



Re-inventing the Nation's Urban Water Infrastructure (ReNUWIt)

Stanford University (lead institution)

Designing the U.S. urban water infrastructure to save energy and water

A National Science Foundation Engineering Research Center since 2011



Partner Institutions:

- University of California at Berkeley
- Colorado School of Mines
- New Mexico State University

The Engineering Research Center (ERC) for Re-inventing the Nation's Urban Water Infrastructure (ReNUWIt) is facilitating the transition of water systems to a new state in which they consume less energy and resources while continuing to meet the needs of urban users and aquatic ecosystems. We are working in partnership with utilities, regulators, private industry, and non-governmental organizations to change the way in which urban water systems are designed, operated, and maintained. ReNUWIt researchers are studying all aspects of water supply, urban drainage, and wastewater treatment with the goal of creating systems that are energy efficient, financially sustainable, and beneficial to the environment.

Research

ReNUWIt is developing and improving water technologies, evaluating their real-world performance in testbeds and using the findings of our testbed studies in regional-scale models designed to assess the overall impact of new technology on water infrastructure systems. Our efforts are divided into three thrust areas:

(1) *Urban Systems Integration and Institutions*, through which we are developing tools needed to make sound decisions about future investments in urban water infrastructure;

(2) *Efficient Engineered Systems*, through which we are developing new, modular technologies, overcoming barriers that prevent the wider application of existing but underutilized technologies, and collecting data on technical performance; and

(3) *Natural Water Infrastructure Systems*, through which we are developing technologies for managing natural systems to treat and store water while simultaneously improving urban aesthetics.

The current urban water infrastructure throughout the U.S. is in steady decay and at the end of its design life. We have a window of opportunity to invest in a new generation of water infrastructure to face long-term challenges posed by energy costs, climate change, population growth, and ecosystem protection.



Education

ReNUWIt's culture encourages broad participation from our researchers in education and outreach programs, which complement our research program by fostering the development of creative, technically proficient students who understand water at a systems level and who will lead us into a new generation of water management. At the K-12 level, our efforts seek to improve water literacy and inspire young people to pursue degrees and careers in the water field.

Innovation Ecosystem

Our industrial and practitioner affiliates support our efforts with representation from the four sectors of the water industry value chain—products, processes, provision, and policies. The affiliate members help identify the barriers and uncertainties and advise ReNUWIt on the research needed to ensure widespread adoption of new technologies. Affiliate members may support graduate-level research and testbed facilities. Urban water systems are complex, and interactions among their physical, social, political, and economic elements must be understood and managed at the systems level if impediments to change are to be removed.

Facilities/Testbeds

ReNUWIt's laboratories offer new and renovated state-of-art facilities in support of fundamental and applied investigations. Engineered and natural systems testbeds help demonstrate that new approaches are reliable under real-world conditions and do not create unintended consequences when integrated into the urban water system. Our testbed research addresses critical research questions pertaining to physical, chemical, and biological processes that affect the removal of contaminants, recovery of energy and resources, and restoration of ecosystems. Systems-level analyses employ coupled engineering/economic testbed models to show that new approaches are financially sustainable. They analyze modular water technologies at the systems level and advance the development of new tools to improve

decision-making, including the measurement of non-monetized ecosystem benefits and the impact of scale on technology performance.



Center Configuration, Leadership, Team Structure

The Director and Deputy Director are responsible for overall management and strategic planning. The Research Director works with the Research Thrust Area and Theme Leaders to plan and coordinate research projects. The Director and Co-Director of Education, and the Graduate Program Director, design ReNUWIt's education and outreach activities, including pre-college, undergraduate, community college, and graduate education. The Education and Outreach Manager administers the Center's education and outreach efforts. The International Program Director coordinates the international efforts and postdoctoral programs, and the Director of Diversity chairs the Diversity Advisory Board and helps set policies and best practices for ReNUWIt. The Administrative Director covers budgeting and reporting. The Director of Collaboration and Innovation supports

the industrial/practitioner outreach mission of ReNUWIt. The ERC receives assessment and advice from the Industrial Advisory Board, the Science Advisory Board, the Deans Council, the Student Leadership Council, and innovation partners.

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