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# GIS-Based Surface Runoff Modeling and Analysis of Contributing Factors; A Case Study of the Nam Chun Watershed, Thailand

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The Nam Chun watershed, situated in the North central part of Thailand, Petchabun Province, has seen extensive land use/ cover changes through human interventions in the past decades. Not only is the watershed losing large quantities of soil, thereby reducing its agricultural yield but the flood plain to which the watershed contributes is also faced with frequent problems of flooding. The watershed that was once covered by forest, is now heavily under the influence of human activities. Deforestation on steep slopes and the use of heavy machinery for farming in the area are causing problems of soil degradation. One implication of this is that there is an increase in surface runoff as a result of changes in land use/ cover management practices. In order to identify areas that require attention, it was necessary to quantify the volume of runoff taking these changes into account. Due to the spatial and temporal variability of the factors involved in surface runoff, the application of a modelling scheme in a GIS environment provided an efficient approach to determine areas of concern.

A spatially distributed semi-physical modelling approach was implemented using the dynamic modelling language of PCRaster to quantify surface runoff in the watershed. The components of surface runoff that were considered in this study include: interception by vegetation, infiltration into the subsurface, surface storage and routing of excess water. Interception and surface storage was modelled by making use of the approach used in EUROSEM. For modelling infiltration, the Green and Ampt approach was selected. Routing of excess precipitation or overland flow was done employing the kinematic wave operator, which is one of the transport functions available in PCRaster.

Simulation results and scenario studies revealed that in general areas with agriculture practice generated higher surface runoff, due to a combination of low hydraulic conductivity and low surface cover values. On the other hand, lower surface runoff values were observed from areas with non-agriculture practice. The model results were found to be sensitive to hydraulic conductivity and micro-relief values used in the infiltration and surface storage components of the model respectively. The results of the model were substantiated by studies done on certain soil properties that affect the generation of surface runoff, in relation to different land use cover types. It was identified that in agricultural areas, soil hydraulic conductivity, porosity and bulk density were being negatively influenced by management practices leading to lowered infiltration rates when compared to other land use/ cover types.