

Conceptualizing socio-hydrological drought processes: the rise and fall of the Ancient Maya civilization

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Different communities have followed different paths to arrive at their present situation as a consequence of the continuous, specific interactions between the hydrological and social system.

The need to understand the current and future pathways to water security becomes more and more pressing, considering the increasingly delicate balance between water demand and water supply.

To contribute to addressing this challenge, we examine the link between water stress and society through socio-hydrological modeling. Within the spirit of the Easter Island model by Brander and Taylor and drawing from the vulnerability literature, we conceptualize the interactions of an agricultural society with its environment.

We apply the model to the case of the ancient Maya, a civilization who occupied the Maya Lowlands (parts of present day Mexico, Guatemala, Belize) from around 2000 BC to after AD 830. The hypothesis that modest drought periods played a major role in the fall of the society is explored.

We are able to simulate plausible feedbacks and find that a modest reduction in rainfall is a necessary, but not a sufficient condition in order to observe a collapse of 80 percent of the population. Equally important are actual population density and the impact of drought on crop growth.

The model shows that reservoirs allow the society to grow larger, but also that the vulnerability to drought increases.