

Integrated Analysis of Freshwater Resources Sustainability in Jordan (JWP)

Call: Freshwater Security

NSF code: G8MUREFU3FP-2200-089

Lead PI: Steven Gorelick, Stanford University, USA

Partners:

Erik Gawel, University of Leipzig, Germany

Bernd Klauer, Centre for Environmental Research – UFZ, Germany

Julien Harou, University College London, United Kingdom

Amaury Tilmant, Université Laval, Canada

Daanish Mustafa, King’s College, London, United Kingdom

Amer Salman, University of Jordan, Jordan

Emad Al-Karablieh, University of Jordan, Jordan

BF/G8HORC sponsors: NSERC, DFG, NERC & ESRC, NSF

Amount: €1,262k

Time period: 36 months

This proposed effort will focus on development of an integrated framework to evaluate water policy interventions in water-stressed countries using Jordan as a model system. Jordan is representative of many arid regions where future natural and social changes set the stage for nationwide water supply failures. Existing water resources models ignore critical interactions between hydrologic and socioeconomic components, resulting in a lack of holistic analysis needed to make long-term policy decisions. Our interdisciplinary team will develop a quantitative policy-evaluation tool to explore ways to enhance the sustainability of freshwater systems through such innovations as optimized allocation procedures, institutional re-structuring, subsidies/tariffs, water-lease markets, and transboundary institutions. We will construct a modular, agent-based hydro-economic model in which each module captures scientific and local knowledge from a unique discipline synthesizing hydrologic, agronomic, and socioeconomic analysis into a coherent analytical framework. The modules will be linked through feedbacks among system components. The policy-evaluation model will combine simulation of natural phenomena (groundwater-surface water flow, crop yield, and soil / water salinity) with human decision-making at the institutional and user levels (water usage, regulation, allocation, trans-boundary water, and trade). We will evaluate a wide range of policy interventions based on a set of quantitative economic and environmental metrics. In addition to developing a new tool for water policy analysis, the project aims to identify innovative policy solutions for a water system that has exhausted traditional supply sources and is operating at the vulnerable edge. Our analysis of risks and benefits associated with policy solutions will be assessed, and management options communicated to stakeholders who will be actively solicited for input. The project will further set the groundwork for deploying the integrated framework to other water-stressed regions throughout the globe.