Thesis Title : Spatial Model for Soil Erosion Assessment Using Geographic Information System and Remotely Sensed Data.

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Abstract

The objectives of this study were to establish a spatial model using the Universal Soil Loss Equation (USLE) and to demonstrate the utility and effectiveness of GIS and Remote Sensing technology in integrating data set for land conservation and management. The study area is located in Khao Suan Kwang district, Khon Kaen province which is the Huai Sua Ten watershed area ,covering an area of approximately 41,000 hectares. The terrain is gently undulating with alluvial plain area associated with the Huai Sua Ten which is drained to Nampong river.

A set of factors as identified in the USLE were studied and reviewed. These factors include rainfall erosivity factor (R-factor), soil erodibility factor (K-actor), slope and slope length factor (LS-factor), vegetative cover factor (C-factor) and conservation practice factor (P-factor). Each factor which consists of a set of logically related geographic features and attributes is used as data input for analysis. The factor layers

were collected from existing information and extracted from Landsat TM imagery.

Rainfall data for the past 11 years was obtained from the Meteorological Department. This information was used to develop the R-factor.

The Spatial K-factor was formulated from the soil map of the Land Development Department (LDD).

LS-factor was generated from Digital Elevation Model (DEM) which was interpolated from elevation contours.

Spatial vegetative covers were identified from the visual interpretation of Landsat TM. The C-factor can be determined to the class as studied by the LDD.

P-factor was developed from the vegetative cover class and assigned value according to the undertaken by the LDD.

Each theme layer was digitally encoded using PAMAP GIS to give five vector layers. Rasterization was then performed to the layer to form 5 polygonal covers. Relevant attribute values of the USLE factors were simultaneously attached to each polygon. The USLE was applied to the generated data set of the theme layers. The resultant map is an overlay of the covers creating one polygonal cover.

The results obtained of the USLE model calculation can be classified into 8 classes of 0-10, 10-20, 20-30, 30-40, 40-50, 50-100, 100-150 and >150 tons/ha/year. The study indicated that low erosion rate are found in the areas of paddy field where slope gradient is very low. A high erosion class was found where land is used for field crops with no conservation practices.

To evaluate the reliability of the resultant map, it was compared with existing soil erosion maps and field survey. Reliable result was obtained.

By modifying the USLE factors, various soil conservation measures can be modelled for any watershed area. Appropriate soil conservation techniques can be selected, and some of the factors can be evaluated to reach a set soil loss value. This study confirms that the use of GIS and remotely sensed data can aid the spatial model of soil erosion.