

FORWARD

Geographic Information Systems (GIS) has become a particularly useful and important tool in hydrology for the scientific study and management of water resources. Climate change and greater demands on water resources require a more knowledgeable disposition of this vital resource. Because water in its occurrence varies spatially and temporally throughout the hydrologic cycle, its study using GIS is especially practical. GIS systems previously were mostly static in their geospatial representation of hydrologic features. Today, GIS platforms have become increasingly dynamic, narrowing the gap between historical data and current hydrologic reality.

With increasing demands placed on surface water resources, it is likely that the demand for groundwater will increase. In some places, this resource has already been severely tapped, and even mismanaged resulting in large scale lowering of the water table. Although not as apparent as surface water flow, groundwater can also be characterized spatially in a GIS and analyzed by scientists and natural resource managers. In fact, hydrogeology is especially well suited to utilize GIS. Groundwater moves much more slowly than surface water, and is 3-dimensional in flow. In contrast, surface water flows much faster and is more 2-dimensional in nature. Head values, geology, groundwater flow direction, water table elevation and location of aquifers, water quality and chemistry, are among the quantities which may be presented spatially in GIS and used for analysis, management of groundwater availability and water quality, and land use practices.

In recent years, GIS based data models have been developed to represent different types of datasets including representations of aquifers and wells/boreholes, 3D hydrogeologic models, temporal information, and data from simulation models. However, to effectively use these data models for groundwater modeling and management, it is essential to understand the related basic concepts of groundwater modeling, well hydraulics, etc. and techniques for data processing.

In order to impart the latest scientific and technical know-how on using GIS for groundwater resources management, the course material by different resource persons has been compiled in two volumes for the Training Course on 'Application of GIS to Groundwater Modeling and Management' which is organized by National Institute of Hydrology, Roorkee, during March 28-April 8, 2011 at Roorkee for Officers of Groundwater Department, Jodhpur, Rajasthan. I would like to place on record my deep appreciation for the efforts made by different resource persons, and believe that the comprehensive course material in these two volumes will aid the trainee officers and other readers in gaining a better understanding of the complexities of aquifer systems and their judicious development and management using GIS.

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