

Remote Sensing and GIS for the Development of a Model for Interaction between Fresh Water and Sea Water - A Case Study for India

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If the salt water from sea travels inland to well fields, the aquifer becomes contaminated with salt which may take years to remove even with adequate fresh ground water available to flush out the saline water. At present there is an unplanned use of ground water through construction of wells, private shallow wells and deep tube wells. Therefore this practice may not be useful in increasing the command area and it may invite saltwater intrusion problems in the coastal aquifers. To improve the present practices, a realistic assessment of the surface and ground water resources a proper planning for their use and nature of seawater movement would be required. The objective of the study is to assess the impact of human activities on sea water intrusion and to develop a GIS based model on sea water - fresh water interaction to predict the intrusion. A map showing the zone of interface between sea water and fresh water is also prepared using GIS. The area proposed for the present study is Pennar river extends up to Bay of Bengal about 50kms downstream of Nellore, Andhra Pradesh, India. The methodology comprised of baseline data collection, remote sensing data analysis, creation of database using ARC/INFO GIS and then development of model. The analysis of results drawn at various stages of this study is revealed that 1). The study area is experiencing man made pollution with over exploitation of ground water and aquaculture activities. The over exploitation leads to salt water intrusion. The depth - wise quality maps depicts salinity distribution at various levels along the coast. 2) Ground water abstraction on the inland areas of the coastal aquifers effects the interface of salt water and fresh water. Over exploitation from lower Pennar region decline the fresh water head and migration of sea water in land. It is in this context, the solute transport modelling studies are to be conducted with a view to understand the movement of saltwater and freshwater interface. 3) The model developed in this study, can be helpful in finding out the features/sources of the formation of saltwater/freshwater interface, the pattern of its movement and the change of chemical characteristics in the sea-water intrusion area. 4) It is concluded that GIS is an excellent tool for potential mapping, point aggregation and probability analysis and modelling for sea water freshwater interface. 5) It is also concluded that the application of this model in prominent coastal aquifer zones in lower Pennar environs may warrant judicious planning of exploitation schemes conjunctively to minimize inland movement of salt water - fresh water interface in the system.