Landslide Hazard Vulnerability: Review of literature and a proposed new approach in landslide risk management for Malaysia

Topic on landslide hazard vulnerability (LHV) in Malaysia is relatively new and received little attention from geoscientists and engineers. Vulnerability is defined as the potential degree of loss (damage) to a given element or risk elements resulting from the occurrence of a natural phenomenon of a given magnitude (Varnes, 1984). Although there are some guidelines and policies regarding hillside development to prevent landslide, the number of disastrous landslides is steadily increases nationwide. This research papers try to review and formulate the concept of LHV by taking into account the socio-economic and science aspects. New approach in vulnerability concept for research in landslide risk management in Malaysia is also introduced herein. To achieve this goal, a framework was designed for assessing the human, physical and environmental vulnerabilities to landslide hazard. The framework was formulated semi-quantitatively through the development of database for the risk elements (human & financial) based on informations from the extensive review of literature and field observations. LHV parameters from the literature were analysed statistically to evaluate their significance in developing an acceptable and practical model for landslide risk management (LRM) that will suit best to the local conditions. The parameters include: social status (physical injury, loss of lives and accommodation), physical implication (property damage, building, internal materials and infrastructural facilities) and interference on environment (affected period, daily operation & diversity). Each considered parameters in the vulnerability assessment is allocated with a certain rating value ranges from 0 (0 % loss/damage), 0.25 (1-25 % loss/damage), 0.50 (26-50 % loss/damage), 0.75 (51-75 % loss/damage) and 1.00 (75-100 % loss/damage). The next step is to count up the total average value for the three types of human, physical and environment vulnerabilities. The value is then classified into five classes of vulnerabilities, namely class 1 (< 0.20) (very low vulnerability), class 2 (0.21-0.40) (low vulnerability), class 3 (0.41-0.60) (medium vulnerability), class 4 (0.61-0.80)

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(high vulnerability) and class 5 (> 0.81) (very high vulnerability). Results from this study indicate that the rating value for the vulnerability on landslide hazard in Malaysia is generally higher than those of the developed countries. This is mainly due to poor awareness, knowledge and exposure amongst the public, as well as poor building codes and lack of consideration on the hazard triggering factors (intense rainfall and earthquake). It is also noted that the rating of vulnerability cannot be simply determined quantitatively because it requires data from field observations supported by the relative secondary data.