



# Tools for Water Utility Risk and Resilience Planning: A Guided Inventory

## Version 1.1 – NE Environmental Finance Center

Here are many available free tools and resources for getting started with basic steps towards a more resilient and prepared utility to support uninterrupted service delivery as discussed in our introductory course. Remember that strengthening your basic business functions is the foundation for resilience—it is not just about an emergency plan. The EFCN provides courses, training, and technical assistance in a variety of those areas, especially for asset management, financial planning, and workforce development as well and operations-oriented technical topics. The last section of this inventory provides links to those additional training and assistance resources.

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## 1. Basic Frameworks for Resilience Work

The United States Environmental Protection Agency (EPA) has developed free tools to assist water and wastewater utilities with managing risks and building resilience. A good place to start is to adopt a framework of ongoing steps you will take as a lifeline enterprise. EPA's [Route to Resilience](#) consists of a five-step framework that defines basic and more advanced objectives for a utility program, and identifies links to other tools such as those covered further on here. It is well-suited to small systems. It is oriented towards physical and security (malevolent acts) risks. It is a good place to start to take steps to meet the risk and resilience and emergency planning requirements under [America's Water Infrastructure Act](#). EPA provides an [Emergency Response Plan Template for Drinking Water Utilities](#) to meet AWIA requirements. The template includes links to many useful Incident-Specific Response Procedures (ISRPs) and "rip and run" checklists. Also useful to effective preparedness is the [Flood Resilience Checklist](#) developed in EPA's Smart Growth program.

For a look at broader frameworks in more depth, the Water Utility Climate Alliance (WUCA) and Water Research Foundation jointly have developed a detailed guide and test of approaches in a [free report](#).

While it has been conducted with large utilities such as Denver Water, specifically aimed at climate impacts, the guidebook illustrates how resilience must be built around a total approach to business functions for any vulnerability. Our Figure 1 we use in training stresses that crisis and emergency resilience is built on strong ongoing business functions. An especially excellent webinar featuring several projects and practice leaders from the WUCA utility alliance is as of this writing still available from the American Society of Adaptation Professionals (ASAP) at their YouTube Channel: [Co-Creation Webinar 8: Designing Utilities of the Future](#) posted November 8, 2021.



Figure 1: Resilience is Built on Your Total Business Capacities

## 2. Identify Vulnerabilities and Threats to Resilient Service, and the Specific Assets Affected

Resilience, as well as emergency response planning work, all depend on identification of vulnerabilities and identification of the specific assets that may be affected. Assets include not only physical resources, whether a circuit breaker panel or an entire water treatment works, but also business functions and supporting resources, including how personnel availability may be affected. That is why we emphasize in our trainings that resilience management means your entire business and its ongoing capabilities and readiness (see Figure 1). There are several available drinking water utility-focused tools for vulnerability assessment covered here.

EPA's [Vulnerability Self-Assessment Tool \(VSAT\)](#) is a web-based, guided program that takes you through a step-by-step process that begins with identifying threats and then pairing each threat with affected assets. Information on types of threats and types of water utility assets including estimates of general costs for damage and priority estimates are pre-loaded in VSAT. The utility user must make judgments

about threat consequences and other inputs with the help of this pre-loaded information. These judgments can include percentages of damage, service days lost, injury and fatalities, among others. The tool then produces a baseline scenario which quantifies in financial and economic terms, as much as possible, the possible consequences of the identified threats for the potentially impacted assets. In this and related tools, the baseline scenario is the measure against which expected losses to an asset can be measured against proposed future loss reduction from “countermeasures” (i.e., risk mitigation).

There is also a pencil-and-paper [Small System Risk and Resilience Assessment Checklist](#) available from the EPA. It is oriented towards drinking water systems of over 3,300 service populations up to 50,000. This checklist is no less comprehensive than the web-based VSAT. This checklist can be a good starting point for understanding and organizing the information needed for risk assessment of vulnerabilities and assets for any size of utility. Conducting a risk and resilience assessment using either VSAT or the Small Systems Checklist can satisfy AWIA’s self-certified assessment requirement.

There is also a related tool, the [Resilient Strategies Guide](#) (RSG). The RSG is also a programmed tool, but it is based on a step-by-step process focused on planning, in which assessment is one step. It takes the user through setting priorities for threats and vulnerabilities and the affected assets to consider; and risk reduction strategies to consider for planning. An additional step takes the user through consideration of funding options for proposed risk reduction.

The RSG is part of suite of tools from EPA’s [Creating Resilient Water Utilities Initiative](#) (CRWU). Additional resource tools include a [case study library and exchange](#)—a source of ideas and lessons for strategies from other utilities—as well as information on possible [future climate conditions](#) and impacts and access to the [CREAT](#) tool. The [Climate Resilience Evaluation and Awareness Tool](#) (CREAT) is in certain ways the most advanced of the multiple resources discussed so far. The VSAT and RSG tools (or Small System Risk and Resilience Checklist) provide needed input information for using the CREAT tool. The CREAT tool is specifically designed to help utilities plan for as-yet-unrealized risks from climate change in the future and to help make the challenging judgments of whether it makes economic sense to invest now for impacts to service continuity that are still in the future. To accomplish this, CREAT includes a tool to access and develop future conditions scenarios from current climate science information, and a tool to conduct analyses of the dollars and sense of possible risk reduction investments—whether such investments may deliver loss avoidance equal to or less than or more than the costs. Thus, CREAT is an integrated suite of tools for which initial risk and resilience assessment is a starting point and including consideration of future climate effects an additional choice that is supported, as well as the most detailed economic analysis among the tools.

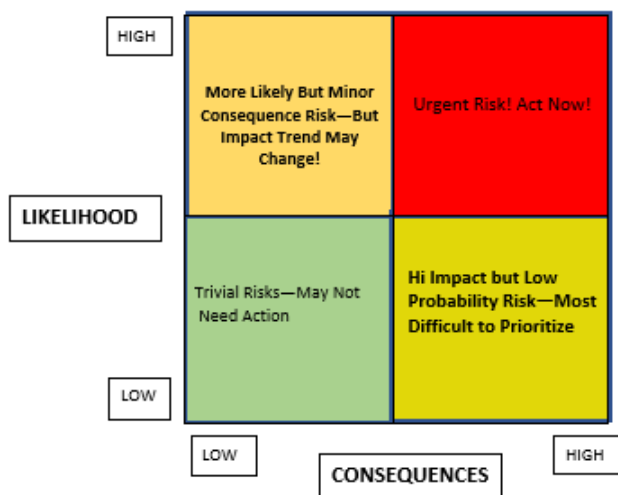
Results from all these tools must, of course, be further evaluated by a utility as to what the priorities are, including consideration of how to pay.

### 3. Prioritize Risks Based on Consequences and Likelihood

No tool can prioritize which risks demand action now, or in the future. As discussed in training, once the needed information on threats, consequence and affected assets is collected, risk prioritization is a matter of judgment. The simple depiction of this task in Figure 2 points out the two most important categories to consider. In the upper left hand are risks that have minor or limited impacts but are more

likely to occur. The judgment to act or not act on such risks may depend on the criticality of the asset involved to operations, available funding, or other resources to address it and good maintenance practices. Another judgment is whether the threat or vulnerability may increase to a higher level of consequence if action is delayed. In the lower right-hand square are the most challenging risks to judge. You may only expect a hurricane occasionally, but the consequences if you are not prepared could be catastrophic to service. One of the most challenging risks here are those that may be changing and increasing in possible impact due to climate change. Threats to your cybersecurity are also growing. They may not happen frequently, or maybe ever. But a failure to be prepared may have serious impact.

Figure 2. Basic Risk Prioritization



In the next few sections, we’ll look at some tools for dealing with these two examples of emerging risks to resilience and a third special topic about how organizing for resilience is being viewed today.

#### 4. Special Topics

Here are three aspects of resiliency getting new and heightened attention.

##### a. Getting a Handle on Climate

There is a growing flood of climate information from multiple sources. It is a challenge to evaluate and understand it all without a navigator, such as your state’s climatologist or a local university scientist good at communication. The uncertainty about when and what change and impacts will occur is no easy task even for the specialists. A good, practical starting point is to see what the trends are in your region and the types of vulnerabilities to consider. You can start with the National Oceanic and Atmospheric Administration (NOAA) [State Climate Summaries](#) which have been updated through 2022. The brief, readable summaries highlight key trends and further sources of information. The EPA Creating Resilient Water Utilities (CRWU) initiative (noted earlier) provides several accessible sources of climate trend information including the stand-alone [Climate Scenarios Projection Map](#) which is part of the CREAT tool; the [Storm Surge Inundation Map](#); and the [Streamflow Projection Map](#). These interactive maps and

others provide planning-level information that is useful for an overall picture of important threat trends in different areas of the United States. The Climate Module in the [CREAT](#) tool uses all this information to allow a utility to construct selectively tailored future climate scenarios for initial planning. Information is also available from [NOAA's climate hub](#), from the organization [Climate Central](#) and others. Also useful to water supply utilities is the [U.S. Drought Monitor](#), again at a general level. The next step is to be sure to connect with your State Hydrologist office and/or State Climatologist office for current characterizations of source supply, hazards, and future trends.

b. Cybersecurity

Malevolent acts can disrupt online control and SCADA systems, and other computer-based business functions. Theft of billing information and denial of service attacks are now recognized as serious vulnerabilities for our utilities with the federal government raising the likelihood standard for risk from 0.10 for drinking water and 0.30 for wastewater utilities to 1.0 in 2021. That means always expect cyber threats can happen and adopt ongoing practices for protecting service. The EFC Network's Small Systems assistance program has recently published a [concise blog on basics of cybersecurity](#) with links to several national resources. This is an excellent single starting point. Every lifeline utility needs to practice what are today called good "cyber hygiene practices."

EPA has instituted a free ongoing [cybersecurity technical assistance service](#) specifically for water utilities via arrangement with a key water sector contractor. Over 100 utilities have received various help with preparedness, response and recovery for cyber incidents of all kinds through mid-2022. The Cybersecurity and Infrastructure Security Agency (CISA) is an program within the federal Department of Homeland Security (DHS) that offers information and assistance.

c. External and Community Partners

More attention is being paid to "Community-Based Water Resiliency" (CBWR). Ideally any utility should have mutual aid agreements with emergency response resources appropriate to their needs. This is readily accomplished by joining their state WARN ([Water and Wastewater Agency Response Network](#)) which is free in almost all cases. Increasing complex and multi-faceted hazards and risks have led to recognition that a water utility needs to go "beyond the billing relationship" and beyond traditional incident-focused mutual aid arrangements to engage both those that depend on them (e.g., customers and institutions like hospitals) and those they depend on for critical resources (e.g., electric power providers, key vendors and so on) on a regular basis. Interdependency is the vital idea here. One example is how safe drinking water utilities must engage cooperation from their customers to manage demand during both short-term supply shortfalls and extended ones due to drought or other impacts. More than a one-way communication, this requires an ongoing relationship that cannot be effectively created overnight. Some utilities have begun meet or touch base annually with key community organizations as well as providers the utility itself will depend on in some situations. This builds understanding and sustainable lines of communication. Resources for CBWR now include a [Community-Based Water Resiliency Guidebook](#) and a [do-it-yourself resource package](#) for conducting training and exercises for community-based water resilience practices.

6. Connect With Additional Resources and Training Opportunities

We have presented highlights of good places to start on various aspects of building resilience for your water system. For every area there are additional training and assistance opportunities offered directly by the United State Environmental Protection Agency staff and/or programs and providers EPA sponsors. One of those major opportunities is the “Building Technical, Managerial and Financial (TMF) Capacity for Small Water Systems” program conducted by the Environmental Finance Centers (EFCs) of the EFC Network (EFCN), now in its ninth round over more than a decade. In addition to the hazards-specific and resilience topics discussed above, the EFCN provides training, technical assistance, and information resources on the wide variety of core business functions that resilience depends on (as illustrated in Figure 1 earlier). For example, responding to impacts without good asset information, durable workforce preparation, and adequate financial basics can be difficult. These and other core topics are included in the portfolio of TMF assistance. To make an inquiry and explore a match to your needs, visit the [EFC Network web page](#) where you can request access to free training, one-on-one technical assistance, and a variety of resources in podcasts, blog articles, tools, dashboards, and more. Navigate to “Our Initiatives” and then to “[Building TMF Capacity for Small Water Systems Project](#)”.