

Time Series Assessment of Soil Erosion Risk Using RUSLE Model: A Machine Learning Approach - A case study in Abaya Lake Sub-Catchment

Tesfaye Abebe Tesema (Ethiopia)

Key words: Geoinformation/GI; Land management

SUMMARY

ABSTRACT

The objective of this study was to examine the nature, extent and rate of soil erosion in Abaya Lake sub-catchment using model estimate and GIS. Revised Universal Soil Loss Equation (RUSLE) integrated with Machine learning approach; satellite remote sensing and geographical information systems (GIS) are used as a methodology. Annual precipitation, FAO digital soil map, 12.5m digital elevation model, land-cover map, land use types and slope steepness were used to determine the RUSLE factors. Findings indicated that, the total soil loss in the sub-Catchment amounted to 2.38 million tons per year, with potential annual soil loss varying from 0.0 to 508.97 tons/ha/year and average annual soil loss rate of 32.84 tons/ha/year, exhibiting notable spatial variability. Specifically, the average annual soil loss in the western catchment ranged from 0.0 to 507.97 tons/ha/year, while the upper and lower section of the Sub-catchment showed average annual soil loss ranging from 0.0 - 101.1

Time Series Assessment of Soil Erosion Risk Using RUSLE
Model: A Machine Learning Approach - A case study in Abaya
Lake Sub-Catchment (13608)
Tesfaye Abebe Tesema (Ethiopia)

FIG Congress 2026
The Future We Want - The SDGs and Beyond
Cape Town, South Africa, 24–29 May 2026

and

0.0 - 64.94 tons/ha/year respectively. The study classified areas experiencing severe erosion covering approximately 13,724 hectares (16% of the total catchment), while regions at high and very high risk accounted for 62,707.5 hectares (73%) and moderate risk covers 9,614.55 hectares (11%). To facilitate effective soil and water conservation strategies, the sub-watersheds were prioritized based on erosion severity. The finding highlighted the critical need for conservation measures in areas classified as severe and very high risk to prevent irreversible degradation. Consequently, sub-watershed "A" was identified as the top priority for immediate conservation efforts followed by sub-watershed "B", "G", and "D" in the second phase, with "H", "F" and "E" in the third phase and finally sub-watershed "C" last.

Key words: Soil Erosion, RUSLE; GIS; Soil conservation; Machine learning

Time Series Assessment of Soil Erosion Risk Using RUSLE
Model: A Machine Learning Approach - A case study in Abaya
Lake Sub-Catchment (13608)
Teshaye Abebe Tesema (Ethiopia)

FIG Congress 2026
The Future We Want - The SDGs and Beyond
Cape Town, South Africa, 24–29 May 2026