Guidelines to prevention of slope failure related disasters in granitic bedrock areas of Malaysia

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A variety of slope failures have occurred in the granitic bedrock areas of Malaysia; the more important of which are slump and debris flows that have sometimes led to considerable economic loss and loss of life. These failures have occurred at cut and fill slopes, as well as at natural ground slopes, having a varied vegetation cover ranging from primary and secondary forest to agricultural crops and grass. The failures have mainly involved weathered materials from morphological Zones I and II of the weathering profiles (or rock mass weathering grades 3 to 6) over granitic bedrock. Several factors are responsible for the failures, though the main cause is saturation and loss of negative pore water pressures within slope materials as the failures have mostly occurred during, or following, short periods (<3 hr) of intense rainfall (when total rainfall >70 mm), or longer periods (>1 day) of continuous rainfall.

In order to prevent slope failure related disasters, it is necessary to evaluate the various factors that give rise to the failures. The regional and local topographic settings of any site or area proposed for development needs to be first evaluated in order to allow recognition of the earth materials present and the earthworks that may be necessary. Evaluation of the local topographic setting is particularly important as the location of buildings and other structures needs to be considered with reference to the surrounding terrain. Surface and subsurface drainage patterns at the proposed site and surrounding area should then be evaluated as they influence variations in moisture contents and pore water pressures within slope materials. Stream channels and valleys also directly control the movement of debris flows in hilly to mountainous terrain. The rainfall at the proposed site and surrounding area also needs to be monitored in order to allow recognition of significant rainfall intensities and/or durations that increase the likelihood of slope failures. The vegetation cover at the proposed site and surrounding area also needs to be monitored as changes in this cover can also give rise to variations in moisture contents and pore water pressures within slope materials. The stability of cut and fill slopes associated with earthworks at the proposed site or area should finally be evaluated. Consideration and evaluation of all these factors will serve as guidelines that can prevent slope failure related disasters in the granitic bedrock areas of Malaysia.

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