

Research & Policy Brief Series

Engaging Researchers and Stakeholders in Improving New York's Water Management

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What is the Issue?

Water and wastewater infrastructure across the U.S. is aging and in need of repair and rehabilitation. New York State (NYS) is no exception, with projected capital needs of approximately \$60 billion for water and wastewater over the next 20 years. Declining federal and state contributions have increased the burden of meeting capital improvement needs on local municipalities. The problem is acute in older cities where aging infrastructure combined with suburbanization has left cities with smaller tax bases taking on legacy costs. Recent extreme weather events, such as Tropical Storms Irene and Lee in 2011 and Hurricane Sandy in 2012, highlighted the vulnerability of water and wastewater systems, and the need for communities, both coastal and inland, to adapt to high precipitation events, changing floodplains, rising sea levels, and variability in climate projections.

New York State Water Resources Institute (WRI) at Cornell University is a federally- and state-designated institution, whose mission is to improve the management of water resources in NYS and the nation. In collaboration with the Hudson River Estuary Program of the NYS Department of Environmental Conservation (NYSDEC), WRI conducts and funds research and outreach of interest to a broad set of stakeholders both in the Hudson River watershed and across the state. Over several years, WRI has established a coordinated research team focused on the assessment and management of the state's water resource infrastructure, its relationship to environmental water quality and community economic vitality, and its resilience in the face of extreme weather and climate change¹. In part, this work is inspired by various state policy developments, such as the *Smart Growth Public Infrastructure Protection Policy Act of 2010*, the *Sewage Pollution Right to Know Act of 2012*, and efforts like *New York Rising* that foster community resilience to climate change.

Infrastructure assessment

Traditionally, water resource managers have relied on 'gray infrastructure' systems such as centralized water and wastewater treatment facilities, distribution networks, and dams to serve the needs of communities. Although effective in meeting local water quantity and quality goals, there is room for improvement in managing these systems. For example, culverts in four Hudson watershed counties were surveyed



Water discharging from a culvert in Columbia County

by Cornell researchers² **Todd Walter** and **Art DeGaetano** for their capacity to perform effectively under current and future precipitation conditions. They discovered that 23-56 percent of culverts were undersized for current 1-year storm runoff. A prototype web-based tool was developed that will help municipalities and local agencies plan for culvert replacement to minimize flood risk. **Peter Woodbury** undertook an investigation into the possibility of retrofitting existing wastewater treatment plants to generate biogas. Seventy-two treatment plants were identified as excellent candidates for retrofitting, based on ease of implementation and positive financial returns projected over a 30-year period.

Decentralized and 'green infrastructure' approaches, which include onsite septic systems, vegetated stormwater detention basins and constructed wetlands, are increasingly being explored for their ability to provide important services at potentially low cost. Various researchers stress that while such approaches can have benefits over gray infrastructure when designed and maintained properly, more evidence is needed to quantify their benefits in the context of local soil and drainage conditions. Stormwater management via roadside ditches is an area that is particularly under-studied. **Rebecca Schneider** and collaborators are sampling roadside ditches to study the transport and transformation of nutrients associated with agricultural runoff, with preliminary results suggesting that ditches are key contributors to regional surface water nutrient issues. Results of these studies are expected to have implications for nitrogen management in agricultural landscapes, as well as for ditch management by landowners, municipalities and state agencies.

Economic Vitality

A strong regional economy is closely linked to well-functioning water infrastructure, as availability of clean and affordable water benefits public health, the environment, and businesses. Alternatively, poor public investment in water infrastructure can be a barrier to regional economic growth and overall quality of life. Small municipalities across NYS often find it hard to provide affordable water and wastewater services to their residents. At times, they seek the support of private suppliers who are able to operate across jurisdictional boundaries. Using a national dataset spanning a decade of municipal water rates, **Rick Geddes** found economies of scale in water production and distribution, i.e., the average cost of supplying water decreased

¹ A list of projects and their final reports is available on WRI website. See: <http://wri.cals.cornell.edu/grants-funding/hrep>

² The researchers named throughout this document are affiliated with Cornell University – for more information about them and their programs, click on their names.

as the water provider became larger, indicating that larger systems are more efficient. However, such economies of scale were not observed in the Northeast, suggesting that characteristics related to city layout and governance affect outcomes, and that consolidation of services in NYS communities must be evaluated on a case by case basis.

Given the presence of historic waterways and strong water-related industries in the Mohawk-Hudson region, Mark Milstein suggested the possibility of promoting a commercial “water cluster” geared toward the global demand for water-related technologies – a \$500 billion market growing at a rapid pace. However, efforts to better organize NYS’s water-related tourism and manufacturing industries are challenged by undervaluation of water assets by the private sector, an unfavorable state business environment and poor coordination among regional stakeholders. Ongoing research by Srinagesh Gavirneni seeks to improve management of state tourism assets such as parks and recreation areas. He is working to analyze sentiment from online user reviews for water-based recreation sites so that state agencies can better manage their facilities.

Integrated Management

Municipalities need more than the right technology to effectively manage water resource assets. Appropriate expertise and financing, sound planning and governance, and strong community relationships are among the ingredients needed to successfully establish integrated management of water resource infrastructure systems. The capital intensive nature of water infrastructure makes it difficult to incorporate changes once initial investment decisions have been made. Moreover, competing stakeholder perspectives and low incentives for cooperation prevent coordinated planning at the regional- or watershed-scale where potential co-benefits exist.

Working with the City of Newburgh, Kieran Donaghy developed a prototype planning support system to manage different scenarios for infrastructure repairs and upgrades across multiple years from a comprehensive regional perspective. According to Donaghy’s work, alternative financial arrangements for infrastructure projects (e.g. a mix of private and public mechanisms), as well as carefully crafted inter-municipal agreements, are essential if the City wants to accomplish all it has set out to do. NYS’s smart growth legislation requires state agencies to incorporate smart growth principles into their infrastructure funding decisions. David Kay’s team explored variations in how key agencies have implemented the law. They found that fewer than half the state’s municipalities were aware of the law’s existence, much less its implications for their infrastructure plans.

Education and Outreach

Communicating scientific findings to municipal officials and the public is a challenge, and WRI has been working to ensure that new understanding of water resource infrastructure and land use decision-



A barge moving down the Hudson River

making reaches these audiences, particularly in the context of extreme weather events and flooding. Shorna Allred collaborated with Cornell Cooperative Extension (CCE) and local Soil and Water Conservation Districts in the Hudson region to identify barriers faced by municipal officials working toward flood adaptation and mitigation. The results of this effort were presented in an

earlier CaRDI publication³. A team led by Ron Frisbee and Liz LoGuidice of CCE Columbia & Greene Counties conducted a series of local outreach and education workshops for municipal officials, highway personnel, contractors and streamside landowners. By reaching a variety of stakeholders and listening to their views and concerns, the researchers intend to influence local land-use planning and public education on the functions of streams and watersheds, on post-flooding restoration and on the impact of climate change on local ecosystems. Nordica Holochuck of New York Sea Grant and Steve Stanne of NYSDEC took education programming into classrooms and developed a curriculum on climate change for K-12 students with a focus on inquiry and future job prospects.

Municipal and Agency Collaboration

A common thread running through these research projects is the involvement of stakeholders in the projects’ planning and implementation process. Often, this has meant close collaboration with municipal governments like the City of Newburgh, advocacy organizations like Empire State Future, government agencies such as the Department of State, NYSDEC, U.S. Geological Survey, and outreach groups like the Lower Hudson Coalition of Conservation Districts. Stakeholder involvement in project development has allowed researchers to incorporate varied perspectives and craft their projects in ways that best address the problems encountered in the communities.

Where is the Program Headed?

After three years of coordinating work on the interconnected issues discussed above, WRI is synthesizing lessons learned and disseminating results. In September 2014, WRI partnered with CaRDI to host a Community Development Institute in the Hudson Valley, bringing municipalities, government agencies, academics, and citizens together to present research results and discuss the future direction of the program. While WRI’s focus has been on the Hudson watershed, communities across the state are facing common water resource management and planning issues, and many issues presented have broad applicability. In the forthcoming year, WRI will continue to pursue its broad assessment of water resources infrastructure and community resilience. To bridge the gap between science and practice, WRI will continue supporting projects with strong stakeholder involvement. WRI’s coordinated program is playing a vital role in the protection and expansion of New York’s water assets by effectively engaging the research community in this long-term mission.



A section of NY-30 in Delaware County washed out during heavy rains

³ See *Research & Policy Brief Issue 57/December 2013*

