| Date of Submission | 20.4.2019 |

IPL Project Proposal Form 2019
(MAXIMUM: 3 PAGES IN LENGTH)

1. Project Title: (2 lines maximum):

   Classification and spatial distribution of landslides on dumps in brown coal basin in the Czech Republic

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

3. Name of Project leader: Mgr. Martin Veselý

   Affiliation: (office and position) Brown coal research institute, Inc.; Charles University

   Contact: (postal address, fax, phone, email)

   Tř. Budovatelů 2830/3, 434 01 Most, Czech Republic; vesely@vuhu.cz; +420728528386

   Core members of the Project:

   Names/Affiliations: (4 individuals maximum): Prof. Vít Vilímek, PhD; Charles University

   RNDr. Jan Burda, PhD; Brown coal research inst., Inc.

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

   To collect complex information about study areas of coal mine dumps, and additionally to find out all available information about all known slope deformations in the area. That includes analysis of causes and mechanisms of landslides. A result will be the database of slope deformation events, including triggering factors and preparation of geotechnical model of dump site areas with map of slope deformation hazards.

5. Background Justification: (10 lines maximum):

   Slope instability negatively affect safety land use in brown coal mining areas under Krušné hory Mts. The area of many present dump and opencast mines will be transferred from brown coal mining companies to local municipalities during next years or decades. Specific area of dumps of overlaying soils, mainly clays, can be very susceptible to slope deformations of vast extent. There is lack of complex studies focused on slope deformation hazards in the area of dump sites. Individual works, mostly assessments, are focused on individual landslides. Nevertheless, in most cases the collected data were not properly evaluated and published yet. These areas are managed by mining companies now, but in future the society will have necessity to know complete information about natural hazards including landslides.

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

   Dump sites of brown coal mining region in the Tertiary basin under Krušné hory Mts (Czech Republic). Case study of 4 vast clay dumps of total area about 25 km^2.

7. Project Duration: (1 line maximum): 3 years

8. Resources necessary for the Project and their mobilization

   Personnel, Facilities, and Budgets: institutional money from home institutions + grant agencies from the Czech Republic

9. Project Description: (30 lines maximum):

   First step will be to collect complex information about study areas of brown coal opencast mine dumps. Now we are able to collect data about geology, geomorphology, hydrogeology of 4 dump site areas. Three of them are inner dumps: in Jiří opencast mine (Sokolov basin), ČSA opencast mine and Slatinice (both in Most Basin). One study area is Radovesice external dump (Most basin). An important part of data collection phase is to find out all available information about all known slope deformation, analyze mechanism of slope processes and key triggering factors of slope stability failures. As an information source about case study areas we can use historic maps, mine plans, remote sensing data, results of historical and present surveys from engineering geology. Also, we have approach to vast and unique documentation about slope deformations in study area.

   By creating the inventory and analysis of documented slope deformations, we plan to set up detailed classification of slope deformations especiallly for dumps of fine-grained, mostly clayey materials. In view of the extent of clay dump areas in Czech Republic new detailed classification will be very beneficial in future.

   For analysis of landslide mechanisms of documented slope deformations, we plan to use geotechnical engineering software. With spatial data we plan to create model of study area that can describe basic geomorphological geological and hydrological characteristics as well as other natural and anthropogenic factors that can influence probability of slope deformation occurrence. It will be possible to map risk factors and create continuous model of spatial distribution for study areas. Then with tools of space analysis we could be able to create map of areas endangered by landslides and other serious slope deformations in the area of dumps.

10. Work Plan/Expected Results: (20 lines maximum; work phases and milestones):

    1. year: data collecting and analysis of triggering factors

    To collect available geomorphological, geological, hydrological spatial data about selected dumped soil bodies. All available reports, assessment works, maps, plans about documented slope deformations with relation to study area will be analyzed. Furthermore, all new landslides will be additionally mapped and analyzed. Besides this, we will use data of field geotechnical survey.

    2. year: landslides inventory and classification

    Classification of slope deformations specified for clayey dump body areas. Also, the database of documented landslides in study area will be created. This phase could be finished at the end of second year.

    3. year: landslide susceptibility and hazard maps

    Digital elevation models of surface and underlaying bed of dumps will be created. Other spatial data - hydrogeology, geology, soil material characteristics will be added successively. Then we plan to do spatial analysis of data from the field survey as well as additional spatial information of documented

landslides. The map of landslide susceptibility (completely covering all four study areas) is expected.

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

Detailed classification of landslides on dumps especially for brown coal mining region with specific conditions of basin of Tertiary clays. Finished in second year.

Complex geotechnical model of four dumps, describing engineering geology characteristics of study area important for landslide susceptibility analysis. Supposed to be done during third year.

Map of landslide susceptibility and also map of all areas affected by landslides. Supposed to be finished at the end of the project.

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

Several regional institutions will benefit from the project (e.g. regional planning authorities, institutions and companies involved in landscape restoration program) as well as the landslide community in the home country. We also plan to contribute to the ICL/IPL Landslide database and publish papers in the frame of ICL/IPL activities. The improvement of geomorphological mapping of landslides on dumps could be also support for geomorphological methodologies in general.

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

- Burda J, Veselý M., Řehoř M., Vilímek V. (2018): Reconstruction of a large run-out landslide in the Krušné hory Mts. (Czech Republic). Landslides, 15, 3, 423-437.

- Burda J., Vilímek V. (2010): Influence of climate factors and watertable changes on the stability of anthropogenic slopes of Krušné hory Mts. (in Czech). Geografie, 115, 4, 377-392, 4.

Note: Please fill and submit this form by 30 March 2019 to ICL Network
<icl-network@iclhq.org> and ICL secretariat <secretariat@iclhq.org>