

Paper Number: 1573

Pollution Potential Mechanisms of Urban Aquifers of Greater Bangalore using Remote Sensing Techniques -A case study , Karnataka, South India

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Establishing sustainable yields is difficult because of problems of definition and consideration of climatic variability. Sustainable use issues include water -budget analyses and the effects of overexploitation-depletion, subsidence ,water quality/quantity issues and protection of special environments. In Greater Bangalore ,a large number of tanks, lakes which provided water for irrigation, drinking, fishing and washing during non-monsoon period in the past either dwindled in number or became cess pool for sewage water due to industrialisation & urbanisation. The space for infiltration of groundwater reduced drastically. The gneisses, granodiorite and granites of the Peninsular Gneissic Complex are the predominant rock types in the area, which are rich in hornblende and mica minerals and prone to contamination. The water quality studies yield useful information of the environments in which water is circulated. The rain water through soil/rock interaction alters its chemistry.

The present study is to understand the pollution mechanisms in urban aquifers of Greater Bangalore area by integrated geophysical, Remote Sensing (RS) and Geographical Information Systems (GIS) techniques and to suggest appropriate technical measures. 176 water samples (7 Dug wells/open wells, 4 surface sources and 165 bore well samples) were collected over an area of 750 km² in and around Greater Bangalore. Sample locations were recorded using Global Positioning Systems. The study area was divided into four quadrants and each such quadrant was further made into two sq. km. grid. Water samples (N-Grid 43, A-Grid 31, B-Grid 34, and C-Grid 63) were collected from each grid and got analyzed .The geochemical, bacteriological and heavy metal analysis of results of groundwater samples were utilized for generation of thematic maps in the GIS environment using Arc GIS software. Satellite data covering area was interpreted and thematic maps on Land use/Land cover, Lineament, Slope, Geomorphology and Groundwater prospect maps were prepared using Arc GIS. Grid wise water samples for 3 seasons were collected, analyzed and plotted to identify polluted areas. It is found that the Geomorphology of the area comprises Residual Hill, Pediment, Pediment Isenberg Complex, Pediplain moderately weathered, Pediplain shallow weathered, Pediplain Eroded Valley. Electrical resistivity survey was carried out at 5 locations to find out the thickness of the weathered zone and to know the depth range of the fractured zone, depth to basement. The study does not indicate the presence of fractures in Medahalli/Avalahalli and National Law School of India University of Jnanabharathi area. Places of college ground, Sports Authority of India, Peenya Industrial area and near Hebbal lake are found to be feasible for groundwater exploration. Lithological profiles of observatory borewells were drawn out to know the Mineralogical composition of rocks and thickness of weathered rocks. Piezometric water level data was plotted and generated flow direction of groundwater and thereby predicted movement of pollutants in the Greater Bangalore Area. A few places are identified showing high concentration of heavy metals .Results From the study suggest that leakage from beneath cities makes a substantial contribution to recharge shallow/deeper aquifers although travel time differs. These time scales ensure that only the most mobile and persistent contaminants are likely to reach these deeper aquifers. The secondary water quality changes are caused by a reduction in the redox potential of the ground waters. For these reasons nitrogen, chloride and chlorinated solvents represent

the contaminants of most concern. Study clearly indicates that Northwest part as well as the Central part of Greater Bangalore area has more potential for groundwater quantity. All precautionary measures should be taken to avoid groundwater quality deterioration. The ground water potential zone map generated through GIS map was verified with the yield data to ascertain the validity of the model developed and found to be generally in agreement, apart from flow direction, with the bore well yield data – the model was further checked using statistical regression analysis on the chemical analysis data.

Keywords: Aquifers , Contaminant Transport, Groundwater, Hydrogeology, Sustainability

