CHARTING THE COURSE FOR THE FUTURE OF WATER

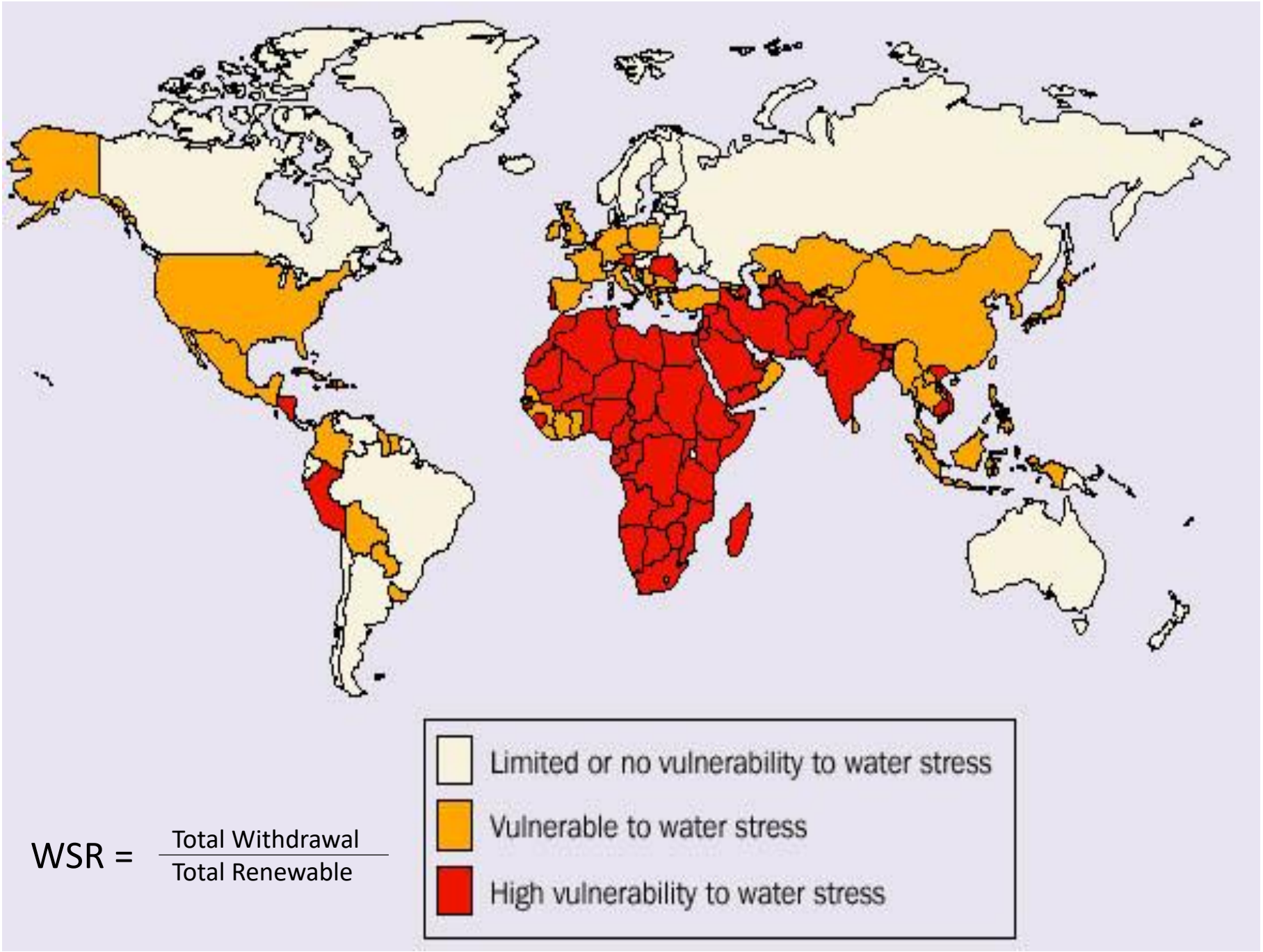
Joseph G. Jacangelo, Stantec and The Johns Hopkins University

Two Posits

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

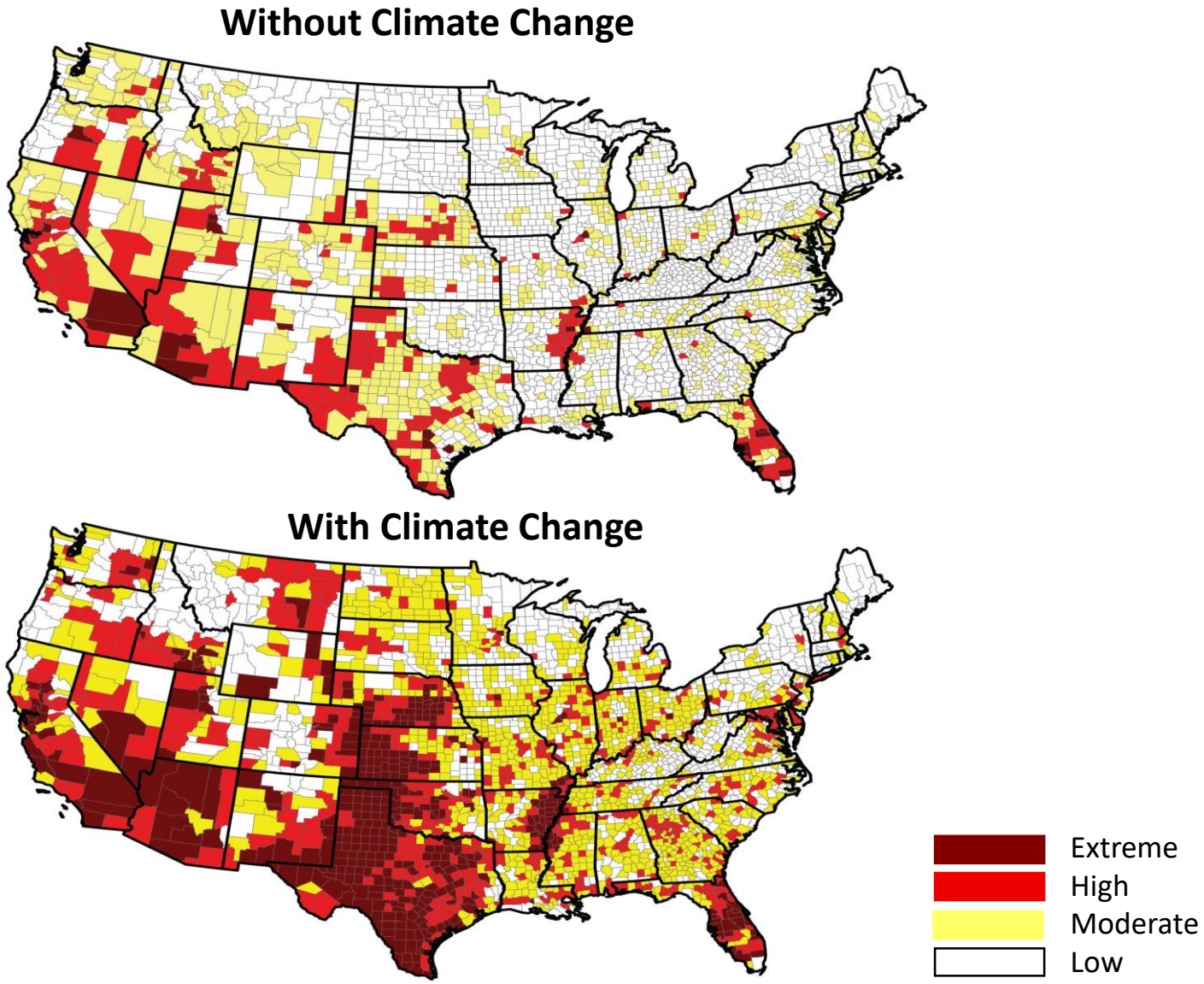
The future is compressed!

World's Current Vulnerability to Water Scarcity

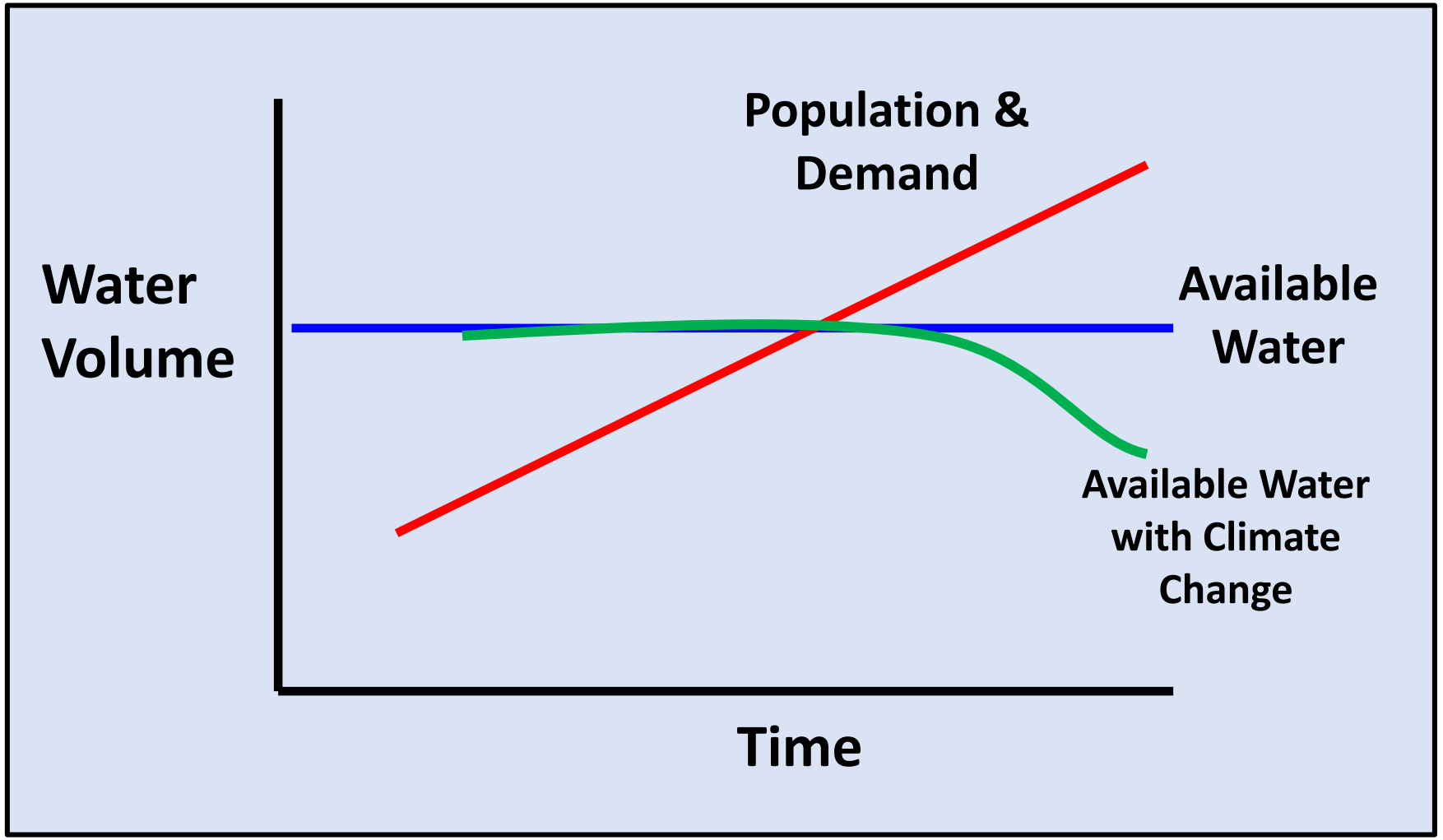


$$WSR = \frac{\text{Total Withdrawal}}{\text{Total Renewable}}$$

2050 Water Stress Index



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!*

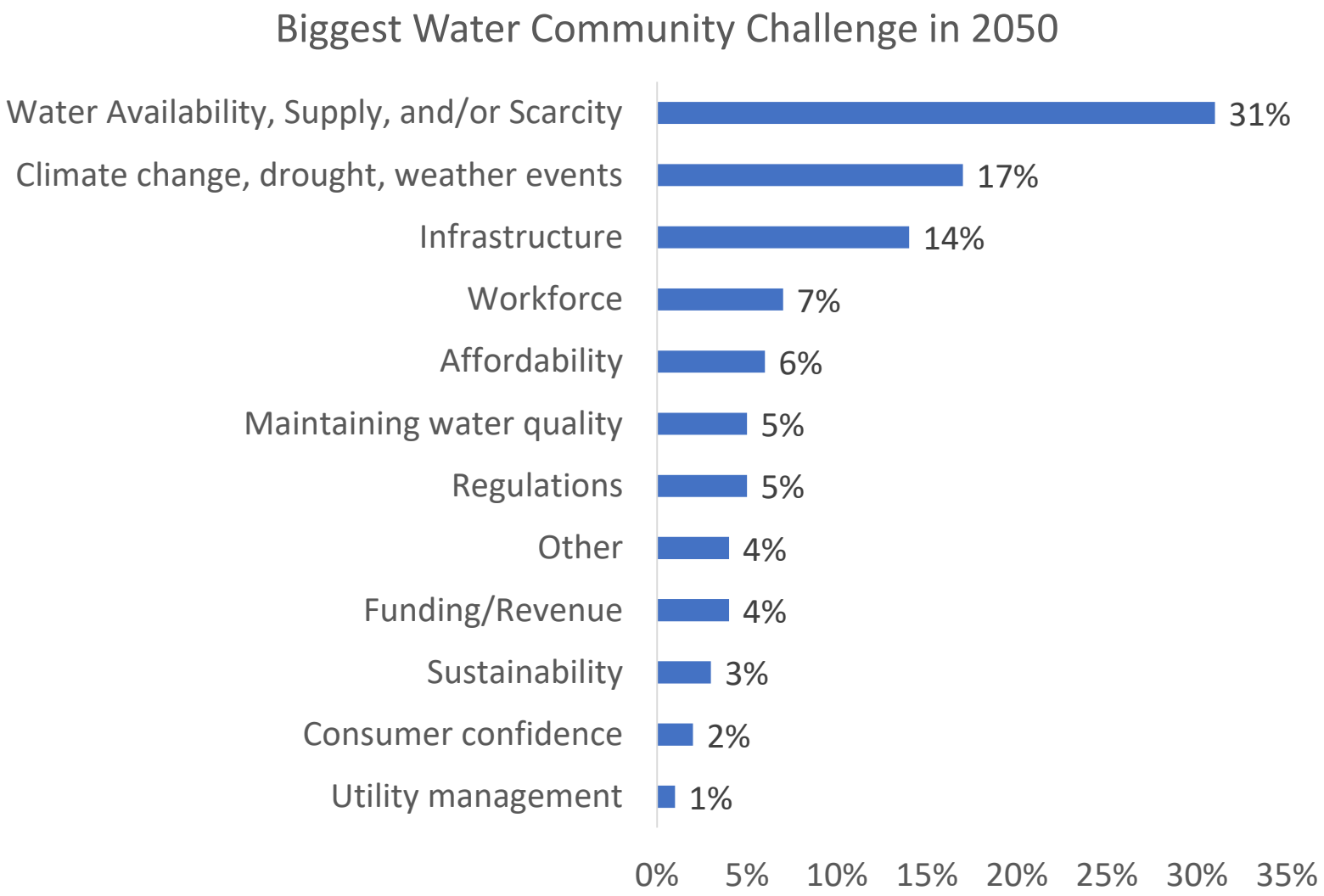
*Source: "Presentation and Perspective of Appealing Green Facilities for Eco-cyclic Water Management" Liu, R., et al.; Chemical Engineering Journal, 227 (2018)

Selected Impacts of Climate Change on NJ Water by 2050

- Heatwaves more frequent and longer.
- Droughts lasting three to six months may increase in frequency.
- Precipitation to increase 4-11%. Greater frequency and intensity of storms.
- 50% chance sea-level rise to exceed 1.4 ft.
- Surface and groundwater to be impaired by n increased nutrient and contaminant loading into waters.

Source: 2020 New Jersey Scientific Report on Climate Change, NJDEP

Survey on challenges the water community will face in 2050



Nearly a third of surveyed AWWA members cited water availability as the water community's top challenge in 2050, followed by 17% choosing climate change or weather events. Together, almost half of AWWA members say these two issues (which can be interconnected) will be the top challenge in 2050.

Water2050

What will the water community's biggest challenge be in 2050? N=1369

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 chart [illegible] for future water [illegible]
- [illegible] prism of five [illegible] 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.

CALL TO ACTION

Drivers Impacting the Future of Water

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

SPECIFICALLY ENGAGED ENTITIES AND ACTIVITIES

Thought Leaders	Utilities	Influencers Outside the Water Community	Gather and Create Thought Leadership
• Black & Veatch • American Cast Iron Pipe • AMWA • US Water Alliance • ISI • Aquasight • EPA • Veolia • Water Quality Association • Water Foundry • CDM Smith • Water Value LLC • Stantec • Tnemec • David Nairne and Associates	• East Bay Municipal Utility District • DC Water • Metropolitan Water District of So. Cali. • NY DEP • Southern Nevada Water Authority	• Coca-Cola • Iowa Soybean Association • Amazon • Clark University • NAWI • NOAA • The Nature Conservancy • SWAN Digital Twin Working Group • Innovyze • World Bank • Resources for the Future (RFF)	• Member Surveys • Journal Publications • Think Tank Reports • AWWA member participation at every level of the organization • Future We Create Videos • ACE Pavilion Storyboard

Think Tank Goals

Develop

High-level recommendations

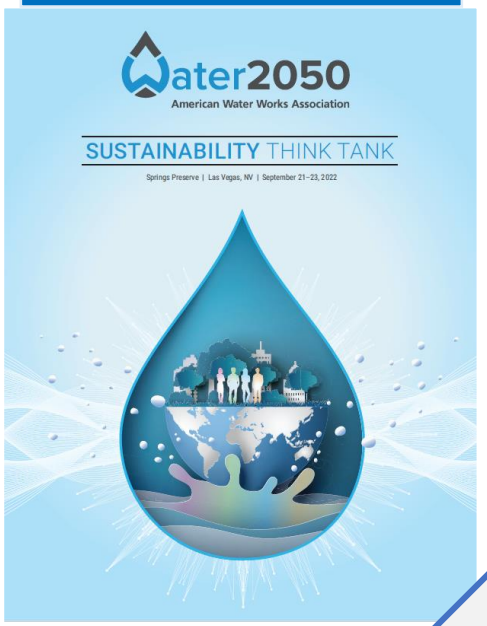
with strategies that support the vision of an innovative water future

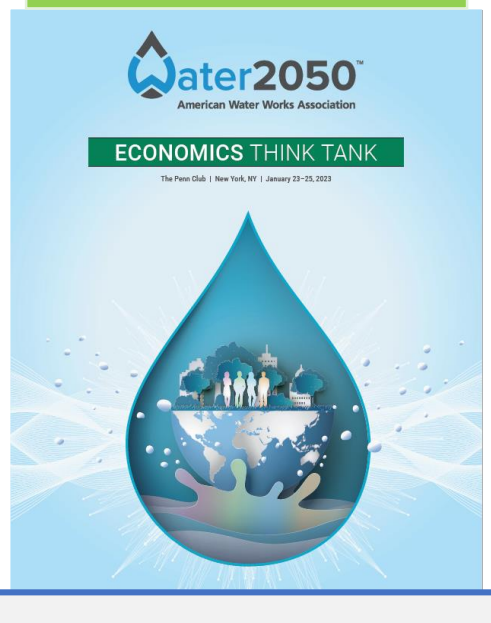
Water2050 Think Tanks

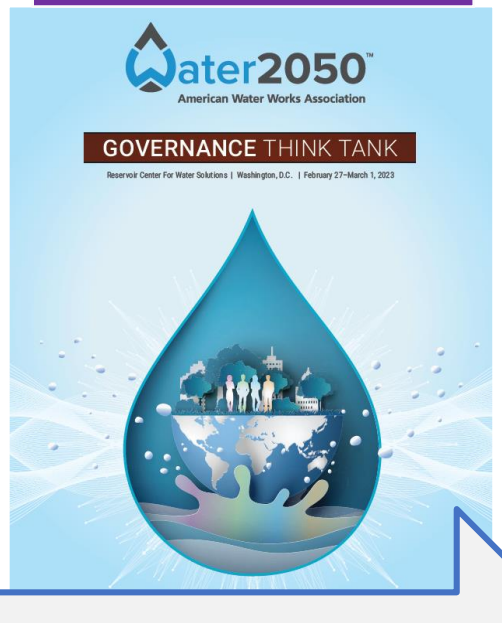
“Art of the Impossible”

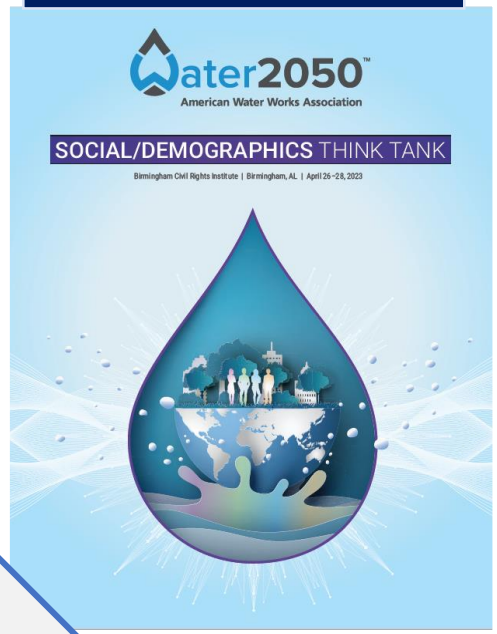
APPROACH OVERVIEW: FIVE THINK TANKS

Sustainability	Technology	Economics	Governance	Social / Demo
Springs Preserve, LV	Comp. Hist. Museum, CA	The Penn Club, NY	Reservoir Center, D.C.	Civil Rights Institute, AL









Crosscutting themes include items such as circular economy, climate change, accelerating innovation, and cross-sector collaboration”

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

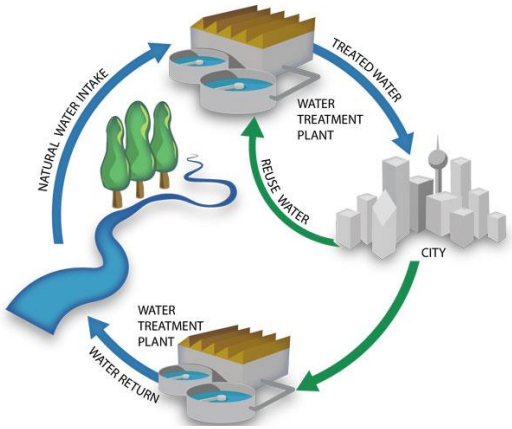
ONE WATER GOVERNANCE AND POLICY

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.

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.

THE WATER 2050 JOURNEY

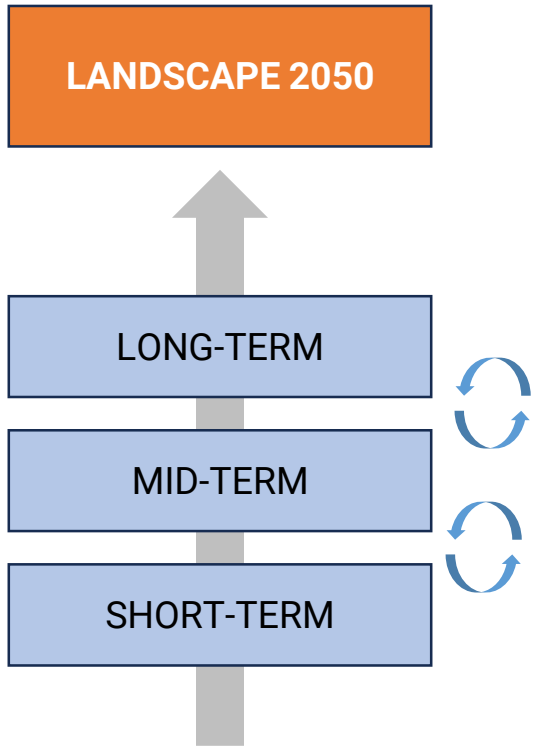
WATER 2050 THINK TANKS

5 STRATEGIC PRIORITIES

47 RECOMMENDATIONS

PRIORITIZATION and IMPLEMENTATION

ROADMAP TO 2050



Reviewed and revised every 5 years based on evolving macro forces and emerging trends

WATER 2050 AND AWWA'S STRATEGIC PLAN 2030

Water2050

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What can you do?

You are all public health practitioners!

You are all difference makers!

Thank You!