SPATIO-TEMPORAL ANALYSIS OF GROUNDWATER RESOURCES OF PESHAWAR CITY USING GIS AND REMOTE SENSING

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Abstract

The menace of Population growth, unplanned urbanization, industrialization and other human activities are increasing stress and, also have devastating impacts on groundwater and other natural resources. Groundwater is an economical and more convenient source of drinking water around the world. In a developing country like Pakistan, the water quality in general and groundwater in particular is of great concern. About 74.4% population does not have access to clean water and is observed as one of water resources stressed country. In this study, Geographical Information System and remote sensing (GIS/RS) based methods have been utilized to investigate spatio-temporal variations in groundwater resources due to the dynamic phenomena, such as, population growth, unplanned urbanization and industrialization. This article primarily covers the qualitative analysis of the groundwater impacted by these dynamic phenomenon in Peshawar (Pakistan). The main objectives of this study are; A) Physiochemical changes of groundwater quality since 1985. B) Geospatial analysis and Mapping of different contamination distribution. C) To illustrate the vulnerable Wards (Union Councils) due to contaminated groundwater. The temporal data for urban growth since 1985 has been estimated from satellite images, and population data have been collected from the Pakistan Bureau of Statistics for the years 1981 and 1998 and projected for 2016. The groundwater data collected by TNO (Toegepast Natuurwetenschappelijk Onderzoek) the Netherlands for WAPDA in 1985, and recent samples of groundwater from 78 tube wells in a field survey with GPS locations in 2016 were analyzed in this study. Utilizing the spatial overlay analysis of GIS, the temporal and spatial variations in groundwater quality have been correlated with the mentioned dynamic phenomena. This study has exposed a general decline in the groundwater quality due to these dynamic phenomena. Based on results from this study, the Urban Wards in the study area have been divided into three classes of groundwater quality; 1) Highly venerable 2) Moderately venerable 3) Low venerable. Our results show that more than half of the population of Peshawar are highly venerable due to contaminated groundwater.

Keywords: Groundwater quality, GIS, Remote Sensing, Urban Growth