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Books and Chapters published in edited volumes

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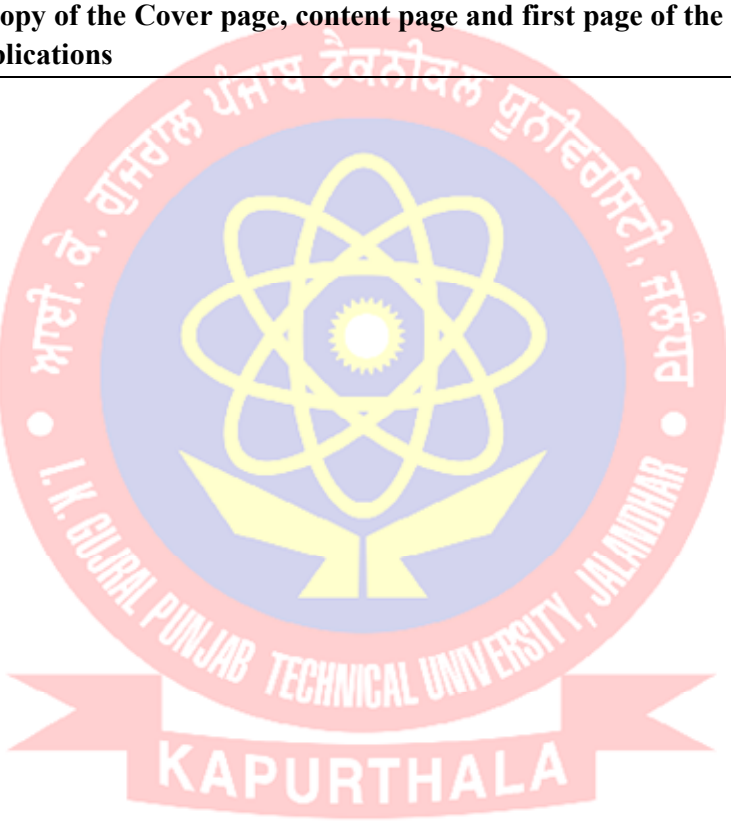

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GIS-Based Assessment and Characterization of Groundwater Quality in a Industrial City of Central Punjab, India

Sashikanta Sahoo[1]*, Dapinder Singh Khosa[2], Pradeep Litoria[1], Mukta Sharma[2] and Brijendra Pateriya[1]

[1] Punjab Remote Sensing Centre, Ludhiana 141004, Punjab, India
Email: sksahoo@prsc.gov.in
[2] Punjab Technical University, Punjab, India
Email: khosa1111@gmail.com

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ABSTRACT: The quality groundwater may be impacted by naturally occurring processes as well as by the activities directly attributable to human interventions in different environs. The complex biodiversity, physiographic setup coupled with prevailing hydrogeological set up attribute to water pollution in various parts of the State. Ludhiana district falls in central part of Punjab, India and it is well known for small and big scale industry hub in India. Different types of industry are set up in the Ludhiana and that can be badly effect the ground water quality. To analyse the effect of pollutants to in ground water, three blocks adjoining Ludhiana City are taken into consideration in which thirty two points are selected for ground water quality mapping. In the present study, the spatial variations in physicochemical quality parameters and heavy metals in groundwater of three blocks were analysed to determine the suitability through development of Water Quality Index (WQI) and Heavy Metal Pollution Index (HPI). The spatial variations maps are generated with the help of Geospatial analyst tool in ESRI Arc GIS. The suitability for drinking purpose was evaluated by comparing the physicochemical parameters of groundwater in the study area with drinking water standards prescribed by Bureau of Indian Standards (BIS). All the physicochemical parameters of groundwater except iron were found to be within the range as per BIS and the heavy metals such as Fluoride, Lead, Aluminium and Selenium were found to be almost more than the prescribed limits at all the stations. WQI and HPI maps shows that the ground water quality of these three blocks (Dehlon, Doraha and Khanna) were in very poor condition. The probable reason for the poor quality of ground water shown in HPI is due to heavy metal pollutants interacting with ground water through streams and nallah.

INTRODUCTION

Water is one of the most important substances on earth. All plants and animals must have water to survive. If there was no water there would be no life on earth. India is rich in water resources. Groundwater and network of rivers are the major sources that can fulfil the requirement of the country in all regions. Groundwater is well thought-out to be the most natural and fresh resource on earth which is used for drinking and irrigation purposes. Now these days ground water quality is badly affected by rapid industrialization and increasing human population, the stress on natural resources is increasing and their conservation is one of the major challenges for mankind. The quality of groundwater is as important as its quantity because it is the major factor in determining its suitability for drinking, domestic, irrigation and industrial purposes. The concentration of chemical constituents which is greatly influenced by geological formations and anthropogenic activities determine the groundwater quality. Both the agricultural and anthropogenic activities have resulted in deterioration of water quality rendering serious threats to human beings. As industrialization and use of chemicals on agricultural has increased that has been contributing significantly to groundwater contamination. Land use pattern has undergone a tremendous transformation in the state. During the recent years, there has been an increase in the area put to non-agricultural uses such as industrial sites, housing, transport systems, recreational purposes, irrigation systems, etc. The industrial effluents discharged into the natural environment are causing water pollution. Besides, a huge amount of municipal wastes is being generated and disposed off without any treatment. 73% of the total municipal solid waste is being generated in the 5 mega towns in the state i.e. Ludhiana, Jalandhar, Amritsar, Bathinda and Patiala. The state Punjab extends from the latitudes 29°32'00" N to 32°28'00" N and longitudes 73°50'00" E to 77°00'00" E and is bounded by Jammu and Kashmir in the north-east, by Himachal Pradesh in east and southeast, by Haryana in south, by Rajasthan in south and west and shares the international boundary with Pakistan on western side. The geographical area of Punjab is 50,362 sq. kms. Kaur (2016) has assessed the groundwater quality for drinking and irrigation purposes using hydro-chemical studies. The Deterioration of groundwater quality due to anthropogenic activities is increasing at an alarming rate in most parts of the Punjab.

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Chapter 23
Groundwater Analytics for Measuring Quality and Quantity

Mukta Sharma

Abstract Groundwater constitutes the key segment of freshwater assets of the world. With increasing urbanization across the globe, quality and quantity of groundwater are the issue of major concern. Water resources are highly dynamic and undergo significant changes with the changing land-use patterns. Rapid industrialization and population growth have strongly accelerated land-use changes globally and have a severe impact on groundwater resources. Accurate monitoring and management of groundwater resources is therefore required for the sustainable development of cities. Mapping groundwater resources is significant for the development and management of same. Estimation of Potential Groundwater zones, Assessment of Ground Water Quality, and Ground Water Vulnerability assessment are the key concerns for Groundwater management. Geospatial technologies have proven to be very useful in the development of optimal approaches for groundwater development, assessment, and management. Studies of various researchers have revealed that interrelated factors of lithology, lineaments or geologic structures and terrain features help in identifying the most promising sites for groundwater exploration. Remote Sensing studies facilitate delineating various geological, topographic, and structural features and further integration in the GIS environment to demarcate potential groundwater zones. Similarly, groundwater models created with sufficient groundwater quality data converted into GIS database give an accurate assessment of the spatial distribution of groundwater quality and changes with time and change in land-use. Information about vulnerability to contamination of groundwater can aid in selecting suitable sites for certain activities and thus minimizing adverse effects on groundwater. GIS-based vulnerability maps based on the subjective rating of hydrogeological factors are commonly used to evaluate groundwater vulnerability and can be effectively used for decision-making and proper groundwater planning. Therefore, an integrated approach including data-driven out from Remote Sensing, ground truth data, and hydrogeological GIS database and groundwater modeling using statistical techniques offers immense potential for groundwater mapping and management.

M. Sharma (✉)
IKG Punjab Technical University, Jalandhar, Punjab, India

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