

With increasing evidence of climate change, a growing population and economic trends, the coordination of adaptation decisions for the management of limited natural resources in food, energy and water (FEW) sectors has become increasingly critical. To date, the ability of FEW actors to strategically coordinate, address and adapt to sudden or chronic perturbations (i.e., drought, policy change) is inadequate. Adaptation plans of diverse FEW actors concentrate on their own sub-system (e.g., wheat farms, dams) and do not consider the possible interference from simultaneously-evolving adaptation decisions in other sub-systems. Moreover, decision support cyberinfrastructures for natural resources management do not enable social network of diverse FEW actors to actively collaborate to generate decision scenarios that are preferred by the community, and therefore, more likely to be adopted.

This project presents InterACTWEL (Interactive Adaptation and Collaboration Tool for managing Water, Energy and Land), a transformational decision support system (DSS) with state-of-the-art analytics and visualization capabilities that empower land, water, energy managers and food producers to conceptualize and co-plan towards a resilient future for their local communities. The tool enables users to coordinate the co-development, evaluation, and revision of adaptation strategies by allowing them to create, access, and use complex and multi-sectoral datasets of varying sizes, advanced simulation models, large-scale optimization algorithms and visualization techniques for rendering of complex decision spaces and spatio-temporal impacts of proposed adaptation decisions. Additionally, the DSS enables FEW actors to share and elicit community's acceptance of proposed strategies and potential on-the-ground decisions helping stakeholders identify optimized and preferred adaptation plans.

Using an active stakeholder-driven planning approach and the FEW actors in the Umatilla and Morrow County regions in Oregon, we developed different perturbation scenarios for this region (e.g., policy changes in water allocations, land use changes to support expansion of renewable energy sectors) that were used as a case study for usability testing of the DSS. Use of the DSS as a XSEDE Science Gateway by these FEW actors demonstrated its value for improving coordination among FEW sectors and provided feedback for the continuous development of interfaces that facilitate end-user engagement and cognitive learning.