Date of Submission	July 2016

IPL Project Proposal Form 2016

(MAXIMUM: 3 PAGES IN LENGTH)

1. Project Title: Time prediction of an onset of a rainfall-induced landslide based on the monitoring of the deformation and the groundwater level in the slope
2. Main Project Fields

(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 Site

Rainfall-induced landslide

3. Name of Project leader

1) Leader: Dr. Mitsuya Enokida

Affiliation: (office and position) Vice President, the Japan Landslide Society

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2) Core members of the Project

Katsuo Sasahara (Kochi University)

Taro Uchimura (University of Tokyo)

Kazuya Itoh (Tokyo City University)

Naoki Sakai (National Research Institute for Earth Science and Disaster Resillience)

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

The objective of the project is to establish (1) time-prediction method of an onset of a rainfall-induced landslide, and (2) prediction procedure of an area and depth of the rainfall-induced landslide, in order to utilize the monitoring of deformation and groundwater in a slope for early warning against rainfall-induced landslides.

5. Background Justification: (10 lines maximum)

The landslide disaster gives much damage to human lives and properties all over the world. An early warning system is an effective tool to mitigate the damage caused by landslides especially in the case of rainfall-induced landslides in a humid and tropical area. Existing methods for the early warning against rainfall-induced landslides is divided into 2 kinds. The first is a rainfall threshold which is for the time prediction of landslides at an area. Properties of a specific slope such as geometry and soil properties

cannot be reflected to the threshold. The latter is monitoring of soil-water or deformation in a slope for a prediction of an onset of landslide at a specific slope. This is especially effective tool if targeted slope have been already selected as a sediment-related disaster hazardous area based on the sediment-related disaster prevention law enacted at 2001 in Japan. Time-prediction method based on the monitoring should be sophisticated to utilize the monitoring for early warning against rainfall-induced landslides.

6. Study Area: (2 lines maximum; where will the project be conducted/applied?)
   Some natural slopes in hilly or mountainous area at Hiroshima, Kochi, Kumamoto in Japan and large scale model slopes in some institutes and universities in Japan.

7. Project Duration: (1 line maximum)
   2017 – 2021 (5 years)

8. Resources necessary for the Project and their mobilization
   Human resources will be selected from the member of Japan Landslide Society who have much experience and ability for the early warning against rainfall-induced landslides and the monitoring of soil-water and deformation in the slope. Field measurement for soil water and deformation will be conducted at the slope which has been already monitored by some researchers in Japan. The monitoring of model slope will be also conducted at the indoor model slopes with rainfall simulators in some universities and institutes. Core members have been already supported financially by Grant-in Aids for "Scientific Research" from Japanese Ministry of Education, Culture, Sports, Science and Technology and Grant-in –Aid for technical development from Japanese Ministry of Land, Infrastructure, Transport and Tourism. Those grants will be spent for implementing the project.

9. Project Description: (30 lines maximum)
   In order to attain the objectives, 3 kinds of activities will be carried out. The first is to make field measurement of soil water and deformation in the slope to recognize actual behavior of soil water and deformation of the slope due to rainfall infiltration. The second is the monitoring of soil water and deformation in the indoor model slope under sprinkling water to know the behavior of soil water and soil just before the failure of the slope. The third is to establish simple prediction methods for time of an onset and an area and depth of the landslide completely based on the monitored data. The methods should be practical based on the simple geotechnical models and should not need indoor tests or numerical simulations.

10. Work Plan/Expected Results: (20 lines maximum; work phases and milestones)
    1) To recognize the actual behavior of soil water and deformation in a natural slope: 2017 – 2019
    Field measurement of soil water and deformation in the selected natural slope will be implemented. Monitoring devices will be installed at 2016 until the start of the project.
    2) To measure the rainfall infiltration and deformation of indoor model slopes: 2018-2021

Monitoring soil water and deformation in the model slope under sprinkling water will be conducted to know the behavior of soil water and deformation in the slope just before the failure of the slope.

3) To establish time-prediction procedure of an onset of a rainfall-induced landslide: 2019

Simple time-prediction method based on the monitoring of deformation and groundwater level might be established.

4) To propose the prediction method of an area and a depth of the landslide: 2019-2021

Simple prediction procedure completely based on the monitoring in the slope will be proposed. This procedure might not need indoor tests and numerical simulations.

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

    To establish time-prediction procedure of an onset of a rainfall-induced landslide until 2019 and to propose the prediction method of an area and a depth of the landslide until 2021

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

    Local residents living in dangerous areas of rainfall-induced landslides, administrative officials and engineers who work for the landslide disaster prevention

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

K.Sasahara and T.Ishizawa: Time prediction of an onset of failure in a sandy model slope based on the monitoring of the groundwater level and the surface displacement at different locations, Aversa et al. (eds) - Landslides and Engineered Slopes. Experience, Theory and Practice (PROCEEDINGS OF THE 12th INTERNATIONAL SYNPOSIUM ON LANDSLIDES, NAPOLI, ITALY, 12-19, JUNE 2016), CRC Press/Balkema, pp.1791-1798, 2016.

Note: Please fill and submit this form by 1 July 2016 to ICL secretariat <secretariat@iclhq.org> and ICL network <ICL-network@iclhq.org>