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Blueprint for a digital twin of a river basin

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Digital twins are part of ongoing digital transformation to test, monitor, and maintain physical environments virtually. The collaboration of smart measurement sensors, advanced communication networks, cloud data storage capacity, and cutting-edge computing techniques has the potential to create a digital twin of a river basin with greater physical, spatial, and temporal scalability. The digital twin is defined as a realistic virtual representation of the physical river basin that aids in improved decision-making through real-time data connectivity, association, and relationship. Because of the continuous bidirectional interactions between virtual and physical entities, the digital twin is unique to the physical river basin. The digital twin has the advantage of adapting to changing real-time river basin characteristics, resulting in increased operational efficiency, better uncertainty quantification, early warning detection, and identification of emergency management. By imagining smart river basin management via the digital twin concept, we are venturing into uncharted territory, with the goal of improving the ecological status of a river basin by balancing environmental and socioeconomic interdependence while minimizing natural resource depletion. This poster provides an overview of the concept, framework, methodology, and challenges involved in developing a digital twin of a river basin. The framework's six dimensions are river basin, data, modeling, infrastructure, service, and connectivity. The methodology emphasizes the digital twin's purpose identification, maturity spectrum, workflow architecture, technical core, data layers, model simulations, knowledge creation, and effective application. We discuss the key services provided by the digital twin for the river basin, as well as its future prospects for autonomous control in the physical river basin.