

Date of Submission	
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IPL Project (IPL-Number) Annual Report Form

**Period of activity under report
from 1 January 2023 to 31 December 2023**

1. Project Number and Title:

IPL-238 Landslides Threatening Russian Cultural Heritage Sites

2. Main Project Fields

(2) Targeted Landslides: Mechanisms and Impacts

B. Landslides Threatening Heritage Sites

(3) Capacity Building

B. Collating and Disseminating Information/ Knowledge

3. Name of Project Leader

Gorobtsov Denis N.

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Core members of the Project

Igor Fomenko – Dr., professor of Department of Engineering geology, Russian State geological Prospecting University;

Daria Shubina – master, Senior Lecturer of Department of Engineering geology, Russian State geological Prospecting University;

Margarita Novgorodova – master, Lecturer of Department of Engineering geology, Russian State geological Prospecting University.

4. Objectives: Development and approbation of the landslides modeling methodology within historical natural-technical systems.

5. Study Area: different objects of Russian cultural heritage, including UNESCO cultural heritage sites.

6. Project Duration: 4 years

7. Report

1) Progress of the project:

In 2023, the authors of this study were involved in several large-scale projects related to

landslide research. As an intermediate result, the following articles were published:

1. Stochastic Analysis in Assessing Slope Stability.
2. Probabilistic approach to modeling slope stability: implementation and features.
3. Modern Landslide Activity and Slope Stability Analysis on the Site "Oreanda" (Southern Slope of the Crimean Mountains)
4. Study and Instrumental Monitoring of Landslides at the "Russkie Gorki" Site in the Mzymta River Valley, Sochi Region, Russia.

Daria Shubina also spoke at several international conferences:

1. 6th World Landslide Forum, Session 1.7. CULTURAL HERITAGE THREATENED BY LANDSLIDES: FROM EARTH OBSERVATION AND IN SITU INVESTIGATION TO SUSTAINABLE MITIGATION MEASURES on the topic: Slope stability assessment of the Nikolskaya mountain in the Mozhaisk Kremlin.

2. Conference: The XIV Congress of the International Association for Engineering Geology and the Environment Engineering Geology for a Habitable Earth on the topic: Modern Landslide Activity and Slope Stability Analysis on the Site "Oreanda" (Southern Slope of the Crimean Mountains).

The project participants have done a lot of work that has allowed them to supplement the database necessary for systematizing information on landslides at historically significant sites. This contributes to the formation of a knowledge system on the features of landslide development within the framework of historical natural and technical systems, as planned.

2) Planned Future Actions or Project Completion Statement

In 2024, it is planned to continue landslide research at cultural heritage sites. Additional work will be carried out to collect and analyze data, and new methods for monitoring and predicting landslide processes will be developed. Particular attention will be paid to the study of historical natural and technical systems that may be susceptible to landslides. This will allow for a better understanding of the mechanisms of landslide formation and development, as well as the development of effective measures to prevent them and minimize their consequences.

As part of this work, active cooperation with experts in the field of archeology, geology and other related sciences is envisaged.

In addition, it is planned to hold training seminars for specialists involved in the study and preservation of cultural heritage sites. This will improve the level of professional training and exchange experience between project participants. Presentations at conferences will also allow us to share the results of our research with the scientific community, receive feedback and discuss further areas of work.

It is expected that the research results of 2024 will become an important contribution to the development of scientific knowledge about landslides and will help preserve unique cultural heritage sites for future generations.

- 1) Project beneficiaries for science, education and/or society: Ministry of Culture of the Russian Federation, Russian Orthodox Church, UNESCO
- 2) Results: Modeling and assessment of the stability of landslides of various types and scales, instrumental monitoring. Performing a local landslide hazard assessment using Scoops3D. Application of GIS-based statistical methods to assess the potential development of landslides. Landslides are regionally located: Sparrow Hills, Moscow; Moscow region; Crimea; Mzymta River Valley, Sochi Region, Russia.