World Environment Center

Developing Water Infrastructure Systems for Greater Resilience and Sustainability

Executive Roundtable Summary (Atlanta/Georgia, U.S.A. – April 23-24, 2024)

Background

Climate change is already causing more frequent and severe weather. Extreme storms, heat waves, wildfires and floods are becoming regular events rather than rare ones. All new investments need to be disaster- and climate-resilient to avoid accumulating new risks, increasing asset loss and damage and disrupting services. Ninety percent of today's infrastructure has been built over the last 50 years (IPCC, 2018). Meanwhile, 60 percent of the infrastructure needed by 2050 is yet to be built. There is a difference between sustainable and resilient infrastructure: Sustainability focuses on minimizing environmental impacts, while resilience is the infrastructure's ability to withstand and recover from disruptions.

Transitioning from a 'business-as-usual' to a low-carbon and resilient infrastructure requires a radical change in governance, design and use (Seto et al., 2016). Fortunately, that development is already undergoing a rapid transformation. Disruptive technologies in construction and other sectors are now achieving the economies of scale necessary to be economically competitive — for example, in the application of nature-based infrastructure solutions (NbIS), often in combination with low-carbon intense grey infrastructure. Recent studies, e.g. Bassi et al, 2021, show that the cost of NbIS is highly competitive. Although NbIS is often a slow solution in a context where many infrastructure investments need immediate impact, over time, grey infrastructure depreciates while that of NbIS appreciates and becomes more effective.

This roundtable convened 37 senior sustainability experts, with 84% from corporate entities spanning various industries and countries, 16% from think tanks, NGOs, and a specialized academic contributor.

Participants

Hosts & Partners

Hosts

Eunice Heath, Chief Sustainability Officer, CRH
Stephen Zarlinski, Client Executive/ Vice President, Jacobs

Moderators

American Business Water Coalition: Mae Stevens
CRH: Dr. Martyn Kenny
Environmental Council of the States (ECOS): Ben Grumbles
World Environment Center (WEC): Margaret O'Gorman

Speakers

- **CIS Solutions:** Dr. Sri Vedachalam
- **CRH Ventures:** Chris Fortunato
- **Environmental Policy Innovation Center (EPIC):** Pete Hill
- **Fresnillo:** Exequiel Rolón
- **Hydro International:** Larry Abatiell
- **Jacobs:** David Bell
- **Jacobs:** Dr. Raja Kadiyala
- **Oldcastle Infrastructure**: Dr. Jeffrey Johnson
- **Pacific Institute**: Katherine Isaf
- **Ricoh**: Kousuke Ito
- **Ryan Companies**: Joe Rozza
- **Syngenta Group**: Diganta Adhikari
- **Syngenta Group**: Paul Backman
- **The Coca-Cola Company:** Madhu Rajesh
- **Virginia Tech:** Prof. Dr. Sunil Sinha
- **Water Finance Exchange**: Josh Clement

Key Points

1. **A holistic approach that integrates advanced technology, comprehensive data management and meaningful community engagement is needed to address water infrastructure challenges, according to participants.** This necessitates innovative solutions that can withstand shifting environmental conditions and meet the needs of growing populations. The fragmentation of water utilities, particularly in regions like the U.S. with over 50,000 utilities, further complicates the challenge. Participants agreed that this underscores the importance of consolidating resources and expertise to effectively manage water supply systems, particularly in states like Georgia, where some utilities lose up to 80% of water due to leaks and outdated infrastructure.

   Human-centric approaches such as building partnerships among stakeholders and ensuring trust remains most significant. For instance, collaboration has been the major driver for innovative approaches like the Pipeline Infrastructure Database, developed in response to the 2014 Flint water crisis in Michigan and exemplifying the potential of data-driven decision-making in infrastructure management. Another example is the Community-Based Public-Private Partnership in Maryland, which demonstrates the potential for holistic, collaborative approaches that incorporate environmental, social and economic benefits. As part of this partnership, the Mentor Protégé Program in Prince George's County has successfully graduated 60 businesses and resulted in $40 million in contracts, highlighting the benefits of investing in local capacity-building to promote equitable access to water resources. Collaborations with startups were also described as extremely valuable, e.g. when they address challenges like microplastics and PFAS contamination.

2. **Improving water infrastructure governance demands collaborative, cross-industry action**. Participants emphasized the significance of integrated efforts across various sectors to develop solutions for water-related challenges. Water scarcity, quality, stormwater management and accessibility challenges must be considered together. The Water Resilience Coalition (WRC) serves as a prime example of collective business action, with its goal to stabilize 100 priority basins by 2030. Their Net Positive Water Impact (NPWI) strategy emphasizes (1) reducing companies' operational water footprints while (2) restoring water resources and (3) promoting collective action. Optimized solutions for collective action on shared water challenges requires targeting areas based on specific needs and pooling resources to scale impact. Key principles include (a) shared targets related to water stress dimensions, (b) tailored programming for specific intervention locations, (c) flexibility to invest beyond individual company goals and (d) streamlined approaches with transparency in decision-making. Initiatives such as the Women + Water collaborative in the Godavari Basin (Karnataka/India) were highlighted, where three companies partnered in a project aimed at improving water access for five million people. Women are emphasized because they are often underrepresented in water resource management decisions despite their crucial role in rural India in water collection and use. Another project is the Mississippi River Basin initiative, a basin-wide approach led by the CEO of a multinational and focused on transforming water management across 31 U.S. states. Although challenges exist, these initiatives demonstrate how collective targeted actions can significantly address shared water challenges.

3. **Nature-based solutions (NBS) can offer a balanced and versatile approach to improving water infrastructure resilience and sustainability. They deliver scalable environmental, social and economic benefits** and range from urban green spaces to natural water treatment systems. However, some participants pointed out that implementing NBS requires coordinated efforts to ensure that private landowners and public entities collaborate

effectively. In order to maximize the benefits of these solutions, incentives can be combined with traditional gray infrastructure. Participants inquired about projects such as Proctor Creek in Atlanta, where the integration of NBS with traditional infrastructure has revitalized disadvantaged communities by improving stormwater management, stream restoration and housing. In addition, appropriate contracting mechanisms, such as public-private partnerships and performance-based agreements, enable private companies to collaborate with government agencies and achieve results that are often unattainable otherwise.

4. **Adaptation to water risks in business operations demands an integrated approach, involving strategic foresight, regulatory compliance and community engagement.** Participants underscored that to establish a sustainable water program, companies must align their strategies with broader societal goals, considering factors like social justice, water equity and corporate reputation. By proactively engaging with local communities and regulators, companies can develop robust risk assessments and clear strategies that mitigate potential disruptions due to climate change and aging infrastructure. A significant point in common was the substantial underinvestment in water infrastructure, emphasizing the importance of long-term investments in both physical infrastructure and technology. An automobile company's proactive strategy to reduce its dependency on the Flint Water Authorities prior to the crisis in 2014 underscores how seriously companies are evaluating water challenges and adjusting supply chains accordingly, although some stakeholders may have hoped for a different company reaction in this specific case. Economic disruptions due to water infrastructure failures have been significant, with a $51 billion loss recorded in the U.S. in 2019 alone. Although the Bipartisan Infrastructure Law passed in 2021 was the largest investment in U.S. water infrastructure history, one speaker stated that it covered only about 5% of the total funds needed to bring water systems to a good state of repair. This funding gap means many water systems remain vulnerable, leading to frequent and costly disruptions, such as water main breaks. Those incidents can halt production, disrupt supply chains and cause significant financial losses to various industries. Thus, despite improved recent infrastructure legislation, underinvestment in the U.S. remains a significant concern, emphasizing the critical role of private-sector involvement.

5. **Artificial Intelligence (AI) offers significant potential to improve decision-making and efficiencies in water management as well as to reduce costs, particularly through predictive analytics and operational optimizations.** Experts emphasized that by providing data-driven insights, AI enables utilities to strategically allocate resources, proactively maintain infrastructure and manage risk more effectively. In the water industry, the role of AI in detecting anomalies, predicting equipment failures and combatting contamination highlights its versatility. Risk management is improved by forecasting equipment failures, enabling proactive action and better regulatory compliance. Cost savings are evident when the search for leakages can be targeted.

   The key to leveraging predictive technology lies in the reliability of the data. Participants emphasized that companies must collaborate by exchanging data and sharing technology. Real-time monitoring and predictive analytics can significantly improve system performance. In addition, participants emphasized the need for comprehensive analysis of data and policy measures, such as environmental equity evaluations, particularly for disadvantaged communities, to enable effective reforms in water infrastructure.

   The water sector's digital transformation has been slow due to the critical service it provides, according to participants. Water utilities manage a vital resource and ensure the delivery of safe, clean water any time. Any errors in this process can have severe consequences, which is why the sector is reluctant to introduce new

technologies without thorough testing and proven reliability. This inherent risk aversion, coupled with the need for trust, has meant that the water sector has been slower to implement digital transformation compared to other industries. For instance, one expert pointed out that only 10% of the data generated by utilities is used to create value and emphasized the untapped potential in data that could be unlocked through AI. However, experts emphasized that technological advancements in AI and sensors are increasingly being recognized for their potential to revolutionize data accuracy in the water industry. Another important topic discussed in the context of AI and water management was the potential benefits of AI in changing human behavior towards better water consciousness and climate change impacts. Providing consumers with data about their consumption patterns, combined with AI recommendations based on specific goals, was emphasized. The impetus for behavior change, strategies to implement these changes and the importance of changing public perception of public goods, like water and consumer patterns, were also discussed.

6. **Financing quality water supply can be strengthened through innovative financing models and strong public-private partnerships.** *Venture capital (VC)* can support startups through capital infusion and by acting as a distribution channel for new technologies. VC is helpful where traditional investment models discourage innovation due to the emphasis on stability and risk aversion. *Specialized finance models* have already started to provide technical assistance and innovative financing solutions to underserved communities. They identify gaps in the traditional financing frameworks that small, rural communities often encounter. Through pre-development funding and credit enhancement programs, they help these communities access the bond markets at lower costs, making essential water infrastructure projects more achievable. *Public-private partnerships* were highlighted as essential for building trust and overcoming funding challenges in water projects. These collaborations promote innovation and accountability in the water sector, but political skepticism often hampers their adoption due to concerns about fee increases. Emphasizing the long-term benefits of investing in water infrastructure through transparent communication can help build public trust and political support.

7. **Technical support should first focus on enabling municipalities to manage their projects effectively and build solid governance structures**, according to some participants. The group discussion also underscored the significance of testing some of the many technological solutions for sustainable and resilient water infrastructure in smaller water infrastructure projects (e.g. though digital twins*) before progressing to large and technically sophisticated data-driven projects. Participants also emphasized that innovative financing models, increased collaboration and transparent communication are crucial elements in driving sustainable water solutions and ensuring that projects are both resilient and able to adapt to future challenges. For example, large companies can empower startups by creating lab spaces where new technologies can be tested to gain customer trust in an industry where failure can have serious consequences. Other cross-sector cases showed how trusted intermediaries are supporting underserved communities through pre-development funds and credit enhancement programs, enabling them to access the bond markets to reduce financing costs.

*During the roundtable, digital twins were explained as digital replicas of physical systems, which can be used to simulate and test scenarios without affecting real-world infrastructure. These simulations can help in planning infrastructure changes, understanding system resilience and optimizing operations.

Further Reading

Barton H. Thompson Jr (2024): Liquid Asset: How Business and Government Can Partner to Solve the Freshwater Crisis
Coalition for Disaster Resilient Infrastructure (CDRI) (2023): Global Infrastructure Resilience. Capturing the Resilience Dividend

Note: WEC Executive Roundtables are conducted under the Chatham House Rule.