Showcasing Leading Practices in Climate Adaptation

Experiences from the Water Sector to Empower Other Sectors and Communities

An Eight-Part Webinar Series June 2022

Hosted by the National Oceanic and Atmospheric Administration, the Water Utility Climate Alliance, The Water Research Foundation, and the U.S. Environmental Protection Agency

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This summary is meant to advance the national conversation on building resilience to climate change and should not be taken as guidance or advice. Information and ideas presented here are not official statements of policy or practice by NOAA, Water Utility Climate Alliance, US Environmental Protection Agency, The Water Research Foundation, or ACQ Consulting.

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Reference this document as follows:
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[3] Portland Water Bureau, Portland, OR
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[5] The Water Research Foundation, Denver, CO
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This monograph is the second in a series on the subject of adaptation by the NOAA Climate Program Office, Climate and Societal Interactions, Adaptation Sciences (AdSci) Program. The AdSci program was established in 2021 to advance the knowledge, methods and frameworks to help move society beyond incremental adaptation toward more widespread, connected, adaptive pathways, and resilience strategies with clear economic and societal co-benefits. Monographs in this series have been prepared to reach a wide audience, including the general public, policy makers, stakeholders, and decision makers. They will each highlight research supported by the Adaptation Sciences Program and its predecessor programs.

Monographs are posted here:
https://cpo.noaa.gov/Divisions-Programs/Climate-and-Societal-Interactions/The-Adaptation-Sciences-Program/AdSci-Resources

Credits and Acknowledgments

Webinar Speakers:

Session 1
Julie Vano (Aspen Global Change Institute), Kavita Heyn (Portland Water Bureau and WUCA)

Session 2
Jason Giovannettone (Dewberry and the American Society of Civil Engineers), Kavita Heyn (Portland Water Bureau and WUCA), Heidi Roop (University of Minnesota)

Session 3
Emily Wasley (WSP USA), Taylor Winchell (Denver Water and WUCA), Alexis Dufour (San Francisco Public Utilities Commission)

Session 4
Mami Hara (US Water Alliance), Chris Orvin (US EPA), Yeana Kwagh (US EPA), Harriet Festing (Anthropocene Alliance), Zach Schafer (US EPA)

Session 5
Janet Clements (One Water Econ), Pinar Balci (NYC DEP), Robyn DeYoung (US EPA)

Session 6
Taylor Winchell (Denver Water and WUCA), Svetlana Taylor (Current Innovation), Alaina Harkness (Current Innovation)

Session 7
Keely Brooks (Southern Nevada Water Authority and WUCA), Margaret Morrissey (Korey Stringer Institute), Paul Gully (Regional Transportation Commission of Southern Nevada)

Session 8
Kim Penn (NOAA), David Goldbloom-Helzner (US EPA), Dan Hartnett (AMWA), Samuel Capasso (FEMA)

About the Organizations

The "Joint Leading Practices in Climate Adaptation" report is the second monograph in a series on climate adaptation by the NOAA Climate Program Office, Climate and Societal Interactions, Adaptation Sciences (AdSci) Program. This specific monograph was done in partnership with the Water Utility Climate Alliance (WUCA), The Water Research Foundation (WRF), and the U.S. Environmental Protection Agency. The monograph series aims to reach a wide audience, including the general public, policy makers, stakeholders, and decision makers.

For further information regarding the "Joint Leading Practices in Climate Adaptation" monograph, please contact ***oar.cpo.adaptation@noaa.gov****.*

NOAA/OAR/Climate Program Office's Adaptation Sciences Program (AdSci):
The AdSci program was established in 2021 to advance the knowledge, methods and frameworks to help move society beyond incremental adaptation toward more widespread, connected, adaptive pathways, and resilience strategies with clear economic and societal co-benefits. We expect to accomplish this through a) developing an understanding of key drivers and conditions that shape and enable adaptation across multiple temporal and spatial scales; and (b) identifying key aspects of and promoting opportunities for the use of scientific information to best support preparedness and planned adaptation of high value to social and economic goals.

For further information regarding the AdSci monograph series program, please contact ***oar.cpo.adaptation@noaa.gov****.*

Water Utility Climate Alliance (WUCA):
The Water Utility Climate Alliance (WUCA) was formed in 2008 to provide leadership and collaboration on climate change issues affecting the country's water agencies. This coalition comprises twelve of the nation's largest water providers. WUCA water agencies supply drinking water for more than 50 million people throughout the United States. WUCA has worked for over a decade to advance climate change adaptation, planning, and decision-making to ensure that water utilities, and the communities they serve, can thrive in the face of these emerging climate and extreme-weather related challenges. WUCA leverages collective utility experiences to develop leading practices in climate change adaptation and mitigation that are actionable, equitable, and serve as a model for others. We collaborate with each other and our partners to enable water utilities to respond to climate change impacts on utility functions and operations to protect our water systems today and into the future.

The Water Research Foundation (WRF):
The Water Research Foundation (WRF) is a nonprofit (501c3) organization which provides a unified source for One Water research and a strong presence in relationships with partner organizations, government and regulatory agencies, and Congress. The foundation conducts research in all areas of drinking water, wastewater, stormwater, and water reuse. The Water Research Foundation's research portfolio is valued at over $700 million. The Foundation plays

an important role in the translation and dissemination of applied research, technology demonstration, and education, through creation of research-based educational tools and technology exchange opportunities. WRF serves as a leader and model for collaboration across the water industry and its materials are used to inform policymakers and the public on the science, economic value, and environmental benefits of using and recovering resources found in water, as well as the feasibility of implementing new technologies.

*For more information about WRF, please contact **info@WaterRF.org***

U.S. Environmental Protection Agency, Creating Resilient Water Utilities (CRWU):
The U.S. Environmental Protection Agency's Creating Resilient Water Utilities (CRWU) initiative provides drinking water, wastewater, and stormwater utilities with the practical tools, training, and technical assistance needed to increase resilience to current and future climate conditions. Through a comprehensive planning process utilizing integrated resources, CRWU assists water sector utilities by promoting a clear understanding of climate science and potential long-term adaptation options. Many opportunities exist for water sector utilities to address climate impact challenges while simultaneously meeting the needs of growing communities and sensitive ecosystems. In some areas, increased stormwater runoff, flooding, or sea-level rise can impact water quality and utility infrastructure. CRWU tools and resources can help to identify adaptation strategies that will protect infrastructure and operations, allowing utilities to provide reliable and sustainable service to their customers. EPA has provided direct technical assistance to drinking water and wastewater utilities across the country to conduct climate impact risk assessments using the Climate Resilience Evaluation and Awareness Tool (CREAT).

*To learn more about how some of these utilities used CREAT to develop adaptation plans and encourage resilience planning in their communities, visit EPA's CRWU Website at **https://www.epa.gov/crwu/**.*

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Introduction

Showcasing Leading Practices in Climate Adaptation

Experiences from the Water Sector to Empower Other Sectors and Communities

SPONSOR WEBSITES

- NOAA Climate Program Office, Adaptation Sciences Program – **cpo.noaa.gov** (Search "*adaptation*" and/or "*water resources*")
- Water Utility Climate Alliance – **wucaonline.org**
- The Water Research Foundation – **waterrf.org**
- U.S. EPA Creating Resilient Water Utilities – **epa.gov/crwu**

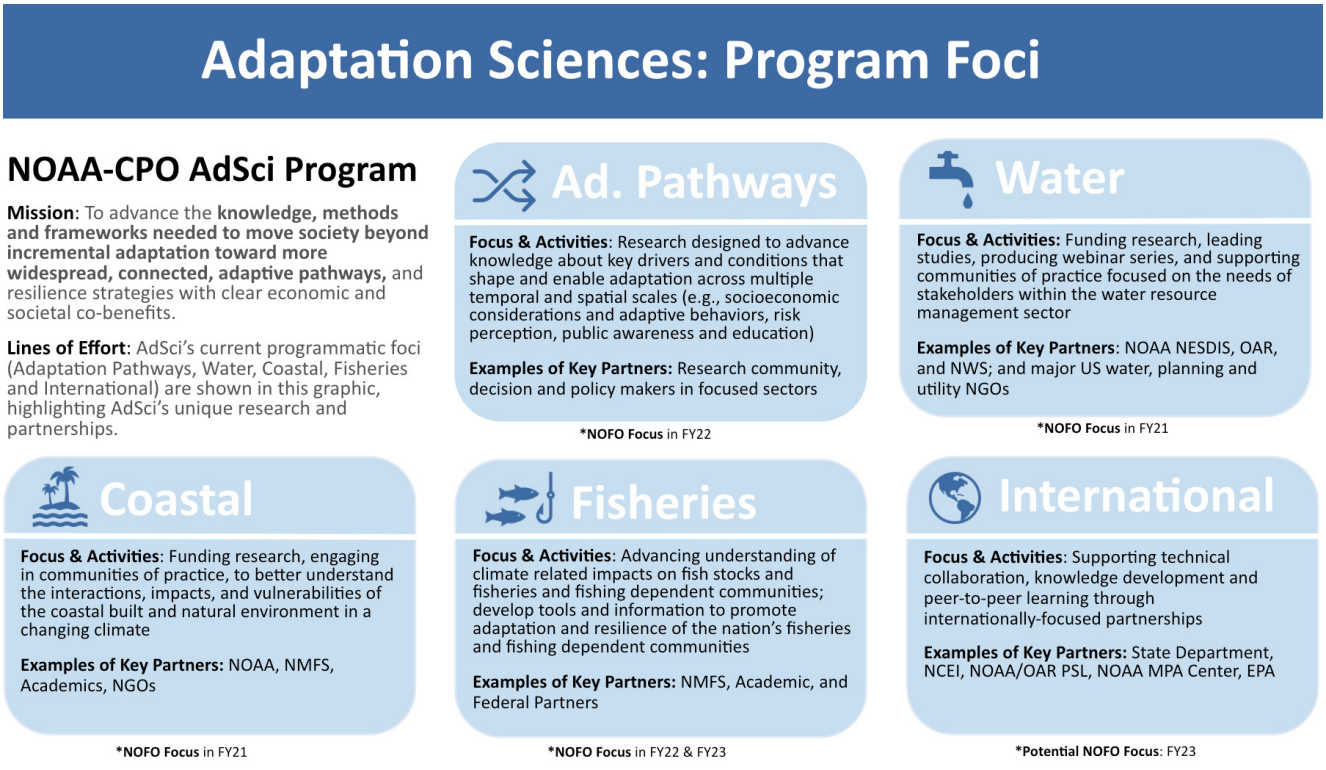
NOAA's AdSci Program

NOAA's Adaptation Science Program, or AdSci, is the next evolution of NOAA's work to help society adapt to climate change. AdSci leverages innovative collaborations which have been established over the last two decades that combine deliberate and strategic use of research announcements with purposeful engagement and partnerships. The AdSci Program goal is to foster widespread, science-based adaptation by:

a. developing an understanding of key drivers and conditions that shape and enable adaptation across multiple temporal and spatial scales;

b. promoting opportunities for the use of scientific information to best support preparedness and adaptation of high value to social and economic goals; and

c. working in place while continuing to do research, and amplifying what we have learned from one community to another to create Communities of Practice.



Source: NOAA AdSci Program team

Purpose of the Webinar Series

Climate change is one of the most significant challenges of the 21st century. This webinar series, sponsored by the National Oceanic and Atmospheric Administration (NOAA), Water Utility Climate Alliance (WUCA), the Water Research Foundation (WRF), and US Environmental Protection Agency (EPA), explores practical lessons and leading practices focused on steps that water resource managers can take to mainstream climate science and build climate resilience. Having worked on climate adaptation for over a decade, leading practitioners in the drinking water, wastewater, and stormwater sectors have learned many lessons and developed a variety of approaches to share with peers that are applicable to any sector. Expanding the exchange of knowledge across communities will foster more effective adaptation and improve community resilience.

The goal of these webinars is to advance our thinking about effective approaches by learning from others on what has worked (or not worked). Beyond sharing examples from the water sector, these webinars foster a multi-sectoral, interdisciplinary dialogue, and provide practical resources and tools for planning.

This monograph provides a brief synopsis of the eight webinars, which are available online at: **https://cpo.noaa.gov/Divisions-Programs/Climate-and-Societal-Interactions/Water-Resources/Showcasing-Leading-Practices-in-Climate-Adaptation-Experiences-from-the-Water-Sector-to-Empower-Other-Sectors-and-Communities**.

Organization of this Monograph

This monograph provides synthesis of the series followed by summaries of each webinar, a select set of resources recommended by the speakers, and speaker contacts for more information.

The eight topics covered include Session:

1. **Leading Practices in Climate Adaptation**
2. **Engineering Case Studies**
3. **Mapping Climate-related Risks and Opportunities to Key Business Functions**
4. **Equity and Environmental Justice Considerations in Climate Adaptation**
5. **Green Stormwater Infrastructure**
6. **Greenhouse Gas and Energy**
7. **Climate Warming and Impacts to Staff and Assets**
8. **Federal and Other Funding for Adaptation**

Webinar Series Synopsis

Deer Island Wastewater Treatment Plant. Source: Daderot via Wikimedia Commons.

What is 'resilience?' How do you do 'adaptation?' Where would an organization even begin? How do we choose priorities when there are so many options? How do we design infrastructure for a fuzzy future? How can we pay for this when we have so many other needs?

Each of the eight webinars in this series attempts to answer these questions. Each addresses different aspects of adaptation that were found relevant for water utilities and that could be applied to other sectors as well. We found that even with differences in sector orientation and requirements, there were some common threads that emerged that are being used in resilience planning.

> *"There are many ways of going forward, but only one way of standing still."*
>
> **—Franklin D. Roosevelt**

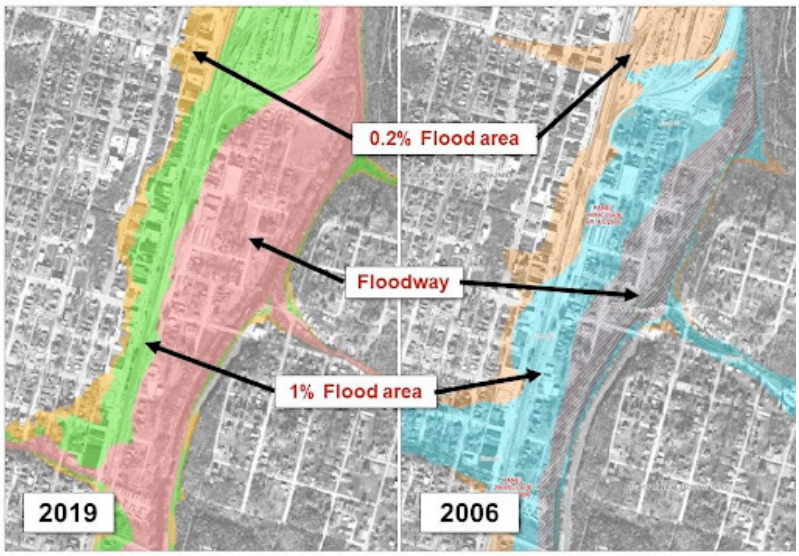
Leading Practices Framework

In the first session, the Water Utility Climate Alliance presented a five-part framework for mainstreaming climate change adaptation in the water sector and building adaptive capacity. Examples of each step of the framework include:

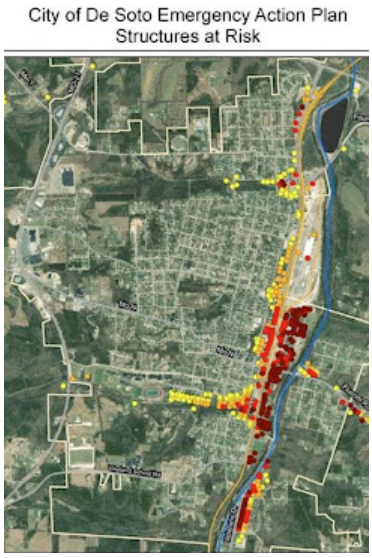
Understand: (Understanding climate science, your system, and your system's vulnerabilities, risks, and opportunities).

- **Example 1:** In session 3, Business Function Mapping, we learned the importance of collaboration across the organization to build common understanding and find solutions for mainstreaming adaptation, as demonstrated by the San Francisco Public Utilities' Tabletop Exercise.
- **Example 2:** In session 7, Climate Warming and Impacts to Staff and Assets, Southern Nevada Regional Transportation Commission demonstrated their webmap of heat risk to identify the most vulnerable communities. WUCA and the Southern Nevada Water Authority then developed a set of heat resilience and adaptation strategies for outdoor workers and utility assets.

Source: Water Utility Climate Alliance



City of DeSoto Floodplain, 2006 vs. 2019. Source: U.S. Army Corps of Engineers



City of DeSoto Structures at Risk. Source: U.S. Army Corps of Engineers

Plan: (Planning for multiple futures and building capacity).

- **Example 1:** In session 2, Engineering Case Studies, WUCA and ASCE provided examples of tools to integrate climate change information and adaptation in capital projects and engineering processes, and tools to prioritize investments to achieve multiple benefits.
- **Example 2:** In session 5, Green Stormwater Infrastructure, OneWater demonstrated how to use a triple bottom line tool to understand the benefit-cost of innovative options.

Implement: (Acting to implement changes in assets and actions).

- **Example 1:** In session 5, Green Stormwater Infrastructure, NYC showed how they made progress by adopting a pay-for-performance structure to incentivize the private sector to install green infrastructure.
- **Example 2:** During session 7, Climate Warming and Impacts to Staff and Assets, Southern Nevada Water Authority explained their workplace practices and strategic communication to prevent heat stress in employees.

Sustain: (Monitoring conditions, developing funding, maintaining capacity, and managing expectations).

- **Example 1:** In session 6, Greenhouse Gas and Energy, WUCA gave select examples of their case studies in greenhouse gas mitigation for water utilities, and Current Water demonstrated how to use recovery of embodied energy in the waste stream to power utility operations and contribute energy for community use.
- **Example 2:** In session 8, Federal and Other Funding for Adaptation, participants heard about funding available through the Federal Emergency Management Agency (FEMA), EPA, NOAA, and other agencies for implementing resilient projects.

Source: United States Mission Geneva via Flickr (CC BY-ND 2.0)

Engage: (Motivating action, engaging and supporting others, and developing climate messages).

- **Example 1:** During session 4, Equity and Environmental Justice Considerations, the Anthropocene Alliance demonstrated how they co-create equitable solutions by engaging community members.
- **Example 2:** In session 8, Federal and Other Funding for Adaptation, EPA described opportunities for technical assistance to help small communities access funds and design projects

Community Leadership

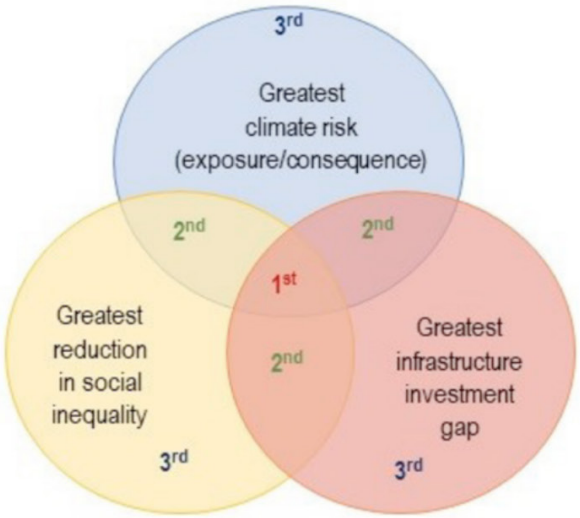
Water utilities are trusted community leaders and can serve as anchor institutions for climate adaptation. They own significant amounts of land, have relationships with key community sectors, local governments, and electric utilities, and have programs that work with the private sector. Water utilities are elevating their work with community groups on issues of equity, and coordinating with health care professionals to understand health and safety risk for staff and residents.

A Growing Community of Practice

Progress is being made and paths forward are being forged thanks to the work over more than a dozen years by many organizations, scientists, academics, water utilities, watershed and sustainability managers, transportation specialists, NGOs, state and local governments, federal agencies, and people with knowledge in almost every discipline. While it will take many more years to ingrain adaptation principles

Prioritization of Adaptation Actions

Prioritization Questions to Consider
- Is there a climate change adaptation plan?
- Are there interdependencies and cascading/external impacts/benefits?
- Greatest sensitivity, exposure, consequences and potential risk reduction to climate change indicators/impacts?
- What are the social benefits and costs?
- Greatest infrastructure investment gap?
- What are the environmental benefits and costs?
- What are the financial and economic costs and benefits?
- Occupancy considerations
- Service life
- Ease of implementation (e.g. political/institutional barriers, time required, number of agencies involved)
- Incorporation of green infrastructure



Source: Figure 4.5 of CSIWG (Climate-Safe Infrastructure Working Group). (2018). "Paying it forward: The Path Toward Climate-Safe Infrastructure in California. Report of the Climate-Safe Infrastructure Working Group to the California State Legislature and the Strategic Growth Council". Sacramento, CA.

Source: Adapted from Fig. 4.5, AghaKouchak, et al, CSIWG (2018)

into technical guides, manuals of practice, regulations, codes, and standards, we find that the urgency of climate impacts is driving communities to develop partnerships and innovative means for taking action.

Interdisciplinary Partnerships: By diving deeper into problem solving, organizations unravel the intractable barriers and find innovations that work. Ideally, we would be able to define and implement whole systems approaches up front, but the complexity of society stymies that approach. Nonetheless, cross-department, interdisciplinary, multi-sectoral approaches that engage all stakeholders including the private sector, are working in that direction. And, as evidenced by COVID-19, climate change will not be the only challenge people and systems face in these future scenarios, so building flexibility and resilience now is important.

Greenhouse Gasses and Energy

Water utilities are at the nexus of greenhouse gas mitigation and climate adaptation. They require energy to collect, treat, and distribute clean water; and they have the opportunity to harvest energy embedded in the waste stream to generate energy. Wastewater plants are increasingly adopting innovative energy recovery solutions using proven technologies.

Practical Climate Information

There is high interest in pursuing resilience and adaptation, but many people find that access to job relevant climate change information is limited. This speaks to the need for sectoral deep dives that build the tools that people can use, much like the work described in this series. Entities like WUCA, WRF, and the American Society of Civil Engineers (ASCE) are working to create job relevant information.

Mainstreaming

Climate adaptation requires working across business functions to integrate climate change thinking and planning throughout an organization. Effective mainstreaming depends on collaboration within organizations and across sectors to understand risks, share knowledge, and create priority strategies that maximize results. Developing new approaches is not easy—nor is the work straightforward—yet there is an incredible power in learning from and with each other. In fact, that is what practitioners prefer: peer-to-peer learning focused on practical approaches and business functions, especially case studies from other water-related professionals. Case studies from WUCA, NOAA, EPA and WRF are a useful and important tool that can provide a roadmap for others to replicate and scale up in different sectors or agencies.

Financing

Financing projects is particularly challenging. The bipartisan infrastructure bill infuses significant new funding into adaptation over the next five years. Federal and state agencies are advised to target communities according to needs rather than relying solely on competitive processes. Agencies are offering assistance to help smaller communities access funding and technical assistance for projects and are focusing at least 40% of benefits of federal spending for disadvantaged communities. Contact your local FEMA representative to find out what projects can be funded using FEMA money; EPA offers a one-stop shop—FedFunds—to help identify funds available for different uses; and the White House has produced a guide to understand opportunities in the Bipartisan Infrastructure Law.

Various tools are available to help evaluate funding priorities and to evaluate the benefit-costs of adaptation actions. Benefit-cost analysis should include not just the costs of construction, repair, and operations, but also its value to society.

Where to Begin: Even smaller utilities have begun to plan for resilience. Communities new to adaptation planning can begin by reviewing WUCA's Leading Practices guide, using EPA's CREAT tool, hosting a Climate 101, and conducting a Tabletop Exercise to create common understanding among organization members about climate change risks and opportunities to the organization. Another tool mentioned in this series, popular for communities beginning the resilience planning process is the NOAA Climate Resilience Toolkit's 'Steps to Resilience'.

Drinking water cooling system. Source: WUCA.

In Conclusion

Climate change poses a complex problem for a complex society. Change is difficult, but it also offers opportunities to redress past inequities. By providing a wide range of support from NGOs and federal, state, and local governments, communities with fewer resources can benefit from this historic infusion of resources to address climate change. Doing so requires building trust to enable stakeholders to be part of the process to co-create solutions. In summary, the goal of this webinar series was to advance our thinking about effective approaches to adaptation planning. Beyond sharing examples from the water sector, these webinars foster a multi-sectoral, interdisciplinary dialogue, and provide practical resources and tools for planning.

SPONSOR WEBSITES

- U.S. Climate Resilience Toolkit – **toolkit.climate.gov** (Search "*water resources dashboard*")
- NOAA Climate Program Office, Adaptation Sciences Program – **cpo.noaa.gov** (Search "*adaptation*" and/or "*water resources*")
- Water Utility Climate Alliance – **wucaonline.org**
- The Water Research Foundation – **waterrf.org**
- U.S. EPA Creating Resilient Water Utilities – **epa.gov/crwu**

Session Summaries

SESSION 1:

Leading Practices in Climate Adaptation

November 4, 2021

Session 1: Leading Practices in Climate Adaptation

November 4, 2021

Speakers:

Kavita Heyn, Portland Water Bureau, WUCA Chair
Laurna Kaatz, Project Lead, Denver Water, WUCA Past Chair
Julie Vano, Research Lead, Aspen Global Change Institute

THUMBNAIL

This webinar, the first of eight in the series, presents an overview of a new report by the Water Utility Climate Alliance, showcasing practical approaches that any water utility – or others in the climate adaptation sector — can take to build resilience to climate change.

Leading Practices Resources:

- WUCA Leading Practices Website and Report
  https://www.wucaonline.org/adaptation-in-practice/leading-practices/
- Climate Adaptation Virtual Training
  https://toolkit.climate.gov/course-lessons/practical-considerations-climate-analysis-and-adaptation

Summary

While water utilities are highly adept at understanding and mitigating uncertainty, climate change exacerbates current challenges and adds new risks to already complex utility practices. Climate adaptation requires working across business functions and organizational silos, necessitating more integration and new tools. It benefits from collaboration across sectors, including businesses and suppliers, and among the utility, the city, and the region. Developing new approaches is not easy—nor is the work straightforward—yet there is an incredible power in learning from and with each other.

For more than 10 years, the Water Utility Climate Alliance (WUCA) has been at the forefront of strengthening the field of climate adaptation. WUCA members have uncovered ways to build adaptive capacity and incorporate new climate science into water management, planning, investments, and actions. To share what worked, WUCA has compiled climate adaptation practices that have been tested, leveraging WUCA members' experiences to build a shared knowledge base and illustrate not-always clear directions forward. The goal is to make approaches for successful climate change adaptation easier to discover, understand, and navigate, and to help other utilities avoid having to recreate the wheel or invest in unnecessary efforts, thus saving time and money.

This collection of leading practices in climate adaptation covers a suite of climate adaptation actions and is intended to broadly promote collaborative learning. Each practice in the collection is explained and supported by concrete examples. These practices are drawn from WUCA work products and WUCA members' experiences, and, when possible, connected to relevant resources and related efforts. Most of these practices are appropriate for water, wastewater, and

Leading Practices (see full size image on page 7).
Source: Water Utility Climate Alliance.

stormwater utilities of any size, as well as other sectors interested in climate adaptation.

The Leading Practices resource is intended for anyone – including those just getting started - and can be plugged in anywhere along the continuum of practices. WUCA also hopes to spur innovations within and across utilities and with the adaptation community more broadly.

In compiling these leading practices, WUCA learned several lessons that may help support climate adaptation practices within other organizations:

- **The process is often more important than the resulting plan.** In this and other WUCA projects, the opportunity to encourage conversations about climate adaptation within and across utilities was valuable. WUCA hopes this report's living-document design will continue to facilitate these types of conversations within and across water utilities and in other sectors as well.
- **Climate adaptation champions are integral to the success of most leading practices.**
- **Utilities are seeking ways to improve their ability to mainstream climate change information into existing business functions.**
- **Mainstreaming simultaneously** allows for the identification of practical, relevant, and achievable adaptation solutions while also fostering internal champions.
- **The science will never be perfect**, so learning about strategies for making decisions in the face of deep uncertainty is key to taking climate adaptation action.
- **The perfect can be the enemy of the good**. Developing perfect climate adaptation actions may slow progress and prevent necessary learning. It is important to try different things to learn and adapt. The climate change adaptation landscape is also rapidly changing, so what gets developed may need to be revised sooner than anticipated.
- **Adaptation is an iterative process**. Essential climate adaptation actions and leading practices need to be re-visited over time as they continue to inform and support each other.

QUESTIONS?

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Julie Vano, Aspen Global Change Institute:
jvano@agci.org

SPONSOR WEBSITES

- NOAA Climate Program Office, Adaptation Sciences Program – **cpo.noaa.gov** (Search "*adaptation*" and/or "*water resources*")
- Water Utility Climate Alliance – **wucaonline.org**
- The Water Research Foundation – **waterrf.org**
- U.S. EPA Creating Resilient Water Utilities – **epa.gov/crwu**

SESSION 2:

Engineering Case Studies

November 18, 2021

Session 2: Engineering Case Studies

November 18, 2021

Speakers:

Jason Giovannettone, Ph.D., P.E, ASCE. Challenges/Solutions towards Implementation of High-Priority Climate Adaptation Actions; Sisters of Mercy of the Americas

Kavita Heyn, Chair, Water Utility Climate Alliance; Climate Resiliency Planning Manager, Portland Water Bureau

Heidi A. Roop, Director, MN Climate Adaptation Partnership; Assistant Professor, University of Minnesota

> *"We need forward-looking infrastructure design to withstand ongoing and future climate risks."*
>
> **—National Climate Assessment, 2018**

THUMBNAIL

This webinar showcases two organizations working to advance the use of climate change information in engineering practice. The first speakers representing the Water Utility Climate Alliance and Minnesota Climate Adaptation Partnership present eight engineering case studies offering insights to practical approaches for adaptation. The second speaker, a member of the American Society of Civil Engineers, introduces concepts from the recent book: *Impacts of Future Weather and Climate Extremes on United States Infrastructure: Assessing and Prioritizing Adaptation Action.*

Engineering Case Study Resources:

- WUCA Engineering Case Studies
  https://www.wucaonline.org/adaptation-in-practice/engineering-case-studies/index.html
- Impacts of Future Weather and Climate Extremes on United States Infrastructure: Assessing and Prioritizing Adaptation Actions, by the Task Committee on Future Weather and Climate Extremes; Mari R. Tye, Ph.D., CEng, and Jason P. Giovannettone, Ph.D., P.E
  https://ascelibrary.org/doi/book/10.1061/9780784415863
- ASCE Future Weather and Climate Extreme Webinar Series
  https://www.asce.org/communities/institutes-and-technical-groups/changing-climate/conferences-and-events

Summary

Researchers for the **Water Utility Climate Alliance** (WUCA) interviewed more than 30 engineers to understand their needs for climate change information, and to understand how climate change information is or is not being used in planning, design, and engineering processes. They found that access to job relevant climate change information is limited, that many organizations do not have climate change expertise on staff, and that 55% of engineers interviewed look to other internal staff for climate change information. They also indicated that they prefer peer-to-peer learning focused on practical engineering approaches and business functions, and that case studies from other water utilities would be helpful. As a result, WUCA reviewed existing literature to identify different engineering processes and then worked with leading practitioners to develop eight practical case studies to demonstrate how engineers and managers are applying climate change data to engineering and infrastructure projects in the water sector. The Engineering Case Studies project provides a fascinating look into the science, social science, and regulatory elements involved in decision making, and each includes key take-aways to guide others.

The eight examples include:

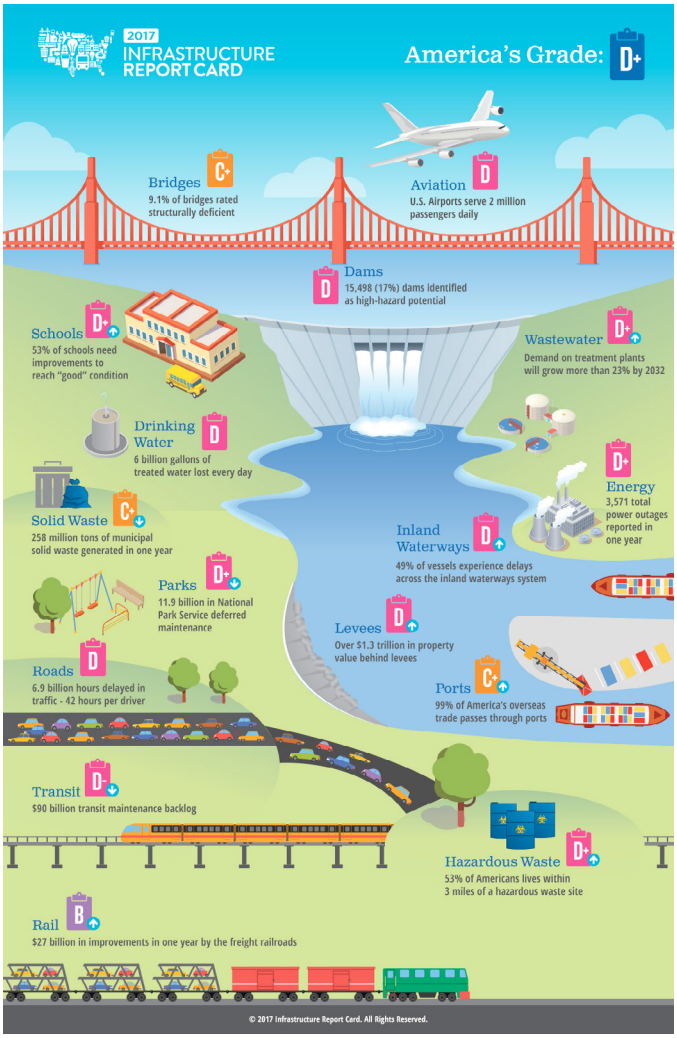
- Ship Canal Water Quality Project (Seattle Public Utilities)
- Colorado Dam Safety Program Dam Design (Colorado Department of Natural Resources)
- Wastewater Treatment Plant Upgrades (Miami-Dade Water and Sewer)
- Sea Level Rise Capital Planning Guidance (City and County of San Francisco)
- Climate Resiliency Standard Operating Procedure (New York Department of Environmental Protection)
- Drinking Water Cooling System (Tarrant Regional Water District)
- Low Lake Level Pumping Station (Southern Nevada Water Authority)
- Cloudburst Management Plan (The City of Copenhagen)

Source: Southern Nevada Water Authority, from WUCA

The **American Society of Civil Engineers** formed the Task Committee on Future Weather and Climate Extremes in 2017 to address the lack of guidance in ASCE codes and standards on addressing climate change. The committee produced a new book that examines how to prioritize climate adaptation actions between and within sectors under limited budgets. The prioritization framework considers four elements: define the vulnerability of the system (exposure, sensitivity, impact, adaptive capacity); consider potential hydro-meteorological impacts (e.g., temperature projections, precipitation, compound and cascading hazards); evaluate changes in return events (e.g., in one example, the amount of rain from a 20-year event was expected to happen twice as often compared to the past); and understand changes in snowmelt and streamflow (including drought and 'snow drought' especially in light of trends showing the center of volume of annual streamflow has shifted).

The speaker discussed the hierarchy of systems that are critical for human society to survive and thrive, based on six main sector categories, including special consideration of their interdependencies:

- Energy transmission, storage, and distribution
- Roads & bridges
- Transit & aviation
- Drinking water & wastewater
- Flood protection
- Navigation, ports & harbors



Source: American Society of Civil Engineers

Source: ISET-International

The book includes several prioritization approaches, for example,

- A qualitative heat plot emphasizes greater interdependency on the Y axis and greater short term impacts on the X axis,
- A Venn diagram of 3 key questions helps to identify which adaptation actions cover two or three concerns,
- A scatter plot provides a more quantitative approach for examining financial and social consequences based on selected criteria.

The ASCE committee aims to foster creative thinking informed by a multidisciplinary and socially diverse group to bridge the gap between research and practical application. This work is especially important in light of the fact that climate change has not been incorporated into the current version of ASCE 7 (ASCE 7-22) on Minimum Design Loads and Associated Criteria for Buildings and Other Structures – and that the next review will not occur for another six years. Meanwhile, both WUCA's work and the work of the ASCE committee can help to fill this gap.

QUESTIONS?

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SPONSOR WEBSITES

- NOAA Climate Program Office, Adaptation Sciences Program – **cpo.noaa.gov**
  (Search "*adaptation*" and/or "*water resources*")
- Water Utility Climate Alliance – **wucaonline.org**
- The Water Research Foundation – **waterrf.org**
- U.S. EPA Creating Resilient Water Utilities – **epa.gov/crwu**

SESSION 3:

Mapping Climate-related Risks & Opportunities to Key Business Functions

December 2, 2021

Session 3: Mapping Climate-related Risks & Opportunities to Key Business Functions

November 18, 2021

Speakers:

Emily Wasley, Practice Leader, Corporate Climate Risk, Adaptation & Resilience, WSP USA
Taylor Winchell, Climate Adaptation & Water Supply Planning, Denver Water
Alexis DuFour, P.E., Water Resources Engineer, Long term Vulnerability Project Manager, San Francisco PUC

THUMBNAIL

This webinar presents a Framework and Guidebook for "*Mapping Climate-related Risks and Opportunities to Water Utility Business Functions*." These resources are designed to foster organization-wide climate mainstreaming to streamline and embed climate science and adaptation into practices, plans, policies, and decisions. The framework is adaptive and flexible to help water utilities of any size to pinpoint risks and opportunities across their business functions. This project is a collaboration between the Water Utility Climate Alliance, The Water Research Foundation, Association of Metropolitan Water Agencies, Denver Water, and San Francisco Public Utility Commission.

Business Function Resources:

- *Project 4729 - Mapping Climate Exposure and Climate Information Needs to Water Utility Business Functions* (2020).
  - Research Report (including case studies), Framework Guidebook, and source of climate data in excel file are available from both The Water Research Foundation, **https://www.waterrf.org/research/projects/mapping-climate-exposure-and-climate-information-needs-water-utility-business** and the Water Utility Climate Alliance **https://www.wucaonline.org/publications/index.html** or
  - Webcast of the project, *Mapping Climate Exposure and Climate Information Needs to Water Utility Business Functions: Framework, Findings, and Insights from Practitioners*, Project 4729, 2020 is available from The Water Research Foundation **https://www.waterrf.org/resource/mapping-climate-exposure-and-climate-information-needs-water-utility-business-functions-2**
- *Project 5056 - An Enhanced Climate-Related Risks and Opportunities Framework and Guidebook for Water Utilities Preparing for a Changing Climate* (2021). A Framework and Supplemental Guidebook to 4729 based on lessons learned applying 4729 at Denver Water and SFPUC. Available from both The Water Research Foundation, **https://www.waterrf.org/research/projects/enhanced-climate-related-risks-and-opportunities-framework-and-guidebook-water**, and the Water Utility Climate Alliance **https://www.wucaonline.org/publications/index.html**
  - Webcast of the project: *Mapping Climate Exposure and Climate Information Needs to Water Utility Business Functions*, Project 5056, 2021 is available from the Water Research Foundation, **https://www.waterrf.org/resource/mapping-climate-exposure-and-climate-information-needs-water-utility-business-functions-3**

Summary

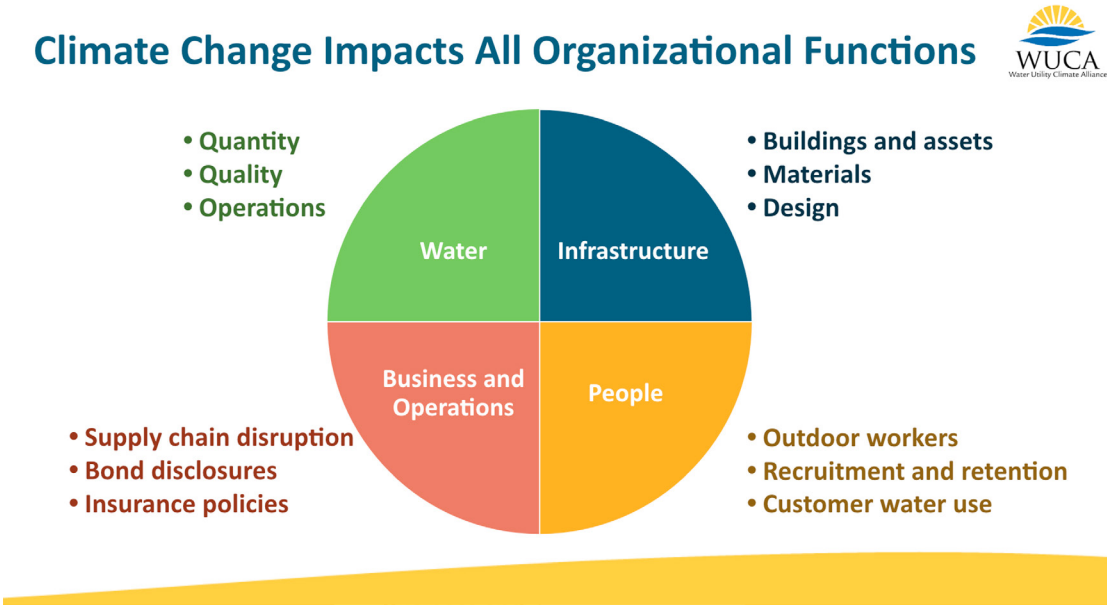
Climate change impacts not only water resources and infrastructure. Its effects are also felt throughout organizational functions. Proactively embedding climate information practices, plans, and decisions (mainstreaming) builds an organization's ability to rapidly adjust, take advantage of new opportunities, or cope with change – in other words, mainstreaming builds adaptive capacity.

The Water Utility Climate Alliance (WUCA), The Water Research Foundation, and the Association of Metropolitan Water Agencies conducted a project to understand how climate change affects water utility business processes. The two reports and case studies provide eye-opening insights: *Mapping Climate Exposure and Climate Information Needs to Water Utility Business Functions and An Enhanced Climate-Related Risks and Opportunities Framework and Guidebook for Water Utilities Preparing for a Changing Climate*.

The framework is the result of a carefully constructed research project involving study of existing frameworks, tailoring approaches for small, medium, and large utilities, and developing and pilot testing a guidebook with several utilities. The framework centers on a tabletop exercise that involves careful planning. To illustrate how it works, two case studies were presented during this webinar by Denver Water and San Francisco Public Utilities Commission.

Denver Water's tabletop exercise spanned 3 days of virtually facilitated discussion during which they identified more than 70 opportunities and solutions to mainstream climate change in their water treatment, water distribution, watersheds, and finance functions. As a result, they are investing in new climate research, expanding their tabletop exercise approach, and enhancing education, engagement, and communication across their enterprise.

San Francisco also conducted a tabletop exercise for 15 hours over 3 days using the framework to identify emerging risks and assess current preparedness. Participants identified more than 40 opportunities and solutions covering budget, planning, staffing, and strategy. Recognizing that more work needs to be done, the utility is continuing to work on ways to mainstream climate change into their business functions, supported by a recurrent budget line item.



Source: Water Utility Climate Alliance

Some of the lessons learned in these experiences include:

- Cross-collaboration and communication across an organization carries immense value and importance for moving forward.
- As evidenced by COVID-19, climate change will not be the only challenge people and systems face in these future scenarios, so building flexibility and resilience now is important.
- Before investing in new data or technologies, identify and explore the data you currently have access to and see if there are opportunities to share them across business functions.
- Smaller utilities can begin by reviewing WUCA's Leading Practices guides (described in Webinar 1), using U.S. EPA's CREAT tool, and hosting a Climate 101 to create a common understanding to help organizational members begin to ask the key questions.

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SESSION 4:

Equity and Environmental Justice Considerations in Climate Adaptation

December 9, 2021

Session 4: Equity and Environmental Justice Considerations in Climate Adaptation

December 9, 2021

Speakers:

Mami Hara, CEO, U.S. Water Alliance
Harriet Festing, Executive Director, Anthropocene Alliance
Chris Orvin, P.E., Urban Waters Team Lead, Office of Wetlands, Oceans, and Watersheds, USEPA
Yeana Kwagh, ORISE Research Fellow, Office of Wetlands, Oceans, and Watersheds, USEPA
Zach Schafer, Senior Advisor, Office of Water, USEPA

Resources:

- Anthropocene Alliance, **https://anthropocenealliance.org/**
- US Water Alliance - Equity Initiative, **http://uswateralliance.org/initiatives/water-equity**
- U.S. Environmental Protection Agency - Urban Waters, **https://www.epa.gov/urbanwaters**
- U.S. Environmental Protection Agency - Environmental Justice, h**ttps://www.epa.gov/environmentaljustice**

THUMBNAIL

Water equity occurs when all communities have access to clean, safe, affordable water and a healthy environment. In the US, more than 2 million people lack access to running water and many more experience water affordability or contamination issues. In addition to facing a barrage of issues including health and environmental disparities, vulnerable people and communities often do not have equal access to essential resources needed to be resilient to — or to recover from — the impacts of climate change such as flooding, extreme heat, and health risks. This webinar highlights lessons learned in the water resource realm with solutions to achieve equity and promote climate change adaptation — and which are applicable for other sectors to strengthen our communities.

Summary

The US Water Alliance (the Alliance) is a national coalition of diverse stakeholders pursuing a sustainable water future for all. The Alliance's work centers around three pillars of water equity: ensuring that all people have access to clean, safe, affordable water service; maximizing the social and economic benefits of water infrastructure investment; and fostering community resilience in the face of a changing climate. Nearly 30 cities across the country have joined the Alliance's Water Equity Network; teams in each city—including representatives from academic institutions, utilities, community organizations, environmental justice advocates, and more—are working together to address the most pressing local water challenges, including climate change.

For example, the Alliance's Imagination Challenge is leading this sector on a pathway to net zero carbon emissions in recognition of the water sector's role in reducing greenhouse gas emissions, and the Alliance's equity initiative helps foster resilient, thriving communities. Their many projects have led to key insights to guide equitable processes that lead to thriving communities amidst a changing climate, including:

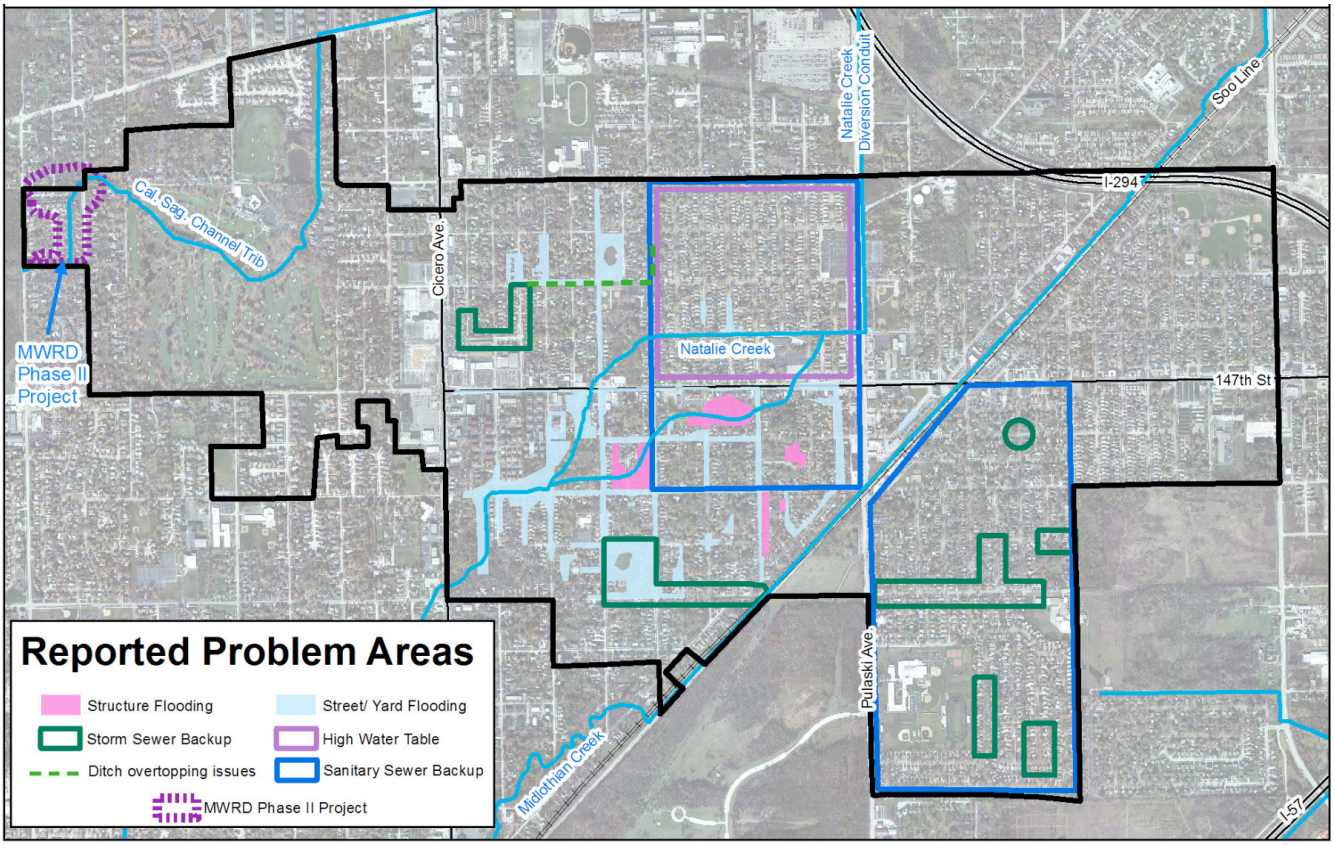
1. Reduce the risk by setting the table with a trusted national convenor.
2. Position water utilities as community-centered anchor institutions.
3. Lift up the wisdom, voice, and experience of the community.
4. Embrace an adaptive management approach.
5. Build culture and capacity for long term collaboration.
6. Move at the speed of trust.
7. Know the risks and address missteps.

Demonstrating similar approaches, the Anthropocene Alliance (A-Alliance) works with underserved communities on climate, justice, and equity. With more than 100 members in 35 states and territories, the A-Alliance began by working with communities impacted by flood, wildfire, heat, drought, and other environmental issues. The A-Alliance uses a "Frontline 360" approach by providing a core package of pro bono scientific, technical, legal, and policy support; grant writing services; and connections to the media, government, and members of congress.

Citizens' Committee for Flood Relief, De Soto, MO.
Source: Anthropocene Alliance

The bottom line for the Anthropocene Alliance is that the "great American climate migration can only be addressed by working at the VERY grassroots level. To take advantage of the huge opportunity offered by the bipartisan infrastructure bill, the A-Alliance suggests that in order for the government and its partners to get resources to the right people they need to:

1. Build off existing programs and structures.
2. Bring in multi-expert teams e.g., USACE Silver Jackets.
3. Target communities according to needs versus competitive processes.
4. Pay community based leaders and organizations for their time and recognize their expertise.
5. Co-design the approach and not over-define the parameters.
6. Put boots on the ground as well as providing information-based solutions (tool kits, training).
7. Focus on scaling versus pilots.
8. Accept conflict: environmental justice communities have been dumped on and have the right to appeal.



Midlothian, Illinois is affected by four primary types of flooding. Source: Anthropocene Alliance

The U.S. Environmental Protection Agency (EPA) also sponsors programs to redress inequity, including its Urban Waters environmental justice program focused on helping disadvantaged citizens have access to safe, clean, waterways and affordable drinking water and wastewater services, and to be resilient to climate change. The Urban Waters Federal Partnership brings together fifteen federal agencies and hundreds of nonprofit and academic partners to work holistically at the community scale to achieve environmental and economic goals. Examples of resources brought to communities include community ambassadors that act as convenors, an expansive peer learning network, and restoration grants and matching funds.

Water utilities are in an optimal position to serve as anchor institutions for equity, but to do so requires taking time to build understanding and trust. Every local project is unique, requiring location specific assessments to understand community concerns, identify mutual priorities, build trust, and develop equitable solutions.

The infrastructure bill is a transformational opportunity and EPA is working to bend the arc of investments for both equity and climate resilience. For example, under the Justice 40 initiative, at least 40% of benefits of federal funding will be directed to vulnerable communities, and half of funding will be delivered as grants or fully forgiven loans. EPA is also working with communities who need assistance to help them access funding and technical assistance.

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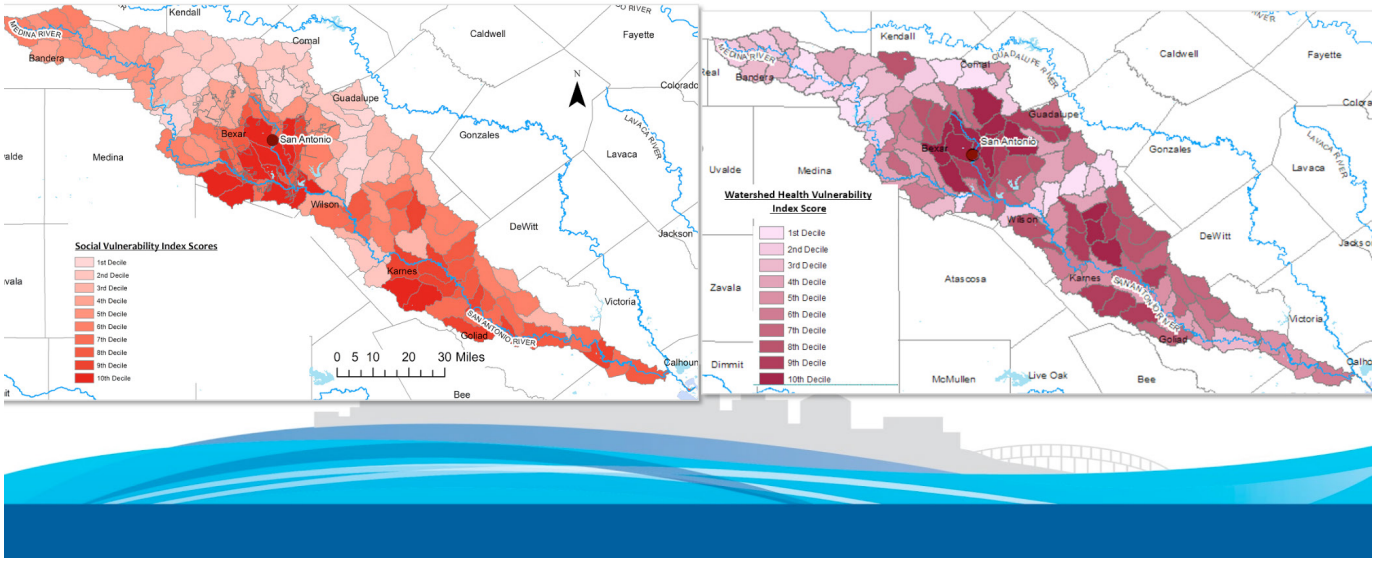
Water Equity Mapping



Social Vulnerability Index overlayed with Watershed Health Vulnerability Index to identify hot spots. Source: U.S. EPA EJScreen

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- Water Utility Climate Alliance – **wucaonline.org**
- The Water Research Foundation – **waterrf.org**
- U.S. EPA Creating Resilient Water Utilities – **epa.gov/crwu**

SESSION 5:

Green Stormwater Infrastructure

January 6, 2021

Session 5: Green Stormwater Infrastructure

January 6, 2021

Speakers:

Pinar Balci, PhD, Assistant Commissioner of Environmental Planning and Analysis, New York City Department of Environmental Protection
Janet Clements, President, One Water Econ
Robyn DeYoung, Lead of Green Infrastructure Program, US Environmental Protection Agency

THUMBNAIL

Water equity occurs when all communities have access to clean, safe, affordable water and a healthy environment. In the US, more than 2 million people lack access to running water and many more experience water affordability or contamination issues. In addition to facing a barrage of issues including health and environmental disparities, vulnerable people and communities often do not have equal access to essential resources needed to be resilient to — or to recover from — the impacts of climate change such as flooding, extreme heat, and health risks. This webinar highlights lessons learned in the water resource realm with solutions to achieve equity and promote climate change adaptation — and which are applicable for other sectors to strengthen our communities.

Resources:

- WRF Project #4852, Economic Framework and Tools for Quantifying and Monetizing the Triple Bottom Line Benefits of Green Stormwater Infrastructure. **https://www.waterrf.org/research/projects/economic-framework-and-tools-quantifying-and-monetizing-triple-bottom-line**; **webinar**.
- NYC DEP Green Infrastructure Program, **https://www1.nyc.gov/site/dep/water/green-infrastructure.page**
- EPA Green Infrastructure, **https://www.epa.gov/green-infrastructure**, including Green Infrastructure Toolkit, **https://www.epa.gov/water-research/green-infrastructure-modeling-toolkit**

Summary

The U.S. Environmental Protection Agency (EPA) is working cooperatively with ten federal agencies to promote the use of green infrastructure (GI) to protect the environment, improve resilience to climate change, and redress historic inequities. EPA and the federal partners are working to promote resilient, equitable and vibrant communities by engaging underserved communities to co-create solutions that build environmental resilience and that build a green workforce while creating jobs in underserved communities. The partnership, for example, is:

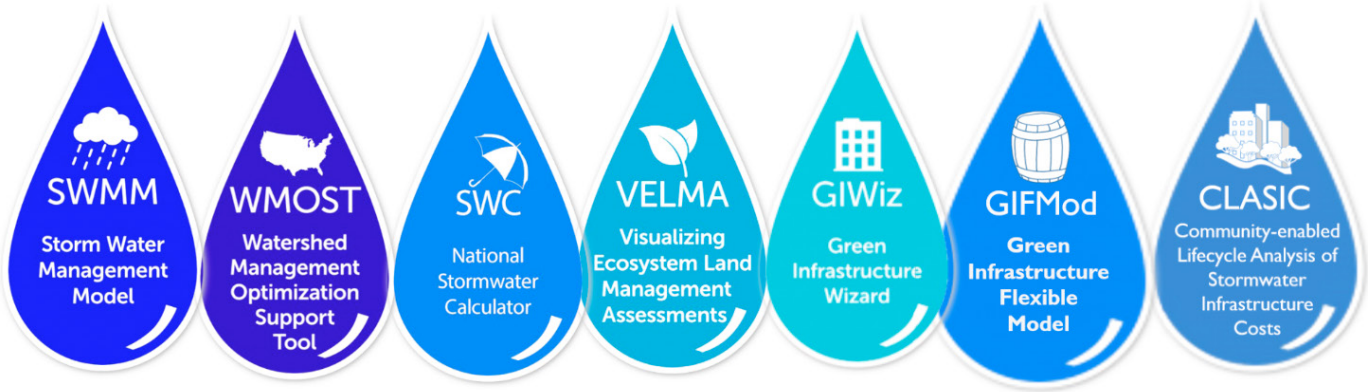
1. Engaging the public not only with webcasts and outreach materials.
2. Building community capacity by providing modeling tools and trainings.
3. Partnering with the Association of Floodplain Managers and Association of Wetland Managers for outreach and technical assistance.
4. Updating the Clean Water Needs Survey 2022 for states which will be used for future budget allocations; and
5. Providing technical assistance and funding to communities through the Bipartisan Infrastructure Law, the Clean Water State Revolving Fund, and the Urban Waters federal partnership program.

Source: Photograph by Mike Peel (**www.mikepeel.net**)

The experience of New York City illustrates how a water and wastewater utility incorporated green stormwater infrastructure to control its combined sewer system overflows while also addressing the worsening impacts of climate change on higher temperatures, increased precipitation, and sea level rise. Recognizing that they couldn't do it using only public lands, NYC is now expanding green infrastructure practices on private land to reach their goal of reducing overflows by 1.67 billion gallons per year by 2030.

In 2021, the City already reduced more than 500 million gallons of combined sewer overflows primarily using public lands on 1,500 greened acres. The City is

EPA's Green Infrastructure Model



https://www.epa.gov/water-research/green-infrastructure-modeling-toolkit

Source: EPA.

Regulations and Incentives

Unified Stormwater Rule
Rule amendments to align stormwater requirements across the city, provide greater onsite stormwater management and a retention-first approach.

Green Roof Tax Abatement
Provides a one-time property tax abatement of $5.23 per SF for properties that install green roofs. Properties within priority districts will receive a tax abatement of $15 per SF.

Green Infrastructure Grant Program
Funds the design and construction of green roof retrofits on private property.

Water Reuse Grant Program
Private property owners that save at least 1 MGY of water through implementation of water efficiency technologies, such as onsite water reuse systems, are eligible for a $10 per gpd water savings achieved

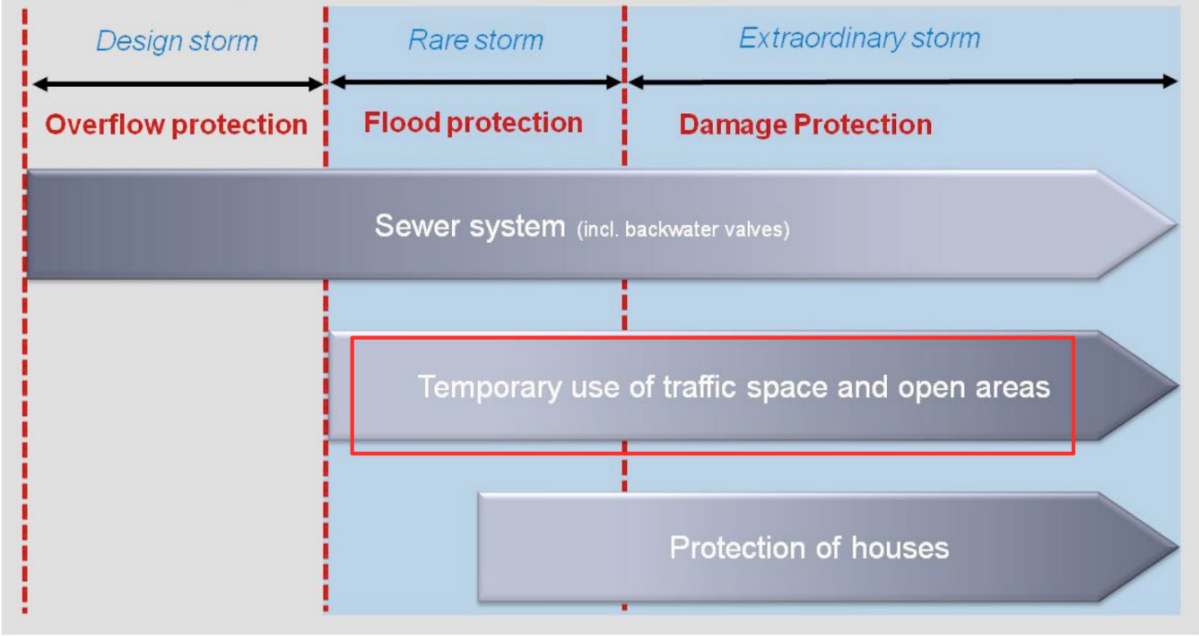
Water/Wastewater Rate Discount
DEP offers a 25% water fee and 76% wastewater fee discount who install reuse systems that reduce the building's water consumption by at least 25% & discharge less than 25% of their wastewater flow

New York City Regulations and Incentives.
Source: Balci.

now turning to the private sector to green an additional 200 acres by targeting highly impervious lots 50,000 SF or larger and using a pay-for-performance framework that provides $250,000 per greened acre, plus bonus payments. Comparing costs, the City realized that private incentives such as these are two to four times cheaper than using public rights-of-way and other public sites. (Costs include design, construction, construction management, and program administration).

But NYC has been grappling with how to manage a new phenomenon relative to climate change: managing cloudbursts - sudden, heavy downpours where a high volume of rainfall occurs in a short amount of time and that exceed the capacity of the sewer system, leading to localized flooding. Their new management approach for short duration high intensity events is to slow, delay, and divert water by creating hydraulic connectivity to store occasional flooding on site. For example, their innovative practices do more with open space, blending form and function in land use designs, and using large-capture road medians.

Cloudburst Management: Slow, Delay, Divert



Elements of flood protection of municipal drainage systems (Reference: DWA, 2008)

Source: DWA, 2008

Hearing from a OneWater economist, webinar participants learned about a framework and tool for quantifying the triple bottom line (TBL), accounting for financial, social, and environmental benefits of green stormwater infrastructure projects. The tool, developed with the engagement of fourteen water utilities, identifies the alternatives that maximize community value, which helps build support in the competition for scarce funding. It can also be used to leverage private capital, alternative funding, partnerships, and incentive programs.

The customizable TBL Tool uses standard economic valuation methods at the neighborhood, city, and watershed scales. In case studies of projects in Seattle and Boca Raton, the benefit-cost ratio of green infrastructure projects was 1.45 and 1.53 respectively.

These experiences demonstrate that green infrastructure can cost effectively help communities tackle the multiple challenges they face - including climate change, underserved communities, and aging infrastructure.

Triple Bottom Line. Source: Research Gate

QUESTIONS?

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- Water Utility Climate Alliance – **wucaonline.org**
- The Water Research Foundation – **waterrf.org**
- U.S. EPA Creating Resilient Water Utilities – **epa.gov/crwu**

SESSION 6:

Greenhouse Gas and Energy

January 20, 2022

Session 6: Greenhouse Gas and Energy

January 20, 2022

Speakers:

Alaina Harkness, Executive Director, Current
Svetlana Taylor, Technical Program Director, Current
Taylor Winchell, Climate Adaptation & Water Supply Planning, Denver Water

THUMBNAIL

Drinking water and wastewater utilities use energy to move and treat water, accounting for 30% of a utilities' total costs. Water utilities have been exploring ways to reduce energy use and greenhouse gas emissions not only through energy and water conservation but also to harness the energy and other resources embedded in wastewater. This webinar focuses on two research projects: 1) case studies highlighting a variety of innovative greenhouse gas mitigation projects at water supply utilities, and 2) a study examining various methods for how private property owners and municipalities can implement sewer thermal energy use (STEU) technologies to recover and reuse energy embedded in wastewater.

Resources:

- Current, **www.currentwater.org**, a nonprofit innovation hub in Chicago, IL whose mission is to grow an inclusive blue economy, accelerate innovation, and solve pressing water challenges.
- Project 4843, *Integrating Sewage Thermal Energy Use (STEU) and Other Emerging Water-Energy-Waste Technologies into Distributed/Decentralized Systems*, (PI: CurrentWater.org), **https://www.waterrf.org/research/projects/integrating-sewage-thermal-energy-use-steu-and-other-emerging-water-energy-waste**
- Water Utility Climate Alliance, *Greenhouse Gas Mitigation Case Studies*, **https://www.wucaonline.org/adaptation-in-practice/greenhouse-gas-mitigation/index.html**

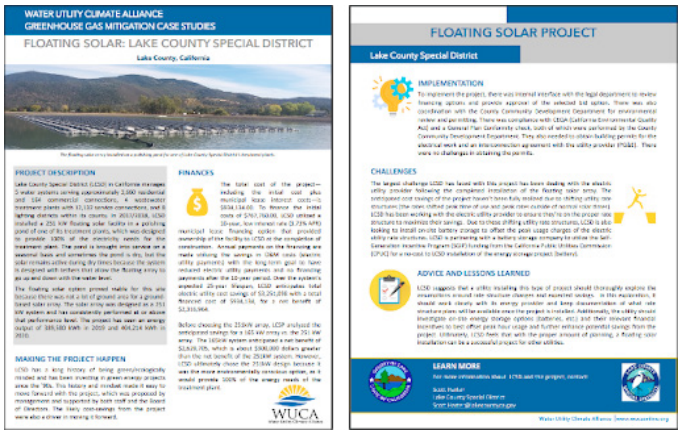
Summary

Water utilities are at the nexus of greenhouse gas mitigation and climate adaptation. Both water supply utilities and wastewater treatment utilities use significant amounts of energy and thus have many opportunities to not only reduce energy use, but to also produce energy. They are trusted community leaders, often have relationships with electric utilities, and own significant amounts of land. In response to water managers' questions, the Water Utility Climate Alliance developed case studies to demonstrate how water utilities in communities nationwide and around the world were taking on the climate challenge.

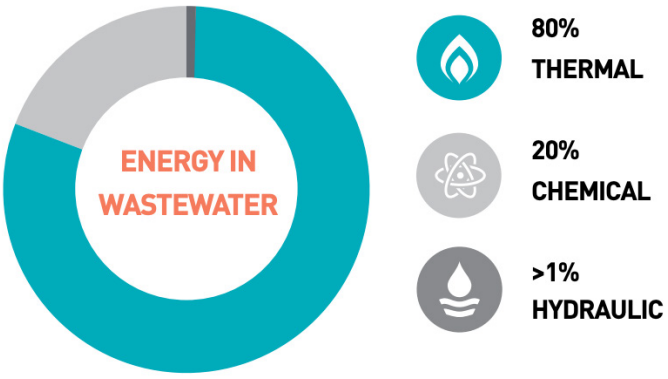
There are opportunities for both water and wastewater utilities to generate energy and reduce energy use.While this webinar highlighted a few examples, the WUCA website has more case studies demonstrating a wide variety of innovations, with more to come:

- Solar
- Floating solar
- Pump optimization/efficiency
- Fleet efficiencies
- Wind
- Battery storage
- Inline micro hydro
- Sustainable treatment plant desalination efficiencies
- Biogas to local natural gas
- Using distributed system for cooling and heating
- Greenhouse gas tracking
- Carbon free water

Turning to the wastewater side of the equation, a study sponsored by the Water Research Foundation documented ways to recover energy from wastewater. Wastewater contains five times more energy than a wastewater plant consumes in the form of 80% thermal, 20% chemical, and a small amount of hydraulic energy. Recovering thermal energy from the waste stream – known as sewage thermal energy use or STEU - is an energy recycling strategy that can provide energy for various uses by people and industries and can decarbonize the heating and cooling sector. The primary technologies are heat pumps and heat exchangers which have been in use for more than 100 years.



Source: WUCA, 2022



Source: WRF 2020. Reprinted with permission. The Water Research Foundation.

Switzerland was the first to use heat recovery in wastewater systems in 1975 and from raw sewage in 1981, and now are in use in thousands of systems worldwide.

Heat pumps efficiently convert low-grade heat of wastewater to high-grade heat that can be used for heating domestic hot water and building spaces often producing three to five times the amount of energy they consume. Another important advantage is that the same equipment can be used to turn the process around to remove heat, offering a low-energy water-efficient alternative to conventional air-conditioning technologies.

Energy recovery systems are appropriate to adopt in various public and private scenarios, including situations where wastewater is produced onsite, where it comes from a nearby sewer, is supplied to the user (such as from a public utility), or is part of a heating and/or cooling loop.

These approaches are proven technologies that are ready for deployment and offer significant potential to reduce carbon emissions in urban environments, save energy, and deliver other economic, environmental, and social benefits. To speed their adoption, policies and regulations are needed related to energy sector decarbonization, wastewater thermal energy ownership and utilization, urban planning and design, and building codes.

The case studies documented in these two projects showed that:

- Leadership drive is essential
- Board-approved energy policies can help
- Two-way communication with operations staff is necessary
- Consider what is the best option: to own or not to own?
- Decide whether to tie back to the grid or not
- Cost savings matter
- Collective purchasing power provides efficiencies
- Water utilities are reliable purchasers of energy
- There are so many opportunities!

QUESTIONS?

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SESSION 7:

Climate Warming and Impacts to Staff and Assets

February 3, 2022

Session 7: Climate Warming and Impacts to Staff and Assets

February 3, 2022

Speakers:

Margaret Morrissey, President, National Heat Safety Coalition, Korey Stringer Institute
Keely Brooks, Climate Change Policy Analyst, Southern Nevada Water Authority; WUCA
Paul Gully, Senior Regional Planner, Regional Transportation Commission of Southern Nevada

THUMBNAIL

High temperature poses risk to worker health and safety and to water utility infrastructure. Speakers in this session highlight two studies, including one by the Water Utility Climate Alliance (WUCA) and the Association of Metropolitan Water Agencies (AMWA), that analyze the impact of extreme temperature on critical water utility physical infrastructure assets and personnel, and provide insight into how to prevent heat stress injury and death.

Resources:

- Heat Safety in the Workplace: Modified Delphi Consensus to Establish Strategies and Resources to Protect the US Workers. **https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2021GH000443**
- Heat Impact Case Studies, **https://www.wucaonline.org/adaptation-in-practice/heat-impact-case-studies/index.html**
- Southern Nevada Extreme Heat Vulnerability Webmap, **https://www.rtcsnv.com/projects-initiatives/transportation-planning/planning-studies-reports/extreme-heat-vulnerability/**
- Strengthening Heat Resiliency in Communities of Color in Southern Nevada. **https://guinncenter.org/wp-content/uploads/2021/09/Guinn-Center-Strengthening-Heat-Resiliency-in-SNV.pdf**

Summary

Every day, eleven workers are seriously injured or die from heat stress in the U.S with an estimated cost per injury of more than $53,000. Reduced productivity due to high heat conditions causes $55 billion in lost earnings annually. Given the fact that 7 of the 10 hottest years on record have occurred since 2000, with more severe heat waves likely to increase in the future due to climate change, this number is projected to grow to 4% of GDP by 2100.

The good news is that 100% of heat-related deaths are preventable. The National Heat Safety Coalition at the Korey Stringer Institute advises employers to use various workplace strategies including prevention (heat acclimatization, environmental monitoring, body cooling) and implementation of a heat policy to address heat-related medical emergencies. One of the keys to reducing heat-related injury and death is training initiatives that focus on recognition and treatment of heat-related illnesses. For exertional heat stroke, the number one goal is to reduce core temperature within the first 30 minutes. Delayed treatment can lead to a greater risk for long term complications or even death.

Higher temperatures also affect infrastructure in several ways. It will cost more money to cool facilities; mechanical components including motors and motor-controlled centers and systems are susceptible to heat resulting in shorter lifespan or loss of service; materials and treatment processes can be compromised; and water supplies are likely to be stressed.

Five water and wastewater utility case studies can provide insight into best practices for adjusting to increasing heat: Southern Nevada Water Authority, Denver Water, Portland Water Bureau, Oklahoma City Utilities, and Miami-Dade Water and Sewer Department, available at the WUCA website. One case study highlighted that even localities that are used to working in warm climates realize the need to prepare for higher temperatures.

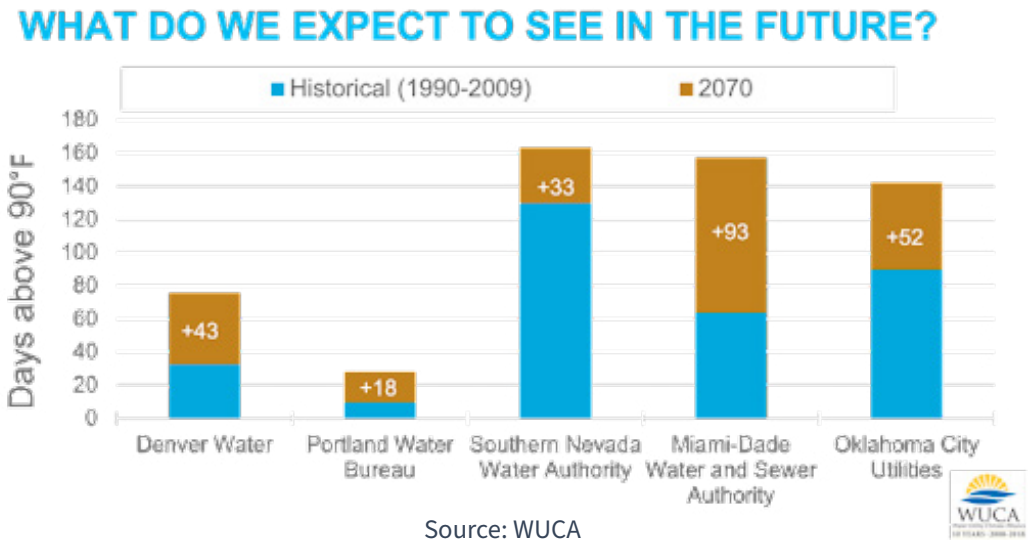
For example, in Southern Nevada, which has an average daytime summer high of 104o F, summers have been getting even hotter, rising from an average of 68 days per year over 100o F from 1990-1999, to 84 days from 2010-2019. The Southern Nevada Water Authority case study found that the heat index (temperature plus humidity) in Southern Nevada will triple by 2070 and, without taking action, workplace accidents could increase 8-17%, with daily down times of nearly 2 hours per worker. As a result, SNWA is increasing staff training to recognize heat stroke and be able to quickly implement emergency procedures and have adopted a communication campaign to ensure that notices are sent to all employees early and often.

Source: National Heat Safety Coalition

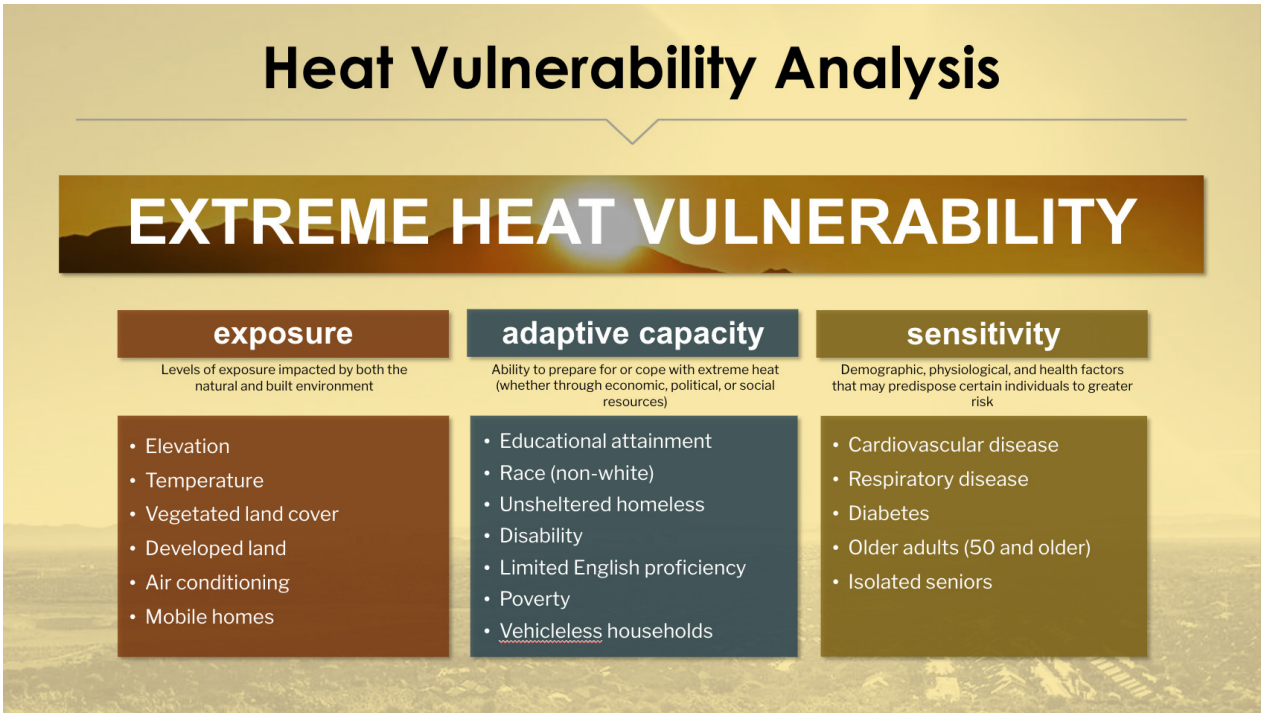
Heat Stress Prevention Strategies
Heat Hygiene Practices
Hydration
Heat Acclimatization
Environmental Monitoring
Physiological Monitoring
Body Cooling
Textiles/Personal Protective Equipment
Emergency Action Plan Implementation

Source: National Heat Safety Coalition

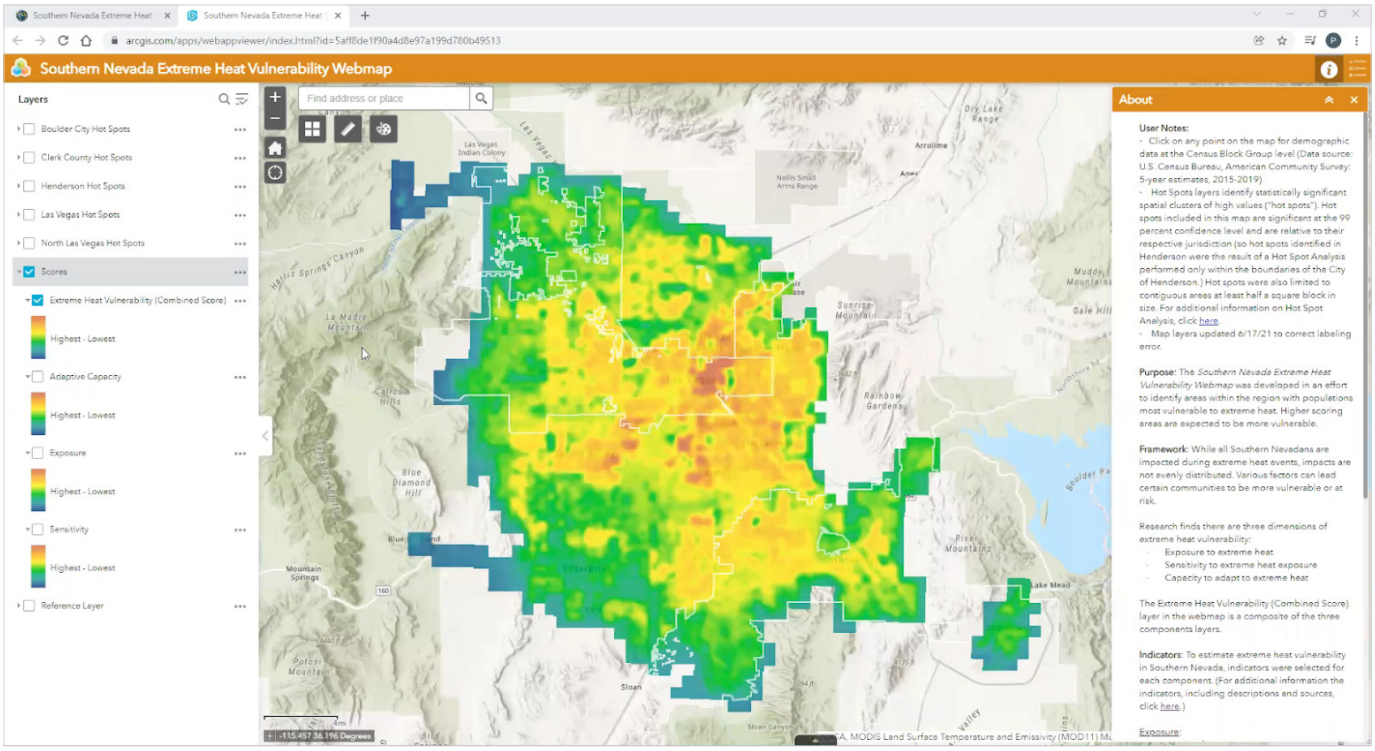
The Regional Transportation Commission of Southern Nevada (RTC), which often collaborates with SNWA, has also been paying attention to extreme heat in recent years. And with good reason: A recent report by a Las Vegas-based policy institute found that southern Nevadans are most likely to experience extreme heat conditions during their commutes. The RTC has been working with local partners to analyze extreme heat vulnerability in the region and explore actions to mitigate heat and minimize its health impacts. The RTC's heat vulnerability webmap enables users to zoom in to the neighborhood level to locate and examine areas with populations most vulnerable to extreme heat conditions, and can help inform heat reduction strategies. Cool pavement, tree canopy expansion, bus shelter design, and community outreach are all strategies currently being explored to better address heat vulnerability in the region. Water utilities too can benefit from understanding sources of risk for their employees.



Source: WUCA



Source: Regional Transportation Commission of Southern Nevada



Source: Regional Transit Commission of Southern Nevada

The webinar speakers' last words of advice:

- Working collaboratively with partners is critical - one agency cannot tackle this alone.
- Communication from environmental health and safety is essential to ensure that staff know what to expect on impending heat days and to remind them what to do.
- Heat has negative effects on health safety and on productivity: but heat related injuries can be prevented with appropriate prevention strategies and heat policies and procedures.

QUESTIONS?

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SPONSOR WEBSITES

- NOAA Climate Program Office, Adaptation Sciences Program – **cpo.noaa.gov** (Search "*adaptation*" and/or "*water resources*")
- Water Utility Climate Alliance – **wucaonline.org**
- The Water Research Foundation – **waterrf.org**
- U.S. EPA Creating Resilient Water Utilities – **epa.gov/crwu**

SESSION 8:

Federal and Other Funding for Adaptation

February 17, 2022

Session 8: Federal and Other Funding for Adaptation

February 17, 2022

Speakers:

David Goldbloom-Helzner, Physical Scientist, Office of Water, US EPA
Kim Penn, Manager, Coastal Communities Program, NOAA
Samuel Capasso, Branch Chief, US Federal Emergency Management Agency
Dan Hartnett, Chief Advocacy Officer, Association of Metropolitan Water Agencies

THUMBNAIL

Federal funds and other resources for climate related initiatives have dramatically increased for spending over the next five years. However, there has proven to be a large gap in the understanding where to find these funds and how to access them. And, many smaller communities don't have the technical or staff resources to be able to apply. This session aims to improve understanding of available financial resources and technical assistance and connects the audience with opportunities for community-based and sector-focused funding.

Resources:

Multi-Agency Resources

- Federal Funding for Water and Wastewater Utilities in National Disasters (Fed FUNDS). **www.epa.gov/fedfunds**

U.S. EPA

- EPA Water Finance Clearinghouse. **https://www.epa.gov/waterdata/water-finance-clearinghouse**

FEMA

- FEMA Resources for Climate Resilience **https://www.fema.gov/sites/default/files/documents/fema_resources-climate-resilience.pdf**
- Hazard Mitigation Assistance Mitigation Action Portfolio (fema.gov) **https://www.fema.gov/sites/default/files/2020-08/fema_mitigation-action-portfolio-support-document_08-01-2020_0.pdf**
- Hazard Mitigation Assistance Program Overview: Hazard Mitigation Assistance (fema.gov) **https://www.fema.gov/sites/default/files/documents/fema_summary-fema-hazard-mitigation-assistance-grant-programs_032321.pdf**
- Mitigate Disaster Damage with FEMA Public Assistance **https://www.fema.gov/sites/default/files/2020-06/fema-pa406-mitigation-brochure.pdf**
- Resources for Applying to Hazard Mitigation Assistance Grants | FEMA.gov **https://www.fema.gov/grants/mitigation/applying**
- Summary of FEMA Hazard Mitigation Assistance Grant Programs **https://www.fema.gov/sites/default/files/documents/fema_summary-fema-hazard-mitigation-assistance-grant-programs_032321.pdf**

NOAA

- Adapting Stormwater Management for Coastal Floods/ **https://www.Coast.noaa.gov/stormwater-floods/**
- Coastal Flood Exposure Mapper. **https://www.Maps.coast.noaa.gov/digitalcoast/tools/flood-exposure.html**
- Digital Coast: Data, Tools, and Technical Assistance. **coast.noaa.gov/digitalcoast**
- Financing Coastal Resilience Webinar Series. **coast.noaa.gov/digitalcoast/training/funding-webinars.html**
- Funding and Financing: Options and Considerations for Coastal Resilience Projects. **coast.noaa.gov/digitalcoast/training/financing-resilience.htm**
- National Coastal Resilience Fund through the National Fish and Wildlife Foundation. **http://Nfwf.org/programs/national-coastal-resilience-fund**
- Sea Level Rise Viewer. **https://www.Maps.coast.noaa.gov/.digitalcoast/tools/slr.html**

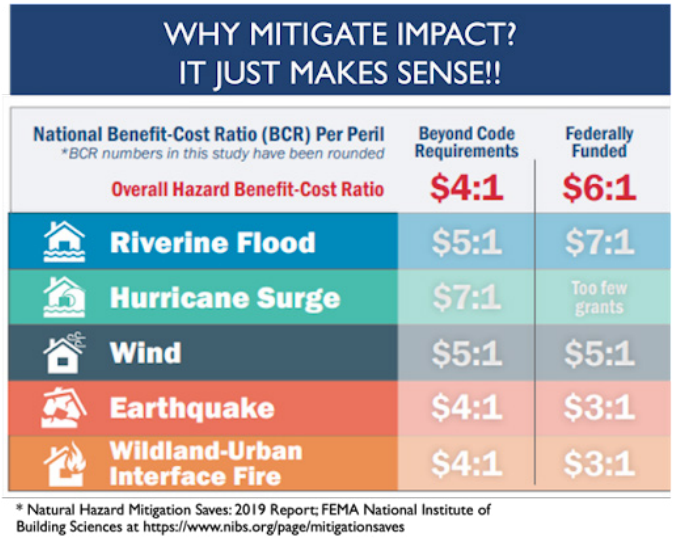
Non-Governmental Resources

- Now is a Great Time for Hazard Mitigation Funding. OpFlow, June 2021
- Successfully Funding Resilience, WEF Conference. February 24, 2022
- Thirsting for Projects and Funds to Mitigate Drought. OpFlow, June 2022

Summary

Readers of this webinar series summary know that building resilience to climate change and recovering from impacts when they happen is a necessity for community health and wellbeing. What some may not know is that planning for the future makes economic sense. Studies have found that there is an average 4:1 benefit-to-cost ratio for investing in resilience, and by using federal funds the ratio rises to 6:1. One example is Elkader, Iowa, population 1,213, built near the Turkey River that is prone to flooding. Using State funding with a 50/50 cost share, the community withstood major flooding events in 2004 and 2008 – avoiding losses to their wastewater lagoon and lift station worth more than 5 times the cost -- and was able to continue to function throughout the events.

The Bipartisan Infrastructure Law signed in November 2021 (sometimes referred to as BIL and sometimes referred to as the Infrastructure and Jobs Investment



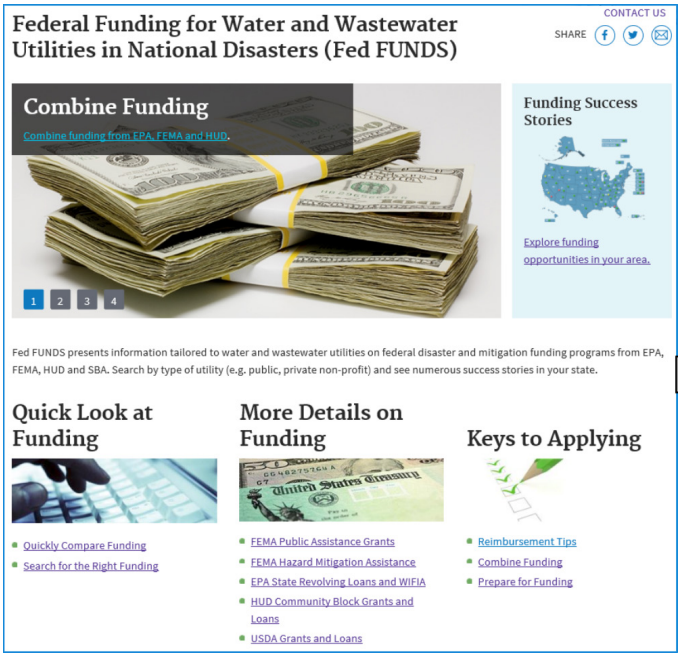
Source: Natural Hazard Mitigation Saves: 2019 Report; FEMA National Institute of Buiding Sciences

Act or IJIA) boosts many funding programs. For example, for water and wastewater systems and eligible stormwater projects, the two state revolving funds (SRFs) for drinking water and for clean water were each boosted $48 billion over 5 years. More than that, the new funding significantly helps small and disadvantaged communities by allowing half of those funds to be grants or fully forgivable loans. Agencies are adopting other changes as well to help prepare for climate change. A formal agreement between the Federal Emergency Management Agency (FEMA) and the US Environmental Protection Agency (EPA) allows EPA state revolving fund money to be used for the 25% match required by FEMA. In essence, a project could be 100% federally funded. EPA is also developing a program to provide advice directly to water utilities.

But accessing funding can be a challenge for anyone – especially small communities. To resolve this, EPA worked with other federal agencies to create *FedFUNDS*, a one stop shop to help communities wade through the alphabet soup of federal funding opportunities and to help find ways to combine funding from different agencies.

Much of the available funding can be used for improving resilience to climate change. At US EPA, the two SRF funds can be used to build resilience in several ways, including for

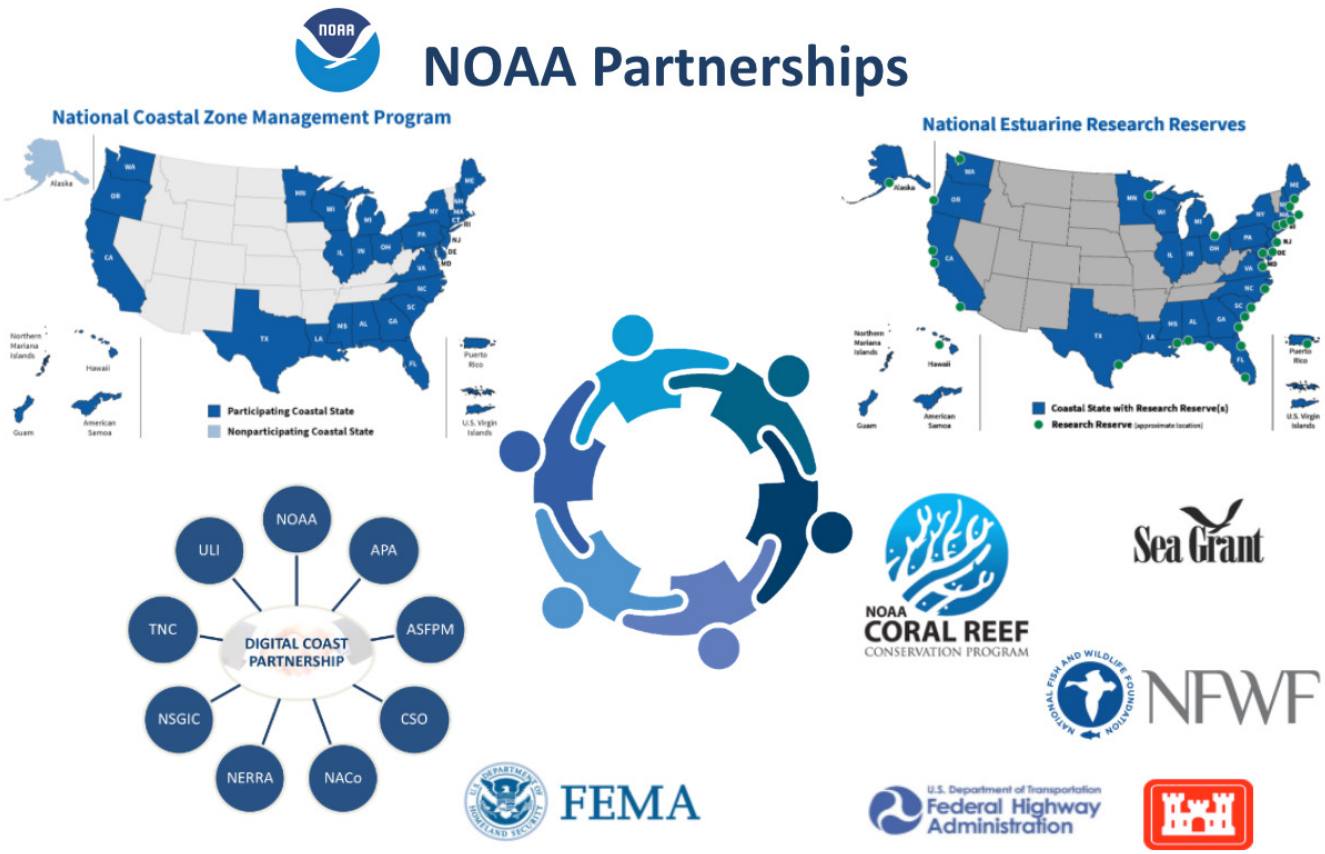
- Relocation/elevation of treatment plants
- Physical flood barriers (e.g., sea walls, levies, dikes, berms)
- Backup generators (new or replacement) and fuel transport/storage
- Wind Resistance
- Drought contingency plans
- Wells – additional, replacement, deepening
- Intakes – reposition, relocation, elevation, alternative, backup
- Vulnerability assessments and operational security



Source: epa.gov/fedfunds

The Water Infrastructure Financing and Investment Act (WIFIA) can also be used to build resilience for:

- Wastewater conveyance and treatment projects eligible for Clean Water SRF
- Drinking water treatment and distribution projects eligible for Drinking Water SRF
- Enhanced energy efficiency projects at drinking water and wastewater facilities
- Brackish or seawater desalination, aquifer recharge, alternative water supply, and water recycling projects
- Drought prevention, reduction, or mitigation projects
- Acquisition of property if integral to project or mitigates environmental impact



Source: Office for Coastal Management

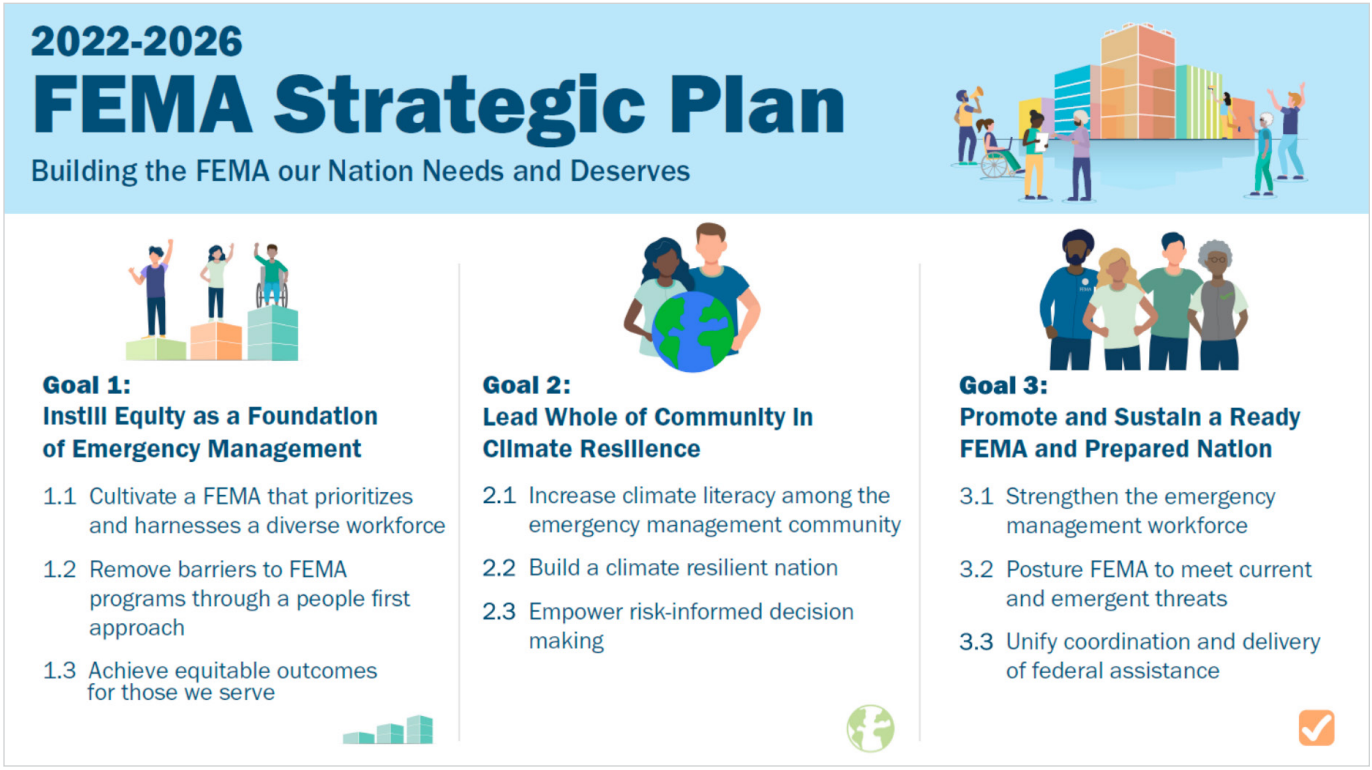
In addition to funding opportunities for resilience, the National Oceanic and Atmospheric Administration (NOAA) programs also offers tools and partnerships including for coastal and Great Lakes communities. One tool in particular, Digital Coast, can help a community build their relationship with FEMA. An online webinar series - Estimating Economic Value to Inform Decisions Making - is a particularly useful aid.

FEMA provides funds both to build resilience to nature-based impacts (including from climate change) as well as to build back better after disasters. FEMA is also working to make its financial resources more accessible and equitable.

To be eligible for FEMA funding a county must have a FEMA approved local hazard mitigation plan. Furthermore, once an emergency has occurred anywhere in your state, funding can be used anywhere for any project, not just where the emergency occurred. Start by contacting your local emergency management agency to find out how your climate adaptation project can be funded.

FEMA advises communities to plan now for future conditions. Ask: What will my community look like at the end of the project's useful life? Where will people live and how will it grow? How will the region around your community change? And be ready: have your project scoped before an emergency occurs.

Start your benefit-cost analysis early – the biggest hurdle to getting funding approved is due to lack of documentation. The benefit-cost analysis should include not just the costs of construction, repair, and operations, but also its value to society.



Source: FEMA

In summary, the bipartisan infrastructure bill provides $550 billions to build resilience for the nation's infrastructure and to build back better once a natural disaster hits. Federal agencies are working to make this funding as accessible as possible for all communities – including and especially for small, rural, and disadvantaged communities.

QUESTIONS?

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