



## **Investigating the influence of human water use practices on the hydrological cycle using a sociohydrological modelling framework with a case study in north India**

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Population growth, urbanisation and environmental change are leading to increased water stress affecting many millions of people worldwide. Attempts to mitigate the problem require a detailed understanding of the feedbacks between humans and the natural environment. Isolating the role humans play in the water cycle, however, is challenging, requiring knowledge of human water use behaviour and the underlying hydrological processes.

Here, we elucidate farmer irrigation decision making using a bottom-up sociohydrological modelling framework which is informed by fieldwork carried out in north India (O’Keeffe et al., 2018). The modelling framework conceptualises and proceduralises observed farmer irrigation practices in the Indo-Gangetic Plain, placing human behaviour at its core while highlighting impacts and interactions between society and the natural environment. Through this approach, we isolate the effects of human behaviour and allow the impact of anthropogenic water use on the hydrological cycle to be quantified. We apply the model to the Gandak river basin; a tributary of the Ganges river located in Bihar state in northern India which is representative of the social and environmental conditions found throughout the region. By simulating the relationships between the water users, irrigation officials and agricultural practices, we highlight the importance of directly including water user behaviour in policy making and operational tools to achieve water and livelihood security as well as improving our understanding of the hydrological cycle.

### References:

O’Keeffe, Jimmy, Simon Moulds, Emma Bergin, Nicholas Brozovic, Ana Mijic, and Wouter Buytaert. 2018. “Including Farmer Irrigation Behavior in a Socio-hydrological Modelling Framework with Application in North India.” *Water Resources Research*, 1–18. doi:10.1029/2018WR023038.