

In many parts of the world, freshwater for people and the environment is a threatened resource. Rapid population growth, climate change and poor management, among other factors, have led to water crises that put people and their livelihoods in danger. Often interlinked, regional water supply shocks can affect people, economies and nature everywhere. Finding locally relevant solutions will depend on incentives, technology, conservation, markets and trade.

Mission

The Global Freshwater Initiative (GFI) is developing strategies that promote the long-term viability of freshwater supplies for people and ecosystems threatened by climate change, shifts in land use, increasing population, decaying infrastructure and groundwater over-pumping. Our investigations of freshwater vulnerability are global in scope but regional in focus.

Goals

We work with policymakers, stakeholders and collaborators throughout the world to:

- Understand the nature and causes of water crises and their impacts on people, economies and ecosystems
- Identify planning and policy prescriptions that ensure regional freshwater supplies for human and environmental needs are sustainable and resistant to disruptions
- Develop innovative, quantitative models that inform improved policies to address regional water supply problems by exploring water markets, infrastructure, technology, taxes, water rights and quotas
- Train the next generation of water resource experts

We Are

An interdisciplinary team of researchers bridging hydrologic science, ecology, geoscience, economics and institutional analysis. We work with scholars, water managers, public and private decision-makers and nongovernmental organizations to identify viable solutions to water challenges throughout the world.

We Reach

- Water managers
- Policymakers
- Governments
- Conservation groups
- Community groups
- Nongovernmental organizations
- Private companies
- Individuals



Lessons Learned

Our work on freshwater vulnerability makes clear that water supplies in developing regions are vulnerable. People tend to forget past water crises, but the threat of droughts continues as population and demand for freshwater grow. The Global Freshwater Initiative is focused on creating predictive tools that enable policymakers to better plan for and manage crises.

Major Research Projects

■ Drought in India: A Monumental Water Crisis

From 2003 to 2004, Chennai (formerly Madras) suffered a crippling water crisis. Reservoirs dried up, the piped supply system shut down and most private wells went dry, forcing city residents to rely primarily on expensive imported water brought in by tanker trucks operated by private vendors. Our research team determined that improving water-distribution efficiency, along with harvesting rainwater to recharge the aquifer, could meet Chennai's growing water needs and avoid costly desalination plants. The researchers recommended establishing a dual-quality system in which all water pumped into the piped network is treated at a central facility, while wells continue to supply lower quality, untreated water for nonpotable purposes. Central to the strategy is rooftop rainwater harvesting to ensure that the aquifer will be recharged and wells will not go dry.

■ When Reservoirs Went Dry in Yaqui Valley, Mexico

The fertile Yaqui Valley produces 40 percent of Mexico's wheat. Population growth, agricultural intensification, water diversions, groundwater pumping, land use changes and aquaculture growth threaten agricultural yields and household incomes. In 2004, an eight-year period of low rainfall caused all three surface-water reservoirs to dry up. Wheat production

dropped to zero. Our research team studied the impacts of the crippling drought by simulating the irrigated agricultural system using a specialized model. Our results showed that the impact of the historic drought could have been significantly reduced without affecting farm profits by better management of risks of allocating surface water and groundwater. Our water management model was implemented by the National Water Commission to reduce the risks associated with future droughts.

■ Improving Freshwater Security in Jordan

At the heart of the Middle East, Jordan is one of the 10 poorest countries in the world in terms of freshwater resource availability. The region is expected to experience temperature increases of about 2.5 degrees Celsius by mid-century with longer dry periods. Jordan is subject to water conflicts and demand increases due to the influx of Syrian refugees. On top of that, water management in Jordan is marked by institutional dysfunction.

We have assembled an interdisciplinary team of international experts from the U.S., Canada, Germany, the U.K. and Jordan to explore how reform of Jordan's institutional water usage rules can improve freshwater system performance. Funded by the Belmont Forum, a consortium of G-8 national science funding agencies, we are developing a nationwide hydrologic-economic model to represent complex human-environment interactions. Our goal is to evaluate policy instruments aimed at improving water security, and to provide a much-needed predictive tool for use by Jordan water managers.

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