



PLANNING AND RESILIENCY IN NORTH CAROLINA'S WATER UTILITIES

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Planning is a long-term investment – it requires a large outlay of time up front, with the hope that, down the line, the effort will pay off in the ability to successfully weather changes. For example, financial plans provide structure to how a utility's finances are managed, laying out ways to build up reserves to accommodate fluctuations in revenues and costs. Emergency/resiliency plans help utilities recover from natural disasters, such as Hurricane Florence, or other issues such as contaminants in the water. Yet is there any evidence that utilities that undergo more extensive planning reap benefits in terms of greater resiliency than other utilities? What kinds of plans do water utilities in North Carolina produce?

PLANNING EFFORTS IN NORTH CAROLINA

Between November 2017 and March 2018, with funding from the North Carolina Policy Collaboratory, the University of North Carolina School of Government's Environmental Finance Center and the North Carolina League of Municipalities set out to answer these types of questions through a statewide survey of water utility management and long-term planning practices. The survey captured data on the planning efforts of utilities, which were matched with data on financial and operational performance. The hypothesis was that utilities that undertake more planning for the future would show greater resiliency, as measured by financial stability and fewer regulatory violations.

All local government-owned and large non-governmental water utilities in North Carolina were invited to participate in

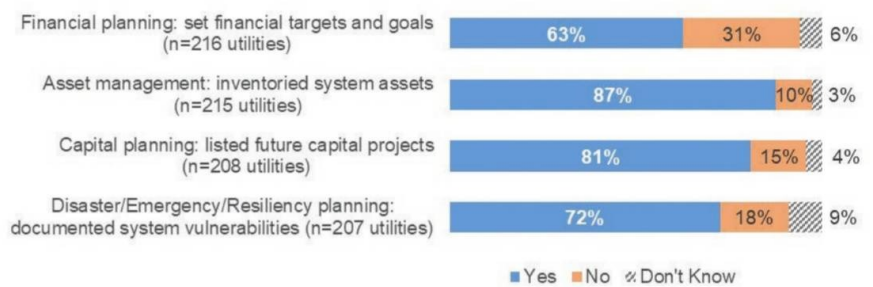


Figure 1: Percentage of utilities indicating they have or are currently developing the key component efforts of the four types of plans

the survey. Out of 511 invited utilities, 227 utilities (44%) participated in the survey. These utilities serve the vast majority of North Carolinians who are connected to community water and/or wastewater systems in the state. Even 35% of the smallest utilities (those serving fewer than 1,000 connections) participated in the survey.

The survey included questions about types of long-term planning that are relatively common among utilities. The list of types of plans was generated from experience as well as a review of relevant documents and literature, including the American Water Works Association's manuals. The survey focused on four types of planning efforts: financial planning, asset management, capital planning, and disaster/emergency/resiliency planning. The basic starting point of each type of plan was labeled the "key component effort" (see **Table 1**). Any utility completing at least the key component effort is considered to have that type of plan,

whether formalized or not. This was done to capture the efforts of utilities that may be participating in planning, but may not have a formal document, or may have a document by a different name.

Figure 1 shows the percentage of utilities that have completed the key component efforts of the four types of plans. The majority of the responding utilities indicated that they have at least started or completed the key component effort of each of the four planning efforts. Among the types of plans, financial planning has been undertaken by relatively fewer systems (63%). Many utilities (87%) have or are currently developing an inventory of their systems' assets, which is the starting point of an asset management plan. In fact, several utilities have made use of the State's Asset Inventory Assessment grants to begin their asset management planning. Likewise, 81% of responding utilities have some type of list of potential future capital projects, with 51% indicating that they have a formalized Capital



Improvement Plan. Capital planning has been promoted by the State and professional associations for many years. Finally, 72% of responding utilities have documented at least one type of system vulnerability. Some of these vulnerabilities include natural disasters (62%), drought/water shortage (48%), and man-made disasters (29%).

FINANCIAL AND OPERATIONAL PERFORMANCE

We define resiliency as a greater ability to adapt to short-term changes, based on having stronger financial and operational conditions. Utilities that have indicators of higher levels of financial performance, such as higher operating ratios, or greater levels of reserves relative to expenses, are likely to be better able to adapt to changes by virtue of their enhanced financial capacity. Furthermore, higher levels of financial performance may indicate that these utilities have already adapted better to changes than other utilities, leading to better financial performance. Likewise, water systems that have fewer permit violations (a potential indicator of performance) may be better able to adapt to changes by virtue of their stronger operating performance. Similar to strong financial performance, strong operational performance may indicate that these utilities are already demonstrating resiliency by complying with Safe Drinking Water Act standards even when there may be changes such as fluctuations in source water quality or contamination.

To study the relationship between planning and resiliency, data from secondary sources were merged with the survey data on planning efforts. Financial performance data for the study came from local governments' audited financial statements collected by North Carolina's Local Government Commission, and water systems' compliance data came from the North Carolina Department of Environmental Quality, via the Safe Drinking Water Information System (SDWIS).

Financial resiliency – measured as the financial performance of the local government utilities in FY2016 – varied across the utilities in the sample, as shown

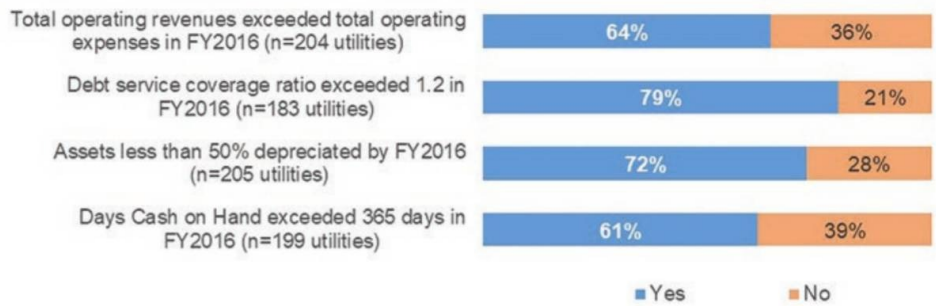


Figure 2: Local government utilities exceeding financial performance metrics in FY2016.

in **Figure 2**. More than a third of the local government utilities in the sample had an operating ratio less than 1.0 in FY2016. That is, their total operating revenues were lower than their total operating expenses (including depreciation) in that fiscal year. While most of the local government utilities in the sample exceeded positive financial performance thresholds in FY2016, 21 to 39% failed to achieve a particular financial performance metric.

The majority (53%) of the water systems in the sample were in compliance with drinking water standards and regulations in the 3 years between 2014 and 2016, as shown in **Figure 3**. However, 42% of the water systems in the sample had at least one monitoring or reporting violation in that period, and 14% had a health-based violation.

STUDYING THE RELATIONSHIP BETWEEN PLANNING AND RESILIENCY

Improvements to resiliency do not instantaneously occur upon the implementation of a long-term plan. For example, a utility cannot create a financial plan one day and then experience a dramatic improvement in its operating ratio the next. To address this latent period between plan development and increased resiliency, utilities were categorized into those with and those without the key component effort of each plan by 2013. We then compared the financial performance in FY2016 and compliance records in 2014-2016 of these two groups.

We also analyzed the effect of having a more comprehensive plan on resiliency.

Each type of planning was broken down into further component efforts beyond the key component effort. It was taken as evidence of more comprehensive planning if the utility completed a greater number of the component efforts.

Finally, we expected that utilities with larger customer bases, as well as dedicated utility managers, perform better than other utilities by virtue of the resources that are available to them. We therefore used statistical methods to control for the service population, the level of staffing per 1,000 service population, and the presence of a full-time dedicated manager. In other words, the results below reveal how a utility that undertakes a particular planning effort – or that has a more comprehensive planning effort – performed better or worse on financial and operational performance metrics than a utility that is identical in service population, staffing level, and dedicated manager presence, but that does not have that planning effort.

Result 1: Utilities with financial planning efforts outperform other utilities on financial performance metrics. Utilities that had set financial targets and goals by 2013 had a higher operating ratio in FY2016 (by 0.08 points on average) than utilities that did not have financial targets set in 2013, even after controlling for utility size and resources. Specifically, utilities with financial targets in 2013 were 2.4 times more likely to have total operating revenues that exceed total operating expenses in FY2016, and were also more likely to consistently have operating revenues greater than operating expenses in fiscal years 2005–2016.



"Our analysis suggests that utility long-term planning is worth the investment of time and effort."

Result 2: Utilities with more comprehensive plans outperform utilities with less comprehensive plans. Although not every financial and compliance performance measure improved with greater comprehensiveness of the planning efforts, we found evidence that more complete long-term plans are associated with improved financial and operational resiliency. Notably, the comprehensiveness of each of the four planning efforts was associated with at least some improved resiliency metrics, and none were correlated with any decreases in resiliency metrics. The specific levels by which financial and compliance performance metrics improved, on average, for utilities with marginally more planning efforts are shown in **Table 2**.

Result 3: Utilities with more customers, a dedicated manager, and a more efficient workforce outperform other utilities. Regardless of planning efforts, utilities with a larger service population and a full-time dedicated manager tend to be

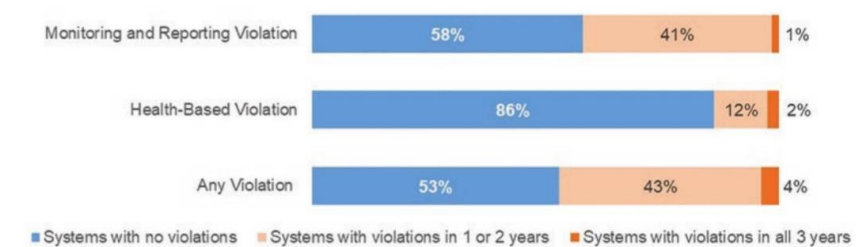


Figure 3: Compliance violations among utilities in the sample (n = 217 water systems) between 2014 – 2016.

more resilient in financial and compliance performance. This is unsurprising, given that more customers mean more financial resources that allow a utility to adapt to changes. Likewise, full-time managers dedicate their attention to the management of the utility and can react to changing circumstances quickly. This was found to be especially true among small utilities: the presence of a full-time dedicated manager at a small utility has a significant and positive impact on its financial and operational metrics relative to

a similar-sized utility without a dedicated manager. Finally, utilities with more efficient workforces, meaning a smaller number of employees per 1,000 service population, tend to have higher financial performance metrics. This is likely due to economies of scale, since larger utilities need to employ fewer staff per 1,000 service population than smaller utilities. The smaller staff per service population results in relatively lower operating expenses per 1,000 service population, which results in higher financial performance measures.

Table 1: Four planning efforts.

Type of plan	Definition	Key Component Effort Question
Financial plan	A plan to ensure that the performance of the utility fund meets or exceeds identified financial benchmarks	Does the utility set specific financial targets and goals?
Asset management plan	A long-range plan identifying how existing physical assets will be managed, and when they will be replaced or rehabilitated	Does the utility inventory its key assets?
Capital improvement plan	A plan that identifies future capital projects and how to pay for them	Has the utility identified potential future capital projects?
Disaster/Emergency/Resiliency plan	Identification of risks to and the vulnerabilities of the utility's functions, and courses of action to mitigate threats	Has the utility documented types of threats or emergencies to which its system might be vulnerable?



Table 2: Improvements to financial and operational performance metrics based on increased comprehensiveness of planning efforts.

Type of Plan	Resiliency Indicator	Average Amount of Change in the Resiliency Indicator for each 10% Increase in Plan Comprehensiveness	Does Increased Comprehensiveness Reflect Improved Resiliency?
Financial Plan	Operating ratio in FY2016	+0.015	Yes
	Percent of years between FY2005- FY2016 when total operating revenues exceeded total operating expenses	+2.3%	Yes
Asset Management Plan	Percent of years between FY2005-FY2016 when total operating revenues exceeded expenditures on operations, maintenance and debt service	+1.3%	Yes
	Percent of years between 2014-2016 when the water system had any violation	-1.6%	Yes
Capital Plan	Operating ratio in FY2016	+0.015	Yes
	Operating ratio (excluding depreciation) in FY2016	+0.026	Yes
	Percent of years between 2014-2016 when the water system had any violation	-2.2%	Yes
Disaster/ Emergency/ Resiliency Plan	Percent of assets that have depreciated by FY2016	-1.2%	Yes
	Percent of years between FY2005-FY2016 when less than 50 percent of the assets have depreciated	+2.6%	Yes

IMPLICATIONS FOR UTILITY MANAGEMENT

Our analysis suggests that utility long-term planning is worth the investment of time and effort. Utilities that have financial, asset management, capital improvement, or emergency/disaster/resiliency plans – or more comprehensive plans – perform better on financial and operational compliance metrics, implying improved resiliency. This is true regardless of utility size, presence of a dedicated manager, and staffing levels. Of course, utility plans have various levels of quality and other nuances that are difficult to capture. What this study ultimately shows is that the small number of water and wastewater utilities without some of the planning efforts would likely benefit from beginning the planning process, and utilities with basic plans should consider making their plans more comprehensive to reap further benefits.

ABOUT THE AUTHORS

Shadi Eskaf joined the Environmental Finance Center in 2004 and has worked on environmental finance projects in local, state, and national settings. Shadi leads the team conducting applied research on a range of topics, including but not limited to water and wastewater rates and rate-setting, utility finance and management, water consumption, infrastructure capital needs and funding, and utility partnerships. Shadi has a Master’s degree in Environmental Engineering from the University of North Carolina at Chapel Hill’s Department of Environmental Sciences and Engineering.

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