Date of Submission	22 June 2025

IPL Project (IPL-Number) Annual Report Form

Period of activity under report
from 1 January 2024 to 31 December 2024

1. **Project Number and Title: 271 - Tree-ring microscopic anatomy as landslide deformation data source for optimization of landslide hazard assessment in forested regions**

2. **Main Project Fields**

Select the suitable topics. If no suitable one, you may add new field.

(1) Technology Development

B. **Hazard Mapping, Vulnerability and Risk Assessment**

(2) Targeted Landslides: Mechanisms and Impacts

A. **Catastrophic Landslides**

(3) Capacity Building

B. Collating and Disseminating Information/ Knowledge

(4) Mitigation, Preparedness and Recovery

A. Preparedness

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Core members of the Project: Prof. Karel Šilhán, University of Ostrava, Czech Republic

Doc. Pavel Raška, Jan Evangelista Purkyně University in Ústí nad Labem, Czech Republic

Dr. Jan Balek, IRSM CAS, Czech Republic

3. **Objectives** (5 lines maximum)

We aim to prepare new methodology of the well establish tree-ring based (cf. dendrogeomorphic) landslide investigations, which will allow i) reliable dating of past landslide events and ii) characterization of their magnitude in terms of regional extend and movements. These parameters are crucial inputs into landslide hazard assessment, but are largely unavailable in forested regions where long-term monitoring is missing and applicability of Earth observing technologies is seriously limited.

4. **Study Area**

The project will be performed in the temperate regions of Central Europe (e.g., Czech Republic, Austria, Slovakia), but the methodology will be applicable globally in all temperate regions.

5. Project Duration

2022 – ongoing

6. Report

1) Progress in the project (30 lines maximum)

We build on our previous findings about the tree growth capabilities to reflect landslide movements, their velocity (cf., sliding/creep) and character of subsurface deformation (extension, contraction, only tilting) to assess the hazard of several complex landslides in the Czech Republic. The dendrochronological data allowed us to evaluate the hazard of landslide areas which have not been monitored, but the tree ring data provided us with movement recurrence frequencies used for this purpose. Their validity was checked against landslide areas with available monitoring. On a different site, we showed that dendrochronology can be applied even on landslides whose movement destroyed all trees. This is the case when a landslide maintains an increased level of movement activity even after the major failure phase.

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

In our future work, we will explore the possible role of dendrochronology in engineering applications, including slope stability calculations. We will continue in calculating landslide hazard based on dendrochronological evidences for all landslides where such information is available. We will try to compare this approach to hazard assessment with other approaches.

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

The results of the project are used by other researchers or offices dedicated to landslide hazard assessment and mitigation.

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

Klimeš, J., Hartvich, F., Šilhán, K. (2024) Long-term movement activity and internal structure of deep-seated landslide by using dendrochronology analysis and electric resistivity tomography in flysch rocks, Carpathians, Czech Republic. Landslides. https://doi.org/10.1007/s10346-024-02330-9

Šilhán K, Balek J, Klimeš J, Blahůt J, Harvich F, Raška P, Riezner J, Šťastný M (2025) Complete historical chronology of complex landslide movements? Improving the tree-ring based results using multidisciplinary approaches. CATENA, 252: 108877. https://doi.org/10.1016/j.catena.2025.108877.

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@landslides.org>
3) Reporting year must be one or two years (Maximum).