**2021**

# Town of Chapel Hill Climate Action and Response Plan

# Acknowledgments

## TOWN LEADERSHIP

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## TOWN ADVISORY BOARDS & COMMISSIONS

Community Design Commission

Environmental Stewardship Advisory Board

Housing Advisory Board

Human Services Advisory Board

Justice in Action Committee

Parks, Greenways, and Recreation Commission

Planning Commission

Stormwater Management Utility Advisory Board

Transportation and Connectivity Advisory Board

## ORGANIZATIONS

Bicycle Alliance of Chapel Hill
Boys and Girls Club of Chapel Hill
Citizens Climate Lobby
Chapel Hill Rotary Club
Clean Air Carolina
Climate Action NC
Climate Action Coalition of Orange County
Dominion Energy
Duke Energy
El Futuro
Habitat for Humanity
                    oundation
Hope Renovations
Inter-Faith Council
NAACP – Environmental Justice Task Force
NC DEQ
NC Sierra Club
Orange County Sustainability
Orange County Climate Council
Orange County Commission for the Environment
Orange County Health Department
Orange County Living Wage
Orange County Solid Waste
OWASA
Piedmont Electric Membership Corporation
PORCH
Rogers Road Community Center
Southeast Regional Climate
Sunrise Movement
The Conservation Fund
Town of Carrboro
Town of Hillsborough
The Nature Conservancy
Triangle Community Foundation
UNC – Chapel Hill
UNC – Coastal Resilience Center
UNC – Institute for the Environment
UNC – Undergraduate Student Government

### CONSULTANT TEAM

Planning Communities

KLA

# Contents

# Message from Leadership

The future of Chapel Hill belongs to the young people of this community, and we have a responsibility to do all that we can to leave this place better than we found it. We also have limited time to avoid the worst of climate change, so our collective actions must be bold, swift, and connected. This plan puts us on a path to address the greatest challenge of our time, and we will be a leader in this effort.

Climate action strikes a balance between **reducing** the greenhouse gas emissions that cause climate change and **adapting** to the impacts that come from a changing climate. To do this, we will use both new technologies and old, harnessing innovation as well as the strength and wisdom of our natural environment.

Our work will uphold **environmental justice** by actively addressing environmental racism. We must embrace our ugly truths and have respect for all when we act. This means we will listen more than we speak. We will ask **all residents** what they need. We will make decisions together, and we will **empower** our entire community.

Our actions will be in partnership with other Orange County communities, those within the greater Triangle area, as well as our peers across the state and the region. We will focus on working relationships that help us maximize our climate goals and generate other benefits like new **jobs**, more **affordable housing**, and greater **protections** to our residents — particularly those who are most at risk to the impacts of climate change.

Our changing climate is a significant threat yet many of the solutions we will consider offer us an opportunity to affirmatively address other societal ills. This plan is a vehicle for helping Chapel Hill truly become a community where everyone feels safe and financially secure, with access to affordable housing, clean air and water, and healthy foods.

Let's get going.

*—Chapel Hill Town Council*

# Town of Chapel Hill Climate Action and Response Plan

The Town of Chapel Hill's community goals include creating a vibrant and inclusive community while being conscious of environmental justice and stewardship. Reaching these goals means that the Town must prepare the community for the future by advancing racial equity and creating resiliency and sustainability.

Since 2006, when it committed to reduce its own carbon dioxide emissions by 2050, the Town of Chapel Hill has maintained its strong commitment to reducing its contribution to climate change. The Town is also committed to improving community resilience to better prepare for the effects of ongoing climate change.

In September 2019, the Town Council passed a resolution to create a Climate Action and Response Plan and to put the Town on a path to 100% renewable energy by 2050. This Climate Action and Response Plan describes climate goals, challenges and opportunities, as well as the highest impact actions the Town and community can begin to take over the next five years to lower carbon emissions and address the effects of climate change. The four main action categories within the plan are:

- Buildings and Energy
- Transportation and Land Use
- Waste, Water and Natural Resources
- Resiliency

These categories are part of a system that connects to everything we do and experience in Chapel Hill. Within each category, there are a series of specific actions and strategies designed to help us reach our goals of being an equitable, resilient, clean energy community by 2050.  To take advantage of new solutions and opportunities, we will update this plan every five years beginning in 2025. Each cycle, our approach will be to learn, act, measure, and adapt – making changes whenever they are needed.

# Climate Change and Extreme Weather

Climate change refers to long-term changes to weather patterns, such as a place becoming generally hotter, colder, drier, or wetter over time. In recent decades, climate change has occurred at an unprecedented rate primarily due to greenhouse gas emissions from human activity. This human impact on the environment is evident in the increasingly unpredictable and destructive weather patterns that negatively affect our community. **This Climate Action and Response Plan will help our community face these climate changes and challenges.**

## WHAT ARE GREENHOUSE GASES?

Greenhouse gases (GHGs) are gases in the earth's atmosphere that trap heat and warm the planet. GHGs include carbon dioxide, methane, nitrous oxide, and fluorinated gases. The right proportion of GHGs keep our planet warm enough to support life. When there are too many GHGs in our atmosphere, too much heat is trapped and overall temperature rises.

Human activity such as burning fossil fuels has caused a dramatic increase in these gases since around 1900, and the trend has rapidly accelerated in recent years.

## HISTORIC WEATHER TRENDS FOR NORTH CAROLINA
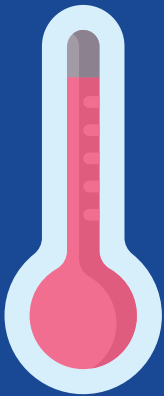
### Temperature

2009-2018 warmest 10-year period on record for NC

2019 warmest year on record for NC

2010-2018 had the greatest number of nights >75° on record for NC

Winter temperatures above average since 1990 (30 years)

### Precipitation and Storms

2020 was the second wettest year on record in North Carolina

2015-2018 had the greatest number of heavy rain events (days with 3 inches or more) since 1900.

2018 - Hurricane Florence - 20-36 inches of rain in the most intense rainfall event on record

2016 - Hurricane Matthew - 10-18 inches of rain over 3 days
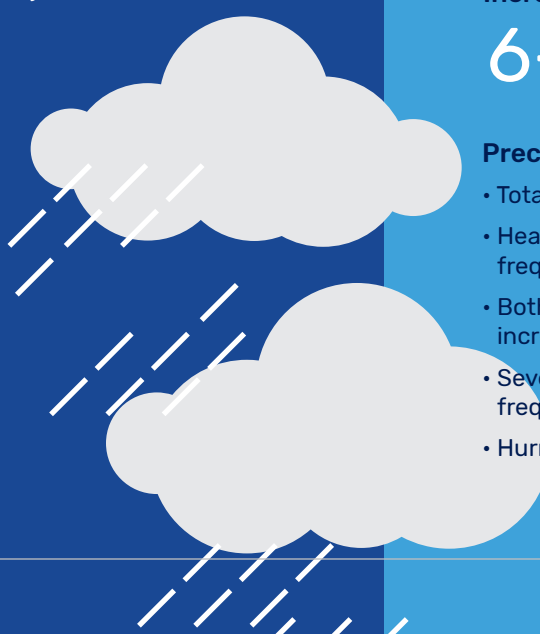
## PROJECTED CHANGES IN REGIONAL TEMPERATURES AND PRECIPITATION BY 2050

### Temperature Increase

**2-5°F** (NC)

### Increase in the Number of Days >95°

**15-25** or more days per year (Piedmont Region)

### Increase in the Number of Nights >75°

**6-35** or more days per year (Piedmont Region)

### Precipitation and Storms

• Total annual precipitation will increase
• Heavy rain events will become more frequent and more intense
• Both coastal and inland flooding will increase
• Severe thunderstorms will become more frequent
• Hurricanes will be more intense and wetter

# High-Impact Actions ⭐

## Top 5 Action Categories

The following is a list of the top action categories to reduce our community carbon footprint by 2050 and build resiliency. These measures are projected to reduce emissions by approximately 62% below projected 2050 levels. In cooperation with UNC's carbon reduction plans, the total reduction in community emissions would be nearly 83% below 2005 levels. Within our authority to act, we are focused on the most impactful actions we can take today, while also continuing to plan for the remaining 17% of emissions as we update this strategy every 5 years. Our new long-term goal is to produce zero net emissions by 2050. Specific actions are highlighted below and detailed later in the plan, where a ⭐ indicates that an action is a high-impact priority between now and 2025.

## 1. Green the grid ▼30-31%



**ACTIONS**
- Advocacy
- Large- and small-scale renewable energy projects

**TARGETS**
- Utilities: net zero emissions by 2050

## 2. Sustainable transportation ▼ 12-13%



**ACTIONS**
- Town-wide EV charging
- Bus rapid transit (BRT) + electric buses
- Mobility Plan build-out

**TARGETS**
- Charging stations: 1,400 Level 2 + 99 Level 3 by 2050
- Complete North-South BRT by 2025
- Implement Mobility Plan by 2035

## 3. Sustainable development ▼ 10-11%



**ACTIONS**
- Green building policy
- Plan for walkable, transit-served communities
- Provide zoning incentives
- Add to tree canopy and greenery

**TARGETS**
- 100% net-zero emissions development by 2030
- More walkable, transit-served areas by 2050

## 4. Green building retrofits ▼6-7%



**ACTIONS**
- Upgrade existing buildings
- Upgrade Town facilities

**TARGETS**
- Convert 15k buildings to all-electric by 2050
- Halfway to net zero by 2050: 15% of commercial, 30% of residential, 100% of Town buildings
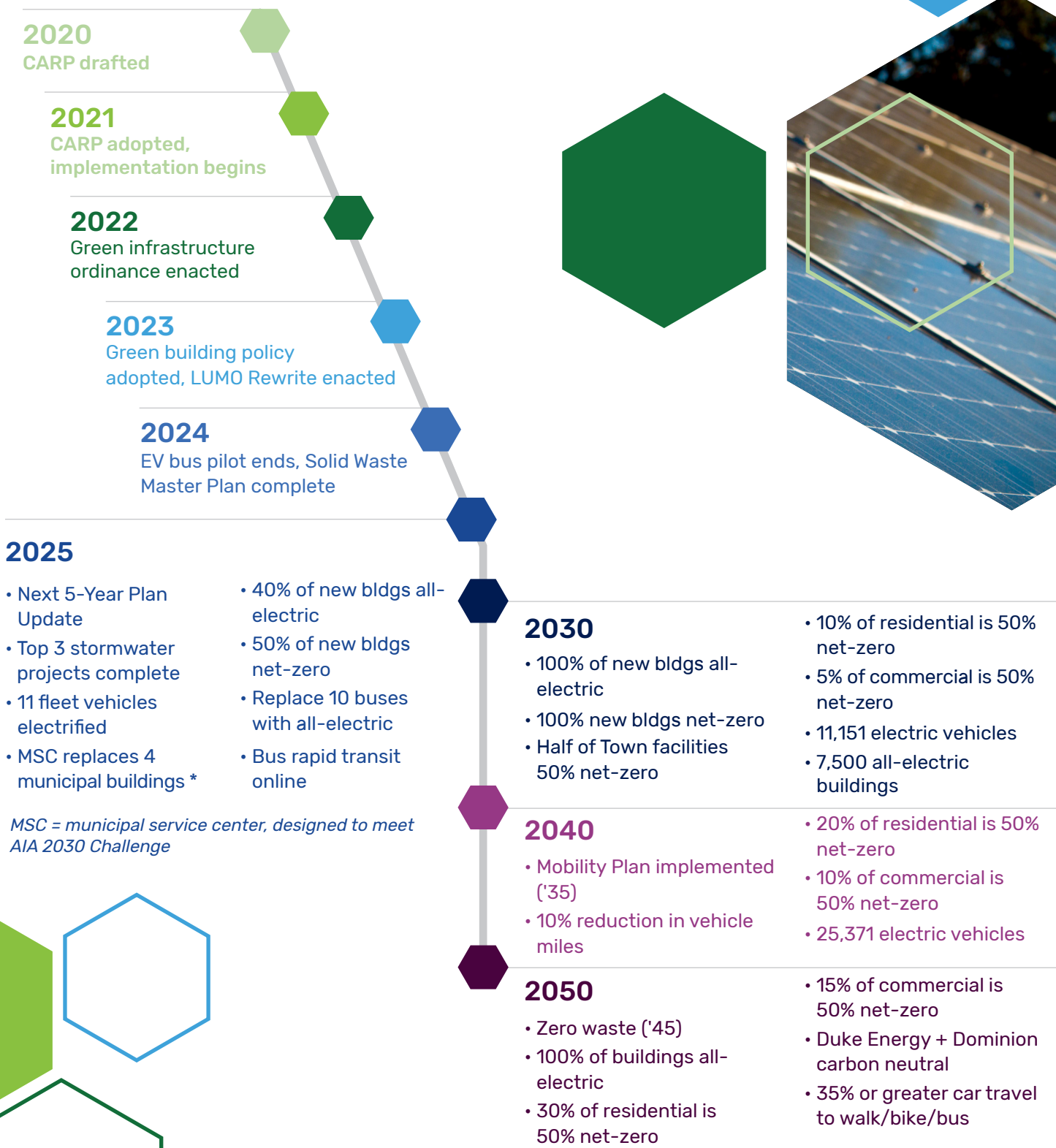
## 5. Green infrastructure ▲ resiliency



**ACTIONS**
- Green infrastructure planning + implementation
- Tree planting + invasive species removal

**TARGETS**
- Green Infrastructure ordinance by 2022
- Complete top 3 subwatershed study stormwater projects by 2025
- Plant 200+ trees per year

# Timeline for Climate Action and Response Plan Implementation

**2020**
CARP drafted

**2021**
CARP adopted, implementation begins

**2022**
Green infrastructure ordinance enacted

**2023**
Green building policy adopted, LUMO Rewrite enacted

**2024**
EV bus pilot ends, Solid Waste Master Plan complete

## 2025

- Next 5-Year Plan Update
- Top 3 stormwater projects complete
- 11 fleet vehicles electrified
- MSC replaces 4 municipal buildings *

- 40% of new bldgs all-electric
- 50% of new bldgs net-zero
- Replace 10 buses with all-electric
- Bus rapid transit online

*MSC = municipal service center, designed to meet AIA 2030 Challenge*

## 2030

- 100% of new bldgs all-electric
- 100% new bldgs net-zero
- Half of Town facilities 50% net-zero

- 10% of residential is 50% net-zero
- 5% of commercial is 50% net-zero
- 11,151 electric vehicles
- 7,500 all-electric buildings

## 2040

- Mobility Plan implemented ('35)
- 10% reduction in vehicle miles

- 20% of residential is 50% net-zero
- 10% of commercial is 50% net-zero
- 25,371 electric vehicles

## 2050

- Zero waste ('45)
- 100% of buildings all-electric
- 30% of residential is 50% net-zero

- 15% of commercial is 50% net-zero
- Duke Energy + Dominion carbon neutral
- 35% or greater car travel to walk/bike/bus

# Mitigation and Resilience

The Climate Action and Response Plan includes strategies the Town and community can take to reduce or "mitigate" greenhouse gas emissions or adapt to the effects of climate change by making our community more resilient.

## What is Mitigation?

Mitigation and resilience strategies work together to achieve climate goals. They are a form of long-term adaptation (or resilience). Mitigation strategies seek to:

• Reduce or eliminate GHG emissions

• Remove GHGs from the atmosphere through carbon sequestration or other measures

### What can I do to make a difference?

You don't have to work for the Town or represent a partner organization to make a difference. Everyone can contribute by making a few greener choices. If everyone takes a small action, it can make a big impact! Here are a few simple ways you can help:

• Walk, bike, ride a bus, or  go car-free

• Switch to a more efficient car or electric vehicle

• Use reusable products, like water bottles, cloth napkins, or soap dispensers

• Plant a native tree, shrub, herb or groundcover

• Capture rainwater from your roof for reuse or put in a rain garden

• Compost

• Choose products with less packaging

• Eat a more plant-based and local diet

• Adjust your thermostat to use less energy and save money

## What makes a Resilient Community?

Climate resilience is the capacity of communities to reduce or avoid impacts from potential climate changes and stresses, recover quickly or "bounce back", and even improve community environmental, social, physical, and economic well-being in order to "bounce forward." Resilience or adaptation strategies focus on how we prepare for and respond to the changes that are already happening in our climate.

Resilience strategies may include:

• Providing resources for at-risk populations vulnerable to climate change impacts

• Planning for severe weather and catastrophic events

• Developing early warning systems

• Building with nature using green infrastructure

• Protecting open spaces

• Improving water quality and stormwater management

• Developing partnerships, especially where issues cross political boundaries

• Supporting environmental and climate education

• Expanding economic opportunity

• Fostering social networks

# Working Toward an Equitable, Sustainable, and Resilient Chapel Hill

Chapel Hill has been working to become a more equitable, sustainable, and resilient community. This involves finding a strong and lasting balance between social, economic and environmental sustainability for our community. We look for connections in all that we do. We strive to learn from our actions, monitor our progress, and innovate to solve problems.

## Past Commitments and Targets

The **Town of Chapel Hill was among the first municipalities in the U.S. to commit to reducing its own** carbon dioxide emissions by 2050 from 2005 levels.

In 2017, the **Town committed to 26-28% carbon reduction from 2005 levels by 2025** to meet the United Nations Paris Agreement.

## What is an equitable, sustainable and resilient community?

- It's about asking, Who is supported by our actions and who is burdened or left out?

- It's where we protect and grow today's opportunities for tomorrow's generation.

- It's about being "future friendly/ready".

- It means decisions and actions that leave Chapel Hill's people, economy and environment better than we found them.

- It's about preparation so we can bounce back from sudden change.

- We believe a sustainable and resilient Chapel Hill is the work of everyone who lives, works, visits, and goes to school here.

In 2016, the United Nations Paris Agreement called all nations to combat climate change and adapt to its effects. Participating nations and communities are committed to limiting the temperature increase this century below 2 degrees Celsius above pre-industrial levels and pursuing efforts to limit the increase to just 1.5 degrees.

## What has Chapel Hill done so far to address climate change and become more sustainable and resilient?

- Participated in Triangle Regional Resilience Assessment
- Energy upgrades in Town facilities
- Green Building Ordinance
- Energy savings with rezonings
- Northside Energy Saver Program
- LED lighting upgrades
- Fare free transit
- Mobility Plan
- Green municipal fleet
- Electric vehicle charging stations
- Trails and greenways
- Commute Alternative Program
- Drive-thru Ordinance
- Stormwater management
- Water conservation with Orange Water and Sewer Authority
- Subwatershed studies
- Illicit Discharge Ordinance
- Jordan Lake Rules
- Explore More at Pritchard Park

- Smart City projects
- Solar on town buildings
- SolSmart community designation
- Renewable energy evaluation
- Tree Planting Program
- Open space protection and acquisition
- Coal ash remediation
- Recycling
- Composting pilot
- Green purchasing
- Creation of the Rural Buffer
- Creation of the Resource Conservation District (RCD)

# Chapel Hill Climate Goals

The Town of Chapel Hill is committed to reducing Greenhouse Gas (GHG) emissions at the Community-wide level and for Town operations.

Governor Roy Cooper issued an executive order in support of the Paris Agreement in 2018. The order commits to reducing statewide GHG emissions to 40% below 2005 levels by 2025.

## Town & Community Goals

### 50%
reduction by 2030

### net-zero
by 2050

### 80%
clean, renewable energy by 2030

### 100%
clean, renewable energy by 2050

## What is clean, renewable energy?

Renewable energy is derived from natural processes that are regenerative over short periods of time or cannot be depleted such as solar, wind or geothermal. Clean energy comes from renewable energy sources that do not generate emissions.

## What is net zero?

Net zero emissions means achieving a balance between activities that create GHG emissions with those that remove them from the atmosphere. Another term for net zero is "carbon neutral." Today, reaching net zero emissions often requires the use of renewable energy to "offset" any GHG emissions that cannot be eliminated.

# Challenges and Opportunities

Addressing climate change will not be easy. There are economic, societal, governmental, regulatory, and technological challenges that must be overcome to make significant progress. However, there are significant opportunities available too. Our community can expect our climate actions to result in many shared benefits that go beyond climate, like improved racial equity, public health and resilience. Challenges and opportunities with implementing climate action were identified through working sessions with Town staff, the climate action opinion survey, advisory board and commission review, and the Community Partners Climate Action Summit.

## Challenges

Town's authority to act is limited by what the State allows.

Regional growth pressures

Continuing climate change brings new challenges

Lack of understanding of climate change and resilience issues

Climate burdens are not felt equally across Chapel Hill communities

Difficulty in reaching everyone affected

Resistance to change

Slow transition to sustainable development patterns

The Town has limited control over community emissions and actions that contribute to climate change

Insufficient funding to meet climate goals

Improving and maintaining stormwater controls

Need for investments in major technology shifts, such as electric vehicles

Insufficient funding to meet climate goals

## Opportunities

Set policies and practices that address racial inequities and drive outcomes

Build on statewide goal of reducing GHG emissions by 40% by 2025 (Executive Order 80)

Leverage Duke Energy and Dominion's goal of being carbon neutral by 2050

Seek out new funding opportunities (grants, partnerships)

Establish new policies, incentives, regulations and partnerships that impact our two largest emissions sectors – buildings and transportation

Adopt more sustainable development and land use policies

Continue modeling best practices in energy use

Strengthen hazard mitigation and community resilience

Continue improving stormwater management

Promote and support sustainable living

Grow and leverage community partnerships

Create more sustainable economic and job opportunities

# Greenhouse Gas (GHG) Inventory

## What is a GHG Inventory?

A GHG inventory helps us measure and monitor how much we as a community are contributing to climate change and whether or not we're on track to meet our goals. The first inventory we did back in 2005 created an initial set of numbers or "baseline" that we now use as a way to measure our progress and identify opportunities for improvement.

Two GHG inventories were prepared for Chapel Hill. The first assesses emissions at a community-wide level, and the second focuses on emissions resulting from municipal actions.

## What standards guide the GHG Inventory process?

The GHG inventory follows the U.S. Community GHG protocol developed by ICLEI Local Governments for Sustainability. The calculations meet the standard reporting requirements defined by the Global Protocol for Community Scale Emissions Inventories. These protocols provide standards methods for estimating emissions from specific sources and activities.

For more details on the Town and Community GHG Inventory, visit the full GHG inventory in the appendices.

### Municipal GHG Emissions by Sector

| | | |
|---|---|---|
| 52.5% | Vehicle Fleet |
| 21.2% | Facilities |
| 15.8% | Employee Commute |
| 7.1% | Streetlights & Traffic Signals |
| 3.3% | Solid Waste |
| 0.1% | Water |
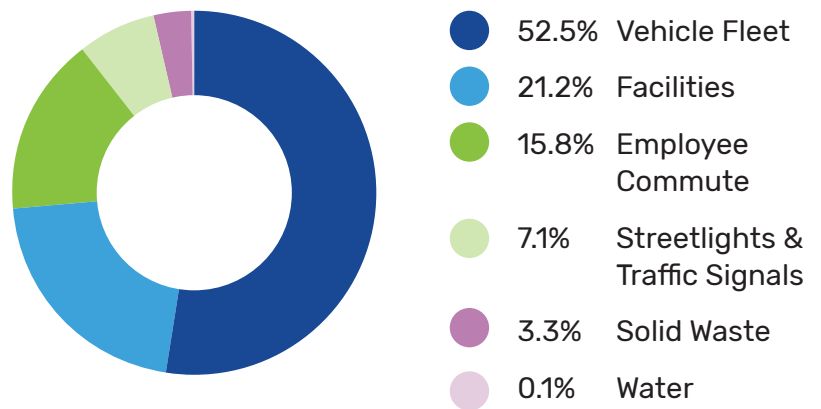
### Community GHG Emissions by Sector

| | | |
|---|---|---|
| 69.7% | Buildings |
| 26.4% | Transportation |
| 3.2% | Waste |
| 0.5% | Wastewater |
| 0.2% | Water |
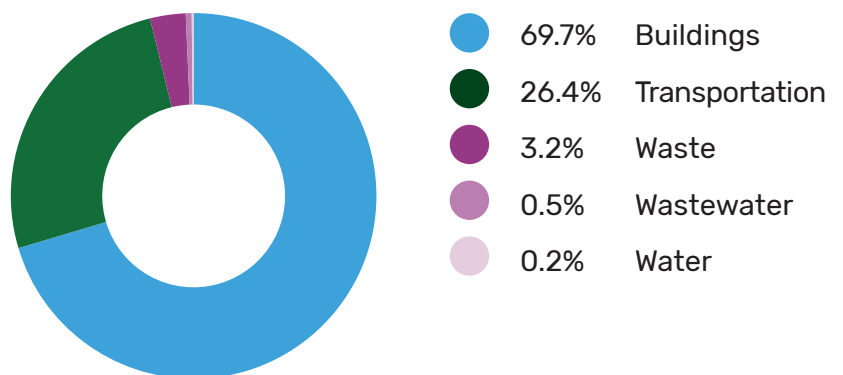
**DID YOU KNOW...**

**The transportation sector is the largest source of GHG emissions in the U.S. (28%), which mostly comes from the burning of fuels like gasoline and diesel.**

## What is included in our Community GHG Inventory?

The Chapel Hill community GHG inventory assesses emissions for the 2017 calendar year because it is the most recent year for which actual data is available for all sectors. The inventory looks at sources of GHG emissions by sector, as follows:

**Buildings** – The buildings sector includes the emissions from generating and using energy to power the buildings in which we live, work and play. It includes everything from the emissions coming from running power plants and manufacturing equipment to the refrigerators in grocery stores and movie theater projectors, to plugging in your cell phone charger or cooking on your stove. Across the community, about 80% of the GHGs from buildings are a result of electricity use and 20% from natural gas.

**Transportation** – The transportation sector includes emissions resulting from fuel consumption from all of the vehicle miles traveled on roads within the Town of Chapel Hill. This includes personal, commercial cars, trucks and buses.

**Waste** – The waste sector includes the emissions associated with the disposal of solid waste, including landfill and compost waste. Landfills are significant sources of GHGs, particularly methane.

**Wastewater Treatment** – The wastewater treatment sector accounts for the emissions that result from the wastewater treatment process.

**Water** – The water sector includes emissions associated with delivering water throughout the community.

## How are GHGs measured?

GHGs are measured in terms of carbon dioxide equivalent, or CO2e. This measurement converts the effects of different GHGs to the amount of carbon dioxide that would cause the same amount of warming so it can be expressed as a single number. The GHG inventory calculates GHG emissions in metric tons of CO2e, or MTCO2e.

### Resident Carbon Footprint Comparison

| City | MTCO2e/Capita |
|---|---|
| Knoxville | 21.7 |
| Atlanta | 20.3 |
| Roanoke | 20.0 |
| Washington DC | 19.7 |
| Durham | 18.1 |
| Chapel Hill | 15.4 |
| Richmond | 14.5 |
| Boston | 13.3 |
| Los Angeles | 13 |
| San Francisco | 10.1 |
| Blacksburg | 8.7 |
| New York | 7.9 |

MTCO2e/Capita

## What is included in the Municipal GHG Inventory?

The Town of Chapel Hill is committed to reducing the GHG emissions within its control. The Municipal GHG inventory is a subset of the community GHG inventory that takes a closer look at emissions from Town operations. Municipal GHG emissions are broken down into the following sectors:

**Vehicle Fleet** – The vehicle fleet sector calculates emissions based on vehicle miles traveled and fuel consumption for the cars, trucks, and buses owned and operated by the Town.

**Facilities** – The facilities sector is similar to the overall buildings sector in the community inventory. It accounts for emissions resulting from energy consumption in buildings that are owned and operated by the Town. Outdoor lighting is also included in these calculations.

**Employee Commute** – The employee commute sector is based on the miles traveled by Town employees going to and from work. It accounts for the types of commutes Town employees use, including driving alone, carpooling, or walking.

**Streetlights and Traffic Signals** – The streetlights and traffic signals sector calculates emissions from the electricity used to power streetlights and traffic signals that are owned and operated by the Town.

**Solid Waste** – The solid waste sector accounts for waste generated at Town facilities and sent to a landfill.

**Water** – The water sector includes both water treatment and delivery, and represents emissions that result from energy consumption from water treatment, extraction, pumping and supply for the amount of water supplied to Town facilities and operations.
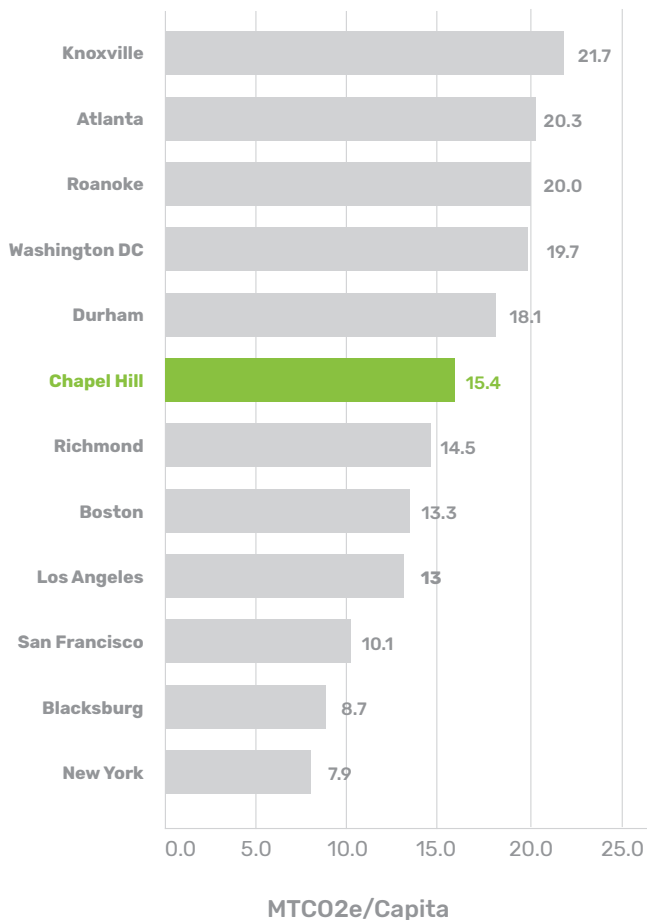
# GHG Projections

## What is Business as Usual?

The Business as Usual forecast predicts what the GHG emissions in our community would be if we did not take any further climate actions. It considers population growth, current efforts, and anticipated improvements in vehicle and appliance efficiency.



| | 2005 | 2017 | 2025 | 2030 | 2040 | 2050 |
|---|---|---|---|---|---|---|
| | 1,047,516 | 914,825 | 926,211 | 1,032,121 | 1,123,766 | 1,203,836 |
| | 1,047,516 | 914,825 | 865,410 | 780,384 | 615,956 | 462,154 |
| | 1,047,516 | 914,825 | 796,044 | 667,664 | 416,528 | 176,018 |
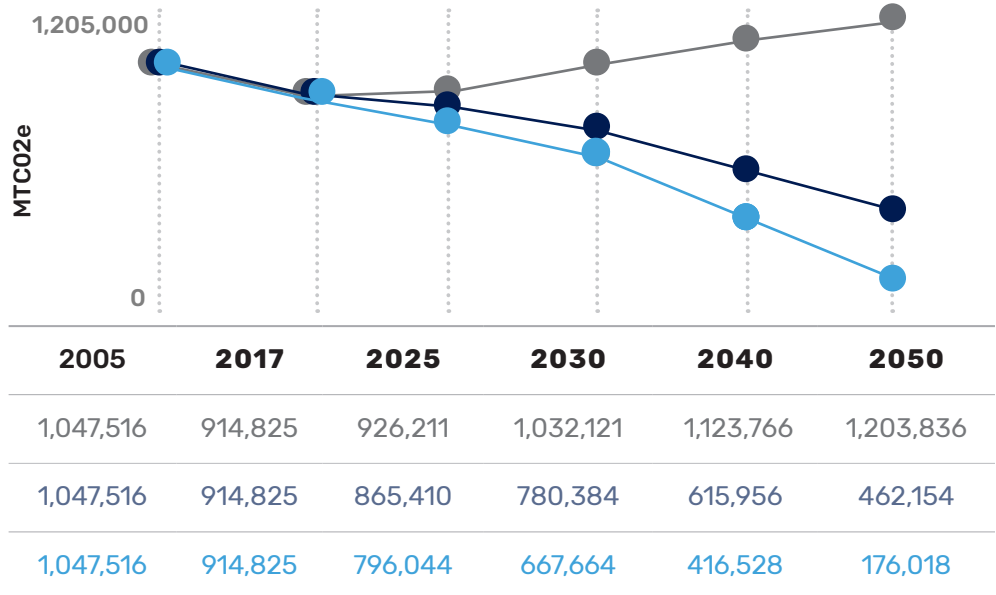
● Business as Usual

● Climate Action & Response Plan (CARP) Implementation

● CARP + UNC Climate Actions

*2005 GHG estimates are based on Orange County data, apportioned based on population.

## What do Chapel Hill's emissions mean?

Climate change is a global process. If global temperature increases are to be limited to 2 degrees or less this century as the Paris Agreement states, it's every community's responsibility to reduce their GHG emissions proportionally.

Our community has made great progress since we began in 2006, but additional GHG reduction efforts are needed to meet our goals. **The graph above illustrates how the measures outlined in this plan can help us reach our goals in support of the Paris Agreement.**

# UNC-Chapel Hill's Greenhouse Gas Emissions

In 2019, UNC-Chapel Hill emitted 473,906 metric tons of carbon dioxide equivalents. This marks a 21% decrease from the 2007 baseline and the fifth consecutive year Carolina has reduced its greenhouse gas (GHG) emissions. This 21% reduction surpassed Carolina's 2020 goal of a 20% emission reduction. The reduction in 2019 was primarily driven by a decrease in coal use but was partially offset by an increase in commuting emissions. Carolina's full emissions trend can be seen in Figure 1 and a breakdown of 2019 emissions can be seen in Figure 2.
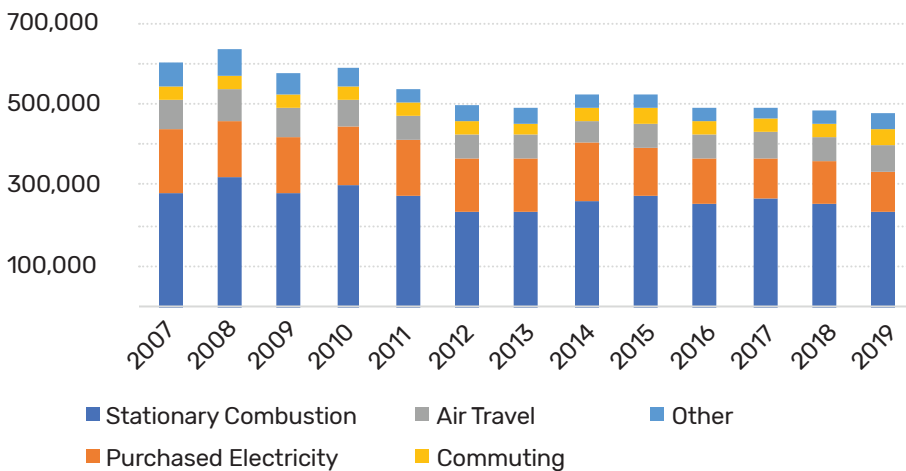


**Figure 1. GHG Emissions by Category Since 2007**



| 49.2% | Stationary Combustion |
| 21.4% | Purchased Electricity |
| 13.8% | Air Travel |
| 8.3% | Commuting |
| 7.2% | Other |
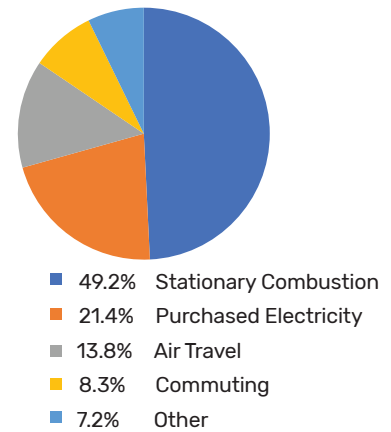
**Figure 2. Breakdown of 2019 GHG Emissions**

## CAROLINA'S GREENHOUSE GAS AND ENERGY GOALS

In 2007, the University of North Carolina at Chapel Hill became a charter signatory of the American College and University President's Climate Commitment (ACUPCC). Carolina's 2009 Climate Action Plan then established a carbon neutrality date of 2050 and interim targets of a 20% reduction by 2020 and a 30% reduction by 2030.

Regarding energy efficiency, Carolina is currently working towards Governor Cooper's Executive Order 80 which states the state will strive to reduce building energy use intensity by at least 40% by 2025 from the 2005 baseline. Carolina has exceeded its previous goal of a 30% reduction in energy use intensity. In fiscal year 2019-20, Carolina had reduced its Energy Use Intensity (Btu/GSF) by 36% compared a 2002-2003 baseline.

## CAROLINA'S GREENHOUSE GAS REDUCTION STRATEGIES

To meet Carolina's 2030 goal, and move the University to carbon neutrality, many carbon reduction strategies will be needed. A few of Carolina's main strategies are laid out below.

## INCREASE ENERGY EFFICIENCY ON CAMPUS

Carolina's Energy Management team is continuously working to reduce campus energy use through low-cost energy conservation projects. These include LED retrofits, airflow reduction projects, HVAC optimizations and many more. Carolina also has a building optimization program that ensures buildings are functioning as designed to limit energy use.

## ELIMINATE COAL USE

Carolina is working to eliminate coal use in the cogeneration facility as quickly as is technically and financially feasible without losing any reliability or resilience. In 2019, Carolina completed a burner restoration project at the cogeneration facility that will allow Carolina to significantly increase its natural gas use and reduce coal consumption.

## INCREASE USE OF RENEWABLE ENERGY

Generating and purchasing renewable electricity is extremely important in lowering Carolina's emissions. Carolina is currently working on multiple on-site solar photovoltaic installations and is assessing its options for procurement of off- site renewable energy through Duke Energy.

## ADDITIONAL STRATEGIES

Other strategies Carolina is using to limit its greenhouse gas emissions include increasing alternative commuting methods, using alternative fuels in fleet vehicles, prioritizing local foods, and educating its community members about how to reduce their personal footprints on and off campus.

# Community Engagement in Climate Action

The Climate Action and Response Plan is a plan for the whole community, not just the Town. Approximately 99% of GHG emissions in Chapel Hill are the result of non-municipal activities from sources like vehicles, homes, businesses, and institutions. The Town government can't reach our community's goals by itself, but a network of committed partners working throughout our community can. Climate action and response relies on community-wide partnerships to build a foundation for broad action.

## How was the community involved in developing the Plan?

Community engagement has been ongoing through the Town's sustainability efforts in recent years and has been incorporated into the climate action planning process. The Town solicited community input on the plan through online surveys, shared information through social media, advisory board meetings, and gathered stakeholders together in a Community Partners Climate Action Summit. Thirty-six individuals representing a variety of stakeholder organizations participated in the Summit. These community leaders and others will be engaged in future climate action outreach.

## How will the community stay engaged in climate action moving forward?

The Climate Action and Response Plan needs community involvement. The Town has developed and will continue to develop COVID-safe engagement resources including presentations, online surveys, and toolkits for use by community partners so that they can continue to share information and engage with the community for future climate action. We will continue to build on partnerships and develop relationships throughout the community to support climate action.

## Chapel Hill Municipal and Community Emissions

| | | |
|---|---|---|
| ● | Community | 514,431 |
| ● | Municipal | 12,378 |
| ● | UNC | 388,012 |
| | **Total** | **914,821** |

*Scope 1 and 2 emissions (MTCO2e)*
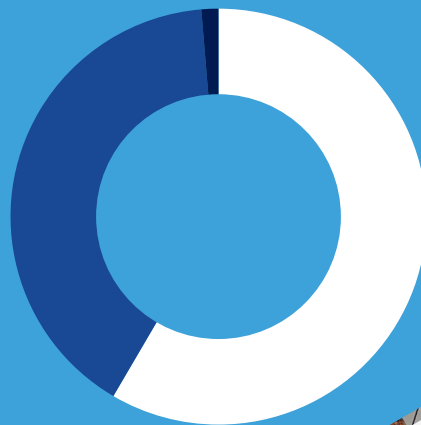
# Engagement Activities

COVID-19 hit our community just as the public engagement portion of the project began. We responded by implementing a variety of online engagement strategies. This work included a video and survey that were published in English, Spanish and Mandarin Chinese, as well as virtual meetings and virtual office hours.

## Community Opinion Survey

Following the climate action community partners summit, we launched a wider climate action opinion survey featured on the town's sustainability website (sustainchapelhill.org) and on social media. The survey focuses on the challenges and opportunities that individual community members see to implementing climate action.

## Key Thoughts from Community Survey

- Challenges include limited Town control and taking action that is accessible and affordable for all

- Needs include incentives, partnerships and advocacy to drive action

Respondents said the Town should:

- Plan for a community that requires less driving and supports more walking, biking and transit service

- Build more climate-resilient infrastructure

- Adopt climate-smart development rules
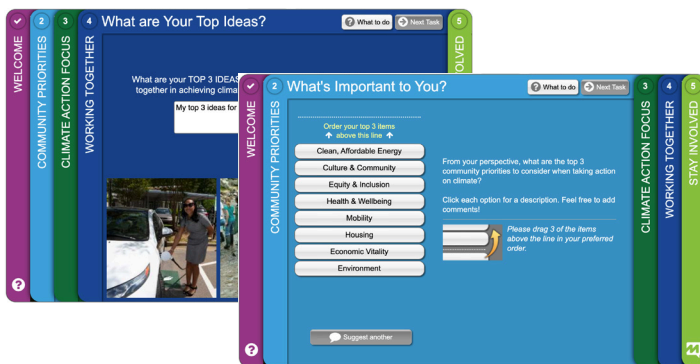


## Metroquest Survey

Ahead of the summit, we distributed a targeted survey to key community stakeholders and organizations to solicit input on community priorities, focus areas for climate action, and ideas for working together between the Town and community.

## Chapel Hill Climate Action Video

We uploaded a climate action plan video to the Town's sustainability website to share information on the project and encourage participation in the community survey.

# Wider Community Benefits of Climate Action

Most climate actions offer a variety of benefits in addition to mitigating GHG emissions or improving resilience to climate change. These are referred to as co-benefits and include:

• Improved racial equity outcomes

• Environmental justice

• Lower costs and greater affordability

• Improved energy security and reliability

• Decreased risk of energy shortages or outages

• Reduced pollution

• Improved air quality

• Improved health outcomes

• Improved economy

• Expanded local jobs creation

• Expansion of transportation choices

• Reduced traffic congestion

• Improved safety

• Improved disaster preparedness

• Reduced flooding risk

• Enhanced and protected natural environment

• Increased ecosystem and habitat resilience

• Reduced water consumption

• Reduced waste and litter

## How do businesses benefit from taking climate action?

Mitigating and adapting to climate change makes our community cleaner, healthier, and more resilient, and that's good for our economy. Major global investors and large corporations are starting to include sustainability actions to reduce their risk to climate impacts. Businesses with experience in climate action and response have found that it also leads to:

• Lower costs, increased efficiency, and higher profits

• Innovative ideas

• Competitive advantages in attracting and retaining talent

• A comprehensive understanding of the full environmental, social, and economic impacts of their operations

• Insight into future possibilities and investment opportunities

• Marketing and branding opportunities

• Reduced risk and increased productivity

# Taking Action Together

The Climate Action and Response Plan focuses on taking action together. Actions are centered on the four areas identified below and are described in more detail throughout the following pages in this section. "Town Government Actions" are those that we as a local government have the ability to initiate or do ourselves. "Town & Community Actions" are those where we don't have full authority and need to work with others to achieve our goals. Taking all of the actions listed below will help us implement the top five action categories described above, while also building community capacity and resiliency.

**Buildings & Energy**

**Transportation & Land Use**

**Waste, Water & Natural Resources**

**Resiliency**

## TOWN GOVERNMENT ACTIONS

- Update Green Building Policy for new construction
- Net-zero emissions for new municipal buildings
- Energy upgrades for existing municipal green buildings & facilities
- Create walkable, bikeable, transit-served neighborhoods
- Increase walking, biking & transit use (mode-shift)
- Electrify the municipal fleet
- Electrify the transit fleet
- Increase transit ridership and implement Bus Rapid Transit (BRT)
- Protect water quality, natural, & agricultural resources
- Enhance green infrastructure
- Strengthen early warning systems for climate hazards & heat

## TOWN & COMMUNITY ACTIONS

- Net-zero emissions for new construction
- Energy upgrades for existing buildings & facilities
- Convert community buildings to all-electric
- Green the grid
- Create a Town-wide EV charging station network
- Expand Transportation Demand Management (TDM) programming
- Produce zero waste
- Broaden community-wide resiliency & recovery actions
- Expand climate action education, outreach, & awareness
- Grow partnerships, funding, & incentives

# Key Benefits of Taking Action

Many wider benefits will result from our community taking climate action, sometimes referred to as "co-benefits". Several co-benefits are highlighted for the proposed actions which focus on climate equity and the overall wellbeing and sustainability of our community.
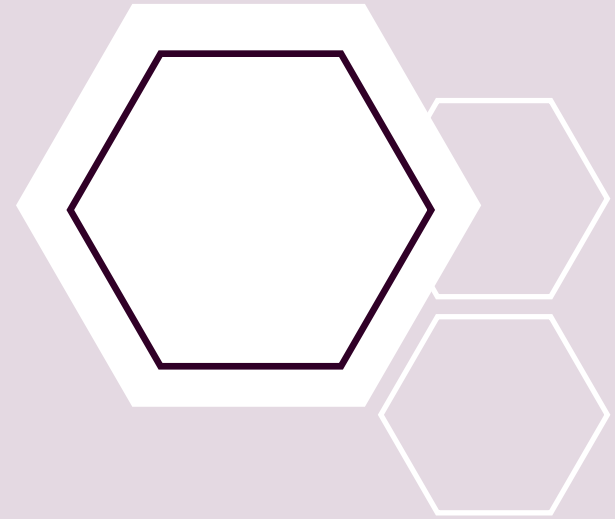
## Public and Environmental Health

Improving air and water quality, stormwater management, recreation, mental health and other ecosystem service benefits.

## Racial Equity and Climate Justice

Addressing inequities in climate change burdens on frontline community members and achieving an equitable distribution of climate action benefits.

## Regional Partnerships

Working collaboratively across the region to take action.

## Resilience to Stressors

Improving our ability to bounce back and bounce forward in the face of climate change.

## Job Creation

Investment in sustainability creates a green economy, with local jobs that pay a living wage like: solar installer, green builder, sustainable farm manager, EV station installer, etc.

# Climate Action Summary Tables

The following summary tables show the potential impacts, resources needed, authority, and co-benefits associated with all of the actions in the plan. Sections following these tables are organized by the action categories of the plan and present more detail on each. The Town's ability to carry out the actions in this plan are a function of the authority granted by the State or that of a local partnership (e.g., Chapel Hill Transit). Where the Town has **no authority** to act, strategies focused on advocacy, partnerships, and incentives are essential. Where the Town has **some authority**, we must act within the State's rules and use advocacy, partnerships, and incentives to bridge the gap. Where the Town has **full authority**, actions can be decided locally.

| ACTION | GHG REDUCTION POTENTIAL (MTCO2e) | LEVEL OF INVESTMENT REQUIRED BY TOWN | TOWN'S AUTHORITY TO ACT | CO-BENEFITS |
|---|---|---|---|---|
| **BUILDINGS AND ENERGY** | | | | |
| Green the grid | + 374,022 | Cost range TBD | No authority 🔴 | 🍃 ⚖️ 🚶 ⤳ 🤝 |
| Net-zero emissions for new construction | + 114,853 | $* | Some authority 🟡 | 🍃 ⚖️ 🚶 ⤳ |
| Convert community buildings to all electric | + 62,186 | $* | Some authority 🟡 | 🍃 ⚖️ 🚶 |
| Energy upgrades for existing buildings and facilities | + 18,582 | $* | Some authority 🟡 | 🍃 ⚖️ 🚶 ⤳ |
| Net-zero emissions for new municipal buildings and upgrades for existing facilities | + 804 | $$$$* | Full authority 🟢 | 🍃 ⚖️ 🚶 ⤳ |

**Legend**

- ✚ Positive
- ◯ Neutral
- ▬ Negative

MTCO2e — Metric tons of carbon dioxide equivalent

- $ Town capital/program costs <$250k
- $$ Town capital/program costs $250k–$1M
- $$$ Town capital/program costs $1-5M
- $$$$ Town capital/program costs >$5M

\* Exact Cost TBD

- 🍃 Public and Environmental Health
- ⚖️ Equity/Climate Justice
- 🚶 Job Creation
- ⤳ Resilience to Stressors
- 🤝 Regional Partnerships

| ACTION | GHG REDUCTION POTENTIAL (MTCO2e) | LEVEL OF INVESTMENT REQUIRED BY TOWN | TOWN'S AUTHORITY TO ACT | CO-BENEFITS |
|---|---|---|---|---|
| **TRANSPORTATION & LAND USE** | | | | |
| Create a town-wide electric vehicle (EV) charging station network | **+** 107,028 | $$$ $1.7M | Some authority 🟡 | 🍃 ⚖️ 🧗 ⌁ 🤝 |
| Expand TDM and plan for mobility on-demand network | **+** 24,119 | $-$$* | Some authority 🟡 | 🍃 ⚖️ ⌁ 🤝 |
| Create walkable, bikeable, transit-served neighborhoods | **+** 19,905 | $* | Some authority 🟡 | 🍃 ⚖️ 🧗 ⌁ 🤝 |
| Increase walking, biking and transit use (mode-shift) | **+** 12,505 | $$$$* | Some authority 🟡 | 🍃 ⚖️ 🧗 ⌁ 🤝 |
| Electrify the transit fleet | **+** 4,572 | $$$$ $2.82M | Some authority 🟡 | 🍃 ⚖️ ⌁ |
| Increase transit ridership and implement Bus Rapid Transit (BRT) | **+** 2,305 | $$$ $200M | Some authority 🟡 | 🍃 ⚖️ ⌁ 🤝 |
| Electrify the municipal fleet | **+** 803 | $$ $480,000 | Full authority 🟢 | 🍃 ⚖️ 🧗 ⌁ |

**Legend**

**+** Positive
◯ Neutral
▬ Negative

MTCO2e  Metric tons of carbon dioxide equivalent

**TDM** is Transportation Demand Management (see glossary of terms for more)

$ Town capital/program costs <$250k
$$ Town capital/program costs $250k–$1M
$$$ Town capital/program costs $1-5M
$$$$ Town capital/program costs >$5M

\* Exact Cost TBD

🍃 Public and Environmental Health
⚖️ Equity/Climate Justice
🧗 Job Creation
⌁ Resilience to Stressors
🤝 Regional Partnerships

| ACTION | GHG REDUCTION POTENTIAL (MTCO2e) | LEVEL OF INVESTMENT REQUIRED BY TOWN | TOWN'S AUTHORITY TO ACT | CO-BENEFITS |
|---|---|---|---|---|
| **WASTE, WATER, AND NATURAL RESOURCES** | | | | |
| Produce zero waste | **+** Amount TBD | $$$$* | Some authority 🟡 | 🍃 ⚖ 🚶   🤝 |
| Protect water quality, natural, and agricultural resources | **+** | Cost range TBD | Some authority 🟡 | 🍃 ⚖ 🚶 ⌇ 🤝 |
| **RESILIENCY** | | | | |
| Expand climate action education, outreach, and awareness | **+** | $-$$* Amount TBD | Full authority 🟢 | 🍃 ⚖   ⌇ 🤝 |
| Grow partnerships, funding, and incentives | ◯ | Cost range TBD | Some authority 🟡 | ⌇ 🤝 |
| Enhance green infrastructure | **+** | Cost range TBD | Some authority 🟡 | 🍃 ⚖ 🚶 ⌇ 🤝 |
| Strengthen early warning systems for climate hazards and heat | ◯ | Cost range TBD | Full authority 🟢 | 🍃 ⚖ ⌇ 🤝 |
| Broaden community-wide resiliency and recovery actions | ◯ | Cost range TBD | Some authority 🟡 | 🍃 ⚖ ⌇ 🤝 |

**Legend**

**+** Positive
◯ Neutral
— Negative

MTCO2e   Metric tons of carbon dioxide

$   Town capital/program costs <$250k
$$   Town capital/program costs $250k–$1M
$$$   Town capital/program costs $1-5M
$$$$   Town capital/program costs >$5M

\* Exact Cost TBD

🍃 Public and Environmental Health
⚖ Equity/Climate Justice
🚶 Job Creation
⌇ Resilience to Stressors
🤝 Regional Partnerships

# Buildings & Energy

### OVERVIEW

Together, buildings and energy account for the largest share of GHG emissions in our community (69%). Improving the efficiency of existing and new buildings, reducing energy use, and transitioning to cleaner energy sources can help reduce GHGs from the building and energy sector. State and local goals for GHG reduction and becoming carbon neutral rely on changes in energy supply and its use in buildings.

## Current and Forecast Greenhouse Gas Emissions from Buildings & Energy

**Existing and Forecast GHGs from Buildings - "Business as Usual" v. Taking Action (MTCO2e)**



- ● Business as Usual
- ● With Actions
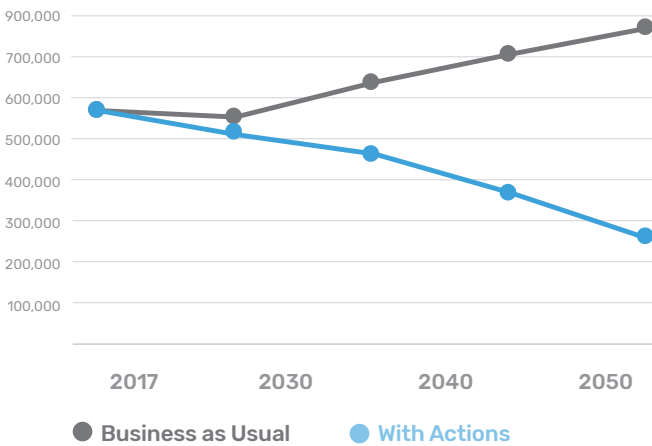
**2017 Community GHGs from Building Energy (MTCO2e)**



- ● Electricity
- ● Natural Gas
- ● Other Heating Fuels
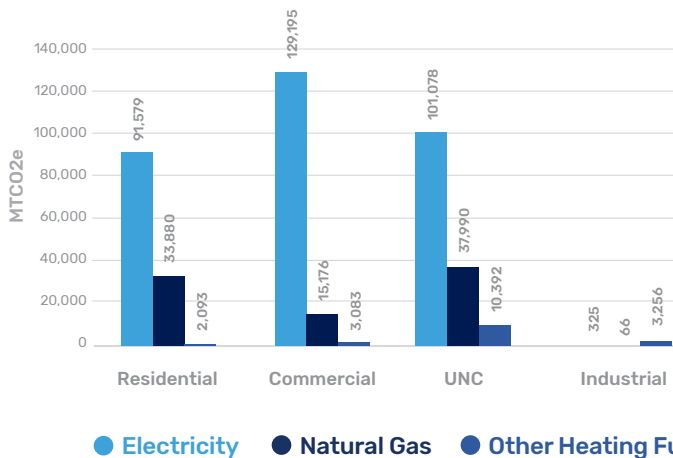
### CARBON NEUTRAL

Carbon neutral means taking actions to remove as much carbon dioxide and other greenhouse gases from the atmosphere as we put into it, achieving net-zero carbon emissions.

## Top Buildings & Energy Actions

| TOWN GOVERNMENT ACTIONS | TOWN & COMMUNITY ACTIONS |
|---|---|
| Update Green Building policy for new construction | Net-zero emissions for new construction |
| Net-zero emissions for new municipal buildings | Energy upgrades for existing buildings & facilities |
| Energy upgrades for existing municipal buildings & facilities | Convert community buildings to all-electric |
| Incentives for net-zero emissions for new construction & energy upgrades for existing buildings | Green the grid |

**POTENTIAL REDUCTION IN GREENHOUSE GAS EMISSIONS**

### Forecast GHG Emissions Reduction Potential from Top Actions for Buildings and Energy (MTCO2e)



Legend:
- Municipal Buildings
- Community buildings
- Building Electrification
- Net-zero new construction
- Green the Grid
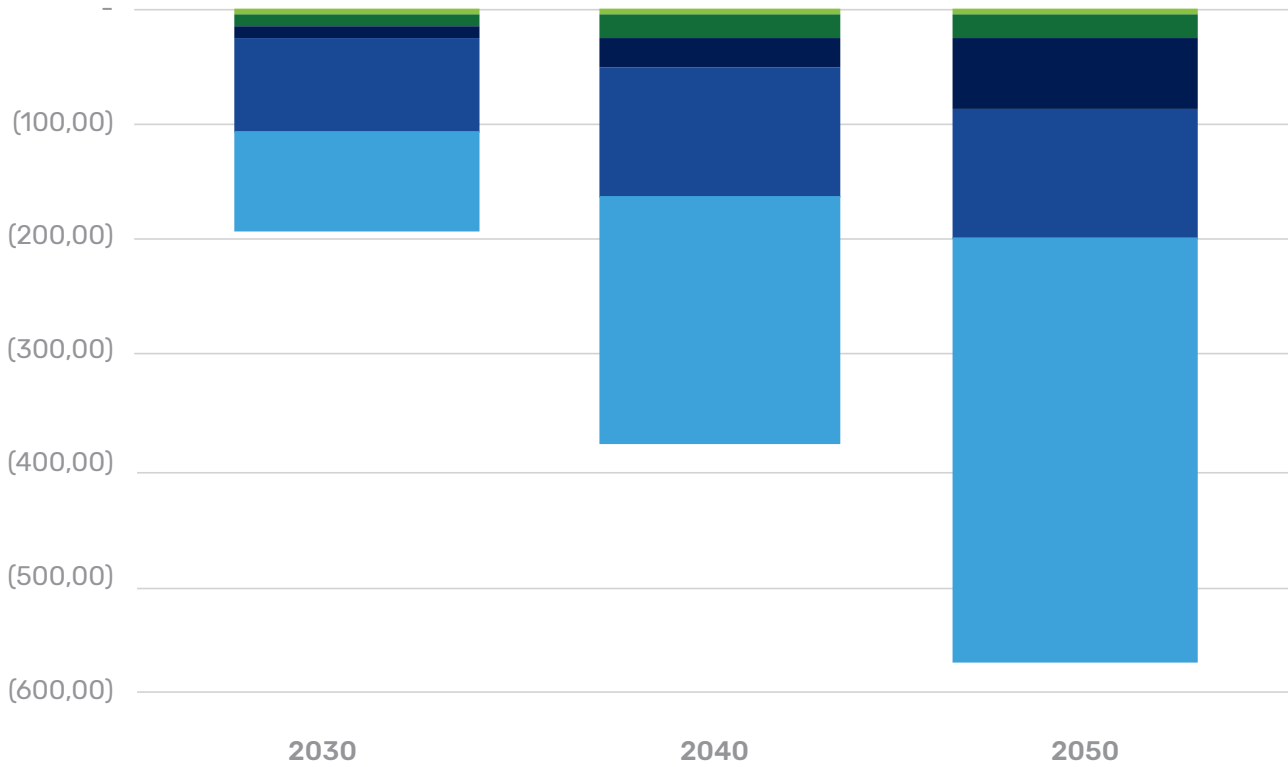
Buildings & Energy Metrics

| INDICATOR | MEASURE(S) | HOW/WHY WE MEASURE |
|-----------|------------|--------------------|
| Reduction in GHGs for buildings and energy sector | MTCO2e by sector | Energy efficiency upgrades and an increase in clean energy will lead to a corresponding decrease in GHGs |
| Percent of energy from clean, renewable sources | Percent | To meet our stated goals, the percentage of energy coming from clean sources must increase over time. |
| Number of buildings meeting LEED or similar standards | Percent | More buildings meeting green building goals indicate that we are building greener. |

**ACTION**

# Net-Zero Emissions for New Construction

Our homes, offices, schools, stores, and other buildings account for a large portion of our community's GHG emissions. Each building's design and construction determines how it affects the environment. Green building means making environmentally friendly choices in how buildings are designed, built, and operated. Green building strategies lower emissions, reduce other environmental negative impacts, and save money.

The Town can address green building through a **Green Building policy** that updates the Council's current one, and with the creation of **zoning incentives** for green building practices. Green building is also a tool for creating and maintaining more **affordable housing** because projects are designed to have lower utility bills and be located in places with access to fare-free Transit and other travel options.

## Vision + Target

Achieve 100% zero net energy in new construction buildings by 2050.

## Strategies to advance this work over the next five years:

- Update the Council's Green Building policy for new construction by 2023, with substantial improvements by 2022
- Create voluntary pathways and other incentives for net-zero construction as part of the LUMO rewrite
- Continue participating in and advocating for higher efficiency standards as part of the building code update cycle
- Advocate for the creation of innovative financing tools that can support net-zero construction (e.g., property assessed clean energy, North Carolina Clean Energy Fund)

### WHAT IS THE TOWN ALREADY DOING?

The Town has previously encouraged developers to design projects that are "20 percent more energy efficient than the latest version of ASHRAE 90.1" and incorporate green building practices. The Environmental Stewardship Advisory Board reviews development projects and makes recommendations to Council regarding net-zero design and other leading standards.

### WHO WITHIN OUR COMMUNITY CAN HELP?

- Architects/Engineers
- Green building and zoning experts
- Contractors
- Lenders
- Building owners/investors
- UNC-Chapel Hill

## Estimated implementation costs

Exact costs to update the policy and rewrite the LUMO are TBD

# Net-Zero Emissions for New Construction



AC Hotel on Rosemary Street with green roof installed by Living Roofs, Inc.

## DID YOU KNOW...

As the electricity grid gets cleaner with more renewable energy (see Green the Grid action), the energy savings from net-zero construction will remain but the GHG reduction potential is less as we get to 2050 and beyond. This means the earlier we reach net-zero construction the better, and that this type of design will save energy for years to come.

| PROJECT EMISSIONS REDUCTION (MTC02E) | 2030: 85,567 | 2040: 115,950 | 2050: 114,853 |
|---|---|---|---|

## OTHER BENEFITS

| | PUBLIC & ENVIRONMENTAL HEALTH | RACIAL EQUITY & ENVIRONMENTAL JUSTICE | JOB CREATION | RESILIENCE TO CLIMATE IMPACTS | REGIONAL PARTNERSHIPS |
|---|---|---|---|---|---|
| Type of Impact | ➕ | ➕ | ➕ | ➕ | ◯ |
| Potential Impacts | + Improved indoor and outdoor air quality<br>+ Positive health outcomes for those who live and work in green buildings<br>+ More natural resources protected & preserved | + Improved environmental conditions<br>+ Lower operating and utility costs<br>+ More affordable housing opportunities | + Jobs for green builders and solar installers | + Lower energy needs easier to address with battery backups | |

## Legend

➕ Positive          ◯ Neutral          ▬ Negative

ACTION

# Net-Zero Emissions for New Municipal Buildings

Upgrading or "retrofitting" our existing Town government buildings to bring them up to energy and water efficiency standards can reduce the Town's annual emissions. Constructing any new Town buildings to meet these standards will also keep emissions as low as possible. Independent industry standards can guide the Town's efforts to improve existing buildings and design new ones, when they are needed.

## Vision + Targets

Achieve 100% net zero emissions in new municipal buildings and 50% in existing buildings by 2030.

## Strategies to advance this work over the next five years:

- Maintain commitment to using the Leadership in Energy and Environmental Design (LEED) green building rating system that provides a framework for healthy, highly efficient, and cost-saving buildings (see glossary of terms for more about "green building")

- Maintain commitment to using the American Institute of Architects (AIA) 2030 Challenge which sets targets for GHG-emitting and energy consumption performance standards that progressively increase to being carbon-neutral in 2030

- Continue assessing public housing buildings and prioritize investment in energy and water efficiency upgrades to lower utility bills

- Continue assessing existing Town buildings and facilities and invest in energy and water efficiency upgrades to lower utility bills

- Explore options for enhanced refrigerant management in Town facilities and update standard operating procedures, as needed

### WHAT IS THE TOWN ALREADY DOING?

Through the Town's Green Building Ordinance for municipal facilities, most recently amended in 2017, new or expanded Town government facilities are built to meet the American Institute of Architects (AIA) 2030 Challenge for fossil fuel reduction targets and LEED rating systems.

### WHY BUILD GREEN?

In addition to reducing operating costs and lowering greenhouse gas emissions, green building has also been shown to increase worker productivity, help patients heal faster, improve student test scores, increase renter satisfaction, reduce tenant turnover, and generate greater awareness about the benefits of sustainable design. Some of the reasons for this include improved indoor air quality and rooms with access to natural light and views of nature.

## Estimated implementation costs

Exact costs to build the Municipal Service Center (MSC) to meet Town standards are TBD. MSC could replace up to four existing and less energy-efficient Town buildings by 2025. Assessment costs for public housing and other Town facilities are TBD.

# Net-Zero Emissions for New Municipal Buildings



The 2013 expansion of the Chapel Hill Public Library achieved a LEED Silver rating from the U.S. Green Building Council.

## DID YOU KNOW...

The earlier we reach net-zero construction, the better. As the electricity grid adds more renewable energy and reaches carbon neutral by 2050, the energy savings from net-zero construction will remain but the GHG reduction potential is less.

| PROJECTED EMISSIONS REDUCTION (MTCO2E) | 2030: 1,487 | 2040: 1,202 | 2050: 804 |
|---|---|---|---|

## OTHER BENEFITS

| | PUBLIC & ENVIRONMENTAL HEALTH | RACIAL EQUITY & ENVIRONMENTAL JUSTICE | JOB CREATION | RESILIENCE TO CLIMATE IMPACTS | REGIONAL PARTNERSHIPS |
|---|---|---|---|---|---|
| Type of Impact | + | + | + | + | ◯ |
| Potential Impacts | + Improved indoor and outdoor air quality<br>+ Positive health outcomes for those who live and work in green buildings<br>+ More natural resources protected & conserved | + Improved environmental conditions<br>+ Lower utility costs (prioritization of public housing buildings) | + Jobs for green builders and solar installers | + Lower energy needs to address with battery backups | |

## Legend

+ Positive      ◯ Neutral      — Negative

ACTION

# Energy Upgrades for Existing Buildings and Facilities

Older buildings are generally less efficient than newer buildings; however, green building strategies are often similar for new construction and upgrades (also called "retrofits"). Upgrades can range from simple, affordable improvements to more expensive and challenging ones, depending on how the building was originally designed.

Energy upgrades are investment opportunities for property owners and renters to lower operating costs and improve the satisfaction of those living and working in the buildings. The Town can provide programming and incentives to assist with and encourage building owners to retrofit their buildings with energy upgrades and other green building strategies. Community partners like utilities can help to provide **incentives** or to implement building improvements. Energy efficiency upgrades also help us meet our **renewable energy goals** by lowering the amount of energy that must be produced to meet all of the needs in Chapel Hill.
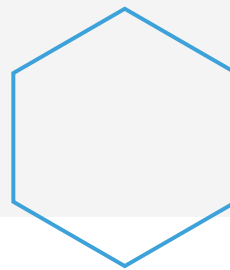
## Vision + Targets

Retrofit 15% of commercial and 30% of residential buildings to 50% net-zero by 2050.

## Strategies to advance this work over the next five years:

- Advocate for a state-wide Property Assessed Clean Energy (PACE) financing program
- Advocate for a North Carolina Green Bank (clean energy fund) to accelerate energy efficiency and clean energy investments
- Develop local certifications or recognition programs, including an evaluation of green rentals
- Create a "big buildings and parking lots" energy benchmarking and recognition program to track energy usage and create friendly competition among large property owners
- Determine who within Chapel Hill is experiencing energy burden in their homes or businesses
- Create an energy efficiency, beneficial electrification, and renewables program that prioritizes frontline communities, offers incentives, and links property owners to qualified local energy contractors

### WHAT IS THE TOWN ALREADY DOING?

The Town is actively exploring opportunities for offering incentives and for building retrofits, including innovative and targeted financing like PACE and a North Carolina Clean Energy Fund (green bank).

### WHO WITHIN OUR COMMUNITY CAN HELP?

- Community and neighborhood leaders
- Architects/Engineers
- Contractors
- Lenders
- Building owners/investors

## Estimated implementation costs

Town program costs are TBD. Community investment estimated at $67M in residential (7,069 households, approx. $9,500/household); $21M in commercial retrofits (30 at $697k/retrofit); with projected net cost savings by 2040

# Energy Upgrades for Existing Buildings and Facilities



Duke Energy contractor testing a newly installed LED streetlight

### DID YOU KNOW...

As part of its first guaranteed energy savings contract, the Town implemented lighting and mechanical system upgrades at Town Hall and two other locations. To date, this project has saved the Town more than $330,000 in avoided utility costs and has reached carbon savings equal to taking 180 cars off the road every year.

The Town has also worked with Duke Energy to convert more than 1,900 streetlights to LED (light-emitting diode), reducing the energy use and GHG emissions from these lights by about 50%.

| PROJECTED EMISSIONS REDUCTION (MTCO2E) | 2030: 11,512 | 2040: 17,742 | 2050: 18,582 |
|---|---|---|---|

## OTHER BENEFITS

| | PUBLIC & ENVIRONMENTAL HEALTH | RACIAL EQUITY & ENVIRONMENTAL JUSTICE | JOB CREATION | RESILIENCE TO CLIMATE IMPACTS | REGIONAL PARTNERSHIPS |
|---|---|---|---|---|---|
| Type of Impact | + | + / − | + | + | ○ |
| Potential Impacts | + Improved indoor and outdoor air quality<br><br>+ Positive health outcomes for those who live and work in green buildings<br><br>+ More natural resources protected & conserved | + Improved environmental conditions<br><br>+ Lower operating costs<br><br>− Availability of incentives will affect equity of retrofit efforts (prioritization of frontline communities needed) | + Jobs for weatherization contractors, lighting installers and solar installers | + Lower energy needs easier to address with battery backups | |

## Legend

+ Positive      ○ Neutral      — Negative

# Convert Community Buildings to All-Electric

Building electrification, sometimes called "affordable and beneficial electrification", means converting natural gas and fuel oil energy use in buildings to electricity. This is done by replacing systems and appliances, such as heating and cooling systems and cooking appliances, to operate on electricity. This is beneficial in the long run because as our electricity grid becomes cleaner and more affordable by switching from fossil fuels like coal and natural gas to renewable energy like solar and wind, so does our use of electricity for more household purposes and business purposes.
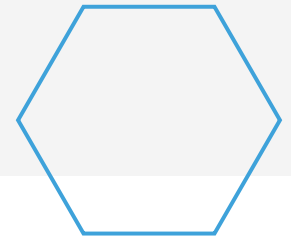
## Vision + Targets

Achieve all-electric energy for new construction by 2030. Retrofit 7,500 buildings and homes to all-electric by 2030 and 15,000 residences by 2050.

## Strategies to advance this work over the next five years:

- Advocate for a state-wide Property Assessed Clean Energy (PACE) financing program
- Advocate for a North Carolina Green Bank (clean energy fund) to accelerate energy efficiency and clean energy investments
- Create a "big buildings and parking lots" energy benchmarking and recognition program to track energy use and create friendly competition among large property owners
- Create an energy efficiency, beneficial electrification, and renewables program that prioritizes frontline communities, offers incentives, and links property owners to qualified local energy contractors

**INCREASING IMPACT OF BUILDING ELECTRIFICATION**

Electrifying buildings with heat pumps will become more impactful as our electricity mix gets cleaner. First, these technologies will improve the overall energy efficiency of heating and cooling buildings. The remaining energy will switch from fossil fuels like natural gas to electricity. This will result in more electricity use, but far less natural gas. In the future newly added electricity use will be supplied by more renewable energy and have fewer GHGs for every new kWh added. Researchers predict that use of natural gas in homes and businesses will decline, eventually being replaced for grid resilience by hydrogen made from electricity.

## Estimated Implementation Cost

Town energy upgrade program costs are TBD. Community investment estimated at up to $280M for up to 20,000 total buildings (new and existing) at $14k/residence.

**WHO WITHIN OUR COMMUNITY CAN HELP?**

- Property/building owners
- Developers
- Contractors
- Suppliers and retailers
- Non-profits

# Convert Community Buildings to All-Electric



Through Duke Energy's Neighborhood Energy Saver Program, 819 homes in the Northside Neighborhood area received home energy efficiency assessments and improvements that can save up to $95/year in utility bills.

### DID YOU KNOW...

The Town is actively involved in the county-wide Long-Term Recovery and Transformation Plan and the Orange County Climate Council. One mutual point of interest across all municipalities within the county is home weatherization – something the towns, the Orange County Home Preservation Coalition and Duke Energy are working to advance.

| PROJECTED EMISSIONS REDUCTION (MTCO2E) | 2030: 7,656 | 2040: 28,887 | 2050: 62,186 |
| --- | --- | --- | --- |

**OTHER BENEFITS**

| | PUBLIC & ENVIRONMENTAL HEALTH | RACIAL EQUITY & ENVIRONMENTAL JUSTICE | JOB CREATION | RESILIENCE TO CLIMATE IMPACTS | REGIONAL PARTNERSHIPS |
| --- | --- | --- | --- | --- | --- |
| Type of Impact | + | + / − | + | + | O |
| Potential Impacts | + Improved indoor and outdoor air quality<br>+ Positive health outcomes for those who live and work in green buildings<br>+ More natural resources protected & conserved | + Improved environmental conditions<br>+ Lower operating costs<br>− Availability of incentives will affect equity of retrofit efforts (prioritization of frontline communities needed) | + Jobs for heat pump and appliance installers | + Lower energy needs easier to address with battery backups | |

**Legend**

+ Positive    O Neutral    ▬ Negative

# Green the Grid

Generating electricity from fossil fuels produces high levels of GHGs. Sources like solar and wind energy greatly reduce the GHGs from the energy sector. "Greening of the grid" means shifting power generation that is carried over our utility grid away from fossil fuels and toward cleaner, renewable energy sources.

The major utility providers in Chapel Hill are Duke Energy, Dominion Energy, Piedmont Electric, and UNC (to campus facilities). These major public utilities as well as renewable energy partners, local businesses, non-profits, civic organizations and homeowners can all contribute by investing in renewable energy projects that make the grid greener and cleaner. The most efficient form of renewable energy is utility-scale (e.g., solar and wind farms). At the same time, local investments in rooftop solar and geothermal help us achieve net-zero emissions buildings and increase our resiliency.

## Vision + Target

Advocate for and support a fast, affordable, and just transition to clean, renewable energy sources as Duke Energy and Dominion Energy pursue their commitments to achieving net-zero carbon emissions by 2050.

## Strategies to advance this work over the next five years:

- Advocate on all levels for a fast, affordable and just transition to clean and renewable energy that supports the Town's goals

- Explore options like Green Source Advantage and Community Solar, and work with utility companies to develop more utility-scale renewable projects in our area

- Support and advocate for the state and utilities to reach their goals for carbon neutrality by actively participating in public processes like Integrated Resource Plan (IRP) reviews and petitions like the one to have North Carolina join the Regional Greenhouse Gas Initiative (RGGI)

- Create an energy efficiency, beneficial electrification, and renewables program that prioritizes frontline communities, offers incentives, and links property owners to qualified local energy contractors

- Actively support UNC in their transition away from coal

## Estimated implementation cost

Costs related to viable community-scale solar projects and the creation of a local energy upgrade program are TBD.

### ADVOCATING FOR CLEAN, 100% RENEWABLE ENERGY

Duke Energy, Piedmont Electric Membership Cooperation, and Dominion Energy provide electricity and natural gas to our area. The Town's goal of becoming a 100% renewable energy community is important but won't meaningfully address climate action if this goal isn't achieved beyond our borders, too. For this reason, we chose to work with our utility partners and representatives to advocate for a grid that is 100% clean and renewable energy. Examples of this work include actively participating and weighing in on utility integrated resource plans, as well as state and federal clean energy policy.

### WHO WITHIN OUR COMMUNITY CAN HELP?

- Energy producers and suppliers
- Renewable energy partners
- UNC-Chapel Hill
- Residents

# Green the Grid



To reach their goal of a 35% reduction in purchased electricity by 2022, OWASA is currently installing large solar photovoltaic (PV) systems like the one in the photo that will generate almost 428,000 kilowatt hours of clean energy every year (equal to powering over 40 homes).

## PROVIDING COMMUNITY RENEWABLE ENERGY OPTIONS

### Green Source Advantage Program

The City of Charlotte is partnering with two solar energy companies and participating in this Duke Energy program to provide a 35-megawatt community level solar energy project, purchasing renewable energy through a special utility tariff rate, called a "utility green tariff". This two-year project will offset 25% of GHGs from city buildings, generate over $2 million in city utility savings, and create almost 500 new jobs.

| PROJECTED EMISSIONS REDUCTION (MTC02E) | 2030: 88,932 | 2040: 218,497 | 2050: 374,022 |
|---|---|---|---|

## OTHER BENEFITS

| | PUBLIC & ENVIRONMENTAL HEALTH | RACIAL EQUITY & ENVIRONMENTAL JUSTICE | JOB CREATION | RESILIENCE TO CLIMATE IMPACTS | REGIONAL PARTNERSHIPS |
|---|---|---|---|---|---|
| Type of Impact | + | +/o | + | + | + |
| Potential Impacts | + Improved indoor and outdoor air quality | + Improved environmental conditions<br><br>· Potential changes in energy costs (advocacy for affordability and equity is needed) | + Jobs for renewable energy installers | + Reduced dependence on fossil fuels | + Potential for regional coordination on greening of the grid and community solar |

## Legend

+ Positive        o Neutral        ▬ Negative

# Transportation & Land Use

## OVERVIEW

The transportation sector is the second largest source of GHG emissions in Chapel Hill (26%). Reducing emissions from transportation in our community will be a collaborative effort between the Town, regional partners, businesses, and individuals. The Town and other regional governments can encourage land use patterns that support a variety of transportation options and provide the transportation infrastructure to make these options available. Businesses can operate vehicles with lower emissions and support commute alternatives for workers. Individuals can choose to walk, cycle, take transit, or invest in lower emission vehicles.

## Current Greenhouse Gas Emissions from Transportation

**Existing and Forecast GHGs from Transportation – "Business as Usual" v. Taking Action (MTCO2e)**



- ● Business as Usual
- ● With Actions
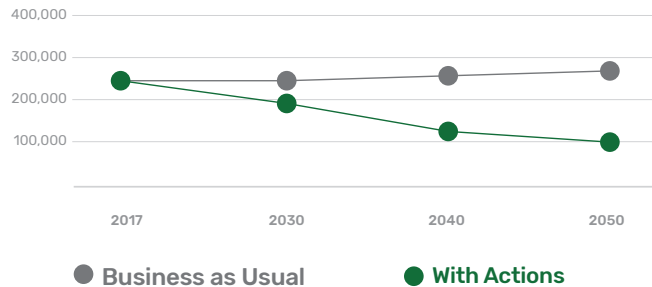
**2017 Community Vehicle Emissions by Vehicle and Fuel Type (MTCO2e)**



- ● Gasoline
- ● Diesel
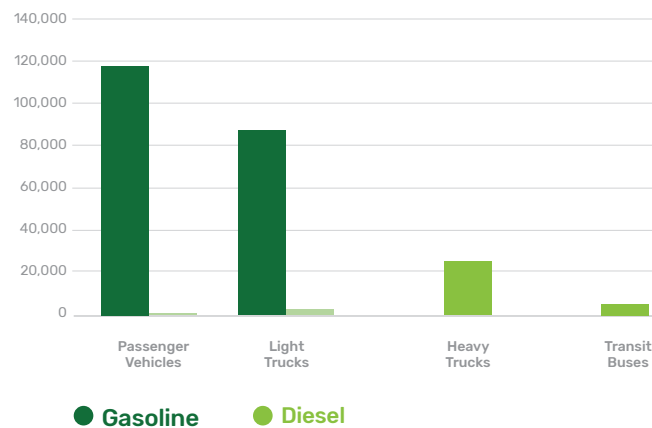
### DID YOU KNOW...

The **Chapel Hill Mobility and Connectivity Plan** sets a goal of achieving 35% bicycling, walking, and transit modeshare for commuting in Chapel Hill by 2025. This goal is in line with the 4% increase in these modes achieved between 2011 and 2015.

## Top Transportation & Land Use Actions

| TOWN GOVERNMENT ACTIONS | TOWN & COMMUNITY ACTIONS |
|---|---|
| Create walkable, bikeable, transit-served neighborhoods | Create a Town-wide Electric Vehicle (EV) charging station network |
| Electrify Chapel Hill Transit fleet and Town fleet | Expand TDM and plan for mobility on-demand network |
| Increase transit ridership and implement Bus Rapid Transit (BRT) | increase walking, biking, and transit use (mode-shift) |
| | Electrify private and commercial fleets |

# Transportation & Land Use

## Forecast GHG Emissions Reduction Potential from Top Actions for Transportation and Land Use (MTCO2e)



Legend:
- Fleet Electricification
- Increased Transit Ridership
- Bus Electrification
- Bike-walk-transit mode shift
- Compact, walkable development
- TDM
- EV Charging
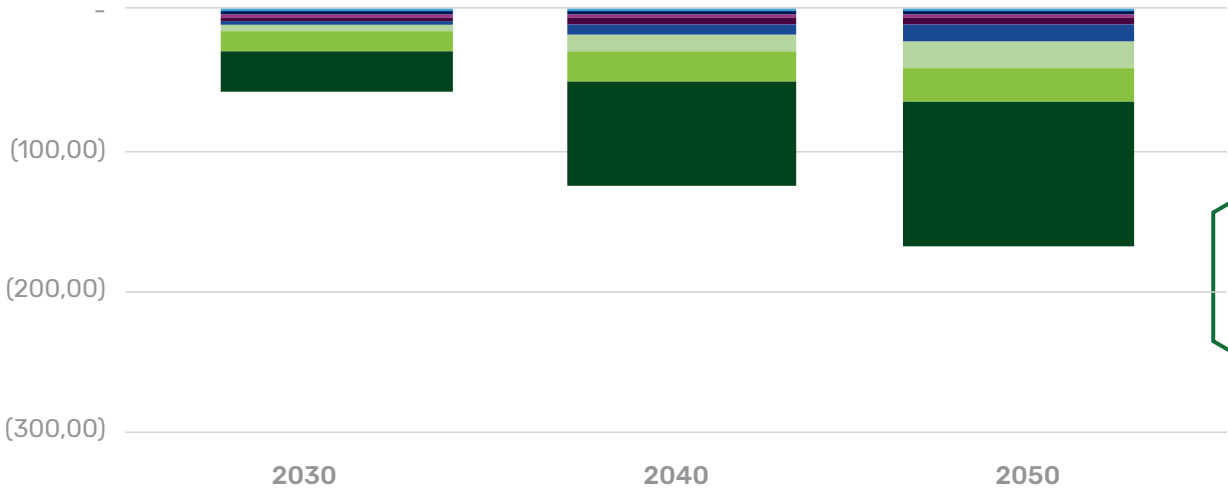
Transportation & Land Use Metrics

| INDICATOR | MEASURE(S) | HOW/WHY WE MEASURE |
|---|---|---|
| Vehicle travel | Vehicle Miles Traveled (VMT) | Reduction in VMT directly relates to transportation emissions. Compact development patterns bring housing, jobs, and other daily needs closer together, reducing VMT and offering other travel options. Data on VMT is readily available. |
| Pedestrian and bicycle travel | Pedestrian and bicycle counts<br><br>Mode Share | Pedestrian and bicycle counts and mode share can track shifts to these modes of travel over time. Sources may include the North Carolina Non-Motorized Volume Data Program or local data |
| Pedestrian and bicycle facilities | Miles of bike lanes<br><br>Funded projects (bike facilities, sidewalks, ADA improvements) | Implemented bicycle and pedestrian facility investments and improvements support shifts to these modes of travel over time. |
| Walkability | Walkscore<br><br>GIS analysis | Walkability evaluation tools assess the availability of destinations and pedestrian and/or bicycle connections between them. |

# Create Walkable, Bikeable, Transit-Served Neighborhoods

People are more likely to walk or bike when their destinations are relatively close together and when there are safe, tree-lined, interesting and comfortable places to walk or bike. Compact, walkable, bikeable development patterns can reduce vehicle travel and emissions by enabling community members to work and acquire the goods and services needed for daily life without driving, as well as promoting **healthier lifestyles**. Sustainable development includes redevelopment, **infill**, jobs and housing, parks and green spaces, as well as infrastructure for transit, bike facilities, sidewalks and other public amenities. This form of development is also a tool for advancing the goals of the Town's **Affordable Housing Plan** and providing less expensive transportation options.

## Vision + Target

Create numerous walkable, mixed-use neighborhoods that are served by transit and/or connected by robust pedestrian and bicycle networks by 2050.

## Strategies to advance this work over the next five years:

- Develop and implement supportive zoning and engineering standards through the rewrite of the Land Use Management Ordinance (LUMO) and related updates (e.g., reduced parking space, lot size, and building setback requirements)
- Integrate land use and transportation planning by following the vision of the recently adopted Charting Our Future land use initiative and continuing to invest in Bus Rapid Transit and the Mobility Plan
- Incentivize more compact, affordable, and mixed income housing, including "missing middle" and accessory dwelling units (ADUs)
- Create zoning and permitting incentives and proactively work with developers to achieve compact development and redevelopment that supports the vision of the Charting Our Future land use initiative
- Continue exploring options for establishing pedestrian only or car-free zones

## Estimated implementation cost

Exact costs of the LUMO rewrite and other strategies listed above are TBD.

### WHAT IS THE TOWN DOING?

The Town has a history of growth management policy that limits the extension of water and sewer services and protects rural areas from the impacts of larger-scale subdivisions and other suburban forms of development. To complement these efforts, recently the Town has experimented with zoning strategies to encourage compact, walkable redevelopment of suburban commercial areas, and is currently updating its land use regulations which are often referred to as the "LUMO" or the Land Use Management Ordinance. This update can implement many of the strategies listed for creating compact, walkable, bikeable, transit-served development.

# Create Walkable, Bikeable, Transit-Served Neighborhoods
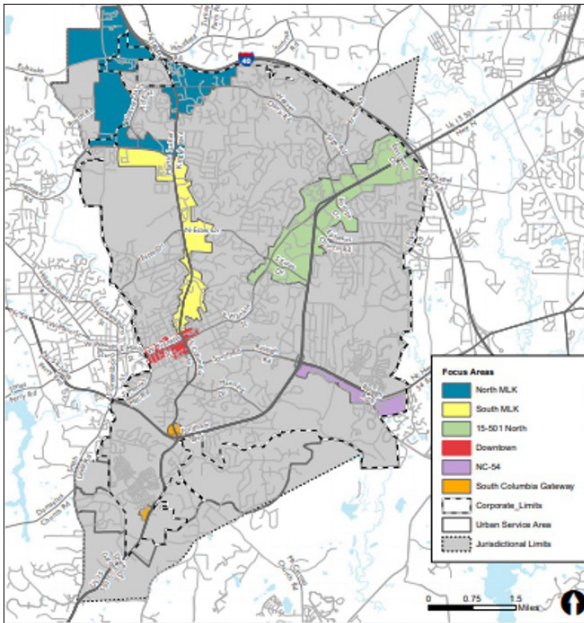


## DID YOU KNOW...

A 2018 study published in the Journal of Urban Planning showed that local policy to increase urban infill had among the highest potential for GHG reduction in Berkeley, Santa Monica, Davis and some other mid-sized California cities with major colleges and universities.

This map from the Charting Our Future land use initiative shows the areas of Chapel Hill that are best suited to support more compact, walkable, bikeable, transit-served neighborhoods.

| PROJECTED EMISSIONS REDUCTION (MTCO2E) | 2030: 5,616 | 2040: 13,544 | 2050: 19,905 |
|---|---|---|---|

## OTHER BENEFITS

| | PUBLIC & ENVIRONMENTAL HEALTH | RACIAL EQUITY & ENVIRONMENTAL JUSTICE | JOB CREATION | RESILIENCE TO CLIMATE IMPACTS | REGIONAL PARTNERSHIPS |
|---|---|---|---|---|---|
| Type of Impact | + | + | + | + | + |
| Potential Impacts | + Increased physical activity levels <br> + Improved air quality | + Improved neighborhood cohesion <br> + More affordable housing opportunities | + Jobs for green builders and construction companies | + Improves access to community services and resources <br> + Ability to get around during fuel disruptions | + Regional greenways and trail linkages <br> + Enhanced bike/ped connections to regional transit service |

## Legend

+ Positive     ◯ Neutral     ▬ Negative

# Increase bicycling, walking, and transit use (mode shift)

Walking and cycling are zero-emission transportation options that also promote **public health**. People choose transportation that is safe, convenient, reliable, and accessible—including mobility for people with disabilities. When facilities for walking and biking are limited or perceived as unsafe, people are less likely to walk or ride a bike. Providing alternatives to driving is critical if we want people to **drive less**.

Transit moves more people in fewer vehicles, resulting in lower emissions than driving alone. Transit riders may also combine their ride with walking or biking. Replacing the "driving alone" trips with a combination of walking, biking, and transit—and even scootering—leads to reduced emissions and a healthier community.
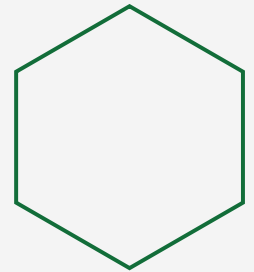
## Vision + Target

Continue shifts to walking, biking, and transit commutes that reach levels of 35% or greater by 2050. Fully implement the Town Mobility Plan by 2035.

## Strategies to advance this work over the next five years:

- Continue designing and investing in multi-modal facilities as shown in the Town's Mobility Plan

- Prepare shovel-ready projects for the anticipated Federal stimulus "Infrastructure bill"

- Develop zoning and permitting incentives to facilitate the construction of multi-modal facilities including trails, greenways, sidewalks, and bike lanes

- Develop a Wayfinding Strategy as called for in the Mobility Plan

- Experiment with ways to promote greenways and trails as travel corridors for things like commuting to work or shopping

- Continue planning for a robust, well-connected network of trails, greenways, sidewalks, and bike lanes

- Continue planning for a well-connected and convenient transit network

### WHAT IS THE TOWN ALREADY DOING?

The Town has completed more than 23 miles of greenways and trails and has plans to keep going. Our Mobility Plan has a goal for 35% of all commuters to bike, walk, and ride transit to work by 2025, up from 27% in 2015.

### Estimated implementation cost

Costs vary by project for nearly 100 projects in the Mobility Plan, with some funded with federal, NCDOT and Town funding; others funded by Town Capital Improvement Program only
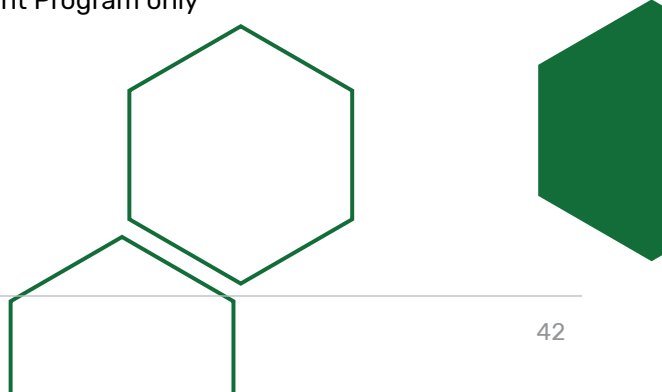
# Increase walking, biking and transit use (mode-shift)



### DID YOU KNOW…

The Town's Mobility Plan envisions a future transportation network for bicyclists, pedestrians and transit riders that safely links neighborhoods, parks, employment centers, transit stops, and other destinations.

| PROJECTED EMISSIONS REDUCTION (MTCO2E) | 2030: 2.404 | 2040: 7,202 | 2050: 17,505 |
| --- | --- | --- | --- |

| | PUBLIC & ENVIRONMENTAL HEALTH | RACIAL EQUITY & ENVIRONMENTAL JUSTICE | JOB CREATION | RESILIENCE TO CLIMATE IMPACTS | REGIONAL PARTNERSHIPS |
| --- | --- | --- | --- | --- | --- |
| Type of Impact | + | + | + | + | + |
| Potential Impacts | + Increased physical activity levels<br>+ Improved air quality | + Decreased transportation costs<br>+ Better connectivity for all transportation modes<br>+ More transportation choices available | + Jobs in transportation construction | + Reduced dependencies on fossil fuels<br>+ Ability to get around during fuel disruptions | + Regional trail linkages<br>+ Enhanced bike/ped connections to regional transit service<br>+ Regional transit linkages |

### Legend

+ Positive      ◯ Neutral      ▬ Negative

# Electrify the Municipal Fleet

The Town operates a fleet of vehicles to support the services it provides. Transitioning our fleet to more sustainable vehicle types is an important way for the Town to reduce our emissions. The Town has already made progress with moving towards alternative fuels, but a full transition to electric vehicles is the next step in achieving significant reductions. While improvements in **smart grid** technology will lessen the impacts of power outages in the future, the transition to EVs must include resiliency measures like on-site renewable energy and **battery storage**.

## Vision + Target

Electrify all Town fleet passenger vehicles, light and medium duty trucks by 2040, and all heavy duty vehicles by 2050.

## Strategies to advance this work over the next five years:

- Become an active member of the Electrification Coalition

- Evaluate a more accelerated fleet replacement program using Electrification Coalition toolkit and set new 5-year targets for 2035–2050

- Pursue grant funding to pilot EV transitions within Town departments and divisions (e.g., DERA, VW Settlement)

- Continue purchasing electric vehicles as the fleet expands or turns over

- Prioritize replacement of higher emissions vehicles with zero or low emissions vehicles

### WHAT IS THE TOWN ALREADY DOING?

The Town's fleet currently operates at 15% lower annual emissions than it did in 2005 because the Town has invested in fuel efficient vehicles and low-carbon fuels like biodiesel, E85, and electricity. In 2016, the Triangle Clean Cities Coalition recognized the Town with a Champion Level NC Smart Fleet designation.

## Estimated implementation cost

To convert 48 passenger and light duty vehicles by 2030, we estimate an added upfront cost of $10,000 per vehicle or a total of $480k over conventional vehicle purchases. Note: This assumes (1) other resources are available for vehicle replacement, and (2) that the total cost of ownership for an EV will be the same or cheaper than a conventional vehicle because EVs generate fuel and maintenance savings that offset their additional upfront costs.
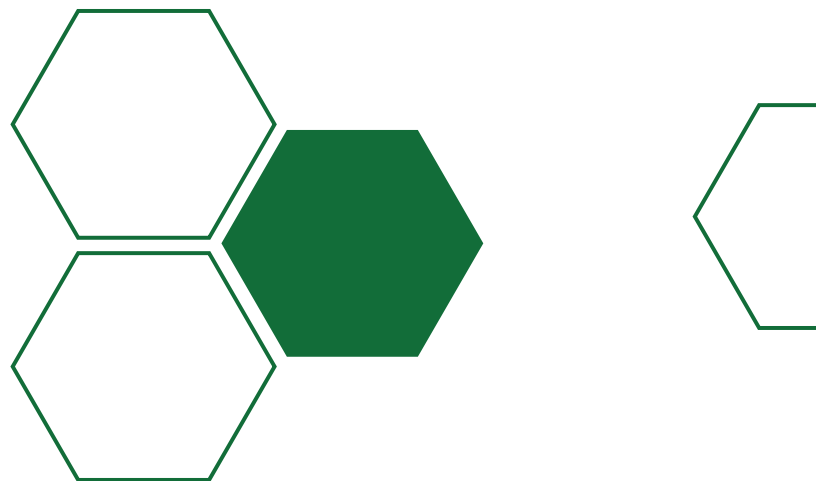
# Electrify the Municipal Fleet



**DID YOU KNOW...**

Initial modeling for a transition to EVs included a switch of all passenger and light duty trucks as they are scheduled to come up for replacement through 2040. Over the next year, the Town will take a closer look at ways to accelerate this work, which could eventually increase the projected emissions benefits by more than six times the values shown in the table.

The Town is actively pursuing grant funding from the U.S. Environmental Protection Agency (EPA) to replace and begin testing all-electric garbage trucks.

| PROJECTED EMISSIONS REDUCTION (MTCO2E) | 2030: 176 | 2040: 735 | 2050: 803 |
|---|---|---|---|

**OTHER BENEFITS**

| | PUBLIC & ENVIRONMENTAL HEALTH | RACIAL EQUITY & ENVIRONMENTAL JUSTICE | JOB CREATION | RESILIENCE TO CLIMATE IMPACTS | REGIONAL PARTNERSHIPS |
|---|---|---|---|---|---|
| Type of Impact | ✚ | ✚ | ✚ + | ✚ | ○ |
| Potential Impacts | + Improved air quality | + Improved environmental conditions | + Jobs for EV charging station installers | + Reduced dependence on fossil fuels | |

**Legend**

✚ Positive        ○ Neutral        ▬ Negative

Climate Action Category:
**Transportation & Land Use**

Town's authority to act: 🟡
GHG Reduction: ▼ 4,572 MTC02e

# Electrify the Transit Fleet (Solar and Battery Backup)

Increasing transit ridership is an important strategy for reducing the number of vehicles on the roads and the associated emissions. However, this strategy is less effective if transit buses have high emissions. Electric buses can significantly reduce emissions from the transit fleet, including support vehicles. Although **smart grid technology** will help to isolate power outages near the source of disruption keeping the power on for more customers, the transition to all-electric buses and support vehicles must include resiliency measures like on-site renewable energy, **battery storage**, and **vehicle-to-building** or "V2B" technologies that can reduce building utility costs and serve as backup emergency power.

## Vision + Target

Replace diesel buses and support vehicles with all-electric options over the next 20 years, replacing the oldest, least fuel efficient buses first.

## Strategies to advance this work over the next five years:

- Pilot up to 10 all-electric buses by 2040
- Issue RFQ to study the potential for on-site solar and battery storage at the Transit facility
- With a successful pilot, continue purchasing Purchase electric buses and pursue grant funding where available (e.g., VW Settlement, Federal Transit Administration Low or No-Emission Program)
- Advocate for utility incentives that support fast-charging equipment and a transition to all-electric buses

## Estimated implementation cost

To convert 10 additional buses by 2030, we estimate an added upfront cost of $270,000-$300,000 per bus or a total of $2.8M over conventional bus purchases. Note: This assumes (1) other resources are available for bus replacement, and (2) that the total cost of ownership for an EV bus will be the same or cheaper than a conventional bus because EVs generate fuel and maintenance savings that offset their additional upfront costs.

**WHAT IS THE TOWN ALREADY DOING?**

The Town's transit fleet includes 29 hybrid-electric buses, and funding has been secured over the last few years to purchase as many as 10 new electric buses. The Town believes that electric buses are the future and will be testing and learning from the first 10 electric buses over the next few years before additional purchases are made.
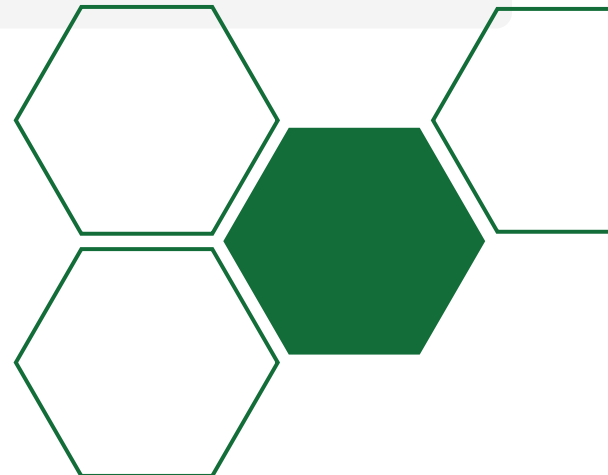
# Electrify the Transit Fleet (Solar and Battery Backup)



Three all-electric buses will "hit the road" in 2021, with as many as seven more scheduled to go into service by 2023.

### DID YOU KNOW...

Initial modeling for a transition to all-electric buses included a switch of those scheduled to come up for replacement through 2050. Over the next year, the Town will pilot the new technology and also look at ways of accelerating this work through the support vehicle fleet.

| PROJECTED EMISSIONS REDUCTION (MTC02E) | 2030: 452 | 2040: 3,205 | 2050: 4,572 |
|---|---|---|---|

## OTHER BENEFITS

| | PUBLIC & ENVIRONMENTAL HEALTH | RACIAL EQUITY & ENVIRONMENTAL JUSTICE | JOB CREATION | RESILIENCE TO CLIMATE IMPACTS | REGIONAL PARTNERSHIPS |
|---|---|---|---|---|---|
| Type of Impact | ✚ | ✚ | ✚ | ✚ | ✚ |
| Potential Impacts | + Improved air quality | + Improved environmental conditions | + Jobs for EV charging station installers | + Reduced dependence on fossil fuels | + Shared access to charging station infrastructure |

## Legend

✚ Positive      ◯ Neutral      ▬ Negative

Climate Action Category:
**Transportation & Land Use**

Town's authority to act: 🟡
GHG Reduction: ▼ 2,305 MTCO2e

# Increase Transit Ridership and Implement Bus Rapid Transit (BRT)

Increased transit ridership helps to reduce GHGs from transportation. The Town has already adopted fare-free bus service to incentivize taking transit, a climate action best practice. Expanding the availability of **fare-free** bus service should continue to increase the use of transit within our community.

One key strategy for transitioning is Bus Rapid Transit (BRT). BRT is proposed for the North-South corridor, running along Martin Luther King, Jr. Boulevard (NC Highway 86), South Columbia Street, and US 15-501 South. Implementing BRT will complement other efforts and improve transit service by increasing the ability to serve more bus riders along busy routes. Zoning that encourages compact, walkable and bikeable development and **redevelopment** along major corridors is essential to making the Town's investment in BRT as impactful as possible.

## Vision + Target

Expand transit service and implement the North-South BRT corridor by 2025.

## Strategies to advance the vision over the next five years:

- Continue to offer fare-free transit service
- Expand transit availability and connectivity, where possible
- Implement BRT along the North-South corridor by 2025
- Explore the feasibility of an east-west BRT concept along the 15-501 corridor

## Estimated implementation cost

$200M estimated cost for two BRT corridors

### WHAT IS THE TOWN ALREADY DOING?

Chapel Hill Transit provides more than 6.5 million fare-free rides per year. Since transitioning to fare-free service in 2002, it has become one of the largest fare-free systems in the United States.

### WHAT IS BRT?

BRT is a strategy for transitioning single-occupancy vehicles to transit. It creates dedicated bus lanes so bus operators can bypass traffic. BRT operates similarly to light rail systems.

# Increase Transit Ridership and Implement Bus Rapid Transit (BRT)



By 2025, Chapel Hill Transit will operate Bus Rapid Transit (BRT) service from Southern Village to the Eubanks Road Park and Ride Lot at Carraway Village.

## DID YOU KNOW...

Projected emissions drop slightly after 2030. This is because we have assumed that BRT will take more single occupancy vehicle car trips (those "driving alone") off the road, and that more of these car trips will be in lower polluting EVs after 2030.

| PROJECTED EMISSIONS REDUCTION (MTC02E) | 2030: 2,650 | 2040: 2,607 | 2050: 2,305 |
|---|---|---|---|

## OTHER BENEFITS

| | PUBLIC & ENVIRONMENTAL HEALTH | RACIAL EQUITY & ENVIRONMENTAL JUSTICE | JOB CREATION | RESILIENCE TO CLIMATE IMPACTS | REGIONAL PARTNERSHIPS |
|---|---|---|---|---|---|
| Type of Impact | ✚ | ✚ | ✚ | ✚ | ✚ |
| Potential Impacts | + Improved air quality | + Improved environmental conditions<br>+ Improved (fare-free) mobility | + Jobs in transportation construction | + Enhanced access to transit for weather emergencies and evacuation | + Potential for working with other regional transit providers and partners |

## Legend

✚ Positive        ◯ Neutral        ▬ Negative

Town's authority to act: 🟡
⭐ High-impact Action: ▼ 8%

ACTION

# Create a Town-wide Electric Vehicle (EV) Charging Station Network

Limited charging infrastructure can be a barrier to widespread adoption of electric vehicles (EV). Expanding charging infrastructure helps to support the purchase of and transition to EVs by making the technology easier to use and more reliable, which results in lower transportation emissions. Expanded EV charging infrastructure also supports the conversion of private and commercial fleets to electric vehicles.
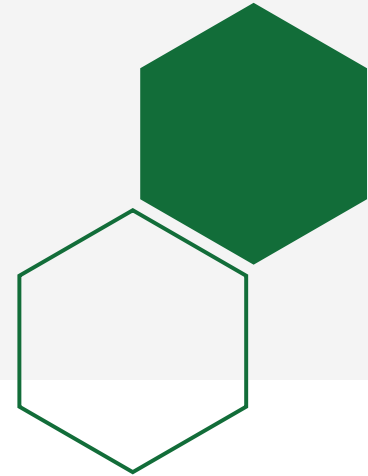
## Vision + Target

Create a Town-wide network of workplace and residential EV charging stations that helps to convert 50% of all community internal combustion engine vehicles to EVs by 2030 and 100% by 2050. Target investments and partnerships that deliver at least 629 public level 2, 99 public level 3 (fast charge), and 761 private level 2 charging stations by 2050.

## Strategies to advance the vision over the next five years:

- Develop a plan for a Town-wide EV charging network

- Promote the benefits of electric vehicles and transition the Town fleet to all-electric vehicles by 2050

- Incentivize or require charging stations for new construction

- Streamline process and reduce barriers to installing charging stations

- Partner with commercial property owners and Duke Energy to establish more workplace and multifamily residential charging

- Work with and incentivize community partners to install public charging stations

- Install solar-powered EV charging stations, where possible

- Continue pursuing grant opportunities to install more EV charging stations on Town property

### WHAT IS THE TOWN ALREADY DOING?

Chapel Hill is among North Carolina's highest-ranking cities for residents with electric vehicles. There are more than 25 publicly available charging stations, including stations managed by the Town downtown and at the Aquatic Center.

### WHO WITHIN OUR COMMUNITY CAN HELP?

- Regional government partners, including the State, County, and other local governments

- UNC-CH

- Non-profits

- Energy suppliers

- EV Charging suppliers

### Estimated implementation cost

$4.1M in public investment (629 Level 2 stations, 99 Level 3 stations); $1.6M in private investment (761 workplace chargers) by 2050

# Create a Town-wide Electric Vehicle (EV) Charging Station Network



## DID YOU KNOW...

Today there are over 25 publicly available charging stations in Chapel Hill, like the two shown here at the Town's Aquatic Center. UNC, Duke Energy, and Piedmont Electric Memberships Corporation are essential partners in the rollout of a successful community-wide EV charging station network.

| PROJECTED EMISSIONS REDUCTION (MTCO2E) | 2030: 29,715 | 2040: 74,848 | 2050: 107,028 |
|---|---|---|---|

## OTHER BENEFITS

| | PUBLIC & ENVIRONMENTAL HEALTH | RACIAL EQUITY & ENVIRONMENTAL JUSTICE | JOB CREATION | RESILIENCE TO CLIMATE IMPACTS | REGIONAL PARTNERSHIPS |
|---|---|---|---|---|---|
| Type of Impact | **+ / –** | **+ / O** | **+** | **+** | **+** |
| Potential Impacts | + Improved air quality<br>– Urban heat island effect from roadway asphalt | + Improved environmental conditions<br>• Location of and access to charging stations could create equity concerns if not managed | + Jobs for EV charging station installers | + Reduced dependence on fossil fuels | + Opportunities to increase EV charging region-wide |

## Legend

**+** Positive　　O Neutral　　— Negative

# Expand TDM and Plan for Mobility On-Demand Network

Transportation Demand Management (TDM) is focused on understanding how people make transportation decisions and helping them to choose alternatives to "driving alone." TDM provides support for a wide range of alternatives to driving in order to reduce the overall number of cars on the road, especially during peak travel times. By taking cars off the road, TDM can also make it easier to find parking when you do have to drive.

Transportation alternatives for TDM include transit, ridesharing, walking, bicycling, telework, and flexible or alternative work schedules. The future of TDM is "mobility on-demand"—a fully integrated network of transportation options that's designed to make any choice easy, convenient, and reliable for the traveler.

## Vision + Targets

Increase the share of telework to at least 30% community-wide by 2040, and help increase the percentage of trips not taken alone in a car to 35% by 2050.

## Strategies to advance the vision over the next five years:

- Continue building partnerships with employers to support telecommuting and alternative commute options
- Continue promoting and encouraging transportation alternatives
- Enhance incentives for choosing transportation options other than driving
- Explore options for creating a fully integrated mobility on-demand system in Chapel Hill

## Estimated implementation cost

Some increased costs for expanded TDM program, activities, and staff

### WHAT IS THE TOWN ALREADY DOING?

The Town's Commute Alternative Program offers resources and encouragement for anyone wanting to try one. "Go Chapel Hill!" has established partnerships and sponsors events to encourage commute alternatives and in 2019 received national recognition for Excellence in TDM Planning from the Association for Commuter Transportation (ACT).

### WHO WITHIN OUR COMMUNITY CAN HELP?

- Employers
- Individuals
- GoTriangle vanpools and ride share matching
- GoTriangle Trip Planner

# Expand TDM and Plan for Mobility On-Demand Network



## DID YOU KNOW...

Commuting can be easier and more enjoyable. What if your commute to work was also your exercise for the day? What if instead of driving alone you could catch a ride and just sit back and relax on your way to work? If you haven't already, consider taking a few minutes to learn about your other options. Visit www.gochapelhill.org to learn about your travel options.

| PROJECTED EMISSIONS REDUCTION (MTC02E) | 2030: 15,570 | 2040: 23,393 | 2050: 24,119 |
|---|---|---|---|

## OTHER BENEFITS

| | PUBLIC & ENVIRONMENTAL HEALTH | RACIAL EQUITY & ENVIRONMENTAL JUSTICE | JOB CREATION | RESILIENCE TO CLIMATE IMPACTS | REGIONAL PARTNERSHIPS |
|---|---|---|---|---|---|
| Type of Impact | + | + | ○ | + | + |
| Potential Impacts | + Improved air quality | + Improved environmental conditions<br>+ Possible increase in transportation options | | + Reduced dependence on fossil fuels<br>+ More travel options during disruption events | + Collaborate to expand regional TDM efforts |

## Legend

+ Positive    ○ Neutral    — Negative

# Waste, Water, & Natural Resources

## OVERVIEW

Greenhouse gas emissions come from many sources, including waste and wastewater processing, which make up about 4% of all emissions in Chapel Hill. We can do a lot of good by generating less waste and using less water. For example, 1 ton of methane emissions released from waste buried in a landfill has a greater impact on climate change than the same amount of carbon emissions. If we conserve water we also save energy and reduce emissions, so this must be a strategy for how we design our buildings and landscapes to use fewer resources.

Climate actions and responses are not limited to reducing energy use or finding cleaner sources of energy. Protecting the natural environment can help our community be more resilient to climate change. There are many ways we can work together to use our resources more wisely, to protect our natural environment, and to harness nature-based solutions to tackle climate challenges.

## Current Greenhouse Gas Emissions from Waste, Water, and Other Sources

**Existing and Forecast GHGs from Waste, Wastewater and Water - "Business as Usual" (MTCO2e)**

| | | | |
|---|---|---|---|
| 400,000 | | | |
| 300,000 | | | |
| 200,000 | ● | ● | ● |
| 100,000 | | | |
| 2017 | 2030 | 2040 | 2050 |

● Business as Usual
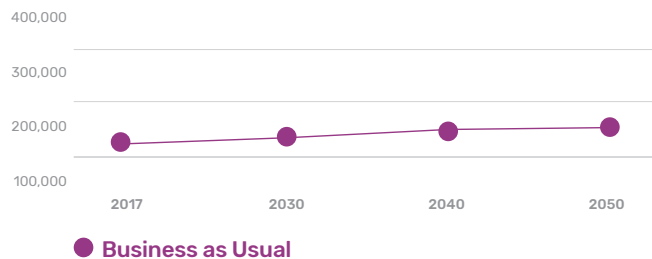
### TOP WASTE, WATER AND NATURAL RESOURCE ACTIONS

| TOWN GOVERNMENT ACTIONS | TOWN & COMMUNITY ACTIONS |
|---|---|
| Protect water quality, natural and agricultural resources | Produce zero waste |

## Waste, Water and Natural Resources Metrics

| INDICATOR | MEASURE(S) | HOW/WHY WE MEASURE |
|---|---|---|
| Reduction in GHGs for waste, wastewater, etc sector | MTCO2e by sector | Meeting our GHG reduction goals requires realizing reductions in all sectors. |
| Solid waste diverted from landfill (recycling, composting, etc.) | Tons | Reductions in landfill waste lead to reductions in GHG. |
| Net acreage of stream buffers and urban forest | Acres | Buffers protect water quality, stabilize streambanks, provide and protect habitat, help maintain natural water flows, decrease flood hazards, filter pollution, and provide shade which mitigates urban heat island effects. |
| Net acreage of urban tree canopy coverage | Acres | Urban tree canopy provides habitat, filters pollution, and provides shade which mitigates urban heat island and encourages walking and bicycling. |

*Note: the chart does not include a forecast because these emissions reductions strategies have not yet been modeled.*

ACTION

# Produce Zero Waste

Pursuing zero waste means that we find a way to reuse all resources and that nothing is sent to the landfill. This involves reducing what we need, reusing as many items as we can, recycling only what we must, and composting the rest. On a big scale, it begins with how we obtain resources and design products and ends with how we dispose of them. A zero waste community uses the things that might otherwise be discarded because it sees today's waste as a resource that's being wasted.

## Vision + Target

Produce zero waste by 2045.

## Strategies to advance the vision over the next five years:

- Partner with Orange County to develop a solid waste master plan by 2024 that outlines strategies for reaching zero waste by 2045
- Explore areas of overlap for waste management and reduction with UNC-Chapel Hill
- Continue encouraging waste reduction, reuse, and compostable products for one-use items
- Expand education and awareness to residents and businesses, including the history of the Rogers and Eubanks Road Neighborhood

## Estimated implementation cost

Costs TBD based on Zero Waste strategies to be implemented from the solid waste master plan

### WHAT IS THE TOWN ALREADY DOING?

Orange County is leading an effort through the Solid Waste Advisory Group to develop a master plan for solid waste that includes a zero-waste goal for the community. The plan will define program costs for reaching a zero-waste goal.

### WHO WITHIN OUR COMMUNITY CAN HELP?

- Waste management and related companies
- Businesses and restaurants
- Homeowners associations and neighborhood champions
- Event organizers
- Schools and universities
- Non-profits
- Individuals

### DID YOU KNOW...

In partnership with Orange County, waste diversion rates reached 64% in 2014. This exceeded the 1997 goal of 61% and was in large measure due to steady increases in curbside and commercial recycling. Compostable materials still make up a large percentage of the waste stream. New goals and strategies are needed to reimagine waste as a resource.

# Produce Zero Waste
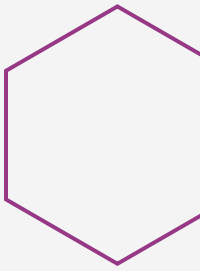


The Rogers-Eubanks neighborhood has sought environmental justice for several years, being an area previously without sewer infrastructure which was impacted by the siting of a landfill in the early 1970s. Thanks to the leadership and perseverance of Minister Robert Campbell (far left) and other residents, in 2018 the Town contributed funds to provide sewer service to the Rogers-Eubanks neighborhood. This project was made possible through a partnership between OWASA, Orange County, and the Towns of Carrboro and Chapel Hill.

| | PUBLIC & ENVIRONMENTAL HEALTH | RACIAL EQUITY & ENVIRONMENTAL JUSTICE | JOB CREATION | RESILIENCE TO CLIMATE IMPACTS | REGIONAL PARTNERSHIPS |
|---|---|---|---|---|---|
| Type of Impact | ✚ | ✚ / ◯ | ✚ | ◯ | ✚ |
| Potential Impacts | + Reduced waste<br>+ Reduced environmental toxins<br>+ Healthy soils support growth of healthy foods | + Less use of resources<br>· Communication and resource availability could affect equity of zero waste programs | + Supports local economies<br>+ Jobs in materials reuse | | + Potential for regional zero waste and green jobs efforts |

**Legend**

✚ Positive          ◯ Neutral          ▬ Negative

**ACTION**

# Protect Water Quality, Natural and Agricultural Resources

Protecting our natural environment, including conserving tree canopy and green corridors, can support our community's resilience to climate change and natural hazards. Agricultural lands provide some of the benefits of natural habitats and provide **local food** sources. High quality waters support our drinking **water supply**, protect **natural habitats**, and provide recreational opportunities. Water conservation and stormwater management are important ways to keep our water supply clean, healthy, and abundant.

## Strategies to protect water quality and natural and agricultural resources over the next five years:

- Preserve, protect, and restore natural and agricultural lands through regulations, incentives and investment, particularly those lands and communities most impacted by natural and human-caused environmental health hazards

- Improve water quality and stormwater management by completing the Cedar Fork and Booker Headwaters subwatershed studies and implementing the top three projects across all studies by 2025

- Encourage rainwater harvesting for non-potable water demands and develop a neighborhood-focused rain barrel / rain garden program

- Promote the use of OWASA's AguaVista software to help residents and businesses monitor water usage, identify leaks, and find ways to conserve.

- Incentivize water conservation measures as part of the Town's energy upgrade program for homes and businesses

- Pilot smart city technology to enhance maintenance strategies for stormwater controls

- Partner with Orange County and the Food Council to explore ways of supporting a sustainable and equitable local food system, including Community Supported Agriculture (CSA), farmers markets, community gardens and regenerative practices

- Identify local food deserts and work with local civic organizations to develop strategies for addressing them

### WHO WITHIN OUR COMMUNITY CAN HELP?

- OWASA and other municipal partners within our watersheds

- Schools and universities

- Community and civic organizations

- Homeowners associations and neighborhood champions

- Orange County Food Council and other agricultural organizations

- Businesses and business organizations

- Non-profits

## Estimated implementation cost

Costs TBD based on Town investments as identified
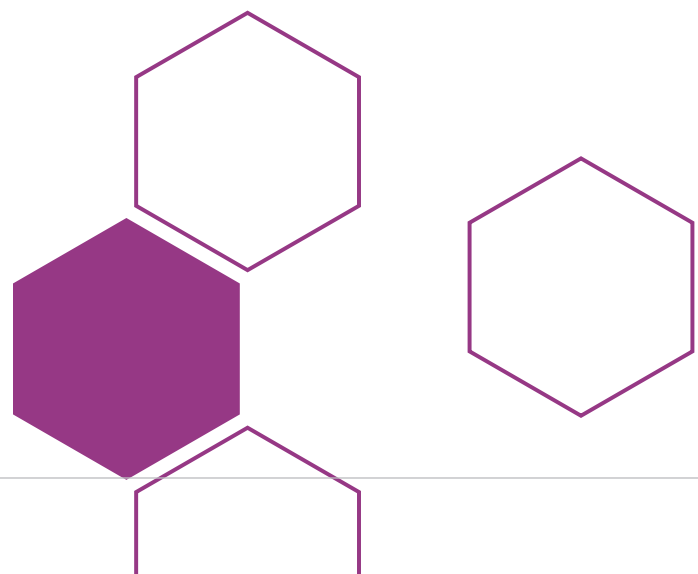
# Protect Water Quality, Natural and Agricultural Resources
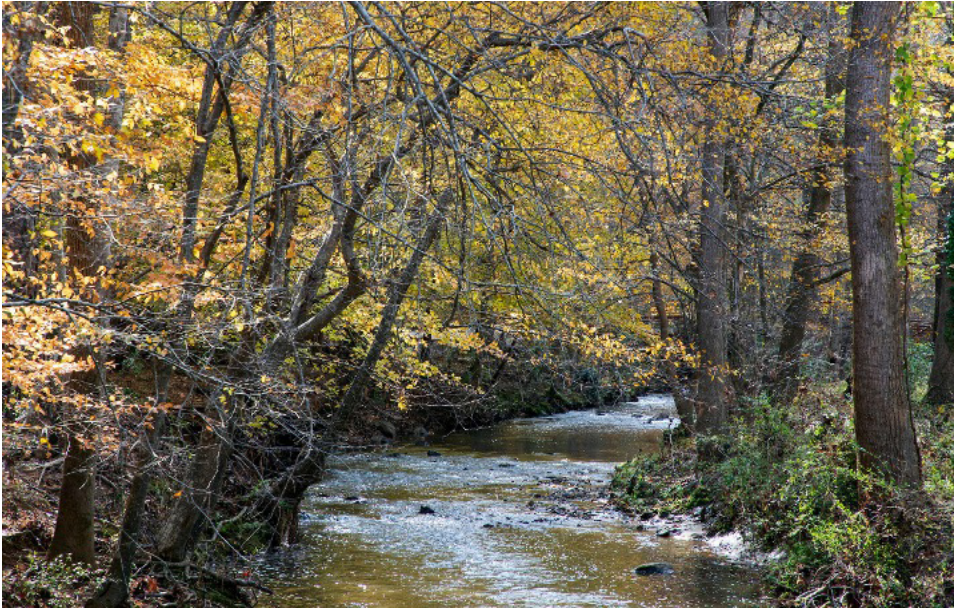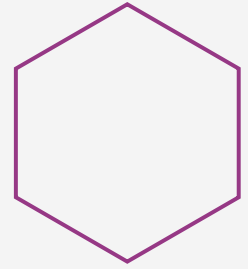


Bolin Creek is one of Chapel Hill's most scenic waterbodies. Can you name any of the other major waterbodies in town and do you know where they go after they leave Chapel Hill?

| | PUBLIC & ENVIRONMENTAL HEALTH | RACIAL EQUITY & ENVIRONMENTAL JUSTICE | JOB CREATION | RESILIENCE TO CLIMATE IMPACTS | REGIONAL PARTNERSHIPS |
|---|---|---|---|---|---|
| Level of Impact | ➕ | ➕ | ➕ | ➕ | ➕ |
| Potential Impacts | + Improved water quality<br>+ Improved access to local foods<br>+ Improved access to nature and green spaces | + Reduced flooding risk from stormwater management | + Jobs for environmental management, engineering, and farming | + Increased ecosystem and habitat resilience<br>+ Reduced flooding risk | + Potential for regional conservation efforts |

## Legend

➕ Positive ⭕ Neutral ▬ Negative

# Resiliency

Resiliency is the ability of an individual or a system such as a family, business, or community to successfully respond to disruptions and adapt to changes. Community climate resilience means that we can anticipate, prepare for, and respond to hazardous events and other consequences of a changing climate, but it's not a substitute for carbon reduction. Adapting to our changing climate and reducing the emissions that cause climate impacts are both essential parts of climate action. In combination with reducing GHGs, resilience strategies focus on adapting to the changes that we are experiencing on a local level. The strategies for building resilience include a wide range of actions, such as improving stormwater management, reducing the risk of heat impacts, building community organizational capacity, and emergency response planning. These impacts are often experienced most directly by those who contribute the least to the problem of climate change. For this reason, planning for resilience must include thinking about our residents who have higher risk levels for various threats and prioritizing their safety and wellbeing.

As communities prepare to become climate resilient, they are seizing the opportunity to build general resilience through more holistic approaches. This involves integrated resilience planning for our energy, transportation, housing, food, water, social capital, health systems and infrastructure. In this way, our community can be prepared to **"bounce forward"** by building broad general resilience rather than simply preparing to recover or **"bounce back"** from climate change impacts.

### CLIMATE EQUITY

Social equity ensures all community members can access opportunities and resources necessary to meet their needs, support their wellbeing, and achieve their potential. Climate equity ensures everyone benefits from climate solutions, and no one takes on more of the burden of climate impacts. This requires intentional efforts to change the systems and structures that worsen climate change and inequality.

### PLANNING FOR RESILIENCE AT THE REGIONAL LEVEL

The Triangle Regional Resilience Assessment (TRRA) (October 2018) was a regional effort to identify climate challenges and stressors and prioritize strategies to build resilience. The Town of Chapel Hill participated in a cooperative partnership with other communities in the region to develop the TRRA. While many of the issues can be more effectively addressed at the regional level, the TRRA shaped the Town's resilience strategies and informed the identification of stressors. In 2020, the Town added a resiliency map series to the Future Land Use Map to inform future land use decisions.

## Top Resiliency Actions

| TOWN GOVERNMENT ACTIONS | TOWN & COMMUNITY ACTIONS |
|---|---|
| Strengthen early warning systems for climate hazards and heat | Expand climate action education, outreach, and awareness |
| Enhance green infrastructure | Grow partnerships, funding, and incentives |
| | Broaden community-wide resiliency and recovery |

# Resiliency



Eastgate Crossing shopping center after Hurricane Florence in 2018.

## Resiliency and Recovery Metrics

| INDICATOR | MEASURE(S) | HOW/WHY WE MEASURE |
|---|---|---|
| Time to recovery after a catastrophic event | Months | Speed of recovery after an event such as a flood or hurricane is an indicator of how resilient a community is. |
| Average Income | $ | Higher incomes and higher diversity of income sources indicate a more resilient population with higher capacity to recover |
| Access to food/basic services | Percent of population and employment within 0.4 miles of transit | Transit accessibility is one way to assess whether the population is able to access food and basic services. A high degree of access means the population is more likely to be resilient to stress. |
| Neighborhood Cohesion | Community survey questions about things like: sense of belonging, perception of safety, getting along well with neighbors | Strong social cohesion at the neighborhood and community levels has been shown to increase access to goods and services and serve as the  foundation for the ability to address and "bounce back" quickly from sudden disruptions (resiliency) |

### ACTION

# Strengthen Early Warning Systems for Climate Hazards and Heat

Early warning systems can help people know when hazards are imminent, allowing them to appropriately prepare and respond. The Triangle Regional Resilience Assessment identified a strategy for developing flood early warning systems with gauges in strategic locations to let people know when to evacuate, as well as providing information on road closures. The Town will explore early warning systems for other hazards, like extreme heat, which would let people know when to take precautions to avoid dangerously hot and prolonged weather.
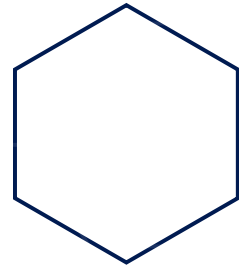
## Vision + Target

Provide residents and business owners advanced warning and faster emergency response times through enhanced smart city early warning system technology by 2030.

## Strategies to advance the vision over the next five years:

- Determine who in our community is most impacted by climate stressors like flooding and extreme heat
- Develop predictive tools that can anticipate flooding and the need for road closures and other responses in advance of a severe weather event
- Find ways of making data readily available to residents and business owners through mapping, apps, flood gauges, warning signs, etc.

## Estimated implementation cost

Costs TBD based on systems considered

**ACTION**

# Enhance Green Infrastructure

Green infrastructure includes things like green space, stormwater control measures, urban forest, and green building features like green walls and rooftops. This form of natural infrastructure can strengthen community resilience and provide several "ecosystem service benefits" like improving air and water quality, replenishing our groundwater, providing shade and habitat for birds and other species, and serving as recreational amenities that have positive effects on our physical and mental health.



Stormwater management "devices" like this one at Southern Community Park can help to manage and treat runoff.

## Vision + Targets

Plant an average of 200 or more canopy trees every year and enact a new green infrastructure ordinance by 2022.

### How can nature-based solutions help us become more resilient?

Trees and green spaces can help to mitigate heat effects. Trees provide shade, and open spaces reduce the amount of paved surfaces that increase heat. Vegetation also helps with water filtration and non-paved areas allow water to soak into the ground, reducing runoff. Green infrastructure provides critical habitat and ecosystem service benefits. As new development occurs over time, it will be critically important to balance these changes with continued investment in the protection, conservation and enhancement of our natural environment.

### Estimated implementation cost

Total cost per tree to ensure survival can range from $500-$1,000. Total cost to develop a green infrastructure ordinance can range from $50,000-$75,000.

**Who within our community can help?**

- Chapel Hill Tree Planting Program
- Friends of Chapel Hill Parks & Recreation
- North Carolina Botanical Garden
- Downtown Partnership
- UNC

**ACTION**

# Expand Climate Action Education, Outreach, and Awareness

Education, outreach and awareness can help equip our community to understand why climate action and response are important and how it can take action. Our community has expressed the importance of sustainability literacy for children, adults, and businesses. The Town, schools, neighborhoods, places of worship and civic organizations can work together to deliver constructive and collaborative educational programs and outreach to increase participation in climate actions. As part of this work, we will explore the role of the Chapel Hill Peoples Academy and opportunities to grow a network of "Plan Ambassadors."

## Estimated implementation cost

Some increased costs for expanded sustainability and climate-related programs, activities, and staff

## Potential Climate Education Topics

- Climate action in Town government (Peoples Academy)
- The importance of climate action
- Public transportation benefits
- Anti-idling
- How individual and business actions impact climate
- Economic/public health benefits and values of climate actions, including the social cost of carbon for decision-making
- Importance of transportation and land use connections to climate

- Lawn care, including the benefits of "leaving the leaves"
- Composting
- How to reduce waste and why it's important
- Recycling
- How to reduce runoff and manage water use
- Importance of stream buffers
- Rain water capture, rain gardens and stormwater
- Sharing best practices
- How to reduce runoff and manage water use
- Training for green jobs

ACTION

# Grow Partnerships, Funding, and Incentives

Making progress on climate action and response as a community will require a variety of resources. Partnerships among the Town, institutions, businesses, and other local organizations are necessary for taking action together. We cannot do this alone and the problems stretch well beyond our borders. Funding sources must be identified, and climate actions should be incentivized to encourage maximum participation.

### Strategies for building partnerships, securing funding, and providing incentives over the next five years:

- Strengthen partnerships for disaster response and explore disaster preparedness planning
- Declare a climate emergency to build support for funding
- Pursue mitigation grants
- Support state and regional efforts, such as the State natural and working lands action plan
- Pursue joint enabling legislation with other municipal partners
- Provide tax and zoning incentives for land preservation
- Encourage competition based on audits of building efficiency for homes and businesses
- Provide funding for retrofits and health care for people with low wealth
- Invest in and implement local watershed plans
- Partner with OWASA on expanded water conservation programming and measures

### Estimated implementation cost

Cost range TBD based on specific Town activities
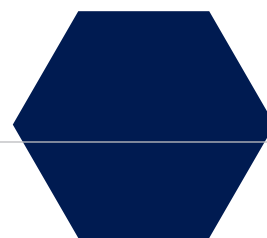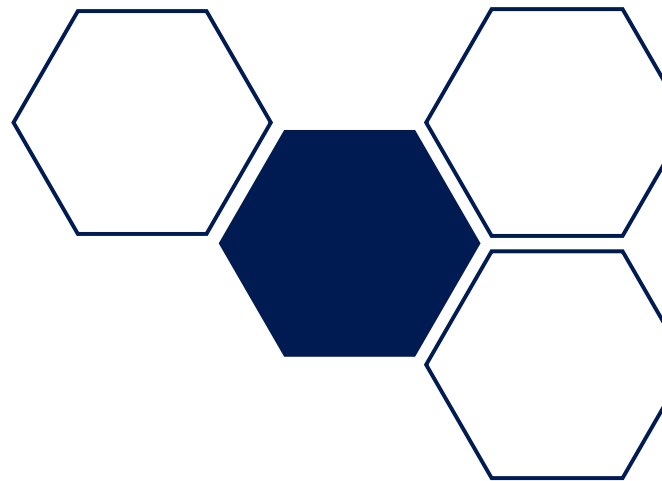
ACTION

# Broaden Community-wide Resilience and Recovery Actions

Our community can implement a variety of strategies to improve resilience and recover from the impacts of COVID-19.

## Resilience and Recovery Strategies Include:

- Collaborate with Orange County partners to develop a long-term recovery plan for COVID-19, and look for ways to keep the positives (e.g., teleworking, flexible work schedules, on-road walking and biking paths)

- Organize emergency staff and volunteers to be ready for rapid response in our community and other parts of the state

- Provide strategic power sites for public use in emergency situations

- Designate cooling centers for 100 degree days

- Advocate for moving water, residents, and groundwater threats from the floodplain

- Cooperate among town, university, and regional partners for emergency management and resilience planning
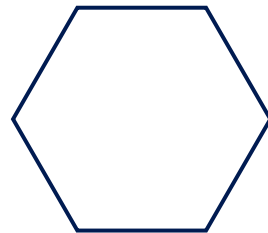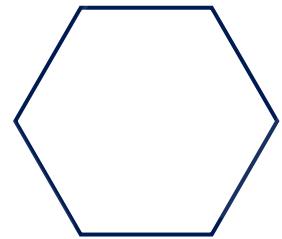
## Estimated implementation cost

Cost range TBD based on specific Town activities
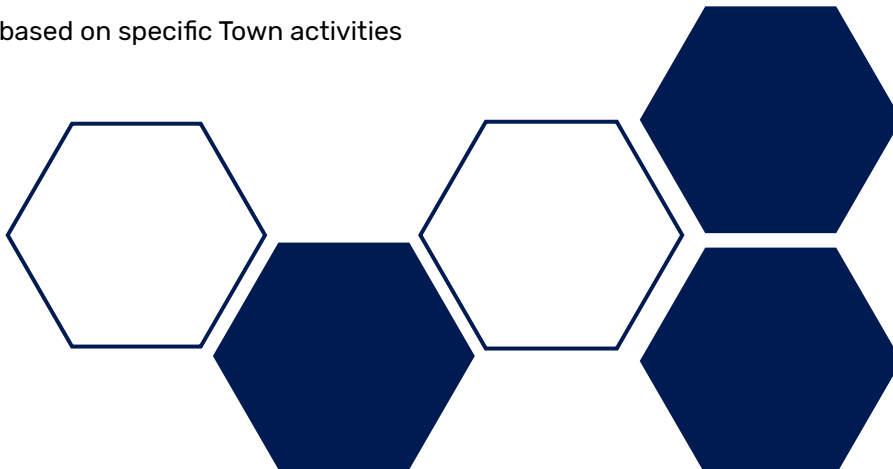
# Implementation and Next Steps

Our Climate Action and Response Plan lays out a framework for the Town and the Chapel Hill community to take action together to meet our climate goals. Now the real work begins.

The Town Council has made climate action their top priority, committing to several key strategies already. To advance racial equity in Chapel Hill, we will work directly with frontline communities and historically marginalized groups to design and implement climate actions that are meaningful and impactful to everyone who lives here. Our goals and the key actions identified within this plan will help guide our municipal decision-making, weighing factors like the social cost of carbon and the long-term impacts to residents most at risk.

The planning process set the foundation for future partnerships among the Town, businesses, institutions, and civic organizations across Chapel Hill. We must continue to strengthen these relationships and work together toward our shared climate goals. We have the knowledge, relationships, and tools we need to advance and support climate actions throughout our community. Now it's up to all of us to stay committed, work together, and put our ideas into action. We will lead the way.

Following the adoption of this plan, we will develop further funding options and a detailed implementation plan that provides more information about things like project scope, cost, timing, project duration, staffing resources, and Town authority. We will provide annual updates to Council and make any necessary adjustments along the way. Let's get going.

# Glossary of Terms

**Building Code** refers to the set of rules for how buildings must be constructed in our state.

**Carbon emissions reduction,** also called climate mitigation or greenhouse gas emissions reduction, refers to any activity that reduces the greenhouse gas emissions that cause climate change (e.g., walking instead of driving, turning on a room fan instead of lowering the temperature of the entire living space).

**Carbon footprint** means the amount of greenhouse gas emissions caused by a person or organization's activities over a period of time, typically one year. Common activities include driving, heating or cooling a home, washing clothes, etc.

**Charging stations** provide the electricity that charges the battery inside of electric vehicles.

**Charting Our Future** is a land use initiative which has created a Council-adopted vision for how Chapel Hill will grow and evolve between now and 2050. This Council's vision outlines strategies and goals for future land use and development and will serve as the foundation for decision-making so that the Town's land use tools are predictable, functional, and intentional.

**Clean energy** comes from renewable sources like the sun, wind, water and earth.

**Climate action** is any activity that reduces our greenhouse gas emissions, or that helps us respond to our changing climate by making Chapel Hill a stronger and more resilient community.

**Climate adaptation** is the process of adjusting to new climate-caused conditions in order to lower risks to people and property (e.g., using less water under times of drought).

**Climate change** refers to long-term changes to weather patterns, such as a place becoming generally hotter, colder, drier, or wetter over time. In recent decades, climate change has occurred at an unprecedented rate primarily due to greenhouse gas emissions from human activity. This human impact on the environment is evident in the increasingly unpredictable and destructive weather patterns that negatively affect our community.

**Climate equity** means that climate action is designed to strengthen the capabilities of residents who are most impacted by climate change.

**Composting** is a process that turns vegetable food scraps and other plant materials into soil. Composting reduces harmful emissions that are otherwise released in landfills.

**Early warning systems** use sensors and other technology to alert us to hazardous conditions so that we can get people out of harm's way.

**Ecosystem services** are benefits that humans receive from natural systems (e.g., food, filtering of air and water, recreation).

**Electric vehicles** are cars, trucks and other vehicles that run on electricity and produce zero tailpipe emissions in this mode.

**Energy burden** is when more than 6% of household income is spent on energy bills.

**Energy efficiency upgrades** are improvements to a building that lower its energy use.

**Energy saving kits** include things like energy efficient lightbulbs and insulation.

**Environmental Justice** means all people and communities have the right to equal environmental protection under the law, and the right to live, work and play in communities that are safe, healthy and free of life-threatening conditions (Columbia University).

**Environmental Racism** means whether, by conscious design or institutional neglect, actions and decisions that result in the disproportionate exposure of people of color to environmental hazards and environmental health burdens (Columbia University).

**Flood storage ponds** are used to capture and hold rainwater to reduce flooding in low-lying areas.

**Food desert** refers to areas within communities where residents have limited access to healthy and affordable food.

**Food system** refers to the activities associated with the production, processing, transportation, and consumption of food and is sometimes called "farm to fork." Food system sustainability issues include things like access to healthy and affordable foods, impacts on the natural environment, and food waste.

**Food waste** is food that is wasted, lost, or uneaten.

**Frontline or climate vulnerable communities** are those most at risk of being exposed to the impacts of climate change (e.g., flooding, extreme temperatures).

**Geothermal heat pumps** use the constant temperature of the earth to reduce the amount of energy needed to heat and cool buildings.

**Green banks** are financial institutions that specialize in funding to increase the use of clean energy technologies and infrastructure.

**Green building** refers to a form of design and construction that aims to reduce our impacts on the natural environment and conserve natural resources.

**Green building strategies** include the use of: cool roofs (white or vegetated); effective insulation and quality, efficient building materials; more efficient plumbing fixtures, heating and cooling systems, and appliances; orienting the building to use natural heating, cooling, and daylight when possible; siting the building near transit or other travel options; recycling and minimizing construction waste; incorporating recycled, reclaimed, or sustainable materials; utilizing innovative and sustainable designs like mass/tall timber construction; native and water-efficient, drought resistant landscaping; and incentives such as fee waivers, tax rebates, low-cost loans, expedited permitting, recognition programs.

Green building strategies include: creating cool roofs (white or vegetated); effective insulation and quality, efficient building materials; more efficient plumbing

fixtures, heating and cooling systems, and appliances; orienting the building to use natural heating, cooling, and daylight when possible; siting the building near transit or other travel options; recycling and minimizing construction waste; incorporating recycled, reclaimed, or sustainable materials; utilizing innovative and sustainable designs like mass/tall timber construction; native and water-efficient, drought resistant landscaping; and incentives such as fee waivers, tax rebates, low-cost loans, expedited permitting, recognition programs.

**Green infrastructure** includes things like green space, stormwater control measures, urban forest, and green buildings.

**Greenhouse Gas Emissions (GHGs)** are gases in the earth's atmosphere that trap heat and warm the planet. GHGs include carbon dioxide, methane, nitrous oxide, and fluorinated gases. The right proportion of GHGs keep our planet warm enough to support life. When there are too many GHGs in our atmosphere, too much heat is trapped and overall temperature rises. Human activity such as burning fossil fuels has caused a dramatic increase in these gases since around 1900, and the trend has rapidly accelerated in recent years. GHGs are sometimes described as "carbon emissions" or a person's "carbon footprint". Carbon dioxide is the main greenhouse gas produced by human activities.

**"Green the grid"** means working with and supporting utilities like Duke Energy and Dominion as they replace fossil fuel burning power plants that use coal and natural gas with renewable energy sources like solar and wind farms, which also use batteries to help store the energy so that it can be provided 24 hours a day.

**High-impact actions** are those that are projected to reduce GHGs equal to or greater than the annual amount of emissions generated by Town government operations (12,378 MTCO2e).

**Infrastructure** includes things like streets, bridges, pipes, power lines, internet cables, etc.

**Living walls and roofs** are surfaces of a building where plants grow. These green areas reduce the

amount of heat that a building will give off, lowering the temperature around it.

**Micromobility** describes a variety of small and lightweight (under 1,100 pounds) vehicles like bikes, shared bikes, electric-assist bikes, electric skateboards and scooters. Micromobility is an important and growing transportation field because it can replace the majority of car trips that are under 5 miles, especially where there are safe and well-connected greenways, trails, bike lanes and other dedicated infrastructure.

**Missing middle housing** refers to a range of clustered houses and smaller multifamily buildings that fill in the "middle" between traditional single family homes and larger multifamily apartments. These housing products provide a community with an essential mix of building types that increase housing affordability and choice. The concept of a "missing middle" suggests that there are not enough of these housing products on the market.

**Mobility on demand** is a fully integrated transportation system that puts the "traveler first" by allowing them to easily move between different transportation options like bus, bike, car and rail. Integration involves the coordination of schedules, payment systems, and ride availability among different transportation service providers, both public and private.

**Mobility Plan** refers to a Town-adopted plan that envisions a transportation network for bicyclists, pedestrians and transit riders that safely links neighborhoods, parks, employment centers, transit stops, and other destinations. The goal of the Plan is for 35% of all commuters to bike, walk and ride transit to work by 2025.

**Net-zero emissions** means achieving a balance between activities that create GHG emissions with those that remove them from the atmosphere. Another term for net-zero emissions is "carbon neutral." Today, reaching net-zero emissions often requires the use of renewable energy to offset any GHG emissions that cannot be eliminated (e.g., adding solar panels to the roof of a house to offset the use of

utility electricity that is generated using coal or other fossil fuels).

**Property assessed clean energy** or PACE is a financing tool that helps homeowners and businesses to invest in energy efficiency and renewable energy projects that can be paid back through annual property taxes which run with the property.

**Purchased clean energy,** also called "carbon offsets", is energy made from renewable sources like solar and wind. This energy is often purchased by organizations when clean energy is unavailable or difficult to produce.

**Rainwater collection** is the process of capturing and storing rainwater in a natural area or tank.

**Rainwater reuse** is taking the captured rainwater and using it to do things like water a garden. This helps lower the amount of clean drinking water that is used for non-drinking purposes.

**Resilience** is the ability of an individual or a system such as a family, business, or community to successfully respond to disruptions and adapt to changes.

**Sewage treatment** is the process of cleaning our sewage (or wastewater) so that it can be returned to Morgan Creek, which flows into Jordan Lake. OWASA does this for our community.

**Social cost of carbon** represents the economic harm caused to people by one ton of greenhouse gas emissions. The value of avoiding this impact is currently estimated at over $50 per ton (Environmental Defense Fund). In addition to cost savings from lower utility bills or other operational adjustments, the social cost of carbon can be used to determine the total value of any project designed to reduce greenhouse gas emissions.

**Solar panels** capture sunlight to make electricity.

**Solar farms** are large installations of solar panels that are mounted on the ground.

**Solar hot water systems** capture sunlight and use the heat to create hot water.

**Stream buffers** or riparian buffers are the natural areas located on either side of a stream. Stream buffers protect water quality (including drinking water), stabilize streambanks, provide and protect aquatic and terrestrial habitat, help maintain natural hydrology (groundwater infiltration, maintain streamflow), prevent flooding, filter pollution, provide shade which mitigates urban heat island effects and provide other "ecosystem services" (see definition above).

**Total cost of ownership** or "TCO" refers to all of the expenses associated with owning an asset like a vehicle or building. When it comes to investments in energy efficiency, a TCO analysis can show how a more energy efficient option helps you recoup your added costs and save money over time compared to cheaper, less efficient investments that cost more to operate and maintain (e.g., electric vehicle vs. conventional gas-powered vehicle).

**Transportation Demand Management** is focused on helping people make decisions about how they can travel in ways that use low-carbon transportation options and reduce traffic congestion, lowering the need for building new roads and travel lanes. TDM travel options include things like: transit, ridesharing, biking, walking and teleworking.

**Utility integrated resource plans** or "IRPs" are approved by the North Carolina Utilities Commission and chart a course for the types of resources a utility will use to generate electricity over a 15-20 year period in order to meet the needs of their customers. IRP reviews are an opportunity for local governments and other interested parties to work with utilities to develop plans that support climate action goals. Topics include things like affordability and access to electricity, renewable energy, energy efficiency, electric vehicle infrastructure, and smart grid technology.

**Water treatment** is the process of taking water from our reservoirs, like University Lake and Cane Creek, and producing clean drinking water that can be sent to people's homes and businesses.

**Zero waste** refers to the idea that we find a way to reuse all resources and that nothing is sent to the landfill. This involves reducing what we need, reusing as many items as we can, recycling only what we must, and composting the rest.

# Appendix

The following documents provide additional details and information about the calculations, assumptions, and research used to develop this plan. These documents can be found at www.sustainchapelhill. org. Following the adoption of this plan, this document will be integrated within the Town's website so that new information and points of connection for advisory boards, residents, businesses and other organizations are more easily accessible over time.

Greenhouse Gas Emissions Inventory and Forecast Report

Community Greenhouse Gas Emissions Inventory and Forecast Calculations

Municipal Greenhouse Gas Emissions Inventory and Forecast Calculations

Carbon Reduction Measures Report

Chapel Hill Greenhouse Gas Emissions Reduction Measures Calculations

SUSTAINABILITY
Climate Action Plan