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ASSESSMENT OF WATER QUALITY IN WADI HANIFA: IMPLICATIONS FOR RESTRICTED IRRIGATION AND URBAN GREENING UNDER SAUDI VISION 2030

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Abstract

Water scarcity in arid regions like Saudi Arabia poses a critical challenge to sustainable urban development, particularly in rapidly growing cities such as Riyadh. With increasing urbanization and population pressures, the demand for innovative water management strategies has intensified, necessitating the exploration of alternative water sources, including treated wastewater reuse. Wadi Hanifa, a historically significant natural watercourse traversing Riyadh, serves as a potential resource for reclaimed water in irrigation and urban greening key components of Saudi Arabia's sustainability goals under Vision 2030. However, the feasibility of such reuse depends on the water's quality and consistency, which remain understudied in this context. This study addresses this gap by conducting a comprehensive water quality assessment of Wadi Hanifa through systematic field sampling and statistical analysis. Over a 12-month period, water samples from seven locations along the Wadi were analyzed for 12 physicochemical parameters, including pH, electrical conductivity, turbidity, total dissolved solids, dissolved oxygen, and nutrient concentrations. The Weighted Arithmetic Water Quality Index (WQI) was applied to evaluate suitability for restricted irrigation, supported by Pearson correlation analysis and boxplot deviation diagrams to identify trends and anomalies. Results indicated spatial variability in water quality, with WQI values ranging from 49.62 ± 24.24 (upstream, SW3C) to 140.43 ± 33.36 (near effluent discharge, SW8G). While most segments met standards for restricted irrigation, areas adjacent to wastewater inflows required further treatment. These findings underscore the potential of Wadi Hanifa's treated water to support the Riyadh Green Project, aligning with national objectives of ecological preservation and sustainable urban expansion. By integrating water reuse into urban greening initiatives, this study provides actionable insights for policymakers and emphasizes the role of adaptive water management in achieving Saudi Vision 2030's environmental targets.

Keywords: Physicochemical Parameters, Saudi Vision 2030, Wadi Hanifa, Water Quality Assessment, Weighted Arithmetic Index Method

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