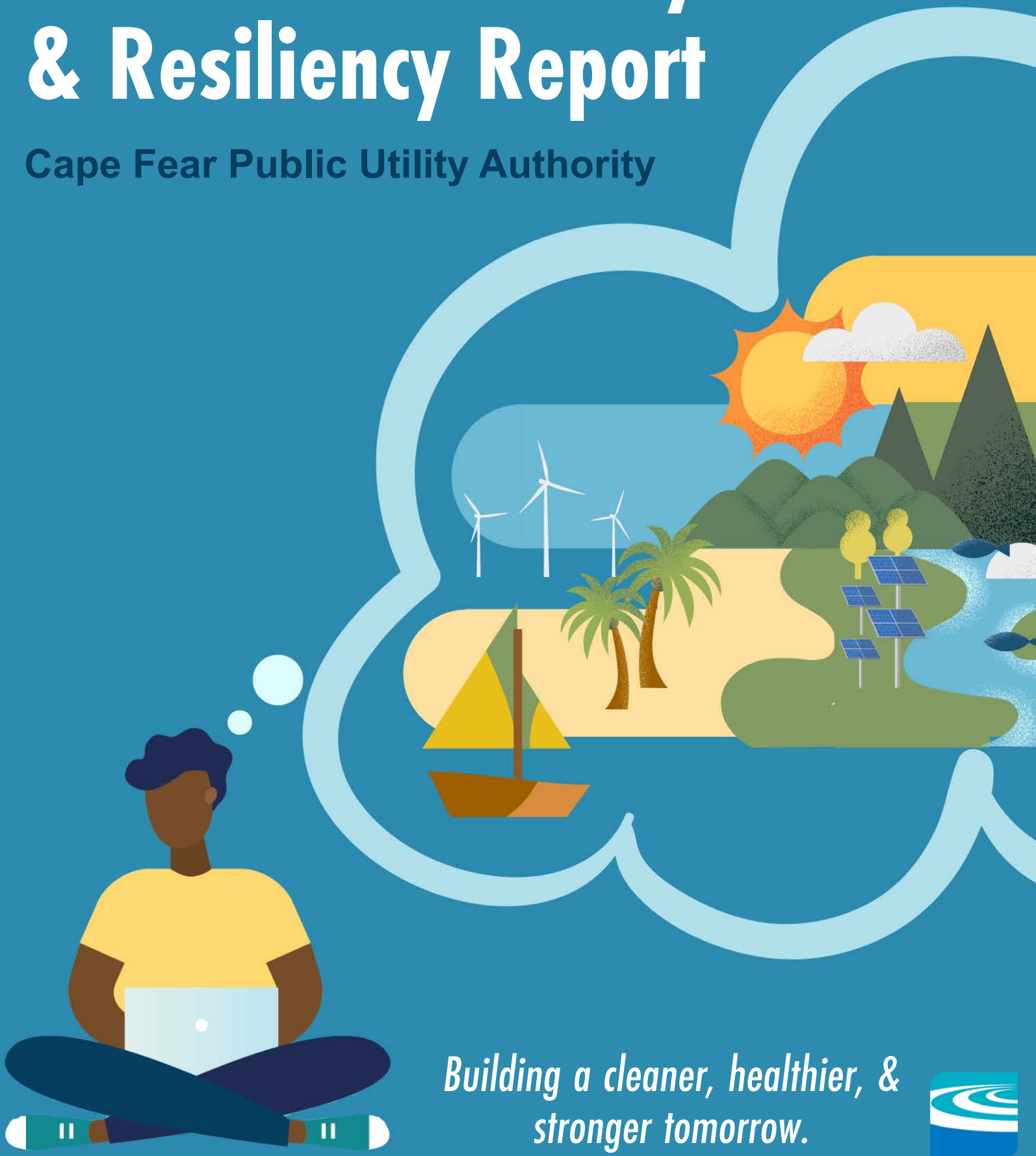
2022 Sustainability & Resiliency Report

Cape Fear Public Utility Authority



Building a cleaner, healthier, & stronger tomorrow.

FORWARD

In 2022, Cape Fear Public Utility Authority implemented a new Strategic Plan that aligns our resources with the organization's mission to "provide quality water and wastewater services to our community." This mission is supported by our organizational values of *Stewardship, Sustainability, Safety, Service,* and *Excellence*. The Strategic Plan also includes five key focus areas to drive intended outcomes, the most relevant to this report are Infrastructure Reliability & Product Quality and Environmental Stewardship & Protection. Together, these values and key focus areas represent the foundation of this report.

To faithfully enact our Strategic Plan, capital and operational activities must take into account and address the spectrum of impacts due to climate variability and climate change. To this end, we will use sound business practices to build *resiliency* within CFPUA and create a future that protects our critical assets, our resources, and our customers.

CFPUA continues to research best practices for mitigation and adaptation recommended by subject matter experts for local, national, and global responses to our changing world. As members of a climate-vulnerable community, we must make data-driven decisions that anticipate future scenarios of coastal inundation, increased numbers and severity of hurricanes, flooding, drought, extreme temperatures, and other secondary impacts. For CFPUA, resiliency means providing uninterrupted service by preparing for these future scenarios, to the best of our ability, using reliable climate modeling, common sense, and the advice of our customers with lived experiences.

We also choose to be part of the global solution by reducing our carbon footprint. Water and wastewater utilities account for 10% of greenhouse gases emitted globally, and CFPUA has established a goal to reduce carbon emissions by at least 43% by 2030, using 2019 emissions as a baseline. We recognize this goal as bold, but achievable.

Water has shaped the history of the Cape Fear region and continues to influence today's geography, culture, and economy. It provides our greatest scenery and hosts our most enjoyed recreation. Water serves as an economic engine that spurs growth and maintains the area's livelihood. Without prudent planning, water can prove itself a source of destruction as well. Water is simultaneously a keystone for a thriving future and a hazard to be respected and mitigated.

CFPUA recognizes the centrality of water, in all its forms, to us and our customers. As a water and wastewater utility responsible for dependably providing essential service, we also recognize the risks posed by water and the resilience required to mitigate those risks. This is a record of our response, and an acknowledgment of the work to be done.

Kenneth Waldroup, P.E.
Executive Director

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OUR APPROACH TO SUSTAINABILITY & RESILIENCY

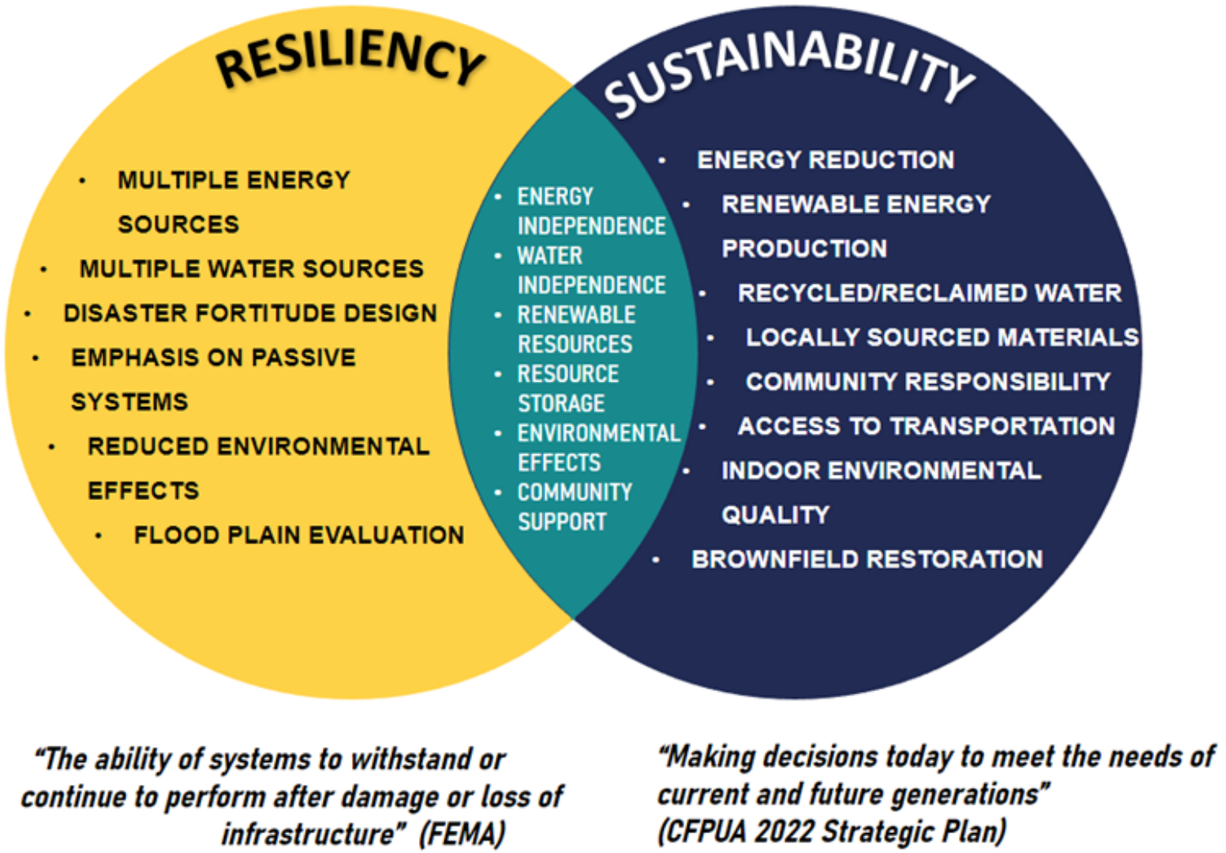


Figure 1. The similarities, differences, and intersection between resiliency and sustainability.

While there are currently no local, state, or federal regulatory drivers that require CFPUA to plan for climate change, financial markets are closely scrutinizing private and public enterprise climate change preparedness through the lens of Environmental, Social, and Governance (ESG) factors as a measure of an organization's financial health. This report helps us focus our efforts to address ESG issues. As an organization, CFPUA also believes it is important to proactively evaluate the potential effects these weather events could have on our infrastructure and continuity of service. This philosophy is reflected in CFPUA's most recent Strategic Plan.

Planning for climate change is just one component of sustainability at CFPUA. To protect the continuity of service, the organization must ensure that CFPUA's operations are sustainable. For example, without resilience to the effects of climate change, CFPUA's water and sewer systems would have difficulty returning to normal operations after climate-related disturbances. The Venn diagram in Figure 1 highlights differences and similarities between resiliency and sustainability.

This is CFPUA's second Sustainability and Resiliency Report, and it documents the organization's fourth annual greenhouse gas (GHG) emissions inventory. Tracking the GHG inventory results over time helps to measure our progress toward reducing emissions and minimizing our contribution to future warming. Similarly, documenting resiliency project updates allows us to record climate mitigation efforts and track what works and what does not. Future reports will document our sustainability and resiliency efforts by:

1. Providing updated adaptation and mitigation metrics used to measure how climate change is affecting the organization, as well as how the organization is affecting the climate through emissions,
2. Summarizing sustainability and resiliency projects that occurred since the last report, and
3. Introducing upcoming sustainability and resiliency projects.

CFPUA also understands that resiliency and sustainability apply not only to physical infrastructure, but also to the community we serve. To ensure our operations are *holistically* sustainable and resilient, we must consider our impact on the community. To do that, we must first understand the larger socioeconomic context in our service area, so that staff knows whether the organization's decisions are helping the community members we serve in a fair and equitable manner.

Finally, a note about how we are moving forward with this report. Last year's report was titled the "Annual Resiliency Report." This year, the revised "Sustainability and Resiliency Report" title reflects two important changes; subsequent reports will be here after published on an as-needed basis instead of annually,and the general consensus in the industry is resiliency and sustainability are related, but distinct concepts.

MONITORING THE TRENDS

To track CFPUA's progress in adapting to the likely impacts of climate change and mitigating our emissions to reduce our climate impacts, the organization has identified metrics for both mitigation and adaptation efforts to monitor over time. Each metric has key indicators gathered from CFPUA asset software and databases that provide local, regional, and national trends. This historical information can be used to inform data-driven decisions. Additionally, CFPUA utilizes the lived experience of employees and information collected by various subject matter experts in the service area. While the speed and severity of climate change is uncertain, building a comprehensive and nuanced database can guide planning and actions. Best practices from the Environmental Protection Agency recognize that using these trends to predict future conditions is difficult, but using the best data available to understand the worst case scenario and prepare for the most likely future environmental conditions is both sustainable and resilient.

MITIGATION METRICS

Mitigation in the context of this report refers to the reduction of greenhouse gases emitted as a result of the organizations operations. Further, it is important to recognize that water and wastewater utilities serve critical community needs that cannot be interrupted. The New Hanover County community is growing, and consequently so is the service required. Through efficiency and optimization, CFPUA will reduce emissions, however without normalizing this data by gallon or customer the impact of this work will not be accurately portrayed. The following indicators are currently used to show the emission reductions over time. Another measure of progress is through the integration of energy that produces fewer emissions, both by the energy provider and CFPUA.

Emissions Intensity: Drinking Water Production

The amount of treated drinking water produced by a public water supplier and delivered to the water distribution system in one year is measured with the unit Million Gallons Distributed (MGD). In 2021 CFPUA produced 7,249 MGD resulting in 2.3 $MTCO_2e$/MGD. Figure 2 shows the decrease in emission per gallon of drinking water since 2018.

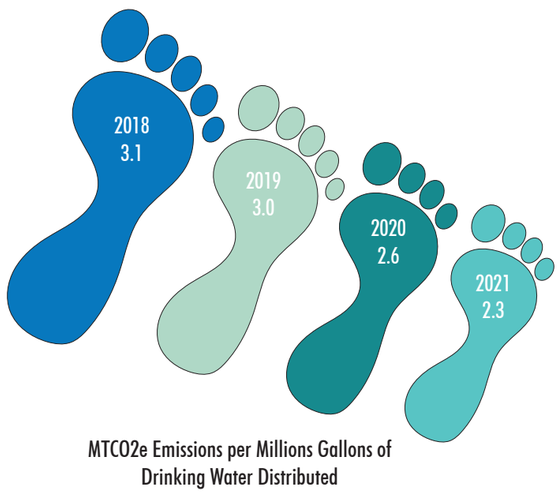


Figure 2. Four year graphic showing the ratio of $MTCO_2e$ emissions per million gallons daily of drinking water distibuted.

Emissions Intensity: Wastewater Processing

Additionally, the amount of water processed by a wastewater treatment facility is measured by MGD. In 2021, CFPUA processed 6,501 MGD resulting in 2.5 $MTCO_2e$/MGD. Figure 3 shows the decrease in emission per gallon of wastewater, since 2019*.

**2018 is not included in this graphic due to incomplete data*

Figure 3. Three year graphic showing the ratio of $MTCO_2e$ emissions per million gallons of wastewater processed.

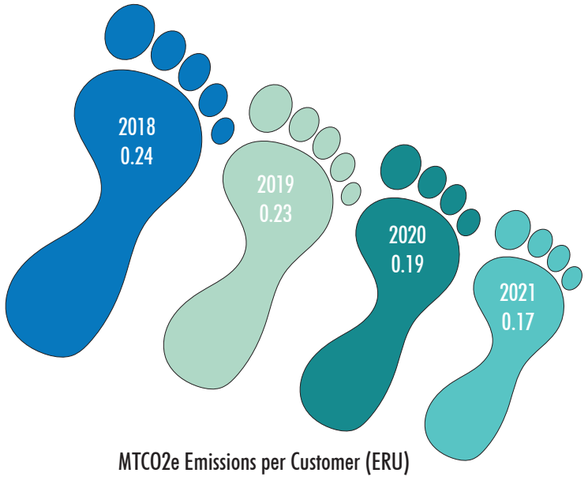


Figure 4. Four year graphic showing the ratio of $MTCO_2e$ emissions per customer.

Clean Energy Integration

By increasing the amount of clean or renewable energy in CFPUA's energy profile, emissions will subsequently decrease. Figure 5 depicts Duke Energy Progress' energy profile according to the 2020 eGRID data for North Carolina.

Emissions Intensity: Growth in the Service Area

An Equivalent Residential Unit (ERU) is the typical amount of water a single-family residence uses. The number of ERUs in CFPUA's service area as of the end of 2021 was 95,409. Figure 4 shows the decrease in emission per ERU, since 2018.

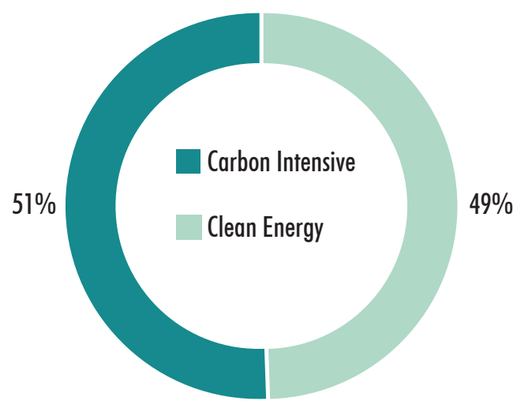


Figure 5. Ratio of carbon intensive versus clean energy used by CFPUA.

CO_2 equivalent (CO_2e): The most commonly known greenhouse gas is carbon dioxide, but there are six other gases organizations should account for as well. Each gas differs in its efficiency in trapping heat in the atmosphere, so a carbon dioxide equivalent is often used to standardize the impacts of different greenhouse gases.

ADAPTATION METRICS

In the context of climate change, adaptation actions are projects and policies that help an organization cope with the actual and potential consequences. For CFPUA, these adaptations include the impacts the water and wastewater system is already facing or may face in the near future. Adaptation actions are specific to the unique geography and man-made pressures placed upon a specific Staff designed the following metrics to identify local change scenarios that may affect operations, and then connect those change projections to the organizational planning process. Following these metrics and models created by subject-matter experts, provides information and scenarios to support decision-making that reduces the risk of maladaptation and guides financial investments in adaptation initiative.

Extreme Heat

Whether they are part of a water sampling crew or a response team to an emergency water main break, many CFPUA employees work outside for much of the day. As the Southeastern United States begins to experience more consistent extreme heat, it will be important for the organization to monitor how many extreme heat days the service area experiences to ensure employees have the equipment and protections needed to stay safe. Over the past year, staff updated the Global Positioning System (GPS) Standard Operating Procedure (SOP) to allow field supervisors the discretion to determine when vehicle idling is needed to maintain a safe work environment by providing staff a respite from extreme temperatures. Figure 6 shows the amount of days with temperatures over 80 degrees Fahrenheit.

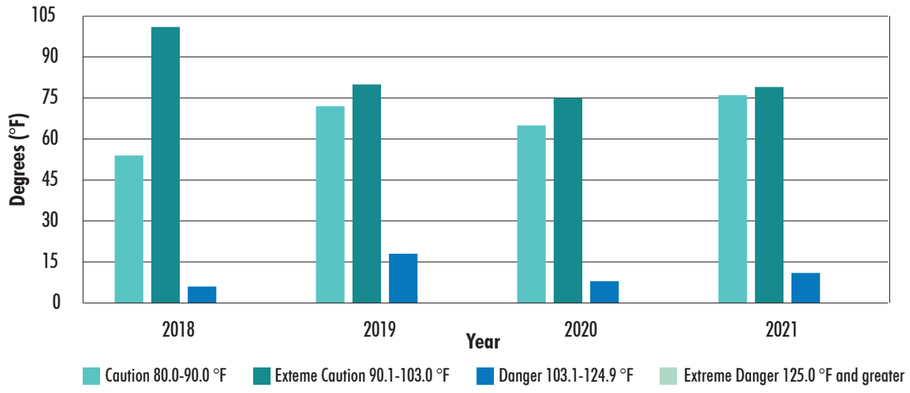


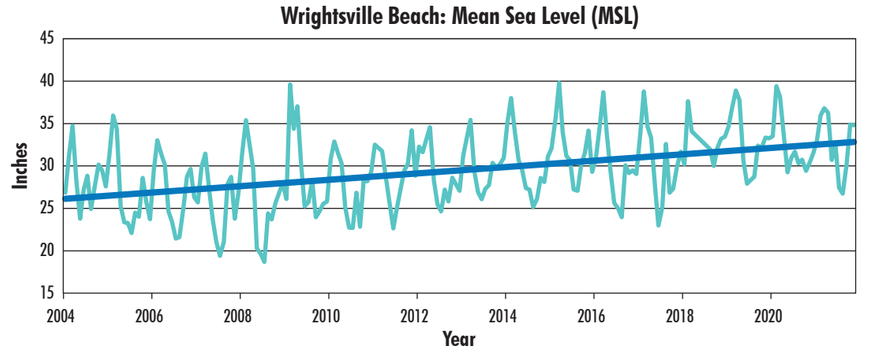
Figure 6. Four year graphic of extreme heat days from 2018 to 2021.

Water Conservation

As temperatures continue to rise, CFPUA will need to manage customer demand for water resources and ensure we use regional capacity as efficiently as possible. Tracking the number of days spent in each stage of the water conservation agreement will help staff monitor how extreme heat and demand in the service area intersect. CFPUA and our regional partner utilities use a “stage” system for water conservation advisories to customers, with higher stages reflecting more stringent conservation measures. For example, Stage 1 implements voluntary conservation measures, while Stage 4 mandates emergency restrictions. CFPUA entered Stage 1 water conservation for 63 days out of 365 in 2021. CFPUA did not enter any conservation stages in the first six months of 2022.

Rising Sea Levels

CFPUA’s service area is surrounded by water sources: creeks, wetlands, the Cape Fear River, and the Intracoastal Waterway. As a result, the service area will almost certainly be impacted by sea level rise as water pushes farther inland. Tracking changes in the median sea level will help the organization monitor sea level rise over time to keep the data in our planning models as updated as possible. Figure 7 shows the changes in sea level in the Cape Fear region.



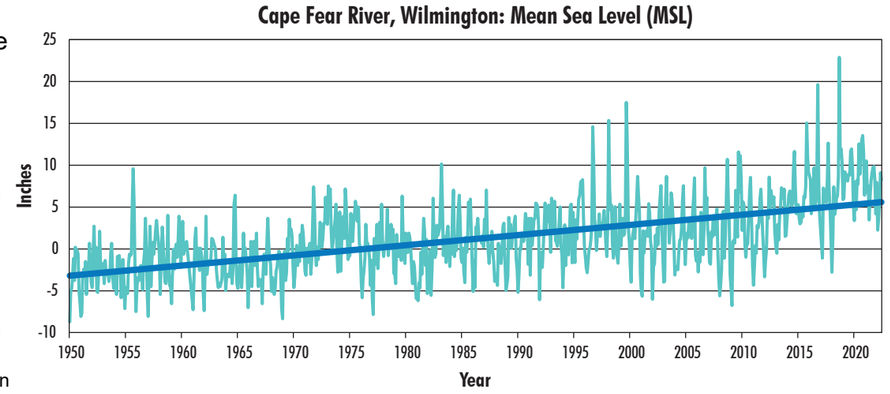
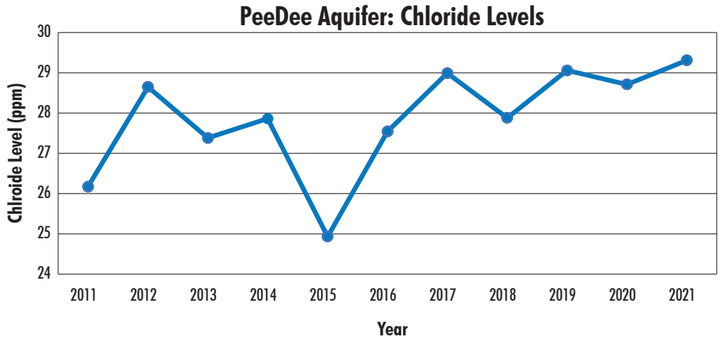
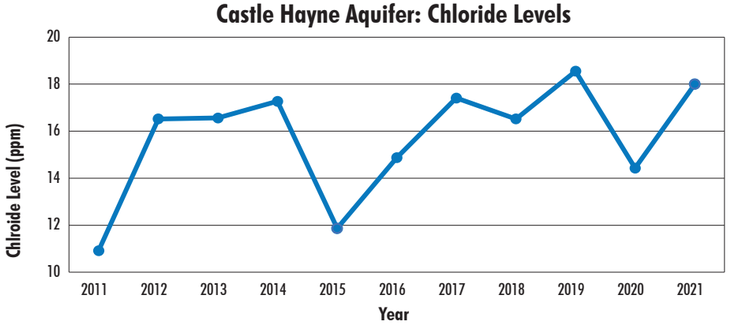


Figure 7. Mean sea level change in inches for Wrightsville Beach (top) and the Cape Fear River (bottom). Data is shown in teal and the linear trend line in blue.





Saltwater Intrusion

CFPUA’s **Richardson Water Treatment Plant** is a groundwater system supplied by two coastal aquifers: Pee Dee and Castle Hayne. Coastal aquifers are naturally vulnerable to saltwater intrusion, with sea level rise and increasing water demand exacerbating the problem. CFPUA’s **Laboratory** staff routinely samples and monitors chloride levels in both aquifers within New Hanover County. Tracking these levels over time will allow staff to monitor saltwater intrusion in the groundwater system. The EPA secondary maximum contaminant level for chloride in water is 250ppm. Figure 8 shows the chloride levels in the two aquifers.

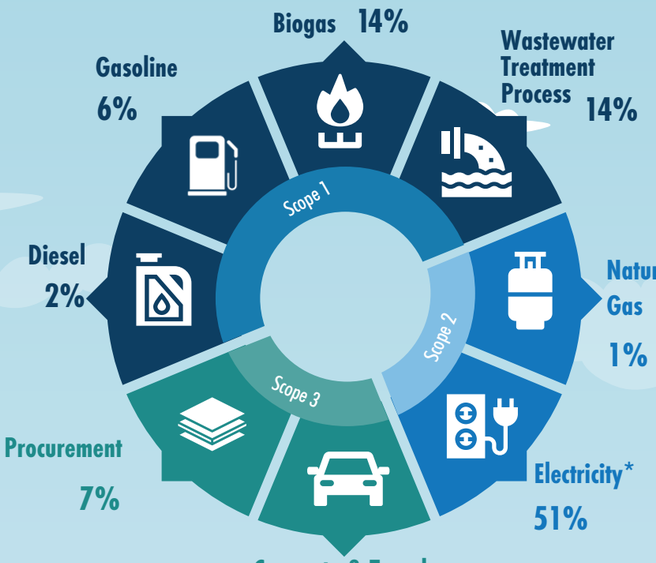
Figure 8. Chloride levels in the PeeDee (top) and Castle Hayne (bottom) aquifers.

2021 CFPUA GREENHOUSE GAS EMISSIONS

Annual Emissions Inventory

This year, CFPUA completed its fourth Greenhouse Gas (GHG) Emissions Inventory as part of its continuing effort to document emissions associated with the operations of our community's drinking water and sewer systems. Following best practices by collecting three years of data first, staff has now determined that calendar year 2019 will serve as its baseline emissions period—a reference point in time that future emissions will be measured against. Staff chose 2019 because, during that time, the service area experienced the weather conditions most similar to what research predicts will be the new normal—generally dry conditions interrupted by intense precipitation events.

CFPUA's Emissions by Activity



Emissions Over the Years

Carbon Reduction Goal

Although this goal was passed outside of the timeline of this report, it's impact is significant enough to add within this inventory. The Sustainability Committee voted to reduce emissions by 43% of the 2019 baseline using Scopes 1 & 2. To normalize the data, emissions will be measured in metric tons per million gallons of wastewater processed. This metric will show the efficiency and optimization of CFPUA infrastructure and operations while taking account of increased customers and any changes in weather.

What is Included in a GHG Emissions Inventory?

Scope 1: 3,753 .58 $MTCO_2e$/MGD

Direct emissions that occur from sources controlled or owned by CFPUA

- Fleet Fuel Combustion
- Generator Fuel Combustion
- Wastewater Treatment Process

Scope 2: 8,498 1.31 $MTCO_2e$/MGD

Indirect emissions associated with CFPUA's energy use

- Purchased Electricity
- Natural Gas

Scope 3: 2,328 .36 $MTCO_2e$/MGD

Indirect activity emissions

- Materials Procurement
- Landscaping & Biosolids Hauling
- Employee Commute & Travel

Biogenic: 1,844 .28 $MTCO_2e$/MGD

Emissions associated with the combustion of biomass

- Biogas Flaring
- Biogas Heating

Reduced Emissions

This year, CFPUA's overall GHG emissions decreased by **8%** from last year.

Emissions Across Operations

*Electricity includes water treatment and distribution.

PROJECTS:

Past & Present

In 2021, with the departure of key leadership, CFPUA experienced substantial internal restructuring which resulted in the consolidation of the Public and Environmental Policy Department and the Environmental Management Department to form the **Environmental Management and Sustainability Department (EMSD)**. This merger provided a larger and more robust employee base to address sustainability initiatives. It also resulted in the creation of a Deputy Executive Director of EMSD position and an Assistant EMSD Director position to ensure the focus on sustainable initiatives remains at the highest level of organization awareness.

While searching for our new sustainability leadership, staff paused work on the projects outlined in the previous Annual Resiliency Report. As a result, this Resiliency Report has an extended reporting period: January 1, 2021, through June 2022.

The following section includes updates on projects from the previous Resiliency Report, recent resiliency and sustainability developments, and any recent or ongoing projects taking place at CFPUA that contributes to sustainability.

Light Bulb Replacement Project

Light-emitting diode (LED) bulb installation is the standard for all new construction and rebuilt pump stations. To maximize existing resources, the **Centralized Maintenance Department** is upfitting incandescent bulbs, and compact fluorescent lamps (CFL) with LED bulbs as current bulbs burn out. Since this project launched in 2020, at least 482 bulbs have been replaced, resulting in approximately a monthly savings of 9,718-kilowatt hours (kWh) and an annual reduction of 32 $MTCO_2e$.

The **Centralized Maintenance Department** assessed several key locations to identify the number of installed LED and non-LED bulbs. Based on this assessment, an estimated 230 $MTCO_2e$ can be reduced by replacing the remaining non-LED bulbs. In addition to reducing carbon emissions, LED bulbs are energy-efficient, durable, long-lasting, safer to handle, and resistant to extreme temperatures without impacting lighting quality in facilities.

The next phase of this initiative includes contracting with a lighting consultant to identify all opportunities to optimize lighting efficiency. Several locations and areas will be reviewed for motion sensor implementation or upgrades, bulb reduction, and rebate opportunities. Internally, the **Sustainability Division** will create educational materials on the health benefits of using natural lighting when possible and partner with the **Communications Department** to develop organization-wide reminders to turn off lights when leaving an area.

Asset Management & Fleet

As new technology and more efficient options become available, CFPUA continuously researches case studies and performs cost-benefit analysis. Projects that include these optimizations and efficiencies often support both economic and environmental stewardship. Additionally, the projects that reduce energy needs, both fuel and purchased electricity, serve to reduce greenhouse gas emissions as well as CFPUA's reliance on third-party resources for service-dependent processes.

Water Distribution System

CFPUA has 1,160 miles of underground water piping to distribute water through three interconnected water systems that are supplied by two advanced water treatment plants and one small groundwater well system. The three systems have approximately 8,000 public hydrants, and 75,000 service connections are supplied by 10 elevated storage tanks, 32 operational wells, and 14 emergency wells. Collectively, these pipes and appurtenances are known as CFPUA's water "distribution systems." The **Sweeney** water distribution system provides treated water sourced from the Cape Fear River to 80 percent of the approximately 200,000 people who rely on CFPUA for drinking water. The **Richardson** water distribution system treats groundwater from the Castle Hayne and Pee Dee aquifers, supplying water to approximately 15 percent of CFPUA customers. Finally, the **Monterey Heights** water distribution system provides drinking water from seven wells to approximately five percent of CFPUA customers.

In 2015 CFPUA initiated a comprehensive meter replacement program and the use of Automated Meter Reading (AMR) technology for its water meters ranging in size from 5/8-inch to 2-inch. Completed in 2019, the program reduced meter reading times by a factor of five (from 48 hours to 8 hours), monthly re-reads were reduced from 1,200 to fewer than 100, and meter reading accuracy was increased from an estimated 97.0 percent to 99.3 percent. All lead to significant reductions in drive times for employees and, consequently, GHG emissions.

CFPUA created an internal water audit team that assesses non-revenue water and other water losses using AWWA Water Audit Software. Water audits have been completed for the past six years. During this time, CFPUA also completed its comprehensive meter replacement program. The water audits demonstrate the benefits realized from the comprehensive meter replacement program, along with a water main rehabilitation/replacement program, and improved record keeping through the CMMS system. A Find-It, Fix-It (FIFI) approach has been developed to identify and correct critical infrastructure deficiencies. This is an efficient, effective program, preventing service interruptions before they occur through infrastructure renewal and rehabilitation using uniform and consistent standard practices. As a result, real losses to leaks and breaks have declined over 300 million gallons per year since 2019.

Wastewater Collection System

CFPUA has 1,083 miles of underground wastewater piping – 928 miles of gravity sanitary sewer lines and 155 miles of pressurized sewer mains. Because of Wilmington's flat topography, CFPUA also relies on approximately 153 pump stations to move wastewater through the piping system to our two wastewater treatment plants. Collectively, these pipes and pump stations are known as CFPUA's "collections system."

Although stormwater flows within a separate piping system maintained by the City of Wilmington, surface stormwater can enter CFPUA's gravity sanitary sewer system through manholes during heavy rain events. This occurrence is referred to as "inflow." Groundwater can also seep into the collections system through joints, cracks, and broken pipes in a process known as "infiltration." Infiltration can also result from rising seawater and high groundwater tables. The older the pipes and manholes, the more likely they are to be infiltrated. CFPUA's collections system was designed to handle wastewater only, and additional flows from outside sources of water can damage the collections system.

If the collections system is forced to support additional flows caused by inflow and infiltration, the subsequent failures and damages can result in sanitary sewer overflows (SSOs), pipe structural failures, and ground subsidence, as well as additional strain on downstream pump stations and at the wastewater treatment plants. CFPUA operates a FIFI gravity sewer rehabilitation program to mitigate these issues and address related emergencies. Projects are implemented based on a priority rating system that incorporates staff knowledge, work order history, and CCTV information. Most issues are found in older gravity sewers adjacent to surface water bodies, such as the Cape Fear River and saltwater creeks, where high groundwater elevation and tidal action provide continual infiltration. CFPUA's FY23 capital improvement plan (CIP) includes a project to conduct flow monitoring and build a wet-weather hydraulic model to help identify and elevate the priority of portions of the system with infiltration and inflow. The new Strategic Business Plan includes an initiative to develop tools and standards to better quantify, track, and monitor inflow and infiltration into the wastewater collection system.

In addition to reducing collections system emergencies, SSOs, and strain on equipment, reducing inflow and infiltration also reduces energy consumption at pump stations and wastewater treatment plants. Not only is the FIFI program necessary for the successful and efficient operation of the collections system, and operating this program ultimately reduces CFPUA's greenhouse gas emissions.

Pump Stations

In 2020, CFPUA conducted a Pump Station Vulnerability Study to evaluate the possible impacts of extreme weather events on wastewater pump stations. This study revealed 18 CFPUA pump stations are in flood-prone areas, and half of the stations are vulnerable to stormwater flooding, while the remainder are vulnerable to storm surge damage. Additional details can be found in this ArcGIS StoryMap.

Over the past several years, **Engineering** staff has raised three pump stations and plans to raise two more. Elevating these stations out of the flood zone will protect assets central to our wastewater service. These projects will also be recorded in StoryMap. In addition, the **Sustainability Division** has been in contact with the City of Wilmington's Heal Our Waterways Program staff to identify partnership opportunities that would alleviate stormwater flooding issues for City and CFPUA assets. Projects that divert water away from infrastructure and access roads may include retention ponds, pervious pavement, and rain gardens.

As CFPUA moves forward with climate change preparations, staff will build on the Pump Station Vulnerability Study by assimilating relevant data from various CFPUA projects and recording future flood data to the StoryMap for all CFPUA assets. When flooding occurs on CFPUA property, staff intends to add the flooding location, source, extent, and details on damages to the StoryMap. The flood data collection process will include interviews with field crews. Effective flood monitoring will require synergy between CFPUA field crews and staff in the office to document the flooding. We hope this data will pinpoint flooding trends and subsequently inform CFPUA's resiliency priorities.

Low Emission Vehicle Program

In 2019, staff created a Low Emission Vehicle (LEV) Program and SOP. This program has facilitated the replacement of three gas-powered vehicles with LEVs. CFPUA's fleet currently includes a Chrysler Pacifica plug-in hybrid electric vehicle (PHEV), a Kia Niro PHEV, and a fully electric Nissan Leaf. Over the past year, CFPUA avoided approximately six $MTCO_2e$ thanks to staff use of the LEVs.

According to the EPA's Greenhouse Gas Equivalency Calculator, six MTCO2e is equivalent to driving 15,079 miles in an average passenger vehicle or using 675 gallons of gasoline.

In the first years of the LEV Program CFPUA staff charged LEVs using a level 1 charger, which requires approximately 14 hours to fully charge the vehicle. In 2021, staff applied for and received an $8,000 reimbursement grant through the North Carolina Department of Environmental Quality (NCDEQ) Volkswagen Settlement fund to install a level 2 LEV charging station. To house the charging station, staff chose the **Meter Services Division**, a location that is easily accessible by two of CFPUA's LEVs. The new charging station will allow staff to fully charge LEVs in 2 to 3 hours. CFPUA anticipates applying for additional grants to purchase LEVs and supporting infrastructure in the near future.

In addition to grants, recent sustainability additions to CFPUA's CIP, budgets, and strategic plan will also support LEV Program growth. As we expand the program, we also aim to improve it. CFPUA's **Sustainability Division** plans to revise the LEV Program SOP to clarify interdepartmental roles and ensure the program functions as smoothly as possible on a logistical level.

Environmental & Emergency Management

Emergency Management is a critical aspect of maintaining a sustainable and resilient water and wastewater utility. The **Safety Division** updates organizational SOPs, provides training and education, and implements industry best practices for the many dimension of Emergency Management. Aligning with sustainability and resiliency, CFPUA strives to manage natural area**s** in a manner that de-risks future issues and promotes environmental stewardship. Next, CFPUA will research building nature-based solutions that reduce the potential of impacts due to climate change to damage the infrastructure and built environment of the utility. Working together, environmental and emergency management will build on the work accomplished already and create win-win situations that support the community.

Land Use & Forestry

In 2021, CFPUA purchased 47 acres in northern New Hanover County for groundwater well development to supplement the water supply at the **Richardson Water Treatment Plant**. Approximately three acres will house six new groundwater wells, while the remaining 44 acres will be maintained as a carbon sink. Carbon sinks are described by the EPA as land areas and/or managed forests “that absorb more CO_2 from the atmosphere than they emit.”

CFPUA consulted with the Cape Fear Area Forestry Service, a subset of the U.S. Forestry Service, to assess the carbon sink land. The assessment includes evaluating forest health, identifying long-term objectives, and potential next steps for land maintenance. Future opportunities exist for natural land improvement by collaborating with universities and other subject matter experts.

In addition to sequestering approximately 37 $MTCO_2e$ annually, preserving this land will improve local air quality and protect green space in an area experiencing rapid local development. Setting this land aside will enhance critical wetland ecosystem services like stormwater infiltration and flood mitigation. As a result, CFPUA and surrounding areas can become more resilient to localized flooding. Next steps include the **Sustainability Division** identifying all property currently owned by CFPUA that can also be maintained as carbon sinks and local properties that may provide mutually beneficial situations for carbon sequestration and water quality.

Source Water Protection Planning

In 2014, the North Carolina General Assembly passed House Bill 894, “An Act to Improve Source Water Protection Planning.” This bill required public water suppliers with surface waters intakes, like CFPUA’s on the Cape Fear River, to complete a Source Water Protection Plan (SWPP). Federal legislation passed in 2018 known as America’s Water Infrastructure Act also required public water suppliers to complete a similar plan, known as the Source Water Risk and Resiliency Plan (SWRRP). In response to these competing requirements, NCDEQ announced that public water suppliers would satisfy their legal requirements under HB 894 with proof they had completed an SWRRP for America’s Water Infrastructure Act. CFPUA staff subsequently completed our SWRRP in 2020.

In early 2021 however, staff applied for the annual State Revolving Funds program and discovered that public water suppliers will only qualify for the extra five possible source water protection points on the application if NCDEQ has approved their SWWP. The EPA’s SWRPP does not qualify. Without an approved plan, CFPUA projects miss out on five points awarded for an SWWP; that can mean the difference between approval or denial of grant or loan funding. Over the past year, staff worked toward meeting the requirements outlined by NCDEQ for receiving an approved SWPP. These efforts included expanding the planning team to include external stakeholders and setting short- and long-term source water protection goals that improve river contaminant management and source water quality over time.

People & Safety

Building a resilient workforce in the face of climate change is key to organizational resiliency. In preparation for a wide range of climate-related impacts, CFPUA is considering policy changes that help employees reduce their carbon footprint, prioritize employee safety, and maximize employee retention. Integrating resiliency protocol into how our employees operate will make CFPUA an attractive employer in the region and ensure we continue to sustain our high level of service into the future.

A Change in Shiftwork

Finding interdepartmental solutions and successes is an essential part of the **Sustainability Division's** vision for making CFPUA more resilient and its operations more sustainable. One example of this is changing the **Wastewater Treatment Department's** operator working shifts from 8 hours to 12 hours. This reduces the number of night shifts operators have to work and decreases emissions associated with commuting. This change also resulted in improved morale because operators have more time off between shifts and saves CFPUA money by reducing the shifts per day from three to two. Additional realized benefits include increased productivity from the continuity of work, reduced adaptation time, reduced absenteeism, and higher task completion. This "win-win" scenario is exactly the type of solution that the **Sustainability Division** hopes to identify and implement with other employee groups.

Community Resiliency

In recent years, staff has been exploring CFPUA's role in creating equity in our community. Staff in the **Finance and Customer Service** departments have hosted numerous meetings about equitable rates, bill affordability, and customer financial assistance, while the **Sustainability Division** has conducted in-depth research and analysis on vulnerable populations in our service areas.

In 2022, CFPUA hosted an internship dedicated to creating a Community Resilience and Equity dashboard and ArcGIS StoryMap.

Together these tools create a comprehensive and interactive resource to help staff learn about Wilmington's social and economic trends by US Census tract. The dashboard and StoryMap include data on income, household expenses, poverty, age of homes, a social vulnerability index, flood hazards, as well as water and wastewater infrastructure.

Staff intends to continue expanding this resource to include past, ongoing, and future CIP projects, greenhouse gas emissions, CFPUA water shutoff metrics, and other social hardship indicators. This resource is intended to help CFPUA make decisions with community equity in mind, including where to allocate potential future resources, where to prioritize equity-based projects, and being mindful of projects happening in vulnerable communities.

In addition to these efforts, CFPUA launched the CFPUA COVID Relief Program in partnership with New Hanover County, the City of Wilmington, and the Good Shepherd Center in September 2021. This project earmarked $1 million – $500,000 each from the County and City – in federal COVID relief dollars for financial assistance to CFPUA customers. Funds were allocated from the American Rescue Plan Act of 2021 (ARPA), which is being managed by the U.S. Department of the Treasury. Through the program, CFPUA customers whose household income was at or below 80 percent of the Median Household Income for New Hanover County could apply for financial assistance to cover part or all of their past-due bills. Throughout the year, CFPUA also helped connect customers with financial assistance through other local programs, including New Hanover County's Emergency Rental Assistance Program and Homeowner Assistance Program, and CFPUA Assist. The CFPUA COVID Relief program ended on January 31, 2022, and ultimately assisted 440 customers with $312,438.79 to cover past-due charges.

Internal Sustainability & Resiliency Education

The 2021 Resiliency Report recognized the importance of staff awareness of climate resiliency to create a strong organizational program. The **Sustainability Division** conducted the first annual survey via email in February 2022 to measure staff's familiarity with the potential effects of climate change, their interest in learning about adaptation methods, and their preferred methods of receiving educational materials. The survey was sent to all employees (approximately 330 people) and 107 responses were received. Every department was represented in the results and almost half of the responses were from staff in various boots-on-the ground departments like **Project Management, Engineering, Centralized Maintenance and Water, and Wastewater Treatment**. Over 94% of all respondents indicated interested in learning about climate change. Overall, the results show that those who filled out the survey are aware of the potential local impacts of climate change such as sea level rise, an increased number of storm events, and increasing temperatures. The survey illuminated the need to provide education on global impacts related to the loss of biodiversity, challenges in agriculture, and amplified impacts on vulnerable communities.

Opportunities to educate staff at CFPUA on the diverse impacts of climate change and tools to become more resilient at home and work will be incorporated into existing training materials, events, and programs. The **Sustainability Division** will begin by creating an educational module for the Safety Skills online training program. They then will build upon research to continue to align everyday work with the most resilient practices. Additionally, the **Climate Resiliency Working Group's Action Planning Team** and the **Volunteer Group** will report opportunities for resiliency projects that align with grant and other funding opportunities. This will energize work and inspire innovation.

Systematizing Sustainability

In recent years, CFPUA has begun to take a deeper look at the sustainability and resiliency of our operations. CFPUA has begun to fund sustainability and resiliency initiatives and include them in decision making processes and organizational frameworks. The **Sustainability Division** intends to begin new projects while also building on existing policies and programs to make sustainability an integral part of daily operations and to continue reducing greenhouse gas emissions.

Over the past year, CFPUA staff prioritized sustainability and climate resiliency in various planning processes, and in doing so helped to incorporate environmental considerations into daily decision-making processes. For example, four of the seven Strategic Initiatives outlined in CFPUA's 2022 Strategic Plan relate to sustainability or resiliency work at CFPUA:

- Positively transform brand perception with the public and our customers
- **Enhance affordability and equitability so all rate payers have continued access to water services**
- Establish an Authority-wide Integrated Management System (AIMS)
- **Optimize water and wastewater systems to produce and deliver high-quality products for our customers and the environment**
- **Manage processes and programs to reduce our carbon footprint**
- **Create a culture for diversity, equity, and inclusion**
- Develop our workforce for personal and organizational growth

Of equal importance, CFPUA's Fiscal Year 2023 (FY23) CIP allocated $1 million dollars to a sustainability fund each year for the next 10 years, and the FY23 Operational Budget included another $1 million for all strategic planning initiatives. Staff also revised CIP project drivers to define sustainability as anything that results in energy savings, reduced carbon footprint, or climate change adaptation. In effect, this makes sustainability one of several considerations in the CIP planning process for the first time in CFPUA's history.

PROJECTS:

Research & Future

Given recent financial support for environmental initiatives and systemization of sustainability at CFPUA, the **Sustainability Division** will be busy implementing projects into the foreseeable future. As projects are developed, they will be routed through the Authority Board's Sustainability Committee and to the full Board via a funding and approval process outlined by the 2022 Strategic Plan. Staff will begin to develop the the rubric in Appendix B with the support of leadership to prepare each of these projects and future for an approval process. Projects in the Research & Future category include projects that have not yet begun as well as research areas being explored by CFPUA staff.

- Green Office Practices
- Incorporating Sustainability into the Southside WWTP Upgrade
- Maximization of Biogas at Northside WWTP
- Solar Feasibility Study
- Tree Replacement & Natural Areas

SEIZING THE MOMENT OF OPPORTUNITY

There has been no time in recent history with more support for the implementation of sustainable technologies or resilient infrastructure. Most notably, since the last report several state and federal policies have passed for climate resiliency and social equity. The **Bipartisan Infrastructure Law** passed in November 2021, allotted $50B in climate change protection alone while also supporting electric vehicle infrastructure and electric grid upgrades. In August 2022, the **Inflation Reduction Act** became the single largest investment in climate resiliency in the history of the United States with $369B for energy efficiency alone. The Inflation Reduction Act supports building resiliency and equity by prioritizing disadvantaged communities and investing $392B will be invested in energy and climate by 2031. This financial support aims to reduce the country's greenhouse gas emissions by 40% of 2005 levels, by 2030.

In 2018, North Carolina Gov. Roy Cooper issued **Executive Order No. 80**, “North Carolina’s Commitment to Address Climate Change and Transition to a Clean Energy Economy.” This executive order resulted in the creation of the **2020 NC Climate Risk Assessment and Resilience Plan**, the state’s “most comprehensive effort to date, based on science and stakeholder input, to address North Carolina’s vulnerability to climate change.” This plan includes a climate science report stating North Carolina’s Coastal Plain region should expect an increase in the average temperature of 2 to 10° F (p 96) by the end of the century, as well as increases in heat severity, drought, extreme precipitation events, and the number of severe thunderstorms. In the past two years, Governor Cooper has signed two supporting **Executive Orders (No. 271 and No. 246)** supporting the implementation of clean energy and an equitable economy. North Carolina has committed to reducing greenhouse gas emissions by 50% of 2005 levels, by 2030.

These goals and funding are representative of a global shift from the reliance on non-renewable resources to those that emit less carbon and have less impact on the environment over their lifetime. This transition includes nearly all aspects of society from infrastructure and technology to investment and culture. By seizing this moment, CFPUA can take advantage of the resulting grants and partnerships and serve as a part of the solution to the world-wide crisis.

GREEN OFFICE PRACTICES

While considerable work is being done to make CFPUA’s operational and maintenance practices more resilient, the staff is encouraging more and new resilient office practices. Operations and maintenance of equipment have the greatest opportunity to reduce emissions; however, CFPUA recognizes the need to reduce waste in all aspects of the organization. Involving each staff member at CFPUA in emission-reducing practices will amplify the results and give staff more ownership of this initiative. For example, CFPUA’s **Information Technology Department** is developing a secure printing policy under which each employee would be given a unique VIN to be entered at the printer to release the employee’s printing job. This policy could eliminate wasteful printing while helping to secure community printers that are used by multiple staff and departments.

In addition to sustainable policies and operating procedures, CFPUA will encourage staff to make habit changes to save energy, resources, and emissions. The **Sustainability Division** is developing educational materials for CFPUA staff on ways to conserve office resources. Building on the previous printer example, materials encouraging thoughtful printing practices including previewing and proofreading documents before printing, printing double-sided, printing only essential pages from large files, and changing document text to lower ink-consuming fonts will be distributed and displayed in appropriate platforms. The ultimate goal will be to provide all of the tools needed to eliminate wasteful printing and employing more sustainable office practices. In return, CFPUA’s offices can reduce energy usage, conserve resources such as ink, toner, and paper, and become more sustainable.

Easily accessible information about various environmentally conscious practices will be available to all staff. Each year, materials can become more job-specific through collaborations with each department. Some basic materials that will be developed in the first year include the health and cost benefits of turning off lights when possible, the importance of heat and AC settings, continued education on sustainable driving and thoughtful idling, increased awareness of waste minimization and diversion, energy-saving technology practices, water-saving and reuse options, and the impacts of green landscaping practices. The impact of these office practices will be accounted for quantitatively through financial and energy-savings as well qualtitatively in the yearly Sustainability & Resiliency Survey to staff.

INCORPORATING SUSTAINABILITY INTO THE SOUTHSIDE WWTP UPGRADE

CFPUA's **Southside Wastewater Treatment Plant (WWTP)** is slated to be upgraded by FY30 to replace the existing aging infrastructure and accommodate some of the the New Hanover County growth projections. According to our FY23 CIP, this upgrade will:

- ✓ Replace existing 12 MGD capacity
- ✓ Provide sufficient capacity for all system growth,
- ✓ Avoid financial challenges of back-to-back upgrades at this and the Northside WWTP, and
- ✓ Meet more stringent discharge regulations

The upgrade also provides ample opportunities for innovative sustainability measures to be built into the project, rather than retrofitting the plant later. As this project moves forward, staff in the **Sustainability Division** will meet with staff in the **Project Management, Wastewater Treatment, and Engineering Departments** to discuss potential projects, including expanded resource recovery, combined heat and power (CHP), and solar PV. In ongoing conversations, staff has considered expanding CHP systems at our WWTPs, and the **Southside WWTP** upgrade presents an opportunity to consider this.

Recent conversations have identified feasibility, cost savings, alignment with our strategic plan, and environmental benefits as primary project drivers. Staff has introduced ideas like accepting more community waste from the local food industry to maximize biogas production and recovering more gas to offset the additional energy needed to power the more advanced plant. Staff has also considered fueling the organization's fleet with compressed natural gas from the biogas. Various resource recovery projects will be considered, but project drivers and business case analyses will ultimately determine whether they are implemented.

Identifying opportunities for energy efficiencies and offsets will be important for future greenhouse gas accounting when the new Southside WWTP goes online. The new facility will incorporate technologies that will increase the water effluent quality and simultaneously require and increase in energy use. These technologies are similar to those at the Northside WWTP. In 2021, Northside produced 1.3 $MTCO_2e$/MGD in comparison to Southside's 0.9 $MTCO_2e$/MGD.

Research is ongoing by staff for the newest and most innovative technologies used by industry-leading utilities throughout the country. Closely following the case studies for the most optimistic projects in addition to updates from water and energy organizations, CFPUA will learn from best practices and lessons learned by other utilities.

MAXIMIZATION OF BIOGAS AT NORTHSIDE WWTP

Biogas is an unavoidable emission in the wastewater collection and treatment process. These gases are primarily a mixture of the greenhouse gases methane and carbon dioxide. At CFPUA's **Northside and Southside WWTPs**, a portion of the biogas is currently utilized for CHP. At **Northside**, about half of the current biogas is utilized, and the other half is flared to reduce the severity of greenhouse gas impacts. CFPUA recognizes the potential sustainability and resiliency benefits of maximizing the use of this biogas instead of flaring the gas.

Staff is considering several options for maximizing the biogas at **Northside**. The main options include expanding CHP applications by using the gas for compressed natural gas in vehicles or pumping it to a different CFPUA location to be used as a source of energy. Staff is weighing the cost, resiliency, sustainability, and community impacts of each option. *For example, the Northside campus has the capacity for incorporating more biogas into the energy portfolio; however doing so could change the fee structure benefits and ultimately cost more over time. These types of nuances are being carefully measured and research will continue within CFPUA and subject-matter experts.*

Additionally, using biogas as an energy resource is being considered in the upcoming capital improvement project at **Southside**. Several subject-matter experts, including from the National Renewable Energy Laboratory and the N.C. State Clean Energy Technology Center, have worked with the **Wastewaater Treatment Department** to create data-driven predictions of each potential future path.

The options will be thoughtfully and thoroughly researched to ensure maximized benefits for CFPUA, the community, and the environment.

SOLAR PHOTOVOLTAICS (PV) FEASIBILITY STUDY

Another of CFPUA's frequently considered and potential sustainability projects is the implementation of solar PV. Across our service area, CFPUA has many potential locations for solar panels. In FY23, the **Sustainability Division** staff plans to take the first steps to determine where and how much solar PV would be feasible for various facilities at CFPUA. Different types of solar PV, like ground mounts and rooftop arrays, will be considered for all treatment plants (Southside, Northside, Sweeney, and Richardson) as well as EMSD and pump stations, while solar PV for covered parking areas will be considered for the treatment plants. **Treatment & Engineering** and **Sustainability** staff are already completing a request for qualifications (RFQ) to hire a third-party consultant to conduct this feasibility study. The goal is to maximize solar PV capacity at each location for the lowest cost.

The study will help guide CFPUA in creating a map forward for PV installation. Locations can be prioritized based on cost, total reduction in GHG emissions, alignment with the CIP, and support from staff and leadership. Additionally, this feasibility will serve as a foundational document for applying for any state or federal grants and rebates for PV projects.

Solar PV projects are most often implemented for sustainability and/or energy optimization projects. The Inflation Reduction Act is one of the first opportunities to utilize federal grants for battery storage. This addition to a solar array will provide more consistent power and increase the resiliency of the project. The battery backup system can be charged by the solar panels when the sun is out, and then use the battery as a source of power at night. Additionally, this will allow the system to be used as a duplication of energy in addition to Duke Energy Progress, instead of needing to go totally off of the traditional grid.

Solar PV is utilized at many water and wastewater facilities, and throughout the state of North Carolina. While it is one of the most promising forms of renewable energy, CFPUA will continue to look at all of the options as new opportunities arise.

TREE REPLACEMENTS & NARUAL AREAS

CFPUA's capital program is responsible for maintaining and rehabilitating water and sewer assets as well as installing new infrastructure for growth or resiliency. Some infrastructure improvements require tree removal. Under City of Wilmington (City) and New Hanover County (County) ordinances, depending on a project's location, CFPUA either pays a mitigation fee to the City or County or additional trees can be replanted. Both options factor in considerations like the size, species, and a number of trees removed.

Currently, the City and County ordinances require the replanting of trees on the same parcel from which they were removed. Unfortunately, sometimes the existing easement or right of way doesn't have adequate space to replant trees and maintain our water and sewer assets. CFPUA has been working with the City and County to develop a plan to allow CFPUA to plant new trees on existing CFPUA-owned parcels with sufficient room, beautifying existing infrastructure like pump stations or wellsite facilities. In addition to improving infrastructure aesthetics and saving money by avoiding mitigation fees, this would also help CFPUA increase our green space and reduce our carbon footprint.

CFPUA's **Sustainability Division** plans to help the **Project Management Department** identify locations to plant the trees and provide the recommended tree species and number for replacement. CFPUA will follow the City and County's calculations and guidelines that determine specific replacement specifications, but the goal will typically be a 1:1 replacement ratio.

The Sustainability Division is researching other ways to support the natural areas owned by CFPUA. An internship in Fall 2022 studied how various utilities use large natural areas for carbon sinks and provide nature-based solutions to resiliency issues such as flooding and heat-island effect. This internship will provide the foudation for more research into CFPUA's easements and other properties. Partnering with various programs in higher education, non-profits focused on environmental preservation, and local government, there are many potential projects community-wide. Additionally, CFPUA may serve to provide examples of best practices for the maintenance of natural areas, especially for coastal regions.

APPENDIX A: ACRONYM DEFINITIONS

CFPUA – Cape Fear Public Utility Authority

CHP – Combined heat and power

CIP – Capital Improvement Plan

FY – Fiscal Year

EMSD – Environmental Management and Sustainability Department

EO – Executive Order

EPA – Environmental Protection Agency

FEMA – Federal Emergency Management Agency

GIS – Geographic Information System

GHG – Greenhouse gas inventory

IAP – Incident Action Plan

LEV – Low emission vehicle

MGD - Million Gallons Distributed

$MTCO_2e$ – Metric tons of carbon dioxide equivalent

NCDEQ – North Carolina Department of Environmental Quality

“Northside” – Northside Wastewater Treatment Plant

PV - Photovoltaic

“Richardson” – Richardson Water Treatment Plant

SOP – Standard Operating Procedure

“Southside”– Southside Wastewater Treatment

Plant “Sweeney” – Sweeney Water Treatment Plant

SWAP – Source Water Assessment Program

SWPP – Source Water Protection Plan

SWPPA – Source Water Protection Plan Area

UNCW – University of North Carolina Wilmington

WTP – Water Treatment Plant

WWTP – Wastewater Treatment Plant

Appendix B:

Resiliency Report Project Rubric						
Project Title:					**Estimated Project Start Date:**	
Project Contact(s):					**Estimated Project End Date:**	
Category	0	1	2	3	4	5
Cost (Capital Cost)	Over one million dollars	$25,000 to one million	$10,000 to $24,999	$5,000 to $9,999	$1 to $4,999	No cost to CFPUA
Alignment with Strategic Plan Initiatives[1]	No alignment	1 initiative	2 initiatives	3 initiatives	4 initiatives	All 5 initiatives
Resiliency[2]	Does not align with any metrics	1 metric addressed	2 metrics addressed	3 metrics addressed	4 metrics addressed	All 5 metrics addressed
Emissions Reduction (annually)	No emission reduction	2 to 100 metric tons reduced	101 to 250 metric tons reduced	251 to 500 metric tons reduced	501 to 1499 metric tons reduced	1500 and above metric tons reduced
Innovation[3]	No additional win-win situations created	1 created	2 created	3 created	4 created	5 created
Total Points						

[1]Strategic Plan Initiatives:

- Customer Satisfaction and Stakeholder Understanding
- Infrastructure Reliability and Product Quality
- Environmental Stewardship and Protection
- Employee Leadership and Development
- Finical Viability

[2]Resiliency Metrics:

- Extreme heat
- Social
- Sea level rise and saltwater intrusion
- Storm events and hurricanes
- Flooding and drought

[3]Innovation Situations:

- Laying groundwork for projects
    - Assessing vulnerability (social and environmental)
    - Data collection
    - Partnerships
- Policy and regulation
- Permits

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Customer Feedback

As your water and wastewater service provider, we welcome your feedback on the content of this report. Please go to www.cfpua.org/Sustainability and fill out the form with any feedback you'd like to share.