Framework for
North Carolina Water Policy

prepared for
NC Chamber Foundation

BLACK & VEATCH

About This Report

North Carolina has a uniquely diverse landscape that stretches from coastal seascapes to urban centers to mountain tops. The state's competitive economy is equally diverse, boasting tremendous residential growth, booming tourism, a dominant agriculture sector, a vibrant and growing business and industry sector, and top academic and research centers. However, there is one common human need woven throughout every component of North Carolina's economy – WATER.

Says the U.S. Water Alliance's One Water Roadmap: "No matter who we are, where we live, or what we do, water connects all of us. When we embrace the belief that water in all its forms has value — water in our lakes, seas, rivers, streams, drinking water, wastewater, and stormwater — the full water life cycle can be optimized to build strong economies, vibrant communities, and healthy environments."

Growth brings fresh challenges, including increased demand on the state's water resources. This Framework for North Carolina Water Policy seeks to answer one key question: "What do we, as a community, need to do to ensure North Carolina has an adequate water supply for our residents and economic growth?"

Drawing on local research, national statistics, and industry trends, this report demonstrates the impacts water has on continued growth, issues communities face, and solutions that have proven to be successful. Based on an understanding of the current conditions and practices of North Carolina's communities and agencies, the opportunities discussed provide a path toward sustainable water supply capable of supporting economic growth throughout the state.

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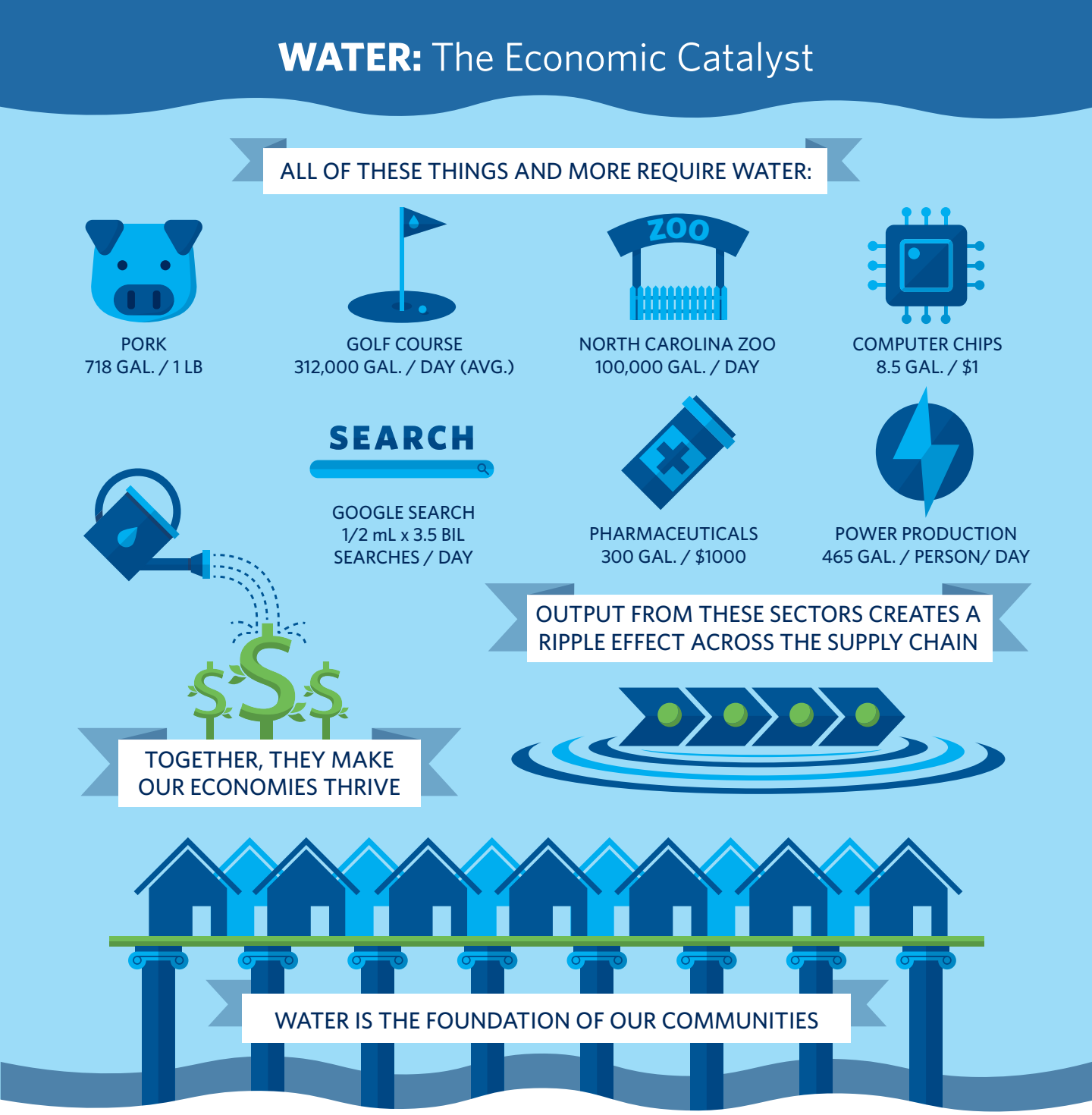
Value of Water: Executive Summary

WATER IS LIFE. IT NOURISHES US. IT CLEANS US AND SUSTAINS US. PUT SIMPLY, WATER IS YOU.

Essential. Reliable. Invaluable. Water—it's the thread that weaves together our daily lives. It keeps our communities healthy, our cities running, and our economies growing. Water is a cup of coffee, the produce aisle, better production, increased exports, and greater American strength. While essential, water infrastructure is largely invisible. Few people realize what it takes to treat and deliver drinking water every day or how wastewater is cleaned so that it can be safely reused or returned to the environment. The high quality of life we enjoy in America would not be possible without water and the infrastructure that cleans, moves, stores, protects, and controls it.

Source: Value of Water Campaign



Executive Summary

SOUND FUTURE WATER STRATEGY GIVES RISE TO RESILIENT, SUSTAINABLE COMMUNITIES

North Carolina's economic engine is strong. Current estimates indicate the state could add an additional 2 million residents by 2030. Bolstered by its location in the middle of the Eastern Seaboard, its transportation infrastructure, and its proximity to top academic institutions, North Carolina is an attractive location for businesses, industries, and research hubs to call home.

Additionally, North Carolina is continually a top tourist destination. Nearly 50 million people vacation in the Tar Heel State every year, and in 2017, those visitors spent more than $24 billion.

To keep up with North Carolina's ever-changing, fast-paced growth, a reliable and high-quality water supply is more important than ever before. In addition, recent hurricanes Matthew, Florence

and Michael exposed deficiencies in eastern North Carolina's aging water infrastructure and other challenges. Unfortunately, these aren't issues unique to the state's eastern region. Aging water infrastructure plagues most of North Carolina's communities, from the state's largest cities to its smallest towns. As one of the most commonly taken-for-granted resources, water has an essential role in sustainable, vibrant communities. If North Carolina is to remain on its current growth trajectory, it is imperative that the state resolve its water infrastructure issues, while also supporting water supply solutions and improving system resilience.

Commissioned by the NC Chamber Foundation, the Framework for North Carolina Water Policy is intended to help North Carolina prepare for future growth and sustain it with a plentiful, safe, reliable, and affordable water supply.

CHALLENGES FACING NORTH CAROLINA

Utilities, industries, regions, and states across the country face varying water infrastructure challenges. Across the Southeast and in North Carolina specifically, system resilience and managing capital costs related to aging infrastructure are considered the most important issues, according to the *2018 Black & Veatch Strategic Directions Water Report* and survey. North Carolina also faces challenges related to an aging workforce as well as data management.

The survey also showed that integrated water planning and innovative treatment approaches are of greater interest in the Southeast as compared with the rest of the United States.

TRANSFORMING CHALLENGES INTO OPPORTUNITIES

Because of water's indispensable role in sustaining both human life and fueling sustainable economies, the cost of inaction is great. If North Carolina is to address its pressing water challenges, the state needs leaders with the political willpower to drive change and innovation, business and political leaders who will collaborate across sectors and industries, and communities that are willing to act.

The opportunity before North Carolina requires forward-thinking, visionary approaches. With an increasingly competitive economy and imminent population growth, the state is in a position to act and drive economic prosperity by strengthening aging infrastructure, streamlining the regulatory process, stabilizing water costs, and achieving resilience.

PATHS FORWARD

Several solutions must be implemented across the state to help build water system, operational, financial, and strategic resilience.

1) Encourage Better Planning

North Carolina has a history of making future planning a priority for continued growth. The state was one of the first states to develop river basin planning that integrated local plans and, ultimately, resulted in a statewide plan. North Carolina should continue the process of regional water planning, where a voice is given to all entities that depend on water. By using a regional approach, local governments facing aging infrastructure challenges and increasing regulatory requirements (including nutrient control and emerging contaminants) will be able to explore options that may help control the high

> *"Just one day with a lack of water service leads to a $43 billion loss in sales. Almost every sector of the U.S. economy would grind to a halt."*
>
> – Radhika Fox CEO, U.S. Water Alliance

costs of rebuilding and enhancing infrastructure. These regional plans, rolled up into a state water plan, can be used to identify and prioritize North Carolina water projects. There should be a five-year planning cycle that develops water plans for a 50-year planning horizon.

2) Significantly Increase Available Funding For Water Projects and Adopt Alternative Funding Mechanisms

Current funding is unable to provide the resources necessary for upgrades to *today's* aging water infrastructure, much less maintain safe and reliable water and wastewater systems in North Carolina *by 2030*. As the state population expands and new business and industry move to North Carolina over the next decade, the funding gap between needed and available resources will only widen. New or additional funding mechanisms must be used to stabilize water and wastewater infrastructure costs. Otherwise, small systems will be unable to keep up with aging infrastructure or comply with increasing regulatory requirements. Funding priority must be given to regional projects and system upgrades where customers would otherwise shoulder excessive cost burden.

3) Elevate the Role of Reuse

Elevating reuse will offset pressure on current source waters and augment existing potable supplies. North Carolina should develop an educational/public relations campaign to promote reuse and set aside infrastructure funding for specific reuse projects.

4) Streamline Regulations

For communities to nimbly capitalize on economic development opportunities, regulations must be streamlined. For example, raising the threshold for what triggers an environmental assessment is just one way that North Carolina could simplify the regulatory process.

5) Improve Data Analytics

Reliable, high quality data is essential to drive informed decision-making and to maintain asset health. North Carolina should enhance its existing data collection process to create a robust data analytics system at the state level and allow utilities across the state to access it. A comprehensive database will provide insight to water systems statewide.

North Carolina communities need resilient systems that provide water security as the state plans for a competitive future. True resilience will equip communities with developed and maintained infrastructure and promote social equity, wellbeing, and empowerment. As a whole, resilience gives rise to sustainable communities where people want to live and work, now and into the future.

Water's Role in North Carolina's Future

"IN EVERY CHALLENGE LIVES A GREATER OPPORTUNITY."

As all water is local, communities across the United States face diverse sets of challenges. Yet all around the country, cities, towns, businesses, and industries exhibit silo-busting examples of integrated and inclusive approaches to water resource planning and management. These approaches exemplify the view that all water has value and should be managed in a sustainable, inclusive, integrated way.

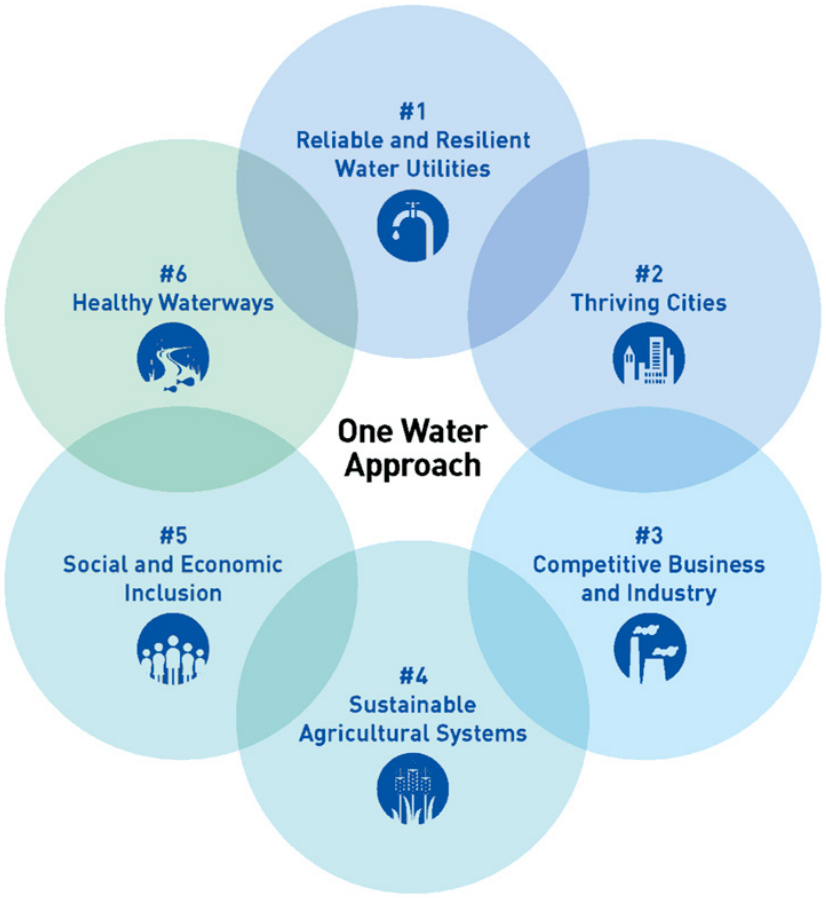
The challenges facing North Carolina bring significant opportunities to drive effective, lasting solutions.

Quote: Jeffrey Benjamin, author/productivity trainer

One Water Roadmap: Arenas for Action

In recent years, the United Nations General Assembly set forth a collection of 17 global goals as part of Resolution 70/1: "Transforming our World: the 2030 Agenda for Sustainable Development," also known as the "2030 Agenda." These 17 goals — from eliminating poverty and hunger to sustainable cities and communities — are all strongly, directly or indirectly related to water.

Similarly, the U.S. Water Alliance's One Water Road map, published in 2017, identifies six arenas for action and offers concrete strategies that advance the One Water approach. Together, the arenas for action can lead to tangible progress regarding how water resources are managed in the United States. This approach recognizes that water must be managed in ways that respect and respond to the natural flows of watersheds and the natural ecosystem, as well as the geology and hydrology of an area.



Source: U.S. Water Alliance

Like the UN's Sustainability Goals, there is natural interdependence. True to the One Water approach, water involves complex and interwoven solutions with many partners across jurisdictions.

The arenas for action cover a range of issue areas, including reliable and resilient water utilities, thriving cities, sustainable agriculture, competitive business and industry, social and economic inclusion, and healthy waterways.

The NC Chamber Foundation commissioned the Framework for North Carolina Water Policy to

> *"Drive economic growth, increase the number of good jobs for North Carolinians, and make North Carolina an even better place to live."*
>
> — North Carolina Vision 2030

EVERY ECONOMIC SECTOR INFLUENCED BY WATER

Due to its far-reaching impacts on public health and widespread impact on everything from agriculture to technology, water's total economic value is immeasurable. However, in recent years with the wide infrastructure investment gap, aging infrastructure concerns, and across-the-board water challenges in communities across the United States, utilities and industries are exhibiting a shift in thinking about the resource.

Some food and beverage companies have set ambitious water sustainability targets. Chemical manufacturers and power producers have taken a deep-dive into water efficiency. Agriculture users are leveraging recycled water for irrigation. In some cases, whole communities or regions are developing new, integrated schemes to sustain economic pillars.

North Carolina's economic success has been well-documented. *Forbes Magazine* ranked North Carolina as the No. 1 state in the U.S. for business in 2017 and 2018. For the fourth straight year, *Site Selection Magazine* named North Carolina the No. 2 state to do business in 2018. Dr. Michael Walden wrote in the *Laurinburg Exchange* that North Carolina "jobs are being added at a pace not seen in years."

More than one-third of the respondents to the 2018 NC Chamber Water Planning Survey indicated that water supply, water/wastewater treatment, water quality, or stormwater issues impede the ability to expand their business. In addition, respondents were nearly unanimous (more than 94%) in their agreement that water and water planning are important to economic success. Further, the results were unanimous that water planning is an important state issue.

As the infographic on page 5 suggests, water impacts all economic sectors. Further, consider the ripple effect across the supply chain as one sector impacts or supports activity in another sector in the same economy.

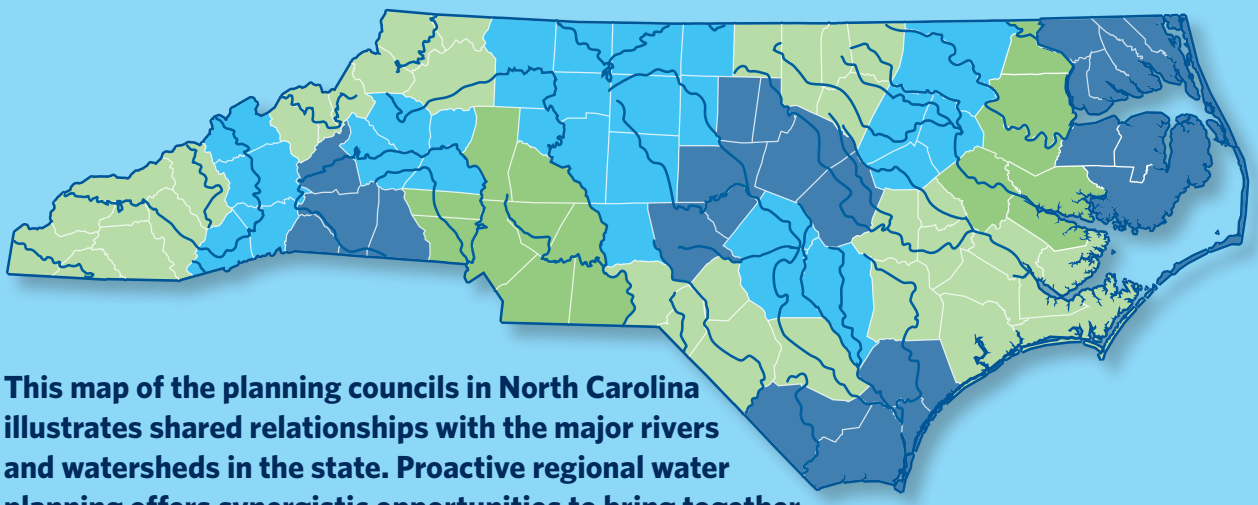
Through a focus on water planning for 2030 and beyond, North Carolina has an opportunity to achieve and sustain prosperity behind a dialog that prioritizes water because of its influence on the success of a community.

Many factors go into developing sustainable communities, including water supply and infrastructure. If water is so essential to all sectors of an economy, how, without it, can we have a place where people want to live and work? Water influences how we can grow, attract, and retain industry and boost commerce in our communities.

The U.S. Water Alliance's Value of Water Campaign may have said it best: "reliable water infrastructure is fundamental to our nation's economic health and competitiveness."

Given water's significance to North Carolina's competitive economy, the state has an opportunity to achieve and sustain prosperity by prioritizing water planning for 2030 and beyond.

The Value of Water campaign found that by funding the annual needs of water infrastructure in the U.S., we can generate more than $220 billion in economic activity and approximately 1.3 million jobs.



This map of the planning councils in North Carolina illustrates shared relationships with the major rivers and watersheds in the state. Proactive regional water planning offers synergistic opportunities to bring together stakeholders from multiple councils and collaboratively develop shared solutions.

Source: NC Association of Regional Councils of Government, map modified by Black & Veatch to show significant river basins.

PROACTIVE PLANNING: BUILD LASTING SOLUTIONS

Water should be managed in a way that is inclusive, integrated, and sustainable. The U.S. Water Alliance One Water Roadmap suggests that planning should be performed on a watershed-scale, with opportunities for agricultural, industrial, municipal, and environmental stakeholders within the watershed to collaborate.

"Integrated and inclusive water resources management can create more vibrant neighborhoods, increase jobs, reduce crime, increase property values, support green space, create green industry hubs, increase resistance to floods and sewage overflows, and reduce impacts from unexpected shutdown," the Roadmap document reads.

Integrated planning also allows localities to have individual water supply plans while encouraging neighbors to work together on long-term regional solutions. Every community is interconnected through watersheds; therefore, the decisions they make and actions they take (or do not take) impact other communities further downstream. The planning process brings communities together to plan and balance multiple water needs, allows an active role for the public in making a difference, and provides economy of scale benefits to the region.

More than two thirds (68%) of respondents in the 2018 NC Chamber Water Planning Survey agree that planning should be done on the regional and state levels. Additionally, more than 77% of participants agree that using regional and state level plans for prioritization of water projects would make planning more effective. Many also agree that project inclusion in regional/state level plans should be tied to state level funding (49%) and permitting (43%).

Integrated planning: identifying and advancing more effective and lasting solutions.

The consensus of the survey is that longer term planning (20-30 years) would be effective.

The Catawba Wateree Water Management Group (CWWMG) is one example of integrated planning. Communities in the Catawba-Wateree River Basin recognize that without an integrated, regional plan, they risk running out of water. Since 2007, CWWMG has been working with regional partners to address issues and protect, preserve, and extend their water supply.

North Carolina has some of the first regional planning agencies in the United States. In 1978, the very first survey of over 400 water utilities was conducted by the North Carolina Public Health Department. North Carolina was also the first state to implement river basin planning in the early 1990s. These plans and the legislature that authorized the efforts demonstrates an early commitment to planning. Today, state agencies work integrally with major utilities and have demonstrated the ability to galvanize regions into action on major water and wastewater issues.

Integrated watershed planning is the next step in tackling water issues comprehensively. Rather than working on just one piece of the equation, communities can work together to identify and implement solutions that are more effective and have a greater overall impact.

FUNDING: OPPORTUNITIES TO OVERCOME FINANCIAL MANAGEMENT CHALLENGES

North Carolina water and wastewater infrastructure dates back well over 100 years and is the backbone of the state's economic engine. The state's water resources provide the citizens and industry with a competitive advantage. However, as with other states, infrastructure investments have been deferred over the years, resulting in infrastructure gaps.

To address these needs, the North Carolina General Assembly created the North Carolina State Water Infrastructure Authority in 2013, which is housed in the North Carolina Department of Environmental Quality (NCDEQ). The authority's primary responsibility is to award federal and state funding for water and wastewater infrastructure projects.

The Authority recognized one of its key tasks was to define and address funding needs through a first-of-its-kind Statewide Water and Wastewater Infrastructure Master Plan (Master Plan). The Master Plan was published in 2017 and provides a vision for the future "by ensuring individual utilities are, or on a path to

NC UTILITY FUNDING SOURCES

Water and wastewater funding sources available to utilities in North Carolina include:

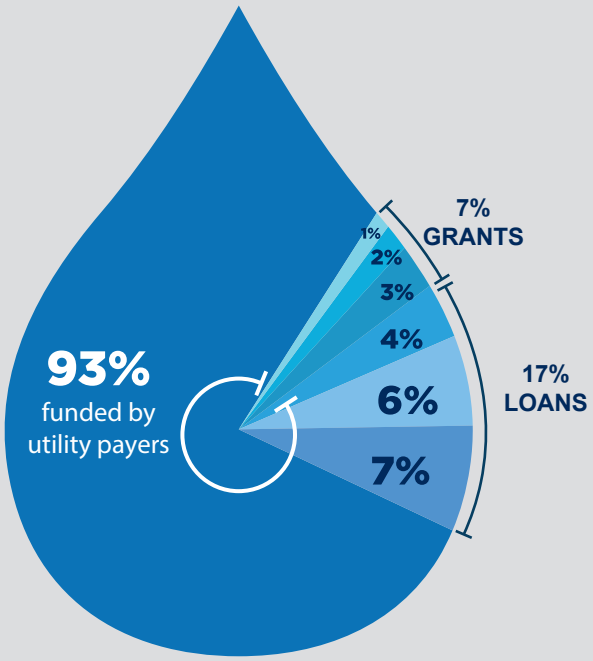
- North Carolina Department of Environmental Quality (6 programs)
- USDA Rural Development (7)
- North Carolina Department of Commerce
- Economic Development Administration (4)
- National Rural Water Association (2)
- Rural Community Assistance Partnership (5)
- CoBank (2)
- North Carolina Clean Water Management Trust Fund (1)
- North Carolina Department of Agriculture and Consumer Services, Division of Soil and Water Conservation (1)
- Rural Economic Development Division (5)

The details of these programs and the availability of funding can be found at:
http://efcnetwork.org/funding-sources-by-state

Estimated
Drinking Water and Wastewater INFRASTRUCTURE NEEDS and FUNDING SOURCES for FY2017 and FY2018 in North Carolina

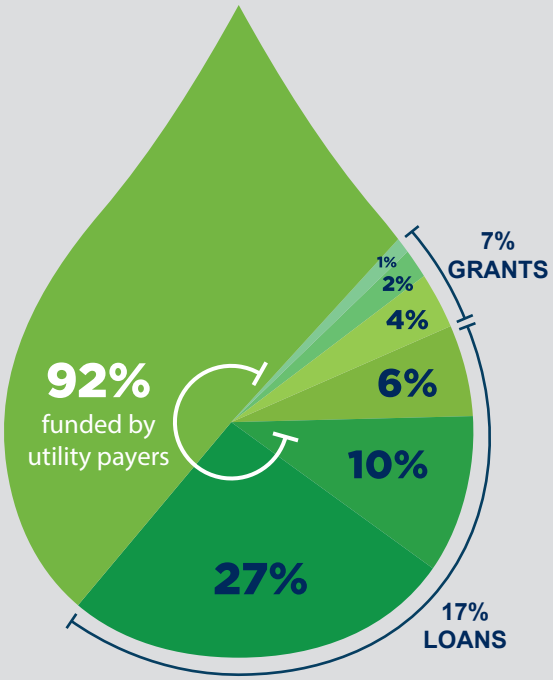
DRINKING WATER

- State Drinking Water Reserve Grants (1%)
- Community Development Block Grant - Infrastructure (2%)
- Drinking Water Connect NC Bond Grants (3%)
- USDA - Rural Development (4%: 3% loans + 1% grants)
- Drinking Water State Revolving Funds (6%)
- Drinking Water Connect NC Bond Loans (7%)
- Drinking Water Needs Deferred or Funded by Other Means (Bonds, Etc)



WASTEWATER

- State Wastewater Reserve Grants (1%)
- Community Development Block Grant - Infrastructure (2%)
- Wastewater Connect NC Bond Grants (4%)
- USDA - Rural Development (6%: 5% loans + 1% grants)
- Wastewater Connect NC Bond Loans (10%)
- Clean Water State Revolving (27%)
- Wastewater needs deferred or funded by other means (bonds, etc.)



Taken from North Carolina's Statewide Water and Wastewater Infrastructre Master Plan, dated 2017NC Water Infrastructure North Carolina Department of Environmental Quality, Division of Water Infrastructure

be, viable systems." The Authority's vision for viable utilities: "foster the long-term viability of individual water and wastewater utilities by providing access to not only the capital funds but also resources that help utilities address organizational and financial management challenges ... contributing to physical infrastructure limitations."

North Carolina's Statewide Water and Wastewater Infrastructure Master Plan identified combined capital cost estimates for water and wastewater infrastructure needs over the next 20 years of $17 to $26 billion, or $0.9 to $1.3 billion per year. These estimates do not include preventative maintenance costs or represent the actual costs to operate the system.

The funding available to water and wastewater utilities varies each year. The Master Plan evaluated the funding requests to the State Water Infrastructure Authority from January 2014 through July 2016. Requests were received for over $1 billion in loan funds and over $650 million in grant funds, and it was only able to fund 60% of requests in loans and 15% of requests in grants. The Master Plan cautioned the following:

> "The amounts requested do not, alone, portray the total infrastructure needs of water and wastewater systems during this time, since applications for funding were received from only a small number of utilities, and do not include estimates for infrastructure needs that were financed from alternative sources (i.e. own revenues, other federal funding programs, bonds, and commercial loans)." (Master Plan page 31)

The graphic included on page 13 of the Water Plan highlights that the utility providers fund the majority of their infrastructure projects (93% for water and 92% for wastewater during FY 2017 and FY 2018). If funding is not available through loans or municipal bonds, or if the utility is not

PERMITTING OBSTACLES

The respondents to the 2018 NC Chamber Water Planning Survey indicated several obstacles regarding permitting for water supply, wastewater, water quality, and stormwater.

Water Supply

- Water transfers (Interbasin Transfer Regulations) that impede cooperation among communities and more regional and state coordination
- Future affordable water supplies to meet long-term growth needs
- Loan repayment schedules

Wastewater

- Nutrient level issues
- Permitting issues including state/county/city
- Old infrastructure

Water Quality

- Inability to monitor/regulate upstream point and non-point discharges
- Emotional/non-scientific responses to regulating emerging contaminants, chemicals, etc.
- Ineffective regulatory processes to remove threats after streams become impaired

Stormwater

- Monitoring and control
- Help industry and the state to have more flexibility on how to meet requirements
- Lack of consistent development rules for runoff, etc., coupled with lack of enforcement knowledge and consistency by regulators in various jurisdictions

able to take on debt, critical work is deferred and added to a growing backlog of infrastructure projects. In an effort to manage their rates, utilities often charge at or below the actual cost to operate, maintain, and plan for future needs.

The 2013 ASCE Report Card indicates the following:

> "...rates that provide enough revenue to balance an annual budget do not necessarily provide enough revenue to cover long term capital and maintenance needs and many utilities charge much less than the full cost of service. Many utilities are not covering their operating expenses, making it difficult, or impossible to rehabilitate aging infrastructure, save for operating emergencies, finance system improvements and expansion, and engage in proactive asset management." (2013 ASCE Report Card page 103)

Floodplain management is a critical issue, particularly in eastern North Carolina.

THEMES: WATER IMPACTS BUSINESS

As referenced on page 10, "Every Economic Sector Influenced By Water," approximately 34% of 2018 NC Chamber Water Planning Survey respondents reported that water supply, water/wastewater treatment, water quality, or stormwater issues impede in some way their ability to expand business opportunities. When asked to elaborate, several themes emerged:

- Some utilities are unable to provide adequate infrastructure capacity for potential future growth.
- Permitting of all types can often take too long and create unnecessary complications in expansion projects.
- Stormwater rules sometimes impede development because of impervious surface restrictions without alternative solutions.

The data cited, while difficult to exactly quantify, indicates there is a significant deficit between the funding needs for investment in new and renewed infrastructure and the funding available, whether it be through bonds, or state and federal grants and loans. Steps must be taken through proactive statewide planning to address this serious issue before public health and economic prosperity are negatively impacted.

The most important of these is assistance to utilities in some of the state's most rural, economically distressed areas (with some of the highest utility rates) by creating permanent management and infrastructure solutions. For the larger metro areas, an emphasis should be placed on funding grants to support utilities as they study the advantages of regional economies of scale and management, access to capital markets, and facility capacities.

The Authority is charged with assisting utilities in working through potential sources of funding to identify appropriate funding opportunities. Consistent with the Authority's charge, nearly 85% of the 2018 NC Chamber Water Planning Survey respondents believe the state should develop strategic water funding initiatives and prioritize projects to leverage funding.

Survey respondents indicated that conservation strategies, water supply diversification, and reuse projects should be at the top of the list of specific water initiatives which should be funded. Most respondents felt that developing adequate water supplies was important to economic growth.

Most survey respondents agreed that funding was not adequate to meet all of their needs, and that most of their needs were largely unmet. Therefore, innovation in funding and financing appears to be a critical need for the state.

REGULATORY AND PERMITTING

Permitting and regulations are generally at the top of the list of discussion items among industry and commercial leaders as well as public and private utilities. The 2018 NC Chamber Water Planning Survey asks several important questions regarding regulations and associated permitting requirements including the following:

- What is the number one regulatory change that would MOST benefit your organization?
- What is the biggest obstacle/challenge regarding permitting in the state, from a water supply, wastewater, water quality, and stormwater standpoint?
- Should state drinking water standards be more stringent, on par, or less stringent as compared to Federal Safe Drinking Water Act Standards.

Based on the results of the survey, the respondents noted the following with respect to regulatory changes that could benefit their organization:

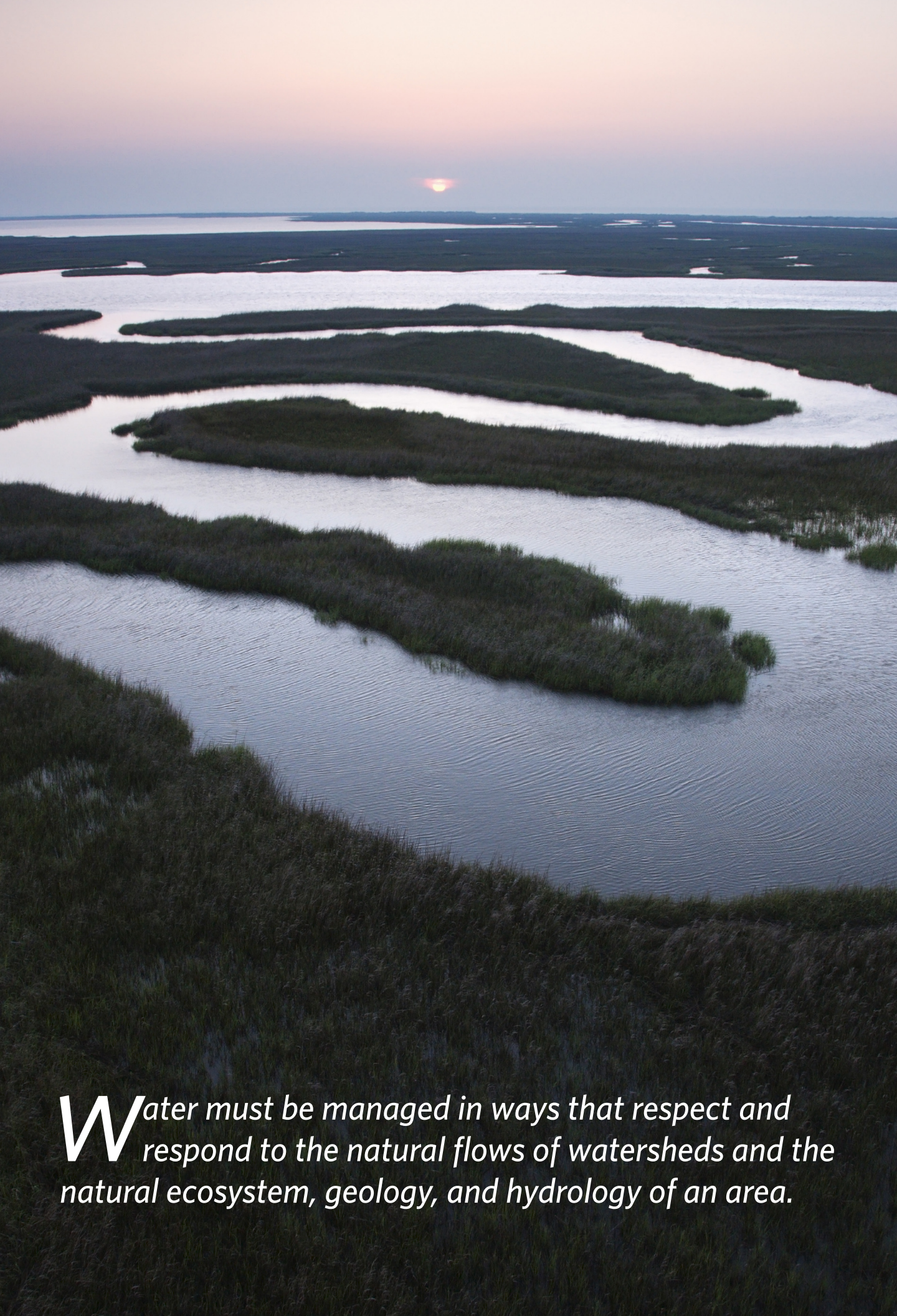
- Create favorable loan and repayment conditions.
- Require or incentivize water systems to reduce non-revenue water to industry acceptable levels.
- Modify the regulations on wastewater permitting to allow more flexibility.
- Provide for flexibility in nutrient management including nutrient credits.

As recent hurricanes Matthew, Florence, and Michael have demonstrated, floodplain management has become a critical issue, particularly for eastern North Carolina communities and the agricultural sector. Flooding continued in the eastern part of the state as rainfall in the upper reaches of the major river basins contributed to persistent flooding long after the hurricanes had moved away from the area. As climate variability has contributed to more intense rainfall in the various watersheds, communities throughout the state have begun to reevaluate plans for stormwater management.

Because of these recent events, nearly all respondents (90%) in 2018 NC Chamber Water Planning Survey indicated an interest in supporting statewide floodplain management regulations.

In an open-ended question, the survey asked: "Based on your knowledge, how are manufacturers/industries in rural areas being impacted by water regulation and permitting issues in the state?" The range of answers highlighted several themes regarding regulatory and permitting issues:

- Some may not have enough knowledge of the current climate.
- Water availability is a factor in location decision-making as well as plant expansions.
- Respondents are unable to receive a deserved and appropriate level of service to help drive economic development.
- Regulatory and permitting issues routinely impact the way businesses operate. The results of the 2018 NC Chamber Water Planning Survey indicate that many of the regulatory relief efforts on the part of the General Assembly over the past several years have positively impacted businesses in a variety of different ways. Many challenges have been identified, but a positive attitude toward solving the long-term issues is evident in the responses.



Water must be managed in ways that respect and respond to the natural flows of watersheds and the natural ecosystem, geology, and hydrology of an area.

STATE HAS OPPORTUNITY TO BUILD SYSTEM AND ORGANIZATIONAL RESILIENCE

North Carolina is not unlike other states in the United States; the gap in infrastructure investment has resulted in several water-specific challenges. Regardless of where the issues sit on the spectrum — funding, aging infrastructure, regulations, etc. — the key driver is resilience.

More than 90% of all survey participants in the *2018 Black & Veatch Strategic Directions Water Report* ranked system resilience as significant among their concerns. States in the Southeastern U.S. rate the subject even more important than the rest of the country. And in North Carolina, all survey participants rated system resilience as important.

System resilience refers to elasticity, or the ability of infrastructure to withstand and recover from shocks and stresses, such as natural disasters. In the 2018 NC Chamber Water Planning Survey, most respondents expressed concern at a higher level for flooding, hurricanes, storms, and cybersecurity breaches. Concern for extreme drought and climate extremes, as well as supply contamination graded out as still concerning but at a slightly lower level.

While more than 70% of respondents indicated their data and asset management programs were average to slightly above average, an opportunity exists to enhance organizational resilience through improved asset management and building system resilience. True resilience is multifaceted and brings opportunity for solutions to the challenges facing North Carolina and other Southeastern states, including aging workforce and infrastructure, funding, regulatory, and data/information management.

In addition to innovative treatment technologies and resource recovery, strategic and financial resilience includes data analytics and coordination with stakeholders to help break the link between water supply and climate. Leveraging data and moving it out of silos provides opportunities to predict problems long before they impact operations and justify and prioritize infrastructure investment. Public and stakeholder engagement and education allows water agencies to strike a balance between affordability and financial sustainability.

By making better use of data analytics and holistic planning approaches, North Carolina can achieve the kind of resilience that not only has systems ready for the next shock but has organizations equipped to handle them as well.

North Carolina's Water Challenges

DRIVE FOR RESILIENCE UNDERSCORES KEY REGIONAL SUSTAINABILITY CHALLENGES.

As North Carolina looks toward a future of growth and opportunity, there comes into view challenges that must be addressed to support the vibrant future ahead. Every sector of North Carolina's economy is impacted by the supply and demand of water, making the factors that impact water as important as its availability.

	Ag	Research	Technology	Medical	Business	Industrial	Population Growth
Water Supply	●	●	●	●	●	●	●
Aging Infrastructure	●		●	●	●	●	●
Quality	●	●	●	●	●	●	●
Funding	●				●	●	●
Rates/Cost Equity	●				●	●	●
Regulatory	●	●	●			●	●
Climate Variability	●	●	●	●	●	●	●

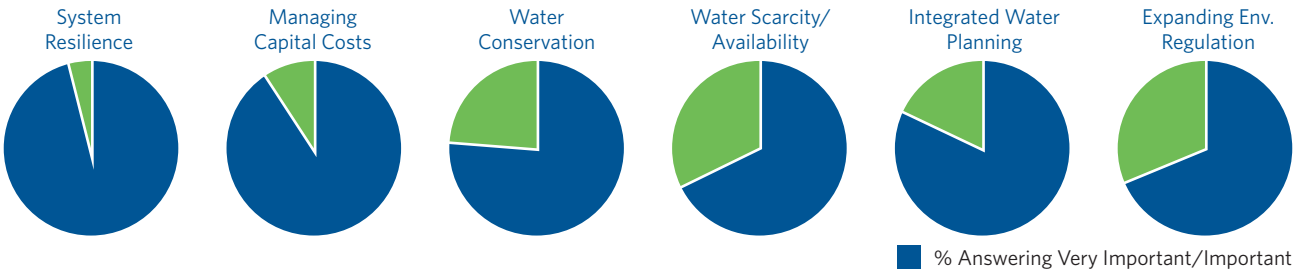
Pressures facing water utilities directly impact economic growth in sectors across the state. *Source: Black & Veatch*

Nationwide trends for water providers are showing an increased focus on asset management, water losses, conservation, and system resilience. As demonstrated in the table above, the pressures that water utilities face directly impact economic viability and growth in sectors across the state.

According to the *2018 Black & Veatch Strategic Directions Water Report*, the Southeast region, including North Carolina, identified system resilience as more important than the rest of the country. Compared to the rest of the country, the report also showed that the region was slightly more engaged with integrated water planning and innovative treatment technology; and was less interested in increasing or expanding the environmental regulations.

The U.S. Water Alliance suggests that water scarcity and flooding, though seemingly opposites, are the result of the same dynamics occurring globally and can have equally devastating impacts. "Communities are confronting increased frequency and intensity of floods due to rising sea levels, extreme weather, and inadequate infrastructure." Because the Southeast tends to be more prone to flooding and stormwater related issues, it is not surprising that water conservation is less of a concern compared to the rest of the country, and that protecting assets from natural disasters, storms, and sea level rise are considered more critical in the region (see pie charts below).

Though water is a natural resource, it takes significant infrastructure — pipes, pumps, reservoirs, treatment plants — to deliver clean water to homes and businesses, and to remove and treat wastewater for safe reuse or discharge to the environment. Some systems were built many years ago, and some communities are growing with systems that cannot keep up. As infrastructure continues to age, utilities need to pay for upgrades, and the challenge becomes keeping rates affordable in both urban and rural communities.



The above charts from the 2018 Black & Veatch Strategic Directions Water Report show the key issues facing the Southeastern U.S.

Unlocking Water Resilience

MULTIFACETED OPTIONS AVAILABLE TO SPARK LONG-TERM SUCCESS.

The water sector faces uncertainty in economic, climate, and social futures. Innovation, research, and development can help to better manage the ambiguity, but industry leadership possesses the key to unlock economic opportunity and support growth. Industry leadership can bring the political will to drive change in thinking, facilitate collaboration across businesses and economic sectors, and foster communities that are willing to act.

Recycled water can be used for irrigation, landscaping, recreation, cooling water and industrial processes, saving billions of gallons of potable water each year and significantly reducing pressure on drinking water supplies.

As North Carolina seeks to enhance its reputation as an attractive destination for businesses and industry, tourism, and residents, one option is to enhance the water planning process by evolving into a regional water planning process. As part of the existing five-year study cycle, water utilities within a given region (geographic areas, hydrologic areas, or similar) could meet quarterly to develop a long-term 50-year regional water plan, that not only takes into account the local plans, but promotes regional coordination and project development.

Such a public process would consider all aspects of the water cycle, and the planning groups would consist of representatives of the public, the environment, water utilities, industries, agriculture, mining, etc., thereby giving a voice to all those that depend on this valuable resource. For each entity in each region (utilities and other water users), the plan would consider growth in long-term water demands, evaluate existing supplies and how those supplies may change in time, determine water shortages, and evaluate and recommend water strategies to meet those shortages.

Information developed during this process could then be rolled up to enhance the state water plan, which could identify and prioritize water projects across the state. This will allow the state to meet the most pressing needs first, while planning for long-term, cooperative solutions. The process also promotes "buy-in" and allows the public to have a more active role in determining future water strategies.

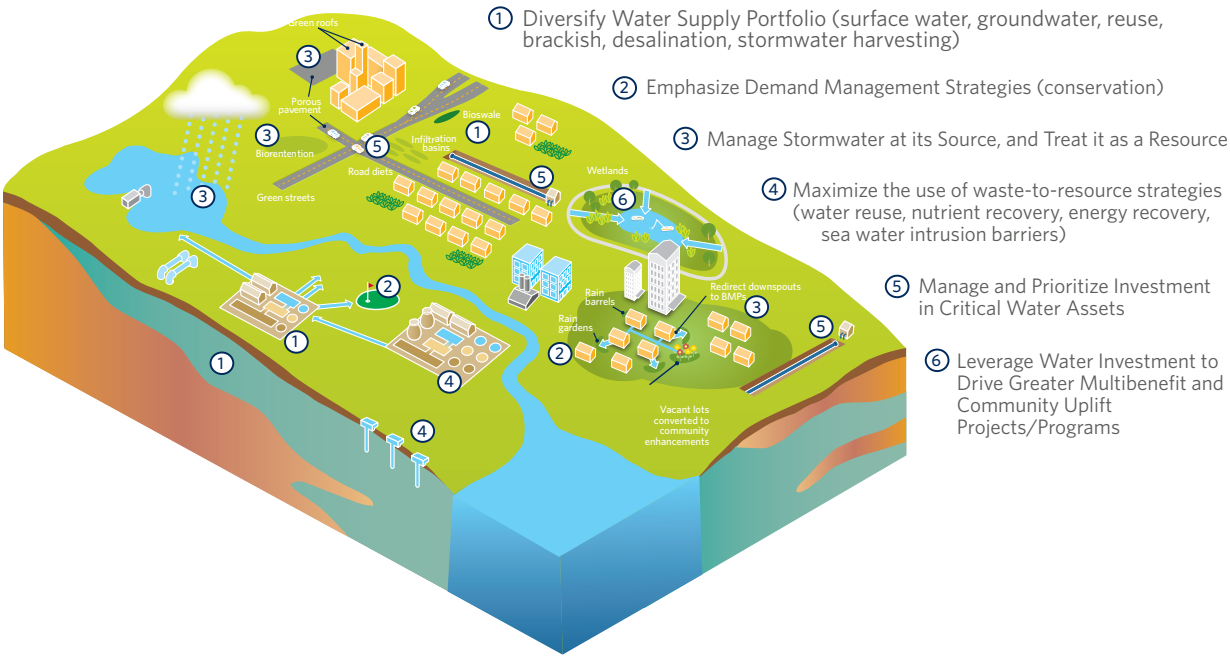
SOLUTIONS

Encourage Integrated Water Planning

Integrated water planning looks at all aspects of water management, including raw water supply, water quality, water treatment and distribution capacity, wastewater collection and treatment, reuse, stormwater management, and more. In doing so, an integrated water plan can develop water solutions for a specific entity such that water plans are holistic and cost-effective.

Facilitate Stabilization of Water Costs

The days of cheap, readily available new water supplies are waning. The cost of new water supplies is increasing and are often variable based on the implementation timeline. Development of regional projects can aid in cost control as it promotes economy of scale. Prioritization of water projects can also assist as it is a way to address the greatest needs first. Alternative funding mechanisms, such as public-private partnerships (P3s) or state-local cost sharing, can also facilitate a process to



allow utilities to gradually increase revenues and ease the pressures associated with new, costly sources of water.

To address the potential funding shortfalls, P3s offer a cooperative arrangement between two or more public and private entities. North Carolina has two primary statutes governing P3s in the state: a) Section 143-128.1C of the North Carolina General Statutes, which authorizes governmental entities to enter P3s with a broad mandate for public-private projects; b) portions of Section 136 which authorizes the North Carolina Department of Transportation and the North Carolina Turnpike Authority to develop transportation infrastructure. The General P3 Statute is basically a procurement statute.

There are no known examples where P3s have been utilized to fund infrastructure projects in the water and wastewater field in North Carolina, but a broad interpretation of Section 143 provides some leeway in what types of projects can be funded. The survey respondents indicated an interest in P3s, but still felt that federal and state grants should be the predominant funding option to support utility water programs.

Promote Role of Reuse

As the price of new supplies increases and the restrictions on effluent discharges become more stringent, reuse could play a key role in the development of future water supplies and in the management of wastewater discharges. Early adoption of reuse will likely center on indirect or direct non-potable reuse that can be used by industries, in cooling towers for power generation, and for irrigation of golf courses, parks, and turf/tree farms. In doing so, this type of reuse can offset the need to use potable supplies. This extends the life of the existing source waters and the water treatment plant capacities. Indirect potable reuse, where highly-treated effluent is discharged into a waterway or reservoir that is subsequently used as a water supply, can be an effective way to augment a utilities existing source water supplies. Finally, direct potable reuse may be a long-term solution, but requires careful implementation and stringent regulation, as well as public acceptance.

In North Carolina, the major metropolitan areas (Charlotte, Raleigh, Greensboro) have or are considering reuse and many smaller communities are actively promoting reuse.

Streamline Regulations

One of the inhibitors to a community's ability to take advantage of economic development opportunities is a lengthy and costly regulatory process. Through state rulemaking or legislative action, rules could be simplified. One example would be to raise the minimum requirement for what triggers an environmental assessment (currently 1 MGD of flow in a force main can trigger an EA). When economic development opportunities strike, communities need to have something in place to act quickly, but unfortunately, the current regulatory environment doesn't allow for a community to "act quickly."

Leverage True Data Analytics

Water service providers face a difficult balancing act. Operations and maintenance costs are on the rise. Historic funding streams are limited, and providers are constantly faced with doing more with less.

At the same time, water utilities are collecting vast amounts of data from their systems: distributed metering, sensor technology, automation/control devices, etc. Yet, too frequently, the presence of multiple data management systems creates silos that prevent operators from leveraging and making the most of all that information.

Data capture is step one, but corresponding software applications that can harness information and break it out of its silos are critical for true data analysis to improve operations. Analysis drives decision-making, helps us to predict, recognize and adapt to changing conditions, and helps to sync demand with resource supply.

Embracing data and moving toward a true digital water program will yield keen insights about asset health and support planning future infrastructure investment.

A regional water planning process would enhance the state water plan and allow the state to meet the most pressing needs first, while planning for long-term cooperative solutions.

Case Studies

VARIETY OF METHODS GET RESULTS ON STATE, REGIONAL LEVELS.

Regional and state water challenges are not met with the luxury of broad-brush solutions. In this section, we take a look at several case studies that demonstrate impactful approaches on the allocation of resources within a state.

Texas Regional and State Planning

PLANNING TIES TO FUNDING, PERMITTING

The Texas Water Development Board (TWDB) oversees the development of 16 regional water plans, which are developed by Regional Water Planning Groups (RWPG) with state funding. These regional water plans are updated every five years and form the foundation of the State Water Plan. The adopted State Water Plan is used to guide regulatory, permitting, and funding decisions at various state agencies.

The plans are based on water available in the historic drought of record for each region and on projection of water demands (rather than a range of possible growth rates). The plans are intended to guide each region and the state toward developing sufficient water supplies to meet future demands over the next 50 years.

STRUCTURE

Each regional water plan is developed collaboratively by RWPG's 12 volunteer representatives from stakeholder groups. Each region is supported by a local Political Subdivision to administer the process (oversee finances, assist with public notification, etc.), and a technical consultant to prepare the plan.

WATER DEMAND VS. SUPPLY

Current and future demands and firm reliable supply data are developed for entities with high use rates. Decade-long demands are projected over a 50-year planning horizon using census data, demographic trends, industry reports, and any other relevant information. Current supplies are based on the water available to an entity under a drought of record scenario, and consider hydrologic availability, existing infrastructure, and legal rights to the supply.

WATER MANAGEMENT STRATEGIES

A "need" (shortage) evaluation is performed where projected demands and existing supplies are compared. Where current supplies are insufficient to meet demands, new water management strategies (water projects) are developed to meet those shortages. Water management strategies can include conservation or demand reductions, new supplies through new or expanded source development, or transfers of water. The capital cost and unit costs of water, environmental impacts, sustainability, and population served are considered when developing potential water management strategies.

ENVIRONMENTAL IMPACTS

The proposed strategies and projects are evaluated in terms of their environmental impacts. The parameters of the planning process require that the plan be consistent with sound groundwater and surface water supply management practices. Additionally, the cumulative effect of the plan (assuming implementation of all strategies) is estimated.

DROUGHT RESPONSE

Although the planning data are based on the historical drought of record, specific drought response plans and preparations are gathered, summarized, and recommended for various entities. Central components include triggers for various stages of conservation at the outset of drought conditions, and emergency response plans.

"North Carolina could benefit from having state permits and low cost funding options being tied to the planning process."

California Water Planning

PLANNING ASSISTS REGULATORY FRAMEWORK

The California Water Plan, prepared by the California Department of Water Resources (DWR), is the state's strategic plan for sustainably managing and developing water resources for current and future generations. Required by state law, it presents the status and trends of California's water-dependent natural resources water supplies and agricultural, urban, and environmental water demands for a range of plausible future scenarios. The plan:

- Integrates information and recommendations from various state plans and initiatives.
- Is updated every 5 years (only partially).
- Encourages collaboration on findings and recommendations to make informed decisions.
- Uses a range of climate and demand scenarios.
- Cannot mandate actions or authorize spending.
- Does not make project- or site-specific recommendations nor include environmental review or documentation.
- Requires policy and lawmakers to authorize and fund specific actions proposed in the plan.

In recent years, California has experienced severe droughts and extreme flooding. The Water Plan was updated in 2018 in response to increased pressure to improve flood control infrastructure, manage water resources sustainably, and shift how groundwater is governed, planned for, and managed in the state. The state has set a goal to establish quantifiable metrics for success and to track the impact of public investments.

STRUCTURE

The plan includes a chapter for each of California's 12 hydrologic regions. Each chapter describes the region's watersheds, sources, ecosystems, climate, demographics, water use, and governance. Integrated regional water management plans and projects are recommended in the planning process and funded by the state to encourage collaborative solutions.

WATER BUDGET

Built on the Water Plan's water budget methodology, DWR's water budget framework is developed for the overlapping watersheds and administrative boundaries. Water data are developed using five different models from departments and programs across the state, including groundwater-surface water simulations, soil-water balance and crop evapotranspiration models, and historical regional supply and demand data.

SCENARIO PLANNING

The California Water Plan considers a range of possible future conditions projected out to year 2100. The climate scenarios are based on two different greenhouse gas concentration projections and 10 different global circulation models for a total of 20 scenarios. Three different population projections were developed by the Public Policy Institute of California.

FUNDING PLAN

The funding plan will be developed in the 2018 update using tools to prioritize near-term investment needs. The plan will include analysis of potential funding scenarios on a geographic basis to prioritize action types (low, medium, or high) based on applicability, reliability, and political viability.

"Scenario planning, similar to what has been forged in California, would allow North Carolina to consider a range of possible futures."

Georgia Regional Planning

INTEGRATING WATER SUPPLY AND WATER QUALITY

Regional water plans in Georgia are developed in accordance with the Georgia Statewide Water Management Plan (State Water Plan), which was adopted by the General Assembly in January 2008. The State Water Plan establishes 10 water planning regions across the state, each guided by a regional water planning council. The State Water Plan also guides regional water planning by the Metropolitan North Georgia Water Planning District, which was created by the Metropolitan North Georgia Water Planning District Act of 2001 and includes the Atlanta metropolitan region.

The State Water Plan requires the preparation of regional water development and conservation plans (regional water plans) to manage water resources in a sustainable manner through 2050. The State Water Plan provides a framework for regional planning consistent with the policy statement that "Georgia manages water resources in a sustainable manner to support the state's economy, to protect public health and natural systems, and to enhance the quality of life for all citizens."

Regional water planning is designed to incorporate input from state agencies, other regional water planning councils, local governments, watershed stakeholders, and the public. Regional water planning councils include up to 30 members from throughout the planning region. Members are appointed by the Governor, the Lieutenant Governor, and the Speaker of the House.

The original regional water plans of the councils were adopted in 2011 and revised in 2017. These plans were developed by the councils and approved by the Georgia Environmental Protection Division (EPD). The Plans provide a roadmap to guide long-term use of the water planning regions' water resources and are to be implemented by water users in the regions along with state agencies and other partners. These plans will also help guide state agency decisions on water permitting and grants and loans for water and wastewater-related projects.

At the beginning of the regional water planning process in Georgia, the councils developed vision statements supported by specific goals. The goals addressed protecting the quantity, quality, and environmental resources of each region in the face of political, climate, and economic uncertainties. The visions and goals guided the councils in developing the regional water plans, particularly the selection of management practices.

The planning process includes estimation of demands for water, wastewater flows, and assessment of the capacity of the region's water resources, in terms of both quantity and quality. Forecasts of water demands for water planning regions were updated for each planning cycle.

The forecasts of current and future water and wastewater demands were compared against assessments of resource capacity. Georgia EPD developed water availability and water quality resource assessments to evaluate the capacity of water resources to meet demand for water supply and wastewater assimilation. The resource assessments identified potential gaps in the capacity of water resources to meet water supply and wastewater demands, within the thresholds EPD selected to indicate potential local and regional impacts.

"Similar to Georgia, North Carolina should holistically plan for water, wastewater, and water quality aspects."

Colorado River Basin Planning

BALANCING DIVERSE STAKEHOLDERS IN A WIDE AREA

The United States Bureau of Reclamation has developed and managed many of the major dams and reservoirs that are central to the water system of the western U.S. This study enabled supply, demand, strategy, and project information to be integrated across the typical water management/political boundaries. The basin is divided into an upper basin and a lower basin for planning purposes.

WATER SUPPLY AND DEMAND SCENARIOS

Scenario planning is used to assess uncertainty associated with both projections of water availability and water demand. Four water supply scenarios are developed based on:

- The assumption that the future hydrologic conditions will be similar to the last 100 years.
- Future hydrologic trends and variability are based on reconstructed streamflow conditions over a period of approximately 1,250 years.
- Future hydrologic trends and variability are based on reconstructed conditions of the last 1,250 years, but scaled to have magnitudes similar to the last 100 years.
- Future conditions based on down-scaled results from an ensemble of 112 global climate models.

Water demand projections are based on six scenarios: current projected (A), slow growth (B), rapid growth (C1 and C2), and enhanced environment (D1 and D2). These demands include assumptions about the consumptive uses of water and international treaty terms with Mexico. The basin model also includes demand projections for hydropower, recreation, and ecological flows.

OPTIONS AND STRATEGIES TO RESOLVE SUPPLY AND DEMAND IMBALANCES

Using all 24 scenarios, imbalances were estimated and viewed as bounded by worst- and best-case scenarios, or estimated using a median. The member states and planning entities developed strategies and projects to diversify their supplies and address imbalances, which has mitigated some of the challenges within the basin. Stakeholder participation has been a critical component to understanding the challenges each entity is facing and to gathering potential strategies to meet future needs.

As part of the planning process, 150 water strategy concepts were received from public outreach and solicitation. These were categorized as either supply increases, demand reductions, operations modifications, or as governance and implementation measures. Initial feasibility screening resulted in 30 options, which were then evaluated quantitatively with cost, yield, and timing estimates. These options were then rated based on 14 criteria at an appraisal level. Once evaluated, the options were used to develop four representative portfolios, which represent different approaches to resolving imbalances within the basin. These four portfolios were then evaluated against an existing system baseline reliability to determine their ability to reduce vulnerabilities.

FUTURE CONSIDERATIONS AND NEXT STEPS

The basin states' representatives and other stakeholders convene regularly to discuss the need for and implementation of measures to address the basin's water resource issues.

Colorado Water Planning

DIVERSIFYING WATER SUPPLY PORTFOLIO

Colorado contains the headwaters for 15 million acre-feet of surface water supplies that serve 18 different states, numerous Native American nations, and two countries. Interstate and international water compacts and treaties dictate how water is divided among users and are often the subject of litigation. Additionally, much of the water originates on the western slope of the Rocky Mountains while most of the state's population and water demands are on the eastern slope. Because of this, the state relies on significant conveyance infrastructure.

Colorado uses scenario planning based on a range of potential climate and demand scenarios, providing flexibility in planning for and responding to future conditions. The Colorado Water Plan addresses three major challenges:

- A growing municipal water supply gap.
- Agricultural dry-up, or the permanent transfer of agricultural water rights to other uses.
- Environmental concerns, including watershed health and ecosystem resilience.

STRUCTURE

The Colorado Water Conservation Board (CWCB) is responsible for surface water protection, water conservation, flood mitigation, stream restoration, drought planning, water supply planning, and water project financing. Basin implementation plans are developed collaboratively by state agencies and local stakeholders.

MEASURABLE OBJECTIVES

The statewide water plan includes goals and milestones to measure progress. These include:

- Reduce the supply-demand gap from 560,000 acre-feet (AF) to zero by 2030.
- Conserve 400,000 AF of water by 2050.
- Incorporate water-saving actions into land-use planning for communities representing at least 75% of Colorado's population.
- Maintain agricultural economic productivity to keep pace with growing state, national, and global needs.
- Attain 400,000 AF of new storage.
- Ensure that 80% of locally prioritized lists of rivers have stream management plans and 80% of critical watersheds have watershed protection plans by 2030.
- Raise $100 million annually starting in 2020 to fund implementation of the plan.

WATER PLAN GRANT FUND

The purpose of the Water Plan Grant Fund is to make progress on the critical actions identified in the plan and its measurable objectives. The board selects projects, programs, and activities to fund from applications that have the best opportunity to make progress on the measurable objectives or critical actions.

WATERSHED MANAGEMENT

Natural disasters have significant impact on source water quality and stormwater response, and increased development and changing land use can impact a watershed's ability to respond to storm events. The plan reviews how the state is meeting goals to preserve the health of watersheds, improve resilience to natural disasters, and maintain water quality.

"Diversifying supplies would insulate North Carolina from both extreme weather events and potential water contamination problems."

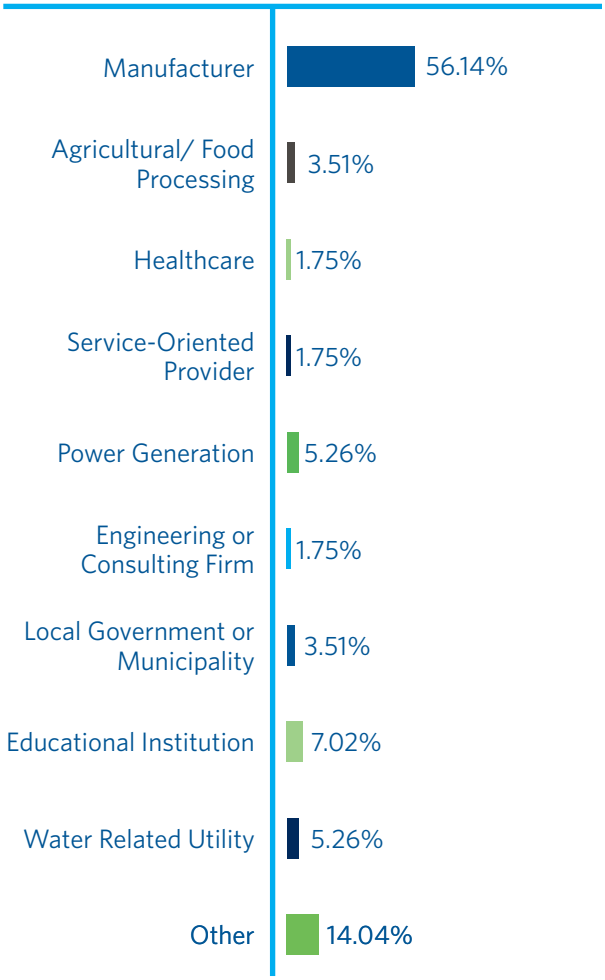
2018 NC Chamber Water Planning Survey Results

WE ASKED. YOU ANSWERED.

In November 2018, the NC Chamber Foundation issued a Water Planning Survey authored by Black & Veatch to help gauge where businesses stand on water issues facing the state of North Carolina and gain insights on opportunities before us.

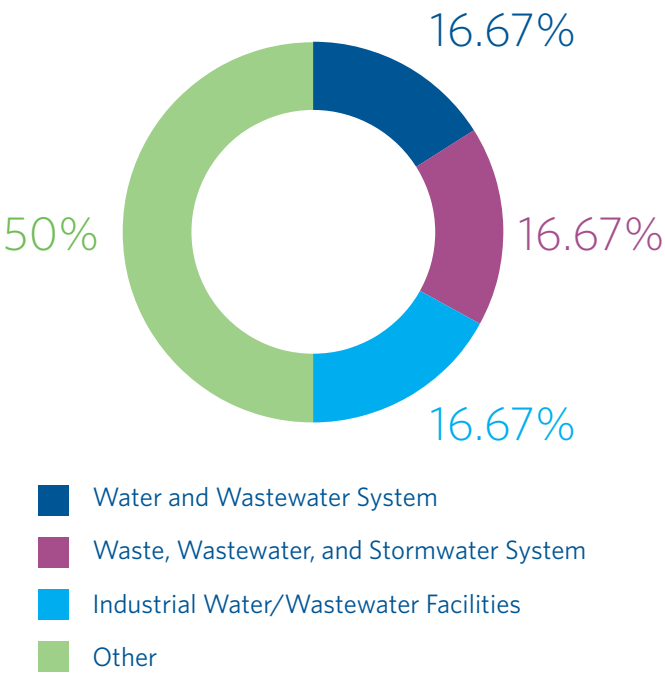
QUESTION 1

Which of the following best describes your organization?



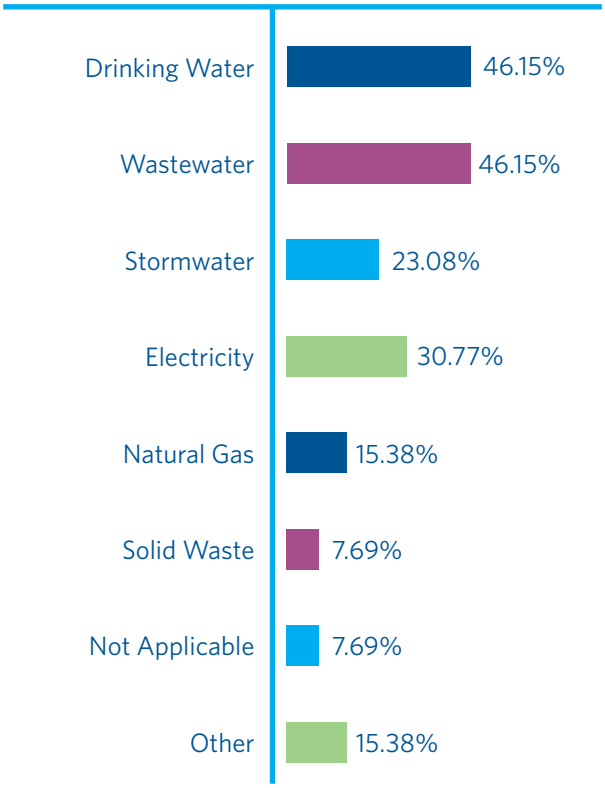
QUESTION 2

If you are a utility, which of the following best describes your organization?



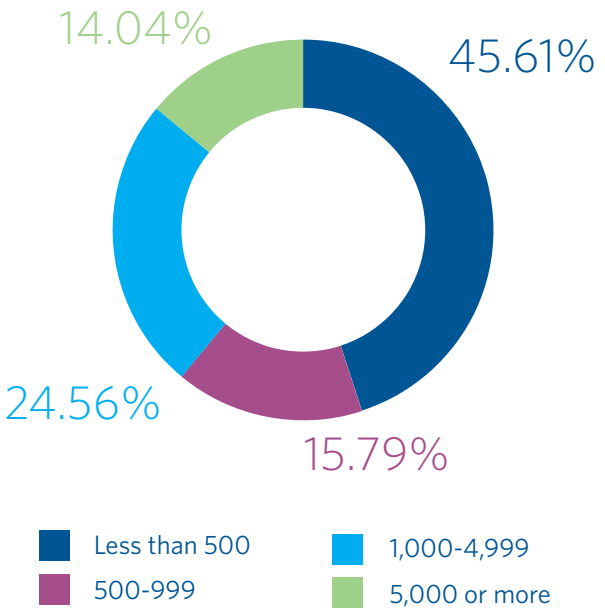
QUESTION 3

Please Identify all of the services provided by your utility.



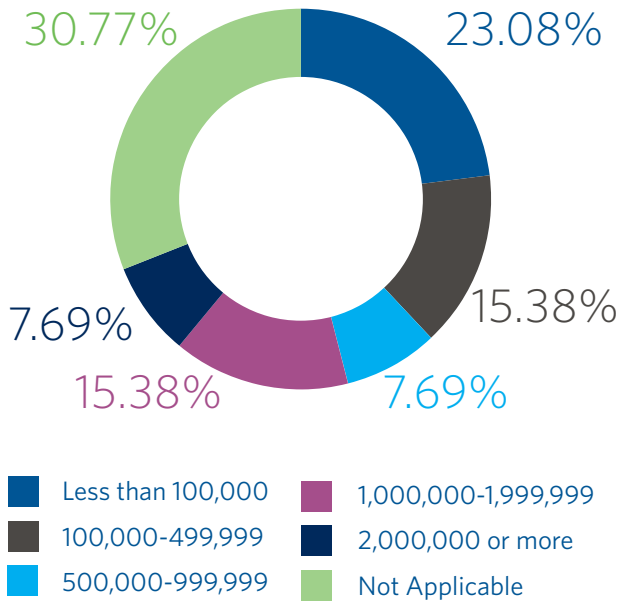
QUESTION 4

What is the estimated work force of your organization?



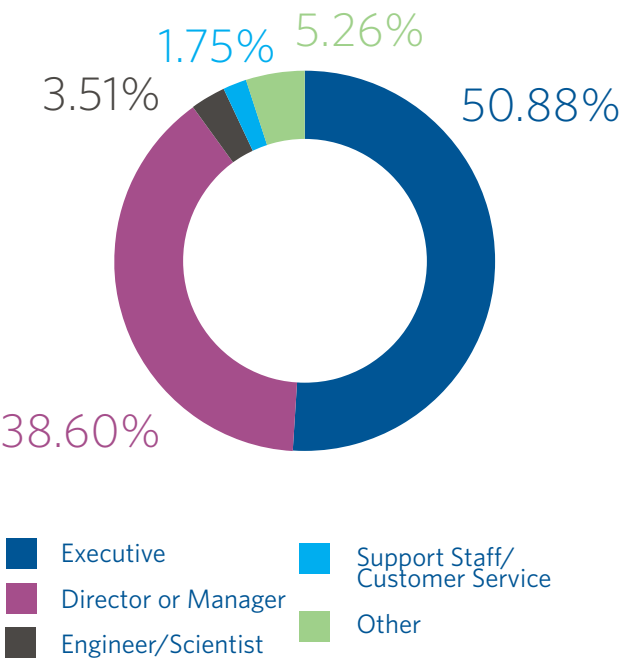
QUESTION 5

If you are a utility, what is the estimated population served by your organization?



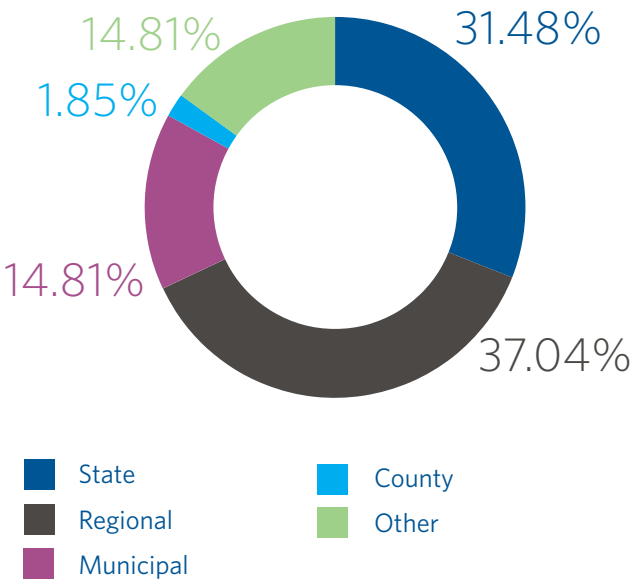
QUESTION 6

Which of the following best describes the position you currently hold within your company?



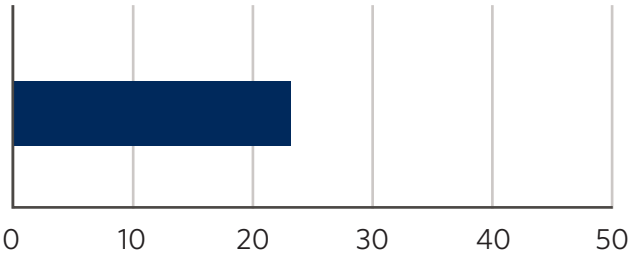
QUESTION 7

Should water planning be done at the state, regional, or local level?



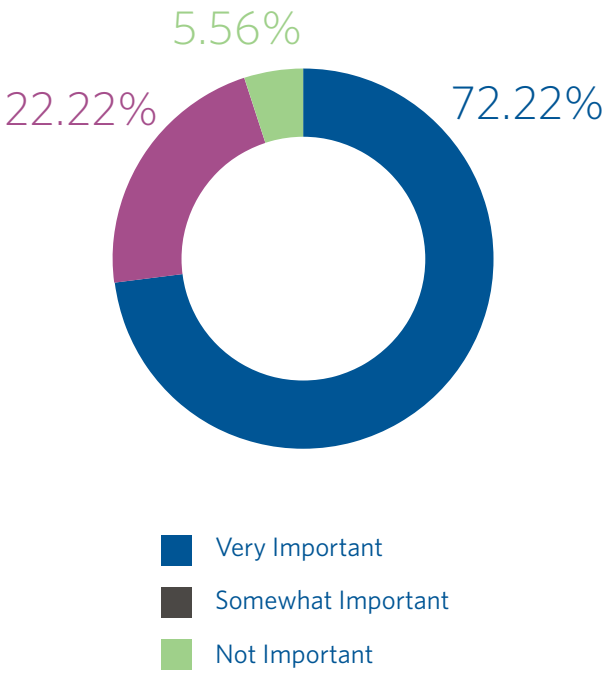
QUESTION 8

What is an appropriate planning horizon for water supply, water quality, an/or wastewater initiatives?



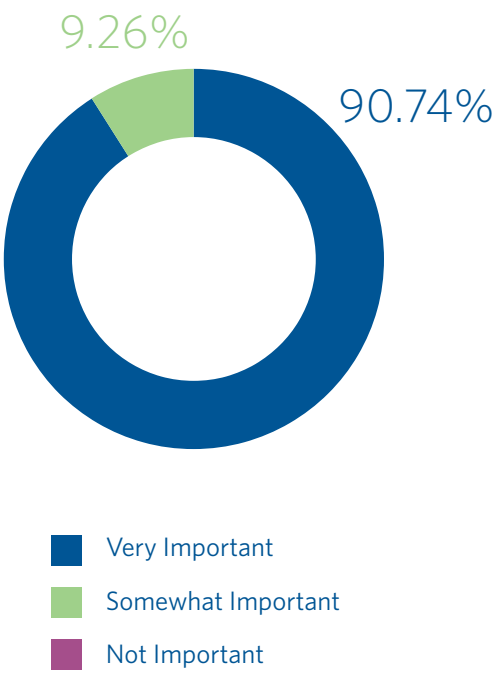
QUESTION 9

How important are water and water planning for the economic success of your organization?



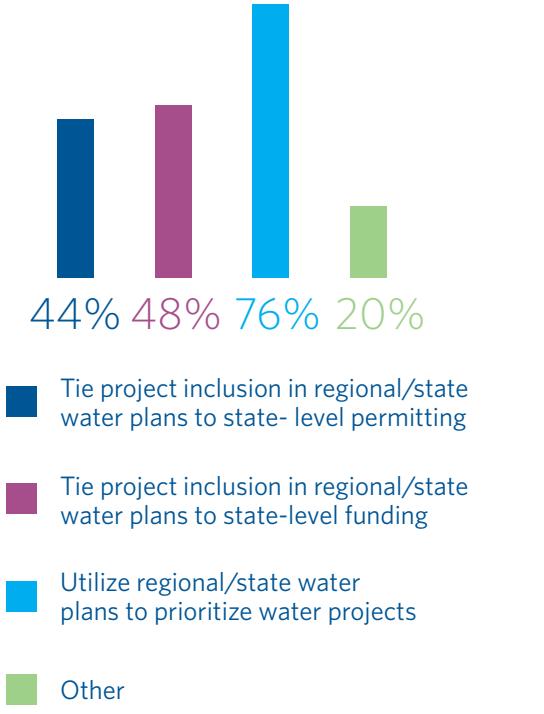
QUESTION 10

How important is water planning for the state of North Carolina?



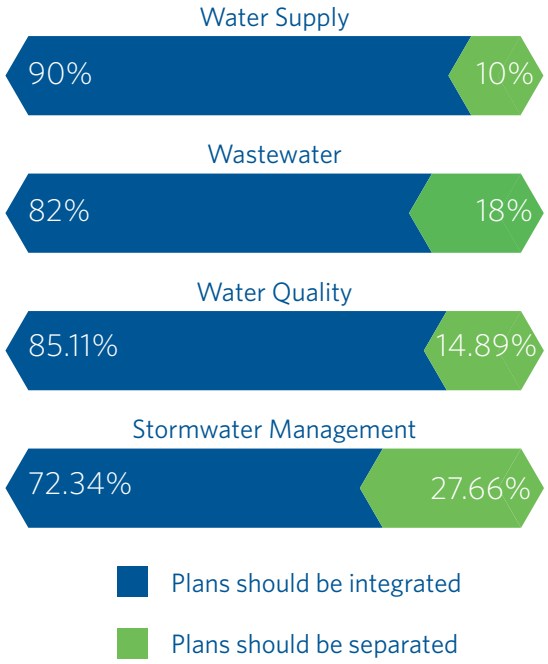
QUESTION 11

What can make water planning a more effective activity?



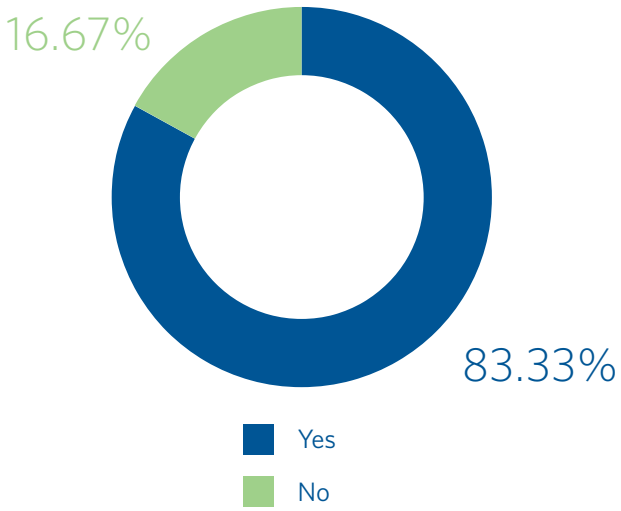
QUESTION 12

For the development of future planning efforts at the regional/state level, which of the following types of water plans should be integrated into a comprehensive water plan?



QUESTION 13

Should the state develop strategic water funding initiatives and use project prioritization to determine the most effective way to leverage funding?

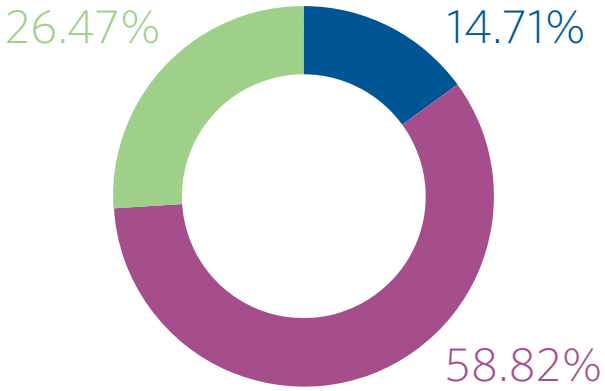


QUESTION 14

What can make water planning a more effective activity?

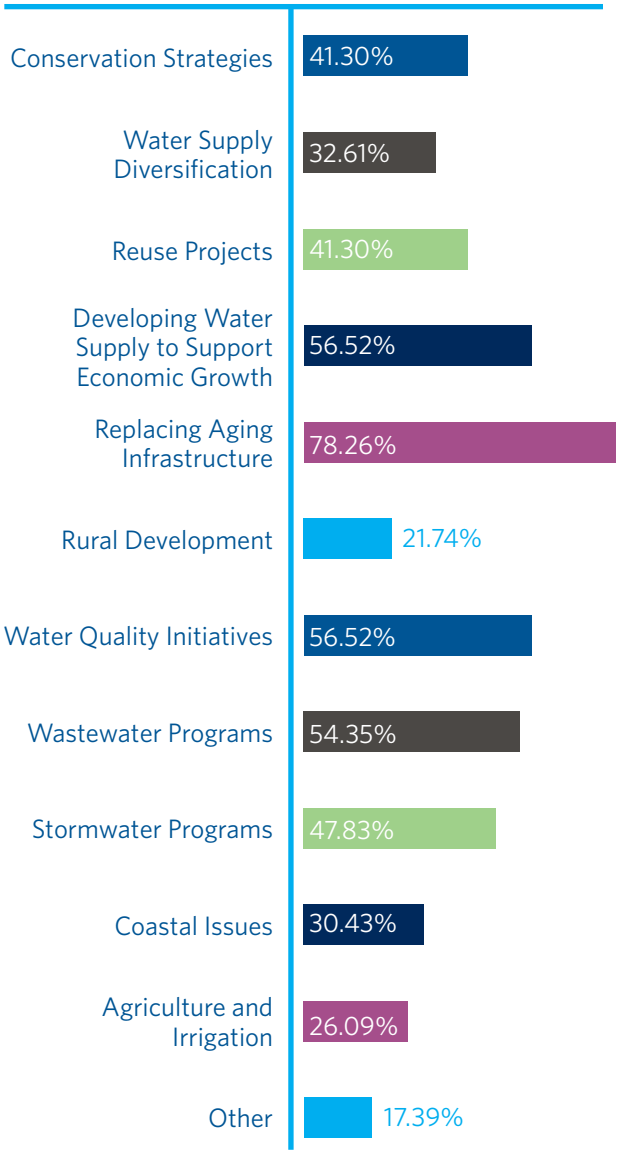
QUESTION 15

Are state and federal funding programs, such as the Drinking Water State Revolving Fund, Clean Water State Revolving Fund, or Water Infrastructure Finance and Innovation Act, sufficient to fund your utility's water programs?



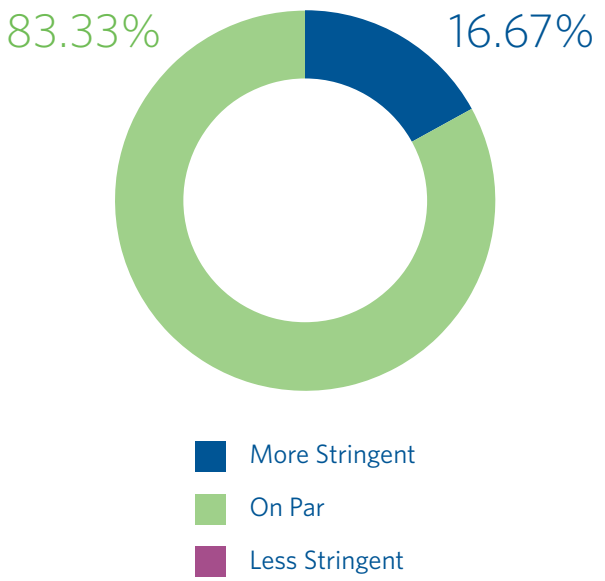
QUESTION 16

What can make water planning a more effective activity?



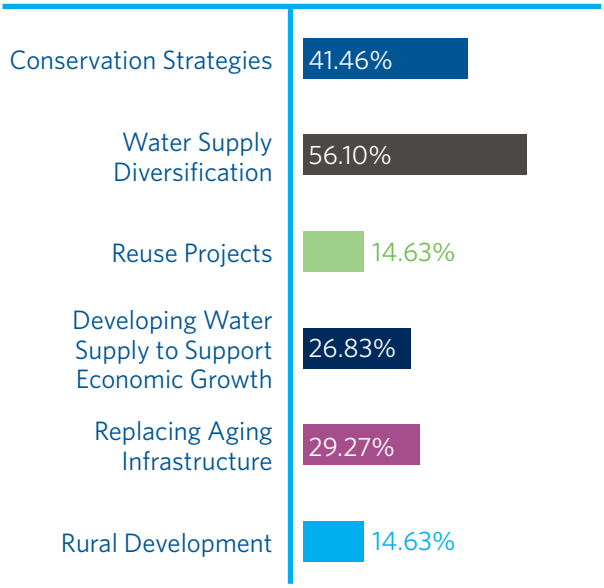
QUESTION 17

State drinking water standards, as compared to Federal Safe Drinking Water Act Standards, should be:



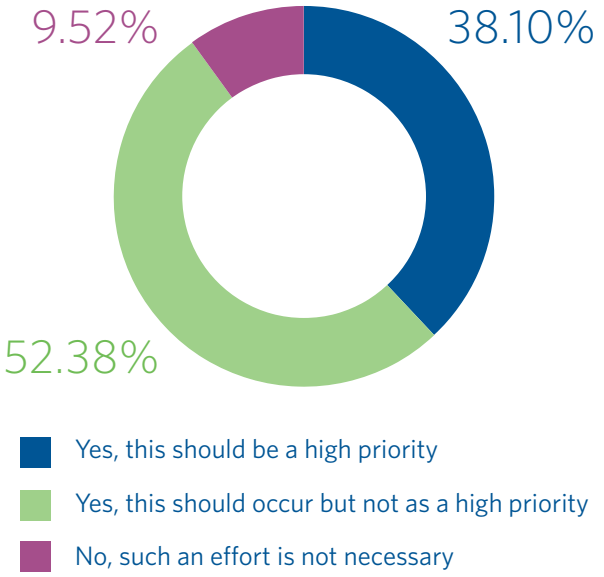
QUESTION 18

What alternative funding options would be valuable for implementation of your utility's water programs?



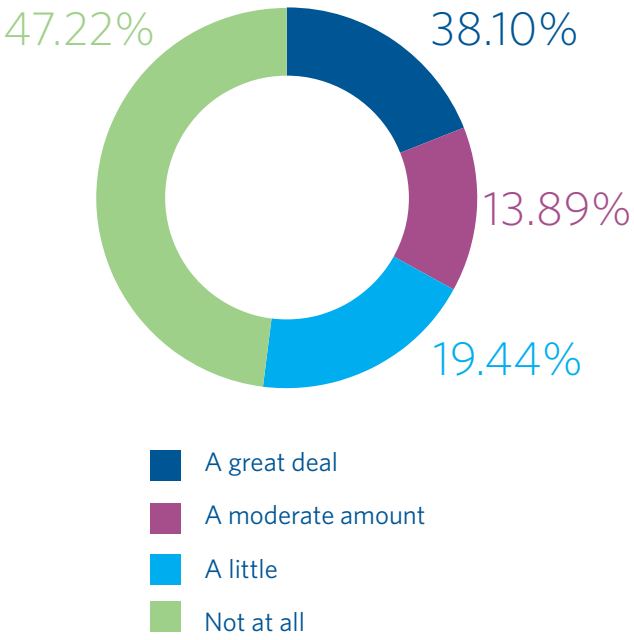
QUESTION 19

Should there be an effort to develop statewide floodplain management regulations?



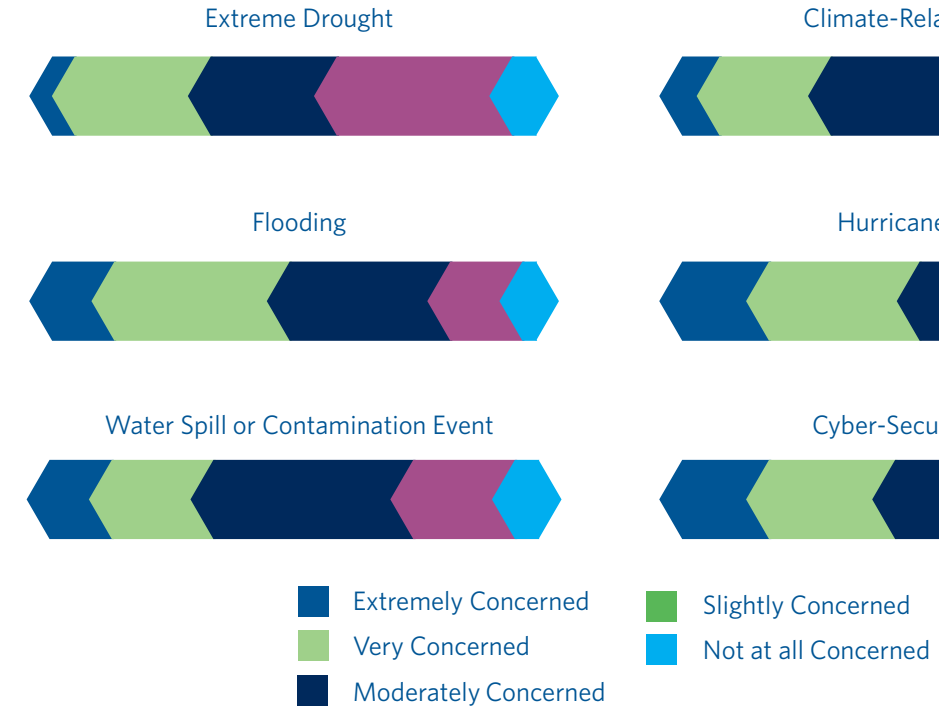
QUESTION 20

To what degree are water supply, water/ wastewater treatment, water quality, or stormwater issues impeding your ability to expand your business?



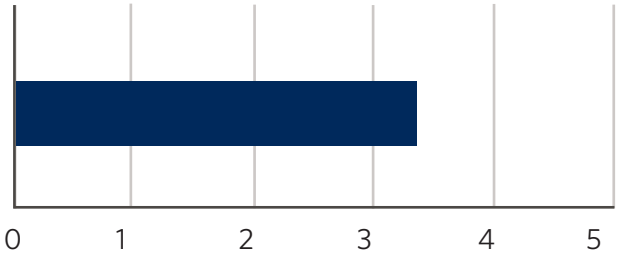
QUESTION 21

Resilience: the ability of a system or organization to withstand and recover from a system shock, such as natural disaster, act of terror, economic collapse, etc. Which of the following events are you concerned about as they relate to resilience of the system(s) you manage in your area?



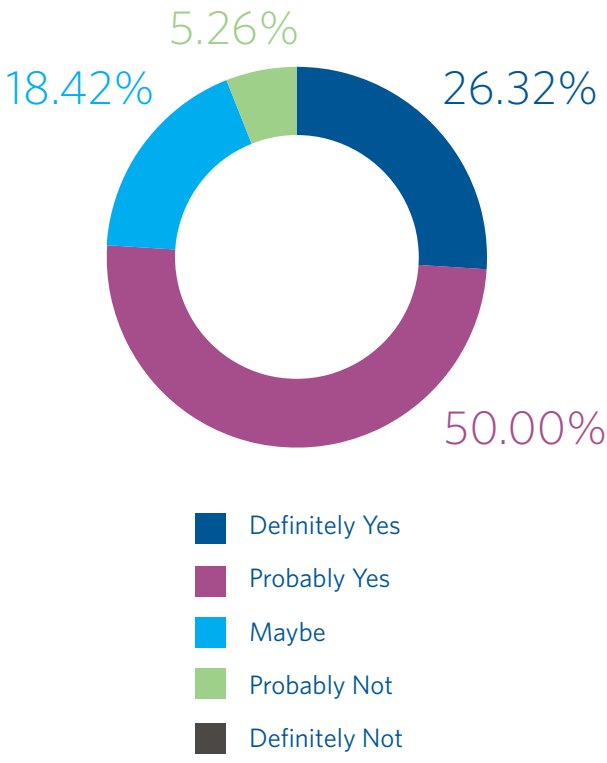
QUESTION 22

How would you rate the strength of the water-related asset and data management program in your organization?



QUESTION 23

In your opinion, would it make sense for one state agency to house the hydrologic and water data for the state?



References and Additional Resources

North Carolina Overview

US Water Alliance: Raleigh Listening Session

In January 2016, the U.S. Water Alliance and the Conservation Fund held a listening session in the Research Triangle area of North Carolina. The session was attended by nearly fifty water leader stakeholders, with the purpose being to use their knowledge and expertise to brainstorm ideas for a national water strategy that can be used at a local North Carolina level.

Aging Infrastructure

Like many areas in the United States, the state of North Carolina is dealing with aging infrastructure and seeking ways to pay for infrastructure improvements. In the Raleigh-Durham area, water utilities have access to needed capital for improvements, but that is not the case statewide. The section on funding provided a number of options for North Carolina to use federal grant money and other sources to provide funding to water utilities within the state. Developing a process to better leverage the funding available may be a way for North Carolina to fund infrastructure improvements.

Capital Needs

North Carolina receives the second largest amount of grants from the USDA. These USDA grants, while beneficial to the state, are not enough to cover the water infrastructure improvements that are needed statewide, but are of immense help in the more rural counties. Petitioning for additional USDA funds is an option for North Carolina to consider.

Another option that North Carolina could pursue is to research targeted investing. There would be effort required to create a matrix that ranks the utilities by improvement needs as well as funding needed. Those utilities and areas with the most need would receive the highest amount of state funding. This would benefit the underfunded rural utilities, many with the most needs. As a result, they cannot maintain or attract the industry they need to stabilize or grow their communities.

Regional Partnerships

While there are shortcomings, many regional partnerships do exist including the Triangle J Council of Governments, Upper Neuse River Basin, and the Jordan Lake Partnership. Opportunities to improve upon partnering challenges include the State Water Infrastructure Authority, which has nine members and is focused on allocating grants and state funds. Another option is to create a river basin commission that has authority over the 17 river basins in North Carolina. European planning efforts are done on a regional basis and are a good reference for connecting cities in the state.

Within North Carolina, there is growing support for an integrated water plan that highlights the state's available funding for water infrastructure, as well as the organizational structure of the utilities within the state. Entities within the state of North Carolina have a desire to expand on regional planning. However, there are many demographic groups that were not engaged in this listening session that would be impacted and should have a say in the decisions made. The agricultural community could become more involved with the agricultural extension service through North Carolina State University. Using this outreach resource, farmers and others in the agriculture industry will be more likely to participate in conversations related to water issues.

Black & Veatch Strategic Directions: Water Report

The annual Black & Veatch Strategic Directions Report series offers analysis and insights into key issues and trends facing cities and utilities and the water, electric, and natural gas sectors. Drawing insights from industry leaders around the globe, the report dives into immediate and long-term market needs, ranging from asset management and infrastructure financing to resilience planning and data analytics. This annual examination allows Black & Veatch to continually measure industry progress, market shifts and emerging challenges to drive infrastructure transformation.

The 2018 Black & Veatch Strategic Directions Water Report addresses contemporary issues affecting water service providers. In light of climate variability, resilience, regulatory and sustainability challenges, utilities are tackling regional issues with innovative water solutions. Nationwide, year-over-year trends include an increased focus on asset management, water loss, conservation, and system resilience against the ever-present concern of aging infrastructure.

As part of each annual water report, each year, Black & Veatch surveys water, wastewater, and stormwater utilities; combined utilities; local governments/municipalities; and federal, state and public health agencies. While the ensuing report is not a plan, it gauges the critical issues affecting water suppliers both regionally and across the United States. The survey responses are compared with similar data from previous years to evaluate trends and regional differences.

Survey responses from utilities in the Southeast region, which includes Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia, were compiled and evaluated next to the other nine regions of the United States.

As reported elsewhere in this Framework for North Carolina Water Policy, Southeast and North Carolina-specific trends and challenges center on system resilience, with this topic ranking higher than the rest of the U.S. In the case of the Southeast, resilience largely pertains to flooding and stormwater issues as well as aging infrastructure, funding and workforce challenges. The Southeast is also more interested in integrated water planning than other U.S. regions.

National Overview

US Water Alliance One-Water Roadmap

The US Water Alliance has produced a One-Water Roadmap that sets out current issues, a framework for thinking about water, and action areas for addressing issues. The Roadmap suggests that planning should be done on a watershed-scale, providing opportunities for agricultural, industrial, municipal, and environmental stakeholders within the watershed to collaborate. The overall theme of the Roadmap is that all water has value, and should be managed in a way that is inclusive, integrated, and sustainable.

Key ideas of the One-Water Roadmap include breaking down silos between stormwater, drinking water, and wastewater entities to improve management; inclusive planning that pays special attention to current and future infrastructure's burden on low income and under-served communities; and the watershed-wide benefits of healthy ecosystems on water quality, stormwater runoff, and system sustainability.

The One-Water Roadmap lays out the current landscape of water in the US, giving detail in the areas of water quantity, water quality, ecosystem

degradation, aging/inadequate infrastructure, pricing/affordability, and climate change. The report then speaks to its approach, which has seven key tenets:

1. All water has value.
2. Water projects should achieve multiple benefits.
3. Use of a systems approach is paramount.
4. Action is on a watershed-scale.
5. Solutions must be right-sized.
6. Partnerships and collaboration feed progress.
7. Inclusion and engagement of everyone.

Finally, the One-Water Roadmap details the arenas for action, and gives attainable goals for each of those arenas. Some of these goals include diversifying and stretching water supplies, transforming wastewater into a resource, adopting a 'dig once' approach, and using on-farm strategies to reduce water consumption and manage nutrients. For a full summary of the One-Water Roadmap's findings, please see Appendix A.

Synthesis of Public Water Supply Use in the United States: Spatio-Temporal Patterns and Socio-Economic Controls

This 2017 study is among the first to evaluate water use and water efficiency data collected by the USGS every five years from 1985 to 2010 at a county-level across the contiguous United States. The data have been analyzed to see spatial and temporal trends in water efficiency based on climate regions, states, and counties. The data were also evaluated based on socio-economic indicators, including a rural and urban classification, pre-capita income, education level, and the state-level investment in public infrastructure.

The data were analyzed for regional and socio-economic trends. The increase in public water-supply withdrawals is largely accounted for by demand growth in the South. Increases in efficiency characterizes 36 states, and the other 12 show declining water-use efficiency, which are mostly in the southeast and central United States. Educational level correlated with conservation, whereas income was sometimes associated with increased efficiency, and other times associated with increased water use, depending on the region. Urban counties showed increased efficiency, and rural counties consistently showed increase in per-capita water use.

The divergence of rural and urban counties in terms of per-capita efficiency may be attributable to poorly funded utilities in rural regions, which can have aging infrastructure and limited conservation programming. Additionally, innovative water supply projects like wastewater reuse tend to be concentrated in higher-income urban areas, which may increase awareness of water issues, the cost of water, and per-capita water use.

Links

U.S. Water Alliance *(uswateralliance.org)*

One Water Roadmap: The Sustainable Management of Life's Most Essential Resource *(uswateralliance.org/sites/uswateralliance.org/files/publications/Roadmap%20FINAL.pdf)*

Value of Water Campaign *(thevalueofwater.org)*

Black & Veatch Strategic Directions: Water Report *(pages.bv.com/SDR-Water-Industry-DL.html)*

The Economic Benefits of Investing in Water Infrastructure *(thevalueofwater.org/sites/default/files/Economic%20Impact%20of%20Investing%20in%20Water%20Infrastructure_VOW_FINAL_pages.pdf)*

Economic Benefits Fact Sheet *(thevalueofwater.org/sites/default/files/Fact%20Sheet_Economic%20Impact%20of%20Investing%20in%20Water%20Infrastructure%20FINAL.pdf)*

The Importance of Water to the U.S. Economy *(water.epa.gov/action/importanceofwater/upload/Importance-of-Water-Synthesis-Report.pdf)*

Key Findings from the 2018 Value of Water National Poll *(thevalueofwater.org/sites/default/files/To%20share%20website%20-%202018%20VOW%20Poll%20Results.pdf)*