

## **Soil erosion hazard zonation mapping using gis-based rusle model, a case study from kegalle district**

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### **Abstract**

*This research integrates the revised universal soil loss equation. Modeling erosion potential with a geographic information system for soil conservation planning from Kegalle District in Sri Lanka. The topography, recorded rainfall patterns and soil variations of Kegalle district are characterized here. These unique climatic and topographic features required a modification of the standard RUSLE factors and their derivatives. The resulting RUSLE GIS model provides a robust soil conservation tool that is easily transferable and accessible to other land managers in similar environments. The changes in agriculture and land use in Kegalle district of Sri Lanka, as well as the rainfall and the nature of the land, can be assumed that the damage in the future will be high. Soil erosion in this region results in high rates of sediment loading in waterways. A number of years ago, there was no reliable or suitable means of mapping or modeling such soil erosion. This recent increase in reliability and resolution has made remote sensing techniques represent significantly improved tools that can be applied to both change and model watershed-scale soil erosion modeling techniques. The revised universal soil loss equation (RUSLE) has not yet been derived for any district in Sri Lanka. Soil loss is high and extreme in the high mountain tops of Kegalle district and the nature of soil erosion is significant in the wet and dry mountainous areas. It can be revealed by the maps mentioned here that it is changing.*

**Key words:** *Kegalle, RUSLE Model, Soil Erosion, Sri Lanka*

## **Introduction**

Soil erosion is a natural process that happens when the top layer of soil is removed by wind or water. It is an important issue because it can lead to the loss of fertile soil, making it difficult for plants to grow. Soil erosion is often caused by human activities such as deforestation, improper farming practices, and construction. The Kegalle District is an area in Sri Lanka that is known for its diverse landscapes, including forests, agricultural lands, and human settlements. Unfortunately, these areas are vulnerable to soil erosion due to various human activities and the region's climate. To understand the extent of soil erosion in the Kegalle District and find ways to prevent it, researchers have developed a model called the Revised Universal Soil Loss Equation (RUSLE). The soil erosion is highlighted as a significant issue with adverse impacts on people's quality of life, agricultural activities, and the occurrence of natural disasters. Notably, in several districts of Sri Lanka with high rainfall, there is a concurrent threat of landslides. Landslides and soil erosion share common processes, where soil particles fall, roll, slide, and flow. To address this concern, it is crucial to assess the risk of soil erosion in various regions of Sri Lanka and implement appropriate conservation measures and land use changes to mitigate further soil loss (Jayasekara, 2018).

## **Problem Statement**

Soil erosion in Sri Lanka has become a severe environmental and socio-economic problem. It is initiated by irregular and unsafe human activities, but ultimate results of which are silt depositing in hydropower generating reservoirs, lowering of land productivity and silt depositing in natural water ways and irrigation tanks (Ministry of Agriculture.,

2012). In Srilanka GIS-based RUSLE frequently used specially the soil erosion assessment on a river basin scale (Amsalu and Mengaw 2014; Ramesh 2016; Prasannakumar et al., 2012). This kind of research has not been applied for any district. Then the among soil erosion hazard prone district Kegalle hazard percentage is significantly high. 6 districts of Sri Lanka have been designated as soil erosion prone districts. Badulla 36.5% (High erosion hazard), Kandy 32%, Kegalle 38.5%, Nuwara-Eliya 40.7%, Rathnapura 38.7%, and Matale 20.3% (Jayasekara & Kadupitiya, 2018). Most of the river basins located in the Kegalle district rapidly increase the rainfall in Kegalle district.

## **Objectives**

The research process was guided by two main objectives.

- To develop spatial model for soil erosion.
- To develop soil erosion and potential map

## **Materials and Methods**

This chapter aims to conduct a spatial analysis of soil erosion in the Kegalle District using the Revised Universal Soil Loss Equation (RUSLE) model. The Revised Universal Soil Loss Equation (RUSLE) has proven to be a valuable tool in predicting soil erosion rates by considering various factors that influence erosion, including rainfall, slope, soil erodability, and land cover, and land management practices.

This includes data on rain fall, soil type, slope, vegetation cover and land use. This data can be collected through remote sensing and other methods. A soil erosion model is used to calculate soil loss rate. There are number of different soil erosion models available, each of them has

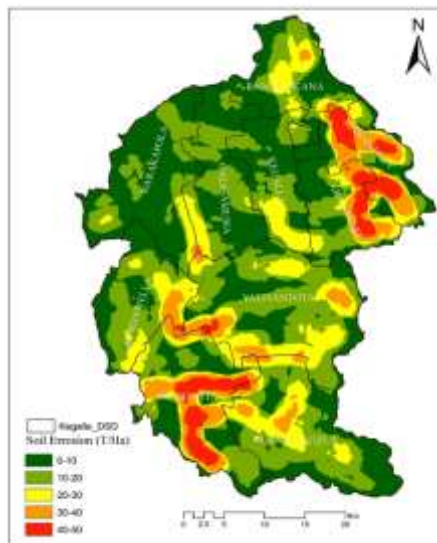
its own strengths and weaknesses. The best model to use well depends on the specific conditions on the study area.

In this study is based on mainly secondary data, Rainfall, land use, soil, and contour were collected in a shape file format from different government department.

## Results and Discussion

Kegalle district is high hazard soil erosion zone.it is 38.5%. According to this study the Kegalle district has experienced significant challenges related to soil erosion. The results show significant differences in soil erosion rates across different land cover types and topographic. Identifying factors that contribute to soil erosion is critical for designing effective soil conservation measures. The analysis revealed that precipitation. Intensity, steep slopes and land cover were the main causes of soil erosion in Kegalle district.

*Figure: 2 Soil erosion Potential Map in Kegalle District*



*Source: Author Developed, 2023*

## Conclusion and Recommendation

The results indicated the spatial distribution of soil erosion across the Kegalle District, highlighting areas prone to high erosion rates. The study also contributes to the existing body of knowledge on soil erosion assessment and modeling, particularly in the context of the Kegalle District. The accuracy of the RUSLE model relies on the quality and availability of input data, and uncertainties may exist in the parameterization process. Arc GIS and RUSLE model are used for all calculations and make map through this study. Overall, this research provides valuable insights into the spatial patterns of soil erosion in the Kegalle District. Implement Erosion Control Measures, Land Use Planning and Zoning, Awareness and Education, Monitoring and Evaluation, Soil Erosion Mitigation Strategies, Collaboration with Local Institutions.

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