World Academy of Science, Engineering and Technology
International Journal of Geotechnical and Geological Engineering
Vol:18, No:05, 2024

Comparison of GIS-Based Soil Erosion Susceptibility Models Using Support Vector Machine, Binary Logistic Regression and Artificial Neural Network in the Southwest Amazon Region

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Abstract : The modeling of areas susceptible to soil loss by hydro erosive processes consists of a simplified instrument of reality with the purpose of predicting future behaviors from the observation and interaction of a set of geoenvironmental factors. The models of potential areas for soil loss will be obtained through binary logistic regression, artificial neural networks, and support vector machines. The choice of the municipality of Colorado do Oeste in the south of the western Amazon is due to soil degradation due to anthropogenic activities, such as agriculture, road construction, overgrazing, deforestation, and environmental and socioeconomic configurations. Initially, a soil erosion inventory map constructed through various field investigations will be designed, including the use of remotely piloted aircraft, orbital imagery, and the PLANAFLORO/RO database. 100 sampling units with the presence of erosion will be selected based on the assumptions indicated in the literature, and, to complement the dichotomous analysis, 100 units with no erosion will be randomly designated. The next step will be the selection of the predictive parameters that exert, jointly, directly, or indirectly, some influence on the mechanism of occurrence of soil erosion events. The chosen predictors are altitude, declivity, aspect or orientation of the slope, curvature of the slope, composite topographic index, flow power index, lineament density, normalized difference vegetation index, drainage density, lithology, soil type, erosivity, and ground surface temperature. After evaluating the relative contribution of each predictor variable, the erosion susceptibility model will be applied to the municipality of Colorado do Oeste - Rondônia through the SPSS Statistic 26 software. Evaluation of the model will occur through the determination of the values of the R^2 of Cox & Snell and the R^2 of Nagelkerke, Hosmer and Lemeshow Test, Log Likelihood Value, and Wald Test, in addition to analysis of the Confounding Matrix, ROC Curve and Accumulated Gain according to the model specification. The validation of the synthesis map resulting from both models of the potential risk of soil erosion will occur by means of Kappa indices, accuracy, and sensitivity, as well as by field verification of the classes of susceptibility to erosion using drone photogrammetry. Thus, it is expected to obtain the mapping of the following classes of susceptibility to erosion very low, low, moderate, very high, and high, which may constitute a screening tool to identify areas where more detailed investigations need to be carried out, applying more efficient social resources.

Keywords : modeling, susceptibility to erosion, artificial intelligence, Amazon
Conference Title : ICGLGSA 2024 : International Conference on Glacial Geomorphology and Spatial Analysis
Conference Location : Vancouver, Canada
Conference Dates : May 20-21, 2024