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Identifying Capabilities and Potentials of System Dynamics in Hydrology and Water Resources as a Promising Modeling Approach for Water Management

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Description / Abstract

Agriculture is the most important sector with regard to water resources management due to its social, economic, hydrological, and environmental aspects, and many scholars and researchers have been driven to investigate the dynamic interrelationships among hydrological, environmental, and socioeconomic factors affecting agriculture. The system dynamics (SD) approach has become widely used because of its merits and benefits as a tool to deal with complex, dynamic problems and systems with many aspects and components that are involved and must be understood to ensure sound decisions regarding water and hydrological systems. Although agricultural water management needs to be studied as a main part of water management, socioeconomic management, and environmental management requiring the use of SD, this review shows that SD is currently used to a limited extent in terms of agricultural water management. This paper sheds light on the studies and investigations on the use of SD in the water sector and highlights the strengths of SD in order to encourage researchers to use this promising method to manage such a vital resource. Accordingly, this review seeks to include a comprehensive and up-to-date survey of existing publications and scholarly papers on the use of SD modeling as an effective technique for dealing with different problems associated with planning, management, and analysis of hydrology and water resources systems. Recent trends in the integration of SD with other modeling systems, such as artificial intelligence systems, are discussed along with the limitations and challenges facing application. This article makes a new contribution by giving a foundation of references and studies for scholars, researchers, and academics which encourages future investigation in employing the SD approach to hydrology and water resources management and planning, especially with agricultural water.

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