



Integrated Planning



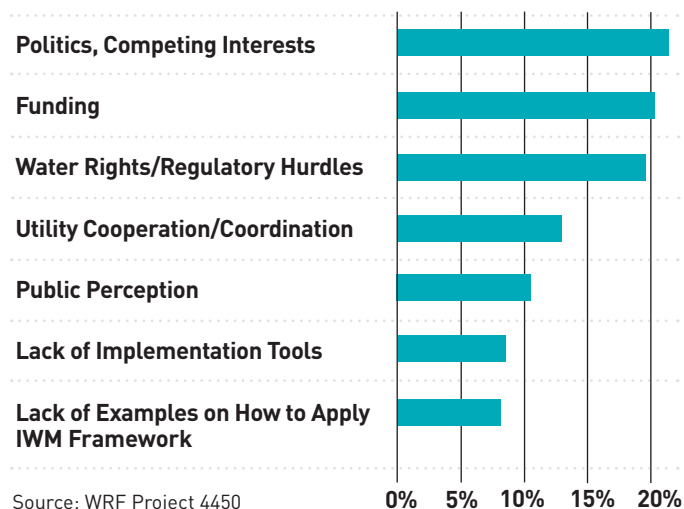
THE CHALLENGE

Clean, safe water depends on many factors that impact the entire water cycle and reach well beyond the water sector. While utilities are at the forefront of providing services like drinking water and wastewater, they don't operate in isolation—they are heavily influenced by other sectors. As increased pressure on the quality and quantity of water supplies drives the need for more efficient and effective processes, utilities are recognizing the need to not only integrate their drinking water, wastewater, stormwater, and reuse operations—but also to coordinate with other sectors, including energy, agriculture, industry, and municipalities.

This recent shift in thinking involves water management that includes unified, sustainable systems. And the payoffs can be substantial, resulting in better prioritization of projects, improved decision making, and more resilient cities and towns, while also maximizing the use of energy and other materials.

Although this holistic approach has the potential to offer many multi-benefit solutions—such as water treatment with added community perks like parks and recreational areas—implementing the approach can be a challenge. Because integrated planning is so inclusive, involving many stakeholders and moving parts, the prospect of this approach can be overwhelming. The challenge is also increased because these integrated goals often contain big-picture, long-term objectives, which run counter to traditional regulation timelines and funding strategies.

INTEGRATED WATER MANAGEMENT CHALLENGES



THE RESEARCH

Over the last 50 years, WRF has built a robust body of research valued at more than \$700M that covers drinking water, wastewater, water reuse, and stormwater; however, in recent years WRF's approach to this research has undergone a substantive change. Recognizing the benefits of addressing water issues holistically and cooperatively, WRF adopted a "One Water" approach. Instead of dividing needs by traditional lines of service, research now looks at the best solutions for a unified collection of water systems. WRF's research guides utilities on how best to integrate their operations with other water agencies and has even started expanding the focus to how water agencies can integrate with other sectors. This type of integration fosters



sustainability in the water sector by allowing entities to align goals, work more efficiently, and maximize resources.

One of the first actions WRF took under this approach was the 2009 launch of a dedicated Sustainable Integrated Water Management (SIWM) research program area, with the overall objective of advancing the shift in water management for cities and towns toward next-generation, integrated, sustainable systems. These systems would integrate wastewater, stormwater, drinking water, and other water resources; maximize triple-bottom line benefits; and incorporate integrated and comprehensive water planning at the national, regional, and local level.

In addition, in 2014, WRF introduced the Integrated Water Management: Planning for Future Water Supplies Focus Area to provide tools to support water supply diversification efforts through an integrated water management approach. That same year, WRF collaborated with Brown and Caldwell to host an international workshop to outline future research opportunities and priorities in this area. The two-day event, part of WRF project *Integrated Water Management: Planning for Future Water Supplies* (4550), brought together a variety of experts and stakeholders to lay the groundwork for a comprehensive integrated water management research agenda, much of which is already underway.

To support this effort further, WRF has performed extensive research on complementary topics such as land use planning, stormwater, green and gray infrastructure, stream restoration, nutrient and resource recovery, reuse, and more. While these topics do not by themselves constitute integrated water management or One Water, they are all important elements of a holistic, future-focused approach.

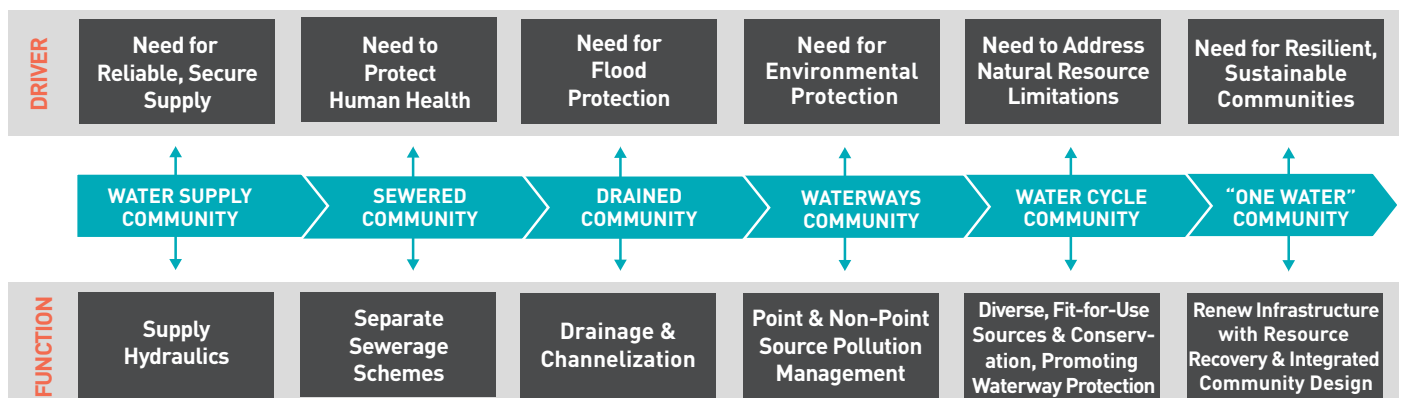
Utility Integration

In 2012, the U.S. Environmental Protection Agency (EPA) released its Integrated Municipal Stormwater and Wastewater Planning Approach Framework to provide guidance on developing and applying more cohesive plans. While much of the water sector acknowledges the value in this approach, bringing together separate agencies that have traditionally operated individually can be a complex undertaking. And because the mixture of systems and processes in use across the country varies drastically, there isn't one solution for all. WRF helps to navigate this process and overcome implementation barriers with guidance and tools to find the best approaches to unify operations. This involves sequencing projects in a way that allows the highest priority environmental projects to come first and using innovative solutions, such as green infrastructure.

In an effort to identify potential barriers, WRF joined forces with Water Research Australia in 2015 on the study *Institutional Issues for One Water Management* (SIWM2T12/4487). The research looks at some of the most cited obstacles to achieving integrated water management, including governance, regulations, finance, and culture. Through in-depth case studies, the research provides practical examples of how utilities and communities have worked through hurdles in order to practice a more integrated, sustainable approach to water resource management. Case studies examine initiatives and interactions between different levels of government, private entities, NGOs, and citizens across a range of barriers. A companion guidebook outlines actions to move forward on the path to One Water.

Following this same line of research, *Blueprint for One Water* (4660), released in 2017, works to advance the adoption of

SOCIETAL DRIVERS FOR INTEGRATED WATER MANAGEMENT





a One Water approach through a user-friendly handbook of practical guidance. Based on information from more than 800 water professionals, the guide provides a roadmap for successful development of integrated water management planning. It outlines critical steps, innovative approaches, and methods to overcome obstacles to help utilities, cities, counties, municipalities, water professionals, and other stakeholders across multiple water resource sectors.

As more utilities attempt to adopt an integrated approach, WRF identified the need to complete a gap analysis of the EPA's integrated planning framework—evaluating available tools, software, and other resources to assist communities in applying the framework and identifying the tools and information communities need to make confident decisions. Results of this effort are featured in *Toolbox for Completing an Alternatives Analysis as Part of an Integrated Planning Approach to Water Quality Compliance* ([SIWM9R14/4854](#)), released in 2018. The guide helps communities decide if embarking on integrated planning is an appropriate pathway, and if so, provides tools to help develop a successful integrated plan, such as an integrated planning considerations tool. The tool helps users cross check the status of various program aspects, such as regulatory, economic, and communications components, to verify that they are giving proper consideration to key factors that have led to other successful integrated planning approaches.

Cross-Sector Integration

While it has become increasingly apparent that various community goals can be more effectively achieved through better aligned practices, many utilities still struggle with the steps needed to achieve this level of coordination, especially when it comes to working with other sectors. WRF is leading the way in identifying potential synergies and helping utilities cultivate collaborations, which are becoming increasingly critical to the water sector's success.

Because water utilities are highly dependent on energy, in 2017, WRF began an effort with the American Water Works Association and the New York State Energy Research and Development Authority to explore how water and electric utilities can coordinate activities. *Water and Electric Utility Integrated Planning* ([4469](#)), examines associated costs and benefits of collaboration, and offers tools and recommendations to advance project-planning opportunities for water and electric utilities. The research highlights 10 case studies from utilities in the United States, Canada, and Australia that are pursuing varying degrees of water electric utility integrated planning.

SOLUTIONS IN THE FIELD: Hampton Roads Sanitation District



Courtesy of HRSD

After the release of EPA's 2012 framework for integrated planning, Hampton Roads Sanitation District (HRSD) became interested in whether this approach could work for them. Facing a costly project to reduce SSOs, HRSD was motivated to maximize their investment. They began looking for ways they could address other issues at the same time, such as regional flooding, aquifer withdrawal limitations, and future, more stringent discharge requirements.

In 2017, HRSD submitted their integrated plan to EPA. The plan couples highly targeted sanitary sewer improvements with wastewater facility upgrades to support the vision of aquifer recharge at 100 million gallons per day; providing the greatest benefit to residents of Hampton Roads (and much of Virginia) at the lowest customer cost. A key component of this is the Sustainable Water Initiative for Tomorrow (SWIFT), HRSD's potable reuse program, which will help meet key compliance goals and make significant improvements to the Bay.

To help other utilities and municipalities implement integrated planning efforts, WRF partnered with HRSD and several communities in different stages of applying EPA's integrated planning framework to develop a series of case studies. The studies are featured in WRF's 2018 *User's Guide for Integrated Stormwater and Wastewater Planning* ([SIWM9R14/4854](#)), an easy-to-follow handbook that provides approach examples and helps users determine if an integrated plan is right for their community.



Moving forward with innovative integrated water management solutions also requires new partnerships between the water managers who promote solutions and the urban planners who implement them. Released in 2018, *Joining Up Water Management with Urban Planning and Design* ([SIWM5R13/4853](#)), takes a closer look at how urban planners and water managers can work together on innovative solutions, such as water recycling and reuse, nutrient recovery, rainwater harvesting, and a host of water conservation and stormwater management techniques. Top strategies to bridge the gap between these professions include scenario planning, visioning, and goal setting, which can help shed light on the common goals shared by different agencies within a city or municipality. Research findings also help identify capital improvement plans, stormwater and green infrastructure plans, and climate adaptation plans where involving planning counterparts could benefit future planning and water management.

The 2018 project *Integrating Land Use and Water Resources: Planning to Support Water Supply Diversification* ([4623](#)) further explores coordinated planning between water and land use planners, this time focusing on current and future opportunities to diversify water supplies. The research resulted in an easy-to-use handbook, *Coordinated Planning Guide*, which identifies specific opportunities in the water and land use planning process where better integration can occur. The guide helps water utilities, land use planners, and development communities identify the role of alternative water supplies. It looks at opportunities throughout the land use planning process, making recommendations for how to advance development of alternative water supplies, including coordinating on long-range planning efforts, codes and regulation requirements, and review processes.



As the water sector works to improve integration, within and beyond the industry, new technology and innovation will have a fundamental role in making this happen. The Leaders Innovation Forum for Technology (LIFT) has initiated several focus areas to help move these technologies to the field quickly and efficiently. Key focus areas that are work-

ing to support these efforts include stormwater and green infrastructure, energy from wastewater, and water reuse.

WHAT'S NEXT?

While the water sector has already started making progress by integrating operations within their own sector (drinking water, wastewater, stormwater, reuse), future water and environmental regulations are likely to become more stringent—making this approach even more critical. WRF will continue to invest in research on how to implement a more unified approach to meet new standards and maximize efficiency. WRF research will also support additional efforts, as the water sector looks beyond itself and identifies other sectors to integrate with, like energy and industry. Future WRF research will seek to provide more guidance around non-traditional types of integration.

One key area WRF is already helping to build relationships with is the forestry industry. In 2015, WRF convened a meeting with the U.S. Forest Service to identify overlapping research needs between water and forestry agencies. The ongoing WRF project *Incorporating Forestry into Stormwater Management Programs: State of the Science and Business Model Evaluation for Nutrient Reduction and Volume Control* ([SIWM12C15/4837](#)) is also helping this process. The study is working to document contributions of urban tree systems to stormwater nutrient and volume control in terms of their effectiveness at various scales, cost, desirability, and practicality. The project will advance understanding of how forest systems impact nutrient reduction and volume control, with particular attention to economic considerations. The research will also include cost comparisons to other stormwater infrastructure, such as green and grey alternatives, as well as a quantification of ancillary benefits.

In addition, WRF is updating the *User's Guide for Integrated Stormwater and Wastewater Planning* ([SIWM9R14/4854](#)) by incorporating five recent EPA Integrated Planning Community Case Studies. WRF is also making efforts through the project *One Water Cities: Development of Guidance Documents and Assessment Metrics* ([4969](#)) to establish key metrics and benchmarks to assess the progression towards One Water cities by utilities and municipalities.