

IPL Project Proposal Form 2023

(MAXIMUM: 3 PAGES IN LENGTH)

1. Project Title: **Landslide risk management on the road network in climate changing conditions**

Select one of two below.

(1) **New project**

(2) Second stage of ongoing project

2. Main Project Fields

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

(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: **Prof. Biljana Abolmasov**

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Core members of the Project:

Prof. Miloš Marjanović, University of Belgrade, Faculty of Mining and Geology, Belgrade, Serbia

(UBFMG)

Prof. Dario Peduto, University of Salerno, Department of Civil Engineering, Salerno, Italy (DICIV-UNISA)

Prof. Igor Peshevski, University of Ss. Cyril and Methodius in Skopje, Faculty of Civil Engineering, Skopje, North Macedonia (USFCE)

Associate members:

Ass. Prof. Uroš Đurić, University of Belgrade, Faculty for Civil Engineering, Belgrade, Serbia (UBFCE)

Assoc. Prof. Marko Pejić, University of Belgrade, Faculty for Civil Engineering, Belgrade, Serbia (UBFCE)

Prof. Settimio Ferlisi, University of Salerno, Dept. of Civil Engineering, Salerno, Italy (DICIV-UNISA)

Res. Dr. Gianfranco Nicodemo, Univ. of Salerno, Dept. of Civil Engineering, Salerno, Italy (DICIV-UNISA)

PhD students:

Jelka Krušić, Ksenija Micić, Pavle Manasijević (UBFMG), Davide Luongo (DICIV-UNISA), Natasa Nedelkowska (USFCE)

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

- i. Evaluation of methodologies for landslide risk management on the roads;
- ii. Involving road managing authorities (public enterprises, local self-governments) in road mitigation (rising awareness, training, etc.)
- iii. Harmonization of data and forms important for landslide risk management for the roads;

- iv. Testing the methodology for landslide risk management on the pilot areas (road network);
- v. Dissemination of Project results (regional, national, international).

5. Background Justification: (10 lines maximum)

Road management authorities are coping with many risks while attempting to provide safe and efficient transport. Some of these risks are caused by natural events, such as landslides, that occasionally occur, sometimes expectedly, but mostly, their location and timing come as a surprise, which has become a common narrative for road managements world-wide. Climate change is deepening this problem even further, by making their occurrence patterns even more complex and less certain to predict. This project aims to initiate systematic landslide risk mitigation in the road sector by developing methodologies and strategies to efficiently report, model and predict landslide events along the roads. The methodologies and strategies are to involve different scenarios and different settings, starting from the state roads governed by public enterprises to local roads managed by local self-governments. The target group is road managing authorities which will benefit from the project by becoming more prepared for landslide events and make sustainable plans for the near or far future.

6. Study Area: (2 lines maximum; where will the project be conducted/applied?)

It is planned to include pilot areas in Serbia (state and local roads in the city of Kraljevo), Italy (state roads in Acri and Lago municipalities in the Calabria Region) and North Macedonia (state roads in the Polog region).

7. Project Duration: 5 years

8. Resources necessary for the Project and their mobilization

University of Belgrade, Faculty of Mining and Geology (UBFMG), Univ. of Salerno, Dept. of Civil Engineering (DICIV-UNISA) and University of Ss. Cyril and Methodius in Skopje, Faculty of Civil Engineering (USFCE) will provide personnel, field, software, technical, laboratory, IT and other facilities support for realization of IPL Project objectives. Budgeting will be covered by all participants and their on-going projects. Extra co-financings for mobility of the project members will derive from Bilateral Erasmus funds for Staff/PhD student mobility exchange.

9. Project Description: (30 lines maximum)

Landslides stand among the most frequent natural hazards affecting the road networks. In light of the changing climate, and changes in ground and atmospheric conditions linked thereto, it is generally expected that landsliding activity will only increase in the future. Anticipating such scenario in advance

10. Work Plan/Expected Results: (30 lines maximum; work phases, milestones and publication)

Phase 1 – Drafting: Developing preliminary methodology for modeling landslide risk on local and state network, starting from terminology consensus, scope and scale definition, landslide inventorying sheets standardization and other input data requirements.

Milestone 1 – Draft methodology

Phase 2 – Training: Familiarizing the road managing authorities with the methodology. Organizing field campaigns to collect landslide data with specified dynamics using simplified, but standardized inventory data sheets.

Milestone 2 – Landslide databases for all pilot areas.

Phase 3 – Testing: Implementing the methodology using the landslide databases and available GIS layers. Assessing the modeling performance and calibrating the models per each pilot area. Producing output maps of landslide risk along the pilot road networks.

Phase 4 – Dissemination: Closing workshops with partners, publishing results in scientific and public

communities, attempting to standardize the methodology through legislation, or within the community (ICL meetings, WP/WLI meetings), project promotion including the contribution plan of articles on the IPL project (progress/result) to the Open Access Book Series P-LRT in the coming few years.

Milestone 3 – Publications:

- Contributions of IPL Project activities will be focused on articles in P-LRT Vol.3 Issue 1 and Issue 2;
- Landslides Journal;
- articles in WLF proceedings;
- articles in ICL ABN ReSyLAB proceedings;
- other Journals and International Conferences (ISL, IAEG).

11. Deliverables/Time Frame: (10 lines maximum; what and when will you produce?)

Objective (i) Evaluation of methodologies: Draft methodology within the first project year using good practice examples and state-of-the art approaches;

Objective (ii) Involving road managing authorities: Establishing cooperation with road authorities in pilot areas within the first project year.

Objective (iii) Harmonization of data and forms: Defining the form standard within the first project year; Initiating and co-organizing field campaigns, overseeing and verifying acquired data, within the second project year.

Objective (iv) Testing the methodology: Using acquired data from pilot areas in draft methodology, adjusting the methodology, calibrating the models, validating the models, within the third project year.

Objective (v) Dissemination: Publishing activities, main findings within the forth and fifth project year, intermediate findings and reports during the entire project duration

12. Project Beneficiaries: (5 lines maximum; who directly benefits from the work?)

Direct beneficiaries of IPL activities will be local/national road authorities responsible for Transport and Infrastructure (Public and Local Self Governmental Enterprises) and the Ministries (as Governmental Institutions). Indirect beneficiaries will be also wider landslide community on national, regional and international level. Results will be also disseminated to PhD students and Young Doctors attending LARAM "LANDSLIDE RISK ASSESSMENT AND MITIGATION" International School, yearly organized by UNISA group of with the contribution of several ICL members.

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

- Abolmasov B., Stanković R., Marjanović M., Vulović N., Đurić U. (2023). CliRtheRoads – An integrated approach to landslide risk management on roads in Serbia. *Progress in Landslide Research and Technology*, Volume 2 Issue 2, Springer, In Press.
- Ferlisi S., Marchese A., Peduto D. (2021) Quantitative analysis of the risk to road networks exposed to slow-moving landslides: a case study in the Campania region (southern Italy). *Landslides*, 18(1): 303-319, ISSN 1612-510X, DOI 10.1007/s10346-020-01482-8
- Marjanović M., Abolmasov B., Milenković S., Đurić U., Krušić J., Samardžić Petrović M. (2019). Multihazard Exposure Assessment on the Valjevo City Road Network. *Spatial Modeling in GIS and R for Earth and Environmental Sciences*, H. R. Pourghasemi and C. Gokceoglu (eds), Elsevier Inc., pp 671-688. ISBN 978-0-12-815226-3 DOI: <https://doi.org/10.1016/B978-0-12-815226-3.00031-4>.
- Marjanović M., Abolmasov B., Peshevski I., Reeves J., Georgievska I. (2020) Regional Slope Stability Analysis in Landslide Hazard Assessment Context, North Macedonia Example. In: Guzzetti F., Mihalić Arbanas S., Reichenbach P., Sassa K., Bobrowsky P.T., Takara K. (eds) *Understanding and Reducing*

Landslide Disaster Risk. WLF 2020. ICL Contribution to Landslide Disaster Risk Reduction. Springer, Cham.pp 267-273. https://doi.org/10.1007/978-3-030-60227-7_29

- Nappo N., Peduto D., Mavrouli O., van Westen C.J., Gullà G. (2019). Slow-moving landslides interacting with the road network: Analysis of damage using ancillary data, in situ surveys and multi-source monitoring data. Engineering Geology 260 (2019), <https://doi.org/10.1016/j.enggeo.2019.105244>

Note: Please fill and submit this form **by 15 July 2023** to:

ICL Network <icl-network@iclhq.org> and KLC secretariat <klc2020@iclhq.org>