

Date of Submission	25.3.2023.
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IPL Project (IPL-220) Annual Report Form

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

1. Project Number and Title: IPL-220, Kostanjek landslide monitoring project (Zagreb, Croatia)

2. Main Project Fields

(1) Technology Development

A. Monitoring and Early Warning,

B. Hazard Mapping, Vulnerability and Risk Assessment

(2) Targeted Landslides: Mechanisms and Impacts

A. Catastrophic Landslides,

B. Landslides Threatening Heritage Sites

(3) Capacity Building

A. Enhancing Human and Institutional Capacities

B. Collating and Disseminating Information/ Knowledge

(4) Mitigation, Preparedness and Recovery

A. Preparedness

B. Mitigation, C. Recovery

3. Name of Project Leader

Martin Krkač

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Core members of the Project:

- Snježana Mihalić Arbanas, Full Professor, University of Zagreb, Faculty of Mining, Geology and Petroleum Engineering
- Sanja Bernat Gazibara, Assistant Professor, University of Zagreb, Faculty of Mining, Geology and Petroleum Engineering
- Hrvoje Lukačić, Assistant, University of Zagreb, Faculty of Mining, Geology and Petroleum Engineering
- Željko Arbanas, Full Professor, University of Rijeka, Faculty of Civil Engineering

4. Objectives (5 lines maximum)

The project aims to develop a procedure for predicting the Kostanjek landslide movement to mitigate the landslide risks. The establishment of the procedure consists of developing the phenomenological (statistical) model for predicting landslide movement, automating the landslide prediction process through the development of customized software, and implementing the technology and results of the project into civil protection.

5. Study Area

Kostanjek landslide is located in the urbanized area of the City of Zagreb, the capital of Croatia. Kostanjek landslide is the biggest landslide in the Republic of Croatia.

6. Project Duration

3 or more years

7. Report

1) Progress in the project (30 lines maximum)

The first four phases of the project, in the period 2017-2022, included: (1) preliminary analyses of the data collected from the Kostanjek landslide monitoring system in the period from 2012 to 2018; (2) definition of prediction parameters; (3) the development of several landslide trigger-movement models and (4) testing and comparison of models. During 2023, the fifth and the sixth phase of the project were carried out. The fifth phase of the project, the development of customized software (application) for visualization and prediction of the Kostanjek landslide, was finished through the final testing of the application. The sixth phase included threshold value definitions for different parameters and warning levels. After completing the application, the definition of various scenarios related to the threat posed by the Kostanjek landslide, started in cooperation with those responsible for managing the risks posed by landslides on the national and local levels (City of Zagreb).

2) Planned future activities or statement of completion of the Project (15 lines maximum)

Future activities are related to the completion of the procedures for different scenarios, related to the threat posed by landslides, in cooperation with those responsible for managing the risks posed by landslides on the national and local levels (City of Zagreb). After that, the defined procedures should be officially implemented in the civil protection procedures of the Republic of Croatia and the City of Zagreb.

3) Beneficiaries of Project for Science, Education and/or Society (15 lines maximum)

The primary beneficiaries are emergency management offices, the City of Zagreb's civil protection, and residents endangered by the Kostanjek landslide. In addition, the research will promote innovation in landslide monitoring and prediction. Finally, the beneficiaries of the research will also be the professionals and scientists involved in geological and geotechnical engineering who are in charge of landslide research and high education.

4) Results (15 line maximum, e.g. publications)

The result of activities in the period 2023 was the final version of the application for the visualization and early warning for the Kostanjek landslide. The name of the application is “Landslide early warning system”. Original title in Croatian is *Sustav ranog upozoravanja na klizišta*, with official abbreviation SRUK.

Note:

- 1) If you will change items 2-7 from the proposal, please write the revised content **in Red**.
- 2) Please fill and submit this form to ICL Network <icl-network@iclhq.org>
- 3) Reporting year must be one or two years (Maximum).