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On coupled dynamics and regime shifts in coupled human-water systems

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To clarify the nonlinear and intertwined dynamics in coupled human-water systems, we developed a stylized model that combines simple hydrological and social dynamics. In this model, neither too much nor too little water is good (think floods and droughts, respectively; this is a feature absent in previous models) and the population self-organizes to respond to relative benefits they derive from the water system and outside opportunities. Despite its simplicity, the model richly yields 6 different regimes. A closer look at the conditions giving rise to these different regimes sheds light on the design of policies and adaptation strategies for the coupled human-water system under different social-hydrological settings. Advantages and limitations of this modeling approach will also be discussed.