Smart Management for Small Water Systems

Resilience: Planning on disaster and preparing for disruption

September 20, 2017 | Webinar

Brandy Espinola, Program Manager, University of Maryland
www.efcnetwork.org

EFCN environmental finance center network

American Water Works Association

This program is made possible under a cooperative agreement with the U.S. EPA.

CEU Certificates

If you need a CEU certificate, you will need to confirm the following on the roster today before you leave:

- Is your name spelled correctly?
- Did you provide an email address UNIQUE TO YOU? A unique email address is required to access your certificate on the AWWA website.
- Did you mark the checkbox that you need a certificate?

Within 30 days of the training, you will receive an email with instructions to print your certificate. Emails from AWWA may be blocked or go to your Junk mail. To avoid this issue, add *educationservices@awwa.org* to your email Contacts or check your Junk mail frequently.

AWWA will apply to the water operator state licensing agency for CEU preapproval when applicable. You may be awarded CEUs by your agency. It is your responsibility to confirm with the agency that training meets relevancy criteria established for your license type as some agencies may not apply CEUs to your license if the training topic is not relevant to your position.

AWWA follows the IACET Standard of CEU calculation.
0.1 CEU = 1 Contact Hour or 1 Professional Development Hour

Questions? Please contact *educationservices@awwa.org*

About the Environmental Finance Center Network (EFCN)

The Environmental Finance Center Network (EFCN) is a university-based organization creating innovative solutions to the difficult how-to-pay issues of environmental protection and improvement. The EFCN works with the public and private sectors to promote sustainable environmental solutions while bolstering efforts to manage costs.

The Smart Management for Small Water Systems Program

This program is offered free of charge to all who are interested. The Program Team will conduct activities in every state, territory, and the Navajo Nation. All small drinking water systems are eligible to receive free training and technical assistance.

What We Offer

Individualized technical assistance, workshops, small group support, webinars, eLearning, online tools & resources, blogs

The Small Systems Program Team

- Environmental Finance Center at The University of North Carolina at Chapel Hill
- Environmental Finance Center at Wichita State University
- EFC West
- New England Environmental Finance Center at the University of Southern Maine
- Southwest Environmental Finance Center at the University of New Mexico
- Syracuse University Environmental Finance Center
- Environmental Finance Center at the University of Maryland
- American Water Works Association (AWWA)

UNC ENVIRONMENTAL FINANCE CENTER

WSU WICHITA STATE UNIVERSITY HUGO WALL SCHOOL OF PUBLIC AFFAIRS Environmental Finance Center

EFCWest Environmental Finance Center West

New England Environmental Finance Center

SOUTHWEST ENVIRONMENTAL FINANCE CENTER

Environmental Finance Center Syracuse University

ENVIRONMENTAL FINANCE CENTER

American Water Works Association

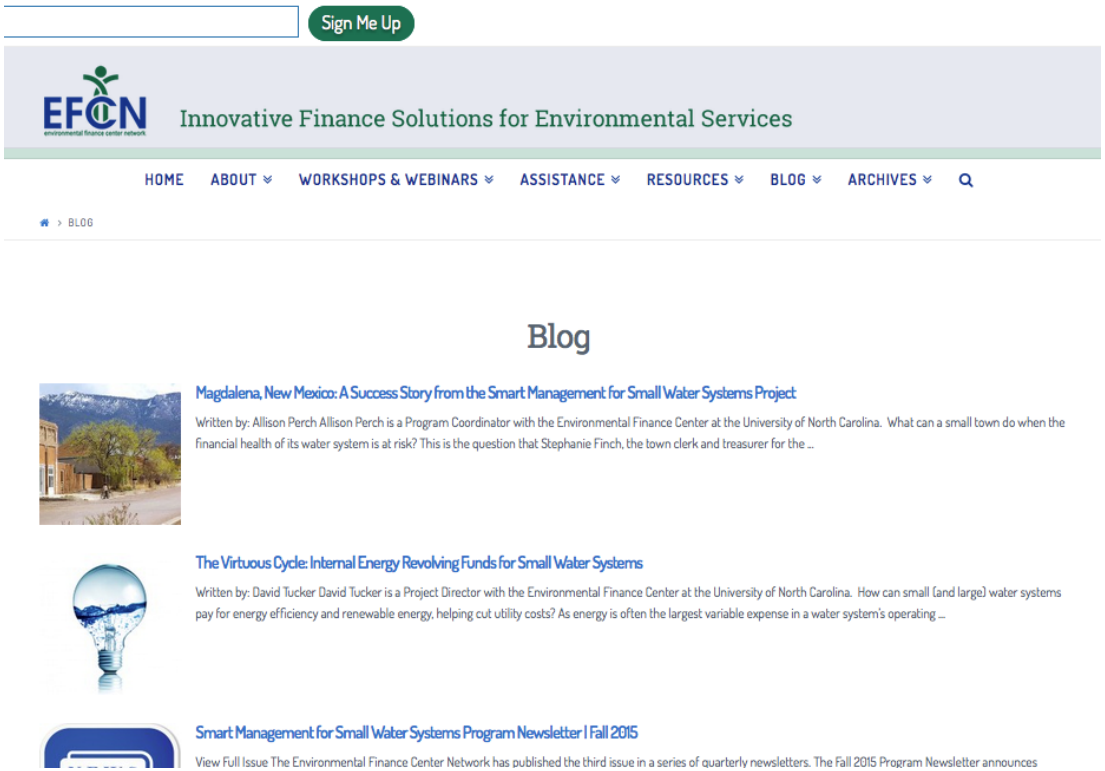
Areas of Expertise

- Asset Management
- Rate Setting and Fiscal Planning
- Leadership Through Decision-making and Communication
- Water Loss Reduction
- Energy Management Planning
- Accessing Infrastructure Financing Programs
- Workforce Development
- Water Conservation Finance and Management
- Collaborating with Other Water Systems
- Resiliency Planning
- Managing Drought

Small Systems Blog

Learn more about water finance and management through our Small Systems Blog! Blog posts feature lessons learned from our training and technical assistance, descriptions of available tools, and small systems “success stories.”

efcnetwork.org/small_systems_blog/



Agenda

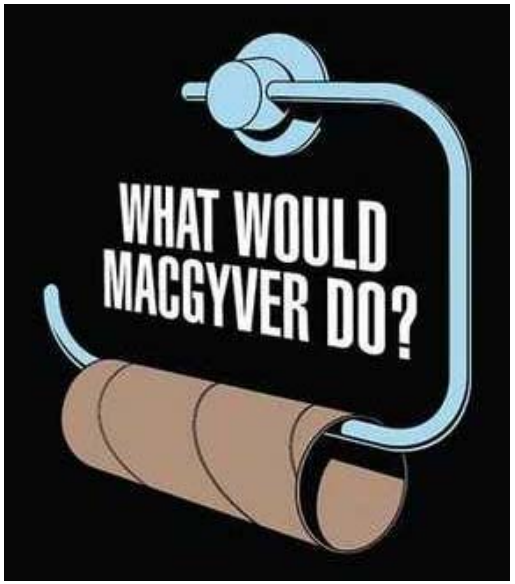
- Introduction to Resilience
- Trends in risks and threats for water systems
- Establishing a framework for planning ahead
- Implementing resilience strategies
- Resources and tools available to assist water system decision-makers
- Q&A

Introduction to Resilience

RESILIENCY:

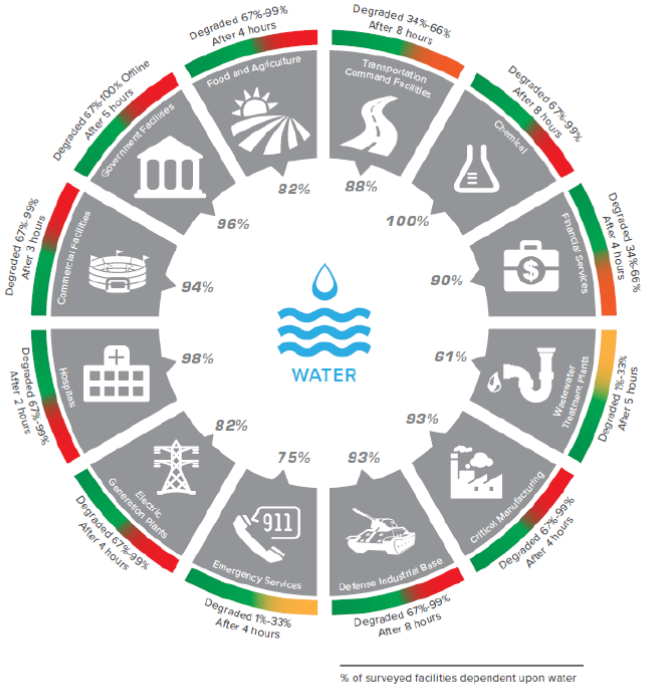
the ability of a person or organization to anticipate, prepare for, and respond to change and sudden disruptions in order to survive and prosper.

4 R's of Resiliency



Impacts to Critical Infrastructure

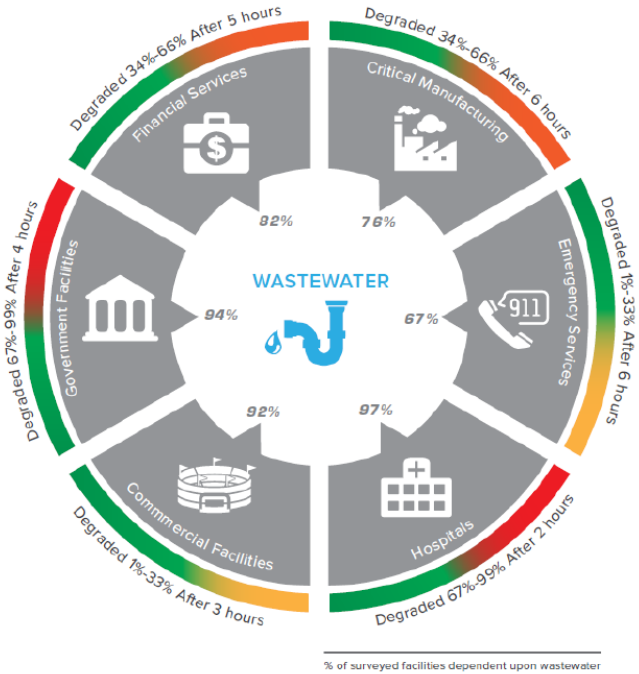
LOSS OF WATER SERVICES



Note: This data represents a majority (60 percent or greater) dependence on water.

FIGURE 3.—Critical Infrastructure Dependent on Water and Potential Functional Degradation Following a Loss of Water Services (Courtesy of DHS and Argonne National Laboratory).

LOSS OF WASTEWATER SERVICES



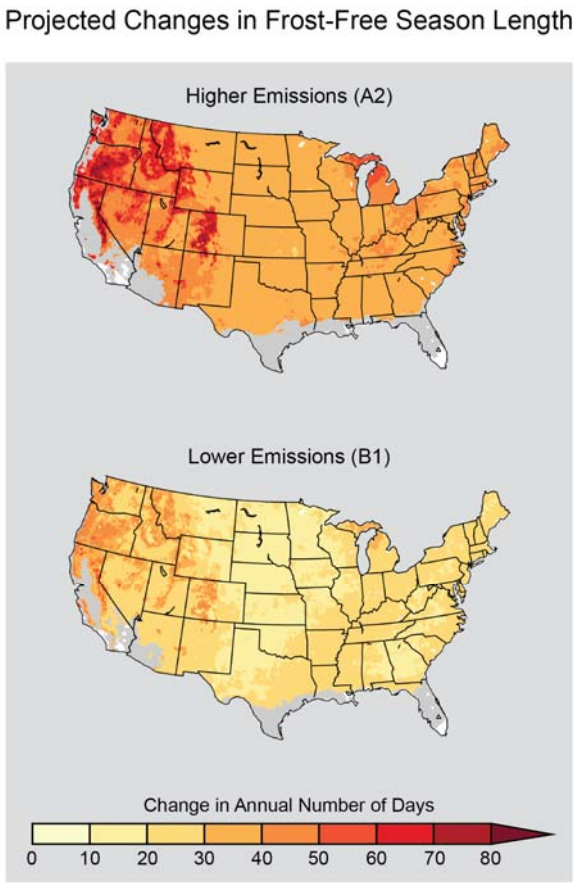
Note: This data represents a majority (60 percent or greater) dependence on wastewater services.

FIGURE 4.—Critical Infrastructure Dependent on Wastewater and Potential Functional Degradation Following a Loss of Wastewater Services (Courtesy of DHS and Argonne National Laboratory).

https://www.massport.com/media/266269/Report_Sector-Resilience-Report-Water-and-Wastewater.pdf

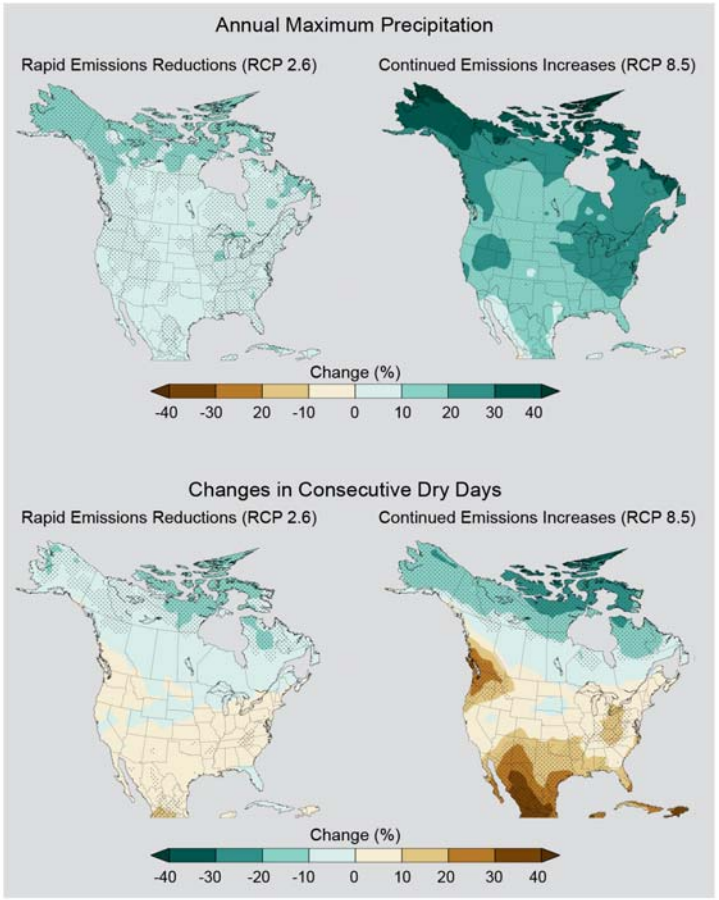
Threats and Extreme Weather

Increased Heat



- Heat Stress
- Cardiovascular failure
- Air quality
- Water-borne diseases
- Vector-borne diseases

Changes in Precipitation



- Higher water demand for agriculture
- Drought
- Fires
- Increased stream flows
- Flooding

The Hard Sell

Waiting is Costly

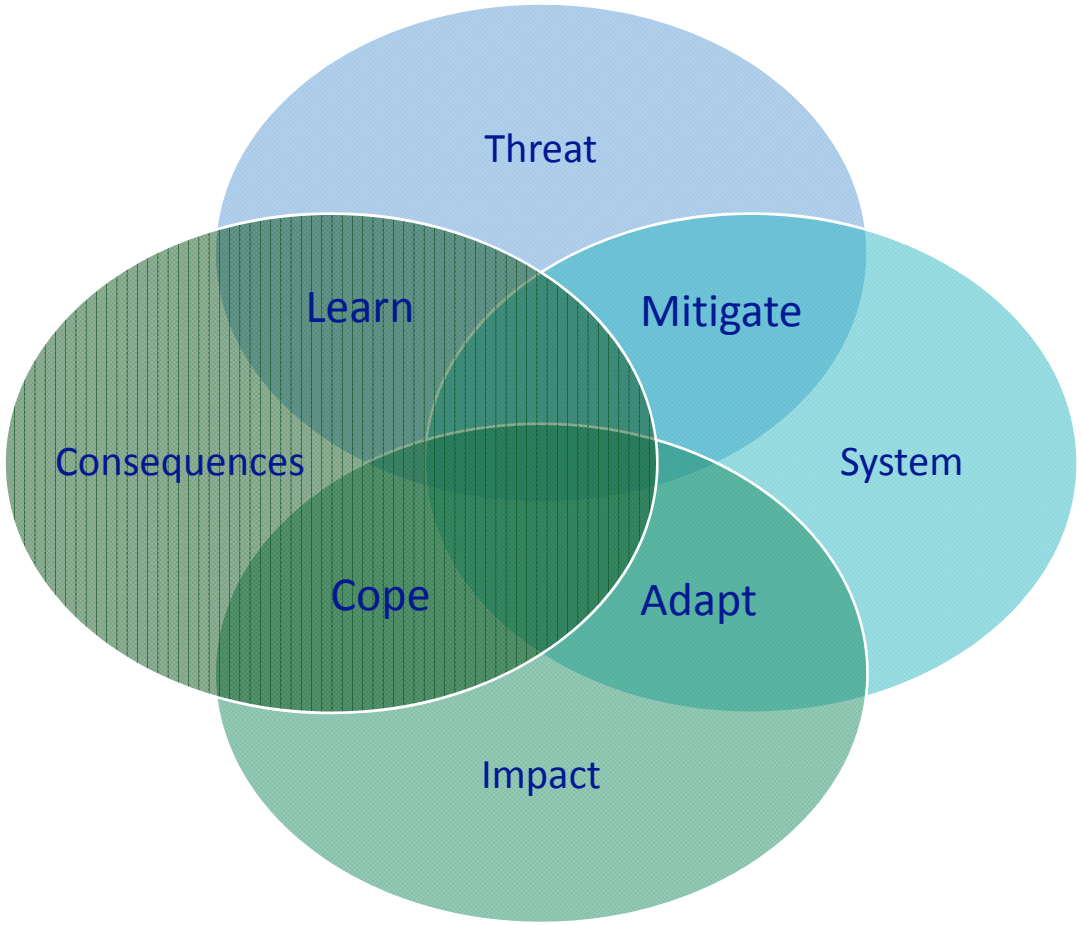
Katrina Oroville Dam Flint UCLA

Frameworks for planning ahead

Adaptation Planning Process Steps

https://www.epa.gov/sites/production/files/2015-04/documents/updated_adaptation_strategies_guide_for_water_utilities.pdf

Safe and SuRe Approach



(Butler, D., Ward, S. et. al., March 2016)

Threat Categorization

Chronic

- Insufficient rehabilitation
- Resource depletion/degradation
- Loss of collective skills and knowledge
- Incremental innovation
- Lack of investment

- Climate change
- Urban creep
- Population growth
- Demographic change
- Stringent regulation
- Increasing affluence

Internal ← → **External**

- Insufficient maintenance
- Accident
- Human error
- Strike action
- Poor management

- Extreme weather
- Natural Disaster
- Power outage
- Sabotage
- Riot/war
- Political pressures

Acute

(Butler, D., Ward, S. et. al., March 2016)

System Impacts

Functional

- Pressure increase (e.g. due to water hammer)
- Sludge bulking in wastewater treatment plant
- Contamination

- Increased demand
- Changing wastewater composition/characteristics

Internal ◄ ► **External**

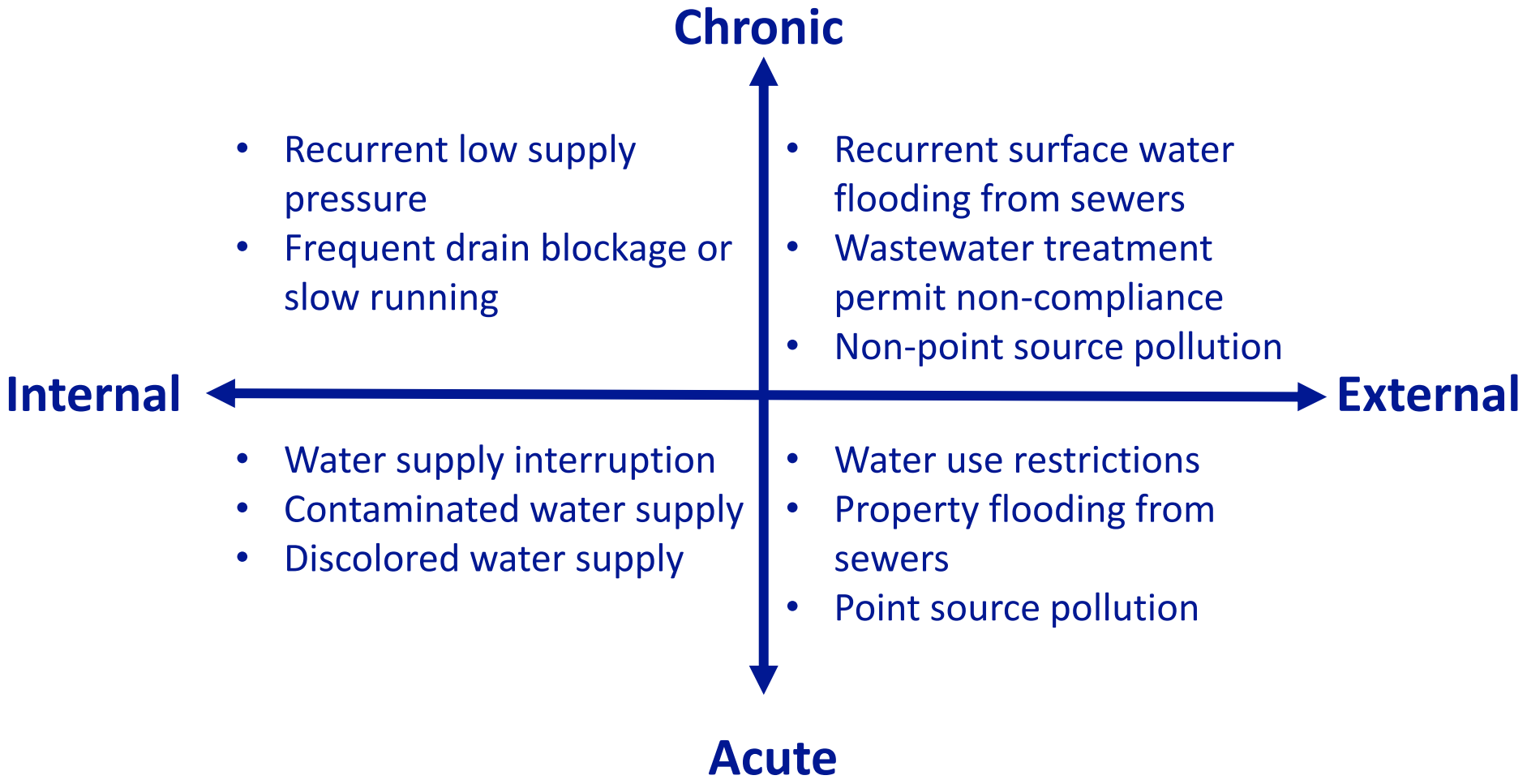
- Pipe failure
- Pump failure
- Billing System failure

- Power system failure
- Other critical infrastructure failure

Structural

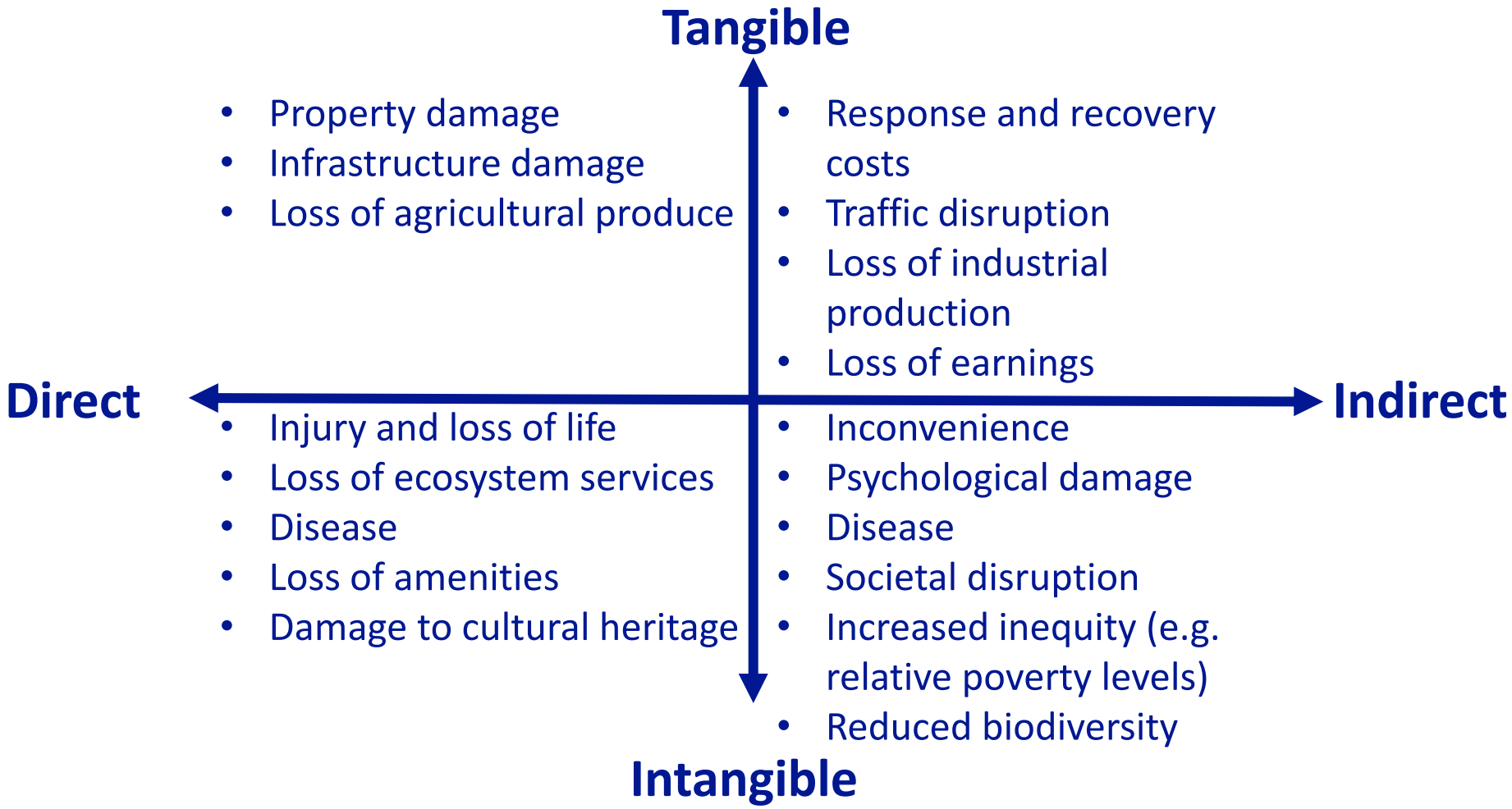
(Butler, D., Ward, S. et. al., March 2016)

Service Impacts



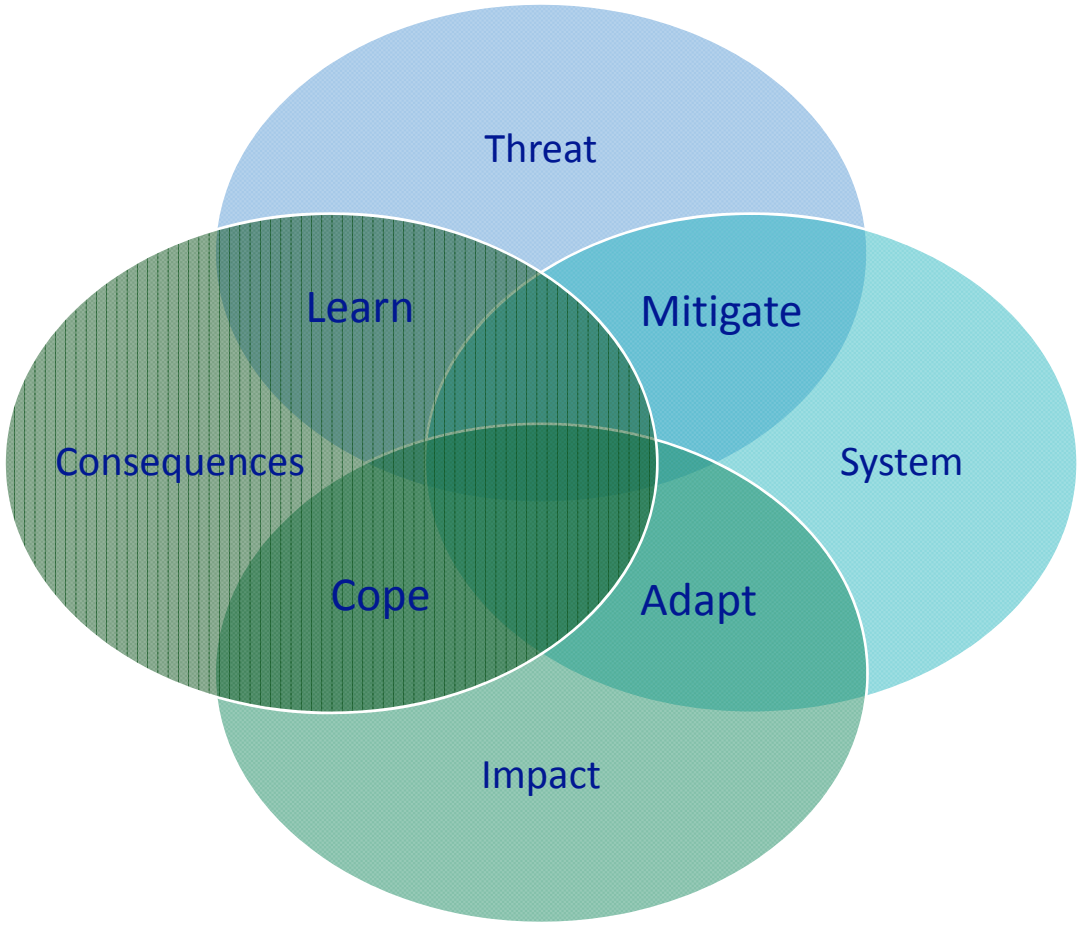
(Butler, D., Ward, S. et. al., March 2016)

Consequences



(Butler, D., Ward, S. et. al., March 2016)

Interventions to Consider



(Butler, D., Ward, S. et. al., March 2016)

Example of Mitigation

Quadrant	Threat	Mitigation Measure
Internal-chronic	Insufficient rehabilitation	Accelerate asset replacement strategy
Internal- acute	Accidents	Develop safety culture
External-chronic	Urban creep	Enforce planning controls
External- acute	Extreme weather	Reduce greenhouse gas emissions of operations

(Butler, D., Ward, S. et. al., March 2016)

Example of Adaptation

Quadrant	Threat	Mitigation Measure
Internal-functional	Sludge bulking	Operational modifications
Internal- structural	Pump failure	Provision backup pumps
External-functional	Increased demand	Promotion of water saving technologies and use of reclaimed water
External- structural	Changing regulations	Provision of additional treatment/new technologies, for example nutrient recovery

(Butler, D., Ward, S. et. al., March 2016)

Example of Coping

Quadrant	Threat	Mitigation Measure
Direct- tangible	Property damage	Temporarily relocate
Direct- intangible	Spread of disease	Boil water
Indirect- tangible	Response and recovery	Purchase building insurance
Indirect- intangible	Reduced biodiversity	Re-introduce species

(Butler, D., Ward, S. et. al., March 2016)

Hazard Identification Vulnerability Analysis (HIVA)

- Check for pre-exisiting HIVA results for your jurisdiction
- Inventory incidents that have caused serious service interruptions during the past 20 years
- Identify vulnerable areas
- Research threats specific to your geography
- Develop response plans to most probable hazards
- Organize and train employees and leaders on scenarios

Consider these components in vulnerability assessment

- Distribution systems including pipes and constructed conveyances
- Physical barriers
- Water collection, pretreatment, and treatment facilities
- Use, storage, and handling of various chemicals
- Storage and distribution facilities
- Electronic, computer or other automated or cyber systems

Implementing Resilience Strategies

Flooding Impacts

- Regional interconnections
- Alternative power supplies
- Monitor and inspect infrastructure
- Elevate or flood-proof assets
- Join a mutual aid network

Changes in Seasonal Runoff

- Monitor
- Incorporate predictions of snowpack and runoff changes into models
- Update drought contingency plans
- Diversify water supplies
- Increase storage capacity
- Establish regional interconnections

Increased Runoff

- Green infrastructure
- Distributed systems
- Invest in watershed management
- Model potential stormwater impacts to your service area
- Monitor runoff, vegetation and land use changes

Stressed Sewer Systems

- Green infrastructure
- Acquire and manage existing ecosystems
- Reduce infiltration and inflow by managing assets
- Increase capacity or capabilities of wastewater treatment system and facilities
- Model potential stormwater impacts to your service area

Community and Economic Impacts

- Collaborate Discuss adaptation options with local businesses
- Communicate adaptation activities and plans to customers
- Become marketers
- Raise rates in an affordable and responsible way

Resources for Planning

Adaptation Strategies Guide for Water Utilities

GROUP		DW	WW
Drought	Reduced groundwater recharge	💧	
	Lower lake & reservoir levels	💧	
	Changes in seasonal runoff & loss of snowpack	💧💧	
Water Quality Degradation	Low flow conditions & altered water quality		💧💧
	Saltwater intrusion into aquifers	💧	
	Altered surface water quality	💧	💧
Floods	High flow events & flooding	💧💧	💧💧
	Flooding from coastal storm surges	💧💧	💧💧
Ecosystem Changes	Loss of coastal landforms / wetlands	💧💧	💧💧
	Increased fire risk & altered vegetation	💧	💧
Service Demand & Use	Volume & temperature challenges	💧💧	💧💧
	Changes in agricultural water demand	💧	
	Changes in energy sector needs	💧	
	Changes in energy needs of utilities	💧💧	💧💧

EPA United States Environmental Protection Agency

CLIMATE READY WATER UTILITIES

EPA

HIGH FLOW EVENTS AND FLOODING (DW)

Return to Introduction

Intense precipitation events may occur more frequently, concentrating the annual total rainfall into episodes that may challenge current infrastructure for water management and flood control. When these protections fail, inundation may disrupt service and damage infrastructure such as treatment plants, intake facilities and water conveyance and distribution systems. Episodic peak flows into reservoirs will strain the capacity of these systems. Furthermore, inflow will be of lesser quality due to soil erosion and contaminants from overland flows, leading to treatment challenges and degraded conditions in reservoirs.

CLIMATE INFORMATION

- Since 1991, the amount of rain falling in very heavy precipitation events has been above average across most of the United States (USGCRP 2014). This observed trend has been greatest in the Northeast, Midwest and Great Plains – projections for these regions indicate that 30% more precipitation will fall in very heavy rain events relative to the 1901-1960 average (Karl et al. 2009).
- Heavy downpours are increasing nationally, with especially large increases in the Midwest and Northeast (Kunkel et al. 2012, USGCRP 2014). Precipitation intensity (e.g., precipitation per rainy day) is projected to continue to increase by mid-century for most of the U.S. This change is expected even for regions that are projected to experience decreases in mean annual precipitation, such as the Southwest (Kunkel et al. 2012, Wehner 2013, USGCRP 2014).
- The increasing intensity of precipitation events can be expected to lead to more flooding and high flow events in rivers. For example, by the end of the century, New York City is projected to experience almost twice as many days of extreme precipitation that cause flood damage (Ntelekos et al. 2010). For the U.S. overall, a recent assessment of flood risks found that the odds of experiencing a 100-year flood are expected to double by 2030 (USGCRP 2014).
- The intensity, frequency and duration of North Atlantic hurricanes has increased in recent decades, and the intensity of these storms is likely to increase in this century (USGCRP 2014).

ADAPTATION OPTIONS

Click to left of name to check off options for consideration; $'s ($-$$$) indicate relative costs
Click name of any option to review more information in the Glossary
No Regrets options - actions that would provide benefits to the utility under current climate conditions as well as any future changes in climate. For more information on No Regrets options, see Page 11 in the Introduction.
Click on the 💧, 💧 or ♻ icon to review the relevant Sustainability Brief.

✓	PLANNING	COST
	Integrate flood management and modeling into land use planning.	$
	♻ Develop models to understand potential water quality changes (e.g., increased turbidity) and costs of resultant changes in treatment.	$
	♻ Expand current resources by developing regional water connections to allow for water trading in times of service disruption or shortage.	$$-$$$
	💧 Plan for alternative power supplies to support operations in case of loss of power.	$
	Adopt insurance mechanisms and other financial instruments, such as catastrophe bonds, to protect against financial losses associated with infrastructure losses.	$
	♻ Conduct training for personnel in climate change impacts and adaptation.	$
	♻ Ensure that emergency response plans deal with flooding contingencies and include stakeholder engagement and communication.	$
	♻ Establish mutual aid agreements with neighboring utilities.	$

Continued on page 2

https://www.epa.gov/sites/production/files/2015-04/documents/updated_adaptation_strategies_guide_for_water_utilities.pdf

Climate Change Workshop Planner

WORKSHOP PLANNER FOR

Climate Change and Extreme Events Adaptation

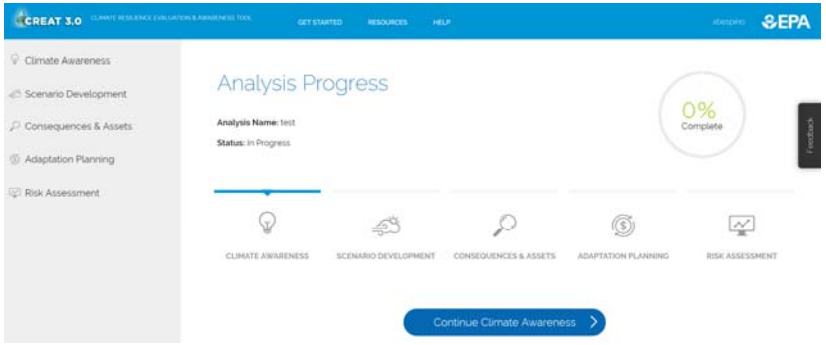
Understanding and adapting to climate change threats is an important part of decision making for water, wastewater and stormwater utilities. Extreme events including floods, drought, sea-level rise, wildfires and reduced snowpack may become more frequent or intense due to climate change. Planning for these extreme events can help protect utility infrastructure and operations, allowing utilities to provide reliable and sustainable service to their customers.

https://workshopplanner.epa.gov/eewp/

https://www.epa.gov/crwu/plan-climate-change-your-utility

Climate Resilience Evaluation and Awareness Tool (CREAT)

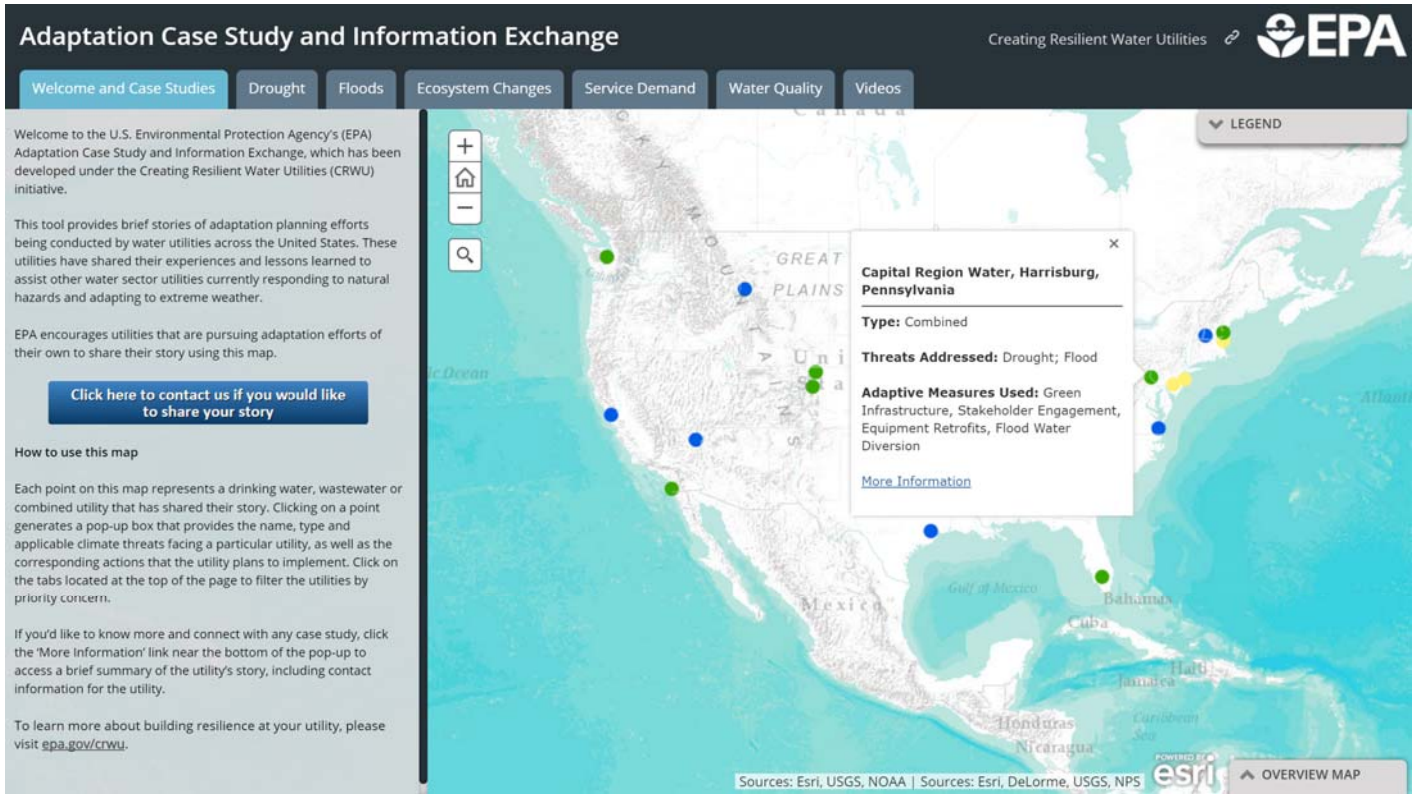
- Risk assessment tool
- Helps utilities in adapting to extreme weather events through a better understanding of current and future climate conditions.



https://www.epa.gov/crwu/build-resilience-your-utility

https://youtu.be/fa0oK_jE8Zw

Adaptation Case Studies



https://epa.maps.arcgis.com/apps/MapSeries/index.html?appid=bfe6b44929a8417b86aa7fd81d6857be

New Hampshire example- https://www.des.nh.gov/organization/divisions/water/dwgb/documents/wd-14-02.pdf

Asset Management Resources

https://www.epa.gov/sites/production/files/2015-04/documents/epa816k03002.pdf

https://www.epa.gov/sites/production/files/2016-04/documents/am_tools_guide_may_2014.pdf

Information Sharing to Support Resilience

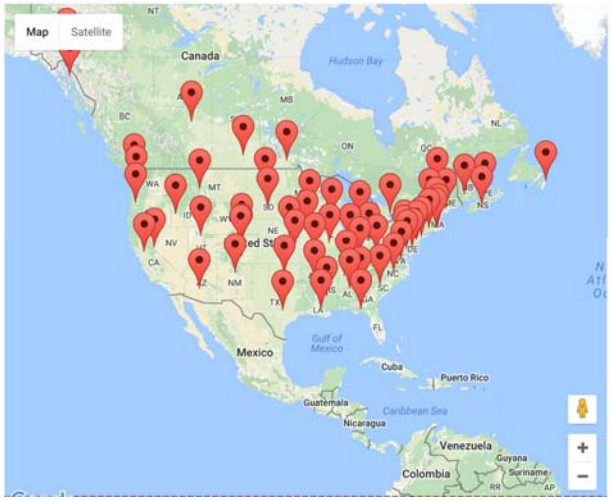
Water/Wastewater Agency Response Network (WARN)

WARN℠

WATER /WASTEWATER AGENCY RESPONSE NETWORK

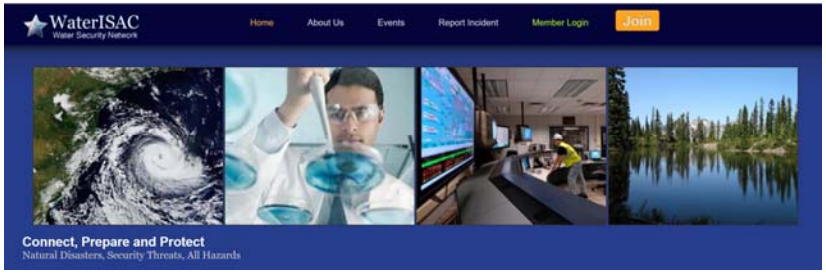
A Water and Wastewater Agency Response Network is a network of utilities helping other utilities to respond to and recover from emergencies. The purpose of a WARN is to provide a method whereby water/wastewater utilities that have sustained or anticipate damages from natural or human-caused incidents can provide and receive emergency aid and assistance in the form of personnel, equipment, materials and other associated services as necessary from other water/wastewater utilities.

Click a pin to view contact information for the local WARN representative, with a link to more information about that state and region. You can also view current **Situation Reports.**



https://www.awwa.org/resources-tools/water-knowledge/emergency-preparedness/water-wastewater-agency-response-network.aspx

Water Information Sharing and Analysis Center (WaterISAC)



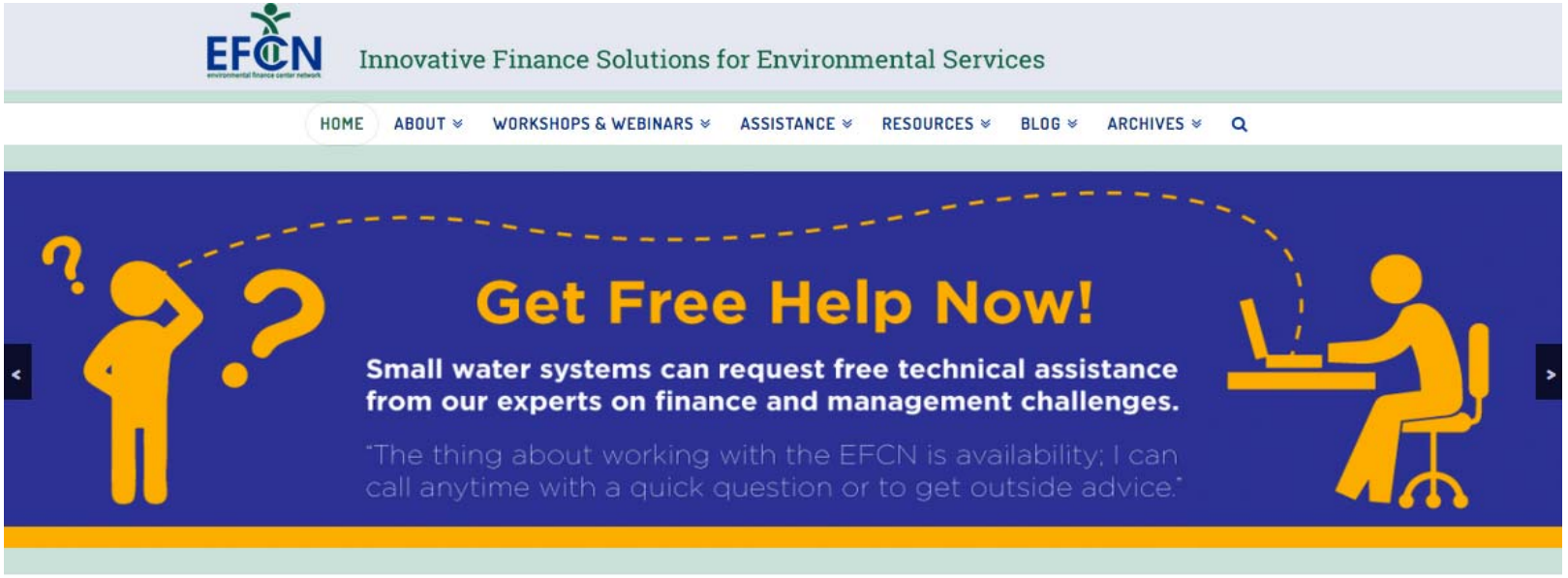
https://www.waterisac.org/

Q&A

- Brandy Espinola
- Program Manager, University of Maryland Environmental Finance Center
- bespinol@umd.edu
- 301.314.9491

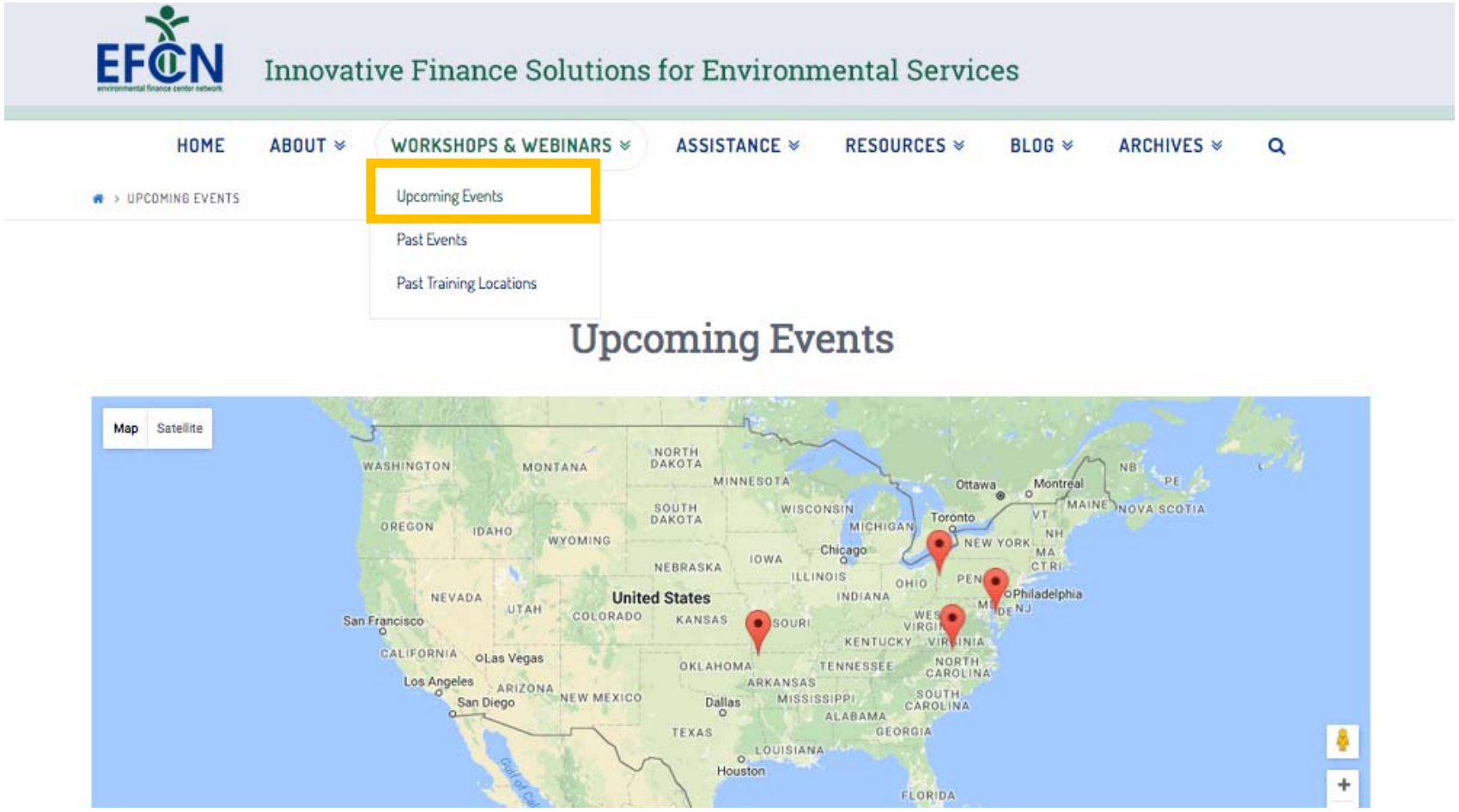
Visit the EFCN Website – *www.efcnetwork.org*

for more information on upcoming events, funding, and resources.



Upcoming Events Calendar

Select “Upcoming Events” under the Workshops & Webinars Tab.

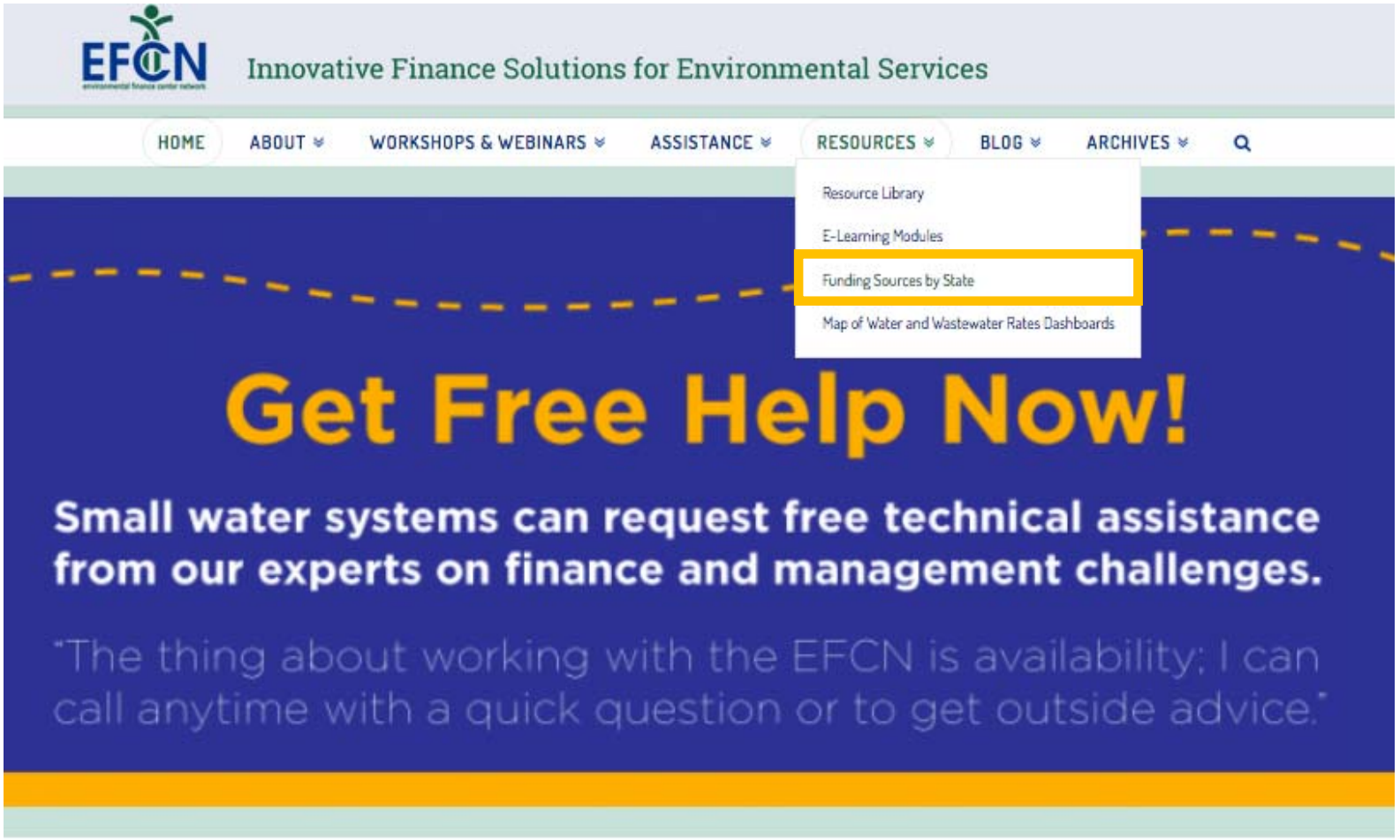


= In Person Event = Webinar

Type	Date/Time	Event
	03/09/2017 2:00 pm - 3:00 pm	WEBINAR I Preparing Winning Financing Applications for Water Infrastructure Projects
	03/22/2017 2:00 pm - 3:00 pm	WEBINAR I Water Audits and Water Loss Control: Entering Your Data into the Spreadsheet
	03/30/2017 9:00 am - 4:30 pm	Maryland I Rates and Finance Workshop for Small Water Systems *Easton Utilities, Easton MD*
	04/04/2017 1:00 pm - 2:00 pm	WEBINAR: Workforce Development: An Overview of Key Components
	05/11/2017 9:00 am - 4:30 pm	Virginia I Rates and Finance Workshop for Small Systems *The Institute for Advanced Learning and Research, Danville Virginia*
	05/25/2017 9:00 am - 4:30 pm	Arkansas I Rates and Finance Workshop for Small Water Systems *Beaver Water District, Lowell AR*
	09/13/2017 9:00 am - 4:30 pm	Pennsylvania I Rates and Finance Workshop for Small Water Systems *Pennsylvania American Water Co, New Castle PA*

Funding Tables By State

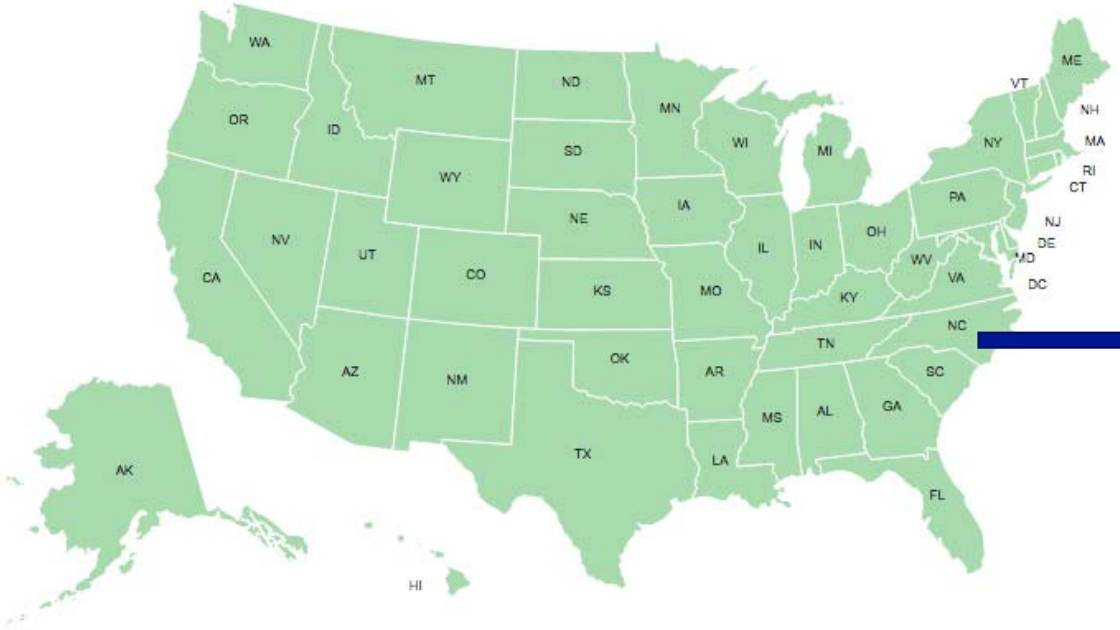
Select “Funding Sources by State” under the Resources Tab.



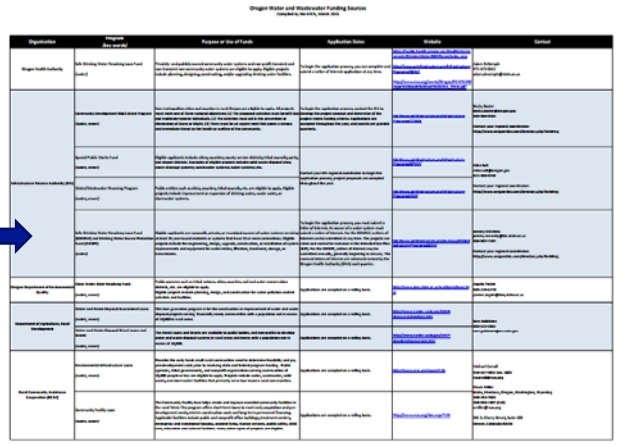
Funding Sources by State

Note: Some states may have additional resources listed below the map.

Click on the map below to view funding sources for each state:

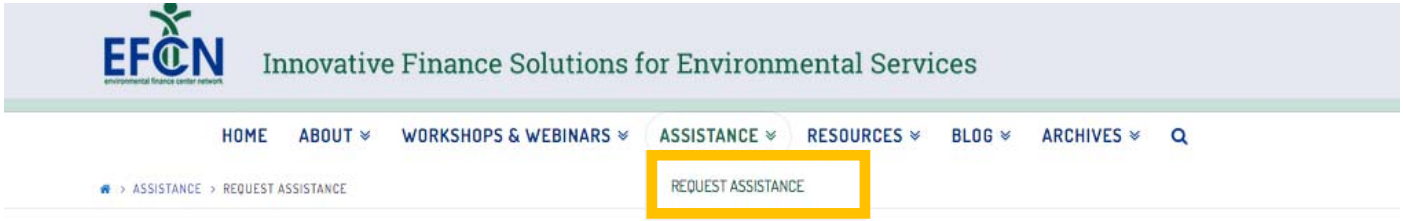


Click on an individual state to view funding table.



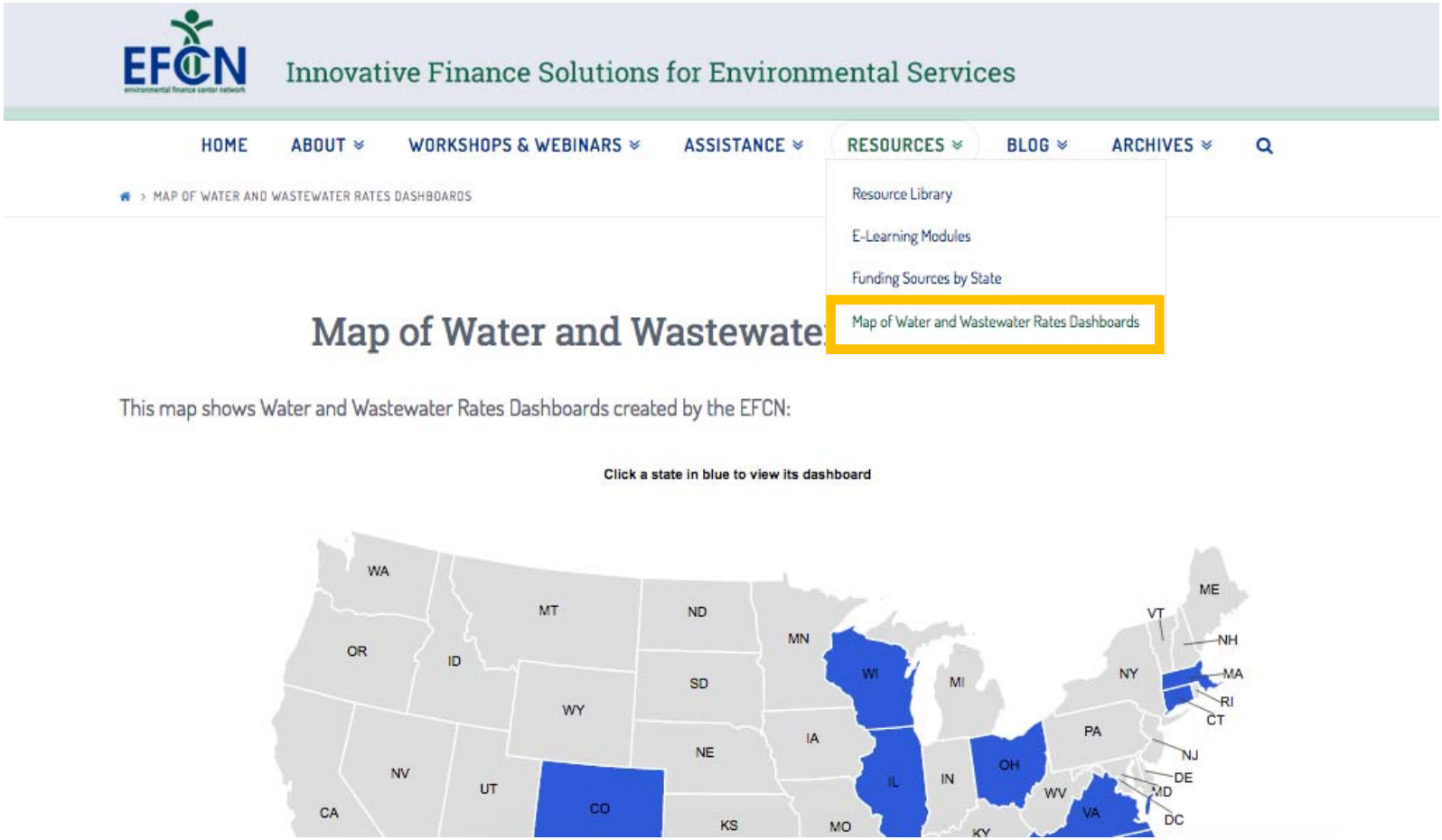
Request Technical Assistance

Select “Request Assistance” under the Assistance Tab off the EFCN homepage to access and submit the TA request form electronically.



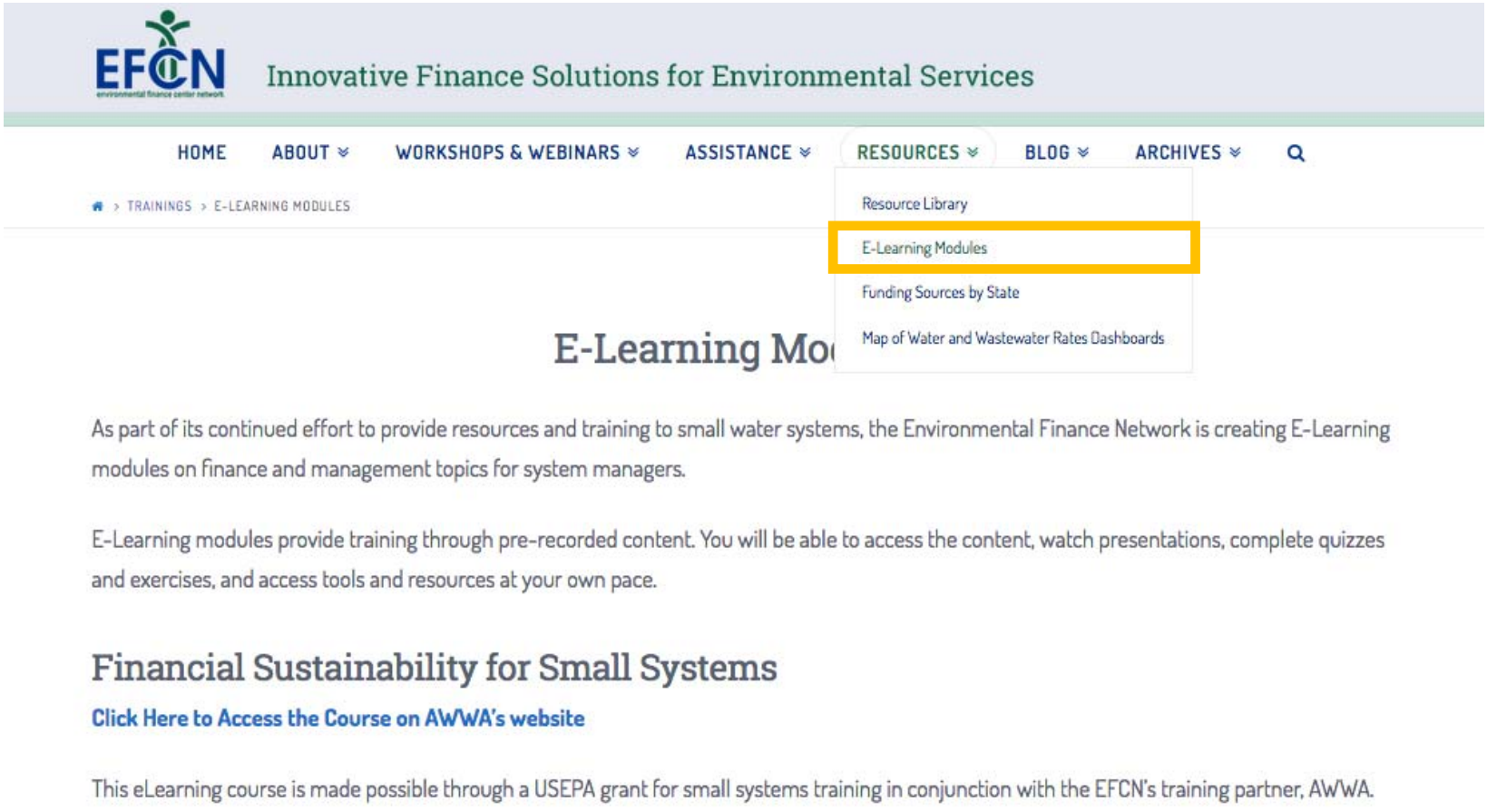
Rates Dashboards

Select “Map of Water and Wastewater Rates Dashboards” under the Resources Tab, and click on any state in blue to view its dashboard.



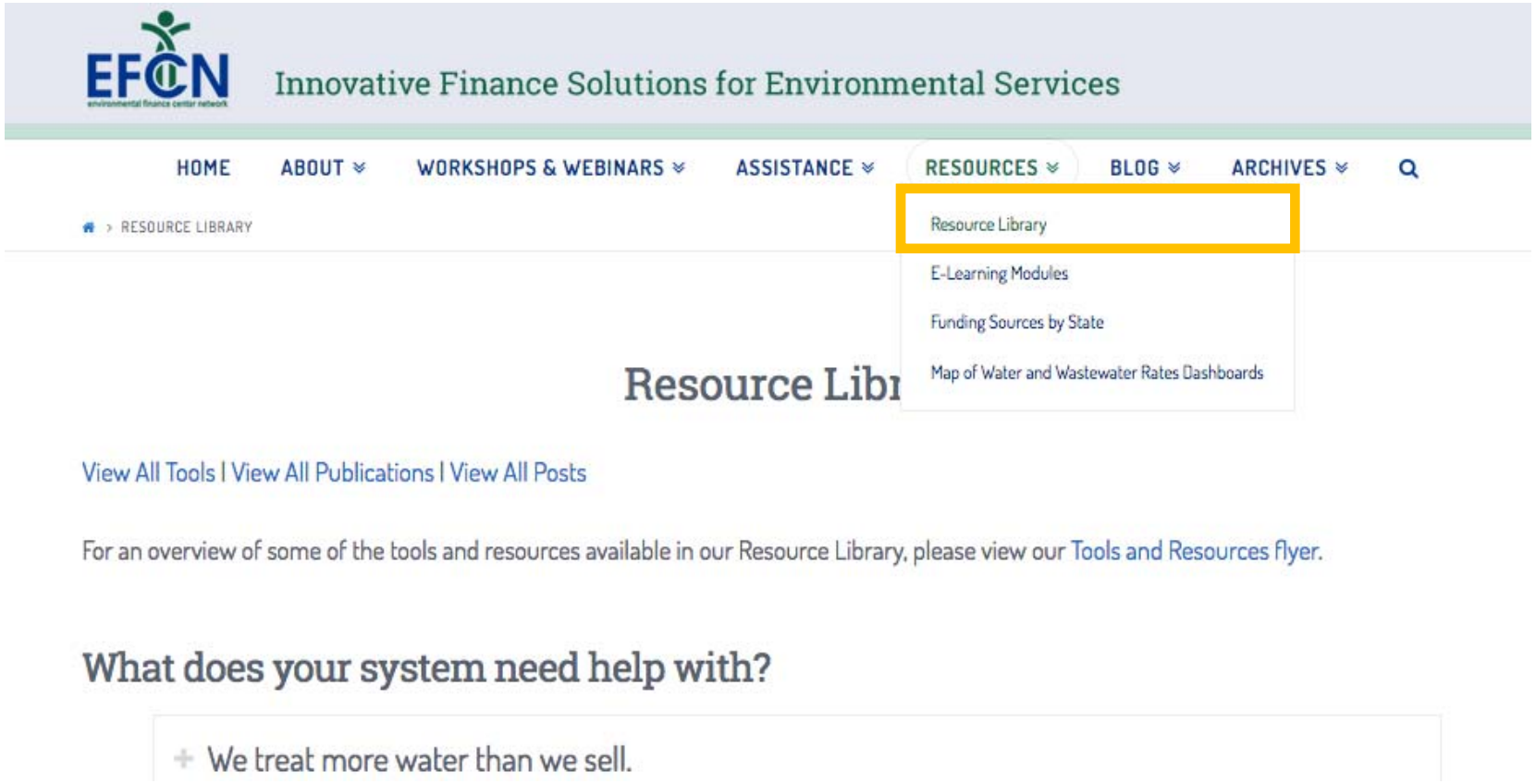
E-Learning Modules

Select “E-Learning Modules” under the Resources Tab off the EFCN homepage.



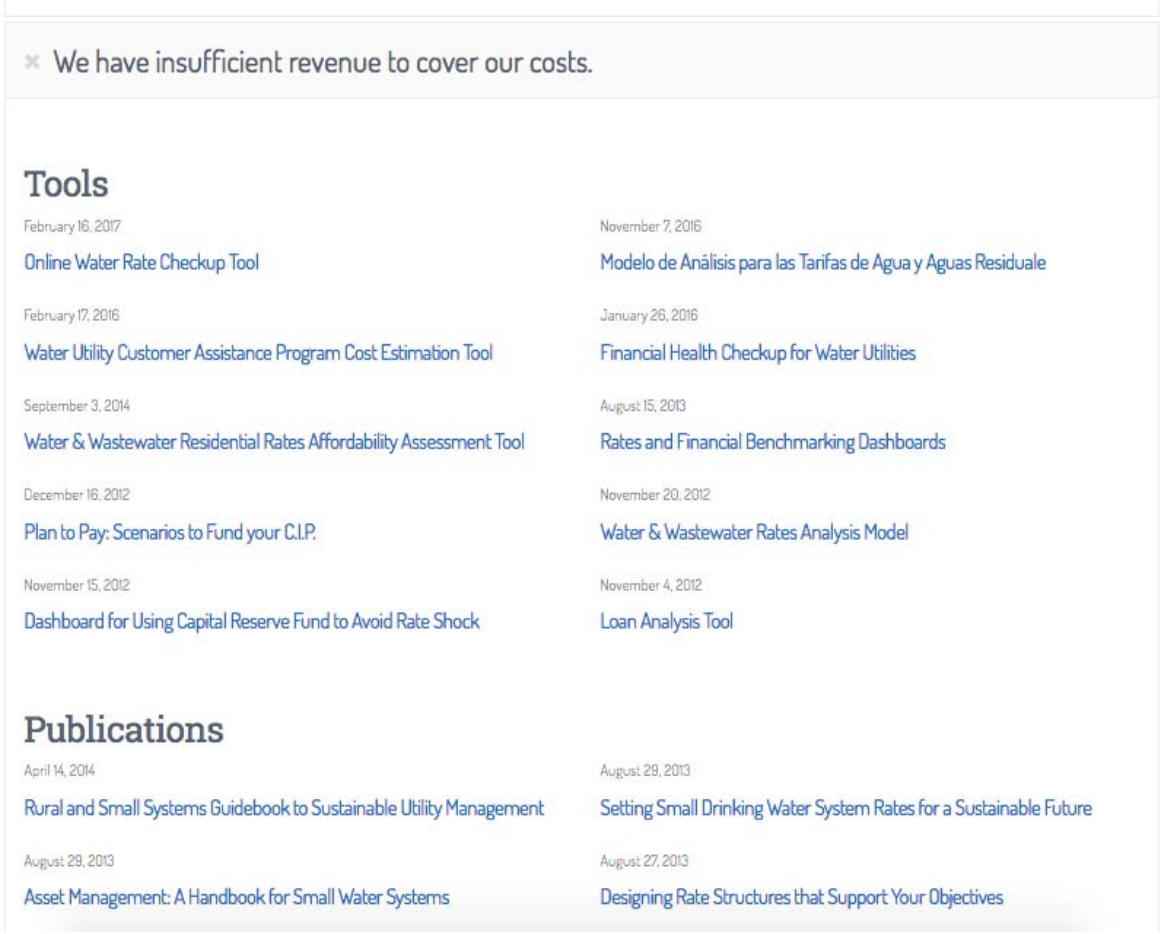
Resource Library

Select “Resource Library” under the Resources Tab off the EFCN homepage.



Resource Library Continued…

Click on a what your system needs help with to reveal tools and publications related to that topic.



Smart Management for Small Water Systems

Thank you for participating today, and we hope to see you at a future workshop!

www.efcnetwork.org

EFCN environmental finance center network

American Water Works Association