A Sustainable Water Future Through a Water 2050 Paradigm

CWWMG

Water for All Summit: Water First

March 28, 2024, Tega Cay, SC

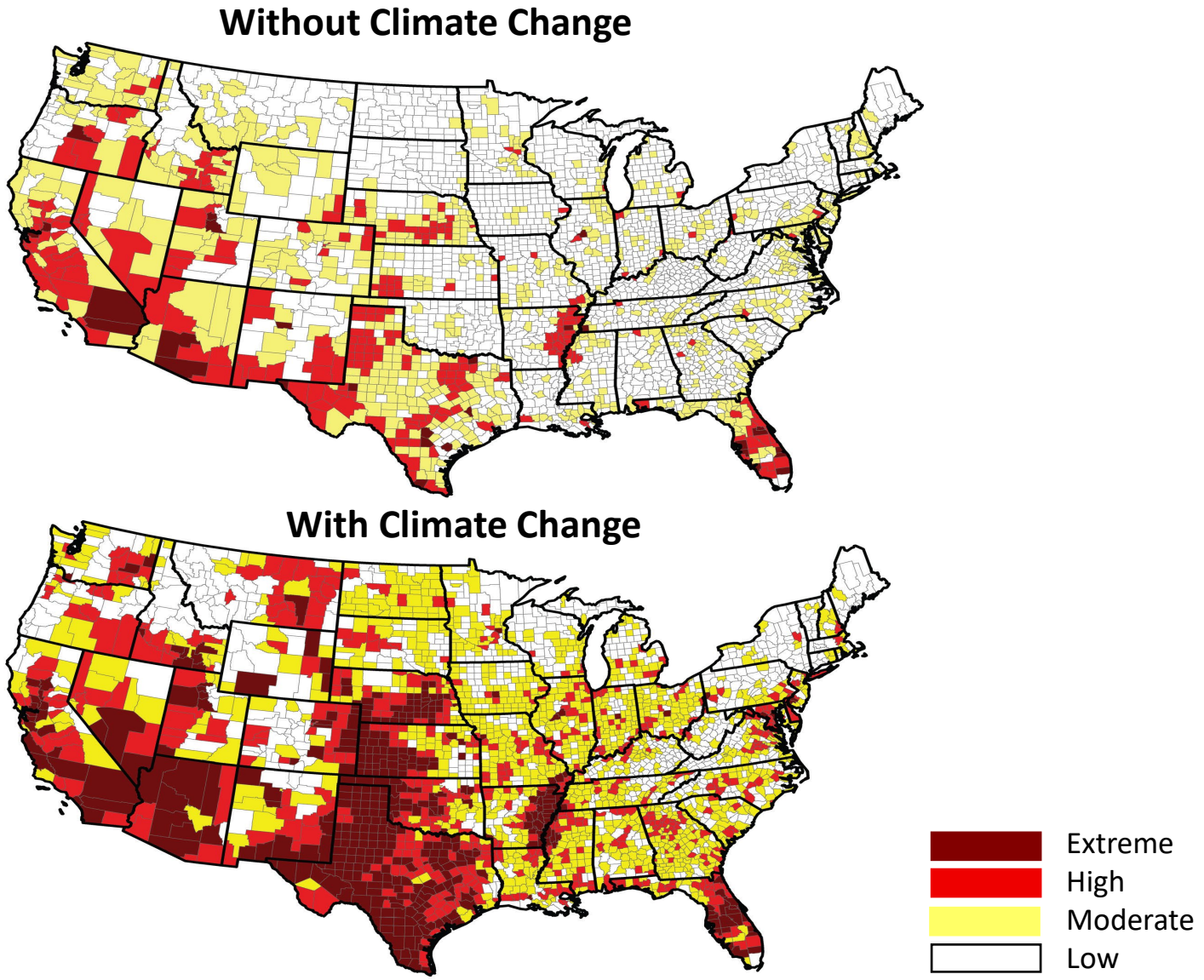
Joe Jacangelo, PhD
Immediate Past-President AWWA
Stantec
Johns Hopkins University Bloomberg School of Public Health

Two Posits

The new normal: We live in a water challenged world!

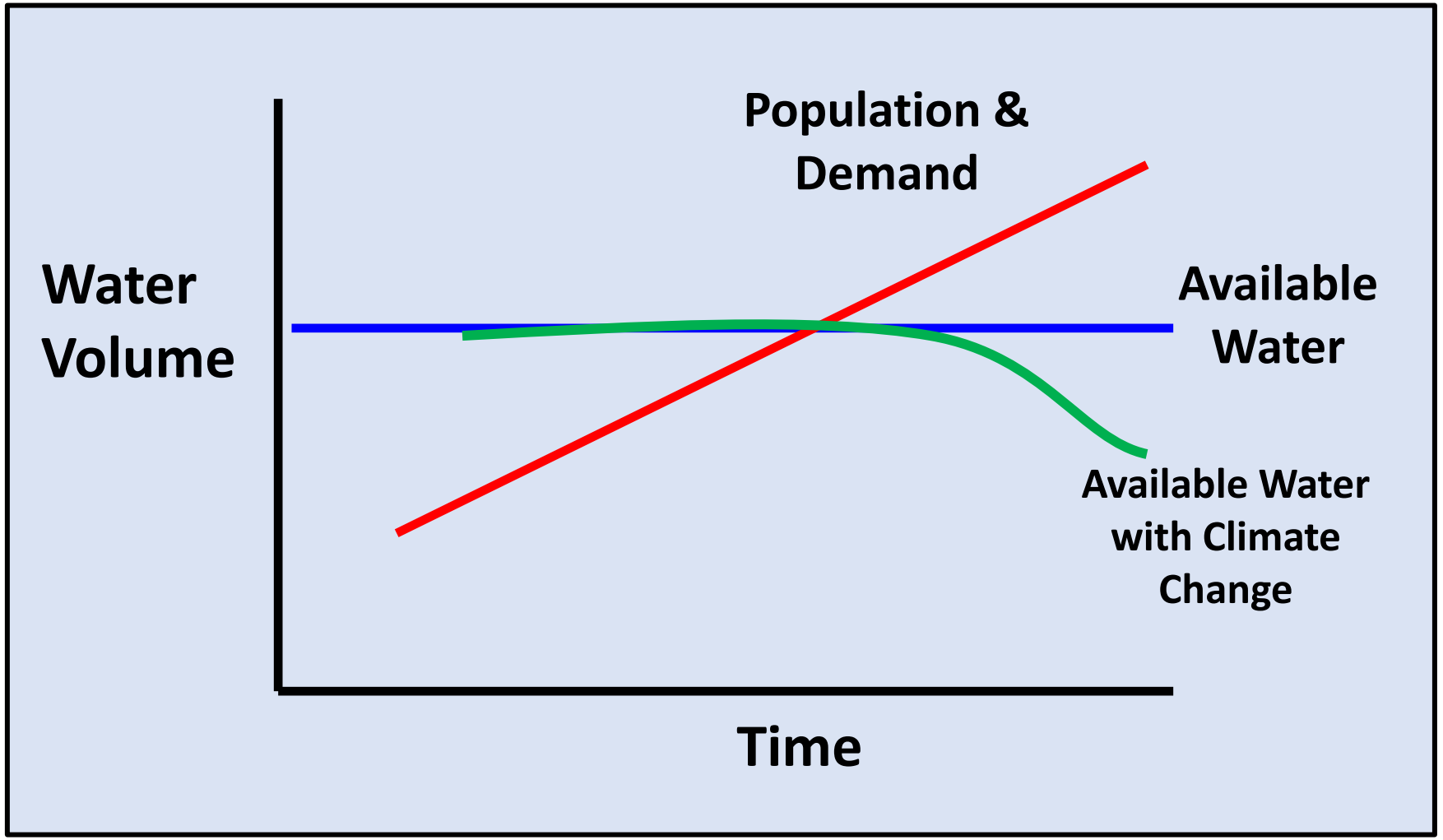
The future is compressed!

2050 Water Supply Sustainability Risk Index



From Roy et al., ES&T 2012

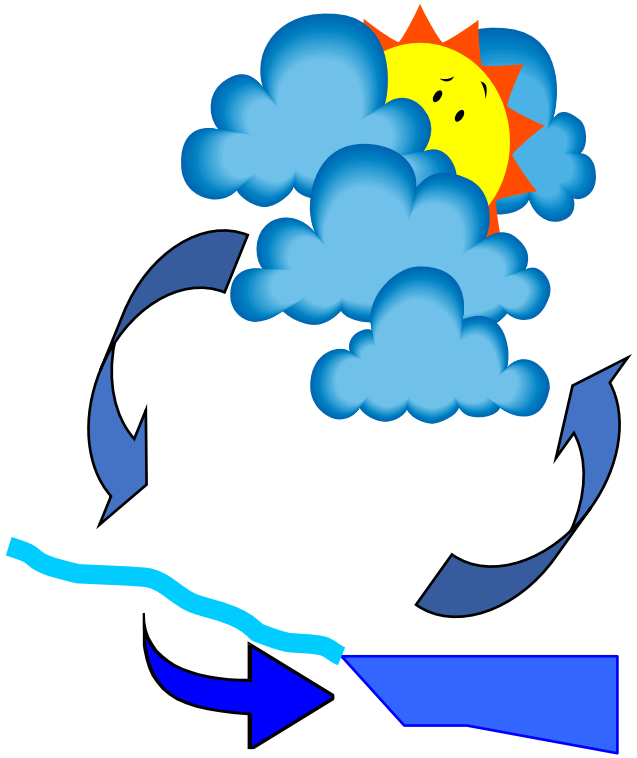
Population Is a Key Factor in the Water Scarcity Paradigm (and Climate Change)



800,000 new urban residents will be added to existing and new cities around the globe EVERY WEEK for the next 40 years!*

*Source: "Presentation and Perspective of Appealing Green Facilities for Eco-cyclic Water Management" Liu, R., et al.; Chemical Engineering Journal, 227 (2018)

There is no new water!



So, what do we do?

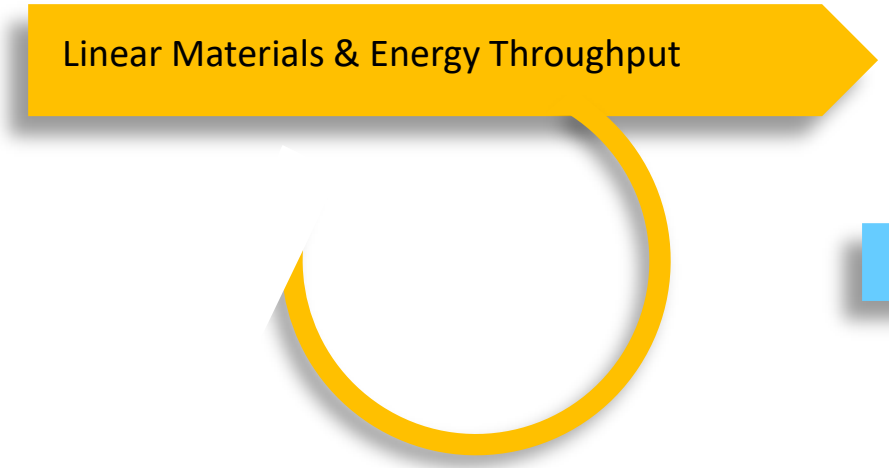
Sustainable Water Supply is the Key

www.blue-economy.ca

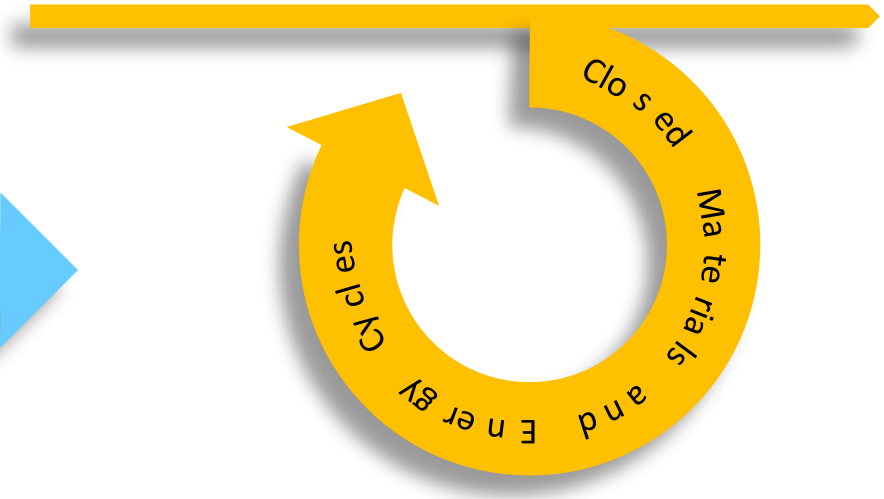
- Adaptable to climate change
- Drought-proof
- Robust and secure
- Superior water quality
- Reliable and redundant
- Reduced energy
- Affordable

Is a Circular Economy Our Pathway to a Sustainable Water Future?

Current economy: Linear flows



Future economy: Circular flows



- ✓ Resource depletion
- ✓ Price uncertainty and volatility

- ✓ Displace primary resource extraction
- ✓ Maintains economic growth potential
- ✓ Reduces environmental impact

Sources: "Coming full circle: Why social and institutional dimensions matter for the Circular Economy"; Moreau, V., et al.; *Jour. of Industrial Ecology* 21(3) (2017)
"Circular economy rebound"; Zinc, T., Geyer, R.; *Jour. of Industrial Ecology* 21(3) (2017)
"How Circular is the Global Economy? A Socio-metabolic Analysis"
Haas, W., et al.; *Springer Publishing International – Switzerland* (2016)

Decoupling is Essential

Decoupling occurs when the recovered resources displace primary resources = Circular Economy

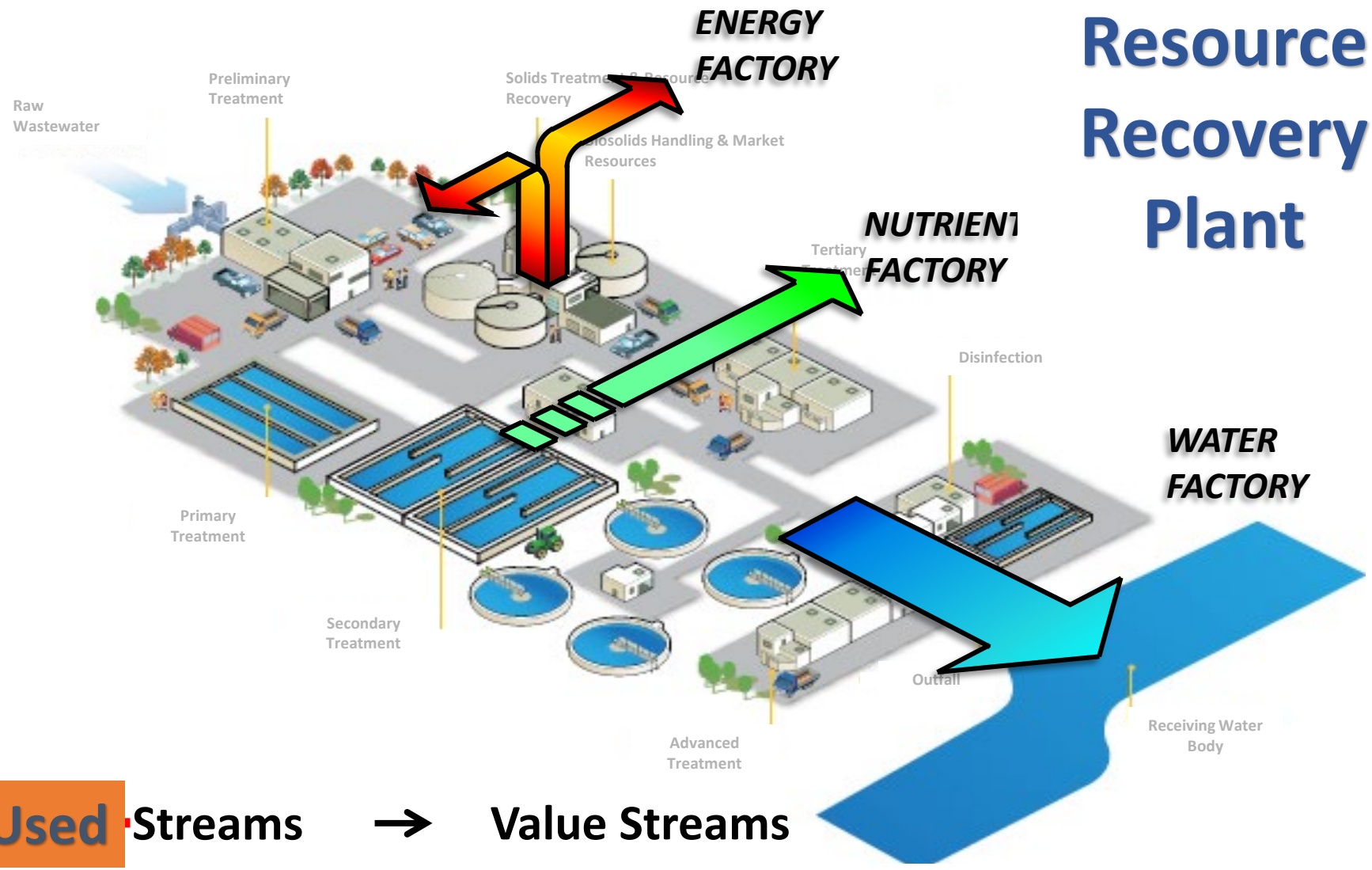
Strong Economies

Cities of Our Future

Healthy Environments

Source: "Coming full circle: Why social and institutional dimensions matter for the Circular Economy"; Morean, V., et al.; *Jour. of Industrial Ecology*; 21(3) (2017)

Treating Used water: Responding to the "New Normal" and the Pathway to One Water



Used Streams → Value Streams

State of the Industry Report

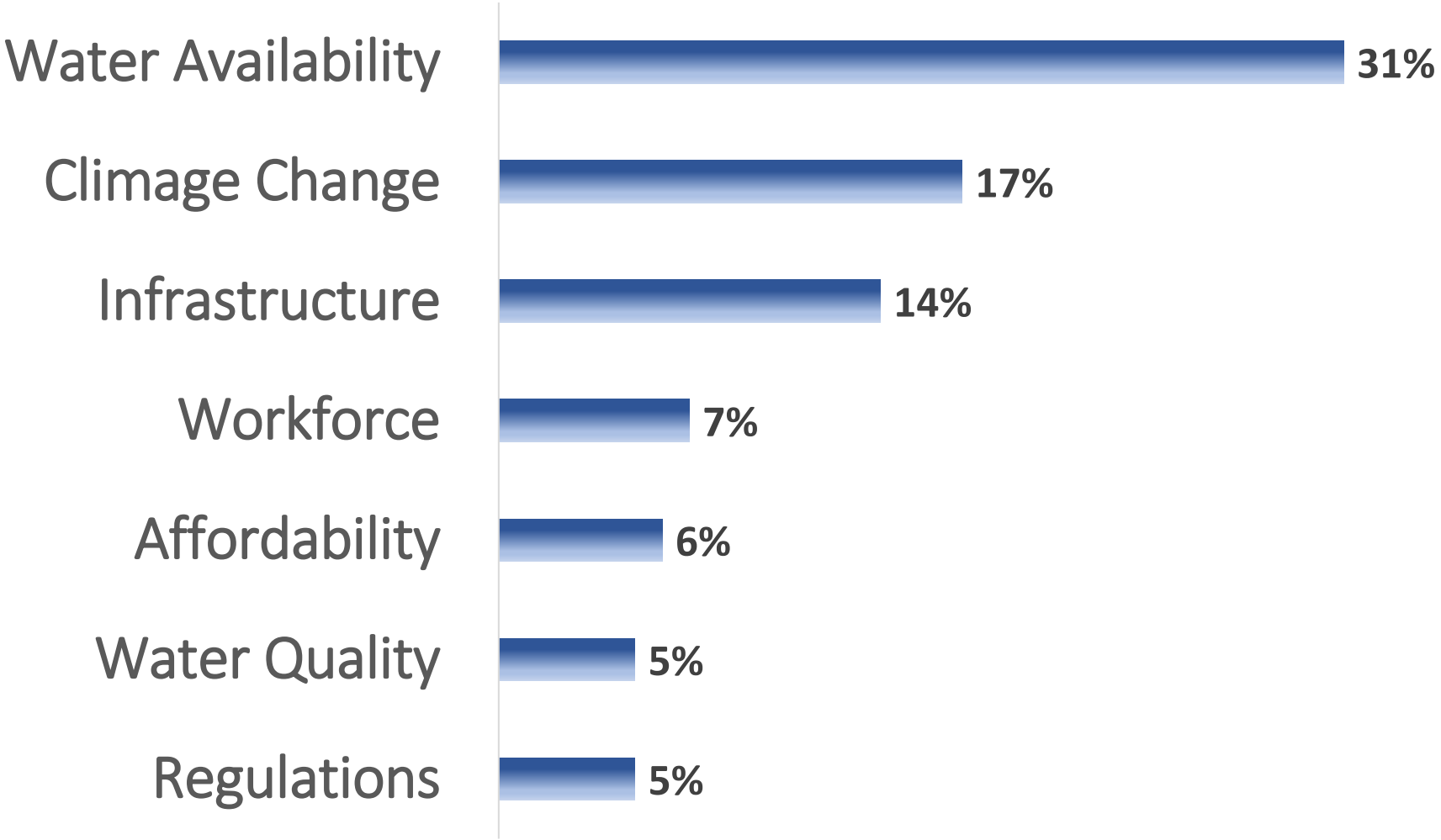
Top 10 Water Sector Challenges

Rate the importance of given challenges on a scale of 1-5
1 = unimportant … 5 = critically important; N=2464

2024	Change	2023	2022	2021	2020	2019
Watershed/source water protection	↑	Renewal and replacement of aging water and wastewater	Renewal and replacement of aging water and wastewater	Renewal and replacement of aging water and wastewater	Renewal and replacement of aging water and wastewater	Renewal and replacement of aging water and wastewater
Financing for capital improvements	↑	Long-term water supply availability	Financing for capital improvements	Financing for capital improvements	Financing for capital improvements	Financing for capital improvements
Renewal and replacement of aging water and wastewater	↓	Financing for capital improvements	Long-term water supply availability	Long-term water supply availability	Long-term water supply availability	Long-term water supply availability
Long-term water supply availability	↓	Public understanding of the value of water resources	Aging workforce/anticipated retirements	Emergency preparedness	Public understanding of the value of water systems and services	Public understanding of the value of water systems and services
Financial sustainability	NEW in 2024	Watershed/source water protection	Public understanding of the value of water systems and services	Public understanding of the value of water systems and services	Watershed/source water protection	Watershed/source water protection
Public understanding of the value of water systems and services	↑	Aging workforce/anticipated retirements	Emergency preparedness	Watershed/source water protection	Public understanding of the value of water resources	Public understanding of the value of water resources
Workforce issues	↓	Public understanding of the value of water systems and services	Watershed/source water protection	Public understanding of the value of water resources	Aging workforce/anticipated retirements	Groundwater management and overuse
Groundwater management and overuse	↑	Emergency preparedness	Public understanding of the value of water resources	Aging workforce/anticipated retirements	Emergency preparedness	Aging workforce/anticipated retirements
Drought or periodic water shortages	↑	Groundwater management and overuse	Groundwater management and overuse	Compliance with current regulations	Compliance with current regulations	Emergency preparedness
Cybersecurity issues	↑	Compliance with current regulations	Cybersecurity issues	Groundwater management and overuse	Groundwater management and overuse	Cost recovery (pricing water to accurately reflect the cost of service)

CHARTING THE COURSE FOR THE FUTURE OF WATER

WATER 2050 SURVEY FROM JULY/ AUGUST



American Water Works Association

Water2050®

LANDSCAPE 2050: THE VISION

A **secure, sustainable, affordable** and **resilient** water future for all**,** driven by **innovation**, in which everyone in **the water community** is **collectively responsible** for the **management and preservation** of this **vital resource**.

What is Water 2050?

- A bold, collaborative initiative to envision the future of water and ch se for future wate

CALL TO ACTION

ugh prism of five

A strategy and implementation plan to get us to the water future we envision will be created through the engagement of those inside and beyond water community.

Drivers Impacting the Future of Water

- Social/Demographics
- Economics
- Governance
- Technology
- Sustainability

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Think Tank Goals

Develop

High-level recommendations

with strategies that support the vision of an innovative water future

Engagement & Diversity

American Water Works Association

Utilities | Consultants | Associations | Academia | Corporates | Regulatory | YPs

Water 2050 Needs an Entire Water Community Effort

Think Tank Participants

- Water Utilities and Agency
- Industry
- Engineering Firms
- Technology Providers
- Regulators
- Water-Related Associations
- Federal Agencies
- Environmental Non-Profits
- Universities
- International Banks

- USEPA
- United Nations
- Isle Utilities
- Asian Development Bank
- World Bank
- NAWI
- United Nations
- Babbit Center for Land and Water Policy
- Amazon
- Water Now Alliance
- Coca-Cola
- USDA
- Iowa Soybean Association
- NOAA
- US Water Alliance

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Think Tanks

“Art of the Impossible”

APPROACH OVERVIEW: FIVE THINK TANKS

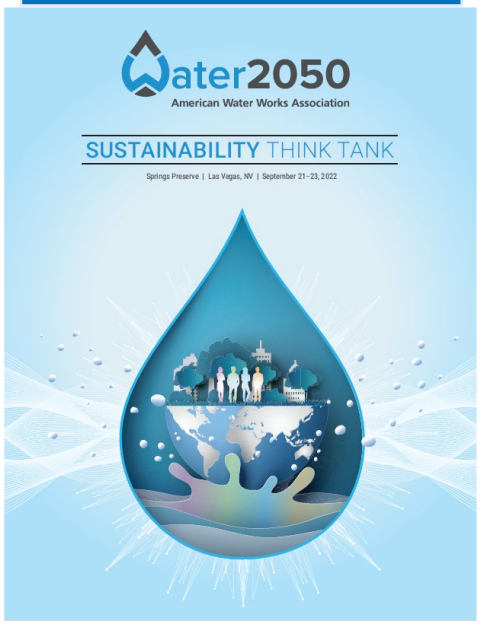
Sustainability
Springs Preserve, LV

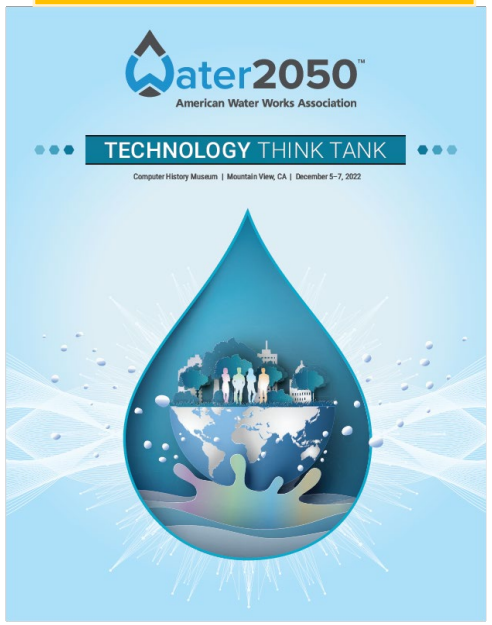
Technology
Comp. Hist. Museum, CA

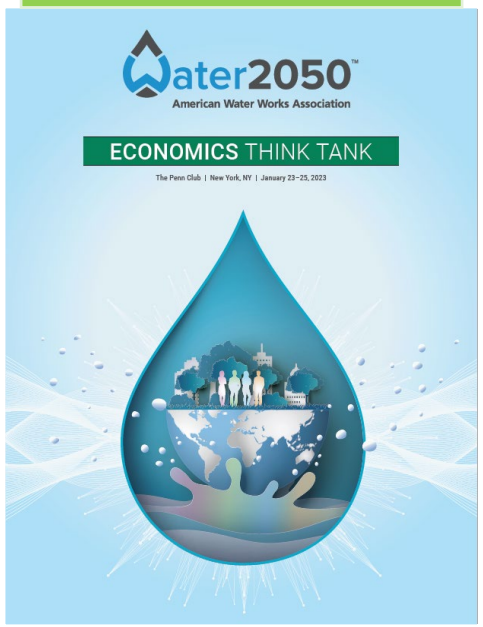
Economics
The Penn Club, NY

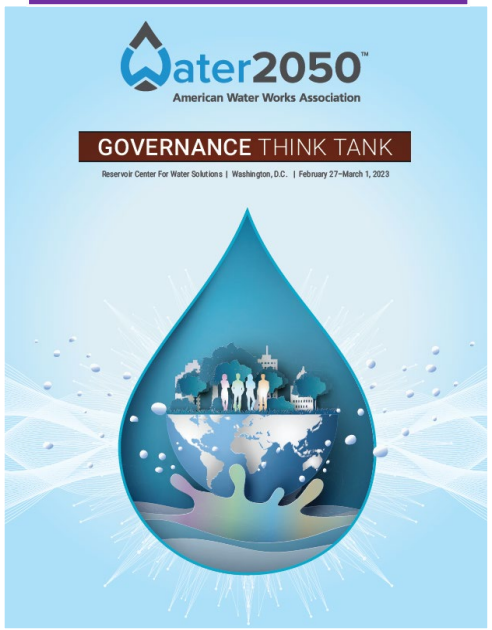
Governance
Reservoir Center, D.C.

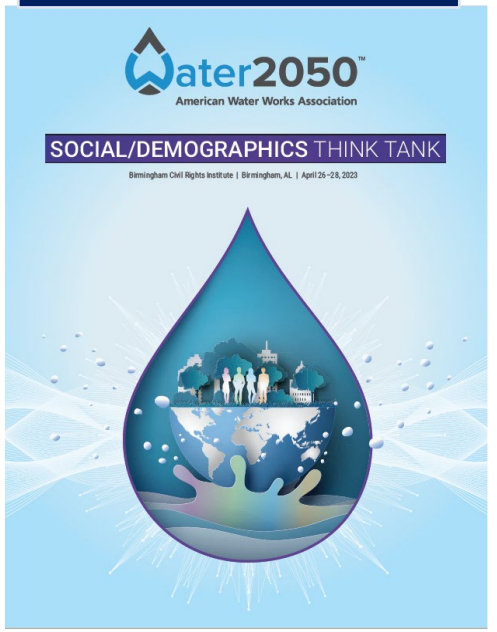
Social / Demo
Civil Rights Institute, AL

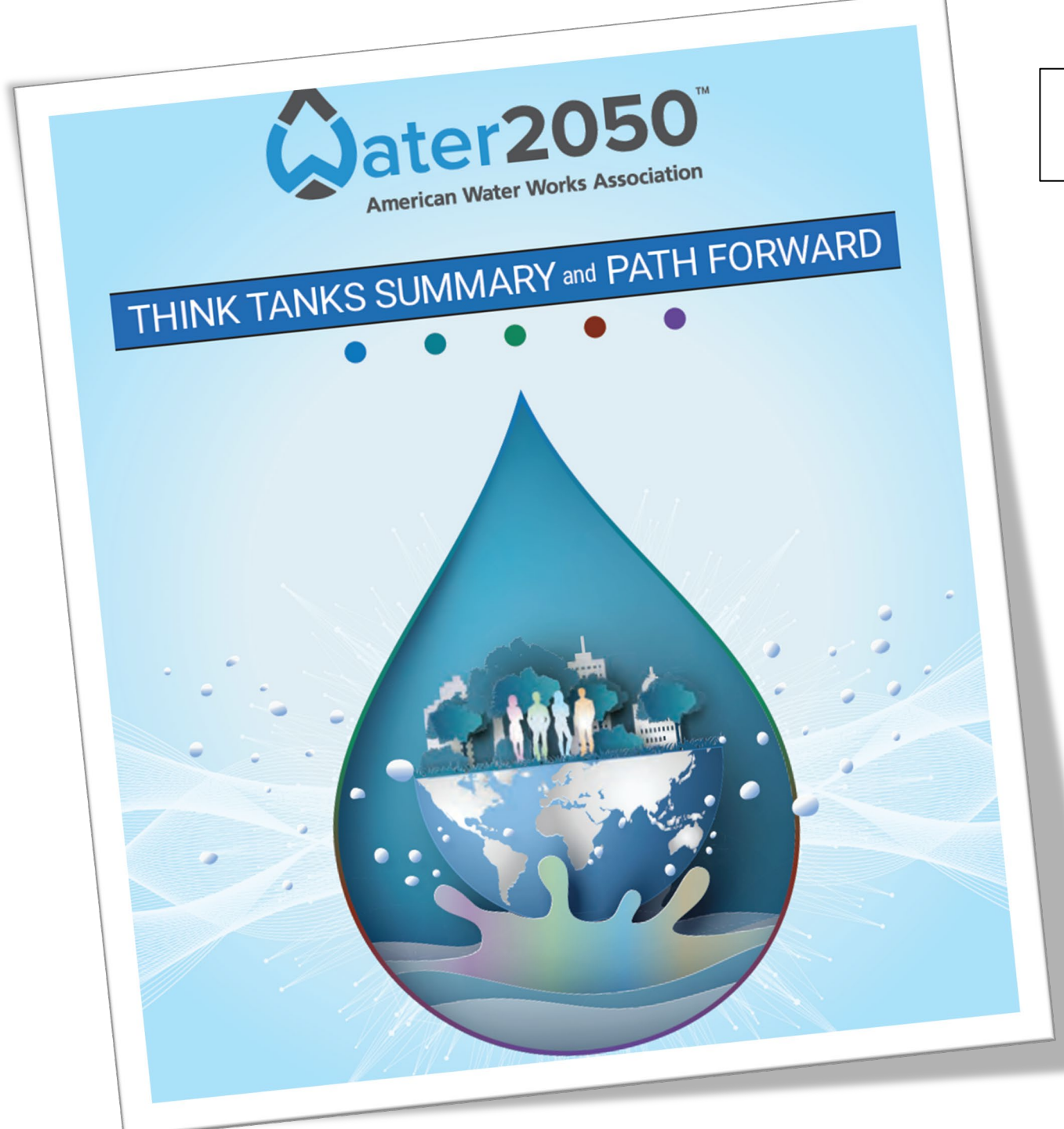












Download at awwa.org

Water2050

Recommendations by Strategic Priorities

Sustainability & Resilience (7 recommendations)	Innovation & Circular Economy (9 recommendations)	Finance & Affordability (9 recommendations)	One Water Governance & Policy (10 recommendations)	Equity, Access & Community Engagement (12 recommendations)
Cultivate a new era of structured partnership with agriculture and other major water users. (S)	Maximize efficiency through reuse, conservation, and expanding collaboration with other sectors. (S)	Rapidly identify financing and funding sources for resilient systems of the future. (S)	Enable a flexible governance framework that encourages proactive planning for extreme events and uncertainties. (G)	Strengthen public trust through steadfast data protection. (T)
Reduce the water community's impact on climate change through adaptive management. (S)	Employ digital solutions such as AI and ML to optimize efficiency, operations, and water quality. (T)	Establish a pricing model that covers all the costs of water. (E)	Integrate decision-making practices for water resource management across urban and rural communities. (SD)	Meet communities' water needs affordably, equitably, efficiently, and transparently. (SD)
Shift to watershed-based thinking. (S)	Leverage technology to break down barriers to innovation, address regulatory compliance, and mitigate unintended consequences. (T)	Enable utilities to finance distributed water technologies and systems. (E)	Provide collaborative, sustainable water services across the entire water cycle utilizing cross-sector partnerships. (SD)	Drive public behavior changes through targeted and sustained education. (E)
Define and quantify a net zero water community. (S)	Transform water management through expansion of in-home and fit-for-purpose treatment technologies. (T)	Assure that equity and affordability are key considerations in water infrastructure and resource investments. (S)	Achieve economies of scale of water systems through consolidation and operational efficiencies. (S)	Fully engage the broader community in water policy decision-making and service delivery (SD)
Integrate climate impact and resiliency into economic and financial modeling. (E)	Strive for rapid adoption of technology that results in equitable and sustainable outcomes. (T)	Align utility sustainability plans and economic growth plans. (SD)	Integrate management of drinking water, wastewater, reuse, and energy utilities (could include telecom). (S)	Ensure a sustainable and skilled water workforce that reflects that diversity of the communities they serve. (SD)
Apply real-time monitoring, predictive analytics and material science to create eternal infrastructure and support resilient resources. (T)	Incentivize investment in innovation and experimentation. (T)	Set rates that reflect the full cost of service while advancing affordable access and recognition of the human right to water.(G)	Regionalize water utilities based on watersheds. (G)	Cultivate a technology-savvy water workforce. (T)
Establish a water community system and culture in which cyber risks are proactively and uniformly addressed. (T)	Optimize efficiency through a circular water economy. (E)	Promote the integration of utility performance standards that support better technical, managerial, and financial practices. (G)	Encourage national governance structures with a One Water focus and regulatory frameworks that include diverse stakeholders. (G)	Empower consumers with real-time information to make informed decisions. (T)
	Adopt innovative financing models and technologies to support all water infrastructure. (E)	Foster strategic partnerships based on shared economic interests. (E)	Establish widely accepted fit-for-purpose standards. (G)	Invest in water workforce talent attraction and development. (E)
	Integrate water-related utilities and partner with other utilities to contribute to a circular economy. (G)	Reframe the value of water to reflect the need to prepare for a sustainable future. (S)	Take a multilateral and cooperative approach to water governance. (G)	Prepare the water community to meet the needs of migrating populations. (SD)
			Integrate research and data across agencies to drive a culture of change and innovation. (G)	Create a culture in which everyone has a personal connection to water and a sense of shared responsibility for it. (SD)
				Recognize water as a merit good. (E)
				Build public trust in water services providers so that they are recognized as anchor institutions in every community

Water 2050

5 Strategic Priorities

1. **Sustainability and Resilience**
2. **Innovation and Circular Economy**
3. **Finance and Affordability**
4. **One Water Governance & Policy**
5. **Equity, Access & Community Engagement**

Think

c

5

Think
Tanks

Strategic
Priorities

125-plus Exp

f Focus for the

th Forward

(Available today!!!)

So What Does Success Look Like in 2050?

Stantec

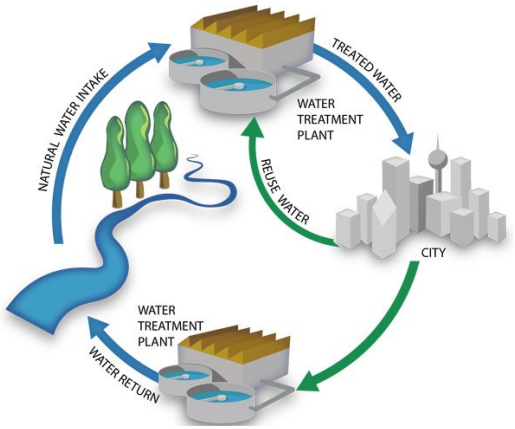
ONE WATER GOVERNANCE AND POLICY

In a One Water future, an integrated management and governance framework will enable the value of water to be governed such that its highest and best use is leveraged to better serve communities and preserve the entire ecosystem.

The envisioned world of 2050 will include:

- **A holistic approach with a national water governance framework** that reconciles the competing priorities of entities (i.e., water, wastewater, energy, etc.) that currently operate in separate paradigms -- to achieve a common water goal.
- **Fully engaged and empowered communities** that view water as a part of their identity and that can influence key water policy.
- **Water and utility providers** as part of the economic and infrastructure growth plans, integrating sustainable practices across our communities.
- **Multilateral and cooperative water governance** approaches, that underscore widely accepted fit for purpose standards.
- **Regionalization of water utilities** around watersheds.

INNOVATION AND CIRCULAR ECONOMY



Enabled by innovation and emerging technologies, the future of a one water approach will be built around a circular water economy in which each component produced through treatment processes (liquid, solid and energy) is leveraged as an intrinsic value stream, reducing waste throughout the water community's footprint.

The envisioned world of 2050 will include:

- **Technologically-transformed water management** with point-of-use and fit-for-purpose treatment technologies.
- **An innovative recycling approach and market-driven incentive structure** for more efficient use of water and its by-products to generate less waste.
- **Optimized conservation** as consumers gain a greater understanding of their water needs vs. water usage.
- **Partnerships and integration between the water and other industries** to create more efficient and effective ways to sustain water while providing service.

SUSTAINABILITY AND RESILIENCE

A sustainable and resilient water future will bring about a more robust, versatile and adaptable water community – with a water paradigm that is not easily impaired by environmental, technical, economic, political, or demographic externalities.

The envisioned world of 2050 will include:

- **Total utility management and collaboration with water users** to create greater economies of scale and higher efficiency.
- **Technically advanced systems and a tech-savvy workforce** that can respond to challenges quickly (even instantaneously) and effectively.
- **A proactive mindset within the water industry** that allows us to recognize and address ever-changing needs and requirements.
- **Protection of water** at the source.

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FINANCE AND AFFORDABILITY

In our envisioned future, water will be viewed as a public good, and the water community will have a shared understanding of the value of water, beyond current-day cost-of-service terms. While we will recognize the true, full costs of water, it will not be an economic burden on low-income, disadvantaged communities.

The envisioned world of 2050 will include:

- **Financial and reinvestment strategies** that ensures the water industry's ability to provide continued and reliable service.
- **Water being valued in more than financial terms**, going beyond pricing, recognizing water as a merit good and its power politically and socially, for a sustainable future.
- **Funding for water that is based on the full cost of the service,** where 'full cost pricing' coupled with non-price methods (to ease the economic burden on low-income and disadvantaged communities, as with the SNAP or Affordable Connectivity Program) will be commonplace.

EQUITY, ACCESS AND COMMUNITY ENGAGEMENT

In our envisioned future, communities will provide water to their citizens in fair and equitable ways, allowing affordable access for all. Everyone in the water community will have a shared sense of responsibility for water preservation and will be empowered to protect it for current and future generations.

The envisioned world of 2050 will include:

- **A community-centered approach to water management** that recognizes the needs of all constituents.
- **Positive water habits** driven by individuals' "personal" connection to water.
- **Cultural and social change** that demands that access to water is viewed in the broader context of poverty and ensures more equitable access within and across communities.
- **Public service employees** who view their jobs as a higher calling, providing water for all.
- **Partnerships with public, private and philanthropic partners**, as well as government at all levels, to advance equitable water services.

How Can Water 2050 be Beneficial to CWWMG and Its Work?

- Evaluate alignment between Water 2050 and the Catawba-Wateree Integrated Water Resources Plan.
- Consider the Water 2050 Strategy (endgame) and recommendations, when updating CWWMG's five-year plan.
- Influence Water 2050 Strategic Implementation Plan so that CWWMG can foster its priorities and stay informed of progress.
- Consider a formal partnership with AWWA under the Water 2050 umbrella.

Water 2050 Can be Employed by Conference Attendees

- Apple
- Bolton & Menk
- Brown & Caldwell
- Brown and Caldwell
- Carolina Land and Lakes RC&D
- Catawba Consulting
- Catawba Regional Council of Governments
- Catawba River Water Supply Project
- Catawba Riverkeeper
- CDM Smith
- Charlotte Stormwater Services
- Charlotte Water
- Chester County
- Chester County Economic Development
- Chester County Wastewater Recovery
- Chester Metropolitan District
- City of Belmont
- City of Camden
- City of Charlotte
- City of Concord, NC
- City of Gastonia
- City of Hickory
- City of Lenoir
- City of Mount Holly
- City of Rock Hill
- Clemson University
- Columbia Water
- Driscoll Sheedy, P.A.
- Duke Energy
- Elevate Textile
- EnergyTech Advisors LLC
- Fairfield County, SC
- Federal Reserve Bank of Richmond
- Freese and Nichols, Inc.
- Garver
- Gaston County
- GHD
- Greenville Water
- HDR
- HIGHFILL
- Jacobs
- Kershaw, SC
- Lake Wateree Association
- Lake Wylie Marine Commission
- Lancaster County Water and Sewer District
- Louisville Water
- LWA
- Mecklenburg County
- Mecklenburg Soil and Water Conservation District
- North Carolina Department of Environmental Quality
- North Carolina Farm Bureau
- Retired
- ReWa
- S.C. Department of Health and Environmental Control
- Salisbury-Rowan Utilities
- South Carolina Department of Natural Resources
- South Carolina Rural Water Association
- Stantec
- Tega Cay
- The Conservation Fund
- The Penn Water Center
- Town of Mooresville
- TRU-City of Gastonia
- U.S. Environmental Protection Agency Region 4
- UNCC
- Union County Water
- Victoria Taylor Consulting Services
- Washington and Lee University
- WithersRavenel
- WK Dickson
- WQR, Inc
- York County

You are all public health

Thank you!

You are all difference makers!