

## IPL Project Annual Report Form 2016

1 January 2016 to 31 December 2016

1. Project Title (IPL-181)

**“Study of Slow Moving Landslide Umka Near Belgrade, Serbia”**

2. Main Project Fields

(1) Technology Development

Monitoring and Early Warning

3. Name of Project leader: Biljana Abolmasov, PhD

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Core members of the Project: Names/Affiliations

Svetozar Milenković, BSc, MSc, The Highway Institute Belgrade

Branko Jelisavac, BSc, MSc, The Highway Institute Belgrade

Uroš Djurić, PhD student, researcher, University of Belgrade, Faculty of Civil Engineering

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

4. Objectives: (5 lines maximum)

The research objectives are directed towards continual monitoring of the proposed case study by combining different monitoring techniques. The ultimate goal would be aiding decision making and mitigation measures design for this particular case study.

5. Study Area: (2 lines maximum)

The study area is covering landslide Umka and it is located at the right bank of Sava river, 25 km south west from Belgrade, Serbia.

6. Project Duration (1 line maximum)

Project duration - 2012-ongoing

## 7. Report

### 1) Progress in the project: (30 lines maximum)

Project IPL 181 – “Study of slow moving landslide Umka near Belgrade, Serbia” was approved in November 2012. Review and organization of existing results was conducted 18 months afterwards, as per the Project Plan. Extensive archive documentation was collected from The Highway Institute as well as papers on Umka and Duboko landslides published on international and local scientific conferences. Results of field investigations and laboratory testing conducted in different phases were analyzed. Data from installed automated GNSS receiver, precipitation and Sava river level were analysed in parallel to these activities. Original paper submitted, accepted and published in *Landslides Journal*. All activities except analysis of aerial photo images were conducted according to the Project Plan (see references).

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

Further research of the Umka landslide will focus on analysis of aerial photo and orthophoto images received from Military Geographical Institute (1959-2015), and coupling the current surface monitoring GNSS system with near-real time inclinometer monitoring. This would support the geotechnical model and reveal the connection between ground displacement and actual displacement on the slip surface level. Finally, the continuation of the current monitoring campaign will further support the geotechnical model development and evaluation of the performed back analysis. For these activities it is necessary 12 months more. Additionally, PhD thesis for young researcher was defined and numerical simulation in Soil Vision software is planned for Umka landslide mechanism and dynamics, as well as quantitative landslide risk assessment for housing and transportation sector.

### 3) Beneficiaries of Project for Science, Education and/or Society (15 lines maximum)

- a) Direct beneficiaries will be local community – owner and residents of the houses affected by landslide Umka (about 1000 people)
- b) Local and regional authorities – regional motorway is affected by landslide (about 10000 vehicles/day)

### 4) Results: (15 line maximum, e.g. publications)

The list of publications in the frame work the project is as follows:

- Abolmasov B., Marjanović M., Milenković S., Đurić U., Jelisavac B., Pejić M. (2017). IPL Project 181: Study of Slow Moving Landslide Umka Near Belgrade, Serbia. Proceeding of 4th World Landslide Forum, 29 May-02 June 2017, Vol 1, in press.
- Erić V., Božić B., Pejić M., Abolmasov B., Pandžić J. (2015). Permanent geodetic monitoring of the Umka Landslide using GNSS technology and GeoMoss system. Abstract book - 2nd Regional Symposium on Landslides in the Adriatic-Balkan Region - 2nd ReSyLAB 2015,

- Eds: Abolmasov B., Marjanović M., Đurić U., University of Belgrade, Faculty of Mining and Geology, Belgrade, Serbia, 39-39, ISBN 978-86-7352-324-8. <http://resylab2015.rgf.rs/>
- Abolmasov B., Milenković S., Marjanović M., Đurić U., Jelisavac B. (2014). A geotechnical model of the Umka landslide with reference to landslides in weathered Neogene marls in Serbia. *Landslides*, Vol 12 (4): 689-702. DOI 10.1007/s10346-014-0499-4, ISSN 1612-510X.
  - Abolmasov B., Milenković S., Jelisavac B., Đurić U., Marjanović M. (2014). IPL Project 181: Study of Slow Moving Landslide Umka Near Belgrade, Serbia, *Landslide Science for a Safer Geoenvironment* (Eds: Kyoji Sassa, Paolo Canuti, Yueping Yin), Vol.1: The International Programme on Landslides (IPL), Part II, pp 75-80, DOI: 10.1007/978-3-319-04999-1\_5, Print ISBN: 978-3-319-04998-4, Online ISBN: 978-3-319-04999-1, Springer International Publishing.
  - Abolmasov B., Milenković S., Jelisavac B., Đurić U., Marjanović M. (2014). Mechanism and Dynamics of Umka Landslide, Belgrade, Serbia, *Landslide Science for a Safer Geoenvironment* (Eds: Kyoji Sassa, Paolo Canuti, Yueping Yin), Vol.1: The International Programme on Landslides (IPL), Part VI, pp 297-302, DOI: 10.1007/978-3-319-04999-1\_41, Print ISBN: 978-3-319-04998-4, Online ISBN: 978-3-319-04999-1, Springer International Publishing.
  - Abolmasov B., Pejić M., Šušić V. (2014). The analysis of landslide dynamics based on automated GNSS monitoring. *Proceeding of the 1st Regional Symposium on Landslides in the Adriatic-Balkan Region - 1st ReSyLAB 2013, Zagreb 6-9 March 2013*. Eds. Sassa K., Mihalić Arbanas S., Arbanas Ž. University of Zagreb, Faculty of Mining, Geology and Petroleum Engineering and University of Rijeka, Faculty for Civil Engineering, Zagreb, Croatia. pp 187-191. ISBN 978-953-6923-26-7, <http://www.klizista-hr.com>
  - Abolmasov B., Milenković S., Jelisavac B., Pejić M., Radić Z. (2014). The Analysis of landslide dynamics based on GNSS monitoring-A case study. *Proceedings of XII IAEG Congress, Engineering geology for Society and Territory, Vol II, Landslide processes, 15-19 September 2014, Torino, Italy*, Springer International Publishing, ISBN 978-3-319-09056-6, pp 143-146.

Note:

- 1) If you will change items 1)-6) from the proposal, please write the revised content **in red**.  
**Position - Core members of the Project**  
**We have changed one member Vladimir Šušić (PhD student) with Assistant Professor Miloš Marjanović, PhD, both from University of Belgrade, Faculty of Mining and Geology.**  
**Uroš Djurić changed job position - from Faculty of Mining and Geology to Faculty of Civil Engineering, both from University of Belgrade**
- 2) Please fill and submit this form by 30 March 2017 to **ICL Network** <[icl-network@iclhq.org](mailto:icl-network@iclhq.org)>