Date of Submission	

IPL Project (IPL-Number) Annual Report Form

Period of activity under report
from 1 January 2022 to 31 December 2023

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)

The conducted dendrochronological research showed that trees can correctly record landslide movements while not requiring regular maintenance, external power supply, or weather protection and in forested regions have excellent aerial coverage. Recent findings showed that tree growth disturbances can be used to distinguish sliding from creep and compression from extension movement within the landslide body. Moreover, trees´ responses to landslide movement disturbances are specific concerning underground properties of sliding masses allowing the identification of more coherent, block-like movements from highly disturbed shallow landslides. The research also proved that trees provide reliable chronologies of landslide movements with their spatial extent, which represent the necessary information for landslide hazard assessment. We are convinced that these findings will allow for reliable landslide hazard assessment of landslides without any previous in-situ or remote monitoring and thus significantly expand regions where landslide hazard and risk assessment can be performed.

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

The future works of the project will aim at the description of the trees as landslide movement sensors in a way which allows them to be used in engineering applications including slope stability calculations.

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 line maximum, e.g. publications)

- Šilhán, K., Balek, J., Hartvich, F., Klimeš, J., Blahůt, J., Hampel, F., 2023. Anatomical growth response of Fagus sylvatica L. to landslide movements. Science of the Total Environment 867, 161554. http://dx.doi.org/10.1016/j.scitotenv.2023.161554

- Šilhán, K., Balek, J., Hartvich, F., Klimeš, J., Blahůt, J., Hampel, F., 2023. Anatomical growth response of Fagus sylvatica L. to landslide movements. Science of the Total Environment 867, 161554. http://dx.doi.org/10.1016/j.scitotenv.2023.161554

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).