

White House Water Security and Climate Resilience Roundtable

October 31, 2024

Building a Resilient Water Sector for America

A circular approach to water is needed to build a more robust and resilient water sector that can meet the needs of American households, agriculture, and industry now and into the future. Within a circular water economy, every drop of water is used as efficiently as possible, revitalizing ecosystems and building resilience in the process (*see text box: Circular Economy Principles*). In addition to developing and commercializing the technologies needed for circular water, fixing the economic incentives that discourage conservation and strengthening the water workforce are also part of the solution.

Advancing the circular water economy

The transition to a circular water economy, while challenging, offers substantial benefits that can reshape the way societies manage water. By rethinking the current linear "take, use, dispose" approach, municipalities, industries, and communities can all play a role in creating a more sustainable and resilient water system. A circular water economy focuses on maximizing water reuse, reducing waste, and recovering valuable resources from water treatment processes. The transition involves several strategic actions: improving water data collection, promoting conservation technologies, catalyzing markets for recovered resources, and building resilience to restore ecosystems.

Improve the collection and use of water data. Accurate and timely data on water usage, availability, and quality is essential for informed decision-making and efficient water management. Better data allows municipalities to optimize water distribution, detect leaks or inefficiencies in the system, and anticipate water shortages. It also enables industries to monitor their water consumption more precisely, helping them reduce wastage and improve operational efficiency. Enhanced water data collection can empower consumers to make informed choices about their water use, contributing to conservation efforts at the household level.

Promote the development and commercialization of conservation technologies. Innovative technologies, such as advanced filtration, water recycling systems, and smart irrigation, can drastically reduce water consumption in industrial, agricultural, and residential settings. Encouraging the adoption of these technologies requires supportive policies, incentives, and investment in research and development. As these technologies become more accessible and affordable, industries and households can achieve

Circular Economy Principles

The circular economy offers a path forward for the water sector. Based on three simple principles developed by the Ellen MacArthur Foundation, the circular economy emphasizes a more thoughtful and holistic approach to production and consumption:

- **Eliminating waste and reducing costs** by finding efficiencies and converting byproducts into resources that can be used elsewhere
- **Circulating products and materials** at the highest level to keep them in use as products or components for new products, rather than the conventional approach to production, which is to take, make, consume, and dispose
- **Regenerating nature**, by moving from extractive to regenerative processes that strengthen nature and replenish resources

Industrial Symbiosis in Action

Kalundborg Symbiosis, an industrial facility in Denmark, is renowned for its circular water economy approach. The initiative, which began in the 1960s, centers on exchanging resources like water and steam between industrial partners, transforming waste streams into valuable inputs. The Asnæs power plant supplies excess heat to the local community while also providing cooling water to nearby companies. Novo Nordisk, a pharmaceutical firm, then repurposes this water for its production processes, significantly reducing freshwater extraction. Additionally, treated wastewater from the power plant is used in other facilities, reducing demand for natural water sources.

The circular water practices in Kalundborg Symbiosis have led to a reduction of about 800 million gallons of water annually, promoting sustainable water management and creating economic value. This closed-loop system minimizes the need for fresh water by ensuring that water is reused multiple times across facilities, reducing consumption and wastewater.

significant water savings, which can be especially important in regions facing water scarcity. The growth of conservation technologies not only helps in managing water more effectively but also stimulates economic activity and job creation in the technology and manufacturing sectors.

Catalyze markets for resources recovered from the treatment process. Treatment plants can recover valuable resources such as nutrients, energy, and even clean water itself. Developing markets for these resources can make water treatment processes more economically viable and sustainable. By turning waste into valuable products, municipalities can reduce treatment costs and create new revenue streams, making the treatment process more financially resilient.

Build resilience and restore ecosystems. Rivers, lakes, and wetlands play a crucial role in water filtration, flood control, and biodiversity. By restoring these ecosystems, communities can improve the natural resilience of water sources against the impacts of climate change, such as droughts and floods. Resilient ecosystems also contribute to better water quality and supply, reducing the need for costly artificial water

treatment methods. Protecting and rehabilitating natural water systems not only ensures the sustainability of water resources but also provides recreational, cultural, and economic benefits to local communities.

Agriculture and industry are the biggest users of water and have significant impacts on watersheds. Agriculture-specific solutions for a resilient and sustainable water sector include:

- Tax incentives for water-saving technologies and enhanced management practices
- Increased federal and state investments in data collection for monitoring and evidence-based policymaking
- Increased research into artificial groundwater recharge and water-efficient crop species
- Application of AI and other advanced technologies for crop planning
- Federal and state regulatory reforms to encourage water conservation and adopt best management practices

For industry, greater collaboration between government and business can save water, reduce costs, and create jobs, an approach called “industrial symbiosis.” Pioneered in Denmark (*see text box: Industrial Symbiosis in Action*), industrial symbiosis identifies ways to reuse water and other resources across multiple facilities in a single industrial park. The approach is becoming increasingly common in the United States. However, for industrial symbiosis to work effectively, the benefits and costs of water must be accurately valued.

Redefining the economics of water

The current system of laws, regulations, and funding for water often creates disincentives for water conservation. While specific technologies are part of the shift to the circular water economy, the economic incentive to conserve must be in place as well. Innovative approaches to funding are also crucial as current federal funding levels, even with recent initiatives such as the Bipartisan Infrastructure Law (BIL) and COVID-19 relief packages, remain inadequate. The U.S. Environmental Protection Agency estimates that a \$1.25 trillion investment will be needed over the next 20 years to maintain existing levels of water infrastructure service, leaving a significant gap that these recent federal measures cannot bridge.

Increase investment in water conservation programs, such as the Bureau of Reclamation Title XVI, along with guidance that directs state revolving fund (SRF) programs to prioritize water conservation, aquifer recharge, stormwater capture, and similar projects. The practice of diverting SRF appropriations to fund earmarks should be discontinued to ensure resources are used effectively. A portion of pre-disaster mitigation funding and post-disaster funds can be allocated toward improving the resilience of impacted systems. Additionally, expanding support for research, development, and commercialization of innovative water conservation technologies through the National Science Foundation, can help in identifying and scaling solutions.

Provide targeted incentives for adopting conservation technologies. Alongside funding to support technology development, economic incentives for agriculture and industry can encourage the adoption of these conservation technologies. In addition to tax incentives, grants or low-interest loans are another option, and could be channeled through existing programs such as the Bureau of Reclamation's WaterSMART program and the SRFs. A new revolving fund focused specifically on resilience and conservation could also be considered. Water conservation credit trading programs are another potential tool for incentivizing water conservation investments.

Ensure regulation supports technology adoption. Utilities are often risk-averse and hesitant to adopt new technologies. Current approaches to regulation exacerbate this tendency. This can be addressed through the use of safe harbor pilot projects for demonstrating effective conservation technologies, along with clearer guidance from federal and state regulators. Stronger enforcement against water loss, inflow and infiltration, and other system failures would also support regulatory efforts.

Creating the Next-Generation Water Workforce

Future-proofing America's water sector will require the talents of a new generation of dedicated, highly skilled professionals. To build that water workforce, we must adopt an evidence-based approach to attracting new talent, investing in training, and cultivating cutting-edge skills. Drawing on the success seen in other sectors, a more coordinated and cohesive approach is also needed, in addition to identifying how AI can be effectively applied to augment worker skills and ensure institutional knowledge is transferred to the next generation effectively.

Raise awareness of water jobs and attract a diverse group of jobseekers. While water jobs have many attractive characteristics, many jobseekers are unfamiliar with these opportunities. Educational campaigns at the secondary and tertiary school levels can help in addressing this. Additionally, the workforce does not fully reflect the population, with women, minorities, returning citizens, and migrants being significantly underrepresented. Expanding the talent pool is essential for strengthening the workforce. Doing so requires a stronger understanding and concerted efforts to break down the barriers to entry and retention—such as language, transportation, housing, family leave, and work authorization.

Develop circular water skills. Standardized training programs are crucial for building career pathways in the water sector. However, licensing requirements vary by state, creating challenges for both employees and employers. Small utilities often lack resources to invest in comprehensive training, which can limit opportunities for hiring and professional development. More comprehensive, sector-wide training programs are needed to help utilities build operator skills. Additionally, education and training programs at the high school and college levels can help in building skills by integrating classroom learning with hands-on experiences.

Launch a water sector workforce development strategy. Industries such as nursing, teaching, and aviation have built strong sector-wide workforce development strategies that help jobseekers find jobs and provide a steady pipeline of skilled applicants for employers. A strong sector workforce strategy consists of four key components: attract, recruit, train, and retain. A coordinated, sector-wide approach is necessary to bring in the next generation of professionals, such as operators, engineers, and scientists, and to provide them with modern skills. Collaboration between associations, educational institutions, and workforce organizations to scale successful regional development programs is essential.

Leverage AI for workforce solutions. Many small, rural, and under-resourced utilities face difficulties with staffing. AI can significantly impact workforce needs, especially in operations and administrative tasks, by reducing the burden through predictive analytics and other technologies. The responsible adoption of AI can help improve workforce efficiency and effectiveness.

The Path Forward

Building a resilient water sector for America requires a multifaceted approach that integrates technological innovation, economic incentives, regulatory reform, and workforce development. A shift toward a circular water economy not only ensures the sustainable management of water resources but also creates opportunities for economic growth, job creation, and environmental restoration. By embracing conservation technologies, building markets for recovered resources, and strengthening data-driven decision-making, we can transform our current water management practices to better withstand the pressures of climate change and population growth. Investing in a diverse and skilled water workforce will further solidify the resilience of the sector, equipping it to meet present and future challenges. Together, these efforts pave the way for a more sustainable and secure water future for all Americans.