

Identification of Suitable Sites for Rainwater Harvesting in Salt Water Intruded Area by Using Geospatial Techniques in Jafrabad, Amreli District, India

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Abstract : The sea water intrusion in the coastal aquifers has become one of the major environmental concerns. Although, it is a natural phenomenon but, it can be induced with anthropogenic activities like excessive exploitation of groundwater, seacoast mining, etc. The geological and hydrogeological conditions including groundwater heads and groundwater pumping pattern in the coastal areas also influence the magnitude of seawater intrusion. However, this problem can be remediated by taking some preventive measures like rainwater harvesting and artificial recharge. The present study is an attempt to identify suitable sites for rainwater harvesting in salt intrusion affected area near coastal aquifer of Jafrabad town, Amreli district, Gujrat, India. The physico-chemical water quality results show that out of 25 groundwater samples collected from the study area most of samples were found to contain high concentration of Total Dissolved Solids (TDS) with major fractions of Na and Cl ions. The Cl/HCO₃ ratio was also found greater than 1 which indicates the salt water contamination in the study area. The geophysical survey was conducted at nine sites within the study area to explore the extent of contamination of sea water. From the inverted resistivity sections, low resistivity zone (<3 Ohm m) associated with seawater contamination were demarcated in North block pit and south block pit of NCJW mines, Mitiyala village Lotpur and Lunsapur village at the depth of 33 m, 12 m, 40 m, 37 m, 24 m respectively. Geospatial techniques in combination of Analytical Hierarchy Process (AHP) considering hydrogeological factors, geographical features, drainage pattern, water quality and geophysical results for the study area were exploited to identify potential zones for the Rainwater Harvesting. Rainwater harvesting suitability model was developed in ArcGIS 10.1 software and Rainwater harvesting suitability map for the study area was generated. AHP in combination of the weighted overlay analysis is an appropriate method to identify rainwater harvesting potential zones. The suitability map can be further utilized as a guidance map for the development of rainwater harvesting infrastructures in the study area for either artificial groundwater recharge facilities or for direct use of harvested rainwater.

Keywords : analytical hierarchy process, groundwater quality, rainwater harvesting, seawater intrusion

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