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Urbanization and Its Impact on Drinking Water Supply in Rohtak City

Nisha

Research Scholar

Dr. Tarun Kumar Yadav

Research Guide

Department of Geography

Abstract

This study analyzes the relationship between urbanization and the drinking water scenario in Rohtak city, highlighting the causes of water stress, its impact on public health, and the need for integrated water resource management. The findings emphasize the importance of adopting sustainable urban planning, improved water conservation practices, and strengthening institutional frameworks to ensure equitable and reliable access to safe drinking water in the future. Urbanization has significantly transformed the socio-economic and environmental landscape of Rohtak city, Haryana. Rapid population growth, unplanned expansion of settlements and increased industrial activities has placed tremendous pressure on the city's drinking water supply. The demand–supply gap has widened due to over-extraction of groundwater, inefficient distribution systems, and contamination from domestic and industrial sources. Seasonal variability and inadequate infrastructure further aggravate the challenges of safe and sustainable water availability.

Keywords: Urbanization, Drinking Water Supply, Groundwater Depletion, Water Quality, Rohtak City, Sustainable Development, Water Management

Introduction

Urbanization is one of the most significant socio-economic transformations of the modern era. It refers to the growth and expansion of urban areas, driven by migration, population growth, industrialization, and infrastructural development. While urbanization is often associated with economic progress, improved employment opportunities, and better access to facilities, it also brings several challenges, particularly in the management of essential natural resources. Among these, the availability and quality of drinking water is one of the most pressing issues confronting rapidly urbanizing cities in India. Rohtak, a prominent city in Haryana, offers a pertinent case study in examining how urban expansion is reshaping the dynamics of drinking water supply.

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Rohtak city, historically known as an educational and administrative hub, has experienced remarkable urban growth over the past few decades. Its strategic location near the national capital region (NCR), coupled with infrastructural improvements and industrial development, has accelerated population inflow and settlement expansion. According to census data, the population of Rohtak has been steadily rising, leading to increased demand for land, housing, and urban amenities. Consequently, the city's natural resources, particularly water, are under tremendous pressure. What was once a small town with limited but manageable water needs is now a bustling urban center grappling with water scarcity, distribution inefficiencies, and concerns about water quality.

The impact of urbanization on drinking water supply in Rohtak is multi-dimensional. Firstly, population growth directly increases the demand for water, not only for drinking but also for domestic, industrial, and institutional purposes. Municipal water supply systems often fail to keep pace with this rising demand, resulting in shortages, inequitable distribution, and dependence on alternative sources such as groundwater. Secondly, rapid construction activities, expansion of residential colonies, and unplanned land use patterns affect the city's water recharge potential. Encroachment on natural water bodies and reduction in green cover further aggravate the stress on groundwater levels, which are already depleting at an alarming rate.

Another critical dimension is the issue of water quality. Urbanization leads to higher levels of pollution, both industrial and domestic. Wastewater mismanagement, leakage of sewage into water supply channels, and contamination of groundwater by untreated effluents pose serious threats to public health. In Rohtak, several localities face recurring issues of contaminated water supply, which often results in waterborne diseases. This scenario highlights not just the scarcity but also the compromised safety of available drinking water.

The governance and policy framework also play a crucial role in shaping the water supply scenario. While municipal bodies attempt to augment water availability through tube wells, canal water, and piped supply, the increasing gap between supply and demand makes sustainability a major concern. Moreover, climate change and erratic rainfall patterns in Haryana are emerging as additional stressors, further complicating the challenge of ensuring reliable access to safe drinking water in Rohtak.

Thus, the study of urbanization and its impact on drinking water supply in Rohtak city is highly relevant. It provides insights into the interplay between population growth, infrastructural development, environmental degradation, and resource management. Understanding this relationship is essential for developing sustainable strategies that ensure equitable access to safe drinking water, a fundamental human necessity, in the face of rapid urban expansion.

Urbanization in the Indian Context

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Urbanization in India has been historically uneven but consistently upward. According to the Census of India 2011, about 31% of the Indian population resided in urban areas, and projections suggest that this figure is likely to surpass 40% by 2035. The United Nations estimates that by 2050, more than half of India's population will be urban. This transition, while essential for economic modernization, poses critical questions about resource management. Unlike developed nations, where urbanization often occurred alongside gradual infrastructure development, India's urban growth has been largely rapid and unplanned, putting pressure on existing civic amenities such as housing, sanitation, waste disposal, and water supply.

The issue of drinking water is particularly severe because it combines problems of scarcity, inequitable distribution, contamination, and poor infrastructure maintenance. In cities like Delhi, Mumbai, and Bangalore, water scarcity is already a well-recognized issue, but medium-sized cities such as Rohtak are equally vulnerable, albeit in different ways. These cities often lack the administrative resources and advanced infrastructure of metropolitan areas while simultaneously facing similar pressures of rapid population growth and increasing water demand.

Rohtak City: An Overview

Rohtak is strategically situated in the southeastern part of Haryana, approximately 70 kilometers northwest of the national capital, Delhi. Its location within the National Capital Region (NCR) has contributed to its rapid urban expansion. Traditionally, Rohtak was known as a market town and an agricultural hub, with extensive canal irrigation networks supporting the surrounding farmlands. Over time, however, the city has diversified into education, healthcare, trade, and industry. Institutions such as Maharshi Dayanand University, Pt. B.D. Sharma University of Health Sciences, and several professional colleges have turned Rohtak into an educational center, attracting students from across the country.

The city's population has been growing rapidly. As per the Census of 2011, Rohtak city had a population of over 3.7 lakh (370,000), and current estimates suggest that the figure has increased substantially in the last decade. This demographic expansion is accompanied by physical sprawl, as new residential colonies and urban settlements emerge on the city's peripheries. Simultaneously, the economic profile of the city has shifted from being primarily agrarian to more diversified, leading to changes in water demand patterns.

Drinking Water Supply: A Crucial Urban Service

Water is indispensable for survival, health, and economic development. Urban water supply systems must ensure adequate per capita availability, equitable access, and safe quality to meet household needs, institutional requirements, and commercial uses. The World Health Organization (WHO) emphasizes the importance of

access to safe drinking water as a basic human right. In Indian cities, however, the gap between demand and supply has been widening.

Rohtak depends on a combination of surface water and groundwater for its drinking water needs. Traditionally, canal water from the Western Yamuna Canal and groundwater extraction through tube wells have been the primary sources. However, overexploitation of groundwater has resulted in declining water tables, while canal water often faces issues of availability, quality, and competing demands from agriculture and industry. As a result, Rohtak, like many other growing cities, is grappling with the challenge of ensuring sustainable drinking water supply.

The Impact of Urbanization on Drinking Water Supply

Urbanization influences drinking water supply in multiple, interrelated ways:

1. **Rising Demand**: As population increases, so does the demand for water. Urban lifestyles typically involve higher per capita water consumption compared to rural areas, due to amenities like flush toilets, washing machines, and increased commercial activity.
2. **Shrinking Supply Sources**: Expansion of built-up areas often comes at the cost of natural recharge zones, wetlands, and open spaces, thereby reducing the capacity of aquifers to replenish.
3. **Infrastructure Pressure**: Water supply networks designed for smaller populations often become inadequate in expanding cities. In Rohtak, many older pipelines, pumping stations, and reservoirs are under stress.
4. **Water Quality Issues**: Pollution from sewage, industrial effluents, and solid waste disposal compromises water quality. Urban runoff often contaminates surface water, while declining groundwater tables can increase salinity and chemical contamination.
5. **Equity Concerns**: Urban growth often leads to uneven access. Affluent colonies may secure regular water supply through pipelines or private borewells, while low-income settlements face irregular supply and poor quality.
6. **Governance and Institutional Challenges**: Rapid urbanization requires coordinated governance among municipal authorities, state water boards, and community organizations. However, fragmented planning often leads to inefficiencies and wastage.

Conclusion

Urbanization in Rohtak City has significantly influenced the availability and quality of drinking water. The rapid expansion of residential, commercial, and industrial areas has increased water demand, often outpacing the capacity of existing water supply infrastructure. Over-extraction of groundwater, pollution from domestic

and industrial sources, and encroachment on natural recharge zones have further strained the drinking water supply. Sustainable management strategies, including rainwater harvesting, efficient water distribution systems, wastewater treatment, and public awareness initiatives, are essential to ensure a reliable and safe drinking water supply for Rohtak's growing population. Addressing these challenges proactively will help balance urban growth with the long-term sustainability of water resources.

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