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IPL Project Proposal Form 2022

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

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

3. Name of Project leader

Dr. Jan Klimeš

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Core members of the Project

Names/Affiliations:

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

4. Objectives: (5 lines maximum; what you expect to accomplish?)

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.

5. Background Justification: (10 lines maximum)

Dendrogeomorphology proved to be an effective tool for past landslide events dating in afforested temperate regions and recently it has also been used for slope scale hazard assessment. But there are several drawbacks which prevent its results to be recognize as reliable input for hazard assessment. When comparing tree-ring based landslide chronologies with complete historical records of past landslide events, dendromorphic data often suggest larger number of the events. Moreover, it is rarely known if the entire landslide or its minor part has been involved in the movement and how large (cf. horizontal or vertical displacement) the movement was. To answer these questions, we will use novel method using microscopic anatomical tree growth response to detect landslide movements. Detected tree responses will be calibrated with long-term (>20 years) monitoring data and complete regional

historical records.

6. Study Area: (2 lines maximum; where will the project be conducted/applied?)
The project will be performed in the temperate regions of the Central Europe (e.g., Czech Republic, Austria, Slovakia), but the methodology will be applicable globally in all temperate regions.
7. Project Duration: (1 line maximum)
The project is planned for three years.
8. Resources necessary for the Project and their mobilization
The project is using already equipped landslide monitoring sites operated by the IRSM CAS (https://www.tecnet.cz/index.php?page=google_mapa_sesuv) as well as up to date laboratory and field equipment for dendrogeomorphological analysis available at the University of Ostrava (<http://www.dendroman.cz/>). The historical information about landslide occurrence will be collected during archive search aimed on specific sites and will also use already processed information from history (Czech historical landslide database - <https://childa.cz/?lang=en>) or recent years (<https://www.irmsm.cas.cz/ext/sesuvy/>). During the first two years of the project, its activities will be co-financed by research project awarded to the all three institutions applying for this IPL project.
9. Project Description: (30 lines maximum)
The main project tasks are: i) processing of available landslide monitoring (Dr. Balek) data into form to be readily comparable with tree-ring records; ii) preparation of complete historical landslide chronologies using already available historical records as well as search in archives for selected sites (Doc. Raška) and interviewing local inhabitants (Dr. Klimeš); iii) interpretation of microscopic anatomical tree growth response from newly obtained as well as archival tree-ring records (Prof. Šilhán). Potential collaborators from other institutions will be searched by all project members, but emphasis will be paid on institutions involved in the Internal Consortium on Landslides.
10. Work Plan/Expected Results: (20 lines maximum; work phases and milestones)
We will process already available monitoring and historical landslide data (see “8. Resources necessary for the Project and their mobilization”) as well as reanalyzing previously collected dendrological records. Large attention will be aimed on searching for potentially interested collaborators from other institutions to involve them in the application of the new methodology we will prepare.
11. Deliverables/Time Frame: (10 lines maximum; what and when will you produce?)
The project aims to connect with other research institutions which are dealing with landslide hazard assessment in temperate, forested regions and can contribute with either tree-ring or landslide monitoring data. One deliverable of this project is network of research institutes which would be interested to apply the new methodology of dendrogeomorphic research. Results of the project will be published in open access book series “Progress in Landslide Science and Technology”. Research results within the Czech Republic will be presented to the public bodies (e.g., village administrations) responsible for landslide hazard assessment and mitigation through scientific opinion statements regularly published by the Czech Academy of Sciences.
12. Project Beneficiaries: (5 lines maximum; who directly benefits from the work?)
Results of the project will be useful especially for other researchers or offices dedicated to landslide

hazard assessment and mitigation. We will present them to administration offices of selected villages and towns in the Czech Republic, where landslides are serious hazard and reliable hazard assessment is so far missing.

13. References (Optional): (6 lines maximum; i.e. relevant publications)

Note: Please fill and submit this form **by 15 September 2022** to ICL Network <icl-network@iclhq.org> and KLC secretariat <klc2020@iclhq.org>