

**IPL Project Proposal Form 2021**

1. **Project Title:** World-wide-web-based Landslide Observatory (W3bLO).
2. **Main Project Fields:** (1) Technology Development: B. Hazard Mapping, Vulnerability and Risk Assessment.
3. **Name of Project leader:** Professor Matjaž Mikoš, dr. sc. techn. ETH.  
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**Core members of the Project:** Jošt Sodnik, PhD (UL FGG), Nejc Bezak, PhD (UL FGG), Mateja Jemec-Auflič, PhD (Geological Survey of Slovenia – GeoZS), Mitja Jermol, MSc (Chair of IRCAI – Research Centre on Artificial Intelligence, Institute Jožef Stefan, Ljubljana, Slovenija – under auspices of UNESCO), and Joao Pita Costa, PhD (IRCAI, IJS).
4. **Objectives:** Development of a web-based Landslide Observatory, capable of collecting/presenting a nearly now-casted information on the present status of selected indicators relevant for landslide risk reduction at the global scale. For its development Artificial Intelligence (AI) techniques will be applied (e. g. Deep Learning, other algorithms), and selected large databases with data from public domain. The observatory is a first step towards building of a Digital Twin of Landslide Risk Assessment.
5. **Background Justification:** Landslides of diverse forms are threatening many parts of the world (Petley, 2012), and the situation will worsen during pronounced climate change in the next decades (Gariano & Guzzetti, 2016). It is important to strengthen joint efforts to reduce landslide disaster risk (Sassa, 2021). A proposed important step can be a development of an observatory of the current situation with landslide risk at the world scale. This world-wide-web-based Landslide Observatory could be used by multiple stakeholders, including the Intergovernmental Panel on Climate Change (IPCC) when working on a special report on climate-change related landslide risk at the global scale. Such an observatory could also serve as the tool to develop a unique dynamic Global Landslide Risk Index to be proposed as an indicator for SDGs (e. g. National Risk Index by FEMA in the USA: <https://hazards.fema.gov/nri/landslide>).
6. **Study Area:** global scale using different on-line satellite data (i. e. Sentinel) and large web databases.
7. **Project Duration:** 3 years (July, 2022 – June, 2025).
8. **Resources necessary for the Project and their mobilization:** The total project budget is estimated at 50.000 EUR, covered by the UNESCO WRDRR Chair from Slovenian national sources and in-kind, and IRCAI from current EU projects. Personnel to work on the projects are up to three post-doc researchers, part-time. Technical facilities are available (computer power, databases).
9. **Project Description:** IRCAI has already developed algorithms using Artificial Intelligence to analyze social media and other media data at the global scale, mainly by using Microsoft Academic data.

UNESCO WRDRR Chair experts will contribute their expertise in landslide risk reduction for development of the W3bLO (Mikoš and Petkovšek, 2019). The web platform for the W3bLO has been developed and is under development for the Water Observatory (NAIADES project: <https://naiades.ijs.si>). A »Water Observatory« (WO) is a website, monitoring water-related events. WO enables insights into water related issues through data analysis and AI and is built for water experts and the general public, a more in-depth description is available (NAIADES, 2021). A similar global observatory with the focus on floods already exists: <https://floodobservatory.colorado.edu/>, initiated in 1993 as the Dartmouth Flood Observatory (DFO) that moved in 2010 to University of Colorado. An observatory on landslide disaster risk will be built around existing AI technologies. The new observatory will complement landslide-related products, such as: Global Landslide Hazard Map (<https://www.arup.com/projects/global-landslide-hazard-map>), EM-DAT International Disaster Database ([www.emdat.be](http://www.emdat.be)) or NASA Earth Observatory, covering also landslides (<https://earthobservatory.nasa.gov/topic/landslides>), the NASA Global Landslide Catalog of rainfall-induced landslides (<https://catalog.data.gov/dataset/global-landslide-catalog-export>) (Kirschbaum et al., 2010; 2015; NASA, 2015) – the largest openly available global inventory of rainfall-triggered mass movements, and Landslide Susceptibility Map (Kirschbaum et al., 2016; Stanley et al., 2017; NASA, 2017; Emberson et al., 2020). NASA products are compiled at: <https://gpm.nasa.gov/applications/landslides#modelingandreportinglandslides>, NASA has developed Landslide Hazard Assessment for Situational Awareness (LHASA) Model using global models for precipitation (Emberson et al., 2018; NASA, 2018).

10. Work Plan/Expected Results: The project will be organized around the following work packages:
  - WP1 – Development of AI tools and techniques to be used for LO. The newest review literature will be used: prediction methods for emergency management (Huang et al., 2021), applications of AI for disaster management (Sun et al., 2020), AI in natural disaster management (Tan et al., 2021), detecting changes on the Earth's surface using remote sensing and AI for disaster management (Shi et al., 2021).
  - WP2 – Building up the observatory using available and curated open datasets and filtered news feeds.
  - WP3 – Structuring of the observatory by interpreting knowledge and validating it at local/regional scale.
  - WP4 – Testing of the observatory using data and expertise from ICL partners.
  - WP5 – Developing a Global Landslide Risk Index to be used as an SDG indicator.
11. Deliverables/Time Frame: The development and validation/testing at local scale will take 2 years, the third year will be used for larger validation at regional scale in selected countries. The last year will also be used to develop and proposed a new dynamic Global Landslide Risk Index, in a different way as the static FEMA National Risk Index covering also landslides (<https://hazards.fema.gov/nri/landslide>).
12. Project Beneficiaries: The methodology will be tested in Slovenia and elsewhere, where publicly available databases in different languages can provide sufficient data for validation. Thus, other ICL members will be invited to support the development in its second phase to provide data, and test the

observatory in their country and language. After the final inauguration of the observatory, general public and experts worldwide will be able to use it to plan prevention measures to mitigate and reduce landslide risk at regional and local scale. One article on the Observatory was already prepared (Mikoš et al., 2022), others will be submitted to the ICL Books Series P-LRT, journal *Landslides* and other periodicals. The link to the Observatory will be published on the ICL web page ([www.landslides.org](http://www.landslides.org)).

### 13. References:

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