both the frequency and severity of such events will increase.

Due to its unique topographical, geological, and hydrological characteristics, Tajikistan is vulnerable to many natural hazards, such as floods, earthquakes, landslides, *mudflows*, avalanches, droughts, and heavy snowfall.

Among the 24 countries in the Europe and Central Asia region, Tajikistan ranks among the highest in terms of vulnerability to climate change and its impacts. Rising annual temperatures are leading to more rapid glacial melting, and droughts, floods, and heat waves or cold snaps are likely to occur more frequently in the future.

⁸⁸<https://faolex.fao.org/docs/pdf/taj190980.pdf>

⁸⁹http://www.portali-huquqi.tj/publicadliya/view_qonunhovview.php?showdetail=&asosi_id=26656

Earthquakes, landslides, *mudflows*, floods, extreme temperatures—droughts or severe frosts—as well as other natural disasters threaten populated areas in both urban and rural settings, key infrastructure facilities such as hydroelectric power plants, land and irrigation systems (including hydraulic structures), transportation infrastructure (including bridges), river embankments, and educational and healthcare facilities—all of which lead to significant economic losses. Consequently, this is likely to increase the additional financial burden on the budget and disrupt the fiscal balance.

Mudflows and floods occur in the country every year, usually in the spring, when temperatures begin to rise. Every year, major rivers that originate in the snow-capped mountains and glaciers overflow their banks, flooding hundreds of hectares of land and causing damage. Severe *mudflows* were observed in 1993, 1998, 2002, and 2015, resulting in loss of life, the destruction of many economic facilities, and enormous damage. *Mudflows* and floods account for the greatest financial losses. For example, from 2010 to 2021, the total damage amounted to more than 1 billion somoni.

Natural disasters impose significant financial obligations on the Government of the Republic of Tajikistan, one of which is securing sources of funding. Following natural disasters, the Government of the Republic of Tajikistan is required to cover the following costs:

- costs related to prevention, emergency assistance, response, and urgent disaster recovery measures;
- restoration of public infrastructure and material losses to social and cultural facilities;
- restoration of key production facilities lost as a result of their complete or partial destruction;
- financial assistance to the population after disasters to restore property and agricultural land;
- support for entrepreneurship, small businesses, and the national economy.

The Government of the Republic of Tajikistan provides compensation for damage to health and property caused by adverse natural phenomena. In this regard, from 2013 to 2020, one-time compensation totaling 1,640,700 somoni was paid from the state budget to those affected by natural disasters.

The financial risks faced by the Government of the Republic of Tajikistan stem from budgetary and extrabudgetary expenditures, the reallocation of resources from various budget lines, an increase in debt, and expenditures from contingency funds and reserve funds.

The Government of the Republic of Tajikistan uses a number of tools to address the consequences of natural disasters, including pre-established budgetary instruments (the contingency fund or the reserve funds of local executive authorities) and disaster insurance transfer mechanisms.

In the event of a major disaster and insufficient funds, the Government of the Republic of Tajikistan resorts to borrowing, the reallocation of budget funds, and state-funded targeted programs. Donors also provide financial support for disaster response and recovery efforts in Tajikistan.

Contingency Fund

To respond to natural disasters and carry out rehabilitation efforts, Tajikistan may utilize the Contingency Fund of the Government of the Republic of Tajikistan from among its pre-established instruments. Expenditures from this fund are made based on relevant decisions by the Government of the Republic of Tajikistan and may also be used to finance other purposes. The fund is included in the annual budget; unused funds are not carried over.

The resources of the Government of the Republic of Tajikistan's contingency fund are limited. In addition to needs arising after a natural disaster, there are other unforeseen expenses that could consume the fund's entire annual resources.

Reserve Funds of Local Executive Authorities

The Gorno-Badakhshan Autonomous Region, Sughd and Khatlon regions, the city of Dushanbe, and cities and districts under republican jurisdiction may establish their own reserve funds, provided that the size of the fund does not exceed 0.5 percent of the revenue of the corresponding local budget. Decisions regarding the use of the fund's resources are made by the relevant local executive authority.

State Material Reserves

In Tajikistan, material reserves provide substantial support in responding to disasters and implementing priority recovery measures. Decisions regarding the use of material assets from the state reserve to support mobilization and urgent work in addressing the consequences of emergencies, to provide support to various sectors of the national economy and organizations, and to deliver humanitarian aid are made by the Government of the Republic of Tajikistan. Support from the material reserve is limited to basic resources such as fuel, construction materials, and food.

Disaster Insurance

The insurance market in the Republic of Tajikistan is in its early stages of development due to the low income levels of the general population, low levels of insurance literacy, and lack of confidence in this area; as a result, only a small number of policyholders have been attracted to this market, particularly for natural disaster insurance.

The development of the insurance market—particularly disaster insurance—is of immense importance, and this process can significantly reduce the burden on the state budget regarding compensation for damage caused by natural disasters.

Financing Instruments Used in the Wake of Natural Disasters

Following natural disasters, the Government of the Republic of Tajikistan may use the following additional instruments to secure financing:

- concessional financing from international financial institutions or borrowed funds;
- international aid;
- reallocation of funds from other budget items.

Statistics on mudflows and avalanches from 2017 to 2024 ⁹⁰:

2017	2018	2019	2020	2021	2022	2023	2024
18	11	24	16	36	31	30	46

As a result of the emergency, ^{the following} length of shoreline protection structures ⁹¹ was damaged:

2003	2020	2021	2022	2023	2024
101.0	4.2	21.0	-	363.0	29.8

Information on floods and mudflows:

In terms of mudflow risk, Tajikistan ranks first among the Central Asian states.

Mountainous and foothill areas make up the majority of the republic's territory; the slopes are covered with a layer of forest or shallow gravelly soils, which contribute to the formation of mudflows during certain seasons of the year.

Mudflows form during torrential rains and occur from March through June, during sudden warm spells in the summer (July–August), and, in rare cases, in September and October.

They flow through numerous ravines and dry riverbeds. In many of these channels, mudflows occur annually, sometimes recurring several times a year.

Every year, mudflows damage homes, villages, private plots, agricultural land, rural roads, and so on. The population affected by these disasters is increasingly vulnerable to the resulting damage.

The main areas where mudflows form in Tajikistan include slope zones—high-mountain, mid-mountain, foothill, and valley—while the classes of mudflows include zonal, regional, and anthropogenic.

Preventive measures against mudflows include:

- technical (construction anti-mudflow structures - regulatory, retention, and stabilization);
- land improvement (afforestation and grass planting, slope terracing; - creation of reservoirs in the upper reaches of mudflow basins to reduce flood peaks;

⁹⁰<https://www.stat.tj/wp-content/uploads/2025/12/machmuai-hifzi-muhiti-zist-2025-baroi-chop.pdf>

⁹¹<https://www.stat.tj/wp-content/uploads/2025/12/machmuai-hifzi-muhiti-zist-2025-baroi-chop.pdf>

- construction of upland canals and storm drains;
- preventive draining of lakes);
- organizational and economic measures (regulation of economic activities in landslide-prone areas).

Due to torrential rains and intense snowmelt, the mountainous and foothill zones are characterized by mudflows of considerable volume and high sediment content.

The high-mountain zone covers the majority of Tajikistan's landslide-prone areas; although landslides occur relatively infrequently, they are characterized by particularly high destructive power due to the activity of high-mountain glacial lakes and intense snowmelt.

However, to date, little knowledge has been accumulated regarding the geographical distribution of mudflows, the natural conditions of their formation, and the characteristics of their hydraulics, dynamics, and hydrological regime.

Due to the limited accessibility of mountainous regions and the difficulties in observing mudflows in the field—owing to their rarity, sudden onset, and catastrophic nature, as well as the lack of reliable methods for hydrometric measurements and the underdevelopment of principles for modeling mudflows in laboratory conditions—many aspects of the mudflow problem have not yet been fully addressed. Furthermore, the lack of field and experimental data hinders the development of theoretical research on mudflows, knowledge of which is absolutely essential for the definitive resolution of such practically important tasks as preventing the development of mudflow events and combating already formed mudflows.

In Tajikistan, there is currently intensive construction of hydropower complexes with small reservoirs and dams, including those intended for hydropower generation and local irrigation. In the long term, a comprehensive approach utilizing modern technologies and technical means—including measures to prevent the onset of anthropogenic mudflows—will help prevent soil erosion on slopes.

In particular, as an example, the Varzob River basin is considered one of the areas most prone to mudflows in Tajikistan. The Varzob River basin covers an area of 6,500 km². The basin includes the city of Dushanbe and the administrative districts of Varzob and Rudaki, which are home to more than 1 million residents. A mudflow originating in the Varzob River basin as a result of heavy rainfall differs from a normal water flow primarily in a high content of solid particles, sometimes reaching such levels that the flow becomes plastic, ceases to obey the laws of hydrodynamics, and resembles a moving snow avalanche rather than a water flow. Mudflows destroy buildings and structures, settlements, power lines, roads, and bridges in their path, and wash away and turn valuable farmland (row crops, orchards, and vineyards) into a desert.

Anthropogenic factors also influence the occurrence and formation of mudflows, such as the clearing of mountain forests and shrublands, their excessive use for grazing, the destruction of vegetation—regardless of variations in slope gradient—and other factors.

Experience with the operation of flood control complexes at the Sashubsay River (1969) and the Sargazon River (1986) has shown that failure to account for all the causal factors contributing to the formation of a mudflow (rain-induced mudflow, etc.), their destructive power, and the nature of the mudflow's movement (mudflow wave) during the selection, design, and construction of a complex of flood control hydraulic structures (dams, spillways, and the creation of artificial mudflow reservoirs) can lead to catastrophic and irreversible consequences.

The benefit of correctly selecting the layout of anti-mudflow hydropower complexes lies in limiting and, to some extent, eliminating the risk of both social (loss of life, various disruptions to the rhythm of public life) and economic damage caused by mudflows, thereby ensuring the hydroecological safety of water use.

Currently, in Tajikistan, the possibility of much more intensive construction of hydropower complexes with small reservoirs and dams in mountain gorges—intended, among other things, for hydropower generation and local irrigation of mountainous lands—is becoming a reality.

Land reclamation in mudflow basins plays a significant role in the overall system of mudflow control. Only a comprehensive approach utilizing all methods and means—including the prevention of anthropogenic mudflows—will make it possible not only to solve the problem of soil erosion on slopes but also to reduce and halt the erosion process.

The impact of mudflow and water reservoirs on a river's hydrological regime—and, consequently, on the surrounding natural environment—is all the more significant the greater their absolute and relative (compared to the river's long-term average discharge) useful volume. The safety of the hydropower complex's retaining structures and economic facilities located in the river valley downstream, as well as the reliability of the power plant's operation, are largely determined by the water resources management regime through the creation of

effective complexes of *flood-control hydropower facilities*. In addressing this problem, it is necessary to proceed from the need to utilize existing, operational hydropower complexes, taking into account their sophistication and adaptation to the tasks of reducing the risk *of mudflow hazards*. One approach to mitigating the harmful effects *of mudflows* is the construction of a cascade of small and medium-sized reservoirs, weirs, and *debris retention basins*. This configuration makes it possible to use clarified water—primarily from the upper layers of the reservoirs—for irrigation systems on sloping lands and, depending on the chemical composition of the sediments, to transport them to irrigated fields and use them as soil conditioners.

In a market economy, the foundation for the successful operation of the water management system in the mountainous and foothill regions of Tajikistan is land irrigation based on water conservation and the protection of land resources for specific river basins.

Improving the hydroecological conditions in the area served by irrigation and land reclamation systems requires the use of environmentally friendly, advanced land reclamation systems and hydraulic engineering technologies and structures that minimize human impact on the surrounding landscape. In this regard, one option is the use of modern, lightweight hydraulic structures made of polymer materials to combat *flash floods* in mountainous and foothill sections of rivers. Using high-strength membranes—large panels reinforced, for example, with mesh-like cables—it is also possible to address a number of structural challenges involved in constructing a cascade *of sediment retention basins and reservoirs*, thereby enabling effective management of *mudflow hazards*.

The payback period for capital investments in the construction of small and medium-sized reservoirs—specifically, the annual profit from the sale of additional agricultural produce from dryland and pasture foothill lands resulting from prevented damage—will be 8–10 years. Currently, the creation and management of a complex *of anti-mudflow hydraulic structures* will help resolve issues related not only to the negative effects *of mudflows* but also to the rational and hydroecologically safe use of water resources.

PART 4:

A Comprehensive Review of Policies and Measures to Mitigate the Effects of Mudflows and Floods in Turkmenistan

Turkmenistan's legislation on natural risk management, including *mudflows*, is based on laws concerning the prevention and response to emergencies, nature conservation, environmental impact assessment, and natural resources, as well as on national strategies (such as on climate change), which require the improvement of subordinate legislation to adapt to climate change and mitigate the effects of natural disasters.

The Unified State System for the Prevention and Response to Emergencies brings together the forces and resources of state authorities, local government bodies, enterprises, institutions, and organizations whose responsibilities include addressing issues related to the prevention and response to emergencies⁹²

Disaster risk management in Turkmenistan falls under the jurisdiction of the President of Turkmenistan, the Cabinet of Ministers, the State Commission on Emergency Situations, the commissions on emergency situations at the velayat, etrap, and city levels, as well as the Main Directorate for Civil Defense and Rescue Operations of the Ministry of Defense of Turkmenistan.

Cabinet of Ministers of Turkmenistan⁹³ (*excerpt, limited to provisions concerning measures to mitigate the effects of mudflows and floods*):

- determines the main directions of a unified state policy...;
- develops strategic and tactical measures ...;
- develops state programs ...;
- coordinates activities related to the development of science and technology, as well as fundamental scientific research and development in the field of...;
- establishes procedures for the creation, storage, use, and replenishment of reserve funds for responding to emergencies.

⁹²https://continent-online.com/Document/?doc_id=31341547

⁹³[https://base.spininform.ru/show_doc.fwx?rgn=131008#:~:text=Law%20of%20Turkmenistan%20dated%20March%202013,%202021,%20on%20the%20prevention%20and%20the%20elimination%20of%20emergencies"%20\(new%20version\)](https://base.spininform.ru/show_doc.fwx?rgn=131008#:~:text=Law%20of%20Turkmenistan%20dated%20March%202013,%202021,%20on%20the%20prevention%20and%20the%20elimination%20of%20emergencies)

Ministry of Defense of Turkmenistan ⁹⁴ (through its Main Directorate for Civil Defense and Rescue Operations (MDCD and RO) *(selectively, only with regard to measures to mitigate the consequences of mudflows and floods):*

- coordinates the actions of services to minimize risks ...;
- conducts training activities for military personnel, officials, and civilians, including courses on emergency response;
- organizes and coordinates the activities of ministries, agencies, and local authorities on matters of public safety.

Main Directorate for Civil Defense and Emergency Rescue Operations under the Ministry of Defense of Turkmenistan ⁹⁵ *(selectively, only with regard to measures to mitigate the effects of mudflows and floods:)*

- develops and implements comprehensive measures within the framework of state programs aimed at preventing ...;
- conducts active preventive work with the population ...;
- acts as the central body coordinating the efforts of various agencies and organizations to minimize damage.

The State Commission on Emergency Situations of Turkmenistan ⁹⁶ *(selectively, only with regard to measures to mitigate the effects of mudflows and floods:)*

- is established to manage major or large-scale emergencies;
- exercises overall leadership over the activities of the unified state system for the prevention and response to ...;
- makes decisions in the field of ..., the implementation of which is mandatory;
- coordinates the activities of government agencies...;
- ensures prompt interagency coordination.

State authorities ⁹⁷ *(selectively, only with regard to measures to mitigate the consequences of mudflows and floods):*

- develop regulatory legal acts in the field of ...;
- train and maintain the necessary forces and resources in a state of readiness;
- provide funding in the field of...;
- establish a system for alerting the public to the threat of or occurrence of emergencies and ensure that it remains in a state of constant readiness;
- collect information regarding the prevention of ..., exchange such information, and promptly alert the public to the threat of or occurrence of ...;
- develop and approve plans for ...

Local self-government bodies of Turkmenistan (Gengeshes) ⁹⁸ *(selectively, only with regard to measures to mitigate the consequences of mudflows and floods):*

- provide training to the public on protection against...;
- disseminate information to the public regarding...;
- develop and approve plans for the prevention and response to....

Local executive authorities (hakimliks) ⁹⁹ *(selectively, only with regard to measures to mitigate the effects of mudflows and floods):*

- Implement measures to prevent and reduce the risks of ... at the regional and local levels;

⁹⁴ <https://mejlis.gov.tm/single-law/252?lang=ru#:~:text=and%20its%20powers-1..> The Ministry of Defense of Turkmenistan performs the following functions:

⁹⁵ <https://vestiabad.ru/ru/news/glavnoe-upravlenie-grazdanskoi-oborony-turkmenistana-usilivaet-profilakticeskuiu-rabotu>

⁹⁶ https://www.cawater-info.net/bk/dam-safety/files/chrez_situ_tm.pdf

⁹⁷ https://www.cawater-info.net/bk/dam-safety/files/chrez_situ_tm.pdf

⁹⁸ https://www.cawater-info.net/bk/dam-safety/files/chrez_situ_tm.pdf

⁹⁹ https://base.spininform.ru/show_red.fwx?rid=56945

- Control over Construction and Land Use in Hazardous Areas.

The key strategic and programmatic documents, as well as regulatory and legal acts, pertaining to the mitigation of the consequences *of mudflows and floods* in Turkmenistan are:

National legislation

- The Law of Turkmenistan “On the Prevention and Response to Emergencies” (2021) establishes the legal framework for activities related to the prevention and response to emergencies and their consequences;¹⁰⁰
- The Law of Turkmenistan “On International Humanitarian Assistance in Emergency Situations” (2020) establishes the legal, organizational, and economic framework for international humanitarian assistance in emergency situations;¹⁰¹
- Law of Turkmenistan “On Civil Defense” No. 206-II of November 29, 2003 ¹⁰²;
- The Water Code of Turkmenistan No. 456-V of October 15, 2016;¹⁰³
- Law of Turkmenistan “On Environmental Safety”; ¹⁰⁴
- Law of Turkmenistan “On Hydrometeorological Activities,” No. 91-VII, dated March 30, 2024;¹⁰⁵

National Regulatory Programs for Disaster Risk Reduction

- Turkmenistan’s National Climate Change Strategy defines preventive measures to reduce losses caused by extreme hydrometeorological phenomena ¹⁰⁶and provides for the creation of digital monitoring systems and adaptation measures in the disaster risk reduction sector;
- The National Program on the Aral Sea (2021–2025) focuses on improving the environmental situation and minimizing the risks of natural disasters in the area affected by the Aral Sea crisis. The program is scheduled to be completed in 2025 ¹⁰⁷;
- The Dawn of a New Era of a Sovereign State: Turkmenistan’s National Program for Socio-Economic Development for 2022–2052 ¹⁰⁸;
- Program for the Socio-Economic Development of Turkmenistan for 2011–2030;
- Program of the President of Turkmenistan for the Socio-Economic Development of the Country for 2019–2025;
- State Program for the Implementation of Key Directions of State Policy in the Field of Civil Defense for 2019–2030;
- Concept for the Development of the “Altyn Asyr” Region of Lake Turkmen for 2019–2025;
- National Strategy for the Development of Renewable Energy in Turkmenistan through 2030;
- National Forest Program of Turkmenistan for 2021–2025.

The key government agencies responsible for mitigating the effects *of mudflows and floods* in Turkmenistan are:

- the Main Directorate for Civil Defense and Emergency Rescue Operations under the Ministry of Defense of Turkmenistan;
- State Committee on Water Resources of Turkmenistan;
- The State Hydrometeorological Service of Turkmenistan (Turkmenhydromet);
- Local executive authorities (hakimliks).

¹⁰⁰ https://www.cawater-info.net/bk/dam-safety/files/chrez_situ_tm.pdf

¹⁰¹ https://online.zakon.kz/Document/?doc_id=35290044&show_di=1

¹⁰² https://online.zakon.kz/Document/?doc_id=31344758

¹⁰³ <https://minjust.gov.tm/ru/hukuk/merkezi/hukuk/527>

¹⁰⁴ <https://turkmenistan.gov.tm/index.php/ru/post/29047/zakon-turkmenistana-%3Cbr%3Eob-ekologicheskoi-bezopasnosti>

¹⁰⁵ https://online.zakon.kz/document/?doc_id=36302627

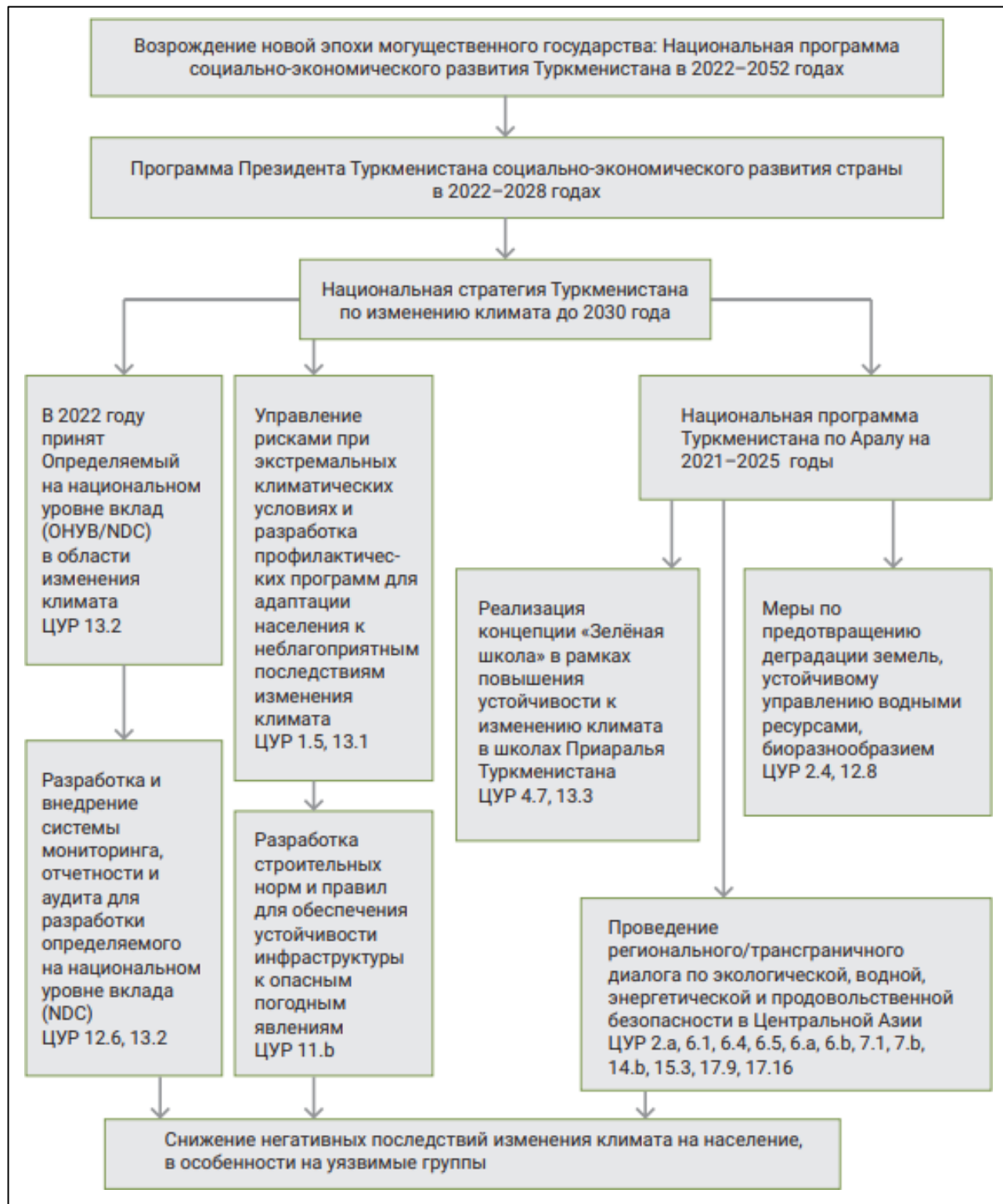
¹⁰⁶ <https://policy.asiapacificenergy.org/sites/default/files/National%20Climate%20Change%20Strategy%20of%20Turkmenistan%20%28RU%29.pdf>

¹⁰⁷ <https://turkmenportal.com/ru/news/40711-turkmenistanyn-20212025nji-yyllar-uchin-aral-milli-maksatnamasy-tassyklanyldy>

¹⁰⁸ <https://turkmenistan.gov.tm/ru/post/60781/The-Program-“The-Dawn-of-a-New-Era-of-a-Powerful-State”-Has-Been-Approved-The-National-Program-for-the-Socio-Economic-Development-of-Turkmenistan-for-2022-2052#:~:text=2022%20-%202052%20-.The%20Program%20“Revival%20of%20a%20New%20Era%20of%20a%20Mighty%20State”%20Has%20Been%20Approved.%20The%20National%20Program%20for%20Social,Turkmenistan%20for%202022%20-2052&text=In%20order%20to%20ensure%20high%20growth%20rates,%20it%20includes%20work%20and%20>

A brief analysis of existing policies, strategies, technologies, practices, research, and funding, as well as gaps and consequences in the implementation of measures to mitigate the effects of *mudflows and floods* in Turkmenistan:

Climate change is a global challenge of the 21st century. The climate is constantly changing, but over the past 100 years, these changes have become more extreme due to human activity. A key factor influencing climate change is greenhouse gas emissions, which continue to rise. Therefore, Turkmenistan has adopted targeted strategic and programmatic documents. The figure below illustrates the relationship between SDG 13 and these documents, as well as other SDGs.¹⁰⁹



¹⁰⁹<https://turkmenistan.un.org/sites/default/files/2023-07/VNR-2023%20Turkmenistan%20Report%20RU%20%281%29.pdf>

Turkmenistan is already facing the devastating consequences of climate change. The number of droughts and floods is increasing, while the frequency and amount of precipitation are decreasing; flash floods, mudflows, and periods of extreme heat are becoming more frequent. The country is also grappling with the consequences of the Aral Sea disaster.

In this regard, Turkmenistan is focusing its efforts on enhancing the country's resilience and adaptive capacity to climate change. Particular attention is being paid to measures to mitigate the effects of climate change not only in the environmental sphere but also in the economic and social spheres.

Turkmenistan's National Climate Change Strategy is a foundational document that takes into account the country's obligations under the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement. The Strategy aims to implement measures to adapt to observed and projected climate change and to limit greenhouse gas emissions. The Strategy identifies the main areas and priority sectors for climate change adaptation, where adaptation measures aimed at reducing climate change-related risks have been planned and are already being implemented.¹¹⁰

The National Strategy of Turkmenistan on Climate Change, in the section concerning the mitigation of the consequences of mudflows and floods establishes the following ¹¹¹:

- improving the climate monitoring system for hazardous weather events;
- improving short-term forecasting hazardous hydrometeorological phenomena, as well as medium- and long-term hydrometeorological forecasts;
- improving the early warning system and the dissemination of climate information to users;
- adapting building codes to ensure infrastructure resilience to hazardous climate events;
- developing a system for insuring against weather and climate risks.

The priorities for adaptation planning in Turkmenistan's natural disaster risk reduction sector are ¹¹² :

- improving the early warning system for natural disasters and the adverse effects of climate change;
- improving crisis and natural disaster management systems and plans;
- engaging local communities in the creation of climate-resilient facilities and zones, as well as providing them with technical and financial assistance;
- establishing monitoring systems and collecting real-time hydrometeorological and geotechnical data to track changes in watersheds and assess the stability of slopes at critical mountain passes;
- relocating populations from areas at high risk of natural disasters.

The country is a party to the United Nations Framework Convention on Climate Change, the Kyoto Protocol, and the Paris Agreement on Climate Change, which provide a unique opportunity to address the impact of human activities on the environment and climate through international agreements. According to the provisions of the UNFCCC, each country must take all possible actions within its territory to address the problem of global climate change.

Turkmenistan is fulfilling the commitments it has undertaken under the Paris Agreement and is also taking all necessary measures to prevent the potential negative consequences of climate change.

Adaptation measures are also being implemented under the Sendai Framework for Disaster Risk Reduction (2015–2030) and are aimed at reducing the risks of natural disasters such as floods, mudflows, and droughts.

In 2022, a complex of structures was built to protect Ashgabat from flooding caused by mudflows descending from the northern slopes of the Kopetdag Mountains in the southern part of the city. The uniqueness of this complex lies in the fact that a series of regulating, intercepting, and debris-discharge structures have been installed in a highly rugged area with complex topography.¹¹³

The following natural hydrometeorological phenomena, which pose the greatest threat to the country's socioeconomic development, are observed in Turkmenistan: floods and mudflows

¹¹⁰<https://turkmenistan.un.org/sites/default/files/2023-07/VNR-2023%20Turkmenistan%20Report%20RU%20%281%29.pdf>

¹¹¹<https://policy.asiapacificenergy.org/sites/default/files/National%20Climate%20Change%20Strategy%20of%20Turkmenistan%20%28RU%29.pdf>

¹¹²<https://www.undp.org/sites/g/files/zskgke326/files/2025-03/undp-tm-policybrief-biodiversity-rus-2025.pdf>

¹¹³<https://turkmenistan.un.org/sites/default/files/2023-07/VNR-2023%20Turkmenistan%20Report%20RU%20%281%29.pdf>

flash floods, strong winds, dust storms, droughts, dry winds, frosts, torrential rains, extreme heat, heavy snowfall, and hail. Between 1996 and 2005, floods and mudflows that resulted in significant property damage occurred approximately 30 times. Strong winds occur on average more than 120 times per year, and extreme heat occurs about 50 times. Compared to the period from 1986 to 1995, the number of floods, mudflows, and torrential rains has been increasing. Due to climate change, the intensity and frequency of extreme hydrometeorological events will increase.

Floods and mudflows are short-lived natural phenomena, but they cause extensive destruction and inflict enormous economic damage. The territory of Turkmenistan can be divided into three large zones that are at high risk of mudflows: Koytendag, Kopetdag, and the Greater and Lesser Balkhans. In 80% of cases, these are mudflows—water currents carrying various types of sediment; in 20% of cases, they are mudflows; and in 15% of cases, they are mixed mud-and-rock flows.

In Turkmenistan, mudflows occur on 229 permanent and temporary watercourses. Rivers prone to mudflows are located mainly in the Kopetdag Mountains. Over nearly 100 years, more than 1,500 mudflow events have been recorded on 80 watercourses in the Kopetdag Mountains; 87% of these occurred between April and August as a result of heavy downpours. The most dangerous months in this regard are April and May, which account for 54% of all recorded mudflows. The mudflow-prone period on the rivers and streams of the Kopetdag ranges from March to September; in rare cases, mudflows occur in October, and even more rarely in winter. Floods are rare during the summer and fall months, but their intensity and discharge volume can be significantly higher than normal, causing very significant damage as a result. Observations have shown that since 1990, mudflows of varying intensity have been observed annually

Approaches to Financing ¹¹⁴

The development of a climate finance infrastructure will play a key role in shaping a balanced climate policy for Turkmenistan. To implement adaptation measures in priority sectors by 2030, international financial support totaling 0.5 billion U.S. dollars will be required.

Currently, investments in adaptation measures in Turkmenistan are planned primarily as part of the preparation and implementation of national, sectoral, and regional programs for the country's socioeconomic development, while the bulk of funding for climate change mitigation measures in the natural disaster risk reduction sector comes from the state budget. At the same time, there is significant potential to increase the volume of climate finance in Turkmenistan through resources provided by international financial organizations and donors. Therefore, institutional reforms in the country will play a crucial role in the development of these mechanisms.

Gaps: Emergency response functions in Turkmenistan are carried out by the fire department, which is under the jurisdiction of the Ministry of Internal Affairs, and the Main Directorate for Civil Defense and Rescue Operations of the Ministry of Defense. In April 2024, against the backdrop of severe flooding in Russia and Kazakhstan, turkmen.news once again warned of the ineffectiveness of such a system.¹¹⁵

Numerous problems have been identified in all countries of the Central Asian region, including Turkmenistan. For example, national hydrometeorological services do not include disaster risk management tasks among their responsibilities. Furthermore, warnings are issued by various agencies—there is often no single body responsible for issuing them. Warnings are published without consideration of their impact and with limited localization and forecasting of consequences. Forecasts and warnings are typically sent to government agencies and ministries, national emergency management authorities, businesses, and the media, and are also disseminated through various channels (e.g., radio, television, social media, etc.) to inform the public and local communities.

Early warning systems in Central Asian countries, including Turkmenistan, face a number of challenges that reduce their effectiveness in preventing and minimizing the consequences of emergencies. The main challenge lies in the limited geographic coverage of monitoring and warning systems. Automated monitoring stations are often absent in remote or mountainous regions, making it difficult to warn the population in a timely manner. Additionally, many systems, including centralized alert systems, are obsolete both technologically and physically, as they were installed decades ago and do not meet modern technological standards¹¹⁶

¹¹⁴<https://www.undp.org/sites/g/files/zskgke326/files/2025-03/undp-tm-policybrief-biodiversity-rus-2025.pdf>

¹¹⁵<https://turkmen.news/turkmenistan-majskie-seli-nanesli-ushcherb-zheleznodorozhnym-putyam/>

¹¹⁶https://cesdrr.org/uploads/docs/2025/24.11.2024_%D0%9E%D0%B1%D0%B7%D0%BE%D1%80_%D0%A1%D0%A0%D0%9E_%D0%A6%D0%90.pdf

PART 5:

**A Comprehensive Review of Policies and Measures to Mitigate the Effects of
Mudflows and Floods in the Republic of Uzbekistan**

Policies and measures to mitigate the impacts of *mudflows and floods* in Uzbekistan are implemented based on a systematic approach that includes national climate change adaptation plans (such as the Sectoral Adaptation Plan for Emergencies), legislative acts (Presidential and Government Decrees), as well as large-scale programs such as “Yashil Makon” (“Green Space”), aimed at increasing resilience to climate risks, strengthening the capacity of government agencies, and protecting the population.¹¹⁷

The main objectives of the unified national system for the prevention and response to emergencies are (*selectively, only insofar as they relate to measures to mitigate the consequences of mudflows and floods*):

- developing and ensuring the implementation of a unified national policy in the field of prevention and response to natural and man-made emergencies..., hydrometeorology, and the sustainable operation of hydraulic structures...;
- the timely identification of risk factors and threats of emergencies, and ensuring early prevention and warning of their occurrence;
- providing comprehensive assistance to the population when their lives, health, or property are threatened, strengthening and expanding dialogue with the public and close cooperation with local self-government bodies and other civil society institutions...;
- ensuring the timely alerting and informing of the public about existing threats;
- developing and managing the State System for Emergency Prevention and Response (SSER)...;
- ensuring comprehensive monitoring and forecasting of threats related to the occurrence and development of emergencies, and conducting hydrometeorological and seismic observations in this area;
- coordinating activities and organizing effective cooperation among state and economic management bodies, local government authorities, citizen self-governance bodies, and other organizations to ensure the protection of the republic’s population and territory from natural and man-made emergencies, and establishing, for these purposes, state reserve funds of financial, food, medical, and logistical resources;
- organizing the development and implementation of a set of measures and targeted scientific and technical programs for the preparation, conduct, and coordination of activities aimed at preventing emergencies and protecting the population and the country’s territory, as well as programs in hydrometeorology, seismic monitoring; exercising oversight and effective control over the safety of hydraulic structures and small vessels; ensuring the safety of people on water bodies; and enhancing the resilience of economic facilities during emergencies;
- organizing and implementing systematic training for the public, officials, and State Emergency Service units to respond to emergencies, making extensive use of modern information and communication technologies and the mass media;
- training highly qualified professionals and enhancing their skills, as well as organizing and conducting research in the fields of hydrometeorology and the prevention and response to emergencies.

The Government of Uzbekistan attaches great importance to public safety and *invests significant resources in creating a comprehensive emergency response system* that both prevents emergencies and addresses their consequences. This emergency response system operates at both the national and local levels. Uzbekistan has established an integrated rescue system, known in the country as the State System for Emergency Prevention and Response (SSEPR).

The emergency management system in Uzbekistan is organized and managed by the Ministry of Emergency Situations. This ministry is responsible for developing policies and programs to prevent and respond to emergencies, ensure safety, mitigate the consequences of natural or man-made disasters, and minimize loss of life and property.

¹¹⁷ <https://www.uzbekistan.org.ua/ru/news/7047-zashita-okrujayushey-sredi---klyuchevoy-prioritet.html#:~:text=In%202021,%20on%20the%20initiative,and%20shrubs%20by%202030.>

In collaboration with other government agencies, the ministry has established a robust network for collecting and analyzing data to support informed decision-making regarding emergency response. This system includes the fire department, law enforcement agencies, military units, medical services, civil defense forces, regional and municipal authorities, as well as various private and humanitarian organizations.¹¹⁸

Cabinet of Ministers of the Republic of Uzbekistan ¹¹⁹: *(selectively, only with regard to measures to mitigate the effects of mudflows and floods)*:

- ensures the implementation of a unified state policy in the field of...;
- determines the procedures for the activities of republican executive bodies, local executive bodies, and other organizations in the field of...;
- ensures the creation of state reserves of financial and material resources for...;
- exercises oversight over the activities of republican executive authorities, local executive authorities, and other organizations in the field of...

The state authority specifically authorized to address issues related to the protection of the population and territories from emergencies (Ministry of Emergency Situations of the Republic of Uzbekistan): *(selectively, only with regard to measures to mitigate the consequences of mudflows and floods)*¹²⁰ :

- implements a unified state policy in the field of...;
- ensures compliance with legislation on the protection of the population and territories from...;
- develops and implements measures to prevent...;
- forecasts possible ... in advance;
- organizes the development of targeted programs and the conduct of scientific research in the field of...;
- within the limits of its authority, makes decisions that are binding on all organizations, regardless of their legal form or departmental affiliation, and on citizens...;
- coordinates action plans, regulations, rules, and instructions regarding...;
- identifies and implements measures at the national, regional, and local levels to reduce the risk of ...;
- exercises state oversight over the implementation of measures to protect against ...;
- participates in the conduct of state expert reviews of projects and decisions regarding ...

Local executive authorities: *(selectively, only with regard to measures to mitigate the consequences of mudflows and floods)*:

- make decisions regarding protection against ...;
- collect and exchange information on the protection of the population and territories, as well as provide timely warnings to the population about the threat of or occurrence of ...;
- establish reserves of financial and material resources for the elimination of ..., and provide funding for measures to protect against ...;
- facilitate the implementation of government programs in the field of protection against ...;
- ensure the implementation of urgent protective measures and emergency recovery operations in the event of ...;
- take measures to compensate for damage caused to the population as a result of ...;
- monitor the readiness of forces to eliminate...;
- mobilize all local forces and resources to address the consequences of ...

Republican executive authorities: *(selectively, only with regard to measures to mitigate the consequences of mudflows and floods)*:

¹¹⁸https://unfccc.int/sites/default/files/resource/Uzbekistan_SAP_Emergencies_RUS.pdf#:~:text=The%20purpose%20of%20the%20adaptation%20plan%20for%20the%20sector%20of%20emergency%20situations%20is%20to%20prepare%20for%20such%20situations%2C%20as%20well%20as%20to%20ensure%20its%20readiness%20for%20such%20situations%2C%20and%20to%20ensure%20its%20readiness%20for%20such%20situations%2C%20as%20well%20as%20to%20ensure%20its%20readiness%20Directorate%20for%20Emergencies,%20as%20well%20as%20ensuring%20its%20resources.

¹¹⁹<https://lex.uz/uz/docs/6161251?ONDATE=23.10.2025>

¹²⁰<https://lex.uz/uz/docs/6161251?ONDATE=23.10.2025>

- ensure compliance with legislation on the protection of the population and territories from ...;
- carry out preventive measures at facilities under their jurisdiction aimed at preventing potential...;
- ensure that facilities under their jurisdiction are prepared to respond in the event of...;
- develop and implement measures aimed at enhancing the operational resilience of the industry and facilities under their jurisdiction under conditions of...;
- submit action plans, regulations, rules, and instructions for protection against... to a specially authorized government agency for approval;
- train personnel at facilities under their jurisdiction on protection methods and actions to take in the event of...;
- provide information on the state of protection of the population and territories, and promptly alert the population and industry workers to the threat of ...;
- establish reserves of financial and material resources for the elimination of ..., set annual allocations for these purposes, and provide centralized support;
- ensure the creation, training, and maintenance of readiness of special forces and resources deployed to prevent and eliminate ...;
- monitor compliance with requirements regarding protection against ... during the design, construction, and reconstruction of facilities under their jurisdiction;
- coordinate with other republican executive authorities on matters of protection against....

Organizations responsible for protecting the population and territories from emergencies are required to:
(selectively, only with regard to measures to mitigate the consequences of mudflows and floods)

- plan, fund, and implement the necessary measures to protect employees of industrial and social facilities from emergencies;
- train employees on protection methods and actions to take during emergencies;
- establish and maintain local and facility-based automated warning systems in a state of constant readiness, and promptly alert employees to the threat of or occurrence of emergencies;
- ensure the stable operation of facilities and the well-being of employees during emergencies;
- ensure, when necessary, the timely construction of engineering protective structures and maintain them in a state of constant readiness;
- create reserves of financial and material resources for emergency response;
- establish the forces and resources required for the prevention and response to emergencies, and ensure their training and readiness;
- promptly inform the local office of the specially authorized state agency of the threat of or occurrence of emergencies within its territory;
- ensure that emergency rescue operations are carried out at facilities under its jurisdiction in accordance with action plans for the prevention and response to emergencies;
- establish specialized rescue services and rescue units in accordance with established procedures, and staff them with personnel, equipment, and supplies;
- carry out evacuation measures in accordance with established procedures and prepare shelters for people in advance;
- provide information on emergency preparedness;
- pay compensation to personnel who have died or been injured while engaged in emergency response.

The Hydrometeorological Service Agency (Uzhydromet) under the Ministry of Ecology, Environmental Protection, and Climate Change

- Provides accurate information on the weather forecast for the affected area;
- Provides information on weather forecasts and potential emergencies.

The key strategic and programmatic documents, as well as regulatory and legal acts, pertaining to the mitigation of the consequences *of mudflows and floods* in the Republic of Uzbekistan are:

Strategic and Programmatic Documents:

- 1) The “Uzbekistan—2030” Strategy: the main document defining priorities for environmental security and sustainable development;
- 2) State Program for 2025 (Year of Environmental Protection and the “Green” Economy). It includes measures to mitigate the effects of climate change and adapt to it;
- 3) National Strategy for Natural Disaster Risk Reduction through 2030: aimed at integrating emergency warning and response systems into all stages of public administration;
- 4) National Action Plan to Enhance Resilience to Natural Disasters and Climate Change: sets out specific steps to protect the population and territories;¹²¹
- 5) Adaptation Plan for the Emergency Management Sector in Uzbekistan for the period 2025–2030.

Regulatory Acts:

- 1) Law “On the Protection of the Population and Territories from Natural and Man-Made Emergencies” No. ZRU-790 of August 17, 2022: the foundational law governing activities in this area;
- 2) Law “On Limiting Greenhouse Gas Emissions” (No. ZRU-1073 of July 7, 2025): part of a long-term strategy to reduce climate risks affecting the frequency of extreme hydrometeorological events;
- 3) Resolution of the Cabinet of Ministers of the Republic of Uzbekistan “On Measures for the Effective Organization of the Activities of the State System for Emergency Prevention and Response of the Republic of Uzbekistan,” No. 171, dated April 29, 2023: regulates the operations of the State System for Emergency Prevention and Response;
- 4) Resolution of the Cabinet of Ministers of the Republic of Uzbekistan “On the Creation and Development of an Automated Emergency Alert System and Ensuring Its Effective Use,” No. 361, dated August 11, 2023;¹²²
- 5) Resolution of the Cabinet of Ministers of the Republic of Uzbekistan “On the Development and Organization of the Effective Implementation of the National Action Plan on Climate Change and Natural Disaster Risks,” No. 362, dated August 11, 2023;
- 6) Annual Presidential Decrees on measures to prepare for *the mudflow and flood season*: these are typically adopted at the beginning of the year to coordinate the actions of the Ministry of Emergency Situations, Uzbekistan Hydrometeorological Service, and local authorities to ensure safety during *the flood season* (for example, in 2025, risks were already identified in May).

The key government agencies responsible for mitigating the effects *of mudflows and floods* in the Republic of Uzbekistan are:

- 1) the Ministry of Emergency Situations of the Republic of Uzbekistan;
- 2) the Ministry of Ecology, Environmental Protection, and Climate Change of the Republic of Uzbekistan;
- 3) the Ministry of Water Resources of the Republic of Uzbekistan;
- 4) the Hydrometeorological Service Agency (Uzhydromet) under the Ministry of Ecology, Environmental Protection, and Climate Change of the Republic of Uzbekistan.

A brief analysis of existing policies, strategies, technologies, practices, research, and funding, as well as gaps and impacts, regarding the implementation of measures to mitigate the effects *of mudflows and floods* in the Republic of Uzbekistan:

Uzbekistan has established the State System for Emergency Prevention and Response (SSERP), whose structure complies with best international practices (i.e., the legal framework and institutional conditions).

The State System for Emergency Prevention and Response (SSEPR) is an organization that brings together more than 40 different agencies and ministries with specific responsibilities for preventing and responding to emergencies, as outlined in the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan “On Measures for the Effective Organization of the Activities of the State System for Emergency Prevention and Response of the Republic of Uzbekistan,” No.

¹²¹https://www.norma.uz/novoe_v_zakonodatelstve/prinyat_nacionalnyy_plan_deystviy_po_povysheniyu_ustoychivosti_k_stihiynym_bedstviyam_i_climate_change

¹²²<https://www.lex.uz/ru/>

No. 171 of April 29, 2023.¹²³ However, there is a need for its further improvement (primarily in the technical and scientific assessment of hazardous natural phenomena).¹²³

To enhance the effectiveness of measures to reduce the risk of natural disasters and increase resilience to climate change, the Cabinet of Ministers of the Republic of Uzbekistan adopted Resolution No. 362 dated August 11, 2023

No. 362 “On the Development and Organization of the Effective Implementation of the National Action Plan on Climate Change and Natural Disaster Risks,” Annex No. 2 to which approves a 26-point “roadmap” “for the implementation of the National Action Plan of the Republic of Uzbekistan on Natural Disaster Risk Reduction and Enhancing Resilience to Climate Change for 2023–2030,” which includes the following key objectives:

- ✓ Preventing emergencies and disasters associated with global climate change that pose a threat to human life;
- ✓ Establishing a system for monitoring and early forecasting of emergencies at reservoirs and other high-risk facilities;
- ✓ Deepening cooperation in areas such as ensuring unified global security, strengthening emergency response capabilities, facilitating the rapid exchange of information with all states in the region, and conducting joint exercises.

For the purpose of early warning, a network of meteorological, hydrometeorological, and hydrological stations has been established in the country to monitor the condition of watercourses and forecast the likelihood of floods and other climate-related phenomena. These stations are also connected to a monitoring center located in Tashkent. This center is responsible for collecting and analyzing data from the stations.

When there is a risk of emergencies, the center issues warnings; the information is forwarded to the Ministry of Emergency Situations and then to local authorities and the public.

Potentially hazardous glacial lakes that could cause *mudflows* are monitored on-site at least once every two years. There are currently no plans for automated online monitoring, in part because many of the lakes are located in neighboring countries.

After the Ministry of Emergency Situations receives early warnings from Uzhydromet, the national center processes the information and forwards it to the regional operations center. The regional operations center is responsible for receiving and analyzing information from the national center, taking local conditions into account, and disseminating alerts to local authorities. It ensures that messages reach the population that may be affected by a natural disaster.

The transmission of hydrometeorological information between ministries and national emergency management services is carried out via public communication channels (telephone, internet), and in emergency situations (threat or occurrence of a natural disaster)—via special communication and alert channels and means.

In Uzbekistan, units of the emergency management system are equipped with a unified communications system. Each unit has its own communication frequency. In the event of an emergency, all units involved switch to a single common frequency. This unified frequency ensures communication among all participants in the emergency response.

Public alerts are disseminated via television, radio, the press, the Ministry of Emergency Situations’ website, “Uzhydromet,” and SMS messages sent through mobile network operators, along with relevant recommendations on behavior and actions to take.

In accordance with the Law of the Republic of Uzbekistan “On the Protection of the Population and Territories from Natural and Man-Made Emergencies,” procedures and protocols have been established for all territories, ministries, agencies, and facilities of the Republic of Uzbekistan, as specified in the “Special Action Plans for Natural and Man-Made Emergencies.”

In Uzbekistan, standard operating procedures (SOPs) have been developed for all components of the rescue system. These SOPs are divided into two levels: military-type SOPs (in the event of a military attack, civil unrest, or a terrorist threat), which are classified; and SOPs for emergencies caused by natural disasters or human activity, which are available to entities involved in the emergency management system.

Joint exercises are conducted annually in Uzbekistan to test the functionality of all emergency services; the plan for these exercises is approved by the government at the beginning of the year. These exercises are held at the national, regional, or municipal level, and participation is mandatory not only for emergency management personnel

¹²³https://unfccc.int/sites/default/files/resource/Uzbekistan_SAP_Emergencies_RUS.pdf

in crisis situations, but also for members of civil defense and other organizations involved in rescue operations.

The Adaptation Plan for the Emergency Management Sector in Uzbekistan for 2025–2030 stipulates the following:

By July 2025, 162 weather stations were operational in Uzbekistan, 45 of which were automated and provided online data transmission. In addition, 42 hydrological and 6 radar stations were in operation. In 2024–2025, with the support of UNDP, the proportion of automated stations increased from 22 to 38 percent. In the area of early warning, nine new regional centers for emergency broadcasting and SMS alerts were put into trial operation and are currently functioning in test mode. Since 2024, satellite monitoring data has been integrated using the Sentinel and Copernicus services, as well as national unmanned aerial vehicles, marking an important step toward digitizing processes and applying big data technologies.

Overall, the plan serves as a roadmap for Uzbekistan to make its emergency management system more resilient to climate challenges, with a clear division of roles and a mechanism for tracking progress.

Uzbekistan Adopts Its First National Standard for Early Warning Systems for the Public Regarding Emergencies¹²⁴

For the first time, Uzbekistan has developed and implemented a national standard defining uniform technical requirements for early warning and public information systems regarding threats or the occurrence of emergencies. This document will serve as an important tool for improving the civil protection system and strengthening national resilience to natural disasters.

The new standard establishes uniform requirements for technical means of alerting the public, their classification, and rules for application to both existing and newly designed systems. These requirements will be taken into account during testing and quality control of technical equipment—whether purchased or manufactured—intended for use in systems for alerting and informing the public about threats or the occurrence of emergencies, which will ultimately improve the effectiveness and reliability of the Comprehensive Early Warning System (CEWS).

The project “Improving the Integrated Early Warning System to Enhance the Resilience of Uzbekistan’s Communities to Hazardous Natural Phenomena Caused by Climate Change” is a joint initiative of UNDP, the Ministry of Emergency Situations, and Uzbekistan Hydrometeorological Service, and is funded by the Green Climate Fund. The project’s activities are aimed at modernizing and transforming the country’s early warning system, with a focus on floods, mudflows, landslides, avalanches, and hydrological droughts in densely populated and economically important mountainous regions of the Republic of Uzbekistan.

Presidential Decree No. UP-185 of October 20, 2025, “On Raising the Level of Reliable Protection of the Population and Territories from Emergencies to a Qualitatively New Level”¹²⁵.

Priority areas for reform:

- Implementation at the mahalla level of measures for early warning of emergencies and mitigation of their consequences;
- introducing new standards and methodologies for emergency prevention, risk management, and the timely response to man-made accidents at energy facilities, large-scale manufacturing plants, construction sites, and service providers;
- Revising requirements and standards for government oversight;
- Widespread adoption of AI, robotics, and modern digital technologies, and the integration of information systems from agencies responsible for preventing such situations into a single technological platform;
- the creation of a comprehensive and continuous training system based on dual education for the targeted training, retraining, and professional development of personnel and managers at all levels of emergency response agencies;

¹²⁴<https://www.undp.org/ru/uzbekistan/news/v-uzbekistane-vpervye-prinyat-nacionalnyy-standart-sistemy-rannego-opovescheniya-naseleniya-o-chrezvychaynykh-situatsiyakh>

¹²⁵<https://lex.uz/ru/pdfs/7777290>

- organizing targeted scientific, innovative, and experimental research in the field of monitoring and forecasting emergencies, as well as protecting the population and territories from the threats of natural disasters, man-made accidents, and fires.

To reduce overlapping functions in the management of this sector, it was decided to transfer the Service for Managing Impacts on Hydrometeorological Processes from the Ministry of Emergency Situations to the Hydrometeorological Service Agency under the Ministry of Ecology, Environmental Protection, and Climate Change.

The document approves:

- The Concept for the Development of a System for the Protection of the Population and Territories from Emergencies.
- The Program of Comprehensive Measures for the Radical Improvement of the Emergency Protection Sector for 2025–2027.
- The composition of the working commission for implementing the Program.

Climate-related hazards in Uzbekistan include mudflows, landslides, floods, torrential rains, droughts, dust storms, and, in some areas, wildfires.

A significant portion of Uzbekistan's territory is at risk of mudflows. Under the influence of increasing climate variability, the areas potentially affected by mudflows may expand. Every year during the spring and summer, the country frequently experiences mudflows and flash floods, which result in significant material losses. These events cause enormous damage to populated areas and economic infrastructure, wash away crops, destroy irrigation canals, collapse bridges, and erode dirt roads and railways, among other effects.

The most likely cause of mudflows in Uzbekistan is heavy precipitation (rain, heavy snow) of high intensity. As a rule, such downpours are short-lived but cause significant damage. Mudflows are most frequent in March through May and occur in the country's foothills—in the Tashkent, Jizzakh, Navoi, Samarkand, Kashkadarya, and Surkhandarya regions, as well as in the Fergana Valley. Given the uneven distribution of heavy rainfall across the territory, mudflows occur on a localized basis.

From May through July and from October through November, mudflow activity persists in the foothills of the Namangan, Fergana, Tashkent, Jizzakh, Samarkand, Kashkadarya, and Surkhandarya regions. Under conditions of elevated temperatures, glacial mudflows are possible in the southern part of the Fergana Valley. There is also a risk of high-altitude lakes—dammed by paraglacial formations—bursting in Tashkent Region and in Kyrgyzstan to the north and south of the Fergana Valley, with mudflows spreading into Namangan and Fergana regions.

There is also an ongoing risk of mudflows caused by the breach of high-altitude lakes. Currently, there are 315 lakes in Uzbekistan that may pose a potential threat. They are located in the basins of 16 rivers, primarily in Kyrgyzstan and Tajikistan. The basins of 8 rivers contain large reservoirs capable of diverting the outflow from 130 lakes in the event of a breach. The mountains surrounding Uzbekistan are heavily glaciated. There are 3,265 glaciers here, with a total area of 1,553 km². Under current conditions of global warming, these glaciers are rapidly retreating, which could lead to the formation of a large number of glacial lakes. The situation regarding research on glacial lakes at risk of bursting has become catastrophic in recent years, as virtually no one is conducting comprehensive studies of them.

Glacial lakes pose a serious risk of breaching, as the dams that hold them back typically have a rather loose structure and often contain an icy core. Due to the high vulnerability of such dams to sudden warming or prolonged elevated temperatures, there is a high probability of their rapid failure, which could ultimately lead to glacial floods and mudflows, sometimes catastrophic (*for example, such as in the upper reaches of the Shahimardan River on July 8, 1998, as a result of the breach of three moraine lakes, as well as in July 1977 in the upper reaches of the Isfayramsay River*). There are reports of other similar floods in the Fergana Valley in previous years, though they were not as catastrophic. One of the most recent examples was a major glacial flood that occurred on August 13, 2010, along the Soh River.

At any time during the hot summer months, high temperatures can cause these lakes to overflow, leading to the destruction of the moraine and ice dams that hold back the meltwater. To mitigate risks associated with the potential breach of high-altitude lakes, every year during the period when snow accumulation ends and snowmelt begins in the mountains—that is, when the lakes reach maximum capacity and begin to empty—Uzhydromet, in collaboration with specialists from other agencies and the Ministry of Emergency Situations, conducts aerial and ground surveys of the condition of the most dangerous lakes and dams at risk of breach.

In paragraph 98 “Emergencies and Prevention of Natural Disasters Related to Climate Change That Threaten the Lives of the Population” of the “Uzbekistan–2030” strategy, approved by Decree No. PF-158 of the President of the Republic of Uzbekistan dated September 11, 2023, the following objectives are defined:¹²⁶

- the implementation in the republic of a national early warning system for strong earthquakes based on integration with the international global seismic observation system;
- establishing a system for monitoring and forecasting emergencies at water bodies and other high-risk facilities;
- deepening cooperation in areas such as ensuring unified global security, strengthening emergency response capabilities, and the prompt exchange of information with all states.

The “Uzhydromet” Hydrometeorological Service Center is a government agency specifically authorized to address issues in the field of hydrometeorology in the Republic of Uzbekistan. Uzhydromet comprises more than 330 stations that conduct hydrometeorological observations and monitor environmental pollution, through which it produces over 240 types of forecast, satellite, analytical, specialized, and reference hydrometeorological products.

The center prepares weather forecasts for the entire country, river flow forecasts, reports on the condition of major agricultural crops, agrometeorological forecasts, provides meteorological services for civil aviation, issues warnings about mudflows, floods, and avalanches, and monitors the condition of high-altitude lakes at risk of bursting, as well as atmospheric air, surface water, soil, and background radiation levels. However, the analysis revealed a number of issues within the service's structure.

Statistics: In recent decades, climate change has become one of the main factors influencing natural processes, including extreme hydrological events. The territory of Uzbekistan, located in a region with a sharply continental climate, is characterized by an increase in the frequency and intensity of *mudflows*.

According to studies, 3,763 cases *of mudflows* were recorded between 1987 and 2020, 61% of which caused material and social damage, and 17% resulted in human casualties. These phenomena pose a serious threat to infrastructure, agriculture, transportation networks, and the population. Mountainous and foothill regions are particularly vulnerable to these phenomena, where active land development without consideration *of mudflow hazards* leads to significant losses.

Mudflow and flash flood processes in Uzbekistan are caused by a combination of natural factors—such as steep slopes, heavy precipitation, and specific soil and geological conditions—as well as human-induced impacts, including the destruction of vegetation cover and improper land use. At the same time, the characteristics of mountainous and foothill regions—such as a high degree of rock fracturing, low soil water-holding capacity, and the intense erosive potential of precipitation—contribute to an increased risk of *mudflows*.¹²⁷

Transboundary Measures

On November 15, 2025, as part of President Kassym-Jomart Tokayev's state visit to Uzbekistan, the Second Meeting of the Supreme Intergovernmental Council of the Republic of Kazakhstan and the Republic of Uzbekistan took place. During the meeting, Nurzhan Nurzhigitov, Minister of Water Resources and Irrigation of the Republic of Kazakhstan, and Shavkat Khamraev, Minister of Water Resources of Uzbekistan, signed an intergovernmental agreement on the joint management and rational use of transboundary water bodies.

The agreement establishes agreed-upon mechanisms for cooperation regarding transboundary rivers and canals that provide water to the populations and agricultural regions of both countries. The document provides for the coordination of operating regimes for water management facilities used by both countries, the conduct of regular joint inspections, and the adoption of preventive measures to ensure their reliable operation and prevent emergencies.

In addition, an agreement was reached on the development of a joint automated system for monitoring water discharge and intake in transboundary sections, with real-time data exchange. The implementation of this system will allow

¹²⁶ [https://lex.uz/ru/docs/6600404#:~:text=1.%20Approve%20the%20\"Uzbekistan%20—%202030\"%20Strategy%20in accordance with, based on%20the%20experience%20gained%20during%20the%20implementation%20of%20Strategy 8](https://lex.uz/ru/docs/6600404#:~:text=1.%20Approve%20the%20\)

strengthen control over the use of water resources and promote trust-building between the water management agencies of the two countries.

The document provides for coordinated measures to modernize and repair water management infrastructure, reduce water losses, introduce water-saving technologies, and improve the reclamation status of irrigated lands. The parties will also coordinate efforts to prevent and mitigate the effects *of floods*, droughts, and other natural phenomena.

To implement the Agreement, a Kazakhstan-Uzbekistan Intergovernmental Commission will be established to coordinate the implementation of the agreements, make decisions on the operation of water management facilities of interstate use, form specialized working groups, and facilitate dialogue between the competent authorities of the two countries. The commission will meet twice a year, alternating between Kazakhstan and Uzbekistan.¹²⁸

Early Warning and Monitoring Systems¹²⁹.

While awareness of emergency preparedness and response may be high in Uzbekistan's cities and higher-level administrative units, the same cannot be said for rural and remote areas, where the population is most vulnerable. These areas may not have access to the same level of education, resources, and infrastructure as urban areas, making them more vulnerable to natural disasters and other emergencies.

In remote and rural areas of Uzbekistan, early warning systems can save lives by providing timely and accurate information to those who would otherwise not have access to it. Often, people living in remote areas may be unaware of the potential risks they face or of the resources available to mitigate the effects of natural disasters. Early warning systems provide them with the information needed to prepare for and respond to emergencies.

Many areas may lack reliable sources of electricity, internet connectivity, and even mobile networks, which makes it difficult to disseminate warnings. In such areas, alternative methods—such as sirens, loudspeakers, or even mobilizing the population—must be used to inform the public.

In Uzbekistan, sirens are used in some areas to alert the public. However, these sirens only sound a warning signal; they do not convey information about the impending danger. Further dissemination of information to the public must be carried out by local authorities or law enforcement agencies, which takes a long time in large areas and may result in the information not reaching all residents in the risk zone.

Another weakness of the warning system is its complete dependence on the power grid. In the event of a sudden power outage, the system becomes blind and mute. The overall warning system must be made more sophisticated and reliable by equipping sirens with the capability to broadcast voice messages, as well as by providing backup power supplies, so that it remains operational in the event of a power outage or a mobile network failure.

As part of the modernization of the early warning and monitoring system, it is necessary to implement automated analysis of satellite imagery, including modeling systems based on artificial intelligence (AI). Such a system can detect dust storms and issue timely warnings. Particular attention can be paid to drought forecasting using advanced modeling systems.

Currently, there are dozens of monitoring stations operating in the country, but they are not connected to the online alert system, so information about hazards is received with a delay. The system assesses the situation every three hours, and in the event of an emergency, every 30 minutes. In the case of dust storms, there is a risk that they will not be detected, as they occur at intervals shorter than three hours.

With technical assistance from UNDP, the Government of Uzbekistan is expanding the Uzhydromet monitoring network, which consists of meteorological and hydrological stations. The meteorological system includes weather stations, radar stations, and aerological stations, including avalanche stations. These stations will be connected online to the central monitoring system, and the early warning system is expected to be significantly improved, especially in remote and sparsely populated areas where the most vulnerable population groups live.

An effective monitoring and warning system is crucial for reducing the likelihood of injuries and fatalities during natural disasters. Improving the capacity of the warning system

¹²⁸<https://www.gov.kz/memleket/entities/water/press/news/details/1106037?lang=ru>

¹²⁹https://unfccc.int/sites/default/files/resource/Uzbekistan_SAP_Emergencies_RUS.pdf

Covering rural and remote areas can ensure that all residents of Uzbekistan receive adequate warnings and preparation in the event of a danger.

Improving early warning systems for adverse events could also significantly strengthen the country’s economy. In particular, the agricultural sector is one of the main drivers of Uzbekistan’s economy, and this sector is heavily dependent on climatic conditions. As extreme weather events become increasingly frequent and threaten crop yields, the implementation of effective warning systems is essential for enhancing the resilience of the agricultural sector.

Making warning systems accessible and user-friendly is also essential to help vulnerable populations in Uzbekistan prepare for natural disasters. Therefore, it is necessary to invest in technologies capable of quickly providing the necessary information in a format that is understandable to the public.

PART 6:

A Brief Overview of Policies and Measures to Mitigate the Impacts of Mudflows and Floods in Central Asia: A Regional Perspective

Regional policies and measures for the prevention and response to emergencies, including measures to mitigate the effects of mudflows and floods in Central Asian countries, are planned and implemented on the basis of and within the framework of:

1) Consultative meetings of the heads of state of Central Asia.

Consultative meetings of the heads of state of Central Asia:

- serve as an annual platform for political dialogue among the region’s leaders—the presidents of Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan;
- constitute the only format that brings together exclusively the countries of the region and serve as the sole platform for discussing critical issues of regional security, the economy, the environment, and the joint resolution of regional problems.

2) Multilateral and bilateral intergovernmental agreements on cooperation in the field of emergency prevention and response ¹³⁰.

The governments of the Central Asian countries,

- taking into account the possibility of large-scale, transboundary emergencies, the consequences of which cannot always be addressed by the forces and resources of a single country, recognizing the need to jointly utilize emergency rescue forces, logistical, medical, food, financial, and informational resources to carry out measures for the prevention and mitigation of emergencies,
- recognizing that cooperation in the field of disaster prevention and response will contribute to ensuring the protection of the population and territories, as well as the well-being and security of the countries of the region, based on the interdependence of ecological systems, which requires the implementation of coordinated policies for disaster prevention and response, as well as the organization of environmental monitoring,
- desiring to extend the principles of regional cooperation to emergency assistance and making joint efforts to ensure effective and coordinated assistance to affected populations, striving to strengthen the traditionally friendly relations between the peoples of their states, the comprehensive development of interstate and international relations, and comprehensive interaction and cooperation among the countries of Central Asia, supporting the United Nations’ efforts in the field of international emergency assistance and taking measures to establish an effective international legal framework,

have agreed to cooperate and collaborate, and to take joint, coordinated actions in the field of emergency prevention and response through the conclusion of multilateral and bilateral intergovernmental agreements.

Multilateral Intergovernmental Agreement of the Central Asian Countries
1998

¹³⁰https://cesdrr.org/uploads/legal/2025/11.08._Обзор_межгосударственных_соглашений.pdf

1.	Agreement between the Republic of Kazakhstan, the Kyrgyz Republic, the Republic of Tajikistan, and the Republic of Uzbekistan on Cooperation in the Field of Emergency Prevention and Response, <i>dated July 17, 1998, Cholpon-Ata (Kyrgyz Republic)</i> .
Bilateral Intergovernmental Agreements	
2009	
1.	Agreements between the Government of the Republic of Kazakhstan and the Government of the Kyrgyz Republic on cooperation in the field of civil defense (protection), prevention, and response to emergencies, <i>dated June 16 June 2009, Astana</i> .
2000	
2.	Agreement between the Government of the Republic of Tajikistan and the Government of the Republic of Uzbekistan on joint measures and cooperation regarding timely warning in the event of a breach of Lake Sarez, <i>dated May 30, 2000, Tashkent</i> .
2013	
3.	Agreement between the Government of the Republic of Kazakhstan and the Government of the Kyrgyz Republic on the Establishment of a Center for Emergency Situations and Natural Disaster Risk Reduction, <i>dated May 17, 2013, Almaty</i> .
4.	Agreement between the Government of the Kyrgyz Republic and the Government of the Republic of Tajikistan on Cooperation in the Field of Civil Defense (Protection), Prevention, and Response to Emergencies, <i>dated May 27, 2013, Bishkek</i> .
5.	Agreement between the Government of Turkmenistan and the Government of the Republic of Uzbekistan on cooperation in the field of emergency prevention and response, <i>dated November 25, 2013, Tashkent</i> .
2014	
6.	Agreement between the Government of the Republic of Kazakhstan and the Government of the Republic of Tajikistan on cooperation in the field of civil defense, emergency prevention, and response, <i>dated September 6, 2014, Almaty</i> .
2017	
7.	Agreement between the Government of the Republic of Tajikistan and the Government of Turkmenistan on cooperation in the field of civil defense, prevention, and response to emergencies, <i>dated November 2, 2017, Dushanbe</i> .
2021	
8.	Agreement between the Government of the Republic of Kazakhstan and the Government of Turkmenistan on cooperation in the field of civil defense, prevention, and response to emergencies, <i>dated October 25, 2021, Ashgabat</i> .
9.	Agreement between the Government of the Republic of Kazakhstan and the Government of the Republic of Uzbekistan on cooperation in the field of emergency prevention and response, <i>dated December 6, 2021, Astana</i> .
2023	
10	Agreement between the Cabinet of Ministers of the Kyrgyz Republic and the Government of the Republic of Uzbekistan on cooperation in the field of emergency prevention and response, <i>dated January 27, 2023, Bishkek</i>

3) Regional Forum—Meeting of Heads of Emergency Management Agencies ¹³¹, established in 2018 and held annually in one of the Central Asian countries on a rotating basis. Decisions adopted at the Meeting of Heads of Emergency Management Agencies are recorded in the form of minutes.

The participating countries in the Regional Forum are the Republic of Kazakhstan, the Kyrgyz Republic, the Republic of Tajikistan, Turkmenistan, and the Republic of Uzbekistan.

The Regional Forum serves as a supporting mechanism for strengthening and developing regional cooperation in the areas of disaster risk reduction, emergency prevention, and response, and functions as *a permanent consultative platform*. All decisions are made

The Regional Forum performs the following functions:

- (a) promoting the implementation of key areas of regional cooperation in the field of disaster risk reduction, emergency prevention, and response;
- (b) to promote capacity-building for disaster risk reduction, prevention, and response to emergencies at the regional and national levels;

¹³¹<https://cesdrr.org/региональный-форум>

- c) cooperating with international, governmental, and nongovernmental organizations in other countries to study best practices and exchange experience in the field of emergency prevention and response;
- (d) improving the professional qualifications of experts and specialists from emergency response agencies by facilitating the organization and conduct of experience-sharing sessions, training sessions, educational courses, exercises, and other activities;
- e) developing proposals and recommendations for review and approval analytical and methodological materials, and the use of international terminology;
- e) support for scientific and technical programs aimed at preventing and investigating the causes and consequences of emergencies.

4) Strategy for the Development of Cooperation Among Central Asian Countries in the Field of Disaster Risk Reduction for 2022–2030¹³².

The objective of the Strategy is to enhance the effectiveness of cooperation among Central Asian countries in the field of disaster risk reduction and emergency response in order to prevent human, economic, and environmental losses and to create conditions for the sustainable development of the countries in the region.

The main objectives of the Strategy are:

- a) strengthening the institutional framework for regional and cross-border cooperation among countries in the field of disaster risk reduction;
- b) to develop a common information platform for assessing and forecasting disaster risks and the occurrence of emergencies;
- c) supporting the development of human resource capacity in the countries of the region in the field of disaster risk reduction;
- d) supporting the development of National Disaster Risk Reduction Platforms in Central Asian countries to develop and implement disaster risk reduction strategies at the national and local levels;
- e) supporting and attracting investment in the field of disaster risk reduction, involving the private sector, international and regional organizations, and partners.

The priority areas of action for achieving the Strategy's goals and objectives are:

- a) improving the regional institutional and legal frameworks for disaster risk management; b) enhancing knowledge and understanding of disaster risk, particularly of a transboundary nature;
- c) attracting investment in disaster risk reduction measures at the regional level; d) strengthening emergency response preparedness.

The Strategy is implemented by the emergency management agencies of the Central Asian countries and the Center for Emergency Situations and Natural Disaster Risk Reduction—the Secretariat of the Regional Forum—the Meeting of Heads of Emergency Management Agencies of Central Asian Countries—based on Action Plans (Roadmaps).

The Strategy is implemented by initiating, developing, promoting, and implementing joint interstate and international programs and projects in the areas of natural disaster risk reduction, climate change adaptation, and emergency prevention and response, with technical and financial support from the participating countries of the Regional Forum, donor agencies, international and nongovernmental organizations, scientific and research organizations, as well as the private sector.

The Strategy is implemented on the basis of Action Plans (Roadmaps) for the implementation of the Strategy, approved by resolutions of the Regional Forum—a meeting of the heads of emergency management agencies of Central Asian countries—in three phases: Phase 1: 2022–2023. Phase 2: 2024–2026. Phase 3: 2027–2030.

5) Regional Strategy for Adaptation to Climate Change in Central Asia¹³³.

Regional Strategy for Adaptation to Climate Change in Central Asia:

- a) was developed by the countries of the region and agreed upon by the Republic of Kazakhstan, the Kyrgyz Republic, the Republic of Tajikistan, Turkmenistan, and the Republic of Uzbekistan;

¹³²<https://cesdrr.org/uploads/regforum/2021/05.11.21%20-%20Стратегия%20развития%20сотрудничества%20стран%20ЦА%20по%20СРБ.pdf>

¹³³<https://centralasiacclimateportal.org/ru/publications/региональная-стратегия-к-адаптаци-к/>

(b) constitutes a “framework” strategic document with a planning timeframe that aligns with the 2030 timeline for achieving the Sustainable Development Goals.

The long-term vision of the Strategy is that by 2030, the countries of Central Asia will enhance climate resilience and minimize vulnerability to climate impacts in accordance with the Paris Agreement through a “better together” collaborative approach.

Based on this long-term vision, the overall objective of the regional strategy through 2030 is to develop a mechanism for cooperation among Central Asian countries to address the negative impacts of climate change and implement adaptation measures.

Most climate change adaptation measures will be implemented at the national level, with regional harmonization of approaches and methodologies, joint resource mobilization, and so on.

Based on this key understanding, the objective of the regional strategy will be achieved through the fulfillment of *four strategic tasks*:

- a) strengthening regional coordination on climate change adaptation;
- b) establishing mechanisms for the development and implementation of adaptation projects and programs and for mobilizing resources;
- c) enhancing adaptation capacity through knowledge accumulation, exchange, and scientific cooperation;
- d) developing systems for climate monitoring, information exchange, and forecasting.

The priority areas for implementing adaptation actions will be the creation of favorable conditions in the most vulnerable sectors at the national level:

- a) water resources;
- b) energy;
- c) agriculture and land use;
- d) public health;
- e) natural ecosystems and biodiversity;
- f) “climate-related” natural disasters.

6) Regional Coordination Mechanism for Emergency Response ¹³⁴.

The Regional Coordination Mechanism was established in 2021 to provide support and assistance in strengthening interaction, cooperation, and coordination among the emergency response agencies of Central Asian countries, as well as international and nongovernmental organizations working in the field of emergency response at the regional level and the provision of international humanitarian aid.

The competent authorities of the Regional Coordination Mechanism are:

- (a) the emergency response agencies of the Central Asian countries—the authorized state bodies responsible for civil protection/defense, and the prevention and response to emergencies;
- (b) international and non-governmental organizations working in the field of emergency response in the Central Asian region (UNDP, UNICEF, UNHCR, UN-HABITAT, WFP, FAO, IFCRC, IOM, and others);
- (c) The activities of the Regional Coordination Mechanism are organized by the Center for Emergency Situations and Natural Disaster Risk Reduction—the Secretariat of the Regional Forum—the Meeting of Heads of Emergency Agencies of Central Asian Countries.

7) Regional Scientific and Technical Council on Emergencies (RSTC)¹³⁵.

The RSTC, established in 2019, is a public expert advisory body of the Regional Forum - the Meeting of Heads of Emergency Agencies of Central Asian Countries, established to assist in strengthening regional scientific and technical cooperation among the emergency agencies of Central Asian countries, international and non-governmental organizations, and scientific and educational institutions in the field of disaster risk reduction, emergency prevention, and response.

¹³⁴<https://cesdrr.org/uploads/regforum/2021/05.11.21%20-%20Regulations%20on%20the%20Regional%20Coordination%20Mechanism%20for%20Emergency%20Response.pdf>

¹³⁵<https://cesdrr.org/uploads/rnts/положение%20РСТС.pdf>

The Regional Coordination Mechanism (RCM) carries out its activities in cooperation with emergency response agencies in Central Asian countries, UN agencies, scientific and educational institutions, the Red Cross and Red Crescent Societies, and other key stakeholders involved in disaster risk reduction, emergency prevention, and response.

The main objectives of the RNTs are:

- a) to promote the strengthening of regional scientific and technical cooperation and collaboration among government agencies, international organizations, scientific and educational institutions, and other stakeholders in the field of disaster risk reduction, emergency prevention, and response, particularly for large-scale and transboundary emergencies;
- b) to facilitate the coordination of scientific and technical activities carried out by government agencies, international and nonprofit organizations, and research and educational institutions in the field of disaster risk reduction, emergency prevention, and response at the regional level;
- c) participating in the planning and implementation of regional scientific, technical, and educational programs and projects aimed at disaster risk reduction, emergency prevention, and response;
- d) developing scientific and technical proposals and recommendations on the application of scientific and practical achievements, information and communication technologies, and innovations in the field of disaster risk reduction, emergency prevention, and response;
- e) conducting public scientific and technical reviews of regional scientific, scientific-technical, educational, and innovative programs and projects, as well as instructional and methodological materials in the field of disaster risk reduction, prevention, and response to large-scale and transboundary emergencies;
- f) participating in the development of regional scientific and technical programs and projects in the field of emergency prevention and response, as well as recommendations for their funding;
- g) facilitating joint scientific and technical work, in collaboration with stakeholders, to protect the population and territories from large-scale and transboundary emergencies;
- h) participating in the collection, synthesis, and dissemination to stakeholders of scientific, technical, and methodological information in the field of disaster risk reduction, emergency prevention, and response at the regional level;

8) Regional system for early warning and mutual notification regarding the threat of and occurrence of emergencies.¹³⁶

Regional system for mutual information sharing regarding the threat or occurrence of emergencies:

- a) is established to ensure that the emergency response agencies of Central Asian countries immediately and urgently exchange operational information regarding the threat or occurrence of natural, man-made, or environmental emergencies, the impact factors of which pose a threat of spreading to the territories of other countries in the region;
- b) to adopt a set of measures aimed at reducing the socioeconomic damage and losses caused by emergencies, particularly those of a large-scale and transboundary nature;

The procedure for establishing and ensuring the functioning of mutual information sharing regarding the threat of or occurrence of emergencies consists of two main stages:

- Stage One: Emergency management agencies in Central Asian countries exchange operational information on a quarterly basis regarding the forecasting and monitoring of hazardous natural, man-made, and environmental processes and phenomena, as well as the status of potentially hazardous facilities that pose a threat of emergencies, the damaging effects of which may spread to the territories of other countries in the region;
- Stage Two: Upon the identification of a threat or the occurrence of natural, man-made, or environmental emergencies—whose damaging factors, according to monitoring data, forecasting, and assessment of the situation, pose a risk of spreading to the territories of other countries in the region, the emergency response agencies of the Central Asian countries shall ensure immediate mutual notification and the exchange of operational information regarding the situation, and shall organize interaction and cooperation to coordinate joint actions.

¹³⁶https://cesdr.org/uploads/2022-news/38/new/181022/Положение_о_PCPO.pdf

9) Protocol of Intent on Improving Early Warning Systems and Mechanisms for Exchanging Information on Threats or the Occurrence of Emergencies¹³⁷, dated October 17, 2025.

The Ministry of Emergency Situations of the Republic of Kazakhstan, the Ministry of Emergency Situations of the Kyrgyz Republic, the Committee of Emergency Situations and Civil Defense under the Government of the Republic of Tajikistan, the Ministry of Defense of Turkmenistan, and the Ministry of Emergency Situations of the Republic of Uzbekistan, hereinafter referred to as the Parties,

with the aim of improving the regional early warning system for hydrological disasters and the mechanism for exchanging information on the threat or occurrence of cross-border emergencies among the emergency management agencies of the Central Asian countries, **have expressed their intention to:**

- to take measures to improve the regional early warning system for hydrological disasters, the effects of which may extend to the territories of other countries;
- to take measures to improve the mechanism for the interstate exchange of information regarding the threat of or occurrence of cross-border emergencies;
- to exchange monthly operational information on potential transboundary threats;
- if additional data is required, intend to request information from other Parties regarding potential transboundary threats;
- upon receiving a request for additional data on potential cross-border threats, intend to provide the relevant information to the other Parties that submitted the request as soon as possible;
- to immediately exchange urgent operational information regarding the threat of or occurrence of cross-border emergencies;
- when exchanging information regarding threats or the occurrence of cross-border emergencies among the emergency response agencies of Central Asian countries, intend to use:
 - the standard form “Monthly Operational Information on Potential Cross-Border Threats”;
 - the standard form “Request for Information on Potential Cross-Border Threats”;
 - the standard form “Urgent Operational Information on the Threat or Occurrence of Cross-Border Emergencies”;

10) Roadmap for the Establishment of a Regional Early Warning System for Hydrological Disasters in Pilot Transboundary River Basins of Central Asian Countries¹³⁸, approved by the Regional Forum-Meeting of Heads of Emergency Management Agencies of Central Asian Countries, Minutes of October 17, 2025.

No.	Activities	Timeline	Responsible Parties	Expected Results
1.	Development of technical specifications for all elements of the system	4th quarter of 2025	CCSSRB	Detailed technical specifications have been developed and agreed upon with GIZ
2.	Procurement and installation of automated hydrometeorological stations with a full set of sensors and other necessary equipment: ▪ On the Ugam River (territory of the Republic of Kazakhstan) ▪ On the Ugam River (in the Republic of Uzbekistan) ▪ On the Zaravshan River (in the Republic of Uzbekistan) ▪ On the Zaravshan River (in the Republic of Tajikistan)	2026 Second quarter of 2026 Second quarter of 2025 Third quarter of 2026 Third quarter of 2026	Central Committee for the Development of the Russian Federation, technical partners, national meteorological services of Central Asian countries, Emergency management agencies of Central Asian countries	Automated hydrometeorological stations with a full set of equipment have been procured and installed in all pilot river basins

¹³⁷https://cesdr.org/uploads/docs/2025/8/Протокол_о_намерениях_по_вопросам_совершенствования_СРО%2С_БО%2С_фин..pdf

¹³⁸<https://cesdr.org/uploads/2025-news/27/Дорожная-карта.pdf>

	- On a transboundary river (to be specified) (Territory of the Kyrgyz Republic) - On the Amu Darya River (Territory of the Republic of Uzbekistan) - On the Amu Darya River (Territory of Turkmenistan)	Third quarter of 2026 Fourth quarter of 2026 Fourth quarter of 2026		
3.	Testing of a pilot model for transboundary monitoring (installation of paired stations)	2026	Central Committee of the State Service for Meteorology and Hydrology, National Meteorological and Hydrological Services of Central Asian countries	Successful testing of the pilot model for cross-border monitoring was conducted—the stations are now integrated with one another
4.	Development of a regional geoinformation platform (GIS) based on the Central Cross-Border Station Network	4th quarter of 2025 – Q2 2026	Central CSSRB, Software developers, partners	A unified regional GIS platform has been deployed using server resources, with the capability to remotely connect to installed sensors automated stations
5.	Purchase and installation of additional siren and public address systems in pilot districts; development and implementation of a mobile app to alert the public	2026–2027	Central Commission for Civil Defense and Emergency Situations, technical partners, emergency agencies of Central Asian countries	Additional early warning systems have been installed at necessary locations along the pilot river basins. A unified mobile app has been developed for alert the public via push notifications
6.	Implementation of the MODSNOW model and other hydrological modeling	2025–2026	GFZ, Central Hydrological and Meteorological Service	A unified regional hydrological modeling system has been developed and implemented
7.	Training of national specialists and conducting transboundary training seminars	2026–2027	Central Hydrological Service of the Republic of Belarus, National Meteorological and Hydrological Services of Central Asian countries, emergency management agencies of Central Asia	A series of training sessions was conducted for representatives of the National Meteorological and Hydrological Services of Central Asian countries, emergency management agencies of Central Asian countries, and representatives of local authorities
8.	Independent assessment of the system, preparation of recommendations, and a region-wide scaling plan	2027	External experts, the Technical Working Group, and the Central Regional Crisis Management and Emergency Response Center	An independent assessment of the system was conducted