Siting of locations for aquifer recharge in Upper Kurram Valley using Geographic Information Techniques

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Water is an essential part of life. The exploitation of groundwater is as ancient as civilization itself. Majority of the inhabitants of Upper Kurram valley depend on groundwater for drinking and agriculture practices. Drastic declination in water table has occurred in the recent past due to high runoff and low recharge, overexploitation of available water resources,andurbanization.

Through this research, an attempt has been made to identify the potential zones for groundwater extraction, demarcation and natural recharge and devising proper artificial recharge mechanism using GIS and RS tools. In order to observe pre- and post-monsoon water table level in the study area, primary and secondary data was used for the year of 2008. Yearly monitoring of water table reveals that of 0.5m to 2.8m variation occurred in groundwater table in Upper Kurram valley. The water levels are divided into five arbitrary depth zones, on the basis of water table depth. Water table is deepest in the central part of the study area and shallow along the Kurram, Zeran and Kirman rivers.

To identify the potential natural recharge areas, different thematic layers were considered namely, surface slope, land cover, proximity to settlement and road, drainage network, soil and geology. These themes were assigned proper weights and ranks on the basis of their relative contribution to groundwater recharge in the area following the guidelines of ASCE and FAO. Thematic layer were integrated in GIS environment using Overlay analysis. Results reveal that the suitable areas for natural recharge make 14% of the study area, which corresponds to nearly 137 km^2.

To augment the groundwater, artificial recharge techniques can be used to enhance the groundwater capacity. Three artificial recharge mechanisms namely, small dams, percolation pond and plantation were considered and their suitability analysis was performed using seven parameters namely surface slope, settlement, soil, geology, roads, drainage and land use. Results reveal that suitable percentage areas for small dams is 3%, for plantation is 9% and 20% is suitable for percolation pond.

The study can be helpful for government as well as for private organization to understand the groundwater situation in Upper Kurram valley. This study is also supportive in the selection of potential sites for artificial recharge techniques to enhance the declined groundwater situation. Study can be helpful to increase the groundwater availability for domestic as well for agriculture uses.