

LANDSLIDE SUSCEPTIBILITY MAPPING USING THE GEOGRAPHIC INFORMATION SYSTEM (GIS) APPROACH

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Highlights: The purpose of this study is to generate a landslide susceptibility map using GIS approach (Analytical Hierarchy Process (AHP) method) at Temangan, Machang District in Kelantan. This study area was located at Temangan, Machang that covers an area of 25 km². Seven (7) parameters that triggered the occurrence of landslide were determined such as lithology, aspect, landuse, slope, distance to road, distance to fault and distance to stream. The result of landslide susceptibility map shows three (3) susceptibility classes, low, moderate, and high). The higher the class value, the higher the landslide susceptibility whereas lower value means a lower susceptibility of landslide. Based on the result of Landslide Susceptibility Map, it can conclude that the study area consist of low susceptibility percentage and the probability to landslide occurrence is low.

Key words: *landslide susceptibility, GIS, AHP method*

Introduction

Landslide is a natural disaster. Worldwide, landslides cause billions of dollars in damage every year and thousands of deaths and injuries. Landslide is the rock, earth (soil) mass movement down a hillside under gravitational influence (Akter et al., 2019). The landslide susceptibility mapping can be created by using the Analytical Hierarchy Process (AHP) including Spatial Multi-Criteria Evaluation (SMCE) and Weighted Linear Combination (WLC) introduced by Saaty 2001. The subjective assessment of the experts can be reduced by generating an objective mapping of the susceptibility to landslide by using the stated approach. Thus, this study is intended to apply AHP method that is embedded within Geographical Information System (GIS) environment to produce a landslide susceptibility map at Temangan, in Machang district, Kelantan. A GIS overlay method and raster calculation approach were applied in order to generate the landslide susceptibility map.

Content

In this study, a GIS-based AHP was used to map the landslide susceptibility in Temangan Machang district, Kelantan. The overall estimation of landslide susceptibility for an area results from the combination of susceptible levels of the seven (7) individual parameters.

From the result, three classes consist of very low, low, moderate/medium, high and very high can be seen on the landslide susceptibility index map (Figure 1). The higher the index, the more prone the region is to landslide event.

It can be observed that almost half of the study area region (53%) falls into low susceptibility to landslide area, meanwhile, 35 % of the study area is suspected to be in moderate susceptibility to landslide. Only 12% of the study area is considered highly susceptible to landslide. Thus, this study suggested that this area is low to moderate risk towards future landslide event.

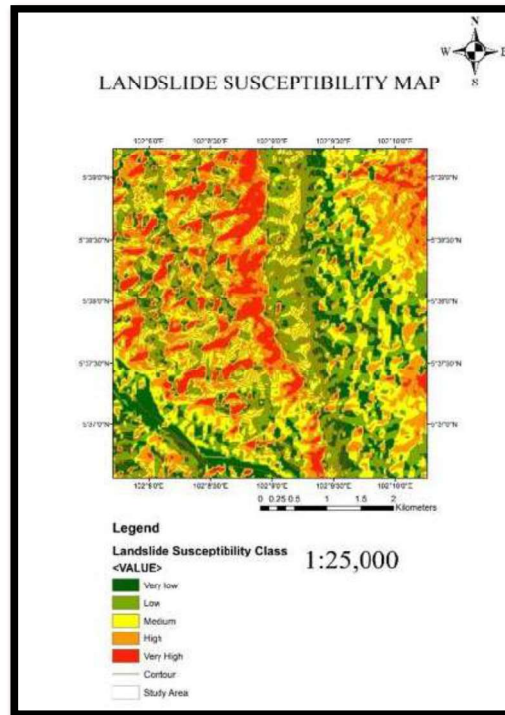


Figure 1: Landslide susceptibility index map

The susceptibility of a given area to landslides can be determined and depicted using hazard zonation. A landslide hazard map can be prepared early in the planning study and developed in more detail as the study progresses. It can be used as a tool to help identify land areas best suited for development by examining the potential risk of landsliding. Furthermore, once landslide susceptibility is identified, investment projects can be developed which avoid, prevent, or substantially mitigate the hazard. In developing areas with landslide hazards, mitigation measures should be selected if they are not already part of the project identification information. It is possible to reduce the possible impact of natural landslide activity and limit landslides which occur as a result of human activity. Landslide hazards resulting from development can be reduced by designing changes to counteract the impact that development may have on slope integrity. This might take the form of permitting only warehouses and storage facilities in higher hazard areas, to reduce the vulnerability to the population should a landslide occur.

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