

Excerpt from July 2024 Water Utility Executive, Association of Metropolitan Water Agencies

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Building a Resilient Future: Tampa Bay's Innovative Approach to Climate Adaptation

July 31, 2024 at 2:00 PM

Along the Gulf Coast of Florida, where the pendulum swings from extreme droughts to intense downpours, ensuring a steady water supply is not just a matter of management—it's a matter of survival. As extreme weather events intensify, [Tampa Bay Water](https://www.tampabaywater.org/) (<https://www.tampabaywater.org/>), one of the largest water supply utilities in the Southeastern U.S., stands out with its advanced approach to climate resiliency, ensuring water supply for over 2.5 million people.

Dr. Tirusew Asefa, Ph.D., P.E., BC.WRE, and System Decision Support Manager at Tampa Bay Water, recently shared expert insights into the organization's water resilience strategies, which focus on sustainability, resilience, innovation, and collaboration. During the discussion with AMWA staff, Dr. Asefa emphasized the importance of climate resilience through multi-scale planning and financial and operational tools. As chair of the [Florida Water and Climate Alliance](https://www.floridawca.org/) (<https://www.floridawca.org/>) and recipient of the 2022 Outstanding Practitioner in Water Resources Engineering Award by the [American Academy of Water Resources Engineers](https://www.asce.org/career-growth/civil-engineering-certification/water-resources-engineering) (<https://www.asce.org/career-growth/civil-engineering-certification/water-resources-engineering>), he highlighted the important role collaboration plays in ensuring sustainability and adaptability to [climate variability](https://www.tampabaywater.org/climate-variability-water-supply-utilities) (<https://www.tampabaywater.org/climate-variability-water-supply-utilities>).

A Multi-Scale Approach to Climate Resilience

Resilience

(<https://www.tampabaywater.org/blog/planning-for-growth-and-resiliency/>) is a central theme in Tampa Bay Water's operations that begins at the helm of the system with its General Manager Chuck Carden. Asefa credits the water system's leadership with ensuring resilient practices throughout the utility. Asefa acknowledged that different individuals may have differing definitions of "resilience." However, he described resilience as "how quickly you can recover from a shock or stress," noting its importance across multiple scales, from daily operations to long-term planning. The utility's resilience strategies include proactive measures during extreme weather events, such as switching to generators before power loss during [Hurricane Irma](https://www.tampabay.com/news/weather/hurricanes/as-day-breaks-hurricane-irma-impact-being-seen-across-tampa-bay/2337030/) (<https://www.tampabay.com/news/weather/hurricanes/as-day-breaks-hurricane-irma-impact-being-seen-across-tampa-bay/2337030/>), demonstrating operational resilience.

The focus on resilience extends to environmental sustainability, with models assessing the impact of water withdrawals on ecosystems and ensuring recovery from droughts. Asefa also discussed the importance of planning for multiple future scenarios, particularly in the face of Florida's unique climate challenges, including unpredictable rainfall patterns, rising temperatures, and population growth.

Tampa Bay Water has developed a comprehensive, multi-scale approach to climate resilience, employing advanced decision-support models to manage water resources efficiently. A key innovation is the system's weekly operational guidance model, which assists in resource rotation based on environmental conditions such as rainfall. Dr. Tirusew Asefa explained, "This model helps operators rotate production efficiently, considering factors like rainfall and environmental conditions." This system also includes long-term planning to project demand and supply allocation up to 30 years ahead.

Among the sophisticated tools Tampa Bay Water uses is a seasonal source allocation model, recently awarded by the [American Journal of Water Resources Planning](https://ascelibrary.org/journal/jwrmd5) (<https://ascelibrary.org/journal/jwrmd5>). This tool uses a multi-objective evolutionary algorithm combined with machine learning to optimize resource use. The utility has also pioneered an integrated risk, reliability, and yield model, linked to a comprehensive financial model, enhancing infrastructure investment

planning.

Tampa Bay Water runs weekly models to forecast water demand and supply, adjusting operations based on current conditions. This short-term forecasting is complemented by seasonal and annual planning, which anticipates projected weather patterns and potential changes in demand. "Our models are built to handle different scenarios—droughts, floods, and everything in between," noted Dr. Asefa.

Long-term planning is crucial in Florida, where water availability can vary dramatically annually. "In Florida, we experience feast or famine conditions," said Dr. Asefa. "We get a significant portion of our rain in just a few months, so planning for these extremes is essential for maintaining a reliable water supply."

Resiliency at Tampa Bay Water also includes maintaining the health of ecosystems and infrastructure. The utility's models assess the impact of water use on wetlands, river flows, and groundwater levels, ensuring environmental sustainability is not compromised. The approach includes planning for the long-term effects of sea level rise and other climate impacts on infrastructure. "We need to ensure that our infrastructure can withstand future changes," explained Dr. Asefa. "This involves not just responding to current conditions but anticipating how things will evolve over the coming decades."

Innovative tools like the seasonal allocation model, which employs machine learning to optimize resource use, and a unique financial model linking water supply forecasts to financial planning, are central to Tampa Bay Water's strategy. These models ensure efficient use of water resources and precise budgeting, allowing for smart investment in infrastructure. "This model helps us anticipate the financial impact of various scenarios, ensuring we can invest wisely and maintain our infrastructure without overextending ourselves," Dr. Asefa added.

The Path Forward: Opportunities for Collaboration

Collaborating with universities, including the University of Florida, Florida State University, and Cornell University, to advance research and develop new tools has proven effective for the water system. These partnerships have led to funding and innovations in climate science and resource management, with practical applications for the utility's operations. For instance, Tampa Bay Water collaborates with the University of Florida on climate change research, focusing

on how shifts in rainfall patterns and rising temperatures impact water resources. Similarly, partnerships with institutions like Cornell and North Carolina State University have resulted in sophisticated financial and risk models that enhance the utility's ability to plan for future uncertainties.

"We've learned a lot from our academic partners," said Dr. Asefa. "Their expertise in climate science and data analysis has been invaluable in developing models that are both accurate and actionable."

In addition to Academia, one of the key opportunities for Florida and coastal utilities is to engage in state-level collaborations and share resources and data. For example, Tampa Bay Water actively participates in initiatives like the [Florida Water and Climate Alliance \(https://www.floridawca.org/\)](https://www.floridawca.org/), which fosters cooperation among utilities and academic institutions to address common challenges.

The utility is also involved in national efforts to assess climate impacts and develop adaptive strategies. These collective efforts help smaller utilities, which may lack the resources for extensive modeling and research, to access valuable information and tools.

Dr. Asefa also mentions staff retention as another significant factor. He states, "My department's staff is passionate about their work, and people tend to stay until they retire. In fact, I often say that my department is unique in the agency because no one has left, except for retirement. We make the work very engaging and rewarding leading to a continuity of crucial efforts."

A Blueprint for the Future

Tampa Bay Water's comprehensive and forward-thinking approach to climate resiliency offers a valuable blueprint for other utilities facing similar challenges. By integrating innovative modeling techniques, fostering academic collaborations, and maintaining a flexible, multi-scale strategy, the system has positioned itself to navigate an uncertain future successfully.

In the face of global climate challenges, proactive planning, technological innovation, and collaboration are crucial. Tampa Bay Water's efforts ensure the sustainability of water resources in the region and provide an inspiring example of building resilience.

Dr. Tirusew Asefa stated, "The future of water management lies in our ability to anticipate changes and adapt our systems accordingly, ensuring long-term resilience. We are not just responding to climate change; we are proactively planning for it." He emphasized the importance of continued collaboration with smaller utilities and universities, sharing data and resources to enhance climate resilience. "The value we get from university and research partners is key because it allows us to apply science directly to our work," Asefa noted.

Tampa Bay Water's strategy, marked by innovative modeling and strong partnerships, addresses immediate operational needs and prepares the utility for future challenges, ensuring sustainable water supply and management for the Tampa Bay region.