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Abstract: The Anthropocene era marks the role of humans as agents of planetary modification. In this era, the search for sustainability in human-environment interactions has pushed the development of modeling techniques able to incorporate dynamic natural and human feedbacks across temporal and spatial scales. While researchers have refined models for both natural and human systems separately, the coupling of these systems via model integration continues to be a challenge. In response, researchers have concentrated their attention on how human decision-making processes respond to and affect the environment. New pathways to sustainability may be developed by examining how human culture informs the decision-making process related to environmental issues. The Values, Beliefs, and Norms (VBN) theory is a culture-dependent conceptual framework that relates human actions to their beliefs and values about the environment. The goal of this paper is to quantify cultural influences on human decisions regarding environmental policy. We focus on freshwater sustainability within the Smoky Hill River watershed, an intensive agricultural region of the Central Great Plains, Kansas, U.S.A. An agent-based model integrates natural and human system processes and the feedback loops and interactions among the systems. The feedback from the natural system to the human system is mediated by a VBN-based decision rule, while the feedback from the human to the natural system is mediated by economic decisions on land use, with land use/land use change impacting biodiversity and water availability. By linking policy support to biodiversity and social structures, this research explores socio-cultural levers to improve freshwater sustainability.

Keywords: Socio-ecological system; Coupled natural and human systems; Kansas; Agent-Based Model; freshwater sustainability.