Landslide Susceptibility Model of Tachileik District, Myanmar Using the Frequency Ratio Method

Author: Meetaoh Tongsae, Student ID: 650510432, Advisor: Asst. Prof. Dr. Pichawut Manopkawee
Department of Geological Sciences, Faculty of Science, Chiang Mai University

Introduction

Tachileik District in Shan State, northeastern Myanmar, is characterized by complex mountainous terrain and high rainfall influenced by the monsoon climate. These environmental conditions increase the susceptibility of the area to landslides. Landslide susceptibility assessment is therefore essential for disaster risk management and land-use planning. This study applies the Frequency Ratio (FR) method integrated with Geographic Information Systems (GIS) to analyze the spatial relationship between historical landslides and environmental factors in order to develop a landslide susceptibility model.

Objectives

- To develop a landslide susceptibility model using the Frequency Ratio method.
- To evaluate the prediction accuracy of the model.

Methodology

The study analyzes the relationship between landslide occurrences and seven conditioning factors using GIS-based analysis.

Conditioning Factors

1. Lithology
2. Slope
3. Curvature
4. Topographic Wetness Index (TWI)
5. Average Rainfall
6. Land Cover
7. Normalized Difference Vegetation Index (NDVI)

Research Procedures

Data Collection

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Preparation of Landslide Inventory

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Preparation of Conditioning Factor Maps

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Frequency Ratio Analysis

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Landslide Susceptibility Mapping

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Model Validation using ROC Curve (AUC)

Results

Susceptibility Level	Area (%)
Very Low	44.07
Low	35.57
Moderate	3.77
High	11.78
Very High	4.81

Table 1. Percentage distribution of landslide susceptibility classes in the study area based on the Frequency Ratio model. The results show that a large portion of the area falls within the low to moderate susceptibility classes, while high and very high susceptibility zones occupy smaller but significant portions of the mountainous terrain.

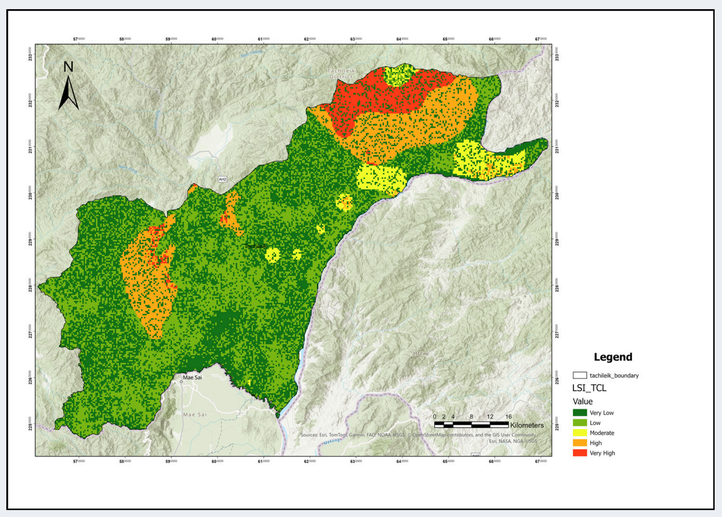


Figure 1. Landslide susceptibility map of Tachileik District, Myanmar, generated using the Frequency Ratio method. The map classifies the study area into five susceptibility levels: very low, low, moderate, high, and very high. Areas with high and very high susceptibility are mainly concentrated in the northeastern mountainous region of the study area.

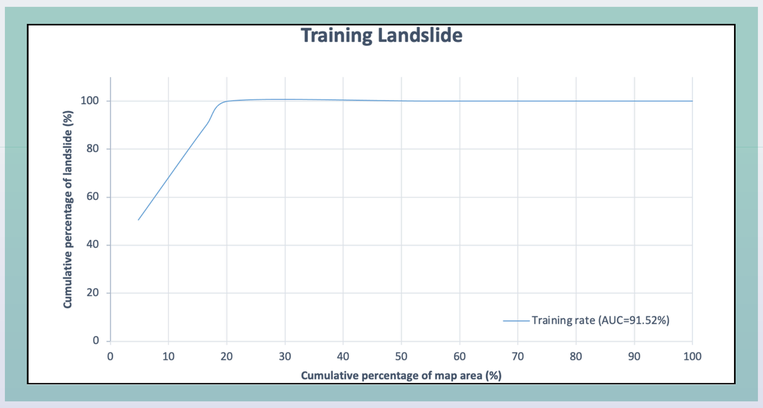


Figure 2. Success rate curve derived from the training landslide dataset used in the Frequency Ratio model. The area under the curve (AUC) value of 0.9152 indicates very good model performance in fitting the training data.

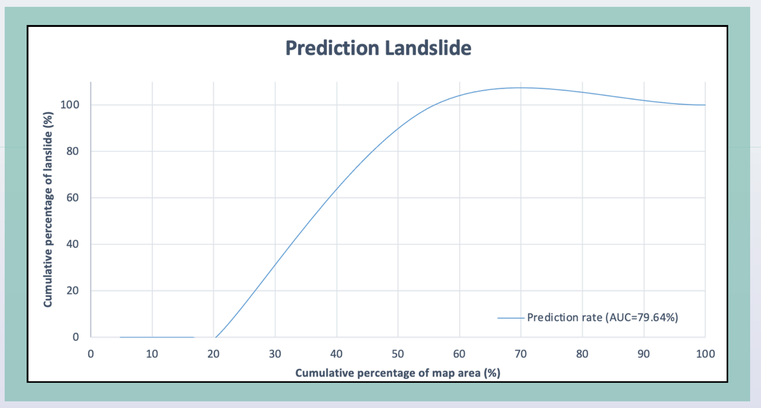


Figure 3. Prediction rate curve obtained from the validation landslide dataset. The AUC value of 0.7965 demonstrates good predictive capability of the landslide susceptibility model.

Conclusion

This study successfully developed a landslide susceptibility model for Tachileik District using the Frequency Ratio method integrated with GIS. The validation results demonstrate that the model has high reliability and predictive capability. The resulting landslide susceptibility map can be used as an important tool for land-use planning, infrastructure development, and disaster risk management in the study area.

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