

Bringing Systems Thinking into Community-based Environmental Management Decisions

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The U.S. EPA's 'Sustainable and Healthy Communities Research Program' is developing methods and tools to assist communities in making decisions that lead to more just and environmentally sustainable outcomes. Work includes collaborative development of systems models that capture linkages between environmental, social, and economic spheres. These models assisted communities and environmental managers in understanding social and economic benefits and trade-offs for choices that range from business-as-usual to taking actions, e.g., adopt innovative wastewater technologies, restore wetlands, implement Agricultural BMPs, adopt multi-state coastal management strategies, enforce existing standards, or implement climate resiliency practices. We will discuss three complementary models and their effectiveness in bringing systems-thinking into community-based environmental management

decisions: A **simple concept map**, which can be developed by individuals or groups to capture their own understanding of systems of interest and integrate knowledge and values from different perspectives. A **Driving Force-Pressure-State-Impact-Response** framework that identifies cause and effect within the system and allows community decision-makers to recognize factors that may need to be quantified in order to evaluate trade-offs and co-benefits. Use of these two models within exploratory workshops with stakeholders and within a structured decision-framework (Decision Analysis for a Sustainable Environment, Economy and Society) resulted in shifts of participants' thinking and willingness to invest in both additional data acquisition and in environmentally protective actions. A **dynamic simulation model** that creates a triple-value system simulation (3VS) for specific watershed management scenarios. Narragansett Bay and the Cape Cod cases brought state, federal and local researchers, and environmental managers together to identify critical model components, linkages, data, management options, and implementation roadblocks. Collaborative development of these models resulted in better understanding of the financial and social impacts to communities of coastal water quality, increased willingness to work across boundaries, recognition of the costs of delaying actions, and agreement on research and data needs.