Why are sustainable practices often elusive?

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Buried machinery in barn lot in Dallas, South Dakota, United States during the Dust Bowl, an agricultural, ecological, and economic disaster in the Great Plains region of North America in 1936. Credit: USDA image no. 00di0971

For at least 200,000 years, we humans have been trying to understand

our environments and adapt to them. At times, we have succeeded; often, we have not. When we get it wrong—through anthropogenic exacerbations leading to the Dust Bowl and the growth of the dead zone in the Gulf of Mexico—the results can be disastrous. However, in both success and failure, we can learn from our past experiments and adapt.

"Our ability to respond to a future disaster is only as good as our ability to remember past challenges and to care about the future," explains Santa Fe Institute (SFI) Complexity Fellow Stefani Crabtree (Utah State University). Crabtree is the lead author of a new study, "Why are sustainable practices often elusive? The role of information flow in the management of networked human-environment interactions," published in the journal *Global Environmental Change*.

In the study, Crabtree led a team of researchers that grew out of SFI's ArchaeoEcology working group. Their goal was to measure how spatial, temporal, cognitive, and cultural limitations affect humans' understanding of their environments. The group comprises experts from archaeology, anthropology, ecology, informatics, and other sciences.

The authors delve into archaeological and historical data from history's "completed experiments" to analyze how information flows from ecosystems to the societies inhabiting them. The resulting conceptual model, called Environmental Information Flow and Perception (EnIFPe), drew from case studies in Eastern Polynesia, the North Atlantic, and the American Southwest. The model yields a quantitative measure of information flow that can help distinguish when decisions have a sound basis in environmental knowledge versus when it's a shot in the dark.

"Of all the social sciences, archaeology is unique in its breadth and time range," says Jeff Altschul, the President of the Coalition for Archaeological Synthesis. "As such, it can detect signals in human

behavior that other sciences with shallow historical reach cannot."

The research provides a framework to assess how societies—both in the past and those in present-day—interact with their environments for good or for ill. This framework can guide environmental decision-making, emphasizes Jennifer Dunne, a contributing author and SFI's Vice President for Science. With current environmental issues like climate change, pandemics, and biodiversity loss, the study's findings are relevant for questions of sustainability and stewardship, both locally and globally.

"Societies that remember ecological information tend to adapt better," concludes Crabtree. "We need to be aware of the limits of our understanding so we can make better decisions and avoid catastrophe."

More information: Stefani A. Crabtree et al, Why are sustainable practices often elusive? The role of information flow in the management of networked human-environment interactions, *Global Environmental Change* (2022). DOI: 10.1016/j.gloenvcha.2022.102597

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