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DEVELOPMENT OF A GIS-BASED NUMERICAL MODEL FOR WATERSHED AND WATER QUALITY STUDIES

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Watershed-based assessments involve preparing data, summarizing information, developing maps and tables, and applying and interpreting models. Each step is performed using a variety of tools and computer systems. The isolated implementation of steps can result in a lack of integration, limited coordination, and time-intensive execution. The GIS-based numerical model makes watershed and water quality studies easier by bringing key data and analytical components together. Analysts can efficiently access international and national environmental information, apply assessment and planning tools, and run a variety of proven, robust point and non-point loading and water quality models. Analysis time is reduced, greater variety of questions can be answered, and data and management needs can be more efficiently identified.

Wide ranging characteristics and potential applications of a numerical model create a difficult situation for a potential model user. Time is spent learning to use a model only to conclude that the model will not meet the need. Few models are simple to use and meet all needs. Complicated models are expected to be more accurate; consequently those models require detail input information. Model users want the best model to meet their needs based on limited available input information.

Minimal data requirements and the ease of application are principal manners to develop simpler numerical model, particularly for developing countries where there is a lack of temporal and spatial series of data. An objective of this study is to develop such GIS-based numerical tool for assessment of water balance and runoff pollutions caused by point and non-point sources in watershed systems. The core of the model is based on Generalized Watershed Loading Functions (GWLFF developed by Haith et al, 1987) and designed to complement and interoperate with enterprise and full-featured MapWindow open source GIS (www.mapwindow.org). This numerical tool called SNU-Watershed (Seoul National University Watershed Model) is a multipurpose environmental analysis system for use by provincial, regional and local authorities/agencies in performing watershed- and water-quality-based studies.

Fig. 1 shows the scheme of the SNU-Watershed model. The numerical model is programming in VB.NET, and interfacing with MapWindow open source GIS. The model includes two components: the runoff component included water balance and nutrient load modules and the routing component used HEC-RAS model.

All components are merging under GIS MapWindow functions as plug-ins. From hydrological data, the model will generate the input files (transport.dat, nutrient.dat and weather.dat) for GWLFF

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(the GWLF component also has been rewritten in VB.NET with a number of additions and enhancements of runoff, sediment and daily time step calculations), after running GWLF the outputted result will be inputted into the routing model. The final information of flow, water quality and sediment transport in a watershed system will be obtained after running the HEC-RAS model.

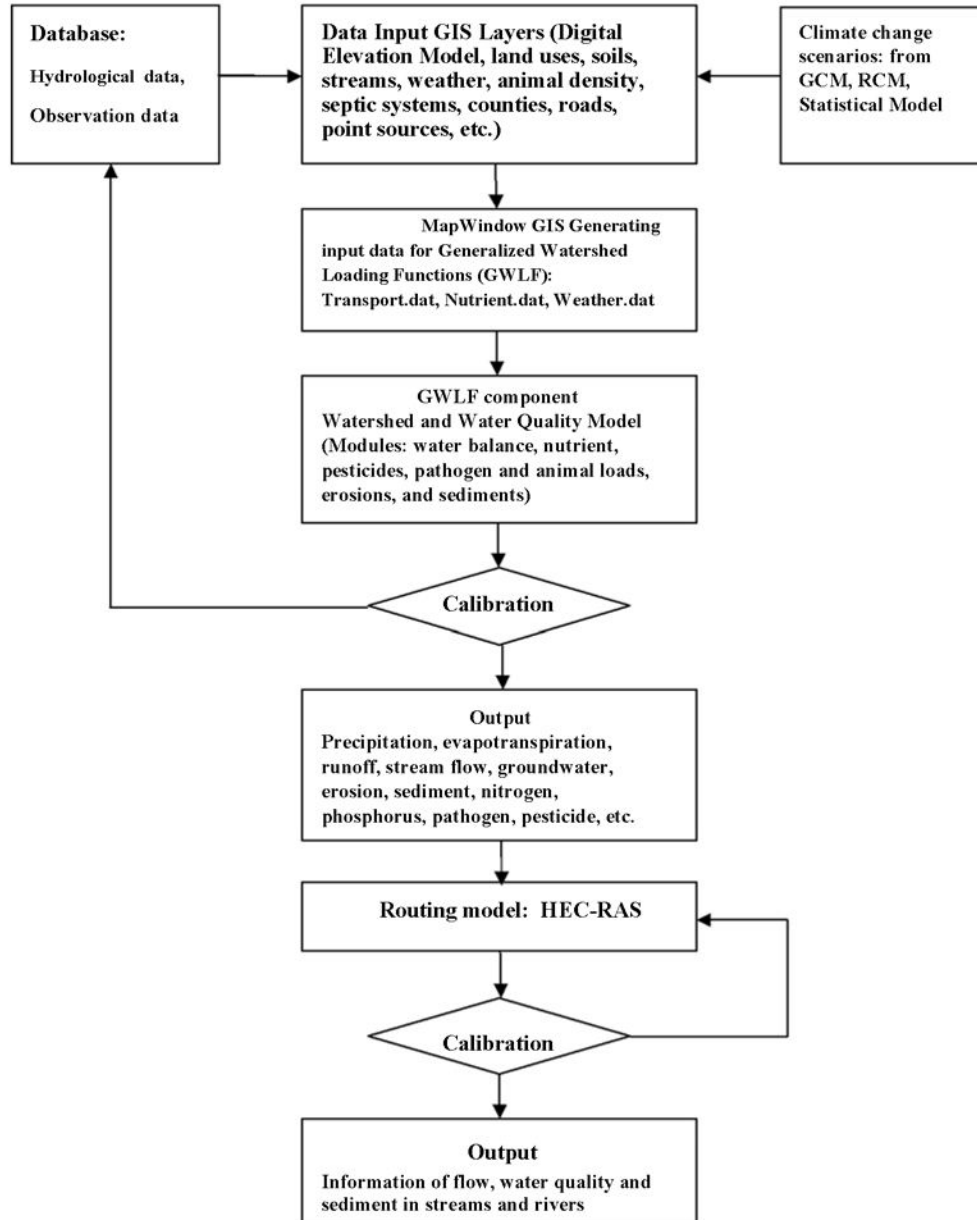


Figure 1 The scheme of the SNU-Watershed model

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 MapWindow Open Source GIS Homepage (<http://www.mapwindow.org/>)