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Development and Verification of a Soil Erosion Model Based on GIS to Determine Erosion Hazard Zones In a Watershed

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A Thesis

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in Partial Fulfilment of the Requirement for The Degree of Master of Engineering in Water Resources Engineering and Management.

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Supervised by Dr.N.T.S.Wijesekara

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Statement;

" This Dissertation was submitted to the Department of Civil Engineering of the University of Moratuwa, Sri Lanka, as a Partial fulfilment of the requirement of the degree of Master of Engineering in Water Resource and Engineering Management''.

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Declaration

This Dissertation has not been previously submitted in whole or part to any university or any Institution for a higher degree.

K.G.Chandrasena

November 2000

Abstract

For Sri Lanka the protection of it's central highland as a watershed is most important because most of development projects in dry areas are based on water and this water is from rivers that flow from central highlands. On the other hand in physical terms, soil erosion causes greater damage to agricultural productivity than any other factor. As a result of soil erosion, serious land degradation takes place specially in hilly areas. The occurrence of landslides and flash floods increases the loss of lives and property causing a set back to the country's economic growth. In a limited resources environment this problem of watershed degradation has been neglected for several decades. Therefore, it is of utmost important to address this problem since soil erosion is one of the major problems in watershed management because it directly affects the natural vegetation and also reduces the agricultural productivity. As such in watershed management , it is natural that soil erosion reduction measures are given priority over many other issues. In this context , it is necessary to identify the most vulnerable areas to implement a watershed management programme in relation to soil erosion. The present study is an attempt to contribute towards that goal of selection of vulnerable soil erosion zones. An area was selected in the Gurugoda watershed of Kegalle District carry out a case study.

Universal Soil Loss Equation (USLE) was used for computation of soil erosion using a Geographical Information System (GIS) technique. Most parameters appear in the USLE were tested and recommended for Western countries and studies for the tropical countries are limited or non-existent. Parameters for computation using USLE was done through a literature survey.

Values of different parameters thus obtained were used to asses the erosion hazard zones in the study area.

The parameters and catchment characteristics such as topography , land cover , soil types etc were incorporated into a layered GIS data base. Overlaying was done to compute the annual soil loss distribution in a spatial context. The zones were classified into three different classes namely the regions with Negligible erosion, Moderate erosion, and Severe erosion

A field survey was conducted to identify the actual erosion hazard zones and these zones were also classified in the same manner. Values obtained from field work were compared with the values from USLE and parameters from literature. The

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comparison of field identified erosion levels with computations, used a trial and error variation of erosion class classification to verify the estimation. The verification of the soil erosion model identified the classification that could be used for watersheds similar to the Gurugoda watershed in the Kegalle District.

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