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Multi Objective Optimisation to sea water Intrusion Problem in South Chennai Aquifer System

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Many coastal areas in the world are dependent on local fresh groundwater resources because of heavy urbanization. One of the most important threats to groundwater in coastal areas is seawater intrusion. In recent decades, the coastal aquifers have assumed greater importance because of increased demands placed on ground water to meet the growing needs of water in larger urban area like Chennai City. The South Chennai aquifer that holds substantial quantity of groundwater, meets 20% of city's water requirement. Due to constant pumping and improper management, this aquifer is facing a severe threat of being contaminated. Especially in drought years the ground water resource is a sole safe guarding arrangement to meet the drinking water requirement.

The South Chennai aquifer system selected for the study covers the area between latitudes 12º05' N and 13º15' N and between longitudes 80º 10' 13" E and 80º 16' 30" E. The total linear distance of the area is about 20 kms in the N-S direction and about 10 kms in the E-W direction. It covers an areal extent of about 200 sq. km. The aquifer system is conceptualized as a single-layer system based upon the available borehole data and the earlier lithological studies. Chloride is the dominant ion of ocean water and normally occurs in small amounts in ground water. On the other hand, bicarbonate is usually the most abundant ion in groundwater and occurs in small amounts in seawater. Thus in order to study the extent of sea water intrusion the parameter $Cl/(HCO_3+CO_3)$ taken as the indicator of seawater intrusion and analyzed through simulation for analysis.). SEAWAT is being used for the simulation of saltwater intrusion.

Multiple, often conflicting objectives arise naturally in most real-world optimization scenarios. Management of sea water intrusion is a multi objective decision problem. The problem is formulated as a multi objective optimization problem consisting of two objectives such as maximization of pumping and minimization of the maximum salt concentration at specified observation points considering the constraints on water levels and concentration. Multi objective Interactions between the various trade-offs were analysed using multi objective evolutionary algorithm.

Keywords: Seawat; Multi Objective; Evolutionary Algorithm