

Application of Novel Approaches in Groundwater Quality Modelling

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Hydrological uncertainty together with the hydrogeological complexities of aquifer systems and unplanned exploitation of groundwater resources has complicated the understanding of growing groundwater quality problems because of anthropogenic activities. The safe drinking water supply, effective management and sustainable development of groundwater resources is becoming a challenging task in many parts of the world. The chemical and mineralogical composition of the soil/rock formations in which groundwater flow occurs and travel time of water in these porous media, hydrogeological and geoenvironmental conditions affect significantly the hydrogeochemical processes within the aquifer systems. The paper presents a number of novel approaches that have emerged in addressing and explaining many complex groundwater pollution problems and quantifying the associated risks that may be crucial from groundwater protection and health care point of view. The fuzzy logic, stochastic approaches and geochemical interactions have been presented to demonstrate their capability in addressing many complex groundwater pollution problems prevailing in different hydrogeological setup. An extensive literature review has been also carried out to bring out the state of the art in groundwater quality modeling and to identify the role of these approaches in improved understanding of the fate and transport of groundwater contaminants as well as associated health hazard, with particular emphasis on arsenic contamination in Bengal Delta Plain (BDP) and fluoride contamination in Western Indian Aquifer (WIA).