

The Role of Time-Scales in Socio-hydrology

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Much of the interest in hydrological modeling in the past decades revolved around resolving spatial variability. With the rapid changes brought about by human impacts on the hydrologic cycle, there is now an increasing need to refocus on time dependency. We present a co-evolutionary view of hydrologic systems, in which every part of the system including human systems, co-evolve, albeit at different rates. The resulting coupled human-nature system is framed as a dynamical system, characterized by interactions of fast and slow time scales and feedbacks between environmental and social processes. This gives rise to emergent phenomena such as the levee effect, adaptation to change and system collapse due to resource depletion. Changing human values play a key role in the emergence of these phenomena and should therefore be considered as internal to the system in a dynamic way. The co-evolutionary approach differs from the traditional view of water resource systems analysis as it allows for path dependence, multiple equilibria, lock-in situations and emergent phenomena. The approach may assist strategic water management for long time scales through facilitating stakeholder participation, exploring the possibility space of alternative futures, and helping to synthesise the observed dynamics of different case studies. Future research opportunities include the study of how changes in human values are connected to human-water interactions, historical analyses of trajectories of system co-evolution in individual places and comparative analyses of contrasting human-water systems in different climate and socio-economic settings.

Reference

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