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IPL Project Proposal Form 2016
(MAXIMUM: 3 PAGES IN LENGTH)

1. Project Title: (2 lines maximum) : Development of Wireless Sensor Network for Monitoring and Earlier Warning of Shallow and Deep Landslides (WISE-LAND)

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 : Dr. AdrinTohari
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Core members of the Project:
 - (1) Arifan Jaya Syahbana, M.Eng/ Research Center for Geotechnology, Indonesian Institute of Sciences
 - (2) Suryadi/ Research Center for Physics, Indonesian Institute of Sciences
 - (3) Mohamad Imam Afandi/ Research Center for Physics, Indonesian Institute of Sciences

4. Objectives: the main objective of this project is to develop a low-cost wireless sensor network applicable for monitoring of shallow and deep landslides in order to establish an effective landslide earlier warning system. This objective will be achieved by developing a prototype of a wireless sensor module for many types of sensor and gateway and by conducting a field test to evaluate and improve the developed wireless sensor module network.

5. Background Justification:

Landsliding is not uncommon occurrence during a period of heavy rainfall in tropical countries including Indonesia. The occurrences of landslide have claimed hundreds of lives and significant economic losses in hilly region in Indonesia. In order to reduce landslide risks, various efforts, such as landslide hazard mapping, slope stabilization and development of monitoring system, have been made by various government agencies in Indonesia, such as National Disaster Management Agency, Ministry of Energy and Mineral Resources, Ministry of Transportation, etc. Currently, landslide monitoring system is mainly based on a traditional monitoring system, in which all sensors will directly communicate to receiver transmitter unit. This conventional system will hinder an effective earlier warning due to its limitation in coverage areas and its application merely for one type of landslides. In contrast, wireless sensor network will have a capability of monitoring landslide hazard in a larger areas with different types of landslide hazard. Thus, this monitoring system will provide an effective earlier warning on landslide hazard.

6. Study Area: the project will be conducted in highly landslide prone residential areas in Bandung and Sukabumi District, West Java. The selection of study areas will be based on the landslide susceptibility assessment.

7. Project Duration: 4 years. Two years for research and development of sensor network, and two year for implementation of wireless sensor networks. The project has been started in 2015.

8. Resources necessary for the Project and their mobilization

The project will involve 4 researchers, 3 technicians and 2 undergraduate students. The research and development will be conducted at Laboratory of Physical Instrumentation and Opto-electronics. Laboratory testing will conducted at Laboratory of Geotechnical Engineering. Meanwhile, field experiments will be performed at some landslide prone sites around Bandung District in cooperation with the regional disaster management agencies and local residences. The project will be funded by Indonesian Institute of Sciences under Competitive Research Grant scheme FY 2015-2018. The total budget is about USD 250.000.

9. Project Description: (30 lines maximum)

The proposed project will involve research, development and implementation of wireless sensor network. To achieve this purpose, the research and development stage will focus on producing a low-cost wireless sensor module, displacement-inclination sensor, gateway and data acquisition software. The wireless sensor modules will be developed to have a long distance communication and facilitated with 4 channels of analog input and 2 channels of digital input. So, it can be connected to a rain gauge, two soil moisture sensors, and wire extensometers. The sensor modules will be also equipped with built-in two axial tiltmeters. The gateway will be developed to receive and transmit data to server. The communication between sensor modules and gateway will use Xbee pro modules. Meanwhile

GPRS module will be used for communication between gateway and server. The development stage will also involve field testing to evaluate and improve the key parameters of warning system, such as accuracy, real-time transmission and low power consumption.

The implementation stage is the core of the project. This stage will consist of installation of the sensor module network and gateway in the selected sites, and establishment of data acquisition center to collect, process and disseminate monitoring data to local disaster management. The installation of sensor network will be conducted after completion of landslide risk assessment at the study sites.

10. Work Plan/Expected Results:

The project will be aimed to produce an effective and low-cost wireless sensor network for landslide monitoring (so called WISE-LAND). For this purpose, the project will be based on three work phase :

WP – 1 (Development of proto type of low-cost wireless sensor network). The activities in this first work phase consists of two tasks (1) developmenet of wireless sensor module and gateway and (2) data acquisition software for different types of sensors.

WP – 2 (Validation of prototype of wireless sensor network). The activities of the second work phase consist of field testing of prototype of wireless sensor network in order to verify its capability to measure the various time of soil parameters, such as water content, pore-water pressures, displacement in different landslide types and slope conditions.

WP – 3 (Implementation of wireless sensor network). This work phase will deal with the application of wireless sensor network at selected sites.

11. Deliverables/Time Frame:

No.	Deliverables	Time
1.	Proto-type of wireless sensor network	2015
2.	Tested and improved wireless sensor netwok	2016 - 2017
3.	Implemented wireless sensor network	2018

12. Project Beneficiaries:

The project will promote some innovations of physical electronic based instrumentation for landslide monitoring system and enhancement of scientific knowledge. The main beneficiaries of this project would be the, local residences, the local and national disaster management agencies in landslide prone hilly region and participating researchers and institution.

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