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Integrated Water Systems: Translating *Physical* Climate Science into *Practical* Water Management Solutions at Global, Regional & Local Scales

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Wednesday, February 25, 2026

1-2 PM (MT) FL2-1022 or Virtual | [Watch Live](#)

Water management is inherently a local (and sometimes regional) problem that increasingly contends with global-scale climate risks. My research has focused on resolving this scale mismatch by developing tools and models that connect fundamental earth system science with the practical realities of water resource decision-making. In this context, my graduate studies and earlier career had an international focus, in Egypt where I worked on the Nile River and saw the need for integrated assessment- linking climate, natural, and agricultural systems; and then to the International Institute for Applied Systems Analysis (IIASA) in Austria, where I introduced water into a global world food trade model. Through these linkages of hydrologic models to economic frameworks, it became possible to show how climate-induced water stress could cascade through socio-economic systems. These insights—that physical water systems are inseparable from human systems—became a principle behind my work in developing and advancing community models like WEAP and WRF-Hydro, which have been widely adopted.

Looking ahead, I believe a new scientific frontier is the merging of earth systems models (ESM) and water system models to better represent critical two-way feedbacks, which are lacking. Accomplishing this requires overcoming technical challenges, including the mismatch between the coarse resolution of ESMs and the rule-based nature of managed water systems. Future work should focus on developing novel coupling strategies that could include leveraging machine learning to bridge these gaps, creating a new generation of tools to support local and regional decision-making under deep uncertainty. [Event Website](#)