

Assessing the Impacts of Water Prioritization Strategies Using Dynamic Input-Output Modeling

Topic: Environmental Input-Output Modeling

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Water reallocation during drought events can have significant but varying impacts on the operation and productivity of sectors within an economy. In this paper, we develop a dynamic input-output model extension to estimate the inoperability and economic losses that are incurred across interdependent sectors over time during prolonged periods of drought. This extension features versatile functions that allow the evaluation of intervention strategies implemented during the drought timeline that can either degrade or enhance sector recovery as water supply conditions evolve. It was applied to a study of the impacts of water distribution strategies in four monitoring basins in the Commonwealth Virginia, USA. Five categories of drought severity based on the Virginia Drought Classification System were simulated. Simulation results identify the critical economic sectors that are sensitive to slight changes in water reallocation strategies, and highlight the interconnected effects of these strategies across sectors. Observed data trends also provide valuable insights for decision makers in formulating drought preparedness policies, long-term water conservation programs and short-term responses aimed to reduce water consumption in cases of emergency. The dynamic water reallocation I-O model developed in this study can be applied to other drought-prone regions, and be used to generate insights on the economic consequences of drought, ecosystem thresholds, and water reallocation strategies that minimize the economic impacts of prolonged drought events and their ripple effects across sectors.