GIS-based landslide susceptibility mapping in Lantau Island, Hong Kong by frequency ratio and logistic regression model

Junyi Huang1,2\*, Qiming Zhou1,2,3

1Department of Geography, Hong Kong Baptist University, Hong Kong, China

2Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences, Shenzhen, China

3The State Key Laboratory of Information Engineering in Surveying, Mapping and Remote Sensing, Wuhan University, Wuhan, China

**Abstract:** Landslides are one of the most destructive disasters that cause damage to both property and life every year. There is an increasingly high demand for land resource to support the growth of economic and population in Hong Kong. The mountainous terrain, heavy and prolonged rainfall and dense development near steep hillsides make Hong Kong as one of the most vulnerable metropolitans to the risk of landslides. Therefore, regional specific landslide susceptibility assessment in Hong Kong is necessary for hazard management and effective land use planning. Various methodologies have been proposed for landslide susceptibility mappings. By applying the statistically-based frequency ratio and logistic regression models in Lantau Island, Hong Kong, this study attempts to add extra value to the literature of evaluating their “prediction rate” (rather than “success rate”) for landslide susceptibility mapping in a temporal context. The spatial relationship among landslide occurrence and nine causative factors (elevation, slope, aspect, plan curvature, profile curvature, NDVI, distance to river, distance to fault and lithology) were examined, and landslide susceptibility maps were generated by frequency ratio and logistic regression model. Validations of the mapping results were performed by calculating relative operating characteristics (ROC). 1864 (70%) landslides records in the Enhanced Natural Terrain Landslide Inventory (ENTLI) from 2000 to 2008 are utilized to train the model while the subsequent 799 (30%) landslide occurred from 2008 to 2009 are used for model validation. The validation result shows that logistic regression model (84.05%) possesses a better prediction power than frequency ratio model (76.64%) for the study area. This study attempts to offer a new model assessment strategy for landslide susceptibility mapping. The resultant maps also provide a scientific assessment of the risk areas with respect to landslides on Lantau Island, and could serve as a basis for decisions or justification of the Lantau development planning.

**Keywords:** landslide susceptibility mapping; frequency ratio; logistic regression; GIS; Hong Kong

**Suggested topic:** Natural disaster

\*Proposed presenter: Mr. Junyi Huang

Department of Geography, Hong Kong Baptist University

Address: 12/F, Academic & Administration Building, 15 Baptist University Road, Kowloon Tong, Kowloon, Hong Kong

Tel: 852-34115986

Fax: 852-34115990

E-mail: jrhuang@life.hbu.edu.hk

Presentation preference: poster