Application Form for World Centre of Excellence on Landslide Risk Reduction 2020-2023

1. **Name of Organization**

   Slope Engineering Branch, Public Work Department Malaysia

2. **Name of Leader**

   - Ir. Hj. Zulkifly Bin A. Ghani;

     Director, Slope Engineering Branch, Public Work Department Malaysia

     Block F, Level 11, 50582 Jalan Sultan Salahuddin, Kuala Lumpur

     zulkiflyag@jkr.gov.my;

   - Mr. Suhaimi Bin Jamaludin

     Senior Superintending Civil Engineer, Public Work Department Malaysia

   - Ir. Wardatun Ahmar Binti Abdul Manan

     Senior Civil Engineer, Public Work Department Malaysia

   - Associate Profesor Dr. Ahmad Safuan A Rashid

     Head of Geotechnical Research Group, University Technology Malaysia

   - Sr. Dr. Muhammad Zulkarnain bin Abd Rahman

     Faculty of Built Environment and Surveying, University Technology Malaysia

3. **Date of Submission of Application:** 31 October 2019

4. **Activity scale and targeted region**

   National and Regional (Hulu Klang as a prone Landslide area in Malaysia)

5. **Title**

   Landslide Susceptibility Map Assessment Base on Climatological Changes Using Geographic Information Systems

6. **Objectives for the initial three (3) years:**

   To appraise the influence of climate variation on regional landslide changes through developing landslide hazard zonation model in Hulu Kelang area, using both areal photogrammetry and airborne laser

scanning data (LiDAR). Besides, to propose estimation maps of a climate sensitivity analysis using the artificial intelligent systems, to investigate the vulnerability of susceptible areas, and to develop a new slope monitoring system based on real-time monitoring system.

7. **Background Justification:**

Landslide is a major problem in geotechnical engineering where disasters involving loss of life and property can do occur. Several different landslide assessment techniques have been implemented to compute the landslide susceptibility values (LSVs) recently. The most influential factors in calculating the LSV are elevation, aspect, slope, curvature, soil type, lithology, distance from predefined cells to a fault, rivers, and roads, land use, stream power index (SPI) and topographic wetness index (TWI) to produce a landslide susceptibility map. The main disadvantages of most current methods in assessing the landslide are that these approaches will not evaluate the effects of climate variations (e.g., temperature, rainfall change, wind and weather systems, precipitation and land cover change) on landslides, including retrospective methods and prospective modeling that use climate records and landslide. Hence, the main objective of this current study is to propose a reliable model, considering all climatic changes influences on landslide hazard zonation in Hulu Kelang area, using an Artificial Neural Network (ANN) method.

8. **Resources available for WCoE activities**

Personnel and Contribution to ICL/IPL-GPC.

9. **Description of past activities related to risk reduction of landslides and other related earth system disasters**

Previously, we had done data collection by using both areal photogrammetry and airborne laser scanning data (LiDAR) with fields study and make a list of landslide inventory, especially in Hulu Klang area. From this information, we proposed a hazard map to classify hazard levels from low to high hazard. We managed to share this map with the local authority, which is Ampang Jaya Municipal Council, Gombak Municipal Council, Kajang Municipal Council, and other government agencies. From this map, we can predict corrective and preventive action for budgeting the allocation to the government expenses, especially in government land.

**Planned future activities /Expected Results:**

Further study will be carried out based on data collection together with new information related to

climatological effect to propose estimation maps of a climate sensitivity analysis using the artificial intelligent systems. Besides, we will assess the intrinsic characteristics of soils in the highly susceptible area using finite element limit equilibrium slope stability methods. Computer software ArcGIS will be used to assess the landslide susceptibility estimation, one Statistical Model (SI), and One Artificial Intelligent System (MLPNN) will be implemented.

Overall, the steps (or activities) that need to be taken to conduct this study are highlighted in 5 general phrases such as:

- Field investigation and climate assessment,
- Data collecting and pre-processing of the spatial database,
- Models development and landslide hazard zonation,
- Evaluating the effects of each climatological factor on landslide distribution map and   detecting the hazardous areas, and
- Field survey, sampling, and calculating the effective geotechnical parameters of the soil and approximating the relative stability of vulnerable slopes.

A graphical summary is shown below:
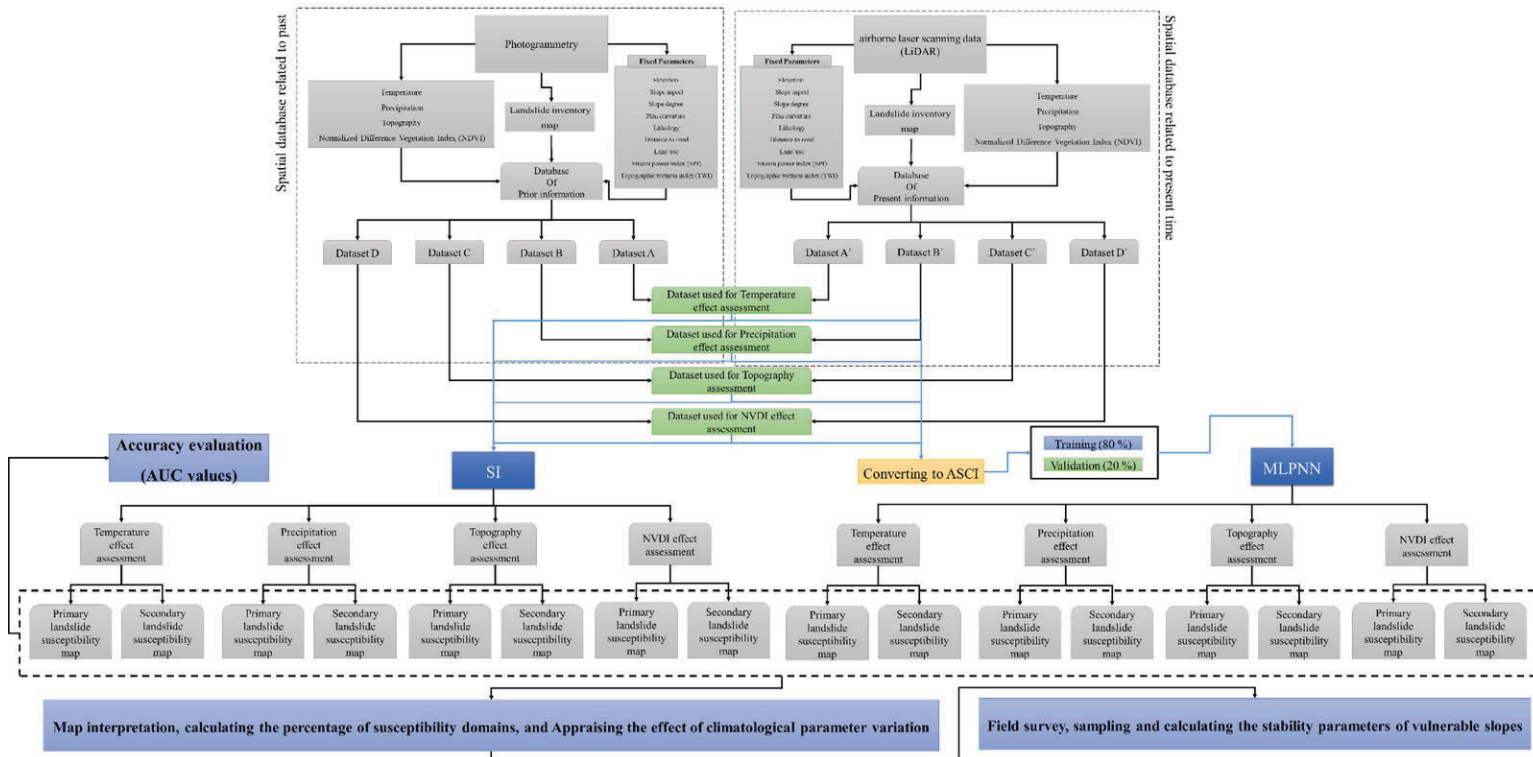
10. Beneficiaries of WCoE:

The outcome of this project will be beneficiary, especially to all government agencies related to hill site development, local authority, resident in a hilly area, developer, consultant, and all researcher, etc.

11. References:

- Slope Engineering Branch, Public Work Department
- Public Work Ministry
- Department of Minerals and Geoscience Malaysia
- Ampang Jaya Municipal Council
- Gombak Municipal Council
- Kajang Municipal Council
- University Technology Malaysia

12. If your organization is an ongoing WCoE 2014-2017, please attach the articles reporting activities of WCoE, IPL project, and ICL network published/contributed to either in *Landslides:* Journal of International Consortium on Landslides or/and the Fourth World Landslide Forum 2017.

Base on the list WCoE in ICL web, the Slope Engineering Branch under the Public Works Department has proposed the title "Landslide Quantitative Risk Analysis Study for Malaysia". This project was suspended due to budgeting constraints, and recently, we just received the approval from the government to continue this 1-year project. Now, we started the preliminaries' work and preparing the inception report. Due to that, we manage to prepare the articles reporting activities of WCoE in the next year's progress report.

14. List of published or planned reports of WCOE 2017-2020 in journal "Landslides" or "WLF5 books" for ongoing WCOE organization.

- The 1st Year 2020 - Preliminary and Data Gathering Report
- The 2nd Year 2021 - Field survey, sampling, and calculating the effective geotechnical parameters of the soil and approximating the relative stability of vulnerable slopes.
- The 3rd Year 2022 - Models development and landslide hazard zonation base on climatological factor on the landslide distribution map
- The 4th Year 2023 – Establish Full Report