

Brief information about the project

Name of the project	BR28713751 « Development of a complex risk management system for the most hazardous moraine lakes in the Ile and Kungey Alatau ranges river basins»
Relevance	In recent decades, global warming has had a significant impact on the moraine-glacial complex of Ile, Kungey Alatau, which is evident in their intensity of melting. This process leads to a significant reduction in the glaciers area, which in turn affects the change in the ecosystem of the study area. In this regard, it is important to use modern monitoring methods, as GIS and RSE, especially in conditions of limited opportunities for conducting and implementing traditional field research. A key aspect of the program is the use of hydrodynamic model, simulating the passage of mudflow during a breakthrough of the most outburst-hazardous lakes, as well as an analysis of 2D mudflow models to determine the territory vulnerability by using indicators such as flow intensity. Based on the results obtained, recommendations will be developed for the prevention and prevention of lake outbursts to reduce the risk of catastrophic mudflows.
Purpose	To develop a comprehensive system for monitoring, warning and preventing breakthroughs of the most dangerous moraine lakes in the river basins of the Ile and Kungei Alatau ranges to reduce the risk of mudflow disasters using ground data, aerial photography data and Earth remote sensing data
Objectives	2025: Conduct a survey and compile a catalog of moraine-glacial lakes in the river basins of the Ile and Kungei Alatau ranges; collect aerial photographs and space images, meteorological data, attribute information, create topographic plans of various scales and purposes, vectorize data. 2026: Identify the most outburst-hazardous moraine lakes and assess the degree of their outburst hazard; develop a technology for determining the size and altitude characteristics of the water surface of glacial lakes using remote sensing methods. 2027: Create models and visualizations of mudflows during breakthroughs of the most mudflow-hazardous lakes, and perform an analysis for 2D mudflow models; develop recommendations for the prevention and avoidance of lake outbursts in order to reduce the risk of mudflow disasters.
Expected and achieved results	1) Results of aerial and ground surveys of the river basins of the Ile and Kungey Alatau ranges to identify and determine moraine and rockfall lakes in order to compile a single catalog of lakes. Collection

	of spatial and non-spatial data, including cartographic, hydrometeorological and remote sensing data of moraine-glacial lakes in the river basins of the Ile and Kungey Alatau ranges. 2) Geoinformation database of moraine lakes: vector data based on aerial photography, meteorological data, and thematic data based on remote sensing, topographic bases and attribute information characterizing moraine lakes. 3) Identification of the most mudflow-hazardous lakes and methods for assessing the outburst hazard of lakes. 4) Technologies for determining the size and altitude characteristics of the water surface of moraine-glacial lakes using remote sensing methods. 5) Creation of a model and visualization of a mudflow during a breakthrough of the most mudflow-hazardous lakes using GIS technology (RAMMS program) and performing an analysis for 2D mudflow models; 6) Development of recommendations for the prevention and avoidance of lake outbursts in order to reduce the mudflow risk of disasters. 7) According to the requirements of the tender documentation, it is planned to publish articles in foreign peer-reviewed scientific journals: - at least 6 (six) articles and (or) reviews in peer-reviewed scientific publications in the scientific field of the program, included in the 1st (first), 2nd (second) and (or) 3rd (third) quartile of the impact factor in the Web of Science database and (or) having a percentile according to CiteScore there are at least 50 (fifty) in the Scopus database. - at least 7 (seven) articles in journals recommended by the Committee for Quality Assurance in Science and Higher Education. - publication of monographs, books and (or) chapters in books of foreign and (or) Kazakhstani publishing houses – it is planned to publish at least 1 (one) monograph or textbook in foreign and (or) Kazakhstani publishing houses recommended by the academic council and (or) scientific and technical council of the applicant's organization;
Research team members with their identifiers (Scopus Author ID, Researcher ID, ORCID, if available) and links to relevant profiles	1. Nyssanbayeva A.S. – Project Manager, STS, Candidate of Geographical Sciences, Head of the Department of Meteorology and Hydrology, Associate Professor at the Faculty of Geography and Environmental Management of Al-Farabi Kazakh National University. Scopus Author ID: 57196262066; h-index – 5; https://www.scopus.com/authid/detail.uri?authorId=57196262066 https://orcid.org/0000-0003-1611-7775 2. Mussina A.A. is a leading researcher, Candidate of Geographical Sciences, Associate Professor at Al-Farabi Kazakh National University, Faculty of Geography and Environmental Management, Department of Meteorology and Hydrology. Scopus Author ID: 57195243363, h-index – 5; https://www.scopus.com/authid/detail.uri?authorId=57195243363

<https://orcid.org/0000-0002-5115-2640>

3. **Kaldybaev A.A.** is a leading researcher, PhD in natural sciences, associate member of the International Academy of Sciences of Eurasia, for the best achievements in scientific activity he became a laureate of the State Scholarship for Talented Young Scientists of Kazakhstan in 2018, is an active member of the IEEE Geoscience and Remote Sensing Society.

Scopus Author ID: 56703542100, h-index-7;

<https://www.scopus.com/authid/detail.uri?authorId=56703542100>

<https://orcid.org/0000-0002-0563-282X>

4. **Samarkhanov K.B.** is a leading researcher, Candidate of Geographical Sciences in the field of geomorphology and evolutionary geography, holds a PhD in Cartography and Geographic Information Systems (GIS) of the People's Republic of China.

Scopus Author ID: 57196121772; h-index-7;

<https://www.scopus.com/authid/detail.uri?authorId=57196121772>

<https://orcid.org/0000-0001-9799-8695>

5. **Dedova T.V.** is a Senior Researcher, Candidate of Technical Sciences, Head of the Laboratory for Modeling Water-ecological Processes at the Institute of Ionosphere, with more than 25 years of experience.

Scopus Author ID: 57222987462; h-index – 3;

<https://www.scopus.com/authid/detail.uri?authorId=57222987462>

<https://orcid.org/0000-0001-5310-6931>

6. **Balakai L.A.** is a Senior Researcher, Candidate of Technical Sciences, highly qualified specialist with more than 25 years of experience in the field of geographic information systems (GIS), development and integration of mathematical models for monitoring and modeling environmental and atmospheric processes.

Scopus Author ID: 6504367336; h-index – 3;

<https://www.scopus.com/authid/detail.uri?authorId=6504367336>

<https://orcid.org/0000-0001-6660-4796>

7. **Zhanabayeva Zh.A.** is a Senior Researcher, PhD candidate, Senior lecturer at the Department of Meteorology and Hydrology, Faculty of Geography and Environmental Management, Al-Farabi Kazakh National University.

Scopus Author ID: 57191187902; h-index-2;

<https://www.scopus.com/authid/detail.uri?authorId=57191187902>

<https://orcid.org/0000-0002-4226-1941>

8. **Rakhimova M.S.** is a leading researcher, PhD, completed her doctoral studies in Cartography and Geographical Information Systems at the Xinjiang Institute of Ecology and Geography of the Chinese Academy of Sciences, People's Republic of China.

Scopus Author ID: 57216812283; h-index – 3;

<https://www.scopus.com/authid/detail.uri?authorId=57216812283>

<https://orcid.org/0000-0002-9873-105X>

9. **Ruslan Salmurzauli** is a leading researcher, PhD, Senior lecturer at the Department of Biodiversity and Bioresources of Al-Farabi Kazakh National University. 14 years of work experience, several internships abroad at Greifswald University (Germany) and Rakuno Gakuen University (Japan).

Scopus Author ID: 56610282000; h-index – 6;

<https://www.scopus.com/authid/detail.uri?authorId=56610282000>

<https://orcid.org/0000-0001-9667-8526>

10. **Altaybek A.A.** is a leading researcher, PhD in Computer Science, a leading researcher at the Institute of Ionosphere, with a basic education in the field of Information Systems. He has more than 19 years of professional experience in various institutions, including Head of the Information Technology Department, senior lecturer at the Faculty of Engineering and developer of the KUTEL-Erasmus+ project at Yesenovo University.

Scopus Author ID: 57218957117; h-index – 4;

<https://www.scopus.com/authid/detail.uri?authorId=57218957117>

<https://orcid.org/0000-0001-8431-7950>

11. **Taukebayev O.Zh.** is a senior researcher, PhD Candidate, Honorary project executor (assistant). Specialist in cartography, GIS and remote sensing. Scopus Author ID: 57347268200; h-index – 3;

<https://www.scopus.com/authid/detail.uri?authorId=57347268200>

<https://orcid.org/0000-0002-7959-1434>

12. **Zulpykharov K.B.** is a senior researcher, PhD Candidate, specialist in the development and application of remote sensing methods for monitoring, assessing and controlling mountain glaciers, the meliorative state of the environment, water resources, and irrigated lands.

Scopus Author ID: 58055198400; h-index – 3;

<https://www.scopus.com/authid/detail.uri?authorId=58055198400>

<https://orcid.org/0000-0002-0275-2463>

13. **Abdullayeva A.S.** is a Senior researcher, PhD, Senior lecturer at the Department of Meteorology and Hydrology, Faculty of Geography and Environmental Management, Al-Farabi Kazakh National University.

Scopus Author ID: 58001704200; h-index – 2;

<https://www.scopus.com/authid/detail.uri?authorId=58001704200>

<https://orcid.org/0000-0001-8947-4920>

14. **María-Elena Rodrigo-Clavero** is a Senior Researcher, PhD, Associate Professor at the Polytechnic University of Valencia (Valencia, Spain) and a member of the Hydrogeology Group at the Institute of Water and Environmental Engineering (IIAMA).

Scopus Author ID: 57214945890; h-index – 8;

<https://www.scopus.com/authid/detail.uri?authorId=57214945890>

<https://orcid.org/0000-0002-8611-0504>

15. **Sydyk N.K.** is a senior researcher, PhD candidate in Space

	Engineering and Technology, Master of Information Systems. Currently, he holds the position of Head of the Laboratory of Space and Geoinformation Technologies at the Ionosphere Institute. Specializes in geographic information systems (GIS) and remote sensing of the Earth (remote sensing). Scopus Author ID: 57221663824; h-index – 2; https://www.scopus.com/authid/detail.uri?authorId=57221663824 https://orcid.org/0000-0003-1429-2393 16. Iskalieva G.M. is a senior researcher, PhD candidate in the field of water resources management. The main areas of scientific activity include the study of water resources, atlas mapping, as well as the use of geographic information systems (GIS) and remote sensing in geographical research. Scopus Author ID: 57218437612; h-index – 1; https://www.scopus.com/authid/detail.uri?authorId=57218437612 https://orcid.org/0000-0002-3183-728X 17. Ospanova M.S. is a Senior researcher, PhD, Senior lecturer at the Department of Meteorology and Hydrology, Faculty of Geography and Environmental Management at Al-Farabi Kazakh National University. Scopus Author ID: 57223190936; h-index – 1; https://www.scopus.com/authid/detail.uri?authorId=57223190936 https://orcid.org/0000-0002-6812-4507 18. Tursumbayeva M.O. – PhD, Senior Researcher, Senior Lecturer at the Department of Meteorology and Hydrology, Faculty of Geography and Environmental Management, Al-Farabi Kazakh National University. Scopus Author ID: 57197808769; h-index – 5. https://www.scopus.com/authid/detail.uri?authorId=57197808769 https://orcid.org/0000-0002-7526-8197 19. Abishev B.Zh. is a researcher, Head of the Department of Emergency Prevention and Operation of Protective Structures of the Ministry of Emergency Situations of the Republic of Kazakhstan. https://orcid.org/0000-0001-9432-4767 20. Merekeev A.A. is a researcher, PhD candidate, Master's degree in Geoinformatics and Remote Sensing of the Earth, Senior Researcher at the Institute of Ionosphere. Scopus Author ID: 58054774800; h-index – 1; https://www.scopus.com/authid/detail.uri?authorId=58054774800 https://orcid.org/0000-0002-9227-4695 21. Kabdeshev A.N. is a researcher, researcher at MNK Astana, Master of Technical Sciences in the field of Surveying. Scopus Author ID: 57221661007; h-index – 1; https://www.scopus.com/authid/detail.uri?authorId=57221661007 https://orcid.org/0009-0007-9688-5833 22. Tursyngali M.N. is a Junior Researcher, PhD doctoral student at
--	--

	the Department of Meteorology and Hydrology, Faculty of Geography and Environmental Management at Al-Farabi Kazakh National University. Scopus Author ID: 58798919700; https://www.scopus.com/authid/detail.uri?authorId=58798919700 https://orcid.org/0009-0005-5925-5889 23. Beksultanova Zh.U. is a Junior Researcher, PhD doctoral student, Senior lecturer at the Department of Meteorology and Hydrology, Faculty of Geography and Environmental Management at Al-Farabi Kazakh National University. Scopus Author ID: 58798919700; h-index – 1. https://www.scopus.com/authid/detail.uri?authorId=58798919700 https://orcid.org/0009-0005-5925-5889 24. Amangeldi A.A. is an engineer at the Ionosphere Institute, a graduate of al-Farabi Kazakh National University with a degree in Geoinformatics. https://orcid.org/0009-0000-1314-0799 25. Sagat M.S. is an engineer at the Ionosphere Institute and a graduate of al-Farabi Kazakh National University with a degree in Cadastre. https://orcid.org/0009-0004-0174-5677 26. Serikkyzy Inkar is the chief engineer-hydrologist of the Department of Emergency Prevention and Operation of Protective Structures of the State Institution "Kazmudflowprotection" of the Ministry of Emergency Situations of the Republic of Kazakhstan, Master of Natural Sciences in the specialty "Hydrology". https://orcid.org/0000-0003-3830-183X
List of publications with links to them	
Patents	