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Evaluating Water Resource Potential of Asansol Municipal Corporation in West Bengal towards its Sustainable Management

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Abstract

Water is essential for all forms of development, yet it faces growing global challenges, making sustainable management practices increasingly critical. Effective water resource management hinges on a deep understanding of the unique availability and demand patterns within each region. The Asansol Municipal Corporation (AMC), the second-largest urban centre in West Bengal, has a long history of water shortages, particularly during the summer months. This study aims to assess the water resource potential of AMC by thoroughly evaluating current demand and supply patterns, groundwater conditions, surface water resources and the potential for rainwater harvesting, including through the utilisation of opencast mining pits and rooftop rainwater harvesting systems. The research is structured around five primary objectives: **Firstly, the present water supply patterns are analysed to estimate the demand-supply gap**. This involves assessing the existing water availability pattern and forecasting domestic water needs to better understand the balance between supply and consumption in AMC. **Secondly, the study investigates the dynamics and sustainability of surface water resources**. It focuses on their availability and the changing landscape of surface water bodies, vegetation, built-up areas and land surface temperature providing an in-depth analysis of whether these water bodies can continue to meet the growing demands of the region. Thirdly, **the groundwater potential zones within AMC are examined to delineate areas where groundwater can be sustainably extracted** by using two popular methods (AHP and FR) in a GIS environment, offering a detailed assessment of groundwater availability and its capacity to support the region's water supply. **Fourthly, the study identifies suitable locations for surface rainwater harvesting structures and estimates the potentiality of** surface rainwater harvesting in opencast mining pits and pit channels. **Finally, the potential for rooftop rainwater harvesting has been assessed** involving the feasibility of such systems in both residential and commercial settings for non-potable uses. The study reveals a growing demand-supply gap in the area, exacerbated by rapid urbanisation, which is leading to the decline of surface water bodies, rendering them insufficient to meet current water needs. Furthermore, the area's hard rock formations result in limited groundwater potential. However, there is significant potential for surface rainwater harvesting, particularly through the use of opencast mining pits and rooftop rainwater harvesting presents a viable solution for addressing non-potable water demands.

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