SUSTAINABILITY

Raleigh Community Climate Action Plan

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Raleigh

The City of Raleigh prepared this document in partnership with:

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Executive Summary

Introduction

Climate action requires the collective action of everyone globally, including individuals, governments, private businesses, and the non-profit community. The City of Raleigh recognizes the important role of local government in community climate action and has prepared this Community Climate Action Plan (CCAP), which begins to address the challenges that climate change presents to our region. The role of government, while important, is small in comparison to the actions that everyone must take. CCAP provides an evaluation of the community greenhouse gas (GHG) emissions, strategies, and actions to reduce emissions; an understanding of the role of equity and the implications of climate change on vulnerable communities; and an overview of the impacts of climate change and how it affects our overall community resilience.

Document Summary

This plan consists of eight chapters in three main sections: **Chapters 1 through 4** provide information on climate action and the climate risks that Raleigh faces. This section details the development of CCAP through the work that was done with City staff, consultants, and community partners and stakeholders to identify suitable strategies and actions to address those risks, as well as to support climate equity and

build community resilience. **Chapters 5 through 7** provide detailed strategies and actions in three categories: Buildings & Energy, Transportation & Land Use, and Resilience & Cross Cutting, including considerations for equity and resilience. **Chapter 8** provides information on implementing CCAP, including roles and responsibilities, communication and outreach, and other methods to empower and inspire climate action throughout the Raleigh community.

Buildings & Energy

Buildings and energy accounts for 56 percent of Raleigh's total GHG emissions. These GHG emissions include residential, commercial, and industrial building energy use. As the largest category of emissions, buildings and energy also represents the largest potential reduction in emissions, including both reductions in the energy used in a building (energy demand) and decarbonization of the energy used in buildings (energy supply). Building energy use is a critical sector for CCAP stakeholders to identify and implement an array of strategies to achieve the GHG reduction goal. The buildings and energy strategies are grouped into the following strategy areas:

- **Energy Efficiency Best Practices (EEBP)**
- **Energy Efficiency Standards (EES)**
- **Energy Supply (ES) and Renewable Energy (RE)**

The success of these strategies will depend upon the interest, involvement, and innovation of all of the community in taking action to meet the community's climate goal.

Transportation & Land Use

According to the City of Raleigh's 2014 emissions inventory study, transportation contributed roughly 42 percent of total GHG emissions. With rapid population and economic growth, this presents an opportunity to focus on building community resilience, supporting equity, and reducing GHGs in area transportation and land use strategies. GHG reductions in this sector are realized mainly through reducing the use of traditional modes of transportation and adopting alternative, low-carbon vehicle technologies, but they are also supported by modifications to land use patterns where we can increase the amount of people driving fewer miles or out of their cars completely. The transportation and land use strategies modeled were grouped into the following strategy areas:

- **Vehicle Miles Traveled (VMT)**
- **Efficient Land Use (LU)**
- **Electric Vehicles/Alternative Fuel Vehicles (EV/AFV)**

With a goal of reducing regional transportation-based GHG emissions, the broad strategies are designed to positively affect community equity, resilience, and safety through increased mobility and access.

Resilience & Cross Cutting

The Resilience & Cross Cutting category of strategies includes those aimed at reducing GHG emissions from waste; strategies addressing flood risk, heat and other climate, resilience, and social impacts; strategies promoting natural and green space and carbon sequestration; and other supporting strategies critical to CCAP success. Specifically, the Resilience & Cross Cutting strategies focus on the following themes:

- **Green Infrastructure**

- **Preservation and Green Space**
- **Waste Reduction and Efficiency**
- **Innovation**
- **Education and Outreach**
- **Funding and Incentives**
- **Equity**

Cross cutting strategies (such as financing, education and outreach, equity, innovation) tackle both logistical as well as value-based methods that help set the foundation and support CCAP stakeholders in implementation, break down barriers and create opportunities to implementation, and address vital community values and needs for equity and resilience.

Implementation

To implement CCAP, there needs to be a collective shift from business-as-usual approaches so that we can tackle the ongoing work needed to make deep cuts to GHG emissions and to fully incorporate equity and community resilience into all aspects of implementation. The Raleigh community is full of innovative and passionate individuals and organizations who are already doing important work that sets the foundation from which we can continue to tackle climate change. Building on the ongoing work in City departments, the work of local organizations and businesses, and the partnerships developed with other organizations through the CCAP outreach process, there should be continuous effort to carry those activities and partnerships forward through the multi-year implementation of CCAP strategies. Critical components for successful implementation of CCAP include funding and financing, tracking implementation and progress, and communications and outreach.

Community climate action is a collaborative, all-hands-on effort, and all partners in the community are needed to engage, support, and implement CCAP together.

Acronyms and Abbreviations

There are several acronyms and abbreviations that are used throughout the document and they are defined here**.** For more definitions on terms, see the Glossary at the end of CCAP (page 100). Throughout the document, glossary terms are highlighted in ***bold italics*** text.

AFV	**alternative fuel vehicle**
BAU	**business as usual**
BRP	**Bioenergy Recovery Project**
BUG	**Building Upfit Grants**
CAFE	**Corporate Average Fuel Economy**
CAMPO	**Capital Area Metropolitan Planning Organization**
CCAP	**Community Climate Action Plan**
CDC	**Centers for Disease Control and Prevention**
CEAP	**Climate Energy Action Plan**
CO_2	**carbon dioxide**
DSIRE	**Database of State Incentives for Renewables & Efficiency**
EEBP	**energy efficiency best practices**
EES	**energy efficiency standards**
ES	**energy supply**
EV	**electric vehicle**
F	**Fahrenheit**
FOG	**fats, oils, and grease**
GHG	**greenhouse gas**
GI/LID	**green infrastructure/low impact development**
HVAC	**heating, ventilation, and air conditioning**
IRP	**Integrated Resource Plan**
LEED	**Leadership in Energy and Environmental Design**
LU	**land use**
MPO	**metropolitan planning organization**
$MTC0_2e$	**metric tons of carbon dioxide equivalent**
MWh	**megawatt hour**
NC	**North Carolina**
NCDOT	**North Carolina Department of Transportation**
NREL	**National Renewable Energy Laboratory**
PEV	**plug-in electric vehicles**
PV	**photovoltaic**
R-CNG	**renewable natural gas**
RE	**renewable energy**
SRVC	**Virginia/Carolina Subregion**
TDM	**transportation demand management**
TRRP	**Triangle Regional Resiliency Partnership**
U.S.	**United States**
USDN	**Urban Sustainability Directors Network**
VMT	**vehicle miles traveled**
W	**waste**
WET	**Water Education Today**
ZEV	**zero emission vehicle**

A Guide to CCAP Chapters

Chapters 1–4: Introduction, Building the Plan, Equity, Resilience

Chapters 1 through 4 of this Raleigh Community Climate Action Plan (CCAP) provide information on climate action and the climate risks that Raleigh faces. This section details the development of CCAP through the work that was done with City staff, consultants, and community stakeholders to identify strategies and actions to address those risks. In these chapters, we will define and explain greenhouse gas emissions, climate equity, and resilience and show how these relate to the community's ability to take action.

Chapters 5 through 7 will provide detail on the strategies and actions for each of the three categories of CCAP: Buildings & Energy, Transportation & Land Use, and Resilience & Cross Cutting. These chapters will help community stakeholders understand potential impacts and implementation options. Chapter 8 will provide further information on implementation, including roles and responsibilities, communication and outreach, and other methods to empower and inspire climate action across the Raleigh community.

Raleigh Pullen Park

Chapter 1 - Introduction

Climate change is a critically important environmental, economic, and social issue for humankind today. The role our community and the other communities across the world play in addressing climate change is vital. Climate ***action*** requires the collective action of everyone globally: individuals, governments, private businesses, and the non-profit community. The City of Raleigh recognizes the important role of local government in community climate action and has prepared this Community Climate Action Plan (CCAP), which begins to address the challenges that climate change presents to our region. The role of government, while important, is small in comparison to the actions that everyone must take.

CCAP provides an evaluation of the community ***greenhouse gas*** (GHG) emissions, strategies and actions to reduce emissions, an understanding of the role of ***equity*** and the implications of climate change on vulnerable communities, and an overview of the impacts of climate change and how it affects our overall community ***resilience***. Recognizing these challenges, in May 2019, the Raleigh City Council established a ***goal*** to reduce community GHG emissions in Raleigh by 80% by the year 2050. This document lays out a process to implement strategies to accomplish that goal.

Climate change will have wide-ranging and systemic impacts on our natural and man-made systems. The nature and amplitude of these impacts are linked to the amount of warming anticipated. While this document does not include specific models of climate impacts, it is important to note that the likelihood, frequency, and strength of climate impacts are linked to the effectiveness of ***mitigation*** measures worldwide. Raleigh's climate change mitigation strategies are one piece of a much larger puzzle. Our actions are necessary to reach a global solution but not enough on their own. The impacts we feel in Raleigh will be a result of efforts by many others. This means that we must take the necessary

step of planning for and adapting to the impacts of climate change simultaneously while also attempting to mitigate those effects.

Historical data suggest that in the Southeast United States, we are experiencing more frequent, longer-lasting heat waves; more frequent heavy rains and storms; more frequent warm nights; and the effects of ocean warming in the form of hurricanes with stronger winds and heavier rains. All of these impacts are taking place in the context of rapid population growth for the Triangle region. Higher population means more development and infrastructure; more impervious surfaces; and more people in need of protection from storms, floods, and extreme heat. The physical changes to our environment caused by climate change will require us to put in place infrastructure, policy, and programs to protect our community.

Our economy will be affected by these physical changes and by our efforts to mitigate them. The infrastructure and technology required to make this transition across the economy will be expensive, and it will take many years of planning, coordination, and collaboration to accomplish. At the same time, our community will need to adapt to an already-changing climate and recover from more frequent natural disasters.

Climate change will also have an impact on society. The environmental and economic impacts of higher global temperatures and the efforts to address them will not affect everyone equally. Some communities will be more exposed to hazards like floods; some may be more burdened by economic measures to address climate change, like ***carbon*** taxes or higher energy prices.

> ***Climate equity*** *involves addressing responsibilities for GHG emissions contributions/ generators, disproportionate distribution of climate change burdens and climate impact vulnerabilities, and just distribution of the benefits of climate protection efforts. This requires climate strategies that deal with the systems that contribute to climate change, the conditions that perpetuate existing inequities, and the effects of climate change and their distribution.*

Keeping all of this in mind, as the City of Raleigh embarked on this project to work with the community to draft Raleigh's first CCAP, it was important that the plan represent a holistic effort to address climate change.

- First, it should take a **transformative approach** to mitigating carbon emissions.
- Second, it should integrate efforts to **improve community resilience and preparedness** for the impacts of climate change.
- Third, it should be a tool to help move toward a **more equitable community**.

While climate change does represent a number of large and costly challenges, it is also important to recognize the opportunities and benefits that climate action presents to our community. Adoption of new technology means high-skill, high-paying jobs will be available to our residents. Reducing vehicle traffic can make our streets safer for bicycles and pedestrians. Reducing GHG emissions means cleaner air and water and healthier residents. The benefits of taking climate action now will be realized for those that are here today and perhaps more importantly for those in future generations.

This document is composed of eight chapters. Chapters 1 through 4 set the stage with an overview of the process used to produce this plan and information about the context and research that inform the strategies. Chapters 5 through 7 contain the strategies and actions in the categories of Buildings &

Energy, Transportation & Land Use, and Resilience & Cross Cutting, which were developed through our participatory process and include strategy equity and resilience considerations that were identified as core community values. The last chapter contains implementation and partnership considerations for the CCAP strategies. Information on how the City can lead the way and the role of the community in taking action is also included.

As a government, the City of Raleigh has some influence over climate action in our community but not a great deal of control. A City can act as a convener and can create an enabling environment for businesses and residents to act on their own. A City also plays an important role in working with State officials and the federal government to fund climate projects and to make connections on policy and partnerships to amplify local efforts. This plan attempts to identify local action that the City or community partners can take or directly support, partnerships among local entities, opportunities to coordinate with State and federal agencies, and outreach and education to catalyze individual action.

CCAP is a living plan that will grow and change with the community over time to help support Raleigh in achieving equity, resilience, and climate outcomes while working towards the 2050 community ***GHG reduction*** goal. Implementation progress will be tracked over time, and continued community feedback and participation will be incorporated. This CCAP document provides a summary of the plan development and lays out a framework for future steps that need to be taken.

Raleigh Greenways System at NC Arts Museum

Chapter 2 - Building the Community Climate Action Plan

2.1 - **The CCAP Project Purpose**

The overall purpose of this project was to develop a CCAP with a transformative vision and climate strategies that are capable of achieving deep emissions reductions through a development process that engages a full range of stakeholders in evaluating climate strategies, to propose actions that are equitable and enhance well-being for all members of the community, and to propose actions that consider community resilience. The project began with the creation of a project charter (Appendix A) that outlined the project scope and objectives. An initial step in the project was for everyone to understand GHG; what they are, where they come from and how they affect the climate.

2.2 - **Stakeholder Engagement**

Stakeholder engagement and partnerships are critical elements of achieving the City's GHG reduction goal. The project began with the creation of teams of stakeholders. At the outset, it was clear that though the City convened and led this process, it could not be completely responsible for the implementation of the plan. The City owns and manages buildings, maintains the water and wastewater systems and infrastructure, maintains a fleet of vehicles and the City bus fleet, and collects a large part of Raleigh's household solid waste. The GHG emissions from these assets and services account for only about 2 percent of total GHG emissions in our community. The City identified early on that partnerships with the private sector, non-profit organizations, the State of North Carolina, the U.S. federal government, and the Raleigh community as a whole will be vital to the successful implementation of CCAP.

A full range of stakeholders convened to discuss climate action goals, identify strategies, and evaluate their impacts on our community. CCAP from the outset has been a collaborative effort between the City of Raleigh and community partners. This participatory approach integrated the perspectives and priorities of potential partners and stakeholders to ensure that the final plan is actionable and achievable. As such, this project began with a series of meetings with four key groups of stakeholders to

educate stakeholders on the issues and goals of the project, solicit input on strategies for GHG reduction, and develop partnerships between the City and its stakeholders and between stakeholders themselves.

Figure 2-1. The CCAP Phased Process


Stakeholder Meetings for the CCAP Process.

Over 270 stakeholders participated in the process that provided the technological methodology and validation of CCAP. The teams discussed goal setting, provided advice and feedback on strategies, provided information on linkages to local resources, and performed an initial equity analysis.

- **City Interdepartmental Team:** This team provided representation across relevant City departments and divisions, identifying projects, opportunities, and support across City service areas. The team gave input into infrastructure, environmental, and community-related goals and on a range of existing community challenges and opportunities to inform equity considerations. This team also played advisory and support roles within the community, including frequent interactions with the project team and assistance in project planning.
- **Technical Advisors Team:** This external stakeholder group contributed expertise into the climate action planning process and included energy, business, education, development, non-profit, and other leaders. These stakeholders gave input into the processes of setting targets, evaluating strategies, and developing partnerships for climate actions. Focused conversations were held with individuals and small groups, organized by topics/sectors (e.g., energy resources, transportation, buildings, housing, social equity, finance, waste, environment, and other "high-impact" topics). Individual organizations contributed ideas and input into strategies that provide the opportunity for their future ownership of implementation of GHG reduction strategies.
- **Community Action Team:** This external group of primary community stakeholders included representatives of community-based, environmental, local non-profit, faith-based, and other organizations. These stakeholders also contributed to the development of strategies by topic area. For implementation, this group will be informed and serve as community advocates for the project. They have robust networks and can lead and form partnerships with others to carry out the community-led, grassroots outreach necessary for CCAP implementation.
- **Equity Advisors Team:** This group provided expertise in equity, environmental justice, equitable economic development, health, and community engagement. This group was consulted to provide feedback on how best to incorporate and embed equity into the development of the project. Equity advisors participated in the stakeholder meetings with the other CCAP teams. The feedback from these advisors will be used to continue to embed equity into the implementation of CCAP strategies.

The City convened with each of these teams at least three times over the course of the project, totaling 10 large internal and external stakeholder meetings. Additionally, a dozen subject area-specific meetings were held during plan development, resulting in the development of additional climate strategies and actions and building partnerships for implementation of CCAP. The development of CCAP was also incorporated into City planning processes and projects, such as department-specific plans and projects, updates to the 2030 Comprehensive Plan, and the formation of new initiatives for the updated Strategic Plan.

2.3 - **Building Equity and Community Resilience into CCAP**

Central to the development of the plan and its strategies was an understanding and inclusion of equity and community resilience. Equity was a key component of CCAP from the outset, and climate equity plays a significant role in climate action work. As such, each team meeting included a specific focus and set of questions to address equity considerations.

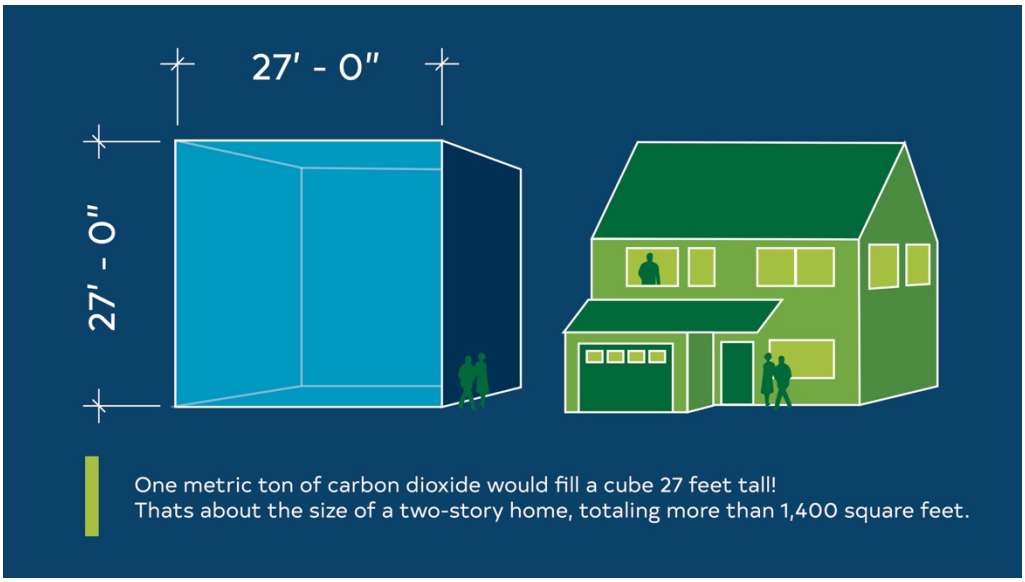
To ensure the City and CCAP stakeholders adequately address equity during implementation, the project team developed and followed the equity process described in Chapter 3, "Supporting Climate Equity." The equity advisory team met separately to discuss equity impacts and inform the equity analyses that are included in this document. As a final analytical step, the City convened four meetings with internal and external partners to discuss potential impacts that could result from CCAP implementation. In particular, these stakeholders worked through a process to review the short-term CCAP strategies against a set of equity indicators via the Equity Impact Matrix, an analytical tool that provides a high-level view of each strategy's potential impacts on environmental, economic, and public health factors (see "Equity Impact Matrix" for more information). These discussions were an initial analysis meant to help guide a future, deeper review of project impacts.

Building community resilience into the strategies was also central to the long-term vision of this plan. See Chapter 4, "Building Community Resilience," to learn more about how strategies and actions can be implemented to adapt to climate change impacts. The CCAP project incorporated collaborative resilience work from the Wake County Hazard Mitigation Plan and the Triangle Regional Resiliency Partnership (TRRP) Triangle Regional Resilience Assessment, and it drew upon the North Carolina Climate Science Report. Collaborative work continued throughout the CCAP development process and helped inform priority areas for action.

As CCAP moves forward, the individuals and organizations that participated in the plan's development can continue to provide important input and guidance to the wider community. It is critical when implementing CCAP that the actions focus on providing benefits across the community and that they do not cause more harm to those in our community who have been or will be most affected by climate change.

2.4 - **Raleigh's Community GHG Emissions**

Central to this project is an understanding of GHG emissions and how decreasing emissions is critical to slow the rate of climate change. See Chapters 5 through 7 for more detail on taking action through CCAP strategies to reduce GHG emissions.



As the temperature of the earth rises from increased emissions, climate change occurs. Mitigation is commonly used to describe the reduction of GHG emissions or efforts to reduce climate change. The term ***adaptation*** in the context of GHGs refers to adapting to the effects of the changing climate. A GHG emissions inventory is an estimate of GHGs emitted to, or removed from, the atmosphere over a specific period (usually one year). GHG emissions are measured in a unit called $MTCO_2e$, which is the abbreviation for ***metric tons of carbon dioxide equivalents***. $MTCO_2e$ is the official unit of measure for GHG emissions that combines multiple gases (e.g., carbon dioxide, methane, nitrous oxide) based on their relative global warming potential. Preparation of an emissions inventory provides the City with an understanding of where Raleigh's GHG emissions are coming from and serves as a starting point for developing strategies that can effectively reduce GHG emissions.

The City has developed GHG emissions inventories with data from the baseline year of fiscal year 2007 and for fiscal year 2014. The trend from 2007 to 2014 shows that community emissions have gone up by 2 percent, while Raleigh's population increased by 16 percent. According to Raleigh's 2014 community GHG emissions inventory, 5,489,378 $MTCO_2e$ were emitted that year. Figure 2-2 presents a graphical breakdown of these emissions by source:

- **Buildings & Energy** (56 percent of total emissions, including energy used in residential buildings, commercial buildings, and manufacturing industries).
- **Transportation & Land Use** (42 percent of total emissions, including on-road and off-road transportation).
- **Resilience & Cross Cutting** (2 percent of total emissions, including solid waste and wastewater).

The majority of community GHG emissions come from energy use in buildings (including homes and businesses) and transportation (mostly from single-occupancy vehicles). Many other areas, such as the waste that we generate, also contribute to GHG emissions in our community. The day-to-day decisions that all residents and visitors to Raleigh make in their lives are causing our emissions.

The City strives to set a good example by adopting best practices for reducing GHG emissions in City operations; however, City GHG emissions are less than 2 percent of the overall Raleigh community emissions. Everyone in the community will need to work together to have a larger collective impact on reducing Raleigh's GHG emissions. See Chapter 8 for more information on the City and community's role in implementing CCAP.

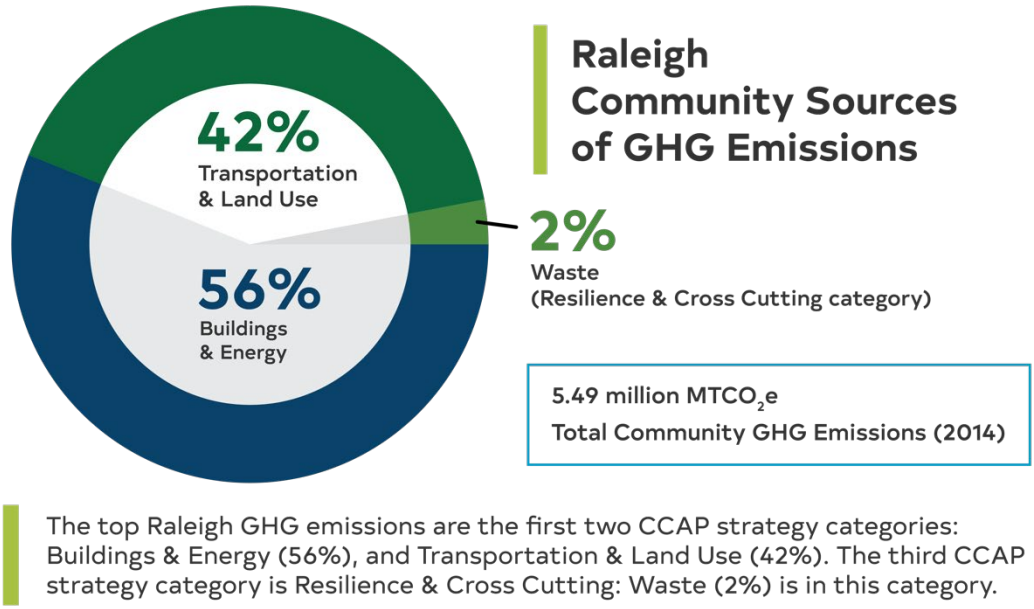


Figure 2-2. Sources of GHG Emissions in Raleigh

2.5 - **Creating the GHG Emissions Forecast**

An emissions forecast is a calculation that estimates future emissions based on an inventory of current emissions and projections of future growth and/or socioeconomic trends called "forecast drivers.

As noted, Raleigh's community goal is an 80 percent reduction of GHG emissions from the 2007 baseline by 2050. Raleigh's population and physical footprint have grown since the 2007 baseline inventory and are projected to continue growing through 2050, making this goal even more challenging. It is necessary to understand what Raleigh's GHG emissions might be in 2050 with no action or steps taken to reduce emissions or, as it is commonly referred to, the ***business-as-usual*** (BAU) scenario. To prepare an estimate of future GHG emissions, the project team evaluated potential factors or forecast drivers that could be applied to the most recent 2014 inventory to provide an estimate of BAU emissions through 2050.

Estimates of future population in Raleigh were readily available and provide a reliable forecast driver for future GHG emissions, since over 95 percent of Raleigh's GHG emissions are directly related to per capita energy use, vehicle fuel use, and consumption and disposal of goods—all of which contribute to GHG emissions. The project team evaluated both a 100-year trend of population in Raleigh and estimates from the ***North Carolina Capital Area Metropolitan Planning Organization*** (CAMPO), as shown in Figure 2-3, and selected the more conservative CAMPO model to estimate Raleigh's future population.

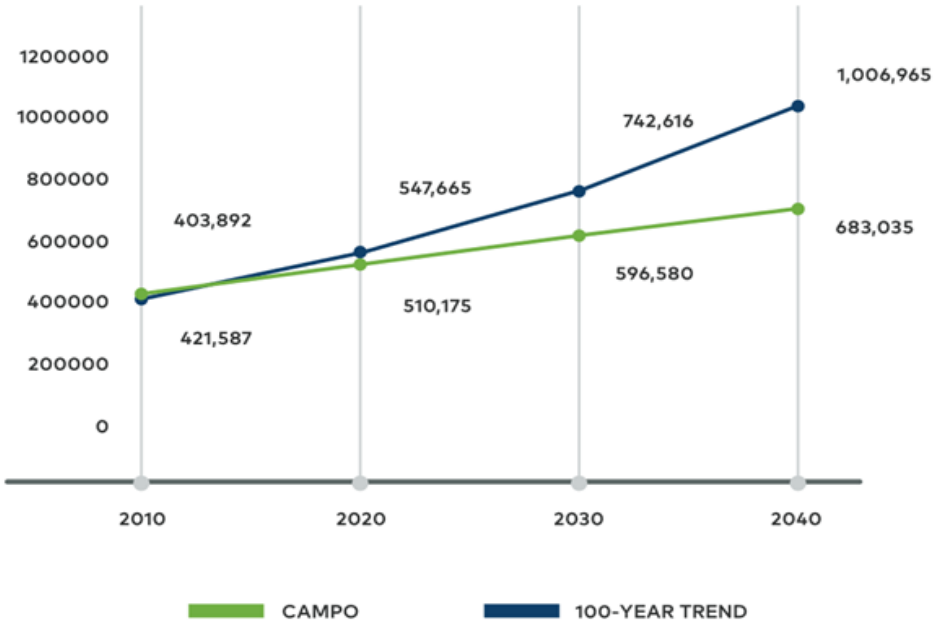


Figure 2-3. Projections Raleigh Population Growth

Source: Capital Area Metropolitan Planning Organization (CAMPO), U.S. Census Bureau, City of Raleigh Department of City Planning

The project team applied the CAMPO model's population forecast to the 2014 per capita emissions ($MTCO_2e$/person) in each category of GHG emissions to estimate future emissions. This BAU forecast, shown in Figure 2-4, will serve as the base case for strategy analysis and GHG emission reduction potential through 2050. The dashed line represents Raleigh's 2050 community goal of an 80 percent reduction in GHG emissions starting with the year 2020 when CCAP development and actions occurred.

When adjusted for this increase in population, this forecast shows Raleigh's GHG emissions rising from about 5.5 million $MTCO_2e$ in 2014 to over 9 million $MTCO_2e$ in 2050. This depicts what GHG emissions in Raleigh might look like if no action is taken to reduce emissions.

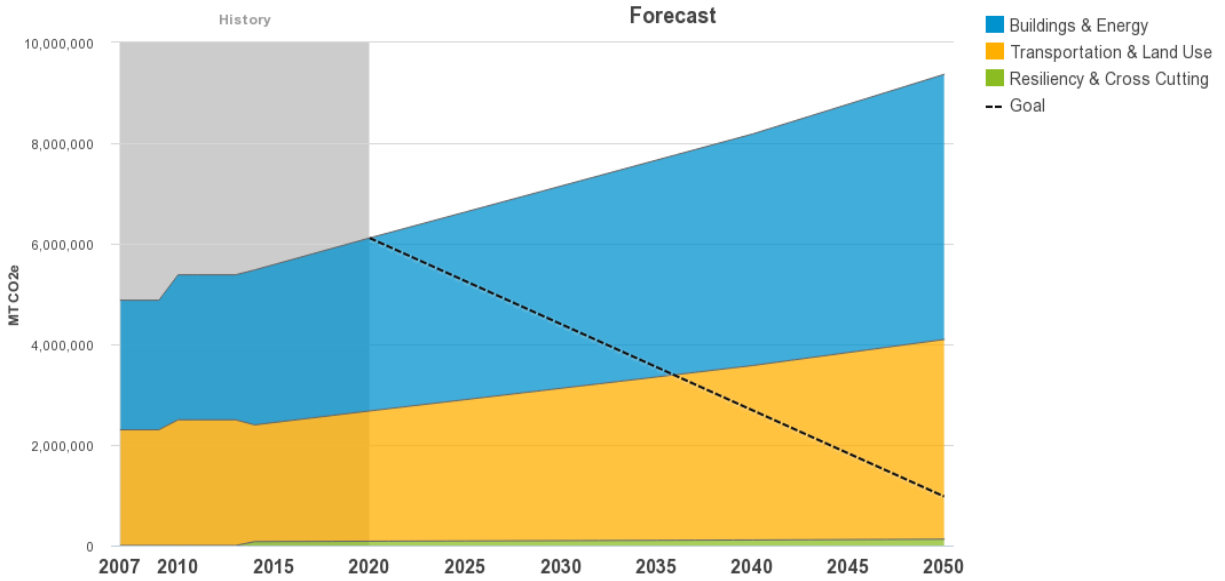


Figure 2-4. GHG Emission Forecast through 2050

2.6 - Development of GHG Mitigation Strategies and Actions for Impact

Through the course of multiple stakeholder engagements and surveys in the development of CCAP, over 600 potential strategies and actions to reduce emissions were identified by stakeholder participants, from other climate plans, and from a best practice review of high-impact strategies from other cities across the country. The project team considered all submissions and then sorted, consolidated, and organized these ideas into categories, strategies, and actions. As depicted in Figure 2-2 above, the final strategies were divided into three main categories of:

- **Buildings & Energy**
- **Transportation & Land Use**
- **Resilience & Cross Cutting**

These categories were designed to both align with the largest areas of GHG emissions in Raleigh (Buildings & Energy and Transportation & Land Use) to maximize GHG reduction potential, as well as to address strategies in the Resilience & Cross Cutting category, which includes cross cutting measures such as climate equity, financing, innovation, education, and outreach. Figure 2-5 shows these three categories broken down into their strategy areas. These strategy areas were created to provide focus specifically where the Raleigh community needs to take action to reduce GHG emissions, address equity and resilience, and create opportunities for successful implementation.

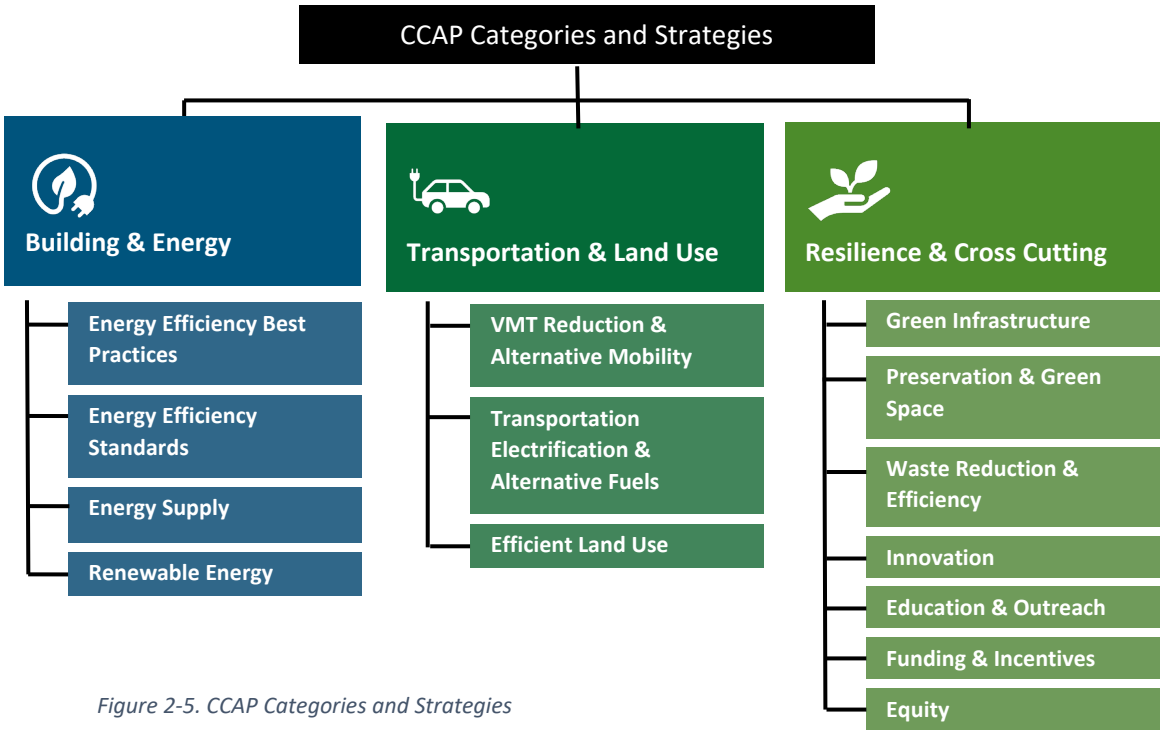


Figure 2-5. CCAP Categories and Strategies

After the strategy areas were created, further stakeholder input and research occurred, and more specific actions within each strategy were identified and described in detail. Actions were assessed for feasibility of implementation in the short term (0 to 7 years) or long term (8 to 30 years).

CCAP was designed to focus on taking immediate action and to maximize impact so the short-term actions were described and analyzed in more detail for more immediate implementation planning, while the long-term strategies provide a road map that can guide stakeholders in their longer-term action planning. The long-term strategies pull from specific topical plans, such as the State of North Carolina's Clean Energy Plan, and from technical experts who plan for the future of areas like buildings, energy, transportation, land use, etc. One example of the organization of the strategies is below in Figure 2-6. This figure shows an example of a category, strategy, action, and its associated description. A complete list of all strategies and actions and their analyses are provided in Chapters 5, 6, and 7.

Category	Strategy	Action	Example Action
Transportation & Land Use	Transportation Electrification and Alternative Fuels	Encourage and incentivize adoption of alternative fuel and electric vehicles, including personal vehicles and private fleets	Work to implement strategies as identified in the Transportation Electrification Study to encourage the community-wide transition to alternative and electric vehicles

Figure 2-6. Example of the Organization of Categories, Strategies, Actions, and Their Associated Descriptions

For CCAP strategy development, the actions and descriptions were purposefully written broadly to allow stakeholders and partners to more easily take ownership of their involvement in climate action and engage in a variety of actions as they fit into their individual lives, workplaces, and organizations. As discussed at the end of this chapter ("Roles and Responsibilities in Climate Action") and in Chapter 8

("Implementation"), stakeholder and partner involvement are key to the success of CCAP and to meeting our climate goals.

Barriers and Opportunities in Strategy Development

For short-term strategies and actions, additional analysis was conducted, including assessments of legality, equity implications, feasibility, and GHG reduction potential through 2050. Some of the assumptions developed for the forecasting and analysis of the strategies' GHG reduction potential were fairly conservative due to constraints on the authority of local government in North Carolina to require certain actions or impose mandates (such as requiring building to above-code construction). Climate strategies for cities in other states have varying approaches to short-term strategy design based on their regulatory authority. As a result of this, some of the action descriptions for CCAP contain language such as "promote," "encourage," and "incentivize" to reflect actions that the City and community have the autonomy to start working on right away, while other actions provide opportunities for CCAP stakeholders to work to break down implementation barriers over time (such as identifying ways to increase participation and impact). Considering the City does not currently have direct authority to require some GHG reduction actions (as compared to strategy approaches in other states) and that the City's operations contribute just 2 percent of the total community GHG emissions, the need for community stakeholders' direct involvement in taking action, partnering with the City and other stakeholders, and leading initiatives with high-impact potential are all critical to Raleigh's success in CCAP implementation. Chapters 5 through 7 discuss in further detail the opportunities for community stakeholders to take action in the CCAP strategy areas.

2.7 - GHG Reduction Modeling

Once the strategies and actions were developed and framed, the project team began a quantitative analysis of the strategies to determine their GHG reduction potential within the context of Raleigh's current activities and projected growth through 2050. Specific assumptions were then developed for each strategy regarding its effectiveness at reducing the following types of emissions: building energy use, the carbon content of energy used, vehicle usage, vehicular emissions, and emissions from waste. The estimates of those reductions were then entered into a customized model to calculate GHG emission reductions over time relative to the base case of GHG emissions growth (the BAU emissions forecast described previously). Note that not every strategy and action have a direct GHG reduction potential (such as cross cutting strategies like financing, education, and equity); therefore, those strategies and actions, while important to the success of the plan, were not modeled in this phase of the project.

The strategies and actions that were modeled are grouped into the following strategy areas (more information on these strategy areas can be found in Chapters 5, 6, and 7):

- Energy Efficiency Best Practices (EEBP)
- Energy Efficiency Standards (EES)
- Energy Supply (ES) and ***Renewable Energy*** (RE)
- Electric Vehicles (EV) / Alternative Fuel Vehicles (AFV)
- ***Vehicle Miles Traveled*** (VMT)
- Land Use (LU)
- Waste (W)

As illustrated in Figure 2-7, the strategies and actions developed, analyzed, and modeled through the course of the CCAP project are significant in terms of their GHG emission reductions and progress toward Raleigh's 2050 goal. The modeling as shown illustrates that Raleigh is close to meeting its 2050 goal, even when some of the theoretical estimates for reductions are based on conservative assumptions related to the current inability of the City to mandate and regulate certain actions (as discussed in "Barriers and Opportunities" above). All the strategies and actions will require the engagement and involvement of residents, business, community leaders, and other stakeholders to make them a reality, and there is real potential for these estimates and projections to be exceeded through the Raleigh community's engagement, innovative thinking, and hard work. This plan is designed to inspire collaboration, partnerships, and the flexibility to adopt new technologies and innovative approaches over time that will help us re-imagine how we can reach and exceed our GHG reduction goal. The next section and subsequent chapters will highlight how both the City and community stakeholders can take action.

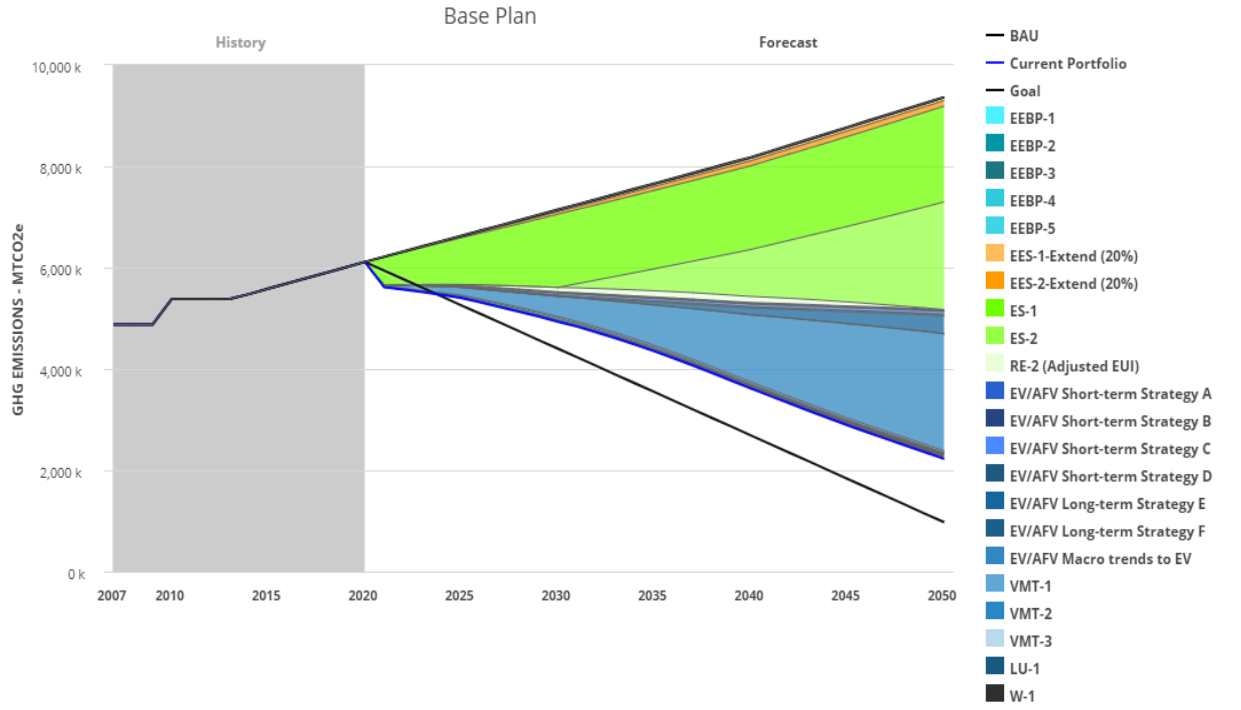


Figure 2-7. Cumulative GHG Emission Reductions from All Strategies Relative to Base Case Projections

2.8 - **Roles and Responsibilities in Climate Action**

The ongoing implementation of CCAP will require continued partnerships and collaborations, and for individuals on the ground to take action. Understanding the role of the City and the community can provide a foundation for maximizing the collective impact of implementation on climate change. These ongoing partnerships can also optimize implementation actions and partnership communications to support resilience and equitable outcomes.

City Roles and Responsibilities

Although the contribution to reducing GHG emissions from City operations is relatively small at 2 percent of total community emissions, there are still many ways that the City can greatly influence and guide change in the community.

The City's overall role in the implementation of CCAP includes:

- **Continuing to lead by example.**
- **Empowering the community by creating outreach and engagement, establishing key partnerships, and serving as a convener and collaborator.**
- **Investing resources in foundational work and evaluating budget priorities for CCAP implementation.**
- **Tracking progress on CCAP implementation, benchmarking, and performance.**
- **Regulating implementation of CCAP actions through City strategies, policies, plans, and codes.**
- **Continuing to build political will and buy-in for CCAP implementation**.

Community Roles and Responsibilities

CCAP could not have been developed without the critical input from the community and key partners, and CCAP cannot be implemented without the community playing a major role. Key stakeholders include government agencies, non-profit organizations, academia, private companies, and individual community members.

The community's overall role in the implementation of CCAP includes:

- **Participating in CCAP strategy-specific working groups.**
- **Being creative, innovative, and a leader.**
- **Investing time and resources into strategy and action implementation.**
- **Embedding CCAP actions into current and future work, planning, and daily life.**
- **Providing feedback and participating in new and existing ideas.**
- **Supporting CCAP implementation by taking action and empowering community networks.**

For more information on the City and community roles, high-impact partners, and specific stakeholders that have been involved in the CCAP process, see Chapter 8.

Summer Camp Program at Raleigh Parks

Chapter 3 - Supporting Climate Equity

Equity plays a significant role in climate action work, and the City of Raleigh and its project partners considered climate equity throughout the development of CCAP. Developing an equitable climate action plan begins with recognizing that not everyone is affected equally by the impacts of climate change or the implementation of climate action strategies. Many times, the communities that are most affected by climate change are those that contribute the least to GHG emissions. In compiling this plan, we therefore took a deliberate approach to integrate equity considerations from development through implementation planning of CCAP.

As a foundational step in the equity planning process, the CCAP project team and equity advisors developed definitions of "equity" and "climate equity." We also enhanced our understanding of how climate change impacts and climate action strategies affect Raleigh's diverse populations. These were essential steps to ensuring that the implementation of CCAP actions provide benefits across the community and that they do not cause more harm to those in our community who have been or will be most affected by climate change.

3.1 - **Building Equity into CCAP Development**

The equity information provided in the following chapters will give stakeholders a starting point on understanding climate equity and serve as a resource for community stakeholders as they begin to implement CCAP actions. This chapter will provide information on the three-phase process that informed the equity approach to CCAP development, which included building an understanding of equity and climate equity, evaluating equity during CCAP strategy development, and creating an Equity Impact Matrix to start to assess potential equity impacts of CCAP strategies. Equity considerations that

were identified in this assessment for CCAP strategies can be found in Chapters 5, 6 and 7 after the strategies and actions for each category (Buildings & Energy, Transportation & Land Use, and Resilience & Cross Cutting). These considerations provide further guidance for community stakeholders on embedding equity into the implementation of actions.

To ensure that equity considerations were included throughout the development of CCAP, the project team developed and followed a three-phase equity process shown in Figure 3-1.

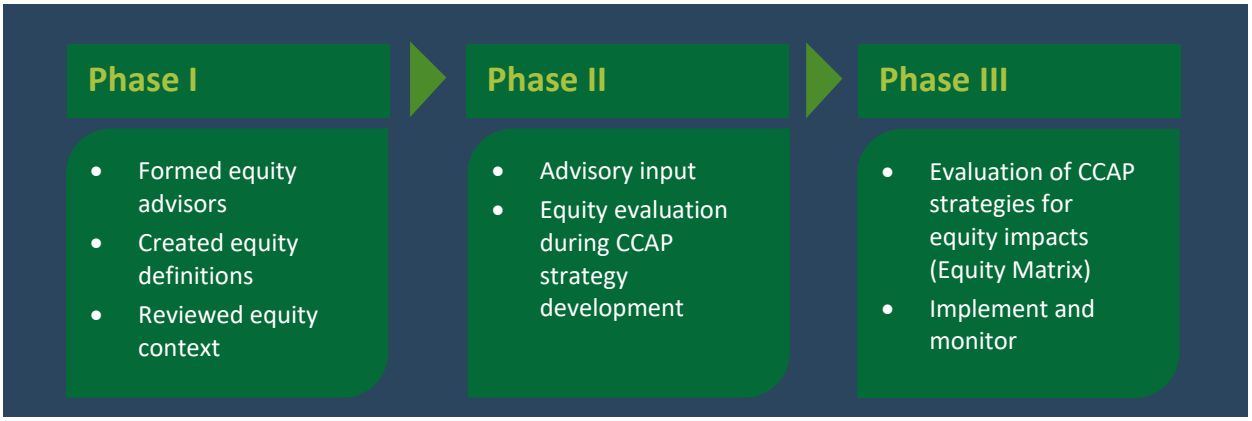


Figure 3--1. Phases of the CCAP Equity Process

3.2 - **Phase 1: Understanding Climate Equity in Raleigh**

Formed Equity Advisors

In the first phase of the equity process, a team of equity advisors was formed to provide guidance on evaluating information on social, economic, and climate factors and risks to understand climate-related disparities in Raleigh; reviewing other climate equity-related definitions and plans from cities and communities across the country; and creating climate and equity definitions that would then be adopted and used by all CCAP stakeholder teams to inform CCAP development.

Created Equity Definitions

While there was no community-wide approach or definition for equity at project outset, all CCAP stakeholder teams agreed upon and adopted the following the definitions early in Phase 1 of the project:

- **Equity** ensures that all people have access to the opportunities and resources necessary to meet their essential needs, support their well-being, and achieve their full potential. It is achieved when race, gender, age, national origin, disability, language access, creed, sexual orientation, gender identity/expression, or economic status do not determine or predict the distribution of resources, opportunities, benefits, and burdens for an individual group.
- **Climate equity** involves addressing responsibilities for GHG emissions contributions/generators, disproportionate distribution of climate change burdens and climate impact vulnerabilities, and just distribution of the benefits of climate protection efforts, as well as ensuring that the actions taken or not taken today do not cause disproportionate costs or impacts on future generations. This requires climate strategies that deal with the systems that contribute to climate change, the conditions that perpetuate existing inequities, and the effects of climate change and their distribution.

Reviewed Equity Context

In addition to the creation of the definitions, CCAP drew from prior work, including the Triangle Regional Resilience Assessment, to identify some key factors in the disproportionate impacts from climate change on certain populations.[1] The assessment identified the impacts of climate and non-climate stressors on people in the Triangle region and focused on socially vulnerable populations by applying the Centers for Disease Control and Prevention's (CDC) Social Vulnerability Index, examining ***metrics*** such as income level (e.g., living below the poverty line), households with disabilities, people age 65 and older, limited English speakers, and other factors. The CCAP team drew on this foundational research to inform its own social equity analysis, which considered the exposure rates, sensitivity, and capacity for adaptation among these different population groups during CCAP development.

Further information about equity impacts from climate change are provided below. This information helped inform the process for creating the next phases of equity development in CCAP, including the Equity Impact Matrix, which begins to evaluate the health, environmental, and economic impacts of CCAP strategies.

The relationship between health and climate change is particularly concerning for Raleigh's vulnerable communities. For example, communities of color and lower-income neighborhoods are often located in areas prone to flooding, causing health and safety hazards. Moreover, high GHG-emitting activities such as driving, lead to higher levels of air pollutants and poor air quality, which disproportionately affect youth, seniors, and health-compromised individuals, increasing their risk for air-quality-related respiratory conditions (e.g., asthma). Longer periods of extreme heat can exacerbate allergies (through increased pollen), lead to higher rates of heart disease and other health conditions, and increase the risk for heat stroke—particularly among outdoor workers and older adults. On the opposite end of the temperature spectrum, extreme cold is most threatening to homeless and low-income populations, who are at heightened risk of suffering hypothermia.

These adverse health effects mean that access to healthcare is critical for the Triangle's vulnerable communities. However, the increased frequency and intensity of extreme weather events that result from climate change could lead to more hospitalizations, potentially overloading medical facilities in low-income areas. Additionally, extreme flooding in vulnerable areas could block routes to health-related facilities for residents and emergency vehicles, and many rural populations live in isolated areas that are more than an eight-minute drive from a medical service location or fire station.

Other climate change effects and potential disparities include the following:

- Property values in communities of color and lower-income neighborhoods that are prone to flooding may be at risk due to ***bluelining***, a process in which banks avoid lending to people in flood-prone areas, thus resulting in reduced property values.
- Inadequate insulation in less-expensive housing stock results in higher energy costs for residents, reduced ability to have adequate heating or cooling, and greater emissions.
- Less educated residents or those with limited English proficiency might lack awareness and information about climate change and thus be more at risk for experiencing disproportionate impacts.

[1] https://cityofraleigh0drupal.blob.core.usgovcloudapi.net/drupal-prod/COR27/trrptechnicalreport.pdf

- In many cases, a community, neighborhood, or individual population group will experience multiple effects and disparities that compound their overall vulnerability to impacts. For example, a single neighborhood may contain flood-prone areas while also experiencing poor air quality due to industry or transportation, have lower-quality construction for housing, and lack green space.
- In addition to these more extreme climate impacts, continued growth and development in Raleigh is also increasing the social vulnerability of low-income individuals and communities of color. The TRRP's Triangle Regional Resilience Assessment found that the region's population grew more than 250 percent between 1970 and 2016. This continued population growth, along with above average wages, further exacerbates demand for newer houses and urban sprawl. Many socially vulnerable populations lack access to affordable housing, jobs, and other resources and services.[2]

Figure 3-2. Equity Process

3.3 - Phase 2: Incorporating Equity During Strategy Development

After creating an equity context to understand climate equity in Raleigh in Phase 1, the first step for incorporating this context into strategy development in Phase 2 was sharing that early information and getting input and feedback from stakeholders. Figure 3-2 depicts Phase 2 of the City's equity process.

Stakeholder Input
The project team met with the equity advisors and other stakeholder teams to solicit their input on equity-related strategies, priorities, and partnerships needed for CCAP implementation.

Strategies Development
The equity advisors helped develop criteria and input that would inform the development process of strategies with the CCAP stakeholder teams. As the CCAP strategies were created, this information was used to evaluate equity in relation to the strategies and actions. After the strategies were developed, an evaluation of equity was done to identify:

- Strategies that *directly* support equity, including various community resilience strategies and actions.
- Strategies that *inherently* deliver an equity component (i.e., a co-benefit).

Across CCAP, many measures that are not directly intended to address equity still relate to equitable outcomes. For example, the Raleigh community relies on transit. Therefore, transit strategies such as implementing the Wake Transit Plan will deliver not only GHG reduction benefits, but also will *inherently* deliver equitable outcomes for transit-dependent populations (along with other co-benefits like better air quality).

For CCAP development, strategies were not only identified for GHG impact, but also resilience and equity impact. With that in mind, the third high-impact area of the CCAP strategy categories was

[2] Page 5. https://www.tjcog.org/sites/default/files/uploads/trrp_report_technicalreport_102418.pdf

identified to be the Resilience & Cross Cutting category, where cross cutting measures could be developed that may also provide co-benefits across multiple strategy areas.

Cross Cutting Strategies Implementation Approach
Four of CCAP's strategies—those regarding ***equity, innovation, education and outreach*****,** and ***funding and incentives***—are cross cutting. These strategies will have no direct impact on GHG mitigation, but rather provide for a qualitative lens to be applied to the implementation of the other CCAP strategies. They guide how all CCAP stakeholders working on implementation can go about designing interventions, identifying resources, prioritizing partners, and working with communities.

The following questions are provided for CCAP stakeholders to use as they start to implement actions. These provide opportunities for thoughtful reflection on prioritizing equity in implementation:

- *Who benefits from this work/project/program? Who is left out?*
- *Who are we working with? How do we work with partners to make the most of resources, open new funding stream opportunities, test new technologies, and reach different communities?*
- *What tools and techniques are we utilizing?*
- *What public and private funds—and human resources—are available for projects?*

3.4 - **Phase 3: Developing the Equity Impact Matrix**

In Phase 3, the CCAP Equity Impact Matrix was created to review the distribution of benefits and burdens of the CCAP strategies across the Raleigh community. The CCAP climate equity definition was used as a guide to create the equity considerations for the Equity Impact Matrix.

In this section, a summary of the Equity Impact Matrix exercise completed by City staff and community stakeholders is provided, which includes an overview of the initial analysis of equity impacts. The results of this matrix—the specific equity considerations of strategies—are included with the strategies and actions in Chapters 5, 6, and 7.

The Equity Impact Matrix contains a detailed set of factors across which there may be differential impacts for distributional, procedural, or intergenerational equity. As the community considers equity from a climate action perspective, it needs to consider these three dimensions:

- **Distributional equity:** How the costs, benefits, opportunities, and burdens of climate change and climate action are spread across our community.
- **Procedural equity**: How the process that the City and community have used to create and implement this plan take into consideration the priorities and perspectives of the people these strategies affect in our community.
- **Intergenerational equity**: How our action or inaction now affects the lives and livelihoods of future generations of Raleigh residents.

Equity Impact Matrix
In October 2020, the City of Raleigh Office of Sustainability convened City staff and external stakeholders in the CCAP process to review the short-term CCAP strategies against a set of equity indicators. The list of indicators and methodology were adapted from work done by the State of Georgia in their review of Project Drawdown[3] strategies for GHG emissions reductions. The chart below (Figure

[3] www.drawdown.org

3-3, pages 22-24) provides an image of the completed Equity Impact Matrix. It is provided here for illustrative purposes. To view the Equity Impact Matrix image in a larger format, see Appendix B.

		Buildings and Energy								
		Energy Efficient Practices				Energy Efficiency Standards		Energy Supply	Renewable Energy	
		EEBP1	EEBP2	EEBP 3	EEBP 4	EES 1	EES 2	ES	RE r	RE c
Environment	Air Quality									
	Water Quality and Quantity									
	Land Use Change									
	Ecosystems - Biodiversity									
	Material Disposability, Waste/Reuse Options									
	Cultural Fit and Way of Life									
	Distribution of Environmental Impacts									
Economic Development and Jobs	Local Economy and local employment									
	Accessibility of Solutions									
	Input Prices									
	Workforce Composition									
	Wages and Benefits: Living Wage									
	Gentrification									
	Property Values/taxes									
	Infrastructure requirements									
	Affordability (cost of living)									
	Distribution of Economic Development									
Public Health	Premature mortality/ life expectancy									
	Morbidity									
	Quality of life									
	Educational Attainment									
	Public Safety									
	Distribution of Public Health Impacts									

		Transportation and Land Use									
		Efficient Land Use	VMT Reduction and Alternative Mobility						Transportation Electrification and Alternative Fuels		
		LU	VMT 1	VMT 2	VMT 3	VMT 4	VMT 5	VMT 6	EV 1	EV 2	EV 3
Environment	Air Quality										
	Water Quality and Quantity										
	Land Use Change										
	Ecosystems - Biodiversity										
	Material Disposability, Waste/Reuse Options										
	Cultural Fit and Way of Life										
	Distribution of Environmental Impacts										
Economic Development and Jobs	Local Economy and local employment										
	Accessibility of Solutions										
	Input Prices										
	Workforce Composition										
	Wages and Benefits: Living Wage										
	Gentrification										
	Property Values/taxes										
	Infrastructure requirements										
	Affordability (cost of living)										
	Distribution of Economic Development										
Public Health	Premature mortality/ life expectancy										
	Morbidity										
	Quality of life										
	Educational Attainment										
	Public Safety										
	Distribution of Public Health Impacts										

		Resilience and Cross-Cutting							
		Green Infrastructure		Preservation and Green Space	Waste Reduction and Efficiency				Innovation
		GI 1	GI 2	PGS	WRE 1	WRE 2	WRE 3	WRE 4	Inno
Environment	Air Quality								
	Water Quality and Quantity								
	Land Use Change								
	Ecosystems - Biodiversity								
	Material Disposability, Waste/Reuse Options								
	Cultural Fit and Way of Life								
	Distribution of Environmental Impacts								
Economic Development and Jobs	Local Economy and local employment								
	Accessibility of Solutions								
	Input Prices								
	Workforce Composition								
	Wages and Benefits: Living Wage								
	Gentrification								
	Property Values/taxes								
	Infrastructure requirements								
	Affordability (cost of living)								
	Distribution of Economic Development								
Public Health	Premature mortality/ life expectancy								
	Morbidity								
	Quality of life								
	Educational Attainment								
	Public Safety								
	Distribution of Public Health Impacts								

Figure 3-3. Equity Impact Matrix

The Equity Impact Matrix provides a high-level view of potential impacts of each strategy on **environmental, economic,** and **public health** factors. Participants were asked to analyze each CCAP strategy against these factors and provide a simple stoplight analysis of its potential impacts:

- **Red:** negative impacts anticipated
- **Yellow:** potential trade-offs/not enough information to determine impacts
- **Green:** positive impacts anticipated
- **Blank:** no impacts anticipated

A macro-level view of the completed Equity Impact Matrix gives the picture of:

- Net positive **environmental** impacts from CCAP strategies.
- A mostly positive impact on **public health**, though with concerns about the distribution of those health impacts.
- Some necessary **economic** trade-offs and potential pitfalls, which the City and its CCAP partners will need to plan for carefully.

The environmental impacts of climate action planning are to be expected. Most GHG-emitting activities produce other types of pollution as well. Curbing or curtailing GHG-emitting activities can also have a positive impact on air quality, reducing runoff into streams and rivers and creating more space for biodiversity and healthy ecosystems. Additionally, while the public health benefits of pollution reduction are widely recognized, these may not be evenly spread across our community in all cases. Finally, many climate action strategies come at a high cost to implement, and while they can have positive impacts on the job market and economic growth, communities may also experience an increased cost of living. From an intergenerational perspective, it will be important to closely analyze cost-of-living impacts against the cost of managing climate-related impacts that the Raleigh community will experience if it fails to act to mitigate or adapt to climate change.

3.5 - **Moving Forward Equitably**

The City of Raleigh cannot achieve equity alone; instead, implementing and supporting climate equity in climate action strategies will depend on the involvement of the entire community. Moving forward from this analysis and keeping these broad patterns in mind, implementers of CCAP strategies will need to seek financing instruments, partner relationships, and community engagement mechanisms that will address potential pitfalls and encourage broad participation in climate action. As implementers embark on these activities, equity-related information and data reflecting on questions about equity, CCAP cross cutting strategies, and the Equity Impact Matrix discussed in this chapter can help inform implementation strategies that are inclusive, transparent, and well-integrated throughout the community.

In our community, energy and transportation are the largest categories of GHG emissions. We know that these categories represent high expenses for Raleigh households: that many in our community struggle with a high energy burden (percent of energy bill costs relative to household income) and low levels of access to transportation options (access to transit and/or the prohibitive cost of vehicle ownership). The effects of climate change are and will continue to disproportionately impact low-income households, and people with fewer resources to respond will be more exposed to extreme heat and higher flood risks. *In our community, like many across the country, these disparities commonly appear along racial*

lines. It is our responsibility to ensure that our climate action solutions do not create additional burdens for low-income households or people of color and to work to equitably distribute the costs and the benefits of climate action.

During CCAP development, the City of Raleigh created its first equity team and resources to address equity organization-wide. City staff participated in the development of this approach, and the Office of Sustainability worked with City departments to embed climate equity into existing equity-related initiatives, programs, and outreach. See the City of Raleigh's Equity Statement in Figure 3-4 below. City staff will continue to work to embed equity into City services, and the CCAP equity resources will continue to serve as a resource and guide for implementing strategies with climate equity in mind.

City of Raleigh's Equity Statement

Equity is already embedded in many City of Raleigh processes. As such, the CCAP aligns with and builds upon the citywide approach laid out in the following equity statement, which prioritizes racial equity to dismantle the policies and systems that have created and sustained inequities:

"The Oty of Raleigh is committed to establishing and advancing an equitable community for all. Because we know that race is the primary predictor of a person's outcomes across all social indicators and societal systems, the City of Raleigh will prioritize racial equity to dismantle the policies and systems that have created and sustained these inequities."

"Inequities in our systems and policies are costly and limit positive outcomes and quality of life for all of us. When we achieve racial equity, all people in Raleigh will benefit from a more just, equitable system. Raleigh aspires to be a model for equity in local government."

Figure 3-4. City of Raleigh Equity Statement Adopted in June 2020

As mentioned throughout this plan, in addition to the focus on reducing GHG emissions and incorporating equity throughout CCAP development, there was also an effort to address how the community will become more resilient and adapt to climate change. The next chapter focuses on building community resilience.

Stormwater Project

Chapter 4 - Building Community Resilience

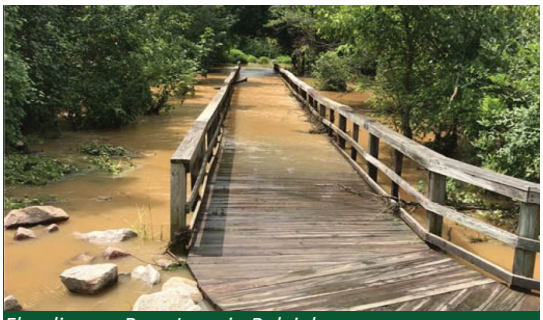
Resilience is the ability to prepare for, withstand, respond to, and recover from a disruption to normal life. As Raleigh continues to experience the impacts of climate change, these disruptions will become more frequent and stronger, and they will last longer. Resilience planning requires accounting for short-, medium-, and long-term investments in infrastructure and community capacity in relation to anticipated climate impacts and disruptions.

***Resilience** is the ability to prepare for, withstand, respond to, and recover from a disruption to normal life.*

Strengthening community resilience not only means planning for our communities to develop equitably, but also rebuilding better following a disruption. Raleigh communities will not experience or react to the effects of climate change impacts the same way. For many, climate change-related natural disasters will be costly and require years of financial recovery. Therefore, we must also ensure an equitable approach to resilience planning so that the most vulnerable members of our community are protected, and so Raleigh's environment is preserved for everyone's benefit and enjoyment. Everyone in the community has a role in addressing climate change impacts, and together, we can build a resilient Raleigh.

4.1 - **Building Resilience into CCAP Development**

The climate action planning process took into consideration climate equity and resilience across short-, medium-, and long-term timeframes. This chapter will provide information on the plans and resources that informed the resilience approach to CCAP development, then provide an overview of anticipated climate impacts and how our community might experience these impacts. The resilience information provided in this chapter is for community stakeholders to use as a resource as they work to implement


Flooding on Rose Lane in Raleigh

CCAP actions. It will give stakeholders a starting point on building resilience into their short- and long-term plans and provide connection points for neighbors, businesses, organizations, and individual Raleigh residents to build connections and partnerships that also further strengthen the ties that build community resilience. An evaluation of resilience considerations for CCAP strategies was conducted using the resources and information gathered for CCAP development and shared in this chapter. These resilience considerations for strategies can be found in Chapters 5, 6, and 7 after the strategies and actions for each category (Buildings & Energy, Transportation & Land Use, and Resilience & Cross Cutting). These considerations provide further guidance for community stakeholders on embedding resilience into taking action.

Resilience considerations were included throughout the development of the CCAP project. Three key resources were used to inform the resilience approach to the CCAP development process:

- The Triangle Regional Resilience Assessment
- The Wake County Hazard Mitigation Plan
- The North Carolina Climate Science Report

The City of Raleigh's resilience work began with the Triangle Regional Resilience Assessment. The TRRP was a collaboration between six regional jurisdictions and the assessment was completed in 2018. The assessment provided recommendations about community resilience concerns and needs in a unified report that assessed resilience at a regional scale. The information from the assessment provided insights and valuable information for communities with shared boundaries to leverage similar strategies. Further information about the TRRP and the assessment results are provided in this chapter.

The 2019 Wake County Hazard Mitigation Plan was also built into CCAP development. The plan develops mitigation strategies to minimize human casualties and property damage from the effects of natural and human-caused hazards. It does this by identifying, assessing, and mitigating hazard risks. It also provides information on relevant hazards and vulnerabilities and identifies and outlines strategies to decrease vulnerability and increase resiliency. This plan is tied to processes to apply for federal and other recovery-related funding when a jurisdiction needs assistance. The City of Raleigh's Office of Sustainability began participating in the update to this plan and provided information to tie the Hazard Mitigation Plan to resilience priorities that were developed through the CCAP process. As Raleigh continues to experience the impacts of climate change disruptions, there may be opportunities to tie CCAP actions to future funding to build community resilience.

The North Carolina Climate Science Report (2020) is a scientific assessment of historical climate trends and potential future climate change in North Carolina. North Carolina-based climate experts authored the report, and the work was informed by the Fourth National Climate Assessment.[4] Understanding the climate trends and climate stressors helped inform the CCAP resilience approach and priority areas for action.

[4] https://nca2018.globalchange.gov/

As mentioned above, the following resilience information in this chapter is provided for community stakeholders to use as a resource as they work to implement CCAP actions.

4.2 - **Anticipated Climate Impacts in Raleigh**

Climate change will have wide-ranging and systemic impacts on our natural and man-made systems. The nature and amplitude of these impacts is linked to the amount of warming anticipated. It is important to note that the likelihood, frequency, and strength of climate impacts are linked to the effectiveness of mitigation measures worldwide. Raleigh's climate change mitigation strategies are one piece of a much larger puzzle. Our actions are necessary to reach a global solution but are not sufficient on their own. The impacts we feel in Raleigh will be a result of efforts by many others inside and outside our community borders. This means that we must plan for and adapt to the impacts of climate change simultaneously with attempting to mitigate those effects.

Climate and Non-Climate Stressors

- *Increasing **extreme precipitation events** that lead to more frequent local flooding.*
- *Increasing **temperatures and temperature variability.***
- *Increasing frequency and duration of **drought conditions.***
- *Robust **population growth** leading to an increasing demand for resources and services and increasing social vulnerability.*

We are already experiencing the effects of climate change. Historical data suggest that in the Southeast United States, we are experiencing more frequent, longer-lasting heat waves; more frequent heavy rains and storms; more frequent warm nights; and the effects of ocean warming in the form of hurricanes with stronger winds and heavier rains. All of these impacts are taking place in the context of rapid population growth for the Triangle region. Some estimates suggest that Raleigh's population could increase by 50 percent in the next 30 years.[5] Higher population means more development and infrastructure; more impervious surfaces; and more people in need of protection from storms, floods, and extreme heat.

*An **impervious surface** is a hard area that does not allow water to seep into the ground. A **pervious surface** allows water to seep through to the area underneath.*

An increase in impervious surfaces affects the amount of runoff and flooding, how quickly that water will flow, and the amount of pollution that will be picked up and carried with that water.

[5] Capital Area Metropolitan Planning Organization (CAMPO)

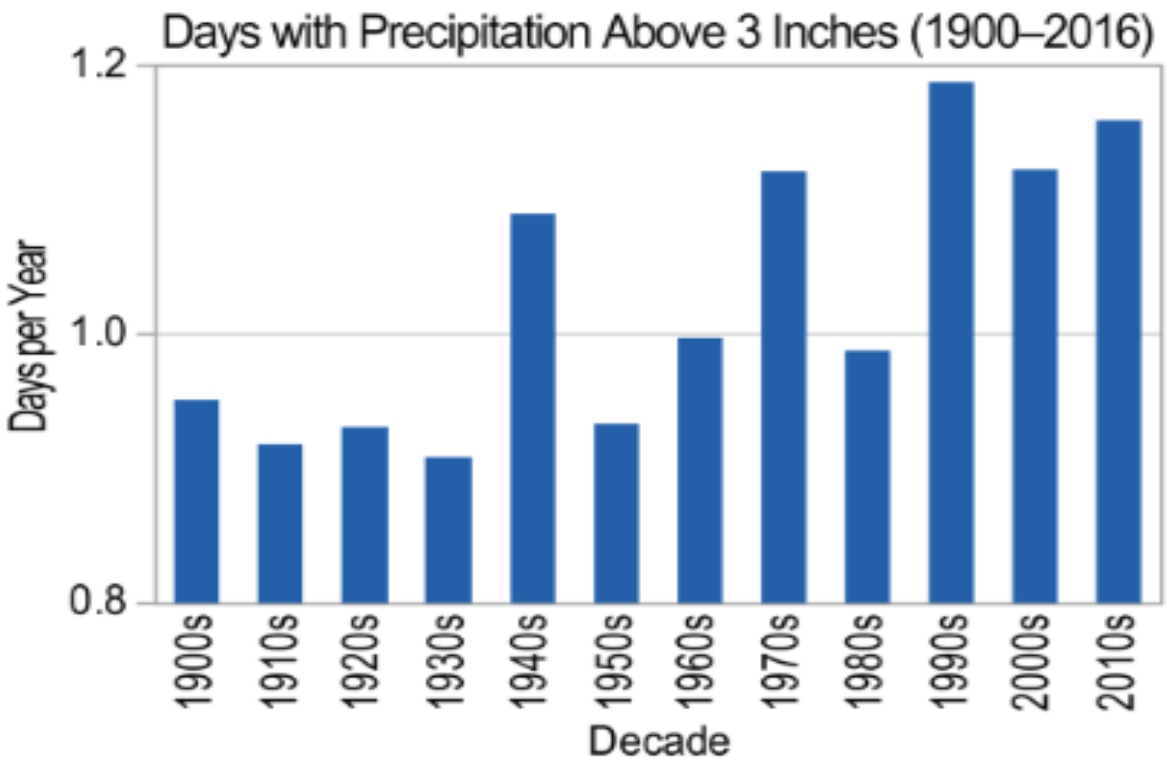


Figure 4-1. Historic heavy rainfall in U.S. Southeast. Source: Fourth National Climate Assessment, Volume II Impacts, Risks and Adaptation in the United States, Chapter 19: Southeast https://nca2018.globalchange.gov/chapter/19/

Figure 4-1 shows 120 years of data from extreme precipitation events. This shows a trend toward more days per year of extreme rain events. These events cause flooding and can lead to infrastructure failures, tree loss, sink holes, and other hazardous conditions. In Raleigh, we have experienced extreme flooding affecting roads, properties, and buildings, which can strand people in their homes, restrict travel into and out of neighborhoods, and damage structures. The four years from 2015 to 2018 had the greatest number of these events in North Carolina since 1900.[6]

[6] Kunkel, K.E, et. al. 2020: North Carolina Climate Science Report. North Carolina Institute for Climate Studies, 233 pp. https://ncics.org/nccsr

Though we are likely to see more variable precipitation over time, with periods of drought and periods of heavier precipitation, the North Carolina Climate Science Report (2020) projects trends toward wetter weather overall in the state in the next 40 years.

While the Southeast has always experienced warm summers, for the past two decades, we have been experiencing a trend toward more days per year of extreme heat. Hot days create physical stress for people and can be hazardous to the elderly, the very young, people with pre-existing medical conditions, and those who work outdoors. This trend is predicted to continue in the coming decades of the 21st century (see Figure 4-2).

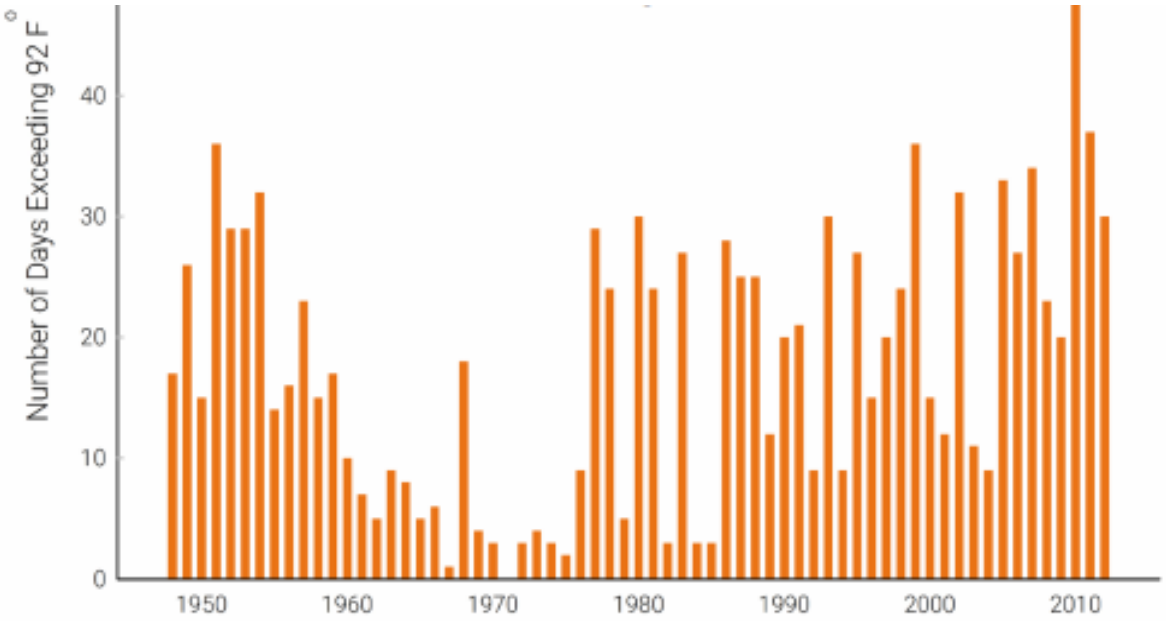


Figure 4-2. Number of Days Exceeding 92°F

In addition to hot days, we are also experiencing increasing numbers of warm nights. Nights where temperatures do not drop below 75° Fahrenheit (F) do not offer buildings and people the chance to cool down, and this maintains a high level of stress on the body. These nights can be particularly hazardous for people without adequate cooling in their homes. Warm nights also cause problems for plant growth. Models in the North Carolina Climate Science Report show increasing numbers of warm nights in the early part of the 21st century (see Figure 4-3).

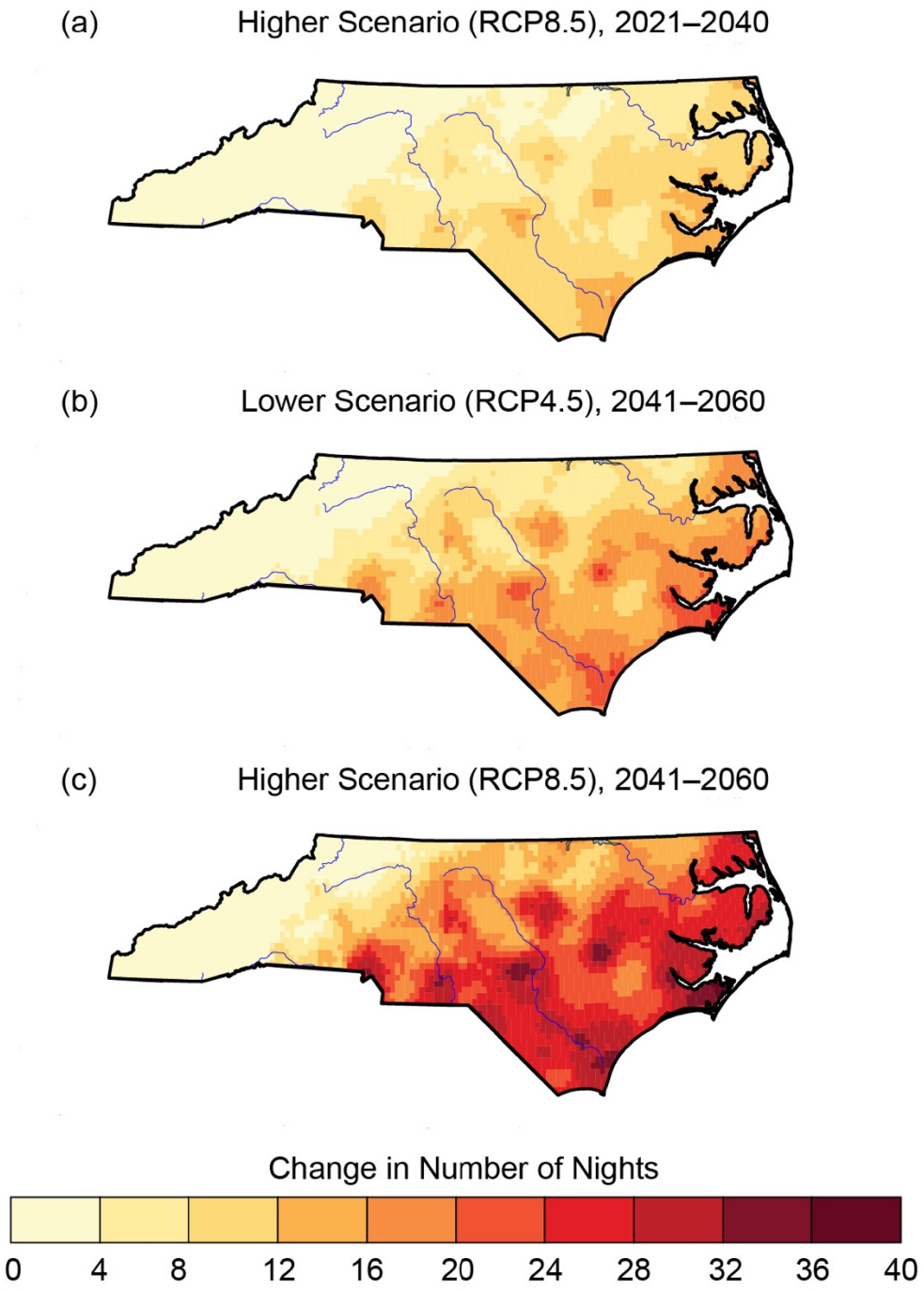


Figure 4-3. These maps show projected changes in average number of warm nights in North Carolina (above 75°F). Source: North Carolina Climate Science Report 2020

While winter storms and thunderstorms are frequent weather events in the Southeast, there is evidence to suggest that these storms could become more frequent over time. These storms bring high winds, thunder and lightning, and rain, all of which can cause damage to homes and other buildings, cause power outages, and create hazards to human life. During the summer months, warm water in the tropics leads to tropical storms and hurricanes in the Atlantic, which can affect North Carolina. Though Raleigh is located over 100 miles from the coastline, the effects of these storms are frequently felt in our community. As warming trends continue globally, ocean temperatures are rising. The North Carolina Climate Science Report states that as "the intensity of the strongest hurricanes is **likely** to increase with warming, this could result in stronger hurricanes impacting North Carolina. … Heavy precipitation accompanying hurricanes is **very likely** to increase, increasing freshwater flood potential" (emphasis in original).[7]

The climate impacts noted above are those most likely to affect the Raleigh area in the next few decades. In addition to these anticipated impacts, Raleigh may also experience more frequent wildfires on the urban-wildland fringe at the outskirts of the community, more unpredictable winter weather, more frequent or longer-lasting drought conditions, more extreme temperatures and temperature variability, in addition to other hazards. These are all likelihoods we should be prepared for and ready to address over time.

4.3 - How Our Community Will Experience Climate Impacts

Identifying who or what is vulnerable to climate change impacts requires an analysis of three factors:

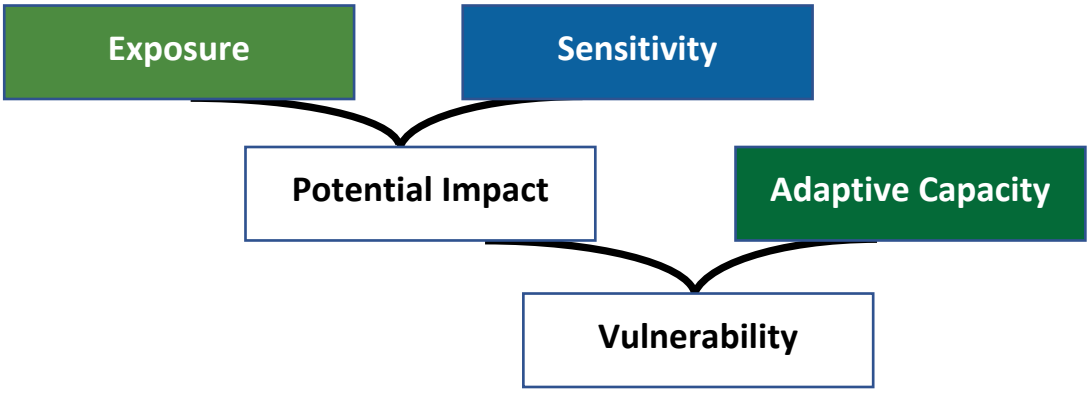


Figure 4-4. Vulnerability Flow Chart

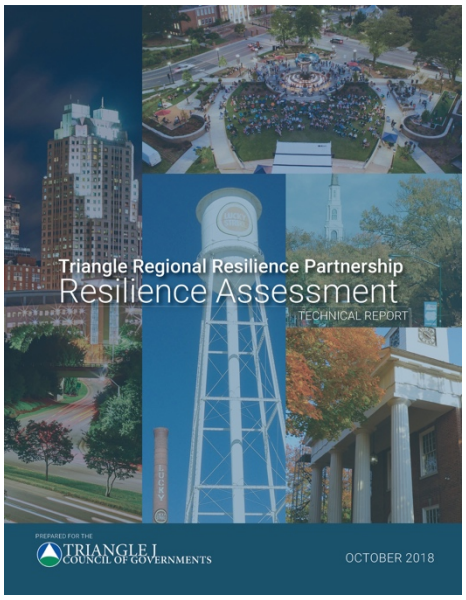
- **Exposure:** What things (people, properties, roads, electrical grid, etc.) are in harm's way? For example, the number of properties in the floodplain. These properties are ***exposed*** to flooding.
- **Sensitivity:** How much a disruption will damage or harm something or someone. For example, if two houses are located the same distance from a stream, they are equally exposed, but if one has a higher foundation, it is less ***sensitive*** to flooding.
- **Adaptive capacity:** The ability to deal with disruptions. There are many factors that contribute to adaptive capacity, such as resources and community cohesion. Some communities have a

[7] Kunkel, K.E, et. al. 2020: North Carolina Climate Science Report. North Carolina Institute for Climate Studies, 233 pp. https://ncics.org/nccsr p. 86

higher adaptive capacity than others, and so they are able to bounce back from a disruption faster.

Taken together, these three factors can give us a sense of who (people) and what (infrastructure, environment, etc.) are most vulnerable to a particular impact. By looking at the combination of exposure and sensitivity, we get a sense of what the potential impact to a given asset might be. A property with high exposure to flooding that also has a house with high sensitivity is likely to experience a large impact, so this property and the associated home are at high risk. Adaptive capacity comes in many forms. It can be financial security, insurance, and/or a history of dealing with natural disasters or adaptable infrastructure (e.g., homes ready-built with easy-to-install storm windows). It can also exist in community connectedness and cultural bonds among neighbors, which add communal resources to an individual's resources and provide social and psychological support during emergency situations.

More adaptive communities are less vulnerable to hazards. When we talk about resilience, we need to bear in mind that everyone might experience the same storm, drought, or heat wave, but that people will feel the impacts of those disruptions differently. Two homes may flood, but if one is insured and one is not, the family that is uninsured will not be able to bounce back as quickly. Often, low-income and minority communities are more exposed to disasters because their neighborhoods are located near a floodplain or have fewer street trees and green space. They may also be more sensitive to impacts because of the age or quality of their housing stock, and so overall, they may have lower adaptive capacity than wealthier and white communities.



TRRP's Resilience Assessment

As mentioned earlier in this chapter, the TRRP's Triangle Regional Resilience Assessment[8] is the culmination of a year-long partnership among regional jurisdictions in the Triangle area. The City of Raleigh collaborated with the City of Durham, the Town of Chapel Hill, the Town of Cary, Durham County, and Orange County to assess climate and non-climate risks and stressors and develop regional options to address them. The data contained in this assessment are invaluable for prioritization and planning of resilience initiatives. The assessment shows overlapping impacts of risks and adaptability. While it is important to understand how climate change will have impacts on our community, the vital factor to understand for planning purposes is how these changes will be experienced differently by different populations. This understanding will help identify priorities for resilience planning and tailor programs and projects to the needs of specific communities.

A variety of both climate and non-climate stressors affect people's sensitivity and ability to adapt to climate change impacts. Anticipated climate stressors in the Triangle region identified by the assessment include extreme precipitation, increasing temperatures, and increased frequency of drought, both at the individual and community level.9 Key non-climate

[8] https://cityofraleigh0drupal.blob.core.usgovcloudapi.net/drupal-prod/COR27/trrptechnicalreport.pdf
[9] https://cityofraleigh0drupal.blob.core.usgovcloudapi.net/drupal-prod/COR27/trrptechnicalreport.pdf

stressors to the Raleigh community include rapid population growth, demographic differences, housing and infrastructure, health, and income.

Figure 4-5, from the Triangle Regional Resilience Assessment, shows areas of the region with high flood risk overlaid with the CDC Social Vulnerability Index.[10] The Social Vulnerability Index is meant to "identify communities that will need continued support to recover following an emergency or natural disaster"—in the Resilience Assessment, this tool was used to indicate community adaptive capacity. It includes 15 social factors like socioeconomic status, race, housing and transportation access, and household composition.[11] From Figure 4-5, we can infer that we should anticipate communities living in the darker shaded areas that are also experiencing social vulnerability will take longer to bounce back from flood events. These communities will need additional resources and support to minimize flood risk in their neighborhoods by reducing flood exposure, reducing building and road sensitivity to flooding, and increasing the community's capacity to prepare for and recover from a flood event.

[10] https://www.atsdr.cdc.gov/placeandhealth/svi/index.html
[11] CDC Social Vulnerability Index fact sheet
https://www.atsdr.cdc.gov/placeandhealth/svi/fact_sheet/pdf/SVI_FactSheet_v10152020-H.pdf

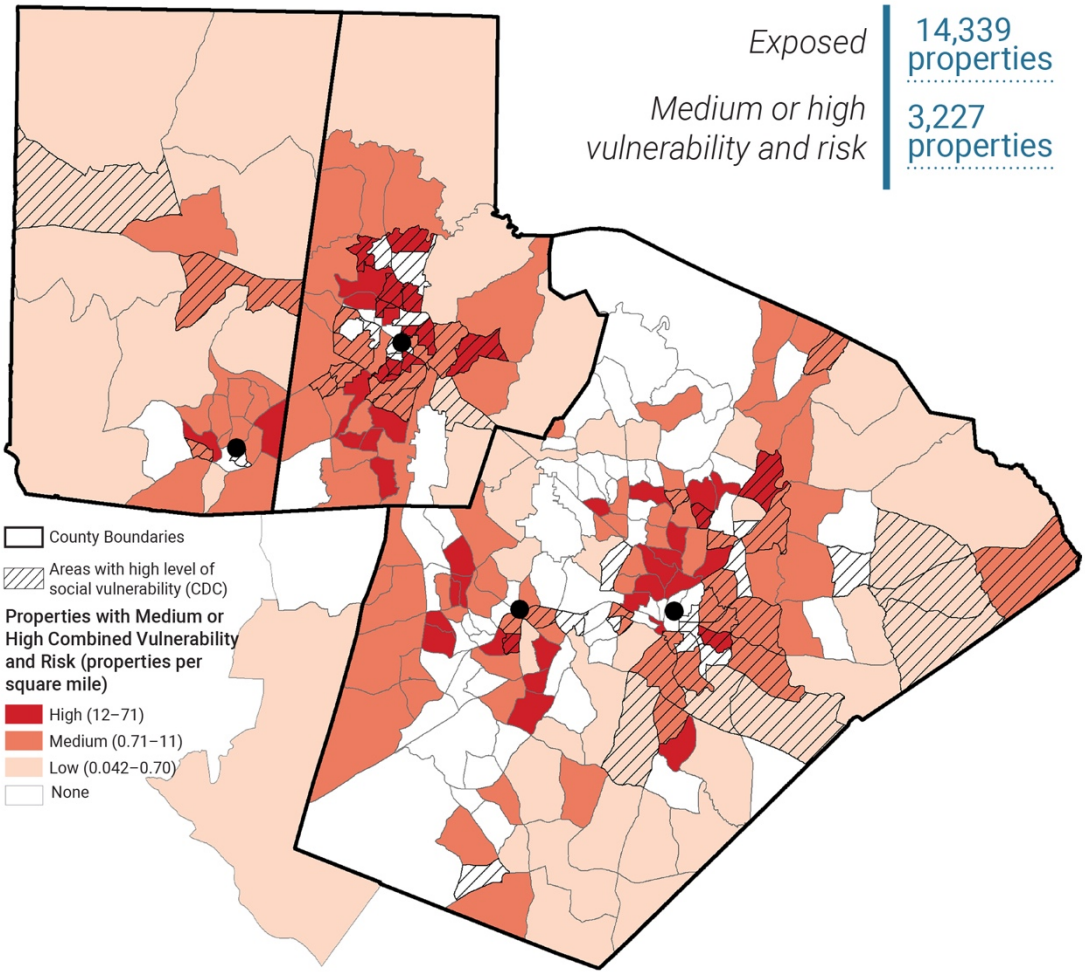


Figure 4-5. Residential Properties and Flooding. This map shows the combined vulnerability and risk of property flooding at the census tract level, overlaid with the CDC Social Vulnerability Index. (Source: Triangle Regional Resilience Assessment, p. 80)

We see similar geographic patterns in Figure 4-6, where we map social vulnerability onto extreme heat events. In urban settings, hot days can be amplified by lack of tree canopy cover and high levels of impervious surface like roads, which absorb and emit heat from the sun. This map clearly shows that all areas of social vulnerability in Raleigh are also more vulnerable to the impacts of extreme heat. These communities are at risk for heat-related illness during periods of prolonged heat. This map can help prioritize partnerships to provide cooling services, relief on utility bills during hot months, home retrofits, outreach on heat-preparedness, and other resilience-building measures.

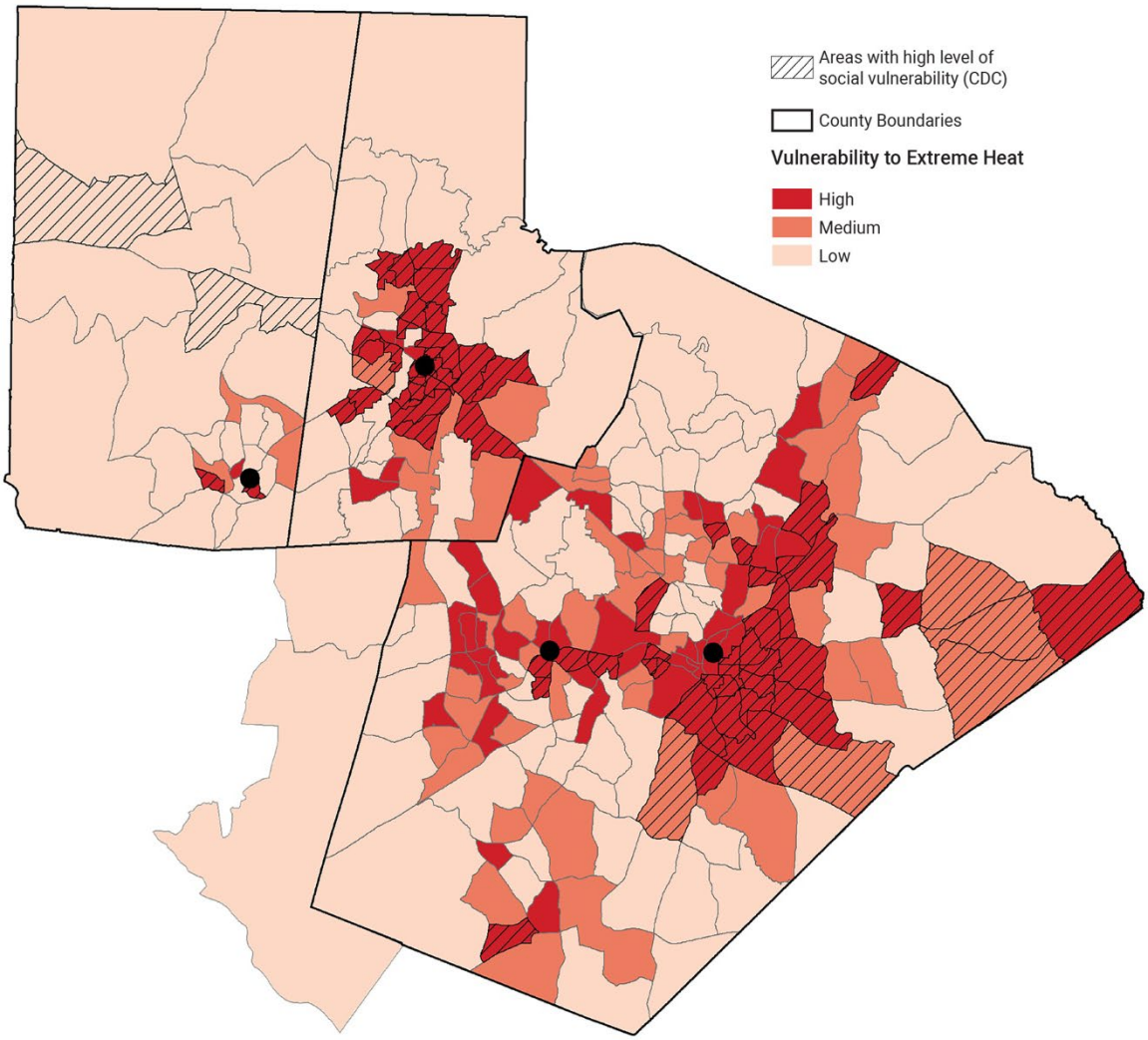


Figure 4-6: Vulnerability to Extreme Heat (Source: Triangle Regional Resilience Assessment p. 112)

Figure 4-7 shows the areas with a high likelihood of roadway inundation. In areas with low-lying roads in flood prone neighborhoods, homes or businesses could become stranded if a flood event makes roads impassable. In an emergency situation, these neighborhoods could be cut off from assistance from the fire department, police or other emergency vehicles, causing potentially life-threatening impacts. This map helps identify areas that could benefit from roadway elevation or stormwater improvements.

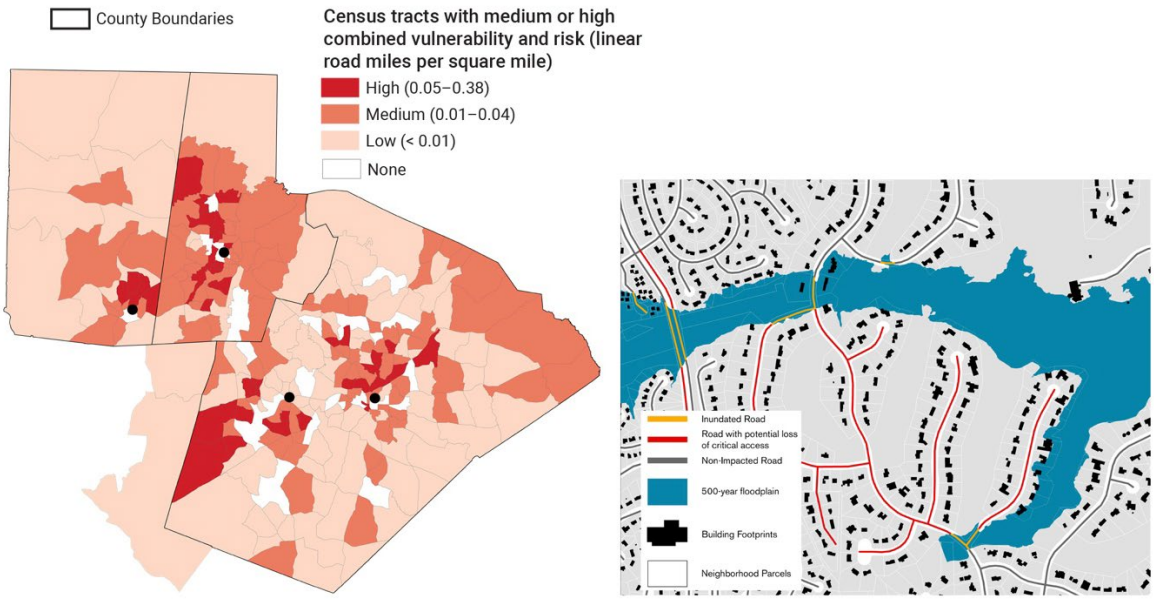


Figure 4-7. Left: Areas at Risk for Loss of Access for Residential Properties Due to 100-Year Flood Event; Right: Illustration of Inundated Road (Source: Triangle Regional Resilience Assessment p. 152)

As we plan for resilience, we need to consider strategies as part of a unified approach to protecting the community. Consider the layers of an onion (See Figure 4-8), where each layer provides additional protection for the core. At the core of our efforts is our community. Protecting people's lives and livelihoods is how we continue to grow and thrive as a community. Preparing our community for climate impacts will be central to that effort. Prepared communities that live and work in protected buildings, shielded from the effects of floods, heat, wind, and rain, are safer and more likely to endure the impacts of a disaster. Reliable community infrastructure—elevated and secure roads, green and gray stormwater infrastructure, telecommunications, redundant electricity supply—can shelter buildings and people from climate impacts. Working across these levels ensures that we prioritize actions that protect people first, particularly those most in need, as we plan for the future.

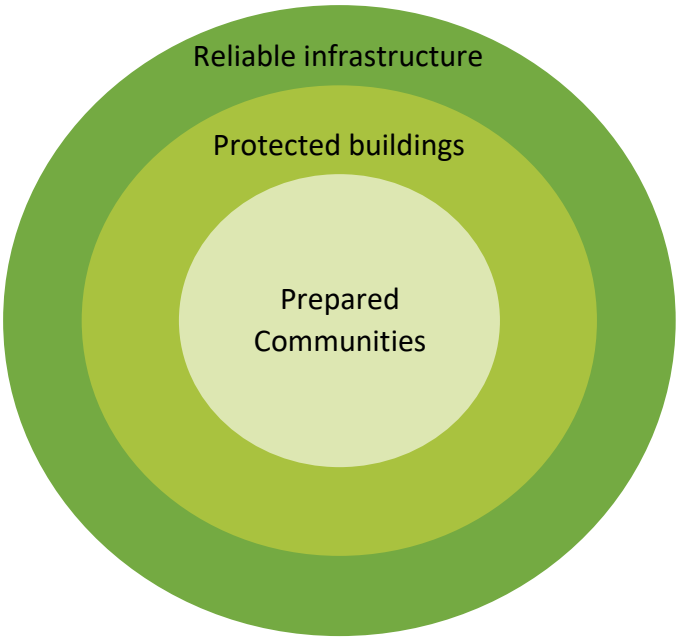


Figure 4-8. Layers of Community Resilience

4.4 - **CCAP Strategies and Resilience**

CCAP has a number of strategies explicitly aimed at increasing resilience in Raleigh by addressing flood risk and preserving open spaces. Additionally, many of CCAP's GHG reduction strategies will likely have resilience co-benefits. Diversifying fuel sources, upgrading buildings, and incentivizing alternative transportation and commuter benefits can all contribute to Raleigh's preparedness and ability to respond to disruptions and to manage the impacts of climate change.

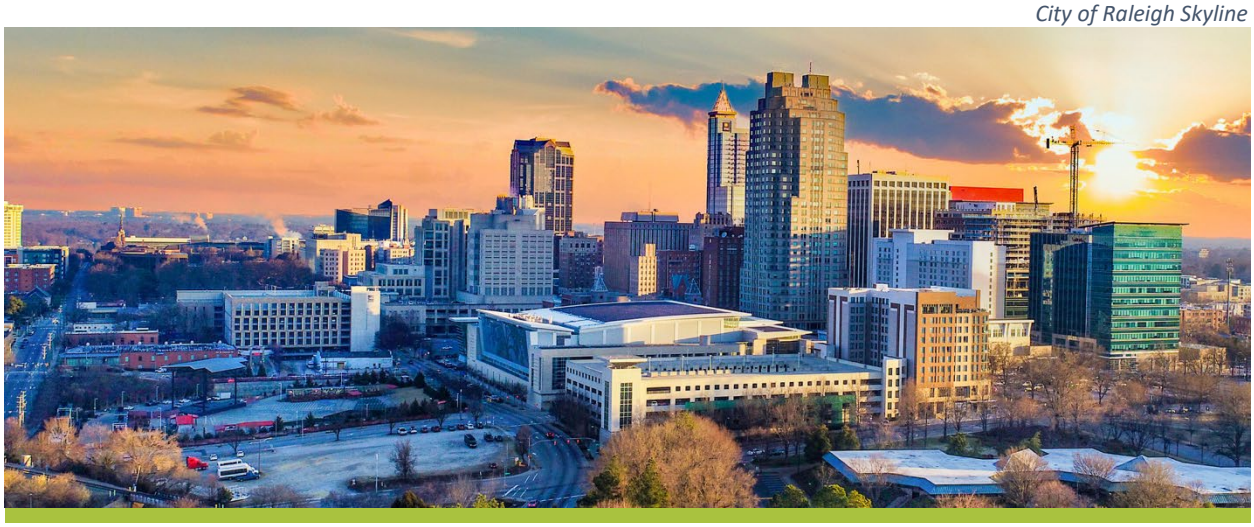
The CCAP development process took into consideration climate equity and resilience across short-, medium-, and long-term timeframes; during implementation, we will continue to look for actions and implementation strategies to build community resilience. The climate actions presented in Chapters 5, 6, and 7 identify the specific equity and resilience considerations for each strategy area: Buildings & Energy, Transportation & Land use, and Resilience & Cross Cutting.

A Guide to CCAP Chapters

Chapters 5–7: CCAP Strategies and Actions

Chapters 1 through 4 of this plan provided information on climate action and the climate risks that Raleigh faces, as well as the work that was done to identify suitable strategies and actions to address those risks. We learned about GHG emissions, climate equity, and resilience and how these relate to the Raleigh community's ability to take action. **Chapters 5, 6, and 7—"Buildings & Energy," "Transportation & Land Use," and "Resilience & Cross Cutting"—provide detail on the strategies and actions for each of these three categories. The information included for each strategy will help CCAP stakeholders understand potential impacts and implementation options. Descriptions of strategies and actions, climate models, equity and resilience considerations, and example actions are provided for each strategy area**. Chapter 8 will provide information on implementation methods to empower the Raleigh community to take action.

City of Raleigh Skyline



Chapter 5 - Buildings & Energy

The Buildings & Energy category accounts for 56 percent of Raleigh's total GHG emissions, as shown in Figure 5-1. This includes a combination of emissions from electricity purchased from the grid (primarily supplied by Duke Energy) and fossil fuels used in buildings (e.g., natural gas and fuel oil for heating, cooking, hot water). The Buildings & Energy GHG emissions include residential, commercial, and industrial building energy use.

As the largest category of emissions, Buildings & Energy represents the largest potential reduction in emissions, including both reductions in the energy used in a building (energy demand) and a ***decarbonization*** of the energy used in buildings (energy supply).

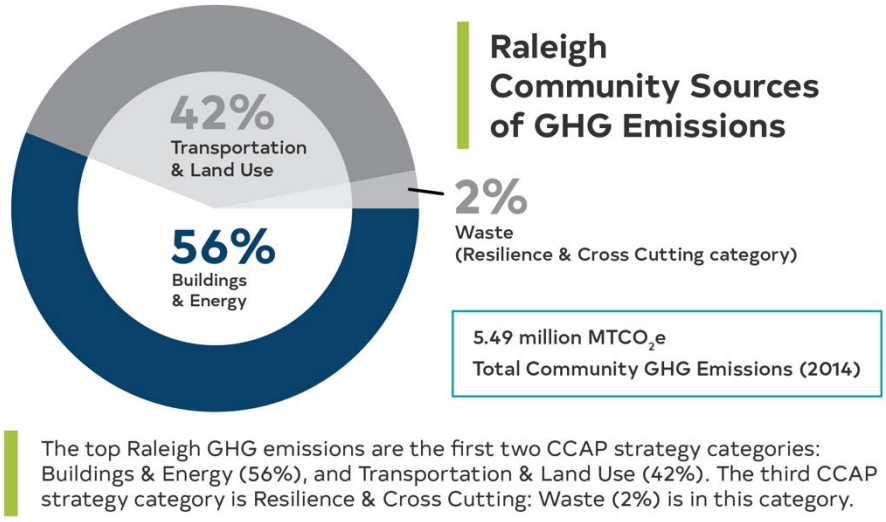


Figure 5-1. Sources of GHG Emissions in Raleigh

***Decarbonization** is the reduction of carbon dioxide emissions by eliminating or significantly reducing the use of fossil fuels.*

The community can reduce carbon emissions associated with electricity, industry, and transportation.

As a result of Raleigh's significant and steadily growing building footprint, energy use in buildings represents the largest category of the community's GHG emissions—contributing more than 3 million $MTCO_2e$, or approximately 56 percent of the total community emissions. Building energy use is a critical sector for CCAP stakeholders to identify and implement an array of strategies to achieve the GHG reduction goal. By the end of 2017, there were nearly 204,000 housing units in Raleigh to accommodate one of the fastest growing urban populations in the country, as illustrated in Figure 5-2.[12] Directly related to these dramatic increases in population and housing, there were more than 43 million square feet of new non-residential building space developed within Raleigh between 2007 and 2018 with a combined construction value of nearly $4.2 billion.[13]

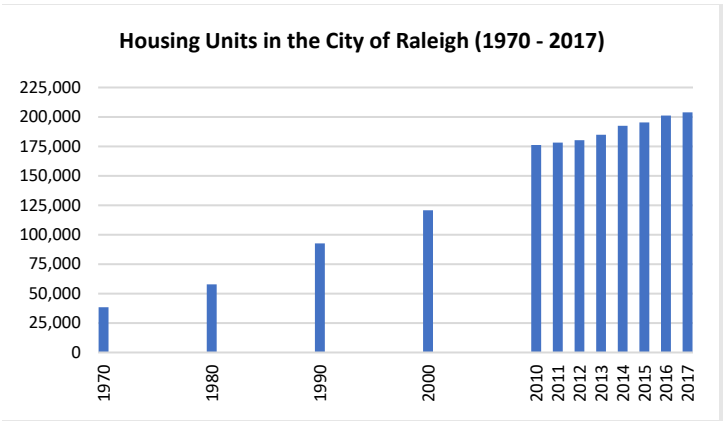


Figure 5-2. Housing Units in Raleigh (1970 – 2017)

Although the City has limited control when it comes to changing energy codes or requiring above-code construction or other legislative actions to reduce GHG emissions, the City can partner with CCAP stakeholders to focus on four core strategies that target a combination of improved energy efficiency with a decarbonization of the electricity supply.

The GHG emissions forecast in Section 2.5 of Chapter 2 (Figure 2-4) shows Raleigh's GHG emissions rising from about 5.5 million $MTCO_2e$ in 2014 to over 9 million $MTCO_2e$ in 2050, assuming no action is taken to reduce emissions. More specifically, GHG emissions from the Buildings & Energy category are expected to grow from about 3 million $MTCO_2e$ in 2014 to about 5 million $MTCO_2e$ in 2050 if no actions are taken to reduce them.

The Buildings & Energy strategies modeled were grouped into the following areas:

- Energy Efficiency Best Practices (EEBP)
- Energy Efficiency Standards (EES)
- Energy Supply (ES) and Renewable Energy (RE)

[12] City of Raleigh, Department of City Planning, December 2019. *City of Raleigh 2018 Data Book,* Figure 2.5.
[13] City of Raleigh, Department of City Planning, December 2019. *City of Raleigh 2018 Data Book*, Figure 4.17.

These strategy areas are discussed in detail in the following sections. For each strategy area, information is included that will help CCAP stakeholders understand potential impacts and implementation options. Information will include a strategy description of the actions that CCAP stakeholders can take to reduce GHG emissions, modeling information that provides a relative comparison of the GHG impact between the various strategies, and equity and resilience considerations for implementing strategies.

Additionally, a full list of Buildings & Energy short-term strategies is provided along with examples of actions under each strategy. These example actions are included to assist CCAP stakeholders in identifying their own actions that best fit with their organization, business, daily life, etc. These example actions also provide further information on where the City is already planning or working to take action or to lead the way, as well as example ideas for actions where CCAP stakeholders can assist, lead, or participate in implementation and action creation and development.

5.1 - Analysis of Buildings & Energy Strategies

Energy Efficiency Best Practices

Description

For existing buildings (both residential and non-residential), the City and CCAP stakeholders will promote and incentivize best practices for energy management, including the completion of energy audits, preventive maintenance, ***retro-/re-commissioning***, and other strategies consistent with the North Carolina Energy Efficiency Roadmap.[14] CCAP stakeholders will also advocate for broad adoption of facility energy benchmarking and disclosure to promote transparency and increased awareness of building energy consumption, an important differentiator for both environmental performance and operating cost. In the future, the City will actively evaluate and promote opportunities for energy efficiency best practices on community projects, such as the Dorothea Dix Park building re-use and infrastructure plan. Also consistent with the North Carolina Energy Efficiency Roadmap, CCAP stakeholders may also strive to develop a methodology for calculating the non-energy co-benefits of optimized building energy efficiency, including those related to public health (via air and water quality), economic development, environmental health (air and water quality), increased property value, and reduced tenant turnover.

Dorothea Dix Park.

[14] This Roadmap, from Duke University, maps out objectives and strategies that can help the North Carolina implement new solutions, remove barriers, and achieve its energy efficiency potential.

Modeling

Five energy efficiency best practice strategies were developed through research and input from CCAP stakeholders and modeled for their GHG emission reduction potential in Raleigh. These strategies include methods to improve energy efficiency and reduce energy use in buildings and pertain primarily to Raleigh's existing building stock. Table 5-1 (and subsequent tables summarizing strategies in other categories) provides an identifier and a brief description for each strategy to correlate them with the corresponding model output graphs showing their GHG impact. For example, for Table 5-1, the identifiers correspond with the strategies for energy efficiency best practices forecast modeling in Figures 5-3 and 5-4 below.

Table 5-1. Energy Efficiency Best Practice Strategies

Identifier	Abbreviated Description
EEBP-1	Non-residential facility energy benchmarking and reporting
EEBP-2	Non-residential facility energy audits, preventative maintenance, and commissioning
EEBP-3	Best practices in energy efficiency and management in existing non-residential buildings
EEBP-4	Residential facility energy benchmarking and reporting
EEBP-5	Residential facility energy audits, preventative maintenance, and commissioning

The results of modeling for these strategies are presented in Figure 5-3 below. This image shows the individual and cumulative GHG emission reductions estimated for the strategies between 2020 and 2050. Note that as indicated by the scale of values on the vertical axis (left side of the graph), the cumulative GHG reduction from these strategies is only about 25,000 $MTCO_2e$ at their peak. The estimated reductions from these strategies relative to the total GHG emissions forecast are minimal as modeled based on conservative assumptions due to limitations in the City's ability to control community-wide activities. However, real potential to exceed these estimated reductions is possible through additional voluntary efforts to advance these strategies by high-impact community partners. An example of these high-impact community partners taking action includes developers and operators of buildings in Raleigh establishing goals and strategies for energy management in buildings, such as a percent reduction in energy use, identifying energy and energy cost savings strategies, or setting a goal for energy efficiency.

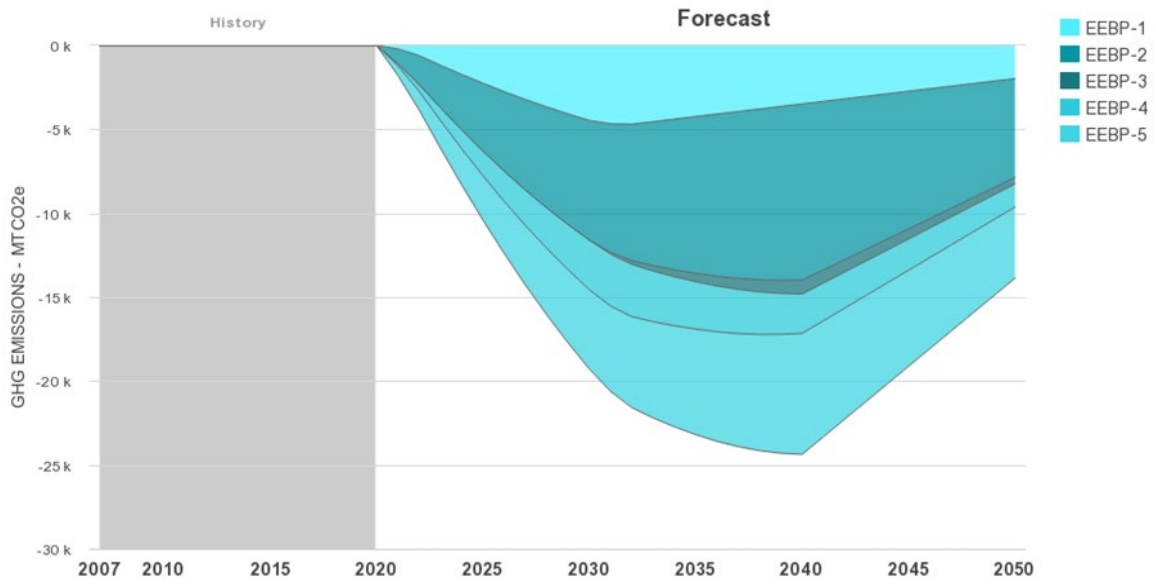


Figure 5-3. GHG Emission Reductions from Energy Efficiency Best Practices

It is also notable that the total reduction increases significantly until 2030, where the reduction potential tapers, and then the reduction potential decreases beginning in 2040. Energy efficiency will achieve significant reductions between now and 2030, but as the electricity that is purchased from Duke Energy is decarbonized based on Duke Energy's climate goals, then the total impact on these efficiencies begins to wane in 2040. While energy efficiency best practices are a necessary and important ***strategy*** toward achieving Raleigh's climate goals, their effectiveness from a GHG reduction perspective will diminish over time as Duke Energy's generation portfolio moves toward ***carbon neutrality*** (see "Energy Supply" strategies later in this section). It is also notable that energy efficiency best practices, such as energy audits, preventive maintenance, commissioning, and energy benchmarking and reporting, are easier to implement in existing non-residential buildings (such as businesses and commercial facilities), where it is easier to have more direct and fewer interactions with those building owners, which can thus achieve a higher impact in the long term.

Based on the assumptions made for these strategies, including the inability for the City to mandate or require above-code standards in the short term (meaning CCAP stakeholders will be acting voluntarily and independently in these strategies), the GHG emission reductions forecast is not modeled as a significant percent of Raleigh's overall GHG emissions reductions. The reductions shown in Figure 5-3 are depicted in Figure 5-4 under the BAU line of the projected total for future emissions (reductions are difficult to view due to the small overall percentage of total emissions). For reference, the reductions shown in Figure 5-3 peak at close to 25,000 $MTCO_2e$, while the BAU projections are in millions of $MTCO_2e$.

Despite these current short-term implementation barriers, the actual GHG reduction from these strategies is potentially much higher if residents and businesses in Raleigh are proactive and effective at implementing them. The U.S. Department of Energy's National Renewable Energy Laboratory (NREL) estimates that over 30 percent of energy used by single-family homes in North Carolina can be saved

through cost-effective improvements.[15] In addition, as mentioned in Chapter 2, Section 2.6, "Barriers and Opportunities in Strategy Development," while CCAP stakeholders work together to implement actions that can be started immediately, there are also opportunities for CCAP stakeholders to pursue and develop strategies to break down these other barriers over time.

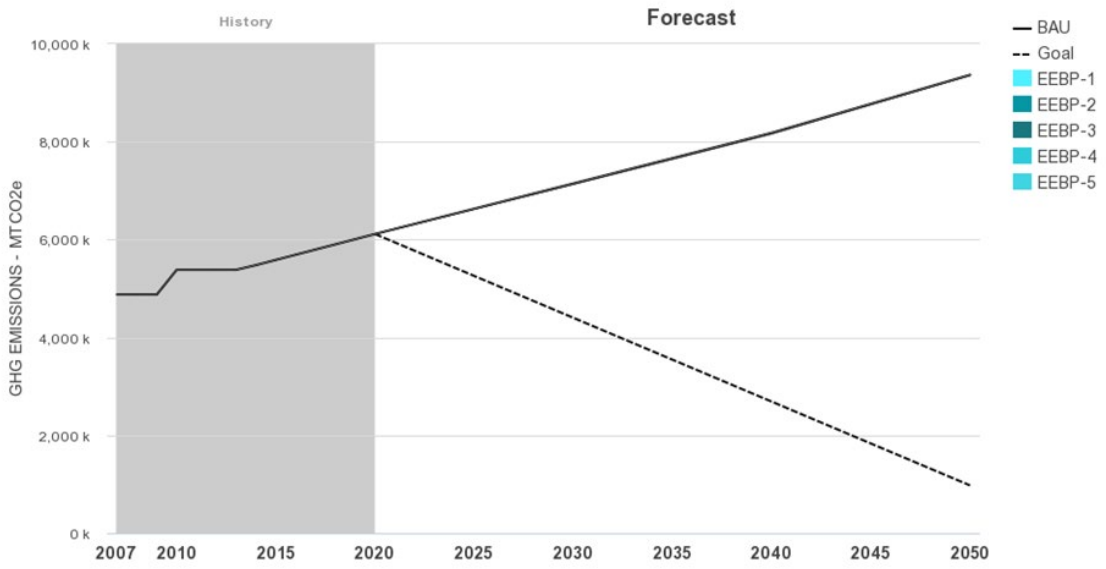


Figure 5-4. GHG Emissions Reductions of Energy Efficiency Best Practices Relative to Base Case Projections

Energy Efficiency Standards

Description

For new construction and renovations across all building categories, the City and CCAP stakeholders will encourage and incentivize construction that exceeds minimum energy efficiency code requirements by utilizing both existing and new programs and tools from partners. Programs range from construction incentives to energy-efficient, affordable housing.

Modeling

Energy efficiency standards are strategies that apply to new and future buildings that will be constructed in Raleigh over time. Encouraging and incentivizing above-code construction is a CCAP strategy that will ensure that future buildings will be constructed to a higher standard of energy efficiency and will save energy and reduce GHG emissions over time. Above-code construction could include upgraded lighting fixtures and controls; heating, ventilation, and air conditioning (HVAC) improvements; and enhanced insulation and efficient windows and doors. These strategies are summarized in Table 5-2 and correspond with the following forecast models in Figures 5-5 and 5-6.

Table 5-2. Energy Efficiency Standard Strategies

Identifier	Abbreviated Description
EES-1	Encourage and incentivize above-code construction and renovations in non-residential facilities.
EES-2	Encourage and incentivize above-code construction and renovations in residential facilities, including affordable housing.

[15] https://resstock.nrel.gov/factsheets/NC

GHG emission reductions for these two strategies are shown in Figure 5-5. As described previously, note the scale of emissions reductions from these strategies as shown on the vertical axis (left side of the graph)—approximately 170,000 $MTCO_2e$ at their peak effectiveness.

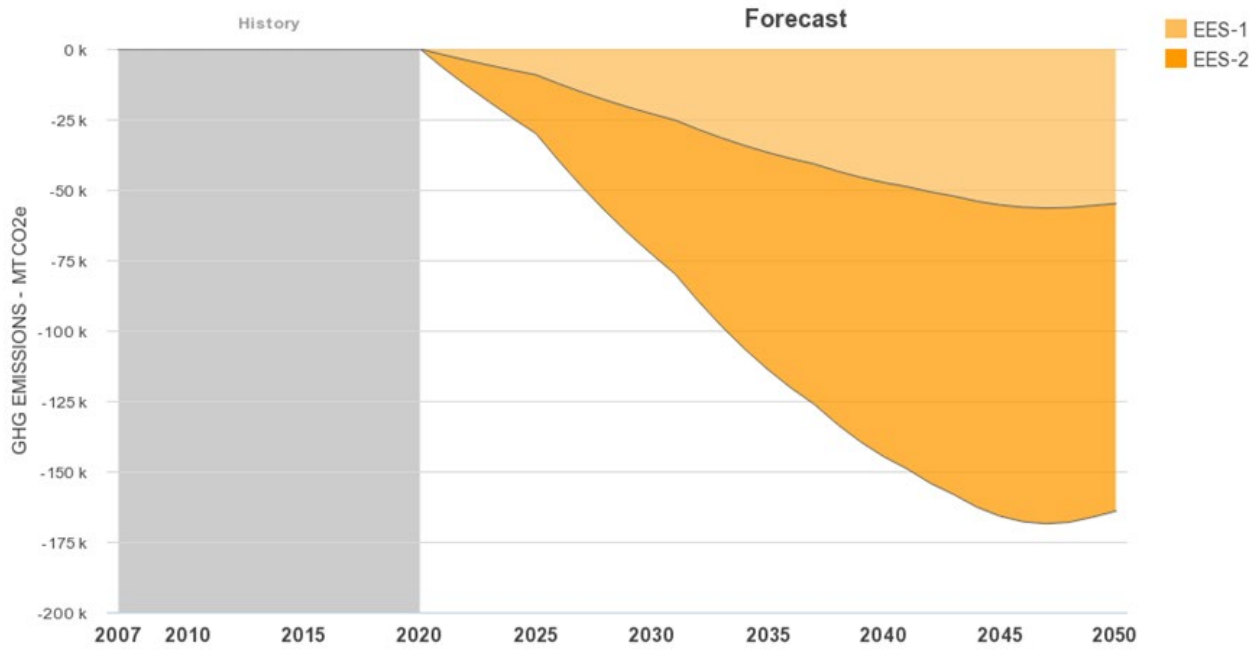


Figure 5-5. GHG Emission Reductions from Energy Efficiency Standards

Due to the projected growth in Raleigh through 2050, both in terms of population and the corresponding increases in residential and non-residential construction, the potential impact of energy efficiency standards for new buildings is greater than what was estimated for energy efficiency best practices in existing buildings. As mentioned above, the effectiveness of these strategies is tempered by Raleigh's lack of direct control of State building codes. High-impact GHG emission reductions can be achieved by community partners taking voluntary action in the short term. High-impact partners for this strategy include large facility owners and developers committing to build energy- efficient buildings that are above the minimum energy code required by the State, as well as making energy efficiency upgrades to existing building stock. The impact of these strategies relative to the BAU scenario is presented in Figure 5-6.

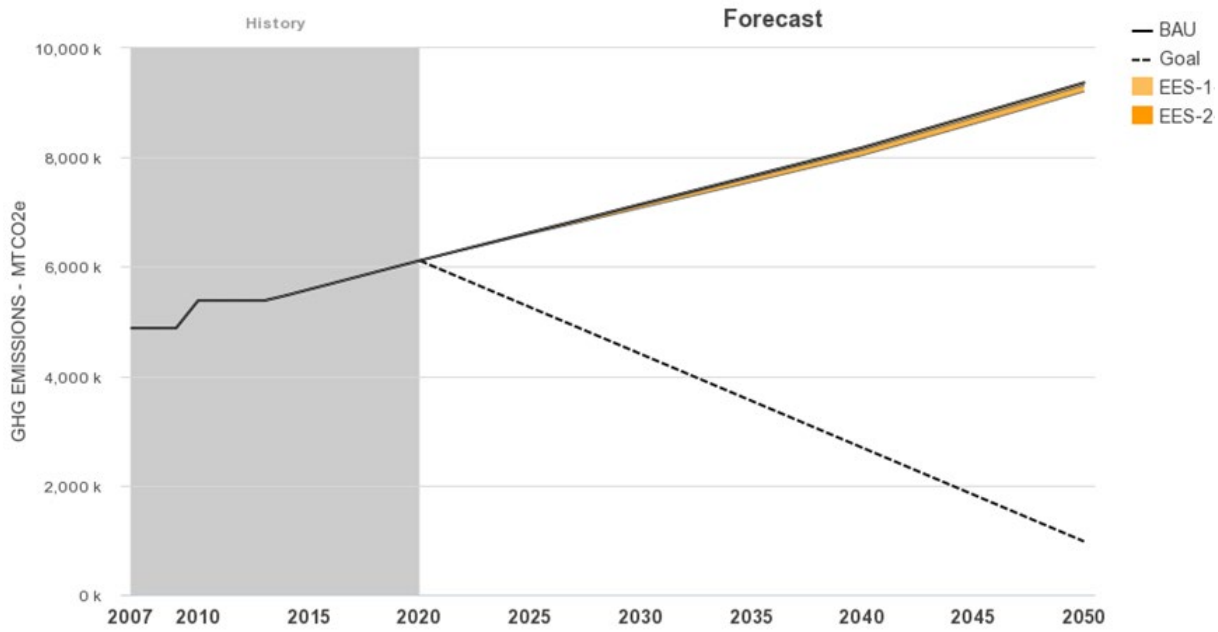


Figure 5-6. GHG Emissions Reductions of Energy Efficiency Best Practices Relative to Base Case Projections

Energy Supply – Decarbonize the Electricity Supply

Description

With GHG emissions associated with purchased electricity representing the single largest emissions source category (approximately 41 percent of the community's total carbon footprint), the incorporation of additional renewable energy resources into the grid represents a critical component within CCAP. Duke Energy, the supplier of grid-connected electricity in the Raleigh community, has set a goal to reduce carbon dioxide (CO_2) emissions associated with electricity generation by at least 50 percent below 2005 levels by 2030 and to achieve net zero CO_2 emissions by 2050.[16]

***Duke Energy** has established an enterprise-wide goal to reduce carbon emissions by 50 percent by 2030, with a 2005 baseline, and to be net zero carbon by 2050. Duke Energy's net zero target by 2050 is not enforceable and relies on State policy actions. The trajectory of the GHG emissions reductions from Duke Energy will depend on regulatory reform and other policy considerations currently underway through the State of North Carolina's Clean Energy Plan.*

Promote and Expand Renewable Energy Programs and Incentives

Description

To supplement Duke Energy's commitment to the generation and distribution of decarbonized, grid-based electricity, the City of Raleigh will continue to support and promote the expansion of renewable energy programs, including opportunities to install onsite renewable energy systems through Duke Energy's solar programs offered in North Carolina. The City of Raleigh will also encourage large businesses to participate in Duke Energy's renewable energy programs, such as the Green Source

[16] Duke Energy, 2020. *Achieving a New Zero Carbon Future, Duke Energy 2020 Climate Report*.

Advantage and future opportunities, as well as to work with partners to advocate for the establishment of programs like community choice aggregation that would enable Raleigh residents and businesses to procure green power at competitive rates. This strategy encourages CCAP stakeholders and partners to pursue renewable energy options at competitive rates in the form and function that works best for them. The Duke Energy Clean Cities Collaborative (described in Chapter 8) is also a resource for local governments to work with Duke on potential options related to community climate strategies and goals in North Carolina.

Modeling — Energy Supply and Renewable Energy

The energy (specifically, electricity) supplied to and used by buildings in Raleigh is a significant source of GHG emissions, accounting for over 50 percent of Raleigh's total GHG emissions. According to the U.S. Environmental Protection Agency, electricity supplied in the Virginia/Carolina Subregion (SRVC) in 2018 was generated from natural gas (34.6 percent), coal (19.1 percent), and oil and other fossil fuels (0.7 percent), and the remainder was from nuclear and renewable sources (37.8 and 7.7 percent, respectively). In 2018, the overall emission rate for the production of electricity in the SRVC was 743.3 pounds CO_2 per megawatt hour (MWh).[17]

In 2019, Duke Energy (Raleigh's primary electricity provider) set ambitious carbon reduction goals (mentioned previously). These are significant goals that, if achieved, will have a correspondingly significant impact on Raleigh's GHG emissions through 2050 and beyond. In addition to supporting Duke Energy's plans to shift to cleaner energy over time, Raleigh will also continue to support and promote renewable energy projects within the community to further reduce the near-term GHG emissions associated with electricity use.

The strategies identified in Table 5-3 correlate to the model output of estimated reductions that follow in Figures 5-7 and 5-8.

Table 5-3. Energy Supply and Renewable Energy Strategies.

Identifier	Abbreviated Description
ES-1	Duke Energy and utility providers shift to clean energy sources (2020–2030).
ES-2	Greening of the grid and expanding renewable energy (2031–2050).
RE-2	Continue to support and promote the expansion of renewable energy programs, including solar rebates and community choice aggregation.

The commitments made by Duke Energy to decarbonize its electricity generation portfolio will have a significant impact on GHG emissions, resulting in a reduction of about 4 million $MTCO_2e$ of GHG emissions by 2050, as shown in Figure 5-8. The City and community can play a role in Duke Energy's transition to decarbonize by working together to identify ways to support the adoption of renewable energy in Raleigh facilities, homes, and properties.

[17] https://www.epa.gov/egrid/power-profiler#/SRVC

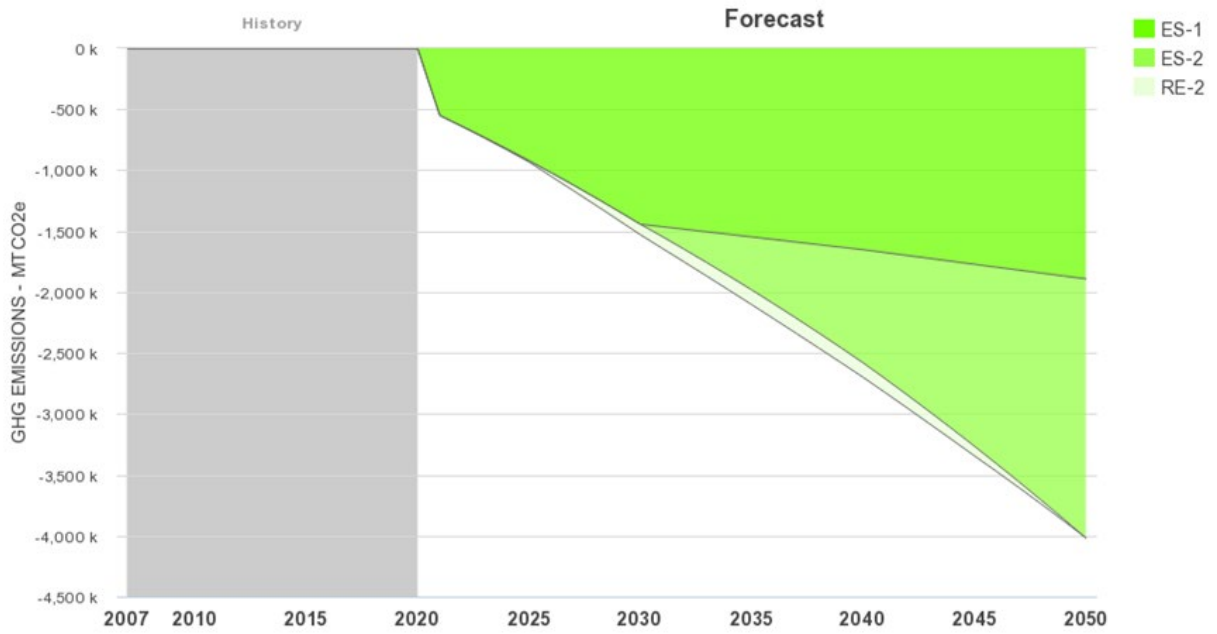


Figure 5-7. GHG Emission Reductions from Energy Supply and Renewable Energy Strategies

In terms of the BAU projections of future emissions, the estimated reductions from these strategies result in almost 50 percent of estimated emissions in 2050, as shown in Figure 5-8.

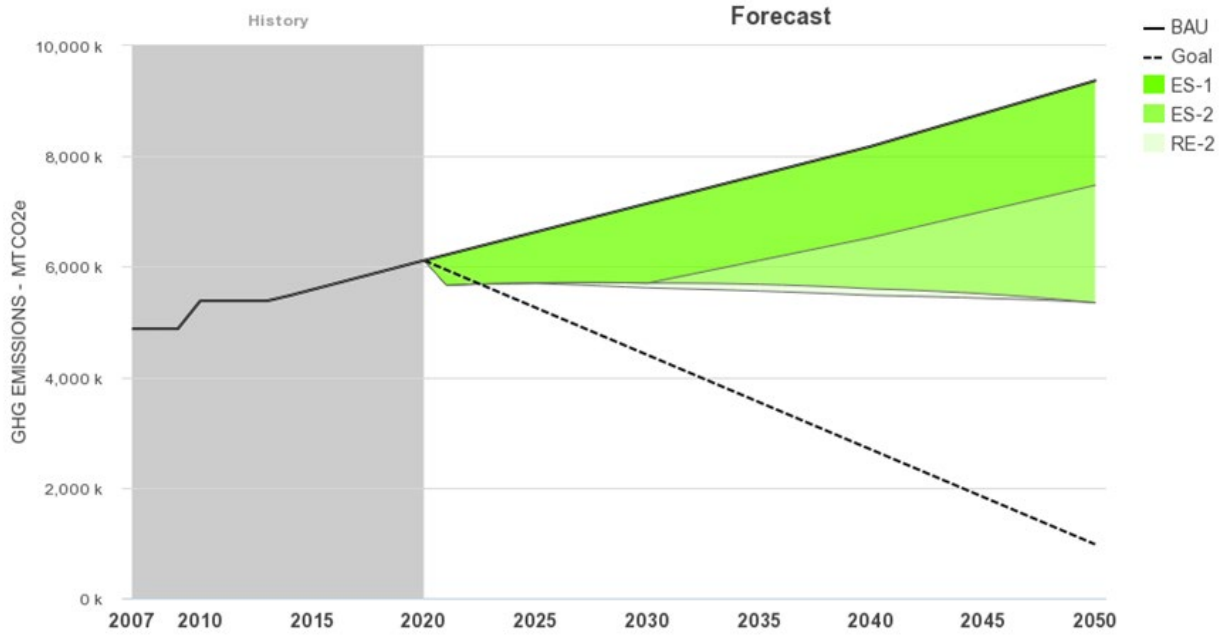


Figure 5-8. GHG Emission Reductions from Energy Supply and Renewable Energy Strategies Relative to Base Case Projections

As referenced in Chapters 3 and 4, "Supporting Climate Equity" and "Building Community Resilience," the following equity and resilience considerations provide guidance and a starting place for CCAP stakeholders on what to consider when implementing and taking action on Buildings & Energy strategies.

5.2 - Equity Considerations

Energy Efficiency Standards and Practices

Energy efficiency measures not only have the capability to lower GHG emissions, but they also have numerous co-benefits. The measures can reduce energy costs to the consumer, make homes more comfortable, and improve indoor air quality, which has health benefits for building occupants. Even though energy efficiency measures are some of the most cost-effective mitigation options (it is cheaper to install energy efficiency improvements than produce additional energy through conventional or renewable sources), they can be relatively costly to install, requiring upfront capital investment in building system upgrades and structural improvements.

Approximately 8 to 13 percent of renters in Wake County fall below federal poverty designations. These individuals will likely spend between 18 and 33 percent of their income on energy costs each year. Energy costs for homeowners are on average a higher percentage of income than for renters. Low-income residents often live in older, less-efficient housing that requires more energy for heating and cooling. Other barriers for low-income communities may include little or no disposable income and little access to credit, which then leads to fewer choices for housing options. Low-income residents are also often more exposed to homes with structural deficiencies that can then make energy efficiency upgrades inaccessible. This means that people who are already burdened by high energy bills due to a limited array of housing options in their price range may be left out of a strategy meant to ease energy burden (and other impacts may also add to the complexity, such as health and environmental impacts related to structural deficiencies and location of housing in flood-prone areas—see Section 5.3, "Resilience Considerations," for further detail on these connections).

A similar pattern may exist in the business community for non-residential buildings. Large businesses have the capability to spend capital on energy efficiency measures in order to reclaim those costs in savings in future years. Smaller businesses may not be as readily able to invest in these measures and therefore will continue to pay higher energy costs.

As energy efficiency strategies are rolled out and promoted in Raleigh, it will be important to address immediate needs for energy efficiency in affordable housing, multi-family housing units, and other rental properties, as well as to identify partnerships with developers, the business community, local community organizations, and property owners to continue to expand access to the benefits of energy efficiency standards and practices.

Energy Supply and Renewable Energy

Energy Supply

Duke Energy is currently on track to achieve its 2030 goal of reducing CO_2 emissions from electricity generation by at least 50 percent from 2005 levels, and the utility set a longer-term goal to reach ***net zero GHG emissions*** by 2050.[18] Over time, this transition will require Duke to retire facilities and invest in new technologies and energy management systems. The cost of this transition will likely affect utility rates for its customers. How energy rates increase over time could have economic implications for residents of Raleigh already burdened by the cost of energy.

[18] Achieving a Net Zero Carbon Future, Duke Energy Climate Report 2020, https://www.duke-energy.com/_/media/pdfs/our-company/climate-report-2020.pdf?la=en

On the positive side, the transition to cleaner energy and adoption of new technologies will open up new employment opportunities across the state and throughout the Raleigh community. These jobs will offer good-paying opportunities in renewable energy installation, maintenance, and development. Coupled with supportive industries like public and private training programs and outreach through local technical schools and universities, a transition to renewable energy at a utility scale and the community scale (more below) will offer many opportunities for economic growth in Raleigh.

Renewable Energy

Increasing installation of renewable energy in Raleigh by installing solar photovoltaic (PV) panels on rooftops or in community solar projects can allow residents and businesses to procure green power at competitive rates. Similar to energy efficiency measures, renewable energy installations in private homes and businesses have a high cost for entry. Though there are a number of rebates and incentives available for these projects, there is a large upfront capital expenditure necessary to take advantage of the savings. There are opportunities for large-scale solar projects such as the Duke Energy Green Source Advantage program and other programs to be adopted by the State of North Carolina Utilities Commission.

Community solar projects offer an opportunity to purchase renewable energy from the grid supplied by smaller installations. These projects could be installed on vacant properties, underutilized spaces, or available open space—such as the Wilders Grove Landfill. The costs of these installations are high, but they are shared by the program participants or subsidized. In the current model of such programs available in North Carolina, community solar projects could be developed for affordable housing units; however, a funding mechanism would have to be identified or created to support them.

5.3 - Resilience Considerations

Energy Efficiency Standards and Practices

Practices for improving the energy efficiency of buildings ensure that the energy used to heat or cool the space serves the maximum benefit. This means that conditioned air stays in the building and does not escape through poorly sealed windows, walls, or leaky ventilation systems. Keeping conditioned air in also means it is easier to keep outside cold or heat from entering an energy-efficient building. If a building loses power, maintaining comfortable and healthy internal temperatures can be lifesaving. Extreme winter storms or hurricanes in warmer months can knock out power to an entire region for multiple days. According to one study, a high-performing single-family house can maintain an internal temperature above 60°F for three days following a winter power outage, compared to 35°F for a conventional house. A high-performing high-rise could maintain internal temperatures below 85°F during a summer outage, compared to a conventional high-rise that could reach 100°F.[19] A study of the Chicago heat wave of 1995 suggested that poor building characteristics in older apartment buildings added significant danger for apartment dwellers during that event.[20] Improving heat and cooling retention in buildings, particularly where vulnerable people live (such as the elderly, very young, and

[19] Leigh, Richard, et. al. “Leaks and Lives: How better building envelopes make blackouts less dangerous” ACEEE Summer Study on Energy Efficiency in Buildings. American Council for an Energy Efficient Economy. 2014
[20] Huang, J. “Using DOE-2 to Study Apartment Indoor Temperatures during the July 1995 Chicago Heat Wave.” Building Energy Simulation User News Vol. 17, No 3, Fall 1996.

those with pre-existing medical conditions), can significantly reduce their sensitivity to extreme weather events.

Energy Supply

A utility-scale transition of our energy supply will increase the share of clean energy produced by renewable sources in North Carolina (solar and wind power), eliminate coal power, and reduce the share of natural gas power over time. This transition to renewable sources will make the energy supply more resilient in the face of market fluctuations and supply chain disruptions. Coal and natural gas must be transported to North Carolina for electricity generation. Most of the coal delivered to North Carolina's power plants is transported by rail from West Virginia, Pennsylvania, and Kentucky. Additionally, North Carolina does not produce natural gas. Natural gas supply arrives in North Carolina through interstate pipelines through Virginia and South Carolina.[21] Railways and pipelines are subject to delay and disruption. Diversifying sources of energy will ensure energy resilience and a more consistent energy supply. Figure 5-9 shows how diversity in energy supply can improve resilience to multiple hazards.

Natural Disaster or Storm Events	Flooding	High Winds	Earthquakes	Wildfires	Snow/Ice	Extreme Temperature
Battery Storage	◒	○	◒	●	○	◒
Biomass/Biogas CHP	◒	◒	◒	●	○	○
Distributed Solar	○	◒	◒	●	◒	◒
Distributed Wind	○	◒	◒	◒	◒	◒
Natural Gas CHP	○	○	◒	◒	○	○
Standby Generators	◒	○	◒	●	◒	○

Ranking Criteria used to estimate the vulnerability of a resource during each type of disaster event:

- A fuel supply interruption
- Damage to equipment
- Performance limitations
- A planned or forced shutdown

○ Resource is **Unlikely to Experience Any** impacts

◒ Resource is **Likely to Experience One, Two, or Three** impacts

● Resource is **Likely to Experience All Four** impacts

Figure 5-9: Distributed Energy Resources Disaster Matrix. (Source: U.S. Department of Energy Oct 2018 https://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/DER_Disaster_Impacts_Issue%20Brief.pdf)

Renewable Energy

At the local level, the energy transition will include rooftop solar installations on homes and businesses and community solar projects. While these small-scale energy projects can help diversify the grid and reduce reliance on fossil fuels, in and of themselves, they do not provide adequate energy resilience for the consumer. To draw a resilience benefit from residential- or community-scale renewable energy

[21] https://www.eia.gov/state/analysis.php?sid=NC

projects, battery storage will be required. With battery power, renewable energy installations can continue to provide energy to a system even when connection to the electrical grid is interrupted.

5.4 - **Buildings & Energy Actions**

As discussed previously, the success of these strategies will depend upon the interest, involvement, and innovation of not only the City of Raleigh, but also all its partners and stakeholders in taking action to meet the community's climate goals. While the modeling presented above shows modest GHG emission reduction impacts for some strategies, the potential exists for much greater impacts. As mentioned, NREL estimates that North Carolina single-family homes can reduce energy use by 31 percent through cost-effective improvements.[22] Instead of just exceeding energy efficiency standards in new buildings, developers could strive for net zero energy buildings. Priorities for action to reduce GHG emissions in the Buildings & Energy category are creating energy-efficient buildings, expanding the use of renewables, and greening the grid.

Table 5-4. (short-term actions) and Table 5-5 (long-term actions) include implementation actions for strategy areas. Table 5-4, "Short-Term Buildings & Energy Actions," provides strategies with examples of actions. Short-term actions are either already underway or will be soon, with implementation expected in zero to seven years. The long-term actions have a longer lead time and will be underway in eight or more years. As both the City and its partners and stakeholders will be involved in these actions, we have provided some indication of who might be responsible for each one. Additional discussion regarding implementation is provided in Chapter 8. The example actions that are provided under each strategy in Table 5-4. provide context and examples for CCAP stakeholders as they go about identifying actions that best fit with their own organization, business, daily life, etc. These example actions also provide further information on where the City is already planning, working to take action, or leading the way. They also provide example ideas for actions where CCAP stakeholders can assist, lead, or participate in implementation as well as creation and development. At the top of Table 5-4., see the legend with icons and descriptions for further detail on the actions.

[22] https://resstock.nrel.gov/factsheets/NC

Table 5-4. Short-Term Buildings & Energy Actions

CATEGORY

Buildings & Energy

SHORT-TERM ACTIONS (0–7 years)

IDEA stage: exploring, identifying partners, evaluating resources and feasibility	GETTING STARTED: buy-in from affected stakeholders to further explore and evaluate for potential feasibility of implementation	Actions UNDERWAY: working with partners on, in some stage of implementation	Actions where the City is a partner or taking the lead

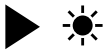
STRATEGY: **Energy Efficiency Best Practices**

ACTION: **Promote programs, provide tools, and encourage non-residential facilities to track, benchmark, and report energy consumption.**

DESCRIPTION	Best practice energy management includes energy benchmarking/disclosure. Energy benchmarking/disclosure can promote transparency, awareness, and cooperation, and it can help to reduce energy consumption.
	ACTION: Perform energy benchmarking on City facilities and track/report energy consumption through an asset management program.
	ACTION: Identify partners who are promoting programs, providing tools, and doing energy tracking and benchmarking work in Raleigh that will provide updates and reports. Example: North Carolina Building Performance Association conference or summit.
	ACTION: Create a Sustainable Business Toolkit and explore a Raleigh Climate Business Leaders program to provide resources and assistance for businesses to focus on reducing energy consumption.

ACTION: **Promote programs, provide tools, and encourage non-residential facilities to conduct energy audits, provide preventive maintenance, and commission and retro-commission facilities.**

DESCRIPTION	Best practice energy management includes energy audits and preventive maintenance that help inform retro-commissioning strategies to reduce energy consumption and improve building performance. Energy audits can promote transparency, awareness, and cooperation, and they can help to reduce energy consumption.
	ACTION: Partner with the Office of Economic Development to expand the Building Upfit Grants (BUG) to integrate sustainability measures, in addition to the current energy efficiency upgrades. This could include funding, education, audits, and other resources to support businesses.
	ACTION: Expand the current equipment auditing program to include energy use audits, (retro-commissioning) and energy benchmarking on high-use City facilities.
	ACTION: Establish a schedule for building audits and benchmarking internally and with external resources. Establish a goal for energy management in buildings: example goals are a percent reduction, savings, or level of efficiency.
	ACTION: Create energy use policies that set energy efficiency standards for City buildings, such as temperature set points and addressing electric heaters.
	ACTION: Establish a City of Raleigh Sustainable Facilities Review Committee that will advise on sustainability and energy efficiency best practices for municipal buildings guided by the City's Leadership in Energy and Environmental Design (LEED) Silver building policy for municipal buildings (Appendix C).
	ACTION: Explore and identify programs that support energy management that will help the community understand how they can reduce energy consumption through best management practices and in turn reduce their energy cost.

	**ACTION:** Develop and distribute educational resources for energy tracking and benchmarking through the City Office of Economic Development and other local organizations.
ACTION: **Promote programs, provide tools, and encourage residential facility energy tracking and benchmarking.**	
DESCRIPTION	Best practice energy management includes energy benchmarking/disclosure. Energy benchmarking/disclosure can promote transparency, awareness, and cooperation, and it can help to reduce energy consumption.
	**ACTION:** Work with Duke Energy to expand the outreach and uptake of low- to middle-income programs for Raleigh residents.
	**ACTION:** Develop and distribute educational resources for energy tracking and benchmarking through local residential organizations.
ACTION: **Promote programs, provide tools, and encourage residential facility energy audits, preventive maintenance plans, commissioning, and retro-commissioning.**	
DESCRIPTION	Best practice energy management includes energy audits and preventative maintenance that help inform retro-commissioning strategies to reduce energy consumption and improve building performance. Energy benchmarking/disclosure can promote transparency, awareness, and cooperation, and it can help to reduce energy consumption.
	**ACTION:** Work with local utilities on expanding and targeting their programs and partner with local universities for audits and training programs.
STRATEGY: **Energy Efficiency Standards**	
ACTION: **Encourage and incentivize energy efficiency in construction and renovations in non-residential facilities.**	
DESCRIPTION	Encourage and incentivize best practice energy practices and standards for commercial, industrial and institutional construction, including building to above minimum energy efficiency code requirements. Promote the utilization of existing programs, incentives, and rebates including utility programs such as Duke Energy's Smart Saver Rebates and Incentives, and Small Business Energy Saver programs, the Lower My Bill Toolkit and the Green Raleigh Review energy efficient building practices.
	**ACTION:** Evaluate the opportunity to add utility sub meters to all City projects to promote energy efficient building practices.
	**ACTION:** Evaluate guidelines for all City building projects, regardless of new or for existing renovations over 10,000 sq ft, to set guidelines for adding pulse meters to receive natural gas, water and electric usage information directly from the energy system.
	**ACTION:** Establish training programs for Planning and Development Department staff that enforce building codes to promote best practice energy efficiency construction and above-code construction. This could also include educational materials that promote/incentivize net zero energy-ready buildings.
	**ACTION:** Encourage builders, owners, and developers to participate in Green Raleigh Review, a plan review process specifically for adding green stormwater infrastructure and energy-efficient practices to a developed site. This process works with site review, bundled site review, and building plans express commercial review.
	**ACTION:** Set a percent goal for energy efficiency, building to higher than required by current code. Include language in all projects with City involvement or funds requiring some energy efficiency criteria, whether new construction, renovation, private, or public.
ACTION: **Encourage and incentivize energy efficiency in construction and renovations in residential facilities, including affordable housing.**	
DESCRIPTION	Encourage and incentivize best practice energy practices and standards for residential construction, including to above minimum energy efficiency code requirements. Promote the utilization of existing programs, incentives, and rebates, including utility programs such as Duke Energy's Residential New Construction incentive program, the Lower My Bill Toolkit, the Green Raleigh Review energy-efficient building practices, and System Vision for Affordable Housing. System Vision partnership with Advanced Energy creates best practice, energy-efficient, affordable housing units that are healthy, safe, and comfortable, with a two-year guaranteed energy bill. Review and update as needed the existing City building standards for energy efficiency improvements.

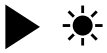
	**ACTION:** Evaluate expanding energy efficiency programs, such as System Vision, to all affordable housing projects; evaluate expanding from single-family housing to include multi-family developments.
	**ACTION:** Establish above-code construction and training programs for Planning and Development Department staff that enforce the code. This could also include educational materials that promote/incentivize net zero energy-ready buildings.
	**ACTION:** Track impacts such as energy savings and GHG reduction of current and future potential weatherization and home repair programs. Expand and streamline current programs to move community members off of waiting lists for services.
	**ACTION:** Encourage community members to participate in Green Raleigh Review, a plan review process specifically for adding green stormwater infrastructure and energy-efficient practices to a developed site. This process works with site review, bundled site review, and building plans express commercial review.
	**ACTION:** Evaluate opportunities to encourage or require above-code energy efficiency standards if the City is involved in funding or selling land for a project.
STRATEGY: **Energy Supply**	
ACTION: **Duke Energy and utility providers shift to clean energy sources.**	
DESCRIPTION	Duke Energy is incorporating more renewable energy resources into the grid as it transforms to a greener grid mix. Duke Energy has committed to reducing GHG emissions in the short term by 50 percent by 2030 (as compared to a 2005 baseline).
	**ACTION:** Community stakeholders may intervene in the Integrated Resource Plan (IRP) process regarding their interest in a cleaner energy supply.
	**ACTION:** The City of Raleigh may intervene in the IRP process to highlight the importance of the transition to clean, renewable energy and the impact of greening the electricity grid on reducing carbon emissions in the community.
STRATEGY: **Renewable Energy**	
ACTION: **Continue to support and promote the expansion of renewable energy programs.**	
DESCRIPTION	The community benefit of a cleaner grid is decreased community-wide GHG emissions for energy. Support opportunities to extend the Duke Energy NC Solar Rebate Program beyond 2022 to 2030. A number of Duke Energy programs enable the Raleigh community to procure green power at competitive rates and should be encouraged and expanded. These programs include Green Source Advantage, Renewables, Shared Solar, Solar Leasing, and other residential and commercial renewable projects.
	**ACTION:** Evaluate the resources needed to incorporate renewables into the design of all City building projects or to build all City facilities to be solar-ready.
	**ACTION:** Evaluate the solar array or other renewable potential of projects on vacant, underutilized, or open spaces, such as Solid Waste Services' closed Wilders Grove Landfill, potential projects with Raleigh Water, etc.
	**ACTION:** Evaluate the feasibility of Duke Energy's Green Source Advantage program.
	**ACTION:** Evaluate opportunities to increase renewable energy projects on City-owned buildings or commercial projects, such as installation of solar shade canopies over parking facilities, at park locations, and on buildings. Also, consider other water, waste, and energy efficiency improvements in City and commercial projects.
	**ACTION:** Evaluate renewable energy opportunities for new and existing construction.
	**ACTION:** Establish criteria that prioritize environmental considerations, in addition to costs and building function, such as meeting energy efficiency standards.

Table 5-5 (long-term) includes implementation actions for strategy areas that have a longer lead time and will be underway in eight or more years. The long-term strategies provide a roadmap that can guide stakeholders in their longer-term action planning. The long-term strategies pull from specific topical plans, such as the State of North Carolina's Clean Energy Plan, and from technical experts who plan for the future of areas like buildings, energy, transportation, land use, etc.

Label Table 5-5. Long-term Building & Energy Actions

CATEGORY **Buildings & Energy**	
LONG-TERM MEASURES (8 or more years)	
STRATEGY: **Building Energy Efficiency**	
ACTION: **Encourage best practice energy efficiency and management in existing non-residential buildings.**	
DESCRIPTION	Best practice energy management includes encouraging energy benchmarking, disclosure, audits, and building retro-commissioning. This promotes transparency, awareness, and cooperation, and it helps to reduce energy consumption for various facility types. Look for best practice opportunities on community projects, such as the Dorothea Dix Park building re-use and infrastructure plan.
STRATEGY: **Non-Energy Benefits in Energy Efficiency**	
ACTION: **Quantify non-energy benefits in energy efficiency.**	
DESCRIPTION	As established in the North Carolina Energy Efficiency Roadmap, recommendation 23, technical experts and stakeholders should develop a methodology to calculate benefits to public health (via air and water quality), economic development, environmental health (GHG emission reduction, air quality, and water quality), and increased property value and reduce tenant turnover for energy efficiency investments.
STRATEGY: **Energy Supply**	
ACTION: **Greening of the grid and expanding renewable energy.**	
DESCRIPTION	Duke Energy is incorporating more renewable energy resources into the grid as it transforms to a greener grid mix. Duke Energy has committed to reducing GHG emissions in the long term by 100 percent by 2050 (as compared to a 2005 baseline).

GoRaleigh Bus

Chapter 6 - Transportation & Land Use

The Transportation & Land Use category includes strategies to reduce emissions from vehicles and the number of vehicle miles traveled, as well as additional strategies to address the effects of land use on transportation.

According to the City of Raleigh's 2014 emissions inventory study, transportation contributed roughly 42 percent of total GHG emissions, more than 2.3 million $MTCO_2e$. With rapid population and economic growth, this presents an opportunity to focus on building community resilience, supporting equity, and reducing GHGs in area transportation and land use strategies.

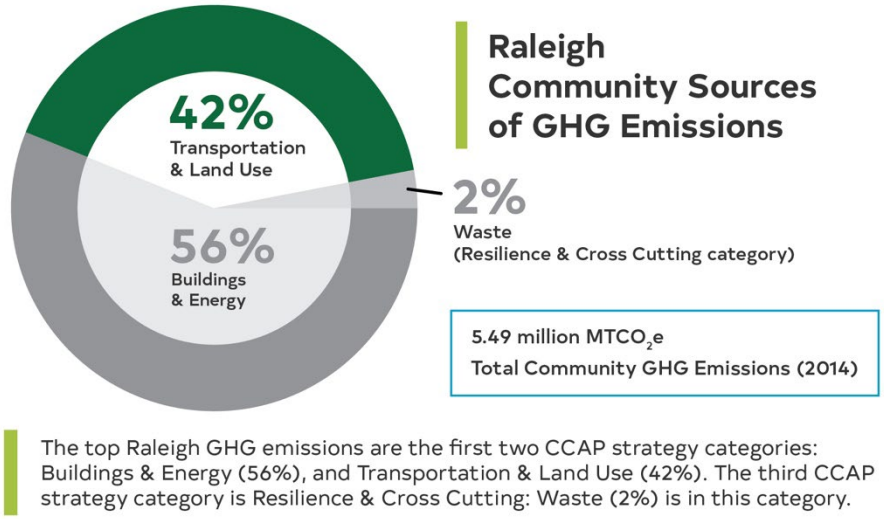


Figure 6-1. Sources of GHG Emissions in Raleigh

Changes to regional transportation systems and land use patterns are critical to the success of CCAP. GHG reductions in this sector are realized mainly by reducing the use of traditional modes of transportation and adopting alternative, low-carbon vehicle technologies; however, they are also supported by modifications to land use patterns where we can get people out of their cars into other modes of transportation or decrease the amount of miles they are driving. With a goal of reducing regional transportation-based GHG emissions, the City's broad strategies are designed to also positively affect community equity, resilience, and safety through increased mobility and access.

Vehicle miles traveled (VMT) *is a unit to measure vehicle travel made by a private vehicle, such as an automobile, van, pickup truck, or motorcycle. Each mile traveled is counted as one vehicle mile regardless of the number of persons in the vehicle.*

To reduce VMT, the community can access non-vehicular modes of travel and support commuter trip efficiency programs to help to mitigate roadway traffic and improve freight efficiency.

Modeling GHG emission forecasts for transportation and land use helped inform development of the associated strategies and actions. Then, a quantitative analysis of the strategies helped determine their GHG reduction potential within the context of Raleigh's current activities and projected growth through 2050 (base case forecast). Specific assumptions were developed for each strategy regarding its effectiveness at vehicle usage and vehicular emissions, and the estimates of those reductions were entered into a customized model to calculate GHG emission reductions over time relative to the base case of GHG emissions growth. The strategies modeled were grouped into the following strategy areas:

- Vehicle Miles Traveled (VMT)
- Efficient Land Use (LU)
- Electric Vehicles/Alternative Fuel Vehicles (EV/AFV)

These strategy areas are discussed in detail in the following sections. For each strategy area, information is included that will help CCAP stakeholders understand potential impacts and implementation options. Information includes a strategy description of the actions that CCAP stakeholders can take to reduce GHG emissions, modeling information that provides a relative comparison of the GHG impact between the various strategies, and equity and resilience considerations for implementing strategies.

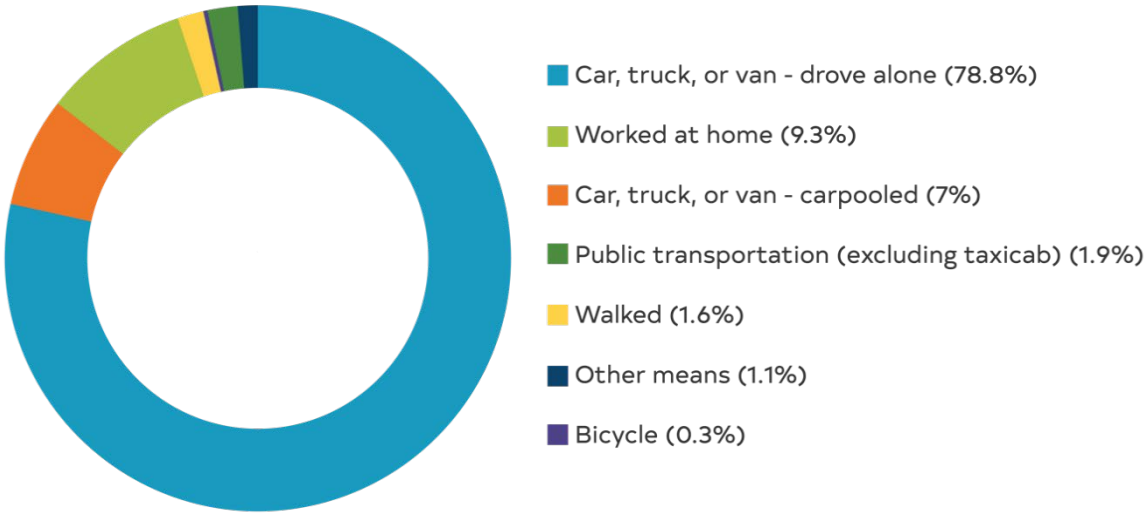
Additionally, a full list of Transportation & Land Use short-term strategies is provided along with examples of actions under each strategy. These example actions are included to assist CCAP stakeholders in identifying their own actions that best fit with their organization, business, daily life, etc. These example actions also provide further information on where the City is already planning or working to take action or to lead the way, as well as example ideas for actions where CCAP stakeholders can assist, lead, or participate in implementation and action creation and development.

6.1 - Analysis of Transportation & Land Use Strategies

VMT Reduction and Alternative Mobility

Description

The City can encourage the use of existing transportation systems to increase bus ridership (which reduces VMT) by implementing alternative and more efficient mobility pathways. In the Raleigh area, most people commute to work alone (see Figure 6-2 below). CCAP strategies include promoting access to and incentivizing non-vehicle ***modeshare*** such as walking and biking; supporting commuter trip efficiency programs such as transit, carpool, and teleworking; expanding access and opportunities to public transit by increasing bus services, routes, and stations; deploying a bus rapid transit system; and increasing ridership by improving public transit experience and safety. Though they will not reduce VMT, CCAP includes strategies to mitigate roadway traffic and improve freight efficiency at intermodal facilities because they reduce higher GHG emissions associated with vehicle idling and stop-and-start driving. Over the long term, partnering with the CAMPO, other regional planning organizations, transit organizations, and employers will be critical to reducing VMT and developing equitable mobility.



Source: U.S. Census Bureau, 2017 American Community Survey 1-year Estimates

Figure 6-2. Typical Modes of Transportation for Commuters

VMT Reduction and Land Use

Description

In addition to reducing VMT through alternative mobility, land use also plays a role in reducing VMT, and Raleigh will work to encourage compact development patterns that limit the need for vehicular trips. Using land efficiently and planning land use in conjunction with transportation objectives can support other GHG reduction strategies while providing long-term impacts on equity through increased mobility. Important actions in implementing this strategy include promoting development patterns that support safe, effective, and multi-modal transportation options, such as auto, pedestrian, bicycle, and transit;

minimizing VMT by providing for a mixture of land uses; and improving walkability and compact community form.

The strategies associated with VMT reduction and land use are listed in Table 6-1 and identified for correlation to graphical output from the GHG emission reduction modeling shown in Figures 6-3 and 6-4 that follow.

Table 6-1. Vehicle Miles Traveled and Land Use

Identifier	Abbreviated Description
VMT-1	Reduce commuter trips
VMT-2	Increase non-vehicular mobility/expand public transit
VMT-3	Freight efficiency
LU-1	Compact development patterns

Modeling

The results of GHG emission reduction modeling for these strategies is presented in Figure 6-2. Note that as indicated by the scale of values on the vertical axis (left side of the graph), the cumulative GHG reduction from these strategies is only about 75,000 $MTCO_2e$ at their peak.

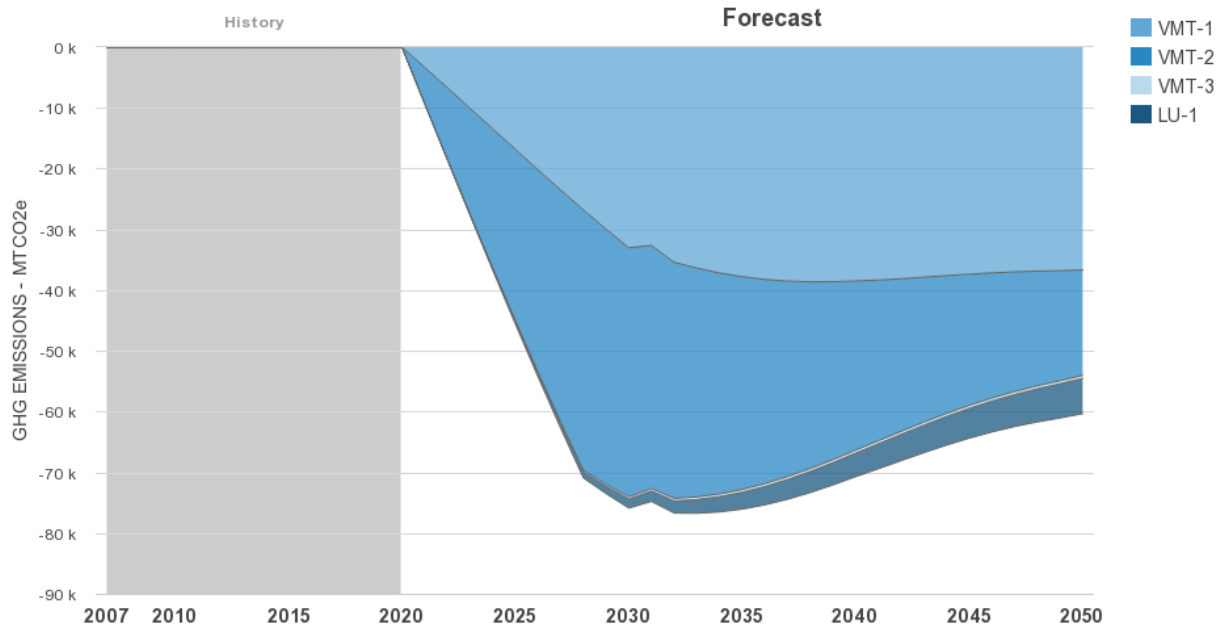


Figure 6-3. GHG Reductions from VMT, Land Use, and Waste Strategies

The GHG emission reductions from these strategies relative to the BAU base case are presented in Figure 6-3. The estimated reductions from these strategies relative to the total GHG emissions forecast are minimal as modeled based on conservative assumptions due to the City's limited ability to control and regulate change over some transportation strategies in the greater Raleigh area; however, the potential to exceed these estimated reductions is possible through community engagement, and

additional voluntary efforts to advance strategies by high impact community partners such as those with large workforces and customer bases. High impact partners and actions include educational institutions, large employers, and large developers adopting commuter programs that reduce commuting by individuals in single-occupant vehicles through methods such as encouraging and incentivizing transit, options such as biking/walking, or the incorporation of teleworking and remote work.

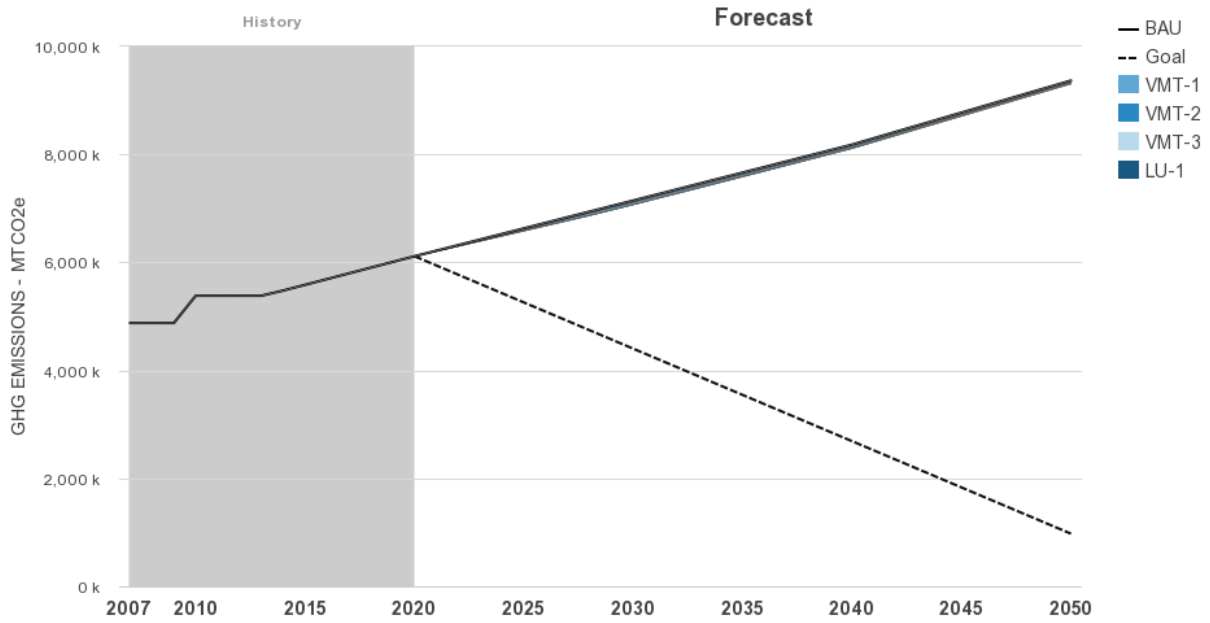


Figure 6-4. GHG Reductions from VMT, Land Use, and Waste Strategies Relative to BAU

Transportation Electrification and Alternative Fuels

EV Stations.

Encouraging the adoption of alternative, low-carbon vehicle technologies is another key strategy to reduce regional transportation-based GHG emissions. Actions supporting this strategy may reflect planning and outreach in the short term and capital investment in the long term when prices for these technologies achieve parity with traditional vehicles and fuels. Actions include encouraging and incentivizing adoption of alternative fuel and EVs in private fleets and for personal use, promoting and planning the transition of bus fleets to alternative fuels and electric, and promoting the installation and utilization of EV charging stations. Additionally, encouraging the acquisition of newer traditional vehicles as their fuel economies improve over the short term will be essential during the gradual transition to alternative fuel and EVs.

The project team evaluated and modeled six strategies related to promoting and incentivizing EV and AFV adoption and fuel efficiency improvements.

Additional to the strategies and actions taken by the City, there is a seventh item modeled to reflect the macro trend of EV adoption nationwide. According to a 2017 Bloomberg New Energy Finance report, domestic EV sales will exceed sales of internal combustion engine vehicles in 2038 (see Figure 6-5).[23]

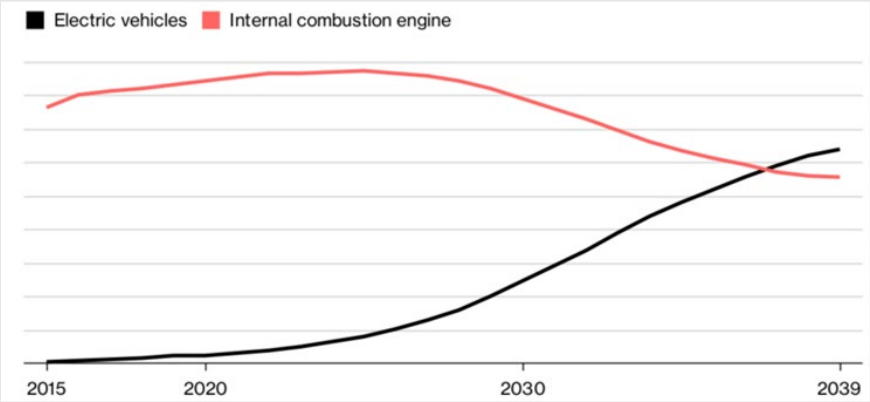


Figure 6-5. Forecast Sales of EVs vs. Internal Combustion Vehicles

This represents a significant shift from the BAU scenario that will likely occur regardless of City and community actions, but this can certainly be accelerated or amplified by City and community actions as listed in Table 6-2. The identifiers for strategies in Table 6-2 correspond to the graphical model output of estimated GHG reductions from these strategies shown in Figures 6-6 and 6-7.

Table 6-2. EV and AFV Strategies

Identifier	Abbreviated Description
EV/AFV Short-term Strategy A	Encourage and incentivize private adoption of alternative fuel and electric vehicles, including personal vehicles and private fleets.
EV/AFV Short-term Strategy B	Encourage, promote, and plan the transition of bus fleets to alternative fuels and electric.
EV/AFV Short-term Strategy C	Promote, encourage, and incentivize installation and utilization of electric vehicle charging stations in both public and private applications.
EV/AFV Short-term Strategy D	Transportation fuel efficiency improvements (short-term).
EV/AFV Long-term Strategy E	Encourage the transition of vehicles to alternative fuels and electric vehicles, including bus fleets, private fleets, and personal vehicles
EV/AFV Long-term Strategy F	Transportation fuel efficiency improvements (long-term).
EV/AFV Macro trends to EV	Assumes fuel efficiency trends continue and EV adoption follows forecasted market trends.

The modeled GHG emission reductions are presented in Figure 6-5. Note that these reductions become more impactful over time due to the "Energy Supply" strategies described in Chapter 5, Section 5.1 and Duke Energy's commitments to reduce the carbon intensity of the electricity it generates. As that transition occurs simultaneously with the transition to EVs, the shift from fossil-based vehicle fuel to electricity also becomes more significant in terms of GHG emission reduction.

[23] https://www.bloomberg.com/news/articles/2017-07-06/the-electric-car-revolution-is-accelerating

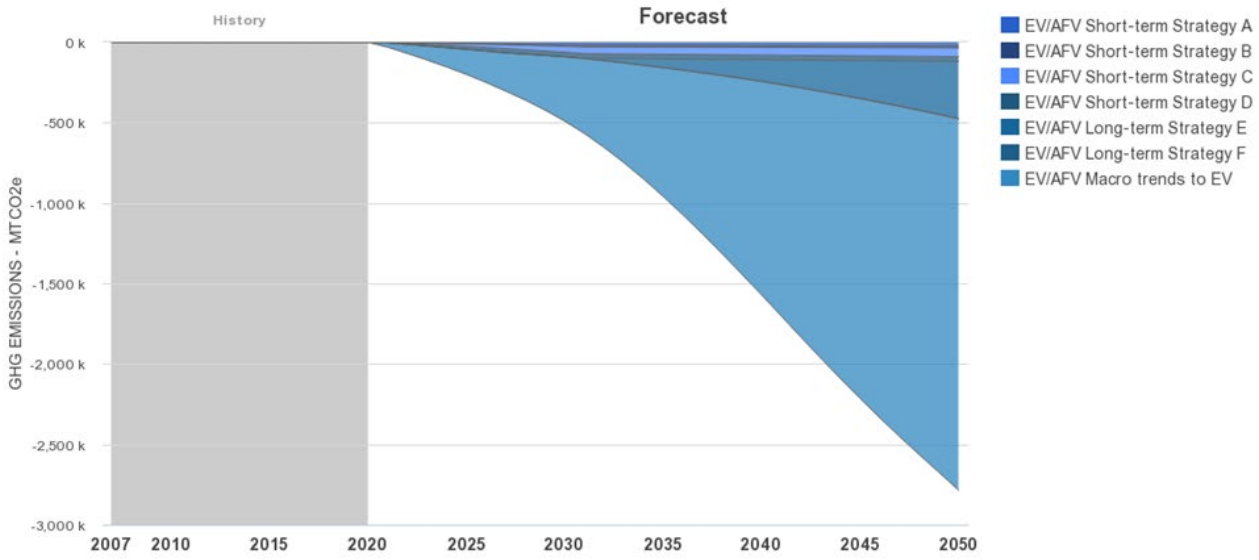
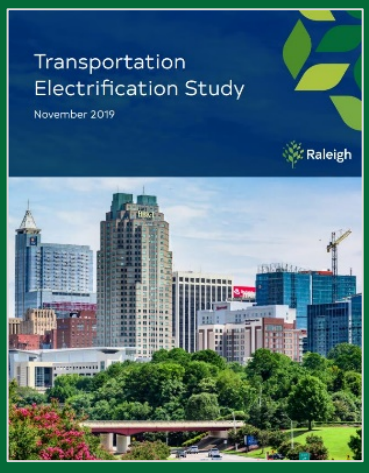


Figure 6-6. GHG Reductions from EV and AFV Strategies

Relative to the BAU base case, these strategies have a significant GHG emission reduction potential toward Raleigh's 2050 goal, as shown in Figure 6-7. High impact community partners, such as developers and businesses can further exceed GHG reductions for this strategy by strategically placing electric vehicle charging infrastructure in developments and community destinations to address the needs of community members to charge their cars; and by also making new developments "EV Ready" by placing the necessary conduit and making space for future electric needs during construction so additional future EV stations can be added easily and cost-effectively as community demand grows. These actions by high-impact partners will greatly support the Raleigh and surrounding community in transitioning to electric vehicles.



Raleigh's Transportation Electrification Study

Understanding that transportation electrification was one of the largest opportunities to have a high impact on GHG reductions, the City of Raleigh worked with partners to create a Transportation Electrification Study in late 2019. This study outlines three dozen recommended strategies and actions on the City fleet, EV infrastructure, equitable economic development, equity and access, and roles and responsibilities related to increasing transportation electrification. This study and the many actions and strategies it identifies directly support strategies and actions identified in CCAP, not only to reduce GHG emissions, but also to equitably distribute the economic and environmental benefits of EVs among Raleigh residents.

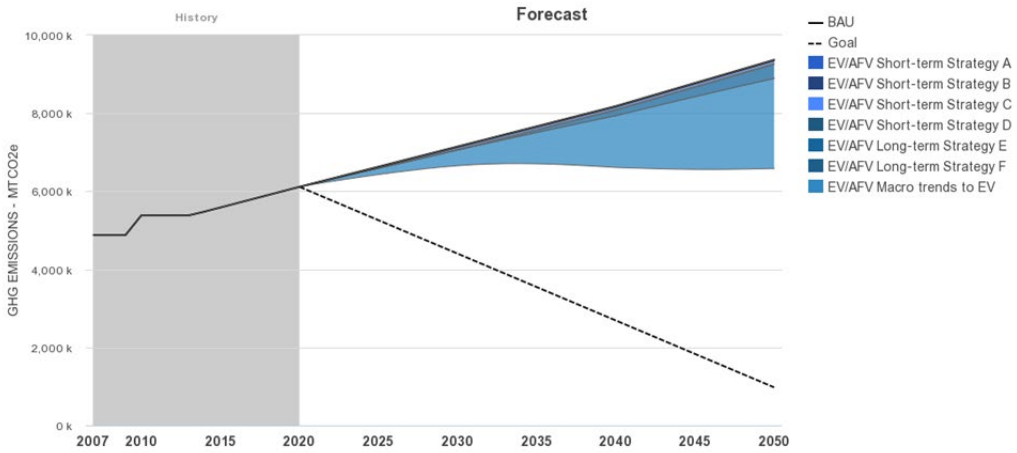


Figure 6-7. GHG Reductions from EV and AFV Strategies Relative to Base Case Projections

As referenced in Chapters 3 and 4, "Supporting Climate Equity" and "Building Community Resilience," the following equity and resilience considerations provide guidance and a starting place for CCAP stakeholders on what to consider when implementing and taking action on Transportation & Land Use strategies.

6.2 - **Equity Considerations**

VMT Reduction and Alternative Mobility

The strategies in this area aim to reduce emissions from transportation and include actions that will increase the ease of vehicle travel to reduce idling and travel times and actions that aim to decrease the use of passenger vehicles altogether.

Reducing traffic delays and idle times for passenger and freight vehicles will increase the travel efficiency of motor vehicles through the community. This can offer expanded economic benefits, particularly to small businesses that receive faster and more reliable access to goods. However, actions taken to improve travel efficiency will largely only benefit the car-driving population. Car ownership is a significant investment and a barrier to participation in the benefits of traffic improvement strategies. These strategies could have the consequence of encouraging more vehicle use and increasing VMT. There is also a likelihood that along roads with greater travel efficiency, there will be a decrease in pedestrian and cyclist safety.

Citrix Cycle Bike Charging Station.

Strategies to increase the feasibility of pedestrian and micro-mobility transportation options across the community have the potential for environmental, economic, and public health benefits that could be broadly shared across Raleigh's residents. However, the distribution of infrastructure projects to meet these aims will be integral to capturing equity benefits from these projects. Equity considerations can be built into the planning process to not only determine where sidewalks or bicycle infrastructure are lacking, but also where they can best serve historically underserved populations in the community and do so safely. Strategies such as developing a bikeshare program that includes ride assist options and prioritizing equitable placement of stations across Raleigh both increase equitable access and mobility.

Strategies to improve the quality and quantity of bus service in Raleigh are likely to have positive impacts on economic and environmental equity. Expansion of bus routes will provide greater service across the community, decrease transit times, and allow access to expanded economic and educational opportunities for underserved populations. As strategies for increased density and transit-oriented development also begin to be implemented, more reliable and comfortable transit will accommodate greater ridership.

Efficient Land Use

For Raleigh to accommodate a growing population and provide reliable, safe, and convenient transit options, development patterns need to create more compact and walkable spaces that contain commercial and retail space as well as residential units. Living and working in these spaces will allow residents to spend fewer resources and less time on travel. This type of development encourages a more active lifestyle and less reliance on cars for short trips, reducing GHG emissions and air pollution at the regional or even community-wide level. At the same time, localized density of commercial and residential facilities can create "hot spots" of particulate air pollution, which affects the rate of respiratory disease in a population.[24] Though, with an increase in fuel efficiency standards for automobiles and an ongoing transition to alternative fuel vehicles and electric vehicles, these hot spots become less severe.

The economic and social benefits from this transition will likely be mixed. Compact development patterns provide more economic opportunity in terms of job density and ease of transit, but higher costs of living can also be associated with dense urban forms. These development patterns concentrate impervious surfaces, which increases flooding risk and the ***urban heat island*** effect. To mitigate flooding and heat, ***green infrastructure*** and low impact development practices should be incorporated into development plans.

Transportation Electrification and Alternative Fuels

Macroeconomic trends are driving the adoption of electric and alternative fuel vehicles. We can observe in Raleigh that there are increasing numbers of these vehicles on the streets, in public and private fleets, and even at our bus stations. Electric and alternative fuel vehicles are part of an important global transition away from fossil fuels. There are numerous health benefits, including improved local air quality for residents, as more of these vehicles replace gas-powered vehicles on our streets.

The location and availability of charging infrastructure for personal EVs is an important equity consideration. To support the use of more of these vehicles on our streets, there is a need to install EV charging infrastructure throughout the community—including underground conduit that would be suitable to support charging infrastructure in the future. Additionally, there are access issues for the renter community. Renters, particularly those in multi-unit dwellings, currently have little or no access to EV charging infrastructure. The cost of installation of this infrastructure could be passed along to renters in the form of rent increases, even if they do not utilize the chargers.[25] The location and timing of infrastructure installation will be an important consideration for the roll-out of this strategy. In the

[24] Mansfield, Theodore J, et. al. "The Effects of Urban Form on Ambient Air Pollution and Public Health Risk: A Case Study in Raleigh, North Carolina. *Risk Analysis,* pages 901-915 Oxford May 2015

[25] Vithanage, Achinthi C. "EV for EV: Equity and Viability in Electric Vehicle Infrastructure Law and Policy" Natural Resources & Environment; Chicago Vol. 34, Iss. 4, (Spring 2020): 11-15.

longer term, greater EV saturation and a decrease in the cost of these vehicles—due to the availability of pre-owned EVs and improvements in the technology—will mitigate short-term disparities caused by EV installations. Also, the cost to install the conduit (needed for future EV infrastructure) when you are building a new facility is minimal. It can cost around six times more to lay the conduit after construction, so even if EV stations are not needed right away, building "EV ready" by installing the conduit allows facilities to participate in the future growth of the market and support the customers or residents they serve. With this in mind, populations and developments that have traditionally been left out of the EV market conversation (like small business, multi-family, or affordable housing developments) should be included in outreach. As the market for EVs becomes affordable for more income levels, these populations will not have the opportunity to reap the many benefits of EVs if the facilities where they live, spend time, or work are not equipped (the cost barrier to run the conduit in facilities that are not built to be EV-ready can be high). Including small and minority-owned business, multi-family, and affordable housing developments in education and outreach so that the conduit is placed during building construction will ensure more equitable distribution of EVs in Raleigh.

6.3 - **Resilience Considerations**

Transportation Electrification and Alternative Fuels

Adopting new vehicle technologies can provide community-wide resilience to supply chain disruptions. During a disaster or accident or in an economic crisis, fuel supplies can be affected. In 2016, North Carolina experienced a fuel shortage when the Colonial Pipeline began to leak in Alabama.[26] If traditional fuels are not able to reach Raleigh residents, having buses, fleet vehicles, and personal vehicles that can be powered by alternative fuels and electricity will help sustain some economic and social activity in the community while the shortage lasts. As market forces drive personal vehicle sales toward a greater share of electric vehicles, the resilience of the electrical grid will be a prime factor in keeping Raleigh moving.

6.4 - **Transportation & Land Use Actions**

As discussed previously, the success of these strategies will depend upon the interest, involvement, and innovation of not only the City of Raleigh, but also all of its partners and stakeholders in taking action to meet the community's climate goals. While some of the modeling presented above shows modest GHG emission reduction impacts, the potential exists for much greater impacts. For example, although we have included the potential impacts of the expected economy-wide shift toward EVs in the coming years, it requires consumers to make that shift away from fossil-fuel-powered vehicles, and also for the City, Duke Energy, local developers, and businesses and other stakeholders to provide access to decarbonized electricity and infrastructure for charging those EVs. Priorities for action to reduce GHG emissions in the Transportation & Land Use category include the transformation to EVs and the reduction in VMT. Table 6-3 (short-term) and Table 6-4 (long-term) include implementation actions for strategy areas. Table 6-3, "Short-Term Transportation & Land Use Actions," provides strategies with examples of actions.

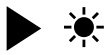
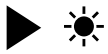
[26] Cusick, David. "What you need to know about the North Carolina gas shortage" ABC 11 News September 20, 2016 https://abc11.com/north-carolina-gas-shortage-price-gouging-why-is-there-a/1518000/

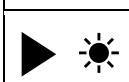
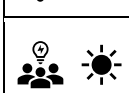
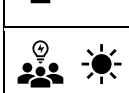
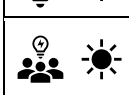
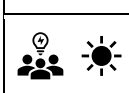
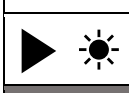
Table 6-3 (short-term) and Table 6-4 (long-term) include implementation actions for strategy areas. Table 6-3, "Short-Term Transportation & Land Use Actions," provides strategies with examples of actions. Short-term actions are either already underway or will be soon, with implementation expected in zero to seven years. The long-term actions have a longer lead time and will be underway in eight or more years. As both the City and its partners and stakeholders will be involved in these actions, we have provided some indication of who is or might be responsible for each one. Additional discussion regarding implementation is provided in Chapter 8.

The example actions that are under each strategy in provide context and examples for CCAP stakeholders as they go about identifying actions that best fit with their own organization, business, daily life, etc. These example actions also provide further information on where the City is already planning, working to take action, or leading the way. They also provide example ideas for actions where CCAP stakeholders can assist, lead, or participate in implementation and action creation and development. At the top of , see the legend with icons and descriptions for further detail on the actions.

Table 6-3. Short-Term Transportation & Land Use Actions

CATEGORY **Transportation & Land Use**			
SHORT-TERM ACTIONS (0-7 years)			
IDEA stage: exploring, identifying partners, evaluating resources and feasibility	GETTING STARTED: buy-in from affected stakeholders to further explore and evaluate for potential feasibility of implementation	Actions UNDERWAY: working with partners on, in some stage of implementation	Actions where the City is a partner or taking the lead
STRATEGY: **VMT Reduction and Alternative Mobility**			
ACTION: **Implement congestion mitigation strategies to reduce traffic delays, idle time, and allow the efficient use of motor vehicles.**			
DESCRIPTION	Congestion mitigation strategies reduce traffic delay, allowing vehicles to operate more efficiently. These strategies generally do not reduce VMT but decrease idling and stop-and-start driving conditions associated with higher levels of emissions. Emission reductions are generally small on a per-project basis but can cumulatively reduce emissions substantially. Many such projects are funded with ***Congestion Mitigation and Air Quality*** program funds; emissions benefits are accounted for in transportation planning during the conformity process.		
	ACTION: The City will continue to implement congestion mitigation strategies to decrease idling and stop-and-start driving conditions, which increase vehicle emissions.		
ACTION: **Promote access to and incentivize non-vehicle modeshare such as walking and biking.**			
DESCRIPTION	Increasing non-vehicular modeshare is associated with compact development patterns. Continue to plan for development that promotes reductions in vehicle miles traveled. Continue to promote bikeshare, scooters, and access to other modeshare options.		
	ACTION: The City will continue to promote reductions in vehicle miles traveled by developing and pursuing strategies that encourage and incentivize individuals to seek out and utilize alternative modes of transportation, including identification and removal of barriers and improvements to existing transit service.		
	ACTION: Explore using greenways as transportation corridors by developing and implementing policy recommendations, operational considerations, and capital investments.		
ACTION: **Support commuter trip efficiency programs such as transit, carpool, vanpool, biking, walking, teleworking, and alternative work schedules. Provide workforce outreach and education opportunities, and work with employers to alleviate traffic by reducing single occupancy vehicle commutes.**			
DESCRIPTION	Continue to support commuter trip efficiency programs; explore opportunities to provide workforce education, outreach, or incentives for employers. Commute Smart Raleigh offers an easy solution to help alleviate traffic congestion and employee stress with transportation demand management (TDM). TDM seeks to move more people in fewer vehicles. Strategies can be used to decrease the use of single occupancy vehicles and encourage the use of alternatives such as transit, carpooling, vanpooling, bicycling, walking, parking strategies, teleworking, and alternative work schedules.		
	ACTION: Evaluate commuter behavior changes due to environmental, political, and/or social situations. Identify opportunities to create additional long-term efficiency programs that reduce congestion, increase air quality, and decrease parking requirements.		

	**ACTION:** The City will continue to support commuter trip efficiency programs and to explore opportunities to provide workforce education, outreach, or incentives for employers to encourage strategies such as telework or carpooling.
	**ACTION:** Explore opportunities to right-size parking.
	**ACTION:** Create a Sustainable Business Toolkit and explore a Raleigh Climate Business Leaders program to provide resources and assistance for businesses to focus on reducing VMT by their employees.
ACTION: **Improve freight efficiency by relieving capacity constraints at freight bottlenecks, improving access to intermodal facilities, and shifting freight modes from truck to rail.**	
DESCRIPTION	Freight improvements decrease the GHG emissions from idling and traffic congestion while supporting strategic investments that support economic growth, job creation, improved infrastructure, and a higher quality of life. Freight efficiency improvements include relieving capacity constraints at freight bottlenecks, improving access to intermodal facilities, and shifting freight modes from truck to rail. The Raleigh community will benefit from the strategic investments in the Triangle Region Freight Plan and the VMT reduction of freight in Raleigh.
	**ACTION:** Strategic investments from the Triangle Region Freight Plan will be made, and these will benefit the Raleigh community. Freight improvements relieve bottlenecks in the transportation system, reduce VMT for freight, and decrease emissions from idling in traffic in Raleigh.
ACTION: **Expand access and opportunities to public transit by increasing bus services and number of routes, improving stops and shelters, and implementing bus rapid transit.**	
DESCRIPTION	The Wake Transit Plan is part of a larger regional initiative to expand access and opportunities and help connect more people to jobs, schools, health care, and entertainment. It will triple the county-wide bus service, increase the number of routes, improve bus stops and shelters, and implement bus rapid transit.
	**ACTION:** The City will continue to support the implementation of the Wake County Transit Plan, including the bus rapid transit corridors, and to strengthen multimodal connections between high-impact activity nodes and different modes of transportation.
	**ACTION:** Identify and map areas burdened by past transportation investments and associated air quality or community impacts; identify mitigation measures to generate better outcomes for impacted residents.
ACTION: **Further promote public transit experience by improving availability, reliability, safety, and traveler experience.**	
DESCRIPTION	GoRaleigh will continue to improve the availability, reliability, safety, and traveler experience for transit.
	**ACTION:** The City will continue to improve the availability, reliability, safety, and traveler experience for transit.
	**ACTION:** Identify and remove barriers to participation in transit services.
STRATEGY: **Efficient Land Use**	
ACTION: **Promote development patterns that support safe, effective, and multi-modal transportation options, including auto, pedestrian, bicycle, and transit, to minimize vehicle traffic by providing for a mixture of land uses, walkability, and compact community form.**	
DESCRIPTION	Shift expected new development to compact development patterns and support equitable development around transit with a focus on increasing public transit ridership, housing affordability, and accessibility to service; minimizing displacement; and providing economic development opportunities.
	**ACTION:** Continue to embed CCAP into the Equitable Development Around Transit, so that the benefits of the future growth around transit and transit investments are shared broadly.

	**ACTION:** Pilot ***performance-based zoning*** with climate and sustainability incentives in target areas.
	**ACTION:** The City will pursue opportunities and partnerships along high-priority transit corridors to advance community priorities, develop specific land use strategies, and support equitable economic development.
	**ACTION:** The City's Planning and Development Services will include carbon emissions analysis in City rezonings, area plans, and other planning studies and decisions to consider the effect of a plan or zoning change on per-capita emissions.
STRATEGY: **Transportation Electrification and Alternative Fuels**	
ACTION: **Encourage and incentivize adoption of alternative fuel and electric vehicles, including personal vehicles and private fleets.**	
DESCRIPTION	Implement strategies to support transition to alternative fuel and electric vehicles by implementing strategies such as those established in the Transportation Electrification Study. Encourage plug-in electric vehicle charging installation for general public use and workplace and retail applications. Explore public-private partnership opportunities. Develop communications/outreach for encouraging workplaces and businesses to install plug-in electric vehicle charging stations.
	**ACTION:** Encourage the transition of private fleets and personal vehicles to alternative fuels and plug-in electric (battery electric and plug-in hybrid) vehicles (PEVs) where possible with focus on light-duty vehicle applications.
	**ACTION:** Work to implement strategies as identified in the Transportation Electrification Study to encourage the transition community-wide to alternative and electric vehicles.
	**ACTION:** Encourage PEV charging installation for general public use and workplace and retail applications.
	**ACTION:** Implement smart city and intelligent transportation and emerging technology solutions, such as the EV mapping tool, to identify and prioritize locations for EV infrastructure to improve mobility.
	**ACTION:** Create an EV-ready playbook as a guide for installing EV infrastructure.
	**ACTION:** Create educational materials with Planning and Development staff of best practices for business owners, property managers, and developers on EV charging infrastructure.
	**ACTION:** Work with Duke Energy and other partners to install publicly available charging stations on City property.
	**ACTION:** Evaluate hardware and software solutions and the associated requirements and standards for implementation and adoption of EV infrastructure.
	**ACTION:** Perform EV facility analysis to evaluate City facilities for energy usage and potential energy loads with EV infrastructure and EV fleet placement in the future.
	**ACTION:** Integrate electric vehicles into the City fleet, including an evaluation of the budgeting process for EVs.
ACTION: **Encourage, promote, and plan the transition of bus fleets to alternative fuels and electric.**	
DESCRIPTION	Transition fleets, including buses, and personal vehicles to alternative fuels and PEVs where possible. This could include school system buses, private shuttle and commuter buses, university shuttles, etc. Explore public private partnership opportunities. Develop communications/outreach for encouraging workplaces and businesses to install PEV charging stations in coordination with existing programs.
	**ACTION:** The City will establish forecasts for transitioning fleets (including GoRaleigh) to alternative fuels and electric along with the associated infrastructure.

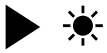
	Transition fleets and buses to alternative fuels and PEVs where possible, with focus on light-duty vehicle applications. This includes private and public organizations, schools, and businesses.
	**ACTION:** Implement the Bioenergy Recovery Project to transition GoRaleigh Transit buses to renewable natural gas (R-CNG) using the captured methane gas from the wastewater process implemented by Raleigh Water.
	**ACTION:** Replace City buses with alternative fuel and electric buses. Install infrastructure to support the expansion of renewable alternative fuel and electric buses over time.
ACTION: **Promote and encourage installation and utilization of electric vehicle charging stations in both public and private applications.**	
DESCRIPTION	Implement strategies to support transition to electric vehicles by implementing strategies for electric vehicle charging stations, such as those established in the Transportation Electrification Study.
	**ACTION:** Raleigh to evaluate options for encouraging or requiring a percentage of parking spaces in a new or renovated parking structures to include electric vehicle supply equipment (EVSE) and to be EV-ready or EV-capable.
	**ACTION:** The City will streamline and simplify the permitting processes for electric vehicle charging infrastructure.
ACTION: **Improve transportation fuel efficiency.**	
DESCRIPTION	Fuel efficiency improvements will continue to occur as the transportation market evolves to higher fuel economy vehicles and is supported by future federal fuel economy standards that continue to support lower GHG emissions. These efficiency improvements will decrease the GHG emissions from the overall vehicle population over time.
	**ACTION:** The federal Corporate Average Fuel Economy (CAFE) standards are regulations to improve the average fuel economy of cars and light trucks and continue to improve vehicle efficiency over time. As vehicle owners' transition to newer vehicles with higher fuel efficiency, the emissions from vehicles in the community decreases.
	**ACTION:** The City will continue to transition the City fleet to more efficient vehicles and implement strategies as identified in the Transportation Electrification Study to encourage the transition to alternative and electric vehicles.

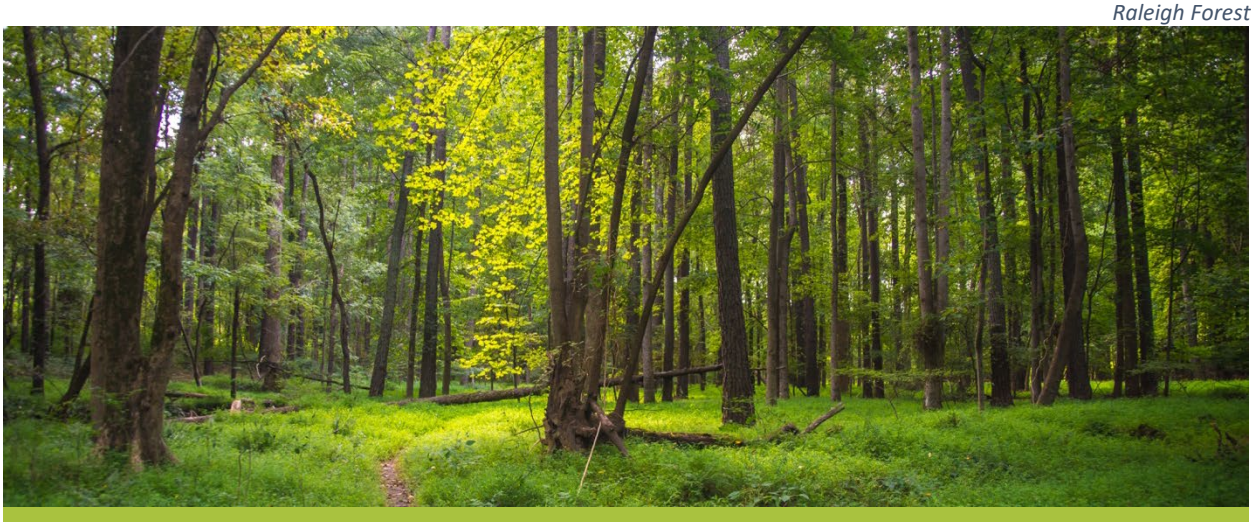
Table 6-4 Long-term Transportation & Land Use Measures
Includes implementation actions for strategy areas that have a longer lead time and will be underway in eight or more years. The long-term strategies provide a road map that can guide stakeholders in their longer-term action planning. The long-term strategies pull from specific topical plans and from technical experts who plan for the future of areas like buildings, energy, transportation, land use, etc.

CATEGORY **Transportation & Land Use**	
LONG TERM MEASURE (8 or more years)	
STRATEGY: **VMT Reduction and Alternative Mobility**	
ACTION: **Increase non-vehicle mobility, including transit, biking, walking, and other options.**	
DESCRIPTION	• Plan for development that promotes reductions in vehicle miles traveled and encourages other modes of transportation. • Increase access to transit by continuing to implement the Wake County Transit Plan in coordination with land use planning. Over the next 10 years, the plan will triple the county-wide bus service, increase the number of routes, and add bus rapid transit. • Explore opportunities to position select greenways as transportation options and continue expanding sidewalk connections. • Analyze community-wide parking availability with future population and vehicle projections to evaluate the true cost of parking and transportation.
ACTION: **Mitigate congestion.**	
DESCRIPTION	Congestion mitigation strategies reduce traffic delays, allowing vehicles to operate more efficiently. These strategies generally do not reduce VMT but decrease idling and stop-and-start driving conditions associated with higher levels of emissions. Develop strategies with local transportation partners to address congestion and transportation emissions through investments in expanded transit and electrification; consider communities of concern most effected by congestion. The CAMPO will continue to partner with regional stakeholders on the congestion management process to evaluate transportation system performance and assesses alternative strategies for congestion management that meet local needs.
ACTION: **Evaluate opportunities to reduce commuter trips.**	
DESCRIPTION	Grow commuter trip efficiency programs; explore opportunities to provide workforce education, outreach, or incentives for employers to encourage telework or carpooling; explore opportunities to right-size parking.
ACTION: **Improve freight efficiency.**	
DESCRIPTION	Improve freight efficiency for both the roadway network and air traffic. The CAMPO partnered with the Durham–Chapel Hill–Carrboro Metropolitan Planning Organization (MPO) and North Carolina Department of Transportation (NCDOT) to develop a Regional Freight Plan for the Triangle region. This partnership recognizes the importance and need for these agencies to jointly address freight issues in the region.
STRATEGY: **Efficient Land Use**	
ACTION: **Shift expected new development to compact development patterns.**	

DESCRIPTION	• Compact development may come from a combination of policies and land use plans and transportation effects on land use form—such as the land use effect of transit. Compact development patterns can reduce the length of vehicle trips and increase walking and bicycling. • Explore opportunities related to parking requirements that incentivize behavior change from single occupancy vehicles to other modes of transportation.
STRATEGY: **Transportation Electrification and Alternative Fuels**	
ACTION: **Encourage the transition of vehicles to alternative fuels and electric vehicles, including bus fleets, private fleets, and personal vehicles.**	
DESCRIPTION	• Implement strategies to support transition to alternative fuel and electric vehicles by implementing strategies such as those established in the Transportation Electrification Study. • Purchase alternative fuel and battery electric buses according to the fleet's bus retirement schedules for City and community bus fleets; develop GoRaleigh electric bus inventory forecast and associated GHG emission reductions for an electric turnover target. • Leverage projects for additional electric vehicle charging stations and coordinate with current programs run by the NC Clean Energy Technology Center and local Clean Cities coalition. Consider incentives and best practices for EV transformation, such as NCDOT's Zero Emission Vehicles (ZEV) Ready plan for 80,000 new EV vehicles by 2025. Leverage funding for the purchase and installation of public access DC fast charging systems along eligible highway corridors in Raleigh's vicinity.
ACTION: **Improve transportation fuel efficiency.**	
DESCRIPTION	• Market evolution to higher fuel economy vehicles will be supported by future federal fuel economy standards, which will support lower GHG emissions from the City's overall vehicle population over time. The standards will require average vehicle fleet fuel economy levels across light-duty vehicle products sold. • Support communications and outreach activities that further encourage purchase and ownership of light-duty vehicles with the highest fuel economy and lowest GHG emissions.

Table 6-4 Long-term Transportation & Land Use Measures

Raleigh Forest



Chapter 7 - Resilience & Cross Cutting

The Resilience & Cross Cutting category includes strategies aimed at reducing GHG emissions from waste; strategies addressing flood risk, heat and other climate, resilience, and social impacts; strategies promoting natural and green space and carbon sequestration; and other supporting strategies critical to CCAP's success.

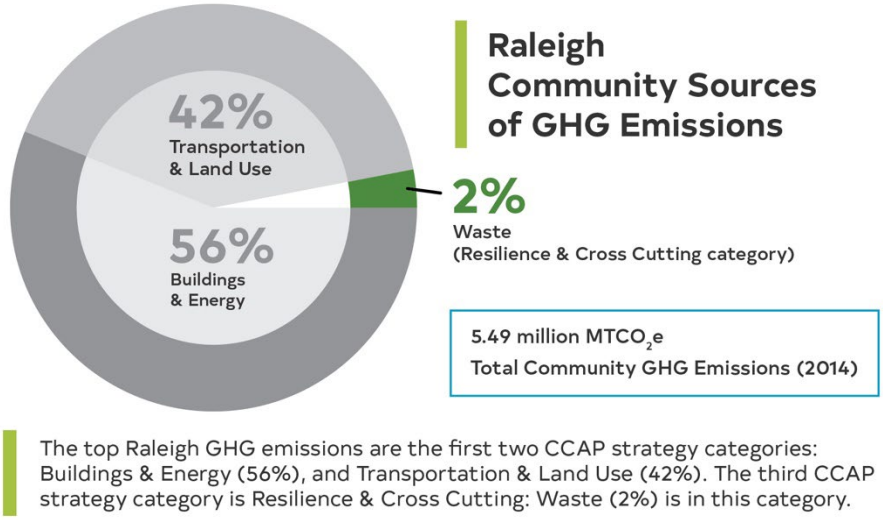


Figure 7-1. Sources of GHG Emissions in Raleigh

This includes cross cutting measures such as education, outreach, innovation, funding, and equity. Many of these strategies may not have a direct GHG emission reduction potential but will be key to moving CCAP forward. Cross cutting strategies (such as financing, education and outreach, equity, innovation) tackle both logistical and value-based methods that help set the foundation; support CCAP stakeholders

in implementation; break down barriers to and create opportunities for implementation; and address vital community values and needs for equity and resilience.

The Resilience & Cross Cutting strategy areas are discussed in detail in the following sections. For each strategy area, information is included that will help CCAP stakeholders understand potential impacts and implementation options. Information includes a strategy description of the actions that CCAP stakeholders can take, modeling information (for the waste strategy), and equity and resilience considerations for implementing strategies.

Additionally, a full list of Resilience & Cross Cutting short-term strategies is provided along with examples of actions under each strategy. These example actions are included to assist CCAP stakeholders in identifying their own actions that best fit with their organization, business, daily life, etc. These example actions also provide further information on where the City is already planning or working to take action or to lead the way, as well as example ideas for actions where CCAP stakeholders can assist, lead, or participate in action creation and implementation.

7.1 - Analysis of Resilience & Cross Cutting Strategies

Green Infrastructure

CCAP includes strategies to promote green infrastructure to support flood resilience. Floods are a highly disruptive climate risk, but their impacts can be mitigated by restricting development in floodplains and by investing in green infrastructure and programs that reduce stormwater runoff. Strategies include incentivizing participation in existing or future programs, such as Raleigh Rainwater Rewards, and developing other flood mitigation efforts.

Preservation and Green Space

The Raleigh community will encourage opportunities to promote green space through initiatives such as Raleigh's Open Space Plan, as well as to address urban heat islands, tree planting programs, pollinator habitat, food access, urban agriculture, and greenway development. Trees and green space create and define spaces; connect people to others and nature; and benefit the environment by consuming carbon, cooling the air, and collecting rainwater.

Urban Garden.

Waste Reduction and Efficiency

Although GHG emissions from waste (solid waste and wastewater) make up only about 2 percent of Raleigh's GHG emissions, there are several important opportunities for reducing those emissions.

Raleigh Water is the drinking water provider and wastewater collection service for most of the residents in Wake County other than the Cary and Apex areas. Raleigh also provides solid waste collection services for regular trash, recycling, and yard waste for residential customers in Raleigh. Raleigh does not provide any solid waste collection services for non-residential or business customers outside of the downtown service district. Wake County and private companies provide services to the area outside of Raleigh and to the non-residential customers in the remainder of Raleigh.

Raleigh Wilders Grover Solid Waste Service Facility.

The best method for reducing emissions from solid waste is to reduce the amount of waste produced by residents and businesses in Raleigh. Residents should make efforts to reduce the overall solid waste generated. Raleigh will explore opportunities to improve education and outreach on waste reduction and recycling throughout the supply chain and by consumers. Organic wastes such as food waste and yard waste that are produced may also be diverted away from landfills where they generate methane (a potent GHG) to other opportunities, including organic waste collection programs and management via composting or other anaerobic digestion projects. The Wake County Waste Characterization Study identifies such opportunities. Wake County will continue to offer waste reduction grants to support businesses, institutions, or non-profits that want to divert waste from the South Wake Landfill. The City will also continue to work to improve solid waste and recycling pickup processes, improve route efficiencies, and reduce VMT associated with collecting and transporting waste.

A strategy example to address wastewater includes Raleigh's planned Bioenergy Recovery Project (BRP) at the Neuse River Resource Recovery Facility. This is an innovative project that will anaerobically digest biosolids generated by the treatment of wastewater—the methane from this process will also be captured and then used as a renewable fuel in the City's bus fleet (this is another co-benefit to the project, as transitioning to clean alternative fuels is an important strategy in CCAP's Transportation & Land Use category). This project may be expanded in the future to include co-digestion of solid organic wastes, including food and yard waste.

Waste Modeling

Although GHG emissions from waste are a small portion (2 percent) of Raleigh's GHG emissions inventory, they still represent an opportunity for GHG emission reduction. The waste management strategy assumes GHG emissions from waste (solid waste and wastewater) will be reduced by 80 percent by 2050. While this is a significant reduction, it is consistent with waste management goals in peer cities and with the City's overall GHG reduction goal. The identifier for the waste management strategy is shown in Table 7-1 to correspond with the GHG reduction modeling output shown in Figures 7-2 and 7-3.

Table 7-1. Waste Strategies

Identifier	Abbreviated Description
W-1	Waste management

The results of GHG emission reduction modeling for this strategy are presented in Figure 7-2. Note the emission reduction from waste management is approximately 100,000 $MTCO_2e$ in 2050.

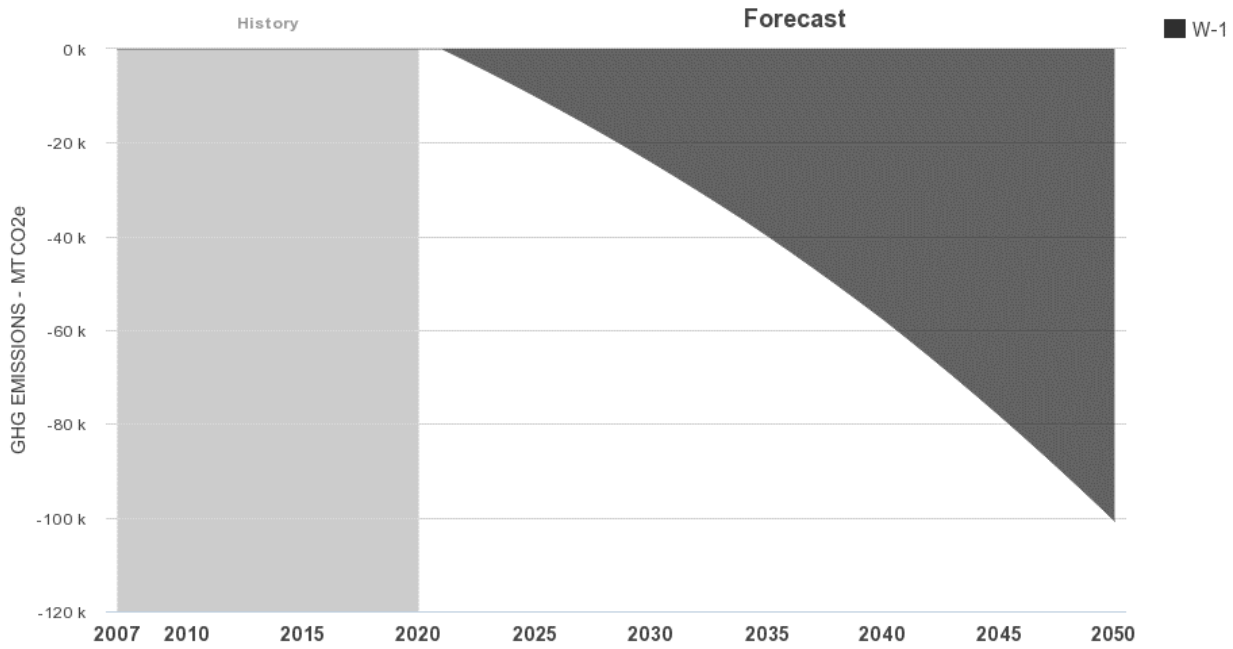


Figure 7-2. GHG Reductions from Waste Strategies

The GHG emission reductions from these strategies relative to the BAU base case are presented in Figure 7-3. Given that GHG emissions from waste are only 2 percent of Raleigh's total inventory, the impact of reducing those emissions is small relative to the BAU projection of total emissions. However, reducing emissions from waste is still an important part of CCAP that will require both City and community involvement to achieve. The City will continue to address GHG emissions through waste by creating additional efficiencies in City recycling, yard waste, and trash programs, continuing with outreach and education to Raleigh residents, as well as the completion of the bioenergy recovery project. Additional waste efficiencies could be realized by high impact community partners (i.e., through efforts of those outside of the City collection system), such as businesses with high waste stream operations improving waste reduction, reuse and recycling opportunities, and programs for builders and developers to continue to address construction and demolition waste. Other specific waste streams may provide unique business development opportunities to reuse or recycle products.

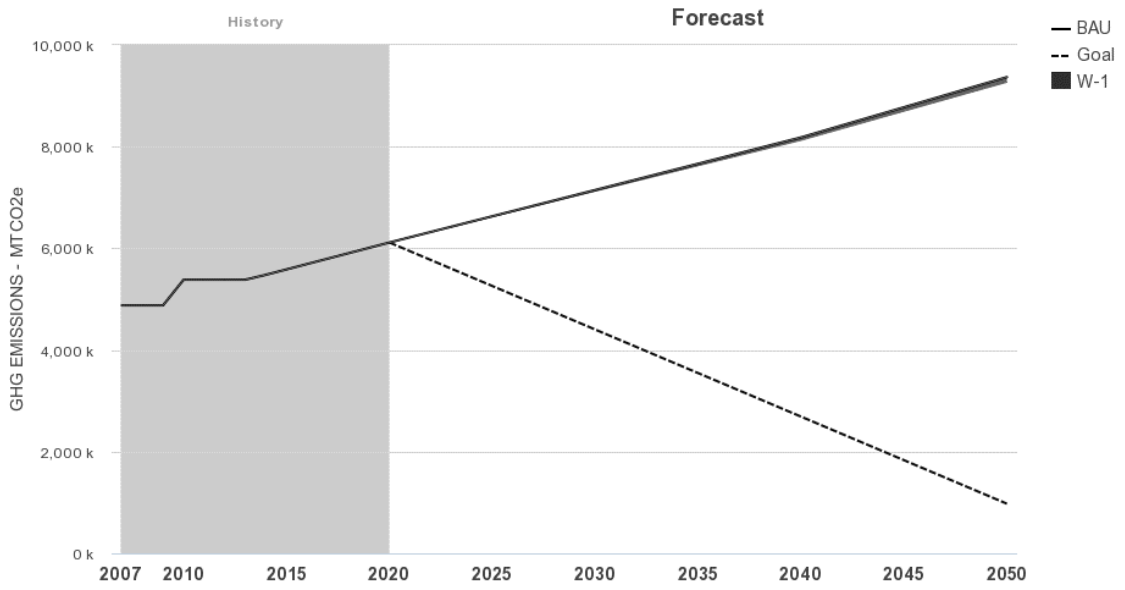


Figure 7-3. GHG Reductions from Waste Strategies Relative to BAU

Innovation

Continued innovation of GHG reduction strategies will be key as technologies and other opportunities (like smart city solutions) evolve to meet Raleigh's climate goals. Smart city solutions are those that use data and technology to solve community issues or to improve services. With climate and sustainability as a priority, the Raleigh community will develop collaborative partnerships to identify opportunities and technologies to innovate in the areas of energy, transportation, waste, resilience, health, and equity. For example, Raleigh may identify scientific and technology-based opportunities to innovate and decrease the GHG footprint of City and community projects. This could include pilot projects to support ongoing climate and sustainability work.

Education and Outreach

Education and outreach have been a key part of this project from the start and will continue to be vital as the project moves to implementation and beyond. Broader education with the Wake County Public School System, academia, community organizations who have large networks of members, and other partners are essential to move climate efforts forward. Strategies in this area will include continuing to build community partnerships with thought leaders, technical experts, non-profits, youth, and community leaders for climate action.

Funding and Incentives

Identifying or developing funding opportunities, incentives, and resources that support climate action will be important to the success of individual strategies and CCAP in general. The City will promote programs within the community that provide funding for climate and energy efficiency projects, such as the Office of Economic Development and Innovation Building Upfit Grants. CCAP stakeholders can also explore developing a central clearinghouse of funding and incentives available (building on existing efforts to include the various aspects of climate planning), such as the policies and incentives listed on the Database of State Incentives for Renewables & Efficiency (DSIRE) website; transportation grants and

incentives; and other local programs that touch on topics such as equity, resilience, housing, green space, innovation, etc., to provide an easy way to navigate opportunities for community-wide climate projects.

As referenced in Chapters 3 and 4, "Supporting Climate Equity" and "Building Community Resilience," the following equity and resilience considerations provide guidance and a starting place for CCAP stakeholders on what to consider when implementing and taking action on Resilience & Cross Cutting strategies.

7.2 - Equity Considerations

Green Infrastructure

CCAP strategies for green infrastructure are twofold: 1) limiting further development in the floodplain to reduce exposure to flood risk and 2) expanding green infrastructure installations throughout the community to absorb and filter stormwater. Both strategies present equity considerations in Raleigh.

As in many communities, many of Raleigh's flood-prone areas are in low-income neighborhoods, and communities of color are disproportionately affected. As an example, the neighborhoods of Rochester Heights and Biltmore Hills in Southeast Raleigh lie in some of the lowest areas of the watershed, receive runoff from impervious areas of Downtown Raleigh, and have been bisected by a major interstate, all of which exacerbate flooding issues. These flood-prone areas are among the only properties that are relatively affordable for low-income communities in proximity to downtown. Conversely, limiting additional development on these properties may constrain their resale value and hinder the growth of personal wealth associated with property ownership for these communities.

Green stormwater infrastructure has been a major focus of Raleigh's Stormwater Management Division for several years, as the City has worked to increase public and private green stormwater infrastructure installations. Green infrastructure projects have the potential to be distributed unequally in cities based on race and class. Ensuring that both public and private green infrastructure programs move forward equitably in Raleigh—for residents of all races, ages, and abilities—requires a careful examination of what barriers exist for green infrastructure, particularly financial barriers and the resources needed to provide maintenance over time.[27]

Waste Reduction and Efficiency

Waste reduction and diversion measures will not only assist in reducing GHGs with less materials going into the landfill, but they will also reduce GHGs associated with transporting that waste. These measures address a very small portion of the total GHG emissions in Raleigh's inventory; however, waste is a visible sustainability issue in the community, and one which touches every resident's life.

Raleigh Solid Waste Services Truck.

[27] Carmichael, Christine; Danks, Cecilia; and Vatovec, Christine. "Green Infrastructure Solutions to Health Impacts of Climate Chane: Perspectives of Affected Residents in Detroit, Michigan, USA" *Sustainability* October 2019.

How waste and waste education are managed by the City, what options are available, and the costs for those options will not only affect compliance rates with recycling or composting programs, but also who can afford to participate at all.

Education for behavior change is challenging. Often, it requires personal interaction and connecting behavior to a business case at an individual or organizational level. This type of outreach requires resources and ongoing collaboration between customers and service providers—public and private—as recycling streams can shift over time and new customers come online. This outreach can be difficult in a growing community like Raleigh, which has communities with mixed access to the internet and who receive waste services from a variety of providers. Issues of access, time, and service cost will need to be closely scrutinized as waste management strategies are rolled out over time.

Preservation and Green Space

Parks and green space play an important role in Raleigh's environment and its economy. Parks and green spaces conserve natural land and resources for people and wildlife, providing air and water quality improvements for residents. The ecosystem services these spaces provide make communities more resilient to natural disasters, reducing costs associated with recovery. Research suggests that parks are important pieces of economic infrastructure because they attract businesses, residents, and visitors to communities. [28] The concern becomes when park investments lead to displacement of existing residents by contributing to gentrification. Preserving and expanding green spaces in Raleigh for human and environmental benefits will require engaging local communities, identifying their needs and priorities for neighborhood development, and coordinating park investment and expansion with other strategies to address housing affordability and economic development.[29]

7.3 - Resilience Considerations

Green Infrastructure

Green infrastructure strategies include both installing green stormwater infrastructure and limiting further development in flood-prone areas. Green infrastructure installations utilize natural resources and landscapes to absorb flood waters and filter them as they move into our streams and rivers. Conventional or "gray" stormwater infrastructure are engineered pipes, tunnels, gutters, and other structures. In these conventional mechanisms, stormwater running off of streets or other surfaces picks up pollutants like petroleum, chemicals, and pet waste. These are carried through pipes and culverts into watersheds.[30] Green infrastructure installations have the potential to mitigate not only the volume of flooding, but also its environmental impacts on the ecosystems in and around Raleigh.

Floodplains are the generally flat areas of land adjacent to rivers or streams. These areas provide the ecosystem service of absorbing and moving floodwaters through an area. As land is developed in the floodplain, the natural processes of capturing and moving stormwater through a floodplain are impeded by ***impervious surfaces***. Impervious surfaces limit the capacity of the floodplain, affecting water quality and wildlife habitat. As the population continues to grow and more people are exposed to flood risks,

[28] Roth, Kevin. "The Economic Power of Local Parks and Rec" *Parks & Recreation.* March 2018.
[29] Rouse, David "Social Equity, Parks and Gentrification" *Parks & Recreation* July 2018
[30] Thiagarajan, Manasvini; Newman, Galen; and Van Zandt, Shannon "The Projected Impact of Neighborhood-Scaled Green-Infrastructure Retrofit" Sustainability Vol 10, Iss 10 2018

allowing the floodways to maintain their floodwater storage capacity will be increasingly important to limiting damage to properties and harm to residents.

Preservation and Green Space


Raleigh Rose Garden.

The impacts of climate change on our environment will have affects not only for humans and infrastructure, but for plant and animal life as well. Preserving green space offers protection for biodiversity—the number of different species of plants and animals living in an area, and the number of individual organisms of each species. Biodiversity is important to preserve, not only because of the environmental benefits of healthy ecosystems (plants and animals filter air and water and contribute to healthy biodynamics in our wild spaces), but also because of the benefits that humans derive from those ecosystems (e.g., pollinators support food crops, trees provide shade, plants and algae provide water filtration). Protecting biodiversity in our community involves both expanding the range of green spaces available to support a diverse population of plants and animals and protecting our native flora and fauna from invasive species. A community-wide and even regional approach to open spaces provides corridors for animal migration, protecting birds, mammals, and even insects as they move seasonally. Green and open spaces also reduce urban heat islands through increased tree canopy and evapotranspiration.

Green spaces also contribute to community resilience through the social and ecological services they offer to our residents. Studies suggest that humans experience positive emotional responses from views of nature. Other benefits from green spaces are increased community connection, a sense of belonging, and increased interaction with other community members. And some evidence suggests that increasing amounts of green space encourages physical activity.[31] Reducing stress, creating connections, and increasing physical health all improve an individual's abilities to respond to disaster or adapt to change.

[31] Barron, Sara, et al. "Greening Blocks: A conceptual typology of practical design interventions to integrate health and climate resilience co-benefits." *International Journal of Environmental Research and Public Health.* Bol 16 Iss 21, 2019.

7.4 - **Resilience & Cross Cutting Actions**

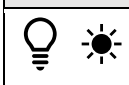
As discussed previously, the success of these strategies will depend upon the interest, involvement, and innovation of not only the City of Raleigh, but also all of its partners and stakeholders in taking action to meet the community's climate goals. While some of the modeling presented above shows modest GHG emission reduction impacts, the potential exists for much greater impact. For example, additional organic waste diversion, recycling, or movement toward zero waste could further waste-related GHG emission reductions. Priorities for action to reduce GHG emissions in the Resilience & Cross Cutting category are efficient waste collection systems and the implementation of the BRP. Couple this with the impact of cross cutting strategies, which can assist in breaking down barriers, as well as creating opportunities to make these projects more viable.

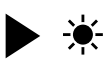
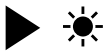
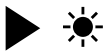
Table 7-2 (short-term) and Table 7-3 (long-term) include implementation actions for strategy areas. Table 7-2, "Short-Term Resilience & Cross Cutting Actions," provides strategies with examples of actions. Short-term actions are either already underway or will be soon, with implementation expected in zero to seven years. The long-term actions have a longer lead time and will be underway in eight or more years. As both the City and its partners and stakeholders will be involved in these actions, we have provided some indication of who is or might be responsible for each one. Additional discussion regarding implementation is provided in Chapter 8.

The example actions that are under each strategy in Table 7-2 provide context and examples for CCAP stakeholders as they go about identifying actions that best fit with their own organization, business, daily life, etc. These example actions also provide further information on where the City is already planning, working to take action, or leading the way. They also provide example ideas for actions where CCAP stakeholders can assist, lead, or participate in implementation and action creation and development. At the top of Table 7-2, see the legend with icons and descriptions for further detail on how to read the actions.

Table 7-2. Short-Term Resilience and Cross Cutting Actions

CATEGORY **Resilience & Cross Cutting**	
SHORT-TERM ACTIONS (0-7 years)	
IDEA stage: exploring, identifying partners, evaluating resources and feasibility	GETTING STARTED: buy-in from affected stakeholders to further explore and evaluate for potential feasibility of implementation
Actions UNDERWAY: working with partners on, in some stage of implementation	Actions where the City is a partner or taking the lead
STRATEGY: **Green Infrastructure**	
ACTION: **Limit development in hazard-prone areas.**	
DESCRIPTION	Preserve flood storage capacity by restricting development in floodplains.
	ACTION: Consider equitable hazard mitigation programs such as buy outs.
	ACTION: Update design standards to mitigate stormwater impacts of development by strengthening stormwater control requirements and design criteria based on climate change.
	ACTION: Continue to assess floodplain development ordinances to preserve flood storage and to protect property and residents.
ACTION: **Encourage and incentivize green infrastructure to reduce stormwater runoff and preserve flood storage capacity.**	
DESCRIPTION	Encourage and incentivize green infrastructure to reduce stormwater runoff. Encourage participation in incentives and programs.
	ACTION: Continue to build support for programs such as the Raleigh Rainwater Rewards and Green Infrastructure/ Low Impact Development (GI/LID) programs to reduce runoff and to promote natural and green space.
	ACTION: The City will encourage and incentivize GI/LID to reduce stormwater runoff and promote Raleigh Rainwater Rewards.
	ACTION: Establish a green infrastructure policy for City projects and facilities.
STRATEGY: **Preservation and Green Space**	
ACTION: **Incentivize and encourage opportunities to support green space to promote carbon sequestration, natural habitats, food access, and security, and to reduce urban heat islands.**	
DESCRIPTION	Support open and natural space plans such as tree planting, pollinator habitats, reduction in urban heat islands, food access, and urban agriculture and greenway development. Trees create and define spaces; connect people to others and nature; and benefit the environment by consuming carbon, cooling the air, and collecting rainwater.
	ACTION: Encourage opportunities to promote green space through initiatives such as Raleigh's Open Space Plan, as well as opportunities to address urban heat islands, tree planting programs, pollinator habitat, food access, and urban agriculture and greenway development.
	ACTION: Create resources for community members to navigate land use codes and regulations related to their ability to establish community gardens and urban agriculture on private land.
	ACTION: Partner with local organizations to map heat island data in the Raleigh area with social vulnerability data and develop potential mitigation opportunities.

	**ACTION:** Map environmental justice concerns to identify areas where climate planning work, planned capital improvements, and negative environmental impacts intersect. Such a tool will assist in planning for instances such as the possibility of adding green space amenities to areas around landfills.
STRATEGY: **Waste Reduction and Efficiency**	
ACTION: **Improve efficiency of waste collection, including solid waste and recycling pickup process and route efficiencies.**	
DESCRIPTION	Reducing waste bound for landfills and improving the efficiency of waste collection can reduce the VMT associated with transporting waste. Continue to improve trash and waste pickup processes and improve route efficiencies.
	**ACTION:** Continue to improve solid waste and recycling pickup processes and improve route efficiencies.
	**ACTION:** Continue to create efficiencies in the yard waste collection program.
ACTION: **Improve education and outreach on waste reduction and recycling.**	
DESCRIPTION	Explore opportunities for education and outreach and planning for waste reduction throughout the supply chain and by consumers. Wake County will continue to offer commercial waste reduction grants to support businesses, institutions, or non-profits that want to divert waste from the South Wake Landfill.
	**ACTION:** As the recycling and waste reduction market, opportunities, and resources continue to shift and change, update the education and outreach materials to Raleigh residents and provide consistent materials.
	**ACTION:** Educate City staff on the Sustainable Events Guide, which covers event-related procurement and waste management practices for City-related events.
ACTION: **Wastewater processing efficiency improvements and methane capture, including bioenergy recovery (anaerobic digester).**	
DESCRIPTION	Complete construction of the BRP at the Neuse River Resource Recovery Facility and consider future expansion and/or co-digestion of food waste, including yard waste. Benefits of the BRP process (also known as anaerobic digestion) include green energy production, with methane being captured and cleaned, converted to renewable natural gas, and used in the City's bus fleet. Other benefits of the BRP include producing high-quality biosolids that can be distributed for beneficial uses; collecting fats, oils, and grease (FOG), which will reduce clogs in sewers and sewage spills, boost gas production in the anaerobic digesters, and generate revenue from FOG tipping fees; and implementing sidestream deammonification, which will reduce the energy and eliminate the supplemental carbon used to treat the stronger ammonia load generated during digestion.
	**ACTION:** Complete construction of the BRP (anaerobic digestion) at the Neuse River Resource Recovery Facility and consider future expansion and/or co-digestion of food waste, including yard waste. The BRP at the Neuse River Resource Recovery Facility will capture the methane from the wastewater treatment process and will eventually fuel transit buses.
ACTION: **Explore and promote additional waste diversion opportunities, including organic waste collection (food, yard waste), composting, and other waste streams.**	
DESCRIPTION	Additional diversion opportunities include pilot projects for organic waste collection (food, yard waste) and management via composting or anaerobic digestion, as well as opportunities to increase recycling of existing and new streams. The Wake County Waste Characterization Study identifies opportunities to further address waste diversion, and commercial waste reduction grants are available to Raleigh businesses, institutions, or non-profits that want to divert waste from the South Wake Landfill. Develop infrastructure to account for potential pilot projects at a yard waste center for curbside collection of yard waste and food waste.
	**ACTION:** Evaluate the resources needed for an organic waste recycling program for residents in Raleigh, which could include food and yard waste.
	**ACTION:** Encourage pilot projects for organic waste (food/yard waste) collection and management via composting.

	**ACTION:** Explore opportunities to increase recycling of existing streams; evaluate opportunities to add other recycling streams such as textiles, construction and demolition, or electronics.
	**ACTION:** City and community stakeholders to participate in Wake County's Waste Characterization Study related to waste diversion opportunities.
	**ACTION:** Enhance yard waste products to encourage Raleigh residents to utilize local compost.
STRATEGY: **Innovation**	
ACTION: **Develop collaborative partnerships to identify opportunities and technologies to innovate in areas such as energy, transportation, waste, resilience, health, and equity.**	
DESCRIPTION	Partner with key stakeholders to identify opportunities and technologies to innovate in areas such as energy, transportation, waste, resilience, health, equity, etc. Examples could include smart city applications such as the use of technology, data, drones, alternative transportation options, microgrids, battery storage, new waste reduction innovations, route optimization, and truck efficiencies.
	**ACTION:** Identify smart city opportunities using data, technology, and science to innovate and decrease the GHG footprint of City and community projects.
	**ACTION:** Evaluate opportunities for mobile solar EV chargers that could serve in temporary locations to evaluate permanent placement and as a backup power source.
STRATEGY: **Education and Outreach**	
ACTION: **Build community partnerships with thought leaders, technical experts, youth, and other community leaders for climate action outreach and education.**	
DESCRIPTION	Partner with non-profits, other governmental units, community members, and technical experts to embed climate action information into outreach and education programs. Identify opportunities to educate the Raleigh community on green living, cost savings, and climate education.
	**ACTION:** Engage with youth to work on climate justice, equity and environmental justice, and resilience education and programs. This could include a climate action youth intern program.
	**ACTION:** Build an outreach strategy for the Ready Raleigh Emergency Preparedness Guide, which connects Raleigh residents with resources to help them prepare for and respond to emergencies and natural disasters. Focus outreach on creating stronger community connections between neighbors and partners. Building connections among neighbors helps households better prepare, endure, and recover. Connected communities are more resilient communities.
	**ACTION:** Partner with community-based organizations on climate-related programming to address environmental justice, resilience, climate impacts, and empowerment of youth and residents through programs like the Raleigh Watershed Learning Network, the Raleigh Youth Leadership Academy, Youth Climate Interns, and more.
	**ACTION:** Create education and outreach that offers information on areas such as money saving tips, financial planning, energy savings, transportation options, food, telecommunication, and recycling; while educating and connecting individual health with environmental quality, and providing tools for taking action.
	**ACTION:** Create and continue to promote and update community resources, training, and educational material related to climate action; utilize partnerships to increase impact. An example includes the jointly developed curriculum for the Project Water Education Today (WET) program that was developed by the City, other government entities, and community partners and is now a State-led program.
STRATEGY: **Funding and Incentives**	
ACTION: **Identify and/or develop funding, incentives, and resources that support climate action.**	
DESCRIPTION	Opportunities include embedding climate action into existing funding processes and providing information to stakeholders to support and incentivize climate action. Examples include funds available from local energy providers; policies and incentives listed on the DSIRE website; and grants and incentives that support climate

	action in areas such as transportation, development, economic development, environment, natural resources, equity, health, innovation, resilience, and community building.
	**ACTION:** Partner with the Office of Economic Development to expand the Building Upfit Grants (BUG) to integrate sustainability measures and resources that support climate action. This could include funding, incentives, or other resources.
	**ACTION:** Leverage community partners to provide education and outreach tools (like databases) that will research financial opportunities for CCAP stakeholders to create a Community Climate Action Funding Resource guide or database for the community.
	**ACTION:** Investigate and leverage public financing opportunities at the local, state, and federal levels to support CCAP implementation. There may be opportunities to leverage funding in government agencies that may not traditionally be seen as climate-related, such as housing, health and human services, general services, economic development, emergency response, and transportation.
	**ACTION:** Support CCAP actions through the City of Raleigh's internal Sustainability Fund. The fund supports projects that embed resilience, reduce costs through energy savings, reduce carbon footprint through energy and GHG emissions, support innovation, and test pilot technologies including data and analytics, as well as projects that address social and racial equity issues, vulnerable populations, and/or low-income residents.
	**ACTION:** The City and community partners can embed sustainability and climate action into existing funding and grant programs, including private foundation grants and private financing.
STRATEGY: **Equity**	
ACTION: **Explore opportunities to grow green jobs and training programs in conjunction with local organizations and educational institutions.**	
DESCRIPTION	Identify opportunities to develop, support, or strengthen a green jobs training program in partnership with local educational institutions and workforce training programs.
	**ACTION:** Develop partnerships with stakeholders such as Wake Tech Community College, the North Carolina Clean Energy Technology Center, the City of Raleigh Office of Economic Development & Innovation, the North Carolina Department of Environmental Quality, and other nonprofits to lift up green jobs training programs.
	**ACTION:** Develop an apprenticeship, internship, and/or jobs training program for climate action work within the City departments, similar to the summer youth employment program.
	**ACTION:** Pilot a green jobs and weatherization training program or apprenticeship program for community members.
ACTION: **Address climate equity and environmental justice in Raleigh through City services and partnerships.**	
DESCRIPTION	Work with community partners to continue to address and identify climate equity and environmental justice issues.
	**ACTION:** Utilize an environmental justice mapping tool to enhance understanding of environmental inequities in our community and identify potential options for mitigation.
	**ACTION:** Explore adding green space amenities and other climate equity and environmental justice mitigation measures. An example might be to explore green space amenities at areas around landfills.

Table 7-3 (long-term) includes implementation actions for strategy areas that have a longer lead time and will be underway in eight or more years. The long-term strategies provide a road map that can guide stakeholders in their longer-term action planning. The long-term strategies pull from specific topical plans and from technical experts who plan for the future of areas like buildings, energy, transportation, land use, etc.

Table 7-3. Long-Term Resilience & Cross Cutting Measures

CATEGORY **Resilience & Cross Cutting**	
LONG-TERM MEASURES (8+ years)	
STRATEGY: **Community Resilience.**	
ACTION: **Promote community resilience.**	
DESCRIPTION	Community resilience to climate and non-climate stressors includes the water, transportation, energy, food and land use sectors of the community. Socially vulnerable populations may experience disproportionate impacts from climate change to their health and access to services. Plans such as the Triangle Regional Resilience Assessment and the Wake County Food Security Plan both identify opportunities to address vulnerabilities to the community. The North Carolina Clean Energy Plan highlights the need for a resilient and flexible energy grid in Recommendation E-1. Continue focus on expanding Green Infrastructure and Low Impact Development to address local flooding vulnerabilities. Continue focus on Equitable Development around Transit to connect people to opportunities, support walkable places, improve air quality, and help save residents money. Continue to evaluate Land Use projects for carbon impact.
STRATEGY: **Waste Reduction and Diversion**	
ACTION: **Promote waste reduction and analysis and evaluate opportunities for pilot projects to divert waste streams from the landfill.**	
DESCRIPTION	Encourage strategies that evaluate total cost approaches to recycling, promote waste reduction and encourage diversion opportunities such as those identified in the Wake County Solid Waste Management Plan. Pilot projects could include organic waste (food, yard waste) collection, and management via composting or anaerobic digestion; and opportunities to increase recycling or diversion of existing streams and new streams, such as those identified in the Wake County Waste Characterization Study.
STRATEGY: **Preservation & Green Space**	
ACTION: **Develop opportunities for open and natural space, carbon sequestration and urban heat islands to preserve green space and the natural environment.**	
DESCRIPTION	Encourage opportunities to support green space through opportunities such as carbon sequestration, natural habitats, urban heat islands, and food access and security. Plans and programs that address these issues include the Upper Neuse Clean Water Initiative, the Clean Energy Plan, 2030 Raleigh Comprehensive Plan, Open Space Plan, Wake County Food Security Plan, Triangle Regional Resilience Assessment and Bee City USA.
STRATEGY: **Innovation**	
ACTION: **Partner with key stakeholders to identify opportunities and technologies to innovate and support climate action.**	
DESCRIPTION	Partner with key stakeholders to identify opportunities and technologies to innovate in areas such as energy, transportation, waste, resilience, health, equity, etc. Expand opportunities to partner on climate related innovation pilots and programs with the Raleigh Smart Cities program and partners such as the Research Triangle Cleantech Cluster and Innovate Raleigh.
STRATEGY: **Education and Outreach**	

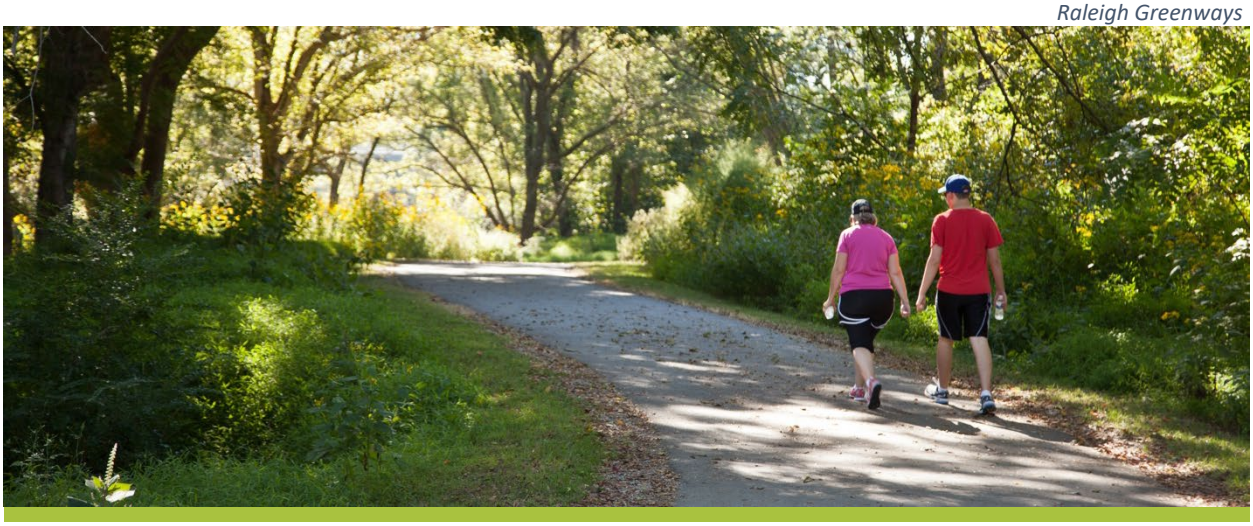
ACTION: **Partner with key stakeholders on climate action outreach and education.**	
DESCRIPTION	Partner with local technical and community leaders to embed climate action information into existing outreach and education. Look to best practices such as the NC Energy Efficiency Roadmap which identifies various initiatives to expand education programs that promote workforce development, certifications, apprenticeships, kindergarten to community college education programs, and other initiatives to develop an energy efficiency industry.
STRATEGY: **Equity**	
ACTION: **Develop green workforce development initiatives that consider equity impacts and long-term resilience strategies.**	
DESCRIPTION	According to the Commercial Energy Policy Toolkit for Local Governments, Green Workforce Development includes existing jobs that require new skills to meet green requirements, jobs that are in greater demand because of green initiatives, and new and emerging occupations. In the commercial building sector, green jobs include high performance building construction, building maintenance, retro-commissioning, energy auditing, engineering and other construction and design professions. Green jobs could contribute as much as 10 percent of all new job growth over the next 30 years and much of that would be connected to the commercial building sector. A number of community wide benefits coincide with developing, enhancing, and better connecting the green workforce with local employment opportunities. Look to best practices such as the Green Jobs Clean Energy Plan recommendations for energy efficiency apprenticeships, long term jobs in renewables and grid infrastructure. Work with industry partners and businesses to ensure jobs exist for those undergoing training.

A Guide to CCAP Chapters

Chapter 8: Implementation

Chapters 1 through 4 of this plan laid out the development of CCAP and the objectives of reducing GHG emissions, addressing climate equity, and addressing resilience. Chapters 5 through 7 provided detail on the strategies and actions in the high impact areas to help the community understand potential impacts and implementation options for strategies. **Chapter 8 will now build on this learning to provide further information on implementation, including partners and collaborative efforts, funding and financing, tracking of efforts over time, communications and outreach, and other methods to empower and inspire climate action across the Raleigh community.**

Raleigh Greenways



Chapter 8 - Implementation

Climate action requires the participation of all members of the community. As we move from development into implementation of CCAP, there needs to be a collective shift from BAU approaches, so that we can tackle the ongoing work needed to make deep cuts to GHG emissions and to fully incorporate equity and community resilience into all aspects of implementation. The Raleigh community is full of innovative and passionate individuals and organizations who are already doing important work that sets the foundation from which we can continue to tackle climate change.

Building on the ongoing work in City departments, the work of local organizations and businesses, and the partnerships developed with other organizations through the CCAP outreach process, there should be continuous effort to carry those activities and partnerships forward through the multi-year implementation of the CCAP strategies.

The community partners that were involved in CCAP development and the new partnerships that will continue to develop will be the key to implementation. This plan is envisioned to set a foundation to educate and empower businesses, institutions, and residents to reduce their own emissions using traditional and innovative strategies, as well as to incorporate equity considerations and address resilience. The strategies and actions in CCAP are directed at both the public and private sectors. **Community climate action is a collaborative, all-hands-on effort, and all partners in the community are needed to engage, support, and implement CCAP together.**

This chapter outlines what is needed to implement CCAP: 1) partners, 2) funding and financing, 3) tracking of CCAP implementation and progress, 4) communication and outreach, and 5) conclusions (key recommendations for community action).

8.1 - **Partners**

As CCAP implementation begins and continues over time, it will be important to map out and align the general roles and responsibilities of the City, the community as a whole, and potential key partners that will support CCAP implementation, building on the partnerships established during CCAP development. The City and community stakeholders will need to periodically assess their own roles and make pivots or shifts as needed. By continuing to reflect on how implementation approaches are progressing, the Raleigh community can take lessons learned and apply them in implementing other planned strategies moving forward. The ongoing implementation of CCAP will require continued partnerships, collaborations, and for individuals on the ground to take action. Understanding the role of the City and of the community can provide a foundation for maximizing the collective impact of implementation on climate change. These ongoing partnerships can also optimize implementation actions and partnership communications to support resilience and equitable outcomes.

The figures below highlight roles and responsibilities for the City (Figure 8-1), the community (Figure 8-4), and key partners (Table 8-1).

The City of Raleigh — Leading the Way

Although the contribution to reducing GHG emissions from City operations is small at 2 percent of total community emissions, there are still many ways that the City can greatly influence and guide change in

Key Roles: City of Raleigh

- **Lead by example:** Continue to execute on City-led efforts that connect to the CCAP strategies and scale up the existing efforts as needed. The City can help signal a shift or a change in many ways.
- **Empower the community:** Create outreach and engagement, establish key partnerships, serve as a convener and collaborator, be available to brainstorm and develop concept ideas with partners, and work with key partners who can support implementation and provide advice and guidance that will lead to overall progress on CCAP implementation.
- **Invest resources in foundational work, evaluating budget priorities for CCAP implementation**: Allocate funding in the City's budget to support and enable CCAP implementation. Look for innovative funding sources and financing mechanisms to fund these priorities.
- **Track progress on CCAP implementation, benchmarking, performance**: Regularly monitor and evaluate the CCAP implementation, including benchmarking and performance measures.
- **Regulate—Implement CCAP actions through City strategies, policies, plans, and codes:** Continue to explore opportunities where the City can lead by example and to understand where the City has the ability to regulate and shift practices through policies, plans, and codes or by creating incentives or disincentives**.**
- **Continue to build political will for CCAP implementation**: Implementing the CCAP strategies will likely need (or could benefit from) changes to City policies, procedures, and funding mechanisms to effectively support the overall CCAP.

Figure 8-1. Key CCAP Roles for City of Raleigh

the community related to GHG mitigation, equity, and resilience. This includes the roles included in Figure 8-1 and through various other guiding plans, policies, and partnerships. This section highlights just a few of the specific City resources and guiding documents that the City utilizes to serve the community, as well as where the City has opportunity to continue to lead and guide climate work by leveraging its various roles and department-specific work.

The CCAP project is the culmination of years of climate work by the City of Raleigh that began in 2007 when Raleigh's City Council endorsed the U.S. Conference of Mayors' Climate Protection Agreement (see Appendix D). Following that action, the City's Office of Sustainability prepared initial GHG emissions inventories of both local government operations and community emissions. The City also completed *A Roadmap to Raleigh's Energy Future: A Climate Energy Action Plan (CEAP) for Raleigh's Municipal Operations* (2012). The local government operations and community GHG emissions inventories were updated (2016) and provided background data for the development of this community-wide project. The base year for the initial inventory was 2007, and the subsequent inventory used 2014 data. In addition to the inventories and the CEAP project, the Fuel and Fleet Transformation Plan was prepared, as well as the Renewable Energy Assessment, the Triangle Regional Resilience Assessment, and most recently the Transportation Electrification Study, which has been incorporated into CCAP as one of the major areas for community GHG reduction. CCAP incorporates learnings and work from all of these plans (and others) to serve as the main guiding document to move our climate work forward together in the Raleigh community.

Climate action is incorporated into departmental projects, plans, and programs across the City. The work may be focused on a specific climate impact, such as incorporating renewable energy, converting the fleet to alternative fuels and electric vehicles, addressing flooding and water quality, increasing natural habitats and green space, addressing environmental justice, or constructing a bioenergy project to convert Raleigh's wastewater into renewable fuel to be used in the City bus fleet.

Figure 8-2 illustrates some examples of guiding documents that incorporate CCAP objectives. There are many other plans—such as those specific to topic areas, like the Wake County Transit Plan and special area studies—that also relate to CCAP and incorporate climate action, equity, and resilience elements. The City will continue to incorporate CCAP and its visioning elements as plans and policies continue to be developed over time.

Figure 8-2. Examples of Raleigh Climate Action Guiding Documents

Strategic Plan Alignment

The Strategic Plan is a powerful tool to drive short-term climate action through City processes. The City Council provides policy guidance for staff through the five-year plan. The City's first Strategic Plan was created in 2015, and the objectives provided guidance related to climate and resilience principles. The Climate Energy Action Plan focused on local government climate action and was included as an initiative in the first Strategic Plan. In late 2020, the City Council created its second five-year Strategic Plan and provided guidance on incorporating the Raleigh community GHG reduction goal and CCAP, equity, environmental justice, climate, and resilience into the plan objectives. City staff included climate-related initiatives such as equity, environmental justice, equitable economic development, energy efficiency, renewable energy, energy procurement, alternative fuels and transportation electrification, flooding and water quality, resilience, tree cover, food security, heat island mitigation, and youth climate engagement into the update of the Strategic Plan. See Appendix E for specific Strategic Plan objectives and initiatives that support the implementation of CCAP. Implementation of CCAP is also included as an initiative of the second five-year Strategic Plan.

2030 Comprehensive Plan Update

The City of Raleigh 2030 Comprehensive Plan is a long-range policy document adopted and amended by the City Council. The plan establishes a vision for the City, provides policy guidance for growth and development, and contains action items directed at the City to implement the vision. Staff used the development of CCAP to inform updates to the 2030 Comprehensive Plan. There are many policies throughout the plan that directly support GHG mitigation, environmental protection and natural resources, mobility, resilience, food security, land use planning, recreation and open space, and climate change preparedness. See Appendix F for examples of policies and actions in the 2030 Comprehensive Plan that demonstrate this commitment.

Other Related Documents and Resources

As mentioned, City departmental work is guided by various other guiding policy and operational documents and plans. Departments work collaboratively with the community to create these plans, which guide their policies and programs. Climate and sustainability have been incorporated into planning and programming over time, and as CCAP was being developed, staff used the process and strategies to inform ongoing projects and plans. Figure 8-3 below is a list of past and present plans that support the ongoing work of CCAP. This list is meant to illustrate examples of the various types of programs and plans that the City uses to guide work and is not comprehensive of every plan that relates to CCAP.

Other Relevant Resources

- A Roadmap to Raleigh's Energy Future: A Climate Energy Action Plan
- Triangle Regional Resilience Assessment — Executive Summary
- Triangle Regional Resilience Assessment — Technical Report
- Greenhouse Gas Emissions Report (2016)
- Greenhouse Gas Emissions Report (2010)
- Renewable Energy Overview
- Fuel and Fleet Transformation Plan
- 2030 Comprehensive Plan
- Strategic Plan
- Wake County Hazard Mitigation Plan
- Ready Raleigh Emergency Preparedness Guide
- Raleigh Capital Improvement Plan
- Transportation Electrification Study
- Wake Transit Plan
- 2040 GoRaleigh Bus Development Plan
- Wake County 2020 Comprehensive Solid Waste Management Plan
- City of Raleigh's Water Shortage Response Plan
- Equitable Development Around Transit
- Stormwater Design Manual
- Triangle Region Freight Plan
- North Carolina Risk Assessment and Resilience Plan
- U.S. Mayors Climate Protection Agreement — Resolution No. (2007) 325 - See Appendix D

Figure 8-3. Other Relevant Resources

The Community — Key to CCAP's Success

CCAP could not have been developed without critical input from the community and key partners, and CCAP cannot be implemented without the community playing a major role. Key stakeholders include government agencies, non-profit organizations, academia, private companies, individual community members, and many more. See Figure 8-4 for the various types of roles that these CCAP stakeholders can play in CCAP implementation.

As mentioned, there are also partners that can provide high impacts through GHG mitigation, equity, and resilience work, as well as key partners that have large networks that can support education, outreach, and other implementation strategies by inspiring others. As CCAP implementation begins and continues over time, engagement and leadership from these high-impact partners will be vital to CCAP success.

Key Roles: The Community

- **Participate in strategy-specific working groups**: Based on partner expertise, engage in working groups by strategy themes (e.g., Buildings & Energy, Transportation & Land Use, and Resilience & Cross Cutting) to provide targeted input and guidance on the CCAP strategy implementation.
- **Be creative, innovative, and a leader**: Suggest new ideas and projects to help achieve climate goals within the framework of categories, strategies, and actions outlined in CCAP. Play a lead role in taking action and in inspiring your peers to do the same.
- **Invest time and resources into strategy and action implementation:** Community partnerships and collaborations are key to amplifying both public and private efforts to move the needle on climate change community-wide. Community partners should continue to identify, reallocate, and invest funding and resources that support CCAP actions and implementation.
- **Embed CCAP actions into current and future work, planning, and daily life:** Embed equity, resilience, and **climate-related initiatives and focus into individual, organizational, and community-wide decision-making.**
- **Provide feedback and participate in new and existing ideas**: Continue to share input and participate in new and existing CCAP efforts that the City and other community partners are implementing.
- **Support CCAP implementation, take action, and empower your networks**: This could be through leveraging human or financial resources to support CCAP actions; leading, partnering, and supporting community-based partners and strategies; and leading grassroots outreach for CCAP implementation.

Figure 8-4. Key CCAP Roles for the Community

Raleigh key partners must take lead roles in CCAP implementation in order to create opportunities and address impacts related to climate action for the community as a whole. These partners have the opportunity and ability to continue to serve as a high-impact partner. Table 8-1 below highlights some key partners who were involved in the CCAP development phase and some additional potential partners for implementation. There are also examples provided below of how partners can play a lead role in implementation and help us engage with the wider Raleigh community to inspire action. This information provides CCAP partners the opportunity to learn and share information, to continue to build coalitions and serve as a leader and model for taking action to their peers, and to identify CCAP actions to work together on. This is not a comprehensive list of all community partners; it is intended to be used as a starting point for new partners and organizations to be continuously added to as CCAP implementation moves forward.

Table 8-1. Potential Key Partners for CCAP Implementation

Key Partners	
GOVERNMENT	
• Capital Area Metropolitan Planning Organization • NC Climate Office • NC Department of Natural and Cultural Resources • NC Department of Environmental Quality • Raleigh City Government	• Raleigh Transit Authority • City Boards and Advisory Commissions • Wake County Government • Triangle J Council of Governments • **Other local governments**
NON-GOVERNMENTAL ORGANIZATIONS	
• 350 Triangle • Advanced Energy • Carolina Small Business Development Fund • City of Oaks Foundation • Clean Air Carolina • Food Bank of Central & Eastern North Carolina: Home • Home Builders Association of Raleigh–Wake County • NC Building Performance Association • NC Interfaith Power & Light • NC Sustainable Energy Association	• NC WARN • Partners for Environmental Justice • Passage Home • Raleigh City Farm • Raleigh Chamber • Sierra Club • Southeast Raleigh Promise • Triangle Land Conservancy • WakeUP Wake County • **Other local NGOs and community members**
ACADEMIA	
• Duke University • Living Arts College • Meredith College • NC State University • Shaw University • St. Augustine University	• UNC Asheville – National Environment Modeling and Analysis Center • UNC – Chapel Hill • Wake Technical Community College • William Peace University • **Other academic institutions**
UTILITIES, COMMERCIAL, RESIDENTIAL, AND PRIVATE SECTOR	
• Dominion Energy • Duke Energy • Waste Industries	• **Highwoods Properties** • **Other private businesses, banks, developers**

Examples of roles that these key partners can play in CCAP implementation:

- Implement program-specific climate actions, regulations, plans, and policies at the state and local levels.
- Continue to contribute insight and expertise and provide communications/outreach on community climate action priorities to wide networks of Raleigh residents and other CCAP stakeholders.
- Provide expertise, be a leader or partner, and support community-based actions in energy, buildings, transportation, waste, equity, environmental justice, resilience, equitable economic development, health, and community engagement, as well as other GHG-related strategies.
- Invest time and resources into CCAP implementation.
- Empower youth and student bodies in climate supportive initiatives, volunteerism, studies, and research.
- Provide leadership, resources, training, and support for data collection, storytelling, research, and analysis that supports ongoing CCAP action implementation.

- Partner and engage with other CCAP stakeholders to design and support programs that serve the community and support CCAP priorities.
- Consult on specific implementation actions and support community climate action within the specific Raleigh customer base served, such as home and business energy efficiency, water conservation, waste reduction, stormwater mitigation, etc.

Other Regional Collaborative Climate Efforts

In conjunction with implementing the CCAP strategies, there are other state-wide and regional collaborative efforts that both helped inform CCAP development; CCAP development also helped inform these ongoing efforts. The City incorporated the CCAP goals, actions, and needs and values of the Raleigh community into these collaborative processes, and our shared goals and priorities will continue to be worked on through these collaborative efforts. The following are just a few examples of collaborative work. These types of initiatives serve as important "levers" to share information, develop best practices, identify shared priorities and opportunities, and work to break down barriers to implementation.

The **North Carolina Cities Initiative** engages governments and stakeholders working on climate change across North Carolina to address community climate goals, educate members on climate-related strategies, and develop priority areas to collaborate. Raleigh staff were also key partners in the Triangle Regional Resilience Assessment, which analyzed both climate and non-climate impacts, as well as the Hazard Mitigation Plan for Wake County communities; both of these processes and plans were embedded into CCAP. Raleigh staff participated in the Urban Sustainability Directors Network's (USDN's) study of high-impact (GHG) practices and a nexus project that is developing best practices for building climate efforts that focus on GHG emissions, equity, and resilience.

The City is participating in the **Duke Energy Clean Cities Collaborative**, which is working collectively with North Carolina local governments and Duke to identify ways to work together to reach climate goals. This collaborative includes exploring options for designing programs that better serve local governments and their communities with topics such as solar, EVs, energy efficiency, and cost savings programs. As mentioned previously, Duke Energy set carbon reduction goals in 2019, and local governments that also have climate goals are sharing information to support implementation of shared priorities.

The **State of North Carolina** has made great strides in climate action by establishing climate goals, and the City has been involved as a stakeholder in developing key plans, including the Zero Emission Vehicle Plan and North Carolina Clean Energy Plan. The City represented Raleigh's goals, community values, and needs and informed the CCAP development based on these engagements. Governor Cooper issued North Carolina Executive Order 80 in October 2018 with a state-wide commitment for a 40 percent reduction in GHG emissions from the 2005 level by 2025. The executive order also calls for a focus on getting 80,000 new electric vehicles on the road by 2025, and for a 40 percent reduction in state-owned buildings emissions. The Clean Energy Plan for North Carolina was released in October 2019 with policy and actions. Some key areas from the Clean Energy Plan that will incorporate local governments include carbon reduction, grid modernization and resilience, clean energy deployment, economic development, and equitable access. The State of North Carolina GHG reduction goal that was established in the Clean Energy Plan is a 70 percent reduction by 2030 and carbon neutrality by 2050.

By continuing to align with key partners and existing efforts and continuing to identify shared goals and objectives, these types of collaborative efforts between partners will help support greater impact on CCAP actions.

8.2 - **Funding and Financing CCAP**

Funding and financing climate action projects is a critical implementation step. CCAP has various climate strategies aimed at reducing GHG emissions while incorporating equity and resilience considerations, as well as addressing the challenges and opportunities that climate change presents to the region. With the wide-ranging partners and various types of projects that support climate action, it is both a great opportunity as well as a great challenge to identify funding streams. All CCAP stakeholders—the City, the community, ongoing partnerships and collaborations, etc.—will be needed to help leverage both public and private resources to support CCAP implementation.

Preparing for Funding — Best Practices for CCAP Stakeholders

As implementation begins and continues over time, there are various ways that community stakeholders can start preparing, planning, and taking action—even before funding is identified. Below are a few examples of how CCAP stakeholders can "set the stage" for future resources to be identified for their actions. It will be important to identify shovel-ready projects and their potential associated funding and resource needs (even if the funding sources are not always known or identified up front). This will allow CCAP stakeholders to work together to identify creative ways to leverage existing resources, as well as to be "opportunistic" when funding sources and funding partners become available. In addition, identifying foundational actions will also set the stage for future funding opportunities. This may look like community partners getting started on actions like pilot projects that track performance data/outcomes as a proof of concept, which can then be scaled up/continued when funding becomes available; working through initial steps for actions that do not require a lot of funding, so that when funding is available, partners are able to act quickly to implement; identifying and working through other barriers to actions (not financial), so that these actions are more attractive to potential funders who can see the potential for both faster implementation and for more funds to be spent on higher impacts (like more community members served) versus the process and time; and working creatively with partners to leverage shared priorities and resources to stretch financial and other resources further.

Some key strategies that the City and community may leverage for funding and financing sources to support CCAP implementation are highlighted below.

- **Leverage public funding opportunities:** Investigate and leverage public financing opportunities at the local, state, and federal levels to support CCAP implementation. Because CCAP actions are so wide and far-reaching, there are opportunities to leverage funding in government agencies that may not traditionally be seen as climate-related, such as housing, health and human services, general services, economic development, emergency response, transportation, etc. The City will continue to evaluate long-term future spending related to CCAP implementation and will continue to evaluate local investment of general and capital funds in climate change-related work consistent with CCAP strategies.
- **Leverage other private, non-profit, and philanthropic funding opportunities:** Investigate and leverage private financing opportunities to support CCAP implementation. This could include public-

private partnership opportunities. Explore banks, non-profits, foundations, and other funding sources for grants and other community work that can incorporate CCAP-type goals into their projects and initiatives (e.g., energy-efficient housing, youth education focused on climate topics, or green space preservation focused on urban heat areas of communities).

- **Educate key partners:** Understanding the climate change risks and potential actions to take in our region by key partners may provide some financing opportunities for mitigation and adaptation.
- **Explore other funding sources:** Incorporate equity, resilience, and GHG reduction measures into existing funding streams for existing projects; also, incorporate climate-related measures into existing funding streams that may incentivize climate action behaviors in new ways (such as incorporating energy efficiency education and resources into existing business upfit grants). Identify ways to reach other already-funded goals that create co-benefits related to climate action, rather than just focusing on climate action as the main goal. Understanding and relating climate action to other community and stakeholder priorities opens the door to much larger opportunities for collaboration, funding, and overall resource sharing.
- **Create funding resource tools:** Leverage community partners who can provide education and outreach tools (like databases) that gather finance-related opportunities for various types of CCAP stakeholders (from residents and neighborhoods to small businesses to large corporations and local governments), as well as various action topics for implementation (from affordable housing and energy efficiency to community gardens and pollinator habitat to smart city technology solutions).
- **Promote cost savings:** Educate and promote cost savings opportunities for Raleigh CCAP stakeholders so that existing funds can be stretched and reallocated for more CCAP-related actions and in supporting community needs and values.

8.3 - Tracking CCAP Implementation and Progress

Tracking performance, benchmarking, providing storytelling, and sharing lessons learned related to action implementation are vital to the success of CCAP. As anyone who is familiar with data tracking is aware, it can be a challenging and resource-intensive process. However, if done intentionally as actions are being planned and started, it can also be rewarding and create several efficiencies and benefits that strengthen the implementation process, allow for efficiencies and savings to be identified, and create more sustainable and long-lasting actions. As CCAP implementation begins and continues over time, the ability for CCAP stakeholders to perform data collection and create more efficient processes for tracking action will evolve. As CCAP stakeholders are getting started, storytelling and sharing lessons learned will help set the foundation for action and inspire and empower more and more of Raleigh to take action.

During CCAP development, stakeholders were surveyed on top needs for implementation. Providing resources, education, training, etc., for ongoing storytelling, data, and metric capture were identified as top needs.

With this in mind, there is an opportunity for CCAP stakeholders, technical experts, and those in the Raleigh community who are skilled at storytelling, data, analysis, technology solutions, etc., to support tracking and measuring, etc. These partners can provide invaluable resources to CCAP stakeholders and the overall success of the plan over time.

The City of Raleigh will continue to play a role in serving as a convener and updating the community on CCAP implementation and progress over time. As mentioned throughout the plan, the City cannot do

this alone. As CCAP stakeholders implement actions and track and share their progress, or as stakeholders identify ways that they can provide foundational assistance to other community partners (like data and tracking support/resources), the more successful we all are. The City will be looking for partners that can provide access (and dedicate their resources) to direct data, storytelling, and ongoing implementation tracking assistance, as well as those that can provide support, resources, training, etc., to other CCAP stakeholders related to tracking and performance.

Tracking Objectives

Implementing CCAP and understanding the needs and progress of each strategy will be an ongoing process. As implementation begins, and the City and CCAP stakeholders work together, efforts to identify accurate, updated, and relevant data as a base foundation for action is a best practice. It is possible that several actions may not have performance data as they get started; however, when possible, efforts to create an efficient process for tracking progress should be established. Once equipped with data, tracking objectives can be set to help measure the CCAP implementation progress. Below are example tracking objectives:

- Make tracking as automated as possible (due to limited City staff capacity).
- Use existing, reliable, and regularly updated sources from which Raleigh-specific data can be drilled down to or inferred.
- Partners can host "clearinghouse" resource websites that contain data, narratives, maps, links to external resources, etc. The City or a partner could create a master site that lists information being tracked and collected by partners for various funding streams. Databases for funding related to specific areas such as energy use in buildings provide a good starting point that could continue to be built on as a community resource.
- Use input from stakeholders, partners, and strategy-specific working groups for storytelling and outreach.
- Focus on specific groups of strategies or categories of emissions each year between GHG inventory iterations. GHG inventories will be conducted periodically (potentially every five years or more frequently if the process becomes less resource-intensive). GHG emissions numbers do not typically change much from year to year or provide the opportunity for action progress to be tied to individual actions or strategies; therefore, focusing on strategy and action implementation data and category-specific metrics (like solar, energy efficiency, transportation, equity, health, etc.) will provide performance tracking on a more granular scale from year to year.
- Create specific milestones to track through the City's strategic planning process, incorporating the ongoing work of the Strategic Plan, as well as efforts being done through the City's 2030 Comprehensive Plan Update. Working toward these milestones will allow the City to stay on track toward meeting the longer-term CCAP goals.

Metrics

To help establish a tracking framework for CCAP implementation, the City and community partners will work together to identify key metrics that can be reported on a regular basis (e.g., annual) for internal and external audiences. Assessing progress on these metrics will require partners to provide information, data, and updates to the City or information that the City can pull directly from other existing sources (such as independent, objective, and reliable data sets that organizations automatically and consistently update).

8.4 - Communications and Outreach

Climate action depends on successfully communicating information about CCAP to the wider Raleigh community and encouraging broader participation in climate-related activities as the plan moves into implementation. As a 30-year plan, successful implementation of CCAP will rely heavily on the collective action of everyone in the Raleigh community and beyond, including individuals, governments, private businesses, and the non-profit community. The role of government, while important, is small in comparison to the actions that everyone must take to communicate and implement CCAP effectively. Although the internal and external partners who participated in CCAP's development, as well as the community at large, are a vital part of these communication and outreach efforts, new community partnerships will form and be leveraged over time as CCAP is implemented.

Education and Outreach

Outreach and engagement efforts are critical for implementing the CCAP strategies and should focus on action-focused collaboration and bringing partners into the implementation of CCAP. Some strategies may necessitate equitable engagement and outreach and should emphasize cultural sensitivity and building trust within communities. Marketing and education will also work to create positive community-led action, broad-based support, and a sense of ownership for CCAP. The goals of CCAP are community-wide, and the City cannot implement all strategies, marketing, and outreach alone.

Storytelling

One of the most effective ways to educate the public on climate change impacts is the use of storytelling. The City and its partners may use narrative text grounded in the real-world experiences and concerns of the Raleigh community to effectively communicate about climate change impacts in the area.

Tracking Ongoing Communications

Ongoing communications from the City, regular website updates, and CCAP stakeholder feedback will keep the community informed about the implementation of the plan's actions and strategies, development of GHG inventories, and progress toward climate goals.

Figure 8-5. Tracking Successful Communications

Reaching a Broad and Inclusive Audience
Community stakeholders should create systems to track events and presentations that incorporate climate action activity to ensure the reach of the messages. The tracking system should include the number of briefings and presentations, partners who report using engagement materials to host a meeting, visits to the project webpage, articles or other media coverage, and percentage disaggregated by demographics (race, ethnicity, income, age, gender, etc.) for participants and/or collected comments received online or through partners.

Sharing the City's Climate Action Results
City departments should measure progress and report on CCAP actions on a consistent basis. A system or form could be developed to support self-reporting by City departments.

Sharing Partners' Climate Action Results
Partners should report their activities on a regular basis, such as annually or semi-annually. This could be accomplished by providing a form or survey to all partners for data collection and input. Partners should be provided the opportunity to share qualitative data and report stories of CCAP progress in addition to any quantitative data that may be available to share.

Increasing Awareness and Affecting Behavioral Change
In order to gauge perceptions about CCAP progress and shifting perceptions on climate-related issues over time, a survey or similar tool may be used. Surveys may be administered at different points in time to allow the City to evaluate trends and understand how perceptions change over time.

8.5 - **Conclusions**

Addressing climate change and the associated impacts in the Raleigh area is an enormous undertaking that is complex and urgent. Taking action needs to include all local community partners, as well as support at the state and national levels. Everyone has a role, and everyone must do their part, both on a personal level and at the community level. CCAP is a deliberate approach to climate action that includes consideration for how everyone in the community will be impacted. If we think globally and act locally, we can collaboratively address the impacts of climate change together. The table below presents key recommendations to drive community action for CCAP.

Table 8-2. Key Recommendations to Drive Community Action

Theme	Recommendation
Communication and Outreach	➢ Support robust community communication and engagement that facilitate the community taking action. ➢ Incorporate renewables. ➢ Discuss climate equity and how to continually integrate the lens of climate equity into CCAP implementation. ➢ Understand how CCAP can serve as a backbone for future decision-making and policies that the City creates.
Monitoring, Evaluation, and Adaptive Management	➢ Establish a tracking system for actions that integrates other City updating processes, such as the Strategic Plan and Comprehensive Plan. ➢ Establish a routine system for GHG emission inventory updates, and work with the community to create an efficient (automated) system to track community actions and data. ➢ Update CCAP, as needed, given that CCAP is a living document and should be adapted with changing environmental, social, and political landscapes. ➢ Understand and assess emerging technologies and opportunities that could help bridge the gap between CCAP goals and forecasted results. ➢ Monitor state and federal policy shifts, as well as funding opportunities to accelerate Raleigh climate programming. ➢ Understand and assess emerging changes in community and voter priorities for climate action and market conditions favoring adoption of electrification, energy efficiency, and other climate strategies.
Data and Information	➢ Identify sources of better data and performance metrics over time to help improve effectiveness of CCAP implementation. ➢ Assess outputs from the CCAP model and future climate risks (e.g., consider carbon cost for future projects, direct and social costs).
Capacity-Building	➢ Leverage City and community dollars on projects and funding that drives the actions needed to achieve Raleigh's GHG reduction goal and the objectives of CCAP. ➢ Leverage community partnerships and expertise to collaboratively implement CCAP. ➢ Internalize process, funding, and climate-related mentality into City and community-wide decision-making.
Implementation Principles	➢ Embed equity and resilience into City and community work as core values. ➢ Empower the community to take action and foster partnerships.

As a living plan, CCAP will evolve with the community over time to effectively support Raleigh in achieving positive equity, resilience, and climate outcomes, including the community GHG reduction goal by 2050. The success of this bold action plan will also depend on the involvement of everyone here in Raleigh. This plan identifies local implementation actions for the City and community partners to work together on to address climate change impacts holistically.

As this plan has conveyed, it is important to continue to recognize that not everyone is affected equally by the impacts of climate change or the implementation of climate action strategies. We must build community resilience and ensure an equitable approach to climate planning, so that everyone in our community can thrive and Raleigh's environment is preserved for everyone's benefit and enjoyment.

It's on all of us *to take action and empower others to take action. From youth to retirees, renters to homeowners, businesses to agencies to community groups, we all have a stake in ensuring that Raleigh remains sustainable, resilient, equitable, and thriving for generations to come.*

Glossary

Action
A specific step taken to implement a strategy.

Adaptation
Actions taken to increase resilience to climate change impacts by reducing vulnerability.

Bluelining
A process in which banks avoid lending to people in flood-prone areas, thus resulting in reduced property values.

Business as usual (BAU)
The scenario in which future greenhouse gas emissions are forecast assuming no further mitigating actions are taken other than those mandated by state or federal policy.

Capital Area Metropolitan Planning Organization (CAMPO)
The joint quasi-governmental unit that coordinates regional transportation planning for all of Wake County and for portions of Granville, Franklin, Johnston, and Harnett Counties.

Capital improvement program (CIP)
A short-range, five-year budget used to fund capital projects and equipment purchases. The CIP provides a planning schedule and identifies options for financing costs. CIP programs involve such one-time expenses as facility construction, as opposed to the operating budget that funds routine and recurring expenses.

Carbon
A structure of molecules and an elemental building block of all organisms on Earth.

Carbon Neutrality
Zero net emissions of greenhouse gases to the atmosphere.

Climate change
Any long-term change in the climate of the Earth, or of a region or city. Anthropogenic climate change is such change attributed to human activity, including the emission of greenhouse gases due to the use of fossil fuels or creation of agricultural or industrial byproducts such as methane. The observed rise in global atmospheric and oceanic temperatures over the past century is also referred to as “global warming.”

Congestion Mitigation and Air Quality Program (CMAQ)
Coordinated growth management techniques, including traffic level of service requirements, standards for public transit, trip reduction programs, and capital improvement programming for the purpose of reducing the cumulative regional traffic impacts of development.

Decarbonization
The reduction of carbon dioxide emissions by eliminating or significantly reducing the use of fossil fuels.

Equity
The state or quality of being just and fair in the way people are treated. This means no group or community faces disadvantages in dealing with environmental hazards or disasters.

Floodplain
The land area susceptible to inundation by water as a result of flooding. Typically, a floodplain is geographically defined by the likelihood of a flood of a certain severity. A 100-year floodplain would be inundated by a flood whose severity could be expected on average once every 100 years; likewise, a 500-year floodplain would be defined by floodwaters whose severity could be expected on average once every 500 years.

Fossil fuel
Combustible fuels formed from the decomposition and transformation of organic matter over a geologic time scale. Examples are natural gas, oil, and coal.

Goal
A broad, high-level statement of future outcome that will be achieved through strategies and actions.

Greenhouse gas (GHG)
Any gaseous compound in the atmosphere that is capable of absorbing infrared radiation, thereby trapping and holding heat in the atmosphere. Greenhouse gases include carbon dioxide, methane, nitrous oxide, ozone, and other compounds.

Greenhouse gas reduction
Actions taken to reduce the number and severity of potential future climate impacts compared to un-checked greenhouse gas emissions.

Green infrastructure
An interconnected green space network that is planned and managed for its natural resource values and for the associated benefits it confers to human populations.[32]

Impervious surface
A hard area that does not allow water to seep into the ground.

Metric
A quantitative measure (and units of data) used to determine if progress is being made toward a goal.

Metric tons of carbon dioxide equivalent ($MTCO_2e$)
Unit of measure for greenhouse gas emissions that combines multiple gases (e.g., carbon dioxide, methane, nitrous oxide) based on their relative global warming potential.

Mitigation
A human intervention to reduce the human impact on the climate system; it includes strategies to reduce greenhouse gas emissions.

Modeshare
The percentage of travel or people using different types of transportation.

Net zero greenhouse gas emissions
Balancing the amount of carbon released with an equivalent amount of carbon sequestered.

Performance-based zoning
Zoning regulations that permit uses based on a particular set of standards rather than on a particular type of use. It is a flexible zoning technique designed to evaluate development on a project-by-project basis. The process involves preparing a detailed analysis of existing conditions in the area and estimates the impacts of development on community facilities, the environment, local economic conditions, and subsequent standards established by the community.

Pervious surface
A hard surface that allows water to seep through to the area underneath.

Renewable energy
Energy derived from natural processes that are regenerative over short periods of time or cannot be depleted (e.g., biomass, geothermal, solar, wind, and low-impact hydrothermal)

[32] Benedict, M., and E. McMahon. (2006). "Green Infrastructure," Island Press.

Resilience
The ability of social, economic, and environmental systems to respond, recover, and adapt in the wake of events that disrupt their essential functions.

Retro-/Re-commissioning
A process to improve the efficiency of an existing building's equipment, systems, and overall performance.

Strategy
A method or approach taken to achieve a goal.

Urban heat island
Occurs when an urban area experiences much warmer temperatures than nearby rural areas.

Vehicle miles traveled (VMT)
A unit to measure vehicle travel made by a private vehicle, such as an automobile, van, pickup truck, or motorcycle. Each mile traveled is counted as one vehicle mile regardless of the number of persons in the vehicle.

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Appendices

Appendix A. The CCAP Charter

Appendix B. Equity Impact Matrix

Appendix C. LEED Building Policy

Appendix D. U.S. Mayors Climate Protection Agreement

Appendix E. Raleigh Strategic Plan Linkages

Appendix F. City of Raleigh 2030 Comprehensive Plan Linkages

Appendix A. The CCAP Charter

City of Raleigh Community-wide Climate Action Plan
Final Project Charter

Overview

In 2007, Raleigh's City Council endorsed the US Conference of Mayors' Climate Protection Agreement. Following that action, the City's Office of Sustainability prepared an initial greenhouse gas (GHG) emissions inventory of City of Raleigh Municipal Operations and in 2012 completed a community-wide GHG emissions inventory and A Roadmap to Raleigh's Energy Future: A Climate Energy Action Plan for Raleigh's Municipal Operations. The Municipal Operations and the Community-wide GHG emissions inventories were updated in 2016.

The City of Raleigh is preparing a Community-wide Climate Action Plan (CCAP) that will present goals, data-driven actions and strategies for reducing GHG emissions. The plan will be developed with robust stakeholder and community engagement that builds partnerships to support implementation of emissions reduction strategies. The plan will educate and empower businesses, institutions and residents to reduce their own emissions using traditional and innovative strategies.

Goals and Objectives

Develop a Community-wide Climate Action Plan (CCAP) with a transformative vision and climate strategies that are capable of achieving deep emissions reductions through a CCAP development process that engages a full range of stakeholders in evaluating climate strategies and proposing actions that are equitable and enhance well-being for all members of the community, including underserved and vulnerable populations.

Objectives of the plan include:

- Define Raleigh's climate challenges and opportunities;
- Evaluate and discuss challenges, opportunities, and options for selecting and meeting climate and Greenhouse Gas (GHG) reduction goals;
- Leverage robust engagement processes and the expertise of stakeholders that include community partners ranging from the scientific community to grassroots community leaders to co-develop strategies and actions and understand the implications to the community;
- Connect the City's existing and developing climate action initiatives, strategies and plans with community's goals;
- Define and prioritize a set of targeted climate actions that are financially, economically and operationally feasible and a long-term strategy plan,
- Establish metrics for measuring progress towards lowering community-wide GHG emissions;
- Analyze the needs and potential impacts of climate change to underserved and vulnerable neighborhoods and communities, including low-income and communities of

color who may experience disproportionate distribution of climate change burdens and climate impact vulnerabilities;
- Using an equity framework and direct engagement with affected communities, outline implementation strategies and measures that address the systems that contribute to climate change, the conditions that may perpetuate existing inequities and the effects of climate change and their distribution in order to ensure equitable actions, benefits and enhanced well-being for all members of the community; and
- Incorporate climate strategies that will activate and engage all residents, businesses and institutions during implementation with positive actions and tangible benefits.

Scope and Deliverables

The CCAP will develop GHG targets and a set of climate strategies and actions community-wide for the City of Raleigh. Due to the nature of air quality and GHGs, the boundaries considered will be throughout the Raleigh area and consistent with other Raleigh planning efforts. The GHG targets will be developed for a medium-term timeframe (such as 2035) to chart a course for the City's short and medium-term actions, as well as a long-term horizon (Urban Sustainability Directors Network's High Impact Practices Study and STAR Communities Climate and Energy Goal area) to set a long-term vision for the City's future. CCAP strategies and actions will be identified for the short, medium and long-term to support achievement of GHG goals.

Development and implementation of the CCAP is divided into two main phases. Phase I includes planning and kick-off of CCAP efforts (Task 0), GHG-related goal-setting (Task 1), and development of climate strategies and actions and preparation of the CCAP (Task 2). Phase II includes planning for ongoing communication, outreach and marketing (Task 3), and beginning CCAP implementation, including activities to transition into multi-year implementation and monitoring of CCAP strategies (Task 4).

Key tasks and deliverables include:

<u>Phase I</u>
- Engagement Strategy Brief (Task 0)
- GHG forecasting, vision and goals (Task 1)
- Equity Planning Framework (Task 1)
- Climate strategies and actions (Task 2)
- Phase I stakeholder engagement (ongoing)

<u>Phase II</u>
- Community-wide Climate Action Plan (Tasks 2-3)
- Communications, outreach and marketing plan(s) (Task 3)
- Transition stakeholder engagement, partnerships and outreach (Task 4)
- Initial implementation actions (Task 4)

Stakeholder Roles and Responsibilities

The vision for the CCAP process and final plan is one that is based on a robust and comprehensive process of stakeholder engagement that builds partnership, momentum and a platform for implementation. Stakeholder groups that will be engaged are described on the following pages and include:

- Internal Teams
  - Project Team
  - City Interdepartmental Staff / Team
- External Teams
  - Technical Advisors
  - Community Action Team
- Community Stakeholders
  - Local & Regional Organizational/Institutional Community Stakeholders
  - Residents
  - CACs / Advisory Boards
  - Economic Development Partners (including public-private partnerships)
  - Job Development / Equity Partners
  - Other resource partners (grants, technical assistance, etc.)

PROJECT TEAM

Role
The Project Team is the core Raleigh CCAP team. The project team will work directly with the consultant team and oversee the planning process, and report to city leadership as needed. The project team will continue throughout all phases of the CCAP project. Regular internal meetings will be established. This group would span the CCAP planning Phases 1 and 2 and core project team members will continue to participate in implementation after Task 4.

Tasks: Project Initiation to Implementation

INTERDEPARTMENTAL TEAM

Role
The Interdepartmental Team will provide representation across relevant City divisions, identifying cross-project opportunities and support across City service areas. The team will provide input into infrastructure, environmental and community related goals and will further enhance equity of input by reflecting a range of existing community interfaces city-wide. This group will be tasked for advisory and advocate roles within the city. They will have frequent interactions with project team, may assist in the project planning and may serve as resources for Community Action Team meetings. This group would span the CCAP planning Phases 1 and 2 beginning with Task 1 (goal setting).

Tasks: Project Goals to Implementation

TECHNICAL ADVISORS

Role
This external stakeholder group will contribute expertise into the Climate Action Planning process and will include energy, business, education, development, non-profit and other leaders. These stakeholders could provide input regarding setting targets, evaluating strategies and developing partnerships for climate actions. Focused conversations will be held with individuals and small groups, potentially organized by topics/sectors (e.g. energy resources, transportation, buildings, housing, social equity, finance, waste, environment, and other "high impact" topics). These discussions will involve opportunities for individual organizations to develop strategies that lead to their ownership over future implementation of these GHG reduction strategies. This group would span the CCAP planning Phases 1 and 2 beginning with Task 1 (goal setting) and could be used during implementation after Task 4.

Tasks: Project Goals to Implementation

COMMUNITY ACTION TEAM

Role
This external stakeholder group can be used as a primary community stakeholder group and may include representatives of community-based, environmental, local non-profit, and other organizations. This group will be informed and become community advocates for the project and be asked to lead or network with others to carry out community-led, grassroots outreach necessary for the CCAP development and implementation. These individuals could provide comments regarding impact on the community and could also review deliverables. This group would span the CCAP planning phases 1 and 2 and could be used in the early stages of the implementation after Task 4.

Tasks: Project Goals to Implementation

ADDITIONAL COMMUNITY OUTREACH (contacts, interviews, liaisons)

These organizational and/or individual contacts will be informed throughout the plan process and are anticipated to become another layer of community advocates for the plan. They may have a role through Key Leader Interviews, small group meetings, other contacts, and/or requests to lead community outreach and engagement themselves with information provided by the project team. A Community Collaboration Event/Meeting in a Box will be developed so that some of these individuals can lead or coordinate with others to conduct community-led, grassroots CCAP outreach efforts working with community and neighborhood organizations, faith-based groups, non-profits, schools and others. The Meeting in a Box will consist of basic materials such as presentation slides or graphics, one or more handouts, comment sheets, contact cards or other materials. Outreach events may also include standing community

meetings such as Citizen Advisory Council (CAC) meetings or related City meetings for the community for areas such as land use or transportation. The community stakeholder contacts will be informed throughout CCAP planning phases 1 and 2 and will remain important with respect to partnerships during implementation.

Tasks: Project Goals to Implementation

Schedule and Risks

The schedule for the main phases and tasks for CCAP development is summarized below.

Phase	Task	Description	Schedule
Phase I	Task 0	Project Initiation	Fall 2018
	Task 1	Goals	Fall-Winter 2018
	Task 2	Strategies	Winter-Spring 2019
Phase II	Task 3	Communications Planning	Summer 2019
	Task 4	Implementation	FY20-TBD

Risks to the schedule and success of the CCAP include: the possibility of not achieving one or more of the objectives outlined in this charter; experiencing delays to implementation timelines due to competing priorities for the city and community partners and potential associated shortages of financial, operational, and/or other resources; not aligning or overcoming competing goals from external stakeholders; or not building necessary relationships with one or more stakeholder groups to support implementation. The ownership of the electric and gas utilities by entities external to the City presents additional risk. The Engagement Strategy Brief will be a key tool in addressing the risks of coordinating with internal and external partners, while project management protocols and the planned coordination and oversight of the Project Team will address general risks to CCAP development and the schedule for the process.

Appendix B. Equity Impact Matrix

The Office of Sustainability convened internal and external stakeholders to review the short-term CCAP strategies against a set of equity indicators. The list of indicators and the methodology were adapted from work done by the State of Georgia in their review of Project Drawdown[33] strategies for GHG emissions reductions. This method provides a high-level view of potential impacts of each strategy on environmental, economic and public health factors.

How to read the Matrix:

Participants were asked to analyze each CCAP strategy against these factors and provide a simple stoplight analysis of its potential equity impacts:

- **Red:** negative impacts anticipated
- **Yellow:** potential trade-offs/not enough information to determine impacts
- **Green:** positive impacts anticipated
- **Blank:** no impacts anticipated

The list of indicators for environmental, economic and public health appear in the far-left column. The CCAP categories and strategies appear across the top. There is also a row of abbreviations across the top. These were abbreviations used for the EIM exercise to evaluate strategy actions. A list of those abbreviations related to CCAP strategies is included on the next page for reference (but is not necessary to understand the Matrix outcomes at a high level). This matrix is included to give CCAP stakeholders a look into where the participants of this exercise categorized strategy areas related to equity impact (i.e., red, yellow, green, blank).

Incorporating equity into implementation planning:

This document provides a summary of an initial analysis. This analysis is preliminary. It represents the input of a group of community stakeholders' prior experience of project implementation scenarios. The purpose of this process was to provide a baseline analysis for further verification and planning purposes: a starting point. Stakeholder engagement focusing on equity impacts will continue as a part of the implementation of CCAP. More conversations and asking questions about equity impact (as referenced in Chapter 3) are important for CCAP stakeholders to incorporate into their implementation planning.

[33] www.drawdown.org

Equity Impact Matrix Abbreviations

Energy Efficiency Practices (EEP)	**EEP1:** Promote programs, provide tools, and encourage non-residential facilities to track, benchmark, and report energy consumption.	
	EEP2: Promote programs, provide tools, and encourage non-residential facilities to conduct energy audits, provide preventive maintenance, commission, and retrocommission facilities.	
	EEP 3: Promote programs, provide tools, and encourage residential facility energy tracking and benchmarking.	
	EEP 4: Promote programs, provide tools, and encourage residential facility energy audits, preventive maintenance plans, commissioning, and retrocommissioning.	
Energy Efficiency Standards (EES)	**EES 1:** Encourage and incentivize energy efficiency in construction and renovations in non-residential facilities.	
	EES 2: Encourage and incentivize energy efficiency in construction and renovations in residential facilities, including affordable housing.	
Energy Supply (ES)	**ES:** Duke Energy and utility providers shift to clean energy sources.	
Renewable Energy (RE)	**RE:** Continue to support and promote the expansion of renewable energy programs	**RE r:** Rooftop solar installations (single building/facility scale)
		RE c: Community solar installations (community level)
Efficient Land Use (ELU)	**ELU:** Promote development patterns that support safe, effective, and multi-modal transportation options, including auto, pedestrian, bicycle, and transit to minimize vehicle traffic by providing for a mixture of land uses, walkability, and compact community form.	
VMT Reduction and Alternative Mobility (VRAM)	**VRAM 1:** Implement congestion mitigation strategies to reduce traffic delays, idle time, and allow the efficient use of motor vehicles.	
	VRAM 2: Promote access to and incentivize non-vehicle modeshare such as walking and biking.	
	VRAM 3: Support commuter trip efficiency programs such as transit, carpool, vanpool, biking, walking, teleworking, and alternative work schedules. Provide workforce outreach, education opportunities, and work with employers to alleviate traffic by reducing single occupancy vehicle commutes.	
	VRAM 4: Improve freight efficiency by relieving capacity constraints at freight bottlenecks, improving access to intermodal facilities, and shifting freight modes from truck to rail.	
	VRAM 5: Expand access and opportunities to public transit by increasing bus services, number of routes, improved stops and shelters, and implementation of bus rapid transit.	
	VRAM 6: Further promote public transit experience by improving availability, reliability, safety, and traveler experience.	
Transportation Electrification and Alternative Fuels (TEAF)	**TEAF 1:** Encourage and incentivize adoption of alternative fuel and electric vehicles including personal vehicles and private fleets.	
	TEAF 2: Encourage, promote, and plan the transition of bus fleets to alternative fuels and electric.	
	TEAF 3: Promote and encourage installation and utilization of electric vehicle charging stations in both public and private applications.	
	TEAF 4: Transportation fuel efficiency improvements. (not assessed)	
Green Infrastructure (GI)	**GI 1:** Limit development in hazard-prone areas.	
	GI 2: Encourage and incentivize green infrastructure to reduce stormwater runoff and preserve flood storage capacity.	
Preservation and Green Space (PGS)	**PGS:** Incentivize and encourage opportunities to support green space to promote carbon sequestration, natural habitats, food access and security, and to reduce urban heat islands.	
Waste Reduction and Efficiency (WRE)	**WRE 1:** Improve efficiency of waste collection including solid waste and recycling pickup process and route efficiencies.	
	WRE 2: Improve education and outreach on waste reduction and recycling.	
	WRE 3: Wastewater processing efficiency improvements and methane capture including bioenergy recovery (anaerobic digester).	
	WRE 4: Explore and promote additional waste diversion opportunities including organic waste collection (food, yard waste), composting, and other waste streams.	
Innovation (Inn)	**Inn:** Develop collaborative partnerships to identify opportunities and technologies to innovate in areas such as energy, transportation, waste, resilience, health, and equity.	

		Buildings and Energy								
		Energy Efficient Practices				Energy Efficiency Standards		Energy Supply	Renewable Energy	
		EEBP1	EEBP2	EEBP 3	EEBP 4	EES 1	EES 2	ES	RE r	RE c
Environment	Air Quality									
	Water Quality and Quantity									
	Land Use Change									
	Ecosystems - Biodiversity									
	Material Disposability, Waste/Reuse Options									
	Cultural Fit and Way of Life									
	Distribution of Environmental Impacts									
Economic Development and Jobs	Local Economy and local employment									
	Accessibility of Solutions									
	Input Prices									
	Workforce Composition									
	Wages and Benefits: Living Wage									
	Gentrification									
	Property Values/taxes									
	Infrastructure requirements									
	Affordability (cost of living)									
	Distribution of Economic Development									
Public Health	Premature mortality/ life expectancy									
	Morbidity									
	Quality of life									
	Educational Attainment									
	Public Safety									
	Distribution of Public Health Impacts									

		Transportation and Land Use									
		Efficient Land Use	VMT Reduction and Alternative Mobility						Transportation Electrification and Alternative Fuels		
		LU	VMT 1	VMT 2	VMT 3	VMT 4	VMT 5	VMT 6	EV 1	EV 2	EV 3
Environment	Air Quality										
	Water Quality and Quantity										
	Land Use Change										
	Ecosystems - Biodiversity										
	Material Disposability, Waste/Reuse Options										
	Cultural Fit and Way of Life										
	Distribution of Environmental Impacts										
Economic Development and Jobs	Local Economy and local employment										
	Accessibility of Solutions										
	Input Prices										
	Workforce Composition										
	Wages and Benefits: Living Wage										
	Gentrification										
	Property Values/taxes										
	Infrastructure requirements										
	Affordability (cost of living)										
	Distribution of Economic Development										
Public Health	Premature mortality/ life expectancy										
	Morbidity										
	Quality of life										
	Educational Attainment										
	Public Safety										
	Distribution of Public Health Impacts										

		Resilience and Cross-Cutting							
		Green Infrastructure		Preservation and Green Space	Waste Reduction and Efficiency				Innovation
		GI 1	GI 2	PGS	WRE 1	WRE 2	WRE 3	WRE 4	Inno
Environment	Air Quality								
	Water Quality and Quantity								
	Land Use Change								
	Ecosystems - Biodiversity								
	Material Disposability, Waste/Reuse Options								
	Cultural Fit and Way of Life								
	Distribution of Environmental Impacts								
Economic Development and Jobs	Local Economy and local employment								
	Accessibility of Solutions								
	Input Prices								
	Workforce Composition								
	Wages and Benefits: Living Wage								
	Gentrification								
	Property Values/taxes								
	Infrastructure requirements								
	Affordability (cost of living)								
	Distribution of Economic Development								
Public Health	Premature mortality/ life expectancy								
	Morbidity								
	Quality of life								
	Educational Attainment								
	Public Safety								
	Distribution of Public Health Impacts								

Appendix C. LEED Building Policy

CITY OF RALEIGH
ENVIRONMENTAL ADVISORY BOARD

Recommendation of the Environmental Advisory Board on Improved Energy Efficiency in Buildings:

NEW CONSTRUCTION:

1) All new City of Raleigh construction and additions encompassing 10, 000 gross square feet or more of building area should achieve a Silver level certification of the US Green Building Councils LEED Green Building Rating System for New Construction (LEED- NC). A higher equivalent rating (Gold or Platinum) should be sought where practical and as funding is available.

(Approved, Mr. Craven did not vote in the affirmative because of his concerns about costs)

2) All City of Raleigh construction and additions encompassing less than 10,000 square feet of building area would not seek LEED Silver level certification but would be designed and built to be eligible for Silver certification, plus meet requirements for energy and water efficiency as follows:

   i. Energy
      Achieve minimum energy efficiency of 30% better than code required by ASHRAE (American Society of Heating, Refrigeration and Air Conditioning Engineers) 90.1-2004 (ASHRAE 90.1 version required in the 2006 NC Building Code).

   ii. Water
      Achieve a 30% water use reduction as quantified by LEED water efficiency standards.

(Unanimously approved)

EXISTING BUILDINGS:

3) All existing City of Raleigh buildings and facilities should use the US Green Building Council's LEED Green Building Rating System for Existing Buildings (LEED - EB) as a guide. The application of these standards is intended to maximize sustainability benefits within

existing resources and provide a means of benchmarking environmental and financial performance improvements in City practices.

Certification of existing buildings under LEED – EB should be evaluated for technical and economic feasibility and pursued at the highest feasible level of certification on a case by case basis as funding and resources are available.

(Unanimously approved)

Other Suggestions:

1) Building efficiency standards should be reviewed annually based on actual performance data to determine if standards should be revised.

2) The City of Raleigh should consider ways to include sustainability incentives in private development.

Denny Murphy, Chair
John Burns, Vice-Chair
Stanford Baird
Alvaro Casella
Bob Mosher
Hampton Pitts
Benson Kirkman
Dona Stankus
Tommy Craven

Respectfully submitted by the Environmental Advisory Board

April 17, 2008

Appendix D. U.S. Mayors Climate Protection Agreement

RESOLUTION NO. (2007) 325

A RESOLUTION ENDORSING THE U.S. MAYORS CLIMATE PROTECTION AGREEMENT

WHEREAS, the U.S. Conference of Mayors has previously adopted strong policy resolutions calling for cities, communities and the federal government to take actions to reduce global warming pollution; and

WHEREAS, the Inter-Governmental Panel on Climate Change (IPCC), the international community's most respected assemblage of scientists, has found that climate disruption is a reality and that human activities are largely responsible for increasing concentrations of global warming pollution; and

WHEREAS, recent, well-documented impacts of climate disruption include average global sea level increases of four to eight inches during the 20th century; a 40 percent decline in Arctic sea-ice thickness; and nine of the ten hottest years on record occurring in the past decade; and

WHEREAS, climate disruption of the magnitude now predicted by the scientific community will cause extremely costly disruption of human and natural systems throughout the world including: increased risk of floods or droughts; sea-level rises that interact with coastal storms to erode beaches, inundate land, and damage structures; more frequent and extreme heat waves; more frequent and greater concentrations of smog; and

WHEREAS, on February 16, 2005, the Kyoto Protocol, an international agreement to address climate disruption, went into effect in the 141 countries that have ratified it to date; 38 of those countries are now legally required to reduce greenhouse gas emissions on average 5.2 percent below 1990 levels by 2012; and

WHEREAS, the United States of America, with less than five percent of the world's population, is responsible for producing approximately 25 percent of the world's global warming pollutants; and

WHEREAS, the Kyoto Protocol emissions reduction target for the U.S. would have been 7 percent below 1990 levels by 2012; and

WHEREAS, many leading US companies that have adopted greenhouse gas reduction programs to demonstrate corporate social responsibility have also publicly expressed preference for the US to adopt precise and mandatory emissions targets and timetables as a means by which to remain competitive in the international marketplace, to mitigate financial risk and to promote sound investment decisions; and

WHEREAS, state and local governments throughout the United States are adopting emission reduction targets and programs and that this leadership is bipartisan, coming from Republican and Democratic governors and mayors alike; and

WHEREAS, many cities throughout the nation, both large and small, are reducing global warming pollutants through programs that provide economic and quality of life benefits such as reduced energy bills, green space preservation, air quality improvements, reduced traffic congestion, improved transportation choices, and economic development and job creation through energy conservation and new energy technologies; and

WHEREAS, mayors from around the nation have signed the U.S. Mayors Climate Protection Agreement which, as amended at the 73rd Annual U.S. Conference of Mayors meeting, reads:

The U.S. Mayors Climate Protection Agreement

A. We urge the federal government and state governments to enact policies and programs to meet or beat the target of reducing global warming pollution levels to 7 percent below 1990 levels by 2012, including efforts to: reduce the United States' dependence on fossil fuels and accelerate the development of clean, economical energy resources and fuel-efficient technologies such as conservation, methane recovery for energy generation, waste to energy, wind and solar energy, fuel cells, efficient motor vehicles, and biofuels;

B. We urge the U.S. Congress to pass bipartisan greenhouse gas reduction legislation that includes 1) clear timetables and emissions limits and 2) a flexible, market-based system of tradable allowances among emitting industries; and

C. We will strive to meet or exceed Kyoto Protocol targets for reducing global warming pollution by taking actions in our own operations and communities such as:

1. Inventory global warming emissions in City operations and in the community, set reduction targets and create an action plan.
2. Adopt and enforce land-use policies that reduce sprawl, preserve open space, and create compact, walkable urban communities;
3. Promote transportation options such as bicycle trails, commute trip reduction programs, incentives for car pooling and public transit;
4. Increase the use of clean, alternative energy by, for example, investing in "green tags", advocating for the development of renewable energy resources, recovering landfill methane for energy production, and supporting the use of waste to energy technology;
5. Make energy efficiency a priority through building code improvements, retrofitting city facilities with energy efficient lighting and urging employees to conserve energy and save money;
6. Purchase only Energy Star equipment and appliances for City use;
7. Practice and promote sustainable building practices using the U.S. Green Building Councils LEED program or a similar system;

8. Increase the average fuel efficiency of municipal fleet vehicles; reduce the number of vehicles; launch an employee education program including anti-idling messages; convert diesel vehicles to bio-diesel;
9. Evaluate opportunities to increase pump efficiency in water and wastewater systems; recover wastewater treatment methane for energy production;
10. Increase recycling rates in City operations and in the community;
11. Maintain healthy urban forests; promote tree planting to increase shading and to absorb CO_2; and
12. Help educate the public, schools, other jurisdictions, professional associations, business and industry about reducing global warming pollution.

NOW, THEREFORE, BE IT RESOLVED that The U.S. Conference of Mayors endorses the U.S. Mayors Climate Protection Agreement as amended by the 73 annual U.S. Conference of Mayors meeting and urges mayors from around the nation to join this effort.

BE IT FURTHER RESOLVED, The U.S. Conference of Mayors will work in conjunction with ICLEI Local Governments for Sustainability and other appropriate organizations to track progress and implementation of the U.S. Mayors Climate Protection Agreement as amended by the 73rd annual U.S. Conference of Mayors meeting.

Adopted: August 7, 2007

You have my support for the Mayors Climate Protection Agreement.

Date: August 7, 2007

Mayor _____

Signature: _____

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Appendix E. Raleigh Strategic Plan Linkages

Growth and Natural Resources

Encourage a diverse, vibrant built environment that preserves and protects the community's natural resources, strives for environmental equity and justice, and encourages sustainable growth that complements existing development.

Objective 1	Identify opportunities to refine and enhance policies and programs that protect and improve environmental resources to include the tree canopy, open space, and plant management policies and practices.	Initiative 1.1: Conduct a city-wide tree canopy cover assessment; establish canopy metrics and tree planting goals; and identify strategies to improve Raleigh's urban forest to help meet climate, sustainability, resiliency, equity, and accessibility goals Initiative 1.2: Build on the Green Stormwater Infrastructure policy and additional tools to encourage low-impact development in private and public projects. Initiative 1.3: Identify opportunities to eliminate barriers and increase education to encourage urban agriculture. Initiative 1.4: Identify opportunities to enhance the effectiveness of green waste collection that reflect current best practices Initiative 1.5: Develop and establish a stream restoration prioritization plan, including the identification of dams that create negative impacts.
Objective 2	Complete, adopt, and implement the Capital Area Greenway Master Plan to support a balance of environmental, multi-modal transportation, and recreational uses.	Initiative 2.1: Develop and implement policy recommendations, operational considerations, and capital investments to position greenway trails as transportation options. Initiative 2.2: Expand greenway connectivity and accessibility across all communities, with a focus on connections between residential areas, activity centers, and green spaces. Initiative 2.3:Incorporate an array of amenities into the network of greenway trails, based on the priorities identified in the Greenway Master Plan and other emerging best practices, to increase and improve user experience.
Objective 3	Identify and facilitate improvements to the built environment and City programs through the use of technology, innovative design practices, and emerging scientific principles.	Initiative 3.1: Utilize an environmental justice mapping tool to enhance understanding of environmental inequities in our community and identify potential options for mitigation. Initiative 3.2: Evaluate City programs and resources for scientific and technological investments that could improve environmental performance. Initiative 3.3: Evaluate opportunities to enhance sustainability, energy efficiency, and renewable energy in new and existing City facilities. Initiative 3.4: Analyze data to identify heat islands within the city and develop potential mitigation opportunities. Initiative 3.5: Identify and implement policy, programmatic, and financial strategies to address repetitive structural flooding caused by factors such as undersized infrastructure, land development, and climate change.
Objective 4	Pursue opportunities to advance adoption of comprehensive stewardship practices throughout the community, including	Initiative 4.1: Identify the priorities and resources necessary for implementation of Community Climate Action Plan (CCAP) actions.

	efforts to reduce community-wide greenhouse gas emissions, address resiliency, and improve climate equity.	Initiative 4.2: Identify policy, partnership, and advocacy opportunities that would support modernization of the electricity distribution system and increase use of renewable energy sources. Initiative 4.3: Implement strategies for city-wide waste reduction. Initiative 4.4: Work with community partners to engage youth in stewardship and environmental education opportunities.

Safe, Vibrant, Healthy Community

Promote a clean, engaged community environment where people feel safe and enjoy access to affordable housing and community amenities that support a high quality of life.

Objective 1	Promote a safe and vibrant atmosphere throughout the city of Raleigh by educating community members on City services and the latest safety measures that help support a thriving community in which to live, work, and play.	Initiative 1.2: Promote safety through education, partnerships, and best practices that empower community members to contribute to a safe and vibrant community. Initiative 1.3: Develop and implement strategies to build community members' resilience to disasters, prioritizing vulnerable communities to support equitable recovery and growth following a disaster.
Objective 3	Promote walkable, mixed-use and mixed-income neighborhoods, including those near transit investments.	Initiative 3.2: Identify and address acquisition of properties in areas undergoing transition, including near future transit and other transformative investments.
Objective 4	Enhance community members' quality of life by providing a well-designed community that facilitates active living and healthy lifestyles.	Initiative 4.3: Work with community partners to implement and support strategies that enhance food security throughout the city.

Transportation & Transit

Develop an equitable and accessible citywide transportation network for pedestrians, cyclists, automobiles and transit that is linked to regional municipalities, rail and air hubs.

Objective 1	Develop partnerships and implement a unified and coordinated transportation and land use vision. Initiative	1.1: Pursue opportunities and partnerships along high priority transit corridors to advance community priorities, develop specific land use strategies, and support equitable economic development. Initiative 1.2: Evaluate the use of curbside space to ensure policies and practices are providing optimum community benefit and flexibility. Initiative 1.3: Develop strategies to address transportation infrastructure priorities associated with key development opportunities or City investments.
Objective 2	Enhance the multi-modal transportation network to reduce reliance on single occupancy vehicle trips.	Initiative 2.1: Develop strategies to strengthen multimodal connections between high impact activity nodes and identify, prioritize, and implement projects that strengthen connections between different modes of transportation. Initiative 2.2: Develop and pursue strategies to encourage and incentivize individuals to seek out and utilize alternative modes of transportation, including identification and removal of barriers and improvements to existing transit service. Initiative 2.3: Evaluate and pursue opportunities, including partnerships, to expand regional transit opportunities

		including bus rapid transit, commuter rail, and high-speed rail.
Objective 3	Identify policies, partnerships, and programmatic opportunities to improve the safety of the City's transportation network, with a focus on pedestrians and bicyclists.	Initiative 3.1: Develop a Vision Zero implementation plan that utilizes partnerships and includes necessary legal, policy, equity, and resource considerations. Initiative 3.2: Develop policy considerations on the appropriateness of citywide speed limits and incorporate traffic calming elements into street design requirements for new development; systematically implement changes. Initiative 3.3: Update the BikeRaleigh Plan with a focus on equitable outcomes and bike lane implementation focused on linking strategic connections.
Objective 4	Implement intelligent transportation and emerging technology solutions that activate smart and connected communities.	Initiative 4.1: Develop a plan to optimize the City's investment in electric vehicle charging infrastructure and model success through continued adoption of electrification and conversion to alternative fuels in the City's fleet. Initiative 4.2: Improve the operational efficiency of the City's bus and public transportation vehicles through renewable CNG and electric buses. Initiative 4.3: Identify opportunities to install electric vehicle charging infrastructure to advance the public adoption and use of electric vehicles including encouragement for private investment. Initiative 4.4: Coordinate, support, and make investments in technology solutions, partnerships, and data collection to improve mobility and support automation, artificial intelligence, service coordination, and other transportation innovations.
Objective 5	Implement equitable transportation programs and service levels with a focus on promoting an inclusive and accessible transportation network	Initiative 5.1: Evaluate revisions to transportation programs and policies to improve equitable implementation of infrastructure improvements, broaden options, increase eligibility, and reduce barriers to participation. Initiative 5.2: Identify and map areas burdened by past transportation investments and associated air quality or community impacts; and identify mitigation measures to generate better outcomes for impacted residents. Initiative 5.3: Improve accessibility for persons with disabilities and active adults by identifying, prioritizing, and implementing transportation supportive infrastructure.

Appendix F. City of Raleigh 2030 Comprehensive Plan Linkages

This is not a complete list. Additional policy guidance relating to climate can be found throughout the 2030 Comprehensive Plan

Section 4, Transportation	Policy T 1.4 Increasing Mobility Choice	Diversify the mobility choices for work trips by targeting transit investments along corridors that connect concentrations of office, retail, and residential uses.
	Policy T 2.13 Increasing Vehicle Policy Occupancy	Encourage and support programs that increase vehicle occupancy, including the provision of traveler information, shuttles, preferential parking for carpools/vanpools, park and ride, transit pass subsidies, and other methods (refer to Triangle Region Long Range Transportation Demand Management Plan).
	Policy T 3.1 Complete Street Implementation	For all street projects and improvements affecting the public right-of way, consider and incorporate Complete Street principles and design standards that provide mobility for all types of transportation modes (pedestrian, bicycle, auto, transit, freight) and support mutually-reinforcing land use and transportation decisions. Work with NCDOT to implement these design standards for state-maintained roads within the city's jurisdiction.
	Policy T 3.2 Integrating Multiple Users	Ensure that all new roadway projects and major reconstruction projects provide appropriate and adequate right-of-way for safe and convenient movement for all users including bicyclists, pedestrians, transit riders, and motorists. Manage the use of rights-of-way to best serve future travel demand (e.g., Multimodal Streets—incorporate wider sidewalks where appropriate
	2.14 Employer-based Trip Reduction	Encourage employers to provide transit and bikeshare subsidies, bicycle facilities, alternative work schedules, ridesharing, telecommuting and work-at-home programs, employee education, and preferential parking for carpools/vanpools
	Policy T 4.1 Promoting Transit	Promote and support quality transit services to enhance mobility options and to meet the needs of the city's residents and visitors, with a focus on transit-dependent households.
	Policy T 4.2 Short-term Bus Improvements	Enhance local and regional bus transit service in the short-term along key corridors where long-term bus rapid transit improvements are planned and identified in the Wake County Transit Plan
	Action T 5.6 Bicycle Plan Implementation	Maintain and implement the BikeRaleigh Plan
	Policy T 6.7 Parking Demand Management	Discourage single occupant vehicle trips through parking supply and pricing controls in areas where supply is limited and alternative transportation modes are available.
	Action T 8.2 Improving Freight Movement	Identify and correct roadway design and operational deficiencies that affect the safe and efficient movement of freight on designated freight routes while maintaining the health and safety of residents.
Section 5, Environmental Protection	Policy EP 1.1 Greenhouse Gas Reduction	Promote best practices for reducing greenhouse gas emissions as documented through the U.S. Mayors' Climate Protection Agreement.
	Policy EP 1.2 Alternative Transportation Options	Promote the adoption of alternative fuel vehicles and advanced transportation technologies, both public and private.

Policy EP 1.3Total Cost of Ownership Analysis	Use Total Cost of Ownership (TCO), life-cycle analysis, and/or payback analysis on all energy saving proposals.
Policy EP 1.4Green Building	Advance green building practices in the public and private sectors by encouraging LEED Gold-level certification and LEED-ND, or their respective equivalents.
Policy EP 1.5LEED Certification for Public Buildings	All new or renovations of existing City of Raleigh buildings encompassing 10,000 gross square feet or more of building area should achieve a Silver-level certification of the U.S. Green Building Council's LEED Green Building Rating System for New Construction (LEED-NC) and Existing Buildings (LEED-EB), or their respective equivalents. A higher equivalent rating (Gold or Platinum) should be sought where practical and as funding is available.
EP 1.6 LEED and Development Agreements	Require any public-private project that includes a development agreement to apply LEED (or the equivalent) certification standards as appropriate to the project and consistent with other Comprehensive Plan policies.
Policy EP 1.8 Sustainable Sites	Encourage the use of environmentally-friendly site planning and landscape design approaches and techniques such as those developed by the Sustainable Sites Initiative. Incorporate sustainable green infrastructure and low impact development practices to help control stormwater runoff and reduce pollutant impacts to streams.
Policy EP 1.9 Sustainable Public Realm	Incorporate sustainable technology and materials into public realm projects.
Policy EP 1.10 Alternative Energy Sources	Support the development and application of alternative energy sources, renewable energy technologies, and energy storage. Such technology should be used to reduce the dependence on imported energy, provide opportunities for economic and community development, and benefit environmental quality.
Policy EP 1.11 Renewable Energy	By 2030, increase the use of renewable energy to meet 20 percent of Raleigh's peak electric load, or maximum electric demand that is typically reached during normal business hours. This target will be reevaluated as additional research and information becomes available.
Policy EP 1.12 Air Quality Improvements	Reduce the number of air quality days categorized as 'unhealthy' or 'hazardous,' based on the Air Quality Index readings provided by the North Carolina Department of Environment and Natural Resources, Division of Air Quality.
Policy EP 1.13 Evaluating Development Impacts on Air Quality	Evaluate potential air emissions from new and expanded development, including transportation improvements and municipal facilities, to ensure that measures are taken to mitigate any possible adverse impacts. These measures should include construction controls to reduce airborne dust and requirements for landscaping and tree planting to absorb carbon monoxide and other pollutants.
Action EP 1.3 Energy Retrofits	Implement a retrofitting program for public buildings based on the "Public Facility Energy Audit" to maximize sustainability benefits within existing resources.
Action EP 1.4 Leadership in Energy and Environmental Design-Existing Buildings (LEED-EB	Evaluate the certification of existing public buildings under LEED-Existing Buildings (EB) (or the equivalent) for technical and economic feasibility and pursue the highest feasible level of certification on a case-by-case basis as funding and resources are available.

Action EP 1.5 Leadership in Energy and Environmental Design-Neighborhood Development (LEED-ND)	Explore adopting the U.S. Green Building Council's Leadership in Energy and Environmental Design for Neighborhood Development (LEED-ND), or the equivalent, as a city standard.
Action EP 1.6 Leadership in Energy and Environmental Design (LEED)	Incentives Encourage and provide incentives for buildings that would qualify for Gold or Platinum LEED certification, or the equivalent.
Action EP 1.8 Solar and Distributed Energy Resource Incentives	Study and consider incentives to encourage home builders and residents to install solar and other distributed energy resource technologies, such as solar photovoltaics, solar thermal, geothermal heating and cooling and energy storage facilities.
Action EP 1.9 Energy Efficient Construction	Study and adopt LEED-like energy efficient construction standards that can be used when older buildings are renovated or adapted for new uses, since it may be difficult for older buildings to meet LEED standards.
Action EP 1.12 Charging Stations	When viable, install charging stations for electric automobiles in public parking lots and garages.
Action EP 1.13 Renewable Energy Economic Development	Provide outreach and education to non-profits and affordable and multi-family housing developments to develop partnerships with local installers, banks and other service providers to encourage financing options and cost-effective renewable energy investments.
Action EP 1.14 Renewable Energy Deployment	Evaluate siting renewable energy facilities on city-owned property, including rooftops. Consider pairing renewable energy generation with on-site energy storage to improve reliability. Where feasible, emphasize exposure to the public through signage and other information to promote awareness of the benefits of renewable energy.
Action EP 1.15 Fleet Transformation	Implement the city's Fuel and Fleet Transformation Plan.
Action EP 1.16 Renewable Energy and Energy Efficiency Education	Create and promote online and print educational material to help Raleigh residents and businesses understand, evaluate, and compare renewable energy and energy efficiency options for both new construction and retrofitting existing buildings. Study and consider a "Home Efficiency Score" for use by developers and real estate agents to inform prospective buyers of the energy efficiency of homes.
Policy Action EP 1.18 Energy Efficiency First	Evaluate the adoption of an "Energy Efficiency First" policy for construction of new city facilities. Such a policy would make energy efficiency a higher priority than energy generation. Where practicable, energy efficiency and energy generation should both be evaluated in order to facilitate prioritization.
Action EP 1.19 Solar Access	Evaluate the feasibility of adding considerations to building site-plan review and approval that address the current and future use of solar energy (i.e. solar easements, landscaping, building height restriction, and orientation)
Action EP 2.1 Natural Resources Inventory	Develop a Natural Resources Inventory to define a program for protecting, conserving and stewarding Raleigh's natural areas, wetlands, water bodies, urban forests, landscapes, priority wildlife habitats, and important natural features, emphasizing their value in terms of carbon sequestration. Incorporate the spatial principles of landscape ecology in planning.
Policy EP 3.18Green Infrastructure	Continue to improve surface water quality and protect water resources through the design, construction, and installation

		of green infrastructure (GI) for city projects and facilities. Green infrastructure uses vegetation, soils; and non-natural materials to absorb and filter polluted water that would normally runoff impervious surfaces directly into a waterway. Low impact development (LID) incorporates many of the principles related to green infrastructure. Widespread use of green infrastructure will also better prepare Raleigh for the effects of climate change along with managing the quality and quantity of stormwater runoff.
	Action EP 3.1 Demonstration Projects	Work with other city departments, regional partners, and the local development community to promote demonstration projects within the City of Raleigh that use multiple water conservation measures on single sites. Incorporate Best Management Practices (BMPs), such as green roofs, bioretention cells, permeable pavers, large-and small-scale rainwater harvesting, and similar innovative projects. Offer incentives, such as grants, fee waivers, expedited review, tax breaks, and/or density bonus or transfer provisions for participating in demonstration programs
	Action EP 3.2 Incorporation of Green Infrastructure/Low Impact Development into City Code	Develop and adopt low impact development (LID) and green infrastructure (GI) code and provisions so that rainwater is retained and absorbed on-site as an alternative to traditional approaches that include piping, channelization, and regional detention. Create templates, facts sheets, and cost estimating tools to help administer the GI/LID ordinance at development sites and within the public right-of-way. Develop incentives for GI/LID, such as stormwater utility fee credits, stormwater quality cost share, public-private partnerships, permitting incentives, and others
Section 7, Housing	Action H 2.18 Sustainability Incentives	Provide financial incentives to developers of affordable housing to ensure that homes are designed to minimize energy costs and meet sustainable design principles
Section 8, Parks, Recreation and Open Space	Policy PR 3.3 Resilience and Green Infrastructure Network	Acquire and maintain greenways along important riparian corridors as identified in the Capital Area Greenway Planning and Design Guide in order to preserve the natural character of watercourses, promote water quality, and increase flood protection.
Section 9, Public Utilities	Policy PU 3.2 Planning for Drought	Enhance the city's water system planning to take changes in climate and precipitation patterns into account when projecting future water supply availability.
	Action PU 5.4 Green Infrastructure Study	Undertake a green infrastructure study that identifies landscapes where stormwater can be absorbed naturally. Model both watersheds and sub-watersheds for the amount of green infrastructure that is present to perform this function.
	Policy PU 6.7 Removing Barriers in Renewable Energy and Energy Efficiency	Remove prohibitions and reduce barriers that impede the installation of solar panels, the use of clotheslines, and other renewable technologies in neighborhoods governed by overlay districts, restrictive covenants, and homeowner associations while allowing for appropriate oversight in historic overlay districts.
	Policy PU 6.8 City Facility Energy and Water Monitoring	Monitor energy and water use of city facilities and establish benchmark for efficiency goals
	Policy CS 2.3 Waste Reduction Target	Reduce, re-use, recycle, and recover beneficial end-products of municipal solid waste to the maximum extent practicable,

Section 10, Community Facilities		with the overall objective of achieving or surpassing the state's waste reduction goal of 40 percent by 2016 as measured against a baseline of fiscal year 1988 – 89.
	Policy CS 4.6 Vulnerable Populations	Explicitly take into account the needs of vulnerable populations and neighborhoods in the emergency management planning process. These include areas and populations that face particular difficulties during and after disasters or emergencies due to economic status, lack of access to resources, lack of community institutions, geographical barriers, or similar issues.
Section 11, Urban Design	Action UD 5.1 LEED-ND and Sustainable SITES Programs	Implement the LEED Neighborhood Design (ND) certification program or Sustainable SITES Programs for neighborhoods as a possible new strategy to reduce energy and resource consumption and improve the long-term sustainability of Raleigh
	Policy UD 8.1 Transit-oriented Development	Promote dense, mixed-use development within the core area around transit stations. Development intensity should be greatest within walking distance of existing and proposed rail stations and bus rapid transit stations.
Section 14, Regional and Interjurisdictional Coordination	Policy RC 1.5 Reducing Regional VMT	Support efforts to reduce traffic congestion and decrease vehicle miles traveled through cross-jurisdictional transit-oriented design and transportation planning programs.
	Policy RC 1.6 Pedestrian and Bicycle Links	Expand regional accessibility and linkages for pedestrians and bicyclists
	Policy RC 1.7 Regional Bicycle Planning	Provide regional bicycle mobility, developing cross-jurisdiction bicycle corridors such as that proposed by Triangle J Council of Governments' (TJCOG) Center of the Region Enterprise (CORE)
	Policy RC 6.4 Air Quality Partnerships	Collaborate with the Triangle Air Quality Partnership, the Triangle Clean Cities Coalition, the Triangle Air Awareness Coalition, and other regional partners to adopt additional air quality policies and fulfill regional air quality goals
	Action RC 6.4 Air Pollution Mitigation Projects	Identify specific transportation projects that will reduce air pollutants and improve air quality. Use Congestion Mitigation and Air Quality (CMAQ) program funds to pay for them.
	Action RC 6.5 Regional Open Space Plan	Work with other jurisdictions and stakeholders to develop a regional open space plan to ensure the continued existence of recreational and natural areas and to provide for regional accessibility and linkages for pedestrians and bicyclists.
	Action RC 6.6 Regional Climate Action Planning	Develop a coordinated regional approach for dealing with issues of climate change
	Policy RC 7.1 Planning and Climate Change	Update water system planning methods with surrounding jurisdictions to account for emerging climate patterns.
	Policy RC 7.3 Regional Energy Planning	Support regional efforts (such as the Research Triangle Energy Consortium) to improve energy efficiency, reduce the environmental impact of energy production, and improve energy security
	Policy RC 7.4 Regional Solid Waste Management	Establish a regional solid waste reduction and management program

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