

Innovative Approaches to Water Resources Management: Addressing Challenges through Machine Learning and Remote Sensing

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Abstract : Water resources management is a critical field that encompasses the planning, development, conservation, and allocation of water resources to meet societal needs while ensuring environmental sustainability. This paper reviews the key concepts and challenges in water resources management, emphasizing the significance of a holistic approach that integrates social, economic, and environmental factors. Traditional water management practices, characterized by supply-oriented strategies and centralized control, are increasingly inadequate in addressing contemporary challenges such as water scarcity, climate change impacts, and ecosystem degradation. Emerging technologies, particularly machine learning and remote sensing, offer innovative solutions to enhance decision-making processes in water management. Machine learning algorithms facilitate accurate water demand forecasting, quality monitoring, and leak detection, while remote sensing technologies provide vital data for assessing water availability and quality. This review highlights the need for integrated water management strategies that leverage these technologies to promote sustainable practices and foster resilience in water systems. Future research should focus on improving data quality, accessibility, and the integration of diverse datasets to optimize the benefits of these technological advancements.

Keywords : water resources management, water scarcity, climate change, machine learning, remote sensing, water quality, water governance, sustainable practices, ecosystem management

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