Progress Report Form of WCoEs 2015
1 January 2015 to 31 December 2015

1. Short Title of WCoE: Landslide Risk Reduction in the Adriatic-Balkan Region through the Regional Cooperation

2. Name of Institution (Name of leader and email): Croatian Landslide Group (Leaders: Željko Arbanas, University of Rijeka, Faculty of Civil Engineering, Radmile Matejčić St. No. 3, 51000 Rijeka, Croatia, e-mail zeljko.arbanas@grad.uniri.hr; Snježana Mihalić Arbanas, University of Zagreb, Faculty of Mining, Geology and Petroleum Engineering, Pierottijeva 6, 10000 Zagreb, Croatia, e-mail smihalic@rgn.hr)

3. List of core members: Professor Željko Arbanas, University of Rijeka, Faculty of Civil Engineering, Rijeka, Croatia; Professor Snježana Mihalić Arbanas, University of Zagreb, Faculty of Mining, Geology and Petroleum Engineering, Zagreb, Croatia; Professor Čedomir Benac, University of Rijeka, Faculty of Civil Engineering, Rijeka, Croatia

4. Progress report of activities up to 31 December 2015 (up to 30 lines)

Activities of WCoE from 1 January to 31 December 2015 are presented related to the main goals proposed in WCoE application:

i) Promoting landslide science and new technologies in landslide researches and landslide risk reduction in the Adriatic-Balkan Region: Promoting and organization of the 2nd Regional Symposium on Landslides in the Adriatic-Balkan Region Landslides and Floods Hazard Assessment held in Belgrade, Serbia in May 2015. More than 100 landslide scientist and professionals from the Adriatic-Balkan Region and around the world participated to the Symposium presenting the current state of a landslide science and landslide risk reduction in the Region.

ii) Promoting application of advanced technologies of landslide monitoring and early warning systems in the Region based on established technologies and applied methodologies in Croatia at the Grohovo Landslide and Kostanjek Landslide: Through the activities of Bilateral Croatian-Slovenian Scientific Project: Study of landslides in flysch deposits: Sliding mechanisms and geotechnical properties for landslide modeling and mitigation (SoLiFlyD) an exchange of knowledge in landslide monitoring and early warning systems was carried out based
on experiences of established monitoring and early warning systems in Croatia (the Grohovo Landslide, the Kostanjek Landslide) and in Slovenia (The Slano Blato Landslide). The Croatian Landslide Group is a member of ICL Landslide Monitoring and Warning Network. Students from University of Vienna, Department of Geography and Regional Research, Vienna, Austria, as a part of fieldtrip in Croatia visited the Kostanjek Landslide and the monitoring system was presented through the field visit and results presentation.

iii) Enhancing development of regional inventories, documents and policies: collaboration with Directorate for Rescue and Civil Protection of the Republic of Croatia in establishment of national landslide data base; collaboration with regional/local authorities in the City of Zagreb and City of Rijeka in establishment of regional landslide inventories and databases, risk reduction preparatory documents and guidelines; collaboration with Croatian Waters, state entity for water management in Croatia, in the Valiči Landslide (Rijeka, Croatia) monitoring and early warning system establishment and risk management. Croatian Landslide Group fostered Croatian national civil protection organization to join and sign ISDR-ICL Sendai Partnerships 2015-2025 for global promotion of understanding and reducing landslide disaster risk (at the 3rd United Nations World Conference on Disaster Risk Reduction, in Sendai, Japan, 2015) with the aim of raising awareness of the need for development of documents and policies related landslide hazard and risk in Croatia.

iv) Capacity development at the regional level through the enhanced cooperation in higher education and life-long-learning education: cooperation between University of Zagreb and University of Rijeka in particular landslide researches, PhD thesis researching and supervising, and publishing of joint research papers in journals and at the conferences. The equipment of the Geotechnical Laboratory at the University of Rijeka and putting into operation new devices enabled wide spectrum of scientific investigations of soil and rock behavior during landslide occurrences and better understanding of landslide processes. Capacity development was also advanced through the Scientific Project Landslide Monitoring and Early Warning system Development for the Purpose of Landslide Hazard Reduction financed by University of Rijeka. The Faculty of Civil Engineering University of Rijeka established bilateral cooperation with the University of Salerno, Department of Civil Engineering (Salerno, Italy) in investigation and laboratory testing of materials from shallow landslides in pyroclastic and flysch materials in saturated and unsaturated conditions.

5. Plan of future activities (up to 30 lines)

The further activities of WCoE will be developed in accordance to the plan presented in WCoE application related to: Promoting landslide science and new technologies in landslide researches and landslide risk reduction; Promoting application of advanced technologies of landslide monitoring and early warning systems; Enhancing development of regional inventories,
documents and policies and Capacity development at the regional level through the enhanced cooperation in higher education in the Region. The particular activities in 2016 will be related to the: contribution in preparatory activities in organization of the 4\textsuperscript{th} World Landslide Forum in Ljubljana (Slovenia) in May 2017 and the 3\textsuperscript{rd} Regional Symposium on Landslides in the Adriatic-Balkan Region in Ljubljana (Slovenia) May 2017. WCoE will continue the contribution in scientific research through existing scientific projects (Bilateral Croatian-Slovenian Scientific Project: \textit{Study of landslides in flysch deposits - Sliding mechanisms and geotechnical properties for landslide modeling and mitigation, SoLiFlyD}; Scientific Project supported by the University of Rijeka \textit{Landslide Monitoring and Early Warning system Development for the Purpose of landslide Hazard Reduction}; Bilateral Croatian-Austrian Scientific Project: \textit{Clay Mineralogy in Landslide Hazard Assessment}); and in cooperation with other ICL and non-ICL organizations from the Region by applying proposals for new scientific projects (Bilateral Croatian-Slovenian Scientific Projects: \textit{Rainfall Induced Landslides: Analysis and Modelling and Laboratory Testing and Numerical Modelling of Landslides in Flysch Deposits in Croatia and Slovenia}). Further cooperation with University of Salerno, Italy, will be continued in exchange of teachers and PhD students within \textit{Erasmus} program. The existing relations and cooperation with national and regional authorities in landslide risk reduction will be continued. The further cooperation with other ICL and non-ICL organizations from the Region is planned through contribution on the national scientific conferences, workshops and other events related to landslide science and landslide risk reduction.

6. Publications

**PhD thesis**


**Book chapter**


**Journal papers**

- Mihalić Arbanas, S., Krkač, M., Bernat, S (In press) Application of advanced technologies in landslide research in the area of the City of Zagreb (Croatia, Europe). \textit{Geologia Croatica}, Accepted for publishing.

**Conference papers**

- Arbanas, Ž., Vivoda, M., Mihalić Arbanas, S., Peranić, J., Sečanji, M., Bernat, S., Krkač, M. (2015) \textit{Analysis of a reservoir water level impact on landslide reactivation}. Proceedings of 2nd Regional Symposium on Landslides in the Adriatic-Balkan Region, (B. Abolmasov Ed.) Faculty of Mining and
Geology, University of Belgrade, Belgrade.


