## Water erosion prediction at a national scale for South Africa

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## Abstract

Erosion is a major soil degradation problem in South Africa, confronting both land and water resource management throughout the country. Given the increasing threat of soil erosion, a need to improve techniques of estimating the soil-erosion risk at a national scale was identified by the National Department of Agriculture and forms the basic premise of this study. Principles and components of the Revised Universal Soil Loss Equation are applied here since the model combines sufficient simplicity for application on a national scale with a comprehensive incorporation of the main soil-erosion factors. Indicators of erosion susceptibility of the physical environment, including climate erosivity, soil erodibility and topography were improved over earlier assessments by feeding current available data into advanced algorithms. Two maps are presented: an actual erosion-risk distribution, and a potential erosion-risk map that excludes the vegetation cover factor. Actual soil-erosion risk, which relates to the current risk of erosion under contemporary vegetation and land-use conditions, was accounted for by regression equations between vegetation cover and MODIS-derived spectral index. The area of land with a moderate to severe potential risk is found to total approximately 61 m. ha (50%). Although more than 91 m. (75%) are classified as having only a very low to low actual risk, approximately 26 m. ha (20%) of land is eroded at a rate greater than a soil-loss tolerance of 10 t/ha·yr, showing the potential to target erosion control to problem areas. The Eastern Cape, Limpopo and KwaZulu-Natal Provinces have the highest erosion potential. Comparison of potential and actual erosion risk indicates that over 26 m. ha (>30% of national land) could be subject to high erosion risk without maintenance or careful management of the current vegetation cover and land use. Although the distribution of the actual erosion risk broadly follows that outlined previously, this study provides an advance on previous assessments of erosion; results are validated more comprehensively than before, and show an overall accuracy of 77%. The paper also describes many of the limitations inherent in regional erosion studies.

Keywords: water erosion, national scale, potential risk, actual risk, RUSLE