

Data Mining-based Landslide Vulnerability Prediction System

D.M.D.S.K. Dissanayaka* and A.M.C. Malkanthi

Department of Physical Sciences and Technology, Faculty of Applied Sciences,
Sabaragamuwa University of Sri Lanka, Belihuloya, Sri Lanka.

*dilindissanayaka18@gmail.com

Badulla district is situated in a complex physical topography with mountain ranges and small valleys that sees a lot of landslides every year. Main causes for this phenomenon are extreme rainfall, slope aspect, unplanned agricultural activities, and unstructured irrigational activities. Thus, this study aims to develop a system to predict the severity of landslides based on the identified associations between landslides and seasonal rainfall patterns and slope in selected regions of Badulla district. Monthly rainfall data and landslide data pertaining to the period from 1999 to 2019 collected from Haputhale, Dambethenna, and Bandarawela divisional secretariats were used in the study. The forecasting model was built on the Anaconda platform with Python, and the areas of interest were selected using Arc GIS. The slope was identified from contour maps for the extracted regions in selected Grama Niladari divisions. From among different time series models, the Seasonal Autoregressive Integrated Moving Average (SARIMA) model was used to predict seasonal variance and monthly rainfall in the rainfall stations considering its higher accuracy. Based on the standard error of 301 and 311 lowest Akaike's Information Criterion (AIC) was used in the SARIMA model to fit as the best statistical model. The system issues a landslide warning for identified months based on three levels considering the severity as low, moderate, and high risk according to the identified threshold value. The possibility of a high risky landslide can be identified with a minimum threshold of 1.698 and a minimum slope of 1200m. Risk level of a landslide and the population in the considered area showed a positive correlation. This system which alerts people in high risk areas can be successfully utilized for disaster management. It can also be used for agricultural planning with minimized losses.

Keywords: Landslide, Python, Rainfall, SARIMA, Slope