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Socio-hydrological modelling: A review asking “why, what and how?”

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Description / Abstract

Interactions between humans and the environment are occurring on a scale that has never previously been seen; the scale of human interaction with the water cycle, along with the coupling present between social and hydrological systems, means that decisions that impact water also impact people. Models are often used to assist in decision-making regarding hydrological systems, and so in order for effective decisions to be made regarding water resource management, these interactions and feedbacks should be accounted for in models used to analyse systems in which water and humans interact. This paper reviews literature surrounding aspects of socio-hydrological modelling. It begins with background information regarding the current state of socio-hydrology as a discipline, before covering reasons for modelling and potential applications. Some important concepts that underlie socio-hydrological modelling efforts are then discussed, including ways of viewing socio-hydrological systems, space and time in modelling, complexity, data and model conceptualisation. Several modelling approaches are described, the stages in their development detailed and their applicability to socio-hydrological cases discussed. Gaps in research are then highlighted to guide directions for future research. The review of literature suggests that the nature of socio-hydrological study, being interdisciplinary, focusing on complex interactions between human and natural systems, and dealing with long horizons, is such that modelling will always present a challenge; it is, however, the task of the modeller to use the wide range of tools afforded to them to overcome these challenges as much as possible. The focus in socio-hydrology is on understanding the human–water system in a holistic sense, which differs from the problem solving focus of other water management fields, and as such models in socio-hydrology should be developed with a view to gaining new insight into these dynamics. There is an essential choice that socio-hydrological modellers face in deciding between representing individual system processes or viewing the system from a more abstracted level and modelling it as such; using these different approaches has implications for model development, applicability and the insight that they are capable of giving, and so the decision regarding how to model the system requires thorough consideration of, among other things, the nature of understanding that is sought.

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