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DRAFT Community Energy and Sustainability Master Plan

Prince William County, Office of Sustainability

21 July 2023

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Executive Summary

On November 20, 2020, the Prince William County (the County) Board of County Supervisors adopted climate mitigation and resiliency goals. This plan, the Community Energy and Sustainability Master Plan (CESMP), presents recommendations on what the County can do to contribute to the achievement of these goals. The County recognizes that climate change is not a distant problem, but one that impacts its citizens and resources directly. Warm weather is not just uncomfortable, it also means poorer air quality, higher electricity usage, and more heat-related illnesses for vulnerable citizens. How much energy we use, and what fuels we burn to cool our homes or get to work contribute to increased pollution in the form of in greenhouse gases (GHG) and global warming. The County's climate is changing, and it's directly related to human activities.

The County recognizes the time for action is now. The goals that guide the action are as follows:

1. **Cut GHG Emissions County-Wide by 2030:** Reduce GHG emissions County-wide to 50% below 2005 levels by 2030

2. **Use 100% Renewable Energy County-Wide by 2035**: Source 100% of the County-wide electricity from renewable sources by 2035

3. **Use 100% Renewable Energy in County Government Operations by 2030**: Achieve 100% renewable electricity in the County government operations by 2030

4. **Become Carbon Neutral for County Government Operations by 2050:** Achieve 100% carbon neutrality in the County government operations by 2050

5. **Prepare for Climate Change:** Become a Climate Ready Region and make significant progress to be a Climate Resilient Region by 2030

This plan presents a list of actions recommended for the County to take, with 25 actions that have been prioritized for immediate execution. Achieving these goals requires unprecedented, aggressive action. In many cases, the actions will be initially driven by the County, but will also require strong participation by residents and businesses. Partnerships and advocacy at the regional, state, and federal levels will become crucial. The 25 High Priority Actions can be grouped into five areas, or sectors, in which significant action is needed: electricity, buildings, transportation, natural resources, and adaptation. These high priority actions are listed in **Table 1** below. A longer list including medium and low priority actions are provided in **Appendix A Complete List of CESMP** Actions**.**

Table 1. CESMP High Priority Climate and Resiliency Actions

Sector	CESMP High Priority Actions
Electricity	E.1: Acquire Clean Electricity Sources for the County
	E.2: Promote Renewable Energy Incentive Programs and Develop Additional Solar Incentives
	E.3: Incentivize Renewable Energy Use in Energy-Intensive Commercial Buildings
	E.4: Promote Existing Green Power Products
	E.5: Install Solar on County Government Facilities
Buildings	B.1: Incentivize Energy Efficiency and Electrification Retrofits
	B.2: Propose Green Zoning Regulations
	B.3: Incentivize Energy Efficient and Electric New Construction
	B.4: Promote Energy Efficiency and Electrification Incentives
	B.5: Create Net-Zero Plan for County Government Facilities
Transportation	T.1: Improve Pedestrian and Bicycle Infrastructure and Enhance Connectivity
	T.2: Incentivize Transit-Oriented Development

	T.3: Expand Existing Programs that Reduce Single-Occupancy Vehicle Trips
	T.4: Upgrade Public Transit Infrastructure
	T.5: Incentivize Zero-Emission Vehicles and Charging
	T.6: Expand Public EV Charging Network
	T.7: Adopt Zero- or Low-Emissions County Fleet
Natural Resources	N.1: Adopt Natural Open Space Requirements
Adaptation	A.1: Develop Adaptation Plans for Critical Facilities
	A.2: Manage Stormwater Flooding in Areas Outside of the Floodplain
	A.3: Improve Power Resilience for Critical Infrastructure
	A.4: Implement Shoreline Protection and Nature-Based Solutions
	A.5: Restore Streams to Reduce Flooding
	A.6: Incentivize Technology for Residents to Make Homes Adaptive
	A.7: Plan Alternate Evacuation Routes for Flood-prone Areas

How were these actions selected and prioritized? And why are these sectors the most significant? The remainder of this plan provides the background analysis and methodology for the answers to these questions. This plan not only presents the actions but provides guidance on what steps we can take first to make progress on achieving our goals.

Plan Structure: The CESMP reviews the County's GHG emissions and climate vulnerability context, outlines what it will take for the County to reach its 2030 goals, and establishes what the County can do to meet these goals through local climate actions. The CESMP divides the County's climate actions into climate mitigation actions, which reduce GHG emissions, and climate adaptation and resiliency actions, which reduce community-wide climate risk. Climate mitigation actions are furthered divided into community-wide actions that address the broader community's emissions and government actions that address County government emissions.

GHG Emissions: The County's GHG inventories can be used to monitor progress toward the 2030 GHG reduction goal. The 2018 snapshot of the sectors contributing to the majority of the GHG emissions is show in **Figure 1** below:
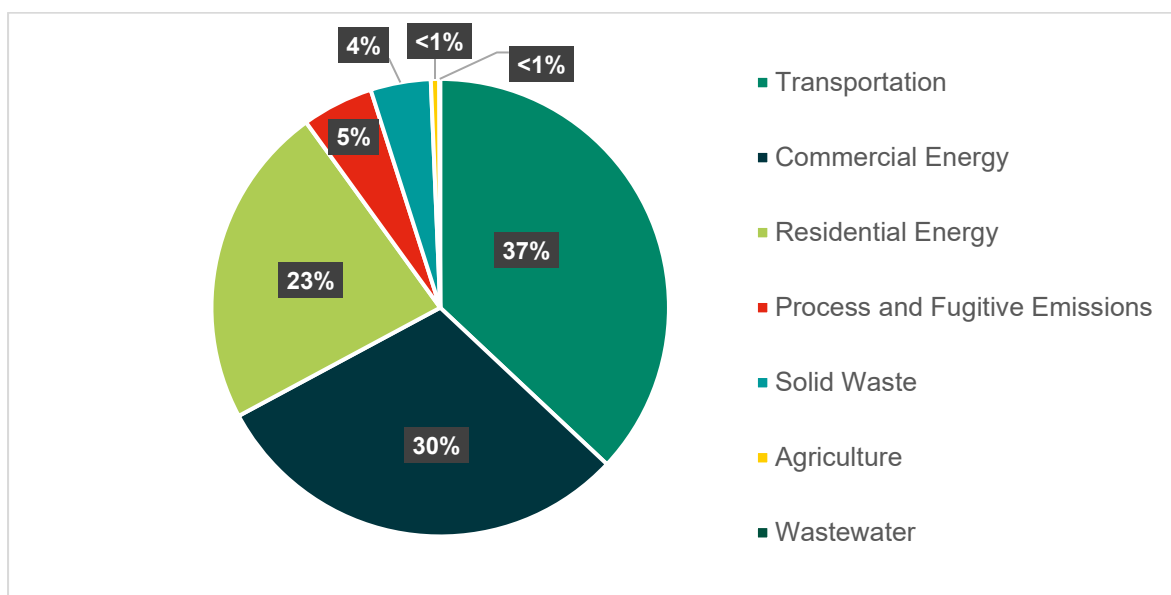

Figure 1. 2018 Community-wide Emissions by Sector

To progress toward the 50% reduction goal by 2030, 2018 County-wide emissions needed to show a 26% **decrease** below 2005 levels – which means emissions are not currently on track for goal achievement. GHG emissions were forecast to demonstrate how emissions could change over time if no further climate action is taken to reduce their growth. The forecasts show that emissions are projected to increase by 37% from 2005 to 2030 and 57% from 2005 to 2050.

To understand what it will take to achieve the 2030 GHG reduction goal, the County developed a preferred GHG reduction scenario comprising a group of high-level technological strategies that are needed to reach the 2030 goal. The first step in developing the GHG reduction scenario was to evaluate how external regulatory or market forces would impact emissions over time. These external factors result in nearly 33% of emissions reductions needed to meet the 2030 target. Building on these external regulatory and market forces, the County selected its preferred 2030 reduction scenario strategies to show what it will take to reach the 2030 GHG goal and guide climate action development. These strategies are listed in **Table 2** below.

Table 2. 2030 Greenhouse Gas Reduction Strategy

92% clean electricity
50% of passenger and medium-duty vehicles are zero-emission vehicles (ZEV)
40% of heating, ventilation, air conditioning (HVAC) systems and water heaters are highly efficient and electric
57% HFCs replaced with low- or zero- global warming potential (GWP) alternatives
5% mode shift from passenger vehicles to active/public transport
60% waste diversion rate
100% high-efficiency lighting and appliances
15% zero emissions off-road equipment
20% reduction in aviation emissions
10% reduction in agriculture emissions

Two important reduction scenario strategies include 92% clean electricity and 50% of passenger and medium-duty vehicles are zero-emissions vehicles by 2030. These two strategies are estimated to produce 81% of the total 2030 GHG reductions needed to meet the 2030 goal.

Climate Vulnerability Assessment: The County evaluated its vulnerability to current climate hazards from extreme temperatures, precipitation, coastal flooding and sea level rise, drought, earthquakes, and high winds/tornadoes. The assessment looked at future climate hazards from extreme temperatures, precipitation, and sea level rise. County assets were divided into categories and the vulnerability of each category was rated based on its exposure, sensitivity, and adaptive capacity.

The CESMP Actions: Climate actions demonstrate what the County can do to reduce emissions and adapt to climate change. The first step in the action development process was to identify current policies and programs that support the 2030 GHG reduction scenario strategies and address local climate hazards, recognize jurisdictional limitations in the County's ability to influence these sectors, and determine areas of opportunity for new action development. The County then evaluated the new actions for their impact on specific evaluation criteria to provide a more holistic understanding of each action's viability and value to the community. Evaluation criteria included GHG reduction potential; climate risk reduction potential; impact on organizational diversity, equity, and inclusion; resource conservation; cost to residents and businesses; local employment; funding source identification; cost to the County; and cost savings to the County. After gathering stakeholder feedback, the County conducted an action prioritization exercise to organize actions into high, medium, and low priority categories. Detailed action tables and implementation roadmaps were created for the high priority actions while the medium and low priority actions are listed in the CESMP.

Required External Advocacy: The County government cannot directly control or influence many community-wide emissions sources or assets, so the County's ability to meet its 2030 GHG reduction and 2030 Climate-Ready Region goals may rely on significant external support from market factors and state- and national-level

regulations. The County identified where external assistance is needed to meet the goals and its role in promoting these external forces through advocacy or partnerships.

Meeting the Goals: In our pursuit of the 2030 GHG reduction goal, it's vital to acknowledge that the County government alone can't exercise direct control over all emission sources in the County. Consequently, the realization of the 2030 GHG target heavily depends on our collective community engagement with the County's CESMP actions. In fact, depending on the level of community participation, we may witness a deficit of approximately 330,000 to 1,500,000 metric tons of carbon dioxide equivalent (MTCO2e) between the total reductions necessary to meet our 2030 GHG goal and what the County's actions alone can feasibly achieve (refer to **Figure 2** for clarity). We believe this gap can be bridged with the help of significant external support, such as contributions from market factors, state- and national-level regulation, incorporating forest and tree removals into our GHG inventories, or potentially through the purchase of carbon offsets. However, it is important to emphasize that the acquisition of carbon offsets would be our last resort, reserved for the scenario where we cannot meet our 2030 goal through direct emission reduction initiatives. As a community, our first line of action should always be focusing on direct emissions reduction.
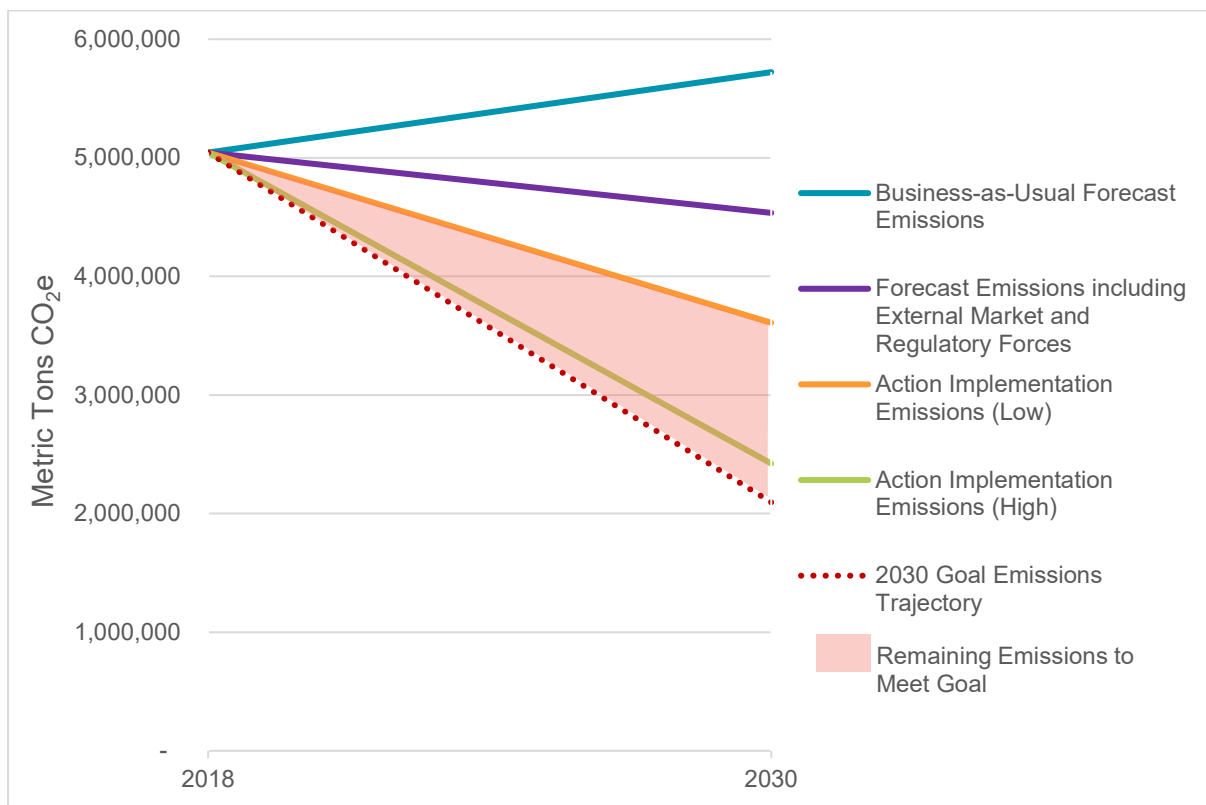
Figure 2. GHG Reduction Potential and Remaining Emissions

Next Steps: [complete after this chapter is completed by County]

Chapter 1 Introduction

The Purpose of This Plan

Text to be provided by County team. Discuss what is within the purview of the CESMP and what is outside of the purview of the CESMP.

The Board of County Supervisors adopted five climate goals that were originally developed by the Metropolitan Washington Council of Governments (MWCOG)[1]. The County's climate and resiliency goals provided in **Table 3** below demonstrate the County's continued commitment to doing what it can do to protect and prepare our

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[1] https://www.pwcva.gov/assets/2022-05/13-D.pdf

citizens ad resources for climate change. The primary purpose of the CESMP is to develop a pathway towards addressing these goals.

Table 3. County Climate Goals

County-wide Goal	Prince William County Government Goal
• Reduce GHG emissions County-wide to 50% below baseline 2005 levels by 2030*	• Achieve 100% renewable electricity in County Government operations by 2030
• Become a Climate Ready Region and making significant progress to be a Climate Resilient Region by 2030*	• Achieve 100% carbon neutrality in County Government operations by 2050
• Source 100% of County-wide electricity from renewable sources by 2035	

*Focus of the CESMP

How the CESMP Was Developed

Prince William County made it a point to bring everybody to the table - to make sure the action we're taking to address the goals accounts for what matters to our people. Stakeholder engagement was embedded throughout the CESMP process as shown in **Figure 3** below. We took into consideration things like the knowledge of our local experts, the voice of the public, and any unexpected side-effects of our actions. Plus, we had to weigh in our County's jurisdiction and think about how realistically these actions could be implemented, both at the County level and out in the community. A complete list of stakeholders that were engaged during the development of the CESMP are provided in Appendix B. List of Stakeholder Groups.

Prince William County staff and residents know which actions will be most effective within the County and the best process to effectively implement them. The stakeholder engagement process was designed to approach stakeholder groups, introduce them to the plan development process, receive their feedback at key milestones, and return feedback to the County Core Team for consideration and incorporation. **Figure 3** demonstrates that stakeholder engagement played a role throughout the action and plan development.

Figure 3. CESMP Development Process
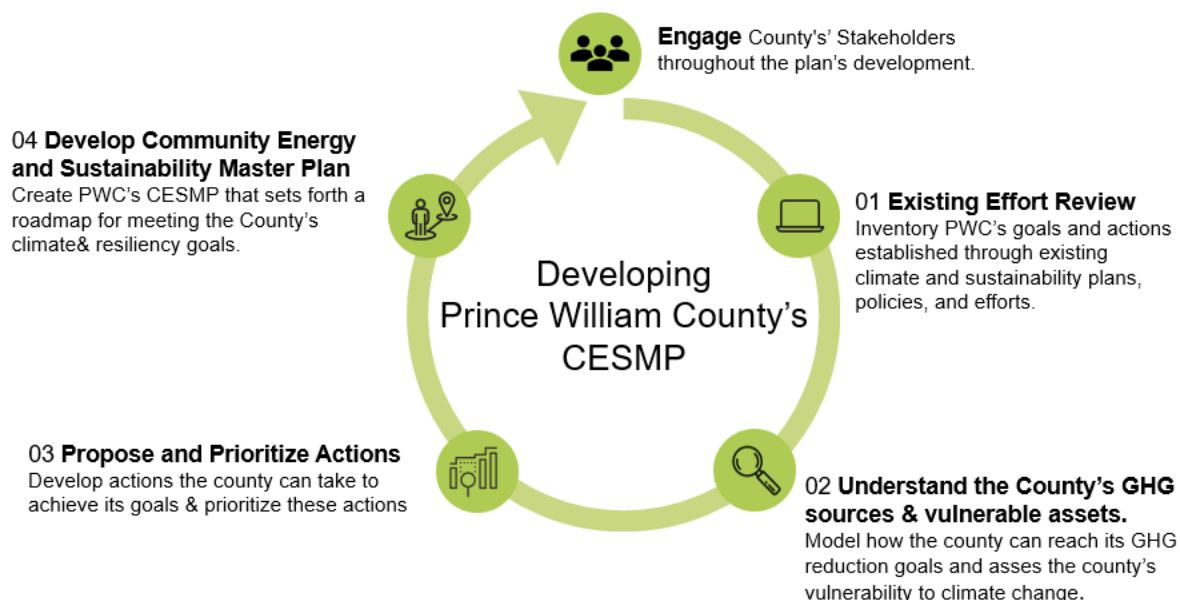
Importance of Climate Action and Resiliency Planning

Recognizing the importance of resilience in a rapidly changing world, the CESMP underscores not only our commitment to mitigating climate impacts, but also our determination to adapt and thrive in the face of adversity.

We firmly believe that understanding the dynamics of climate change and fostering resilience are key pillars of sustainability and integral to the ongoing vitality and prosperity of the County.

As it related to climate change, greenhouse gases (GHGs) function like a snug, warm blanket around our Earth, absorbing and re-emitting heat. This natural process, known as the greenhouse effect, is vital for our survival, keeping the planet at a habitable temperature. GHGs come in various types, each with a different ability to trap heat — we call this their "global warming potential." To make sense of all these gases, we convert their quantities into carbon dioxide equivalents (CO2e) for easier comparison.

There are several major GHGs that result from human activity and are included in U.S. and international estimates of GHG emissions, including:

- Carbon Dioxide (CO_2)

- Methane (CH_4)

- Nitrogen Oxide (N_2O)

- Nitrogen Trifluoride (NF_3)

- Sulfur Hexafluoride (SF_6)

- Hydrofluorocarbons (HFCs)

- Perfluorocarbons (PFCs)

While GHGs naturally occur at beneficial levels, maintaining the Earth's temperature, our actions, such as burning fossil fuels for power or transportation, have tipped the scale since the 1800s. This disruption in balance is "climate change," a long-term shift in average global or regional weather patterns. This imbalance ushers in a host of troubles like extreme droughts, water scarcity, severe fires, rising sea levels, flooding, melting polar ice, devastating storms, and declining biodiversity. Human activities, such as burning fossil fuels to power buildings or vehicles, have been the main driver of climate change.

The United Nations Intergovernmental Panel on Climate Change (IPCC)—the leading international body for assessing climate science—noted that more severe climate impacts could be avoided if global warming is limited to 1.5 degrees Celsius (°C) (or 2.7 degrees Fahrenheit [°F]) above pre-industrial levels. To do this, global emissions need to fall by at least 45% from 2010 levels by 2030 and reach carbon neutrality by 2050.

"Carbon neutrality" means maxing out GHG reduction efforts through strategies like energy efficiency, clean electricity, and zero-emission tech. Any remaining emissions are then balanced out by removing them directly from the atmosphere through natural sequestration by trees or direct air capture technologies.

To tackle this challenge, world leaders developed the Paris Agreement —a legally binding international treaty with a goal of holding the global average temperature increase to well below 2°C (3.6°F) above pre-industrial levels and pursuing efforts to limit the temperature rise to 1.5°C. The United States re-joined the Paris Agreement in 2021 and developed a nationally determined contribution (NDC) of reducing net GHG emissions by 50-52% below 2005 levels by 2030.

Relevance to Prince William County

In Prince William County, climate change is a pressing reality that is already impacting the community, not a distant issue for future generations to address. This local impact mirrors a global trend where cities and counties contribute significantly to the problem, accounting for over 75% of the world's energy-related greenhouse gas emissions[2]. Daily activities are part of this large puzzle. For instance, whenever we use fossil fuels to power vehicles and buildings, handle solid waste and wastewater, experience refrigerant and natural gas leakages, or carry out agricultural practices, we are contributing to the production of these emissions. Each action, seemingly small on its own, adds up to our collective footprint on the climate. These emissions have contributed to the dangerous levels of climate change the County experiences today. Looking back over the 20th century, the County and Virginia have experienced increased average temperatures more than 0.83°C (1.5°F) and a small

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[2] World Resources Institute, C40 Cities Climate Leadership Group, & ICLEI - Local Governments for Sustainability. (2014). Global protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC).

upward trend in annual total precipitation based on data compiled for the National Climate Assessment.[3] Analysis developed for the County's Vulnerability Assessment (**Chapter 3 Vulnerability Assessment**) confirm these trends and project increased sea level rise throughout the 21st century.

Climate Action the County is Currently Taking

This CESMP is not the first step the County has taken to act on this growing concern. The roadmap shown below in **Figure 4** lays out our journey, showcasing key milestones the County has hit in confronting climate change. It's a testament to our grit, hustle, and commitment to this monumental task, as we steer our beloved city toward a greener, more sustainable future.

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[3] Virginia - State Climate Summaries 2022 (ncics.org)

Office of Sustainability Stood Up

Office of Sustainability is created and charged with developing the CESMP. The Environmental and Energy Sustainability Officer is hired to lead the effort.

03/2022

CESMP Kicks Off

The County launches the CESMP development process with a kick-off meeting.

10/2022

06/2022

Board Adopt the MWCOG 2030 Goals

Board of County Supervisors adopts Climate Mitigation and Resiliency goals.

11/2020

11/2020

05/2022

2030 Climate and Energy Action Plan

MWCOG publishes its action plan and new 2030 goals for area governments.

Region surpasses 2020 climate goals

Preliminary results are revealed indicating that the region achieved 24% GHG emission reduction from 2005 to 2020.

Sustainability Commission Stood Up

Board of County Supervisors authorizes the creation of the Sustainability Commission to guide the County on developing policies and programs. The Commission first meets in May 2022.

Figure 4. Timeline of CESMP Launch

Ongoing Progress on Climate Action

County staff to add this section and describe efforts thus far to obtain funding for actions, funding already received, discuss CRPG, and summarize fast track actions.

The County is already pursuing many programs, projects, and actions that benefit GHG reduction or climate adaptation. One of the first things we did was comprehensive review of established programs, policies, and action that are already underway. If a project already has a solid foundation and doesn't need a major overhaul, then it would not be considered as a new action for the CESMP. The County should continue to support, staff, advertise, bolster, and fund these programs so they continue to have a positive effect toward the goals and reduction targets. However, the CESMP actions in **Chapter 4** will largely focus on implementation and start-up of new efforts.

The County's ongoing GHG mitigation efforts target a comprehensive set of emission areas as described in **Figure** 5**.**
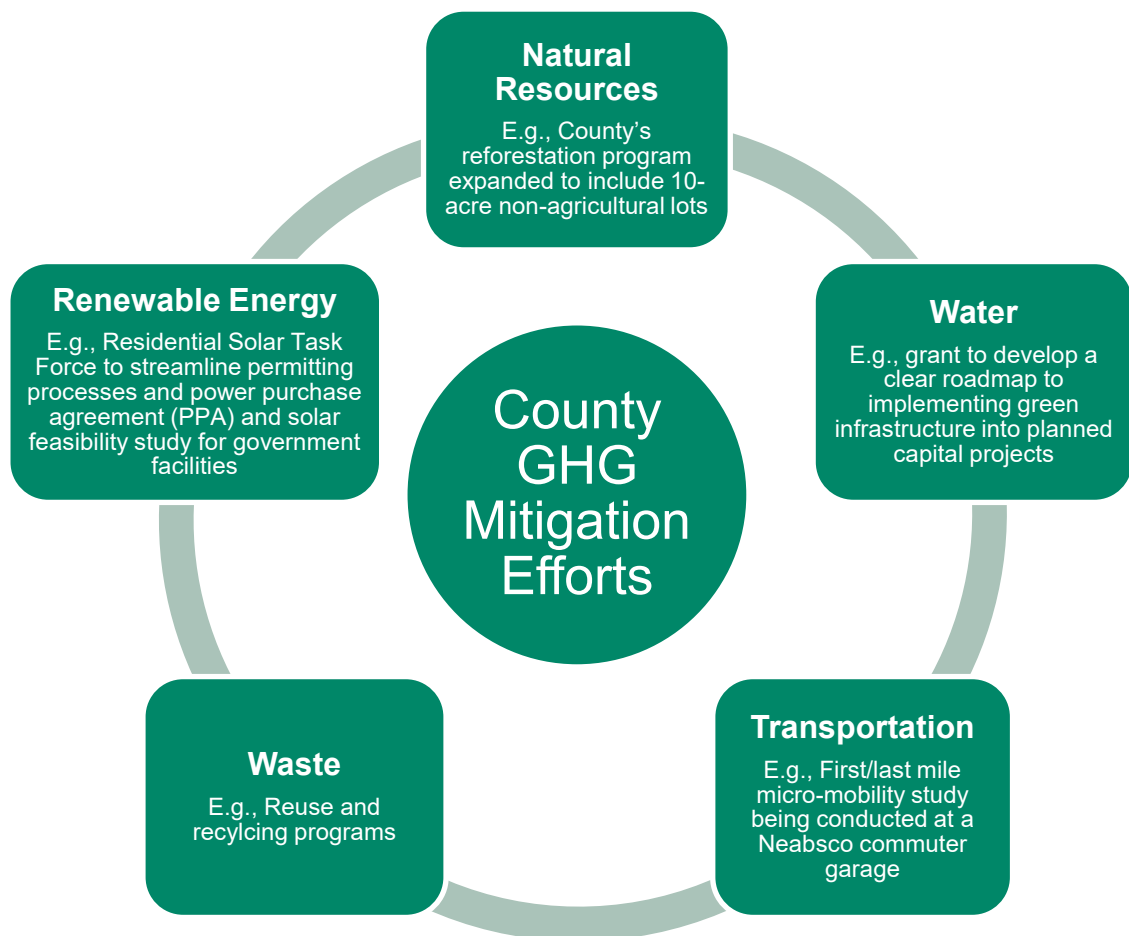
Figure 5. Ongoing GHG Mitigation Efforts

The County's Office of Emergency Management (OEM) is already leading many hazard mitigation and resilience initiatives to address flooding resiliency such as the development of a County Automated Flood Warning system and extreme heat resiliency such as established warming and cooling centers. OEM actively coordinates with many other organizations such as Federal Emergency Management Agency (FEMA), Fairfax Water, Commonwealth Transportation Board, and Prince William County Service Authority (PWCSA) on resilience programs and projects and conducts community outreach through Ready Prince William. OEM and Public Works develop, maintain, or follow local plans such as a Flood Resilience Plan, Emergency Operations Plan, Northern Virginia Hazard Mitigation Plan, and an Emergency Response Plan.

For a full list of the County's current efforts, please refer to **Appendix C. Existing County Actions.**

Chapter 2 Prince William County Greenhouse Gas Emissions

Greenhouse Gas Inventory

One of the tools that is used to address climate change is the GHG inventory. This chapter will talk about the concept of this tool, its relation to our plan, and how it's been used to understand what our GHG emissions might look like in the future if we did nothing.

The GHG inventory is a record of the emissions generated by the community. It allows us to measure our progress and identify areas where we can make improvements. Understanding the current emissions is important as we work toward achieving the climate action goals.

The graphic below represents the most current and representative emissions of the County, allowing us to identify areas where we can make improvements.
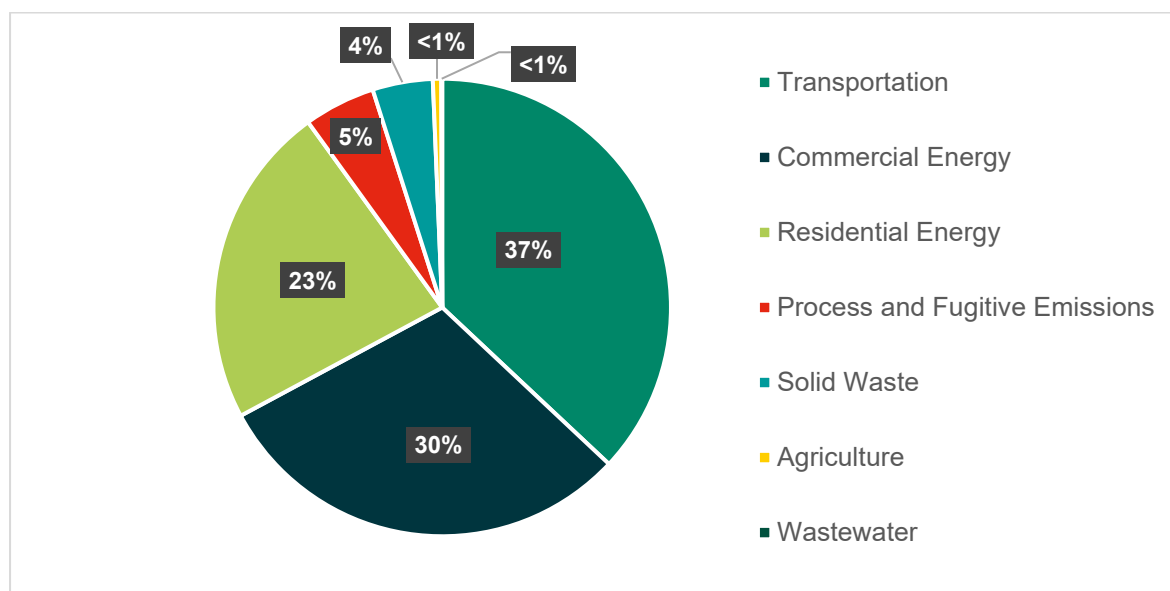
Figure 6. 2018 Community-wide Emissions by Sector

Of the County's 2018 emissions, 37% of are from transportation and mobile sources, 30% are from commercial energy, 23% are from residential energy, and the remainder are from fugitive emission sources, solid waste management, agriculture, and wastewater treatment (see **Figure 6)** It's important to underscore that more than half of total emissions are generated by electricity used in commercial and residential sectors, largely a consequence of our region's reliance on fossil fuels such as natural gas and coal for power generation. Additionally, on-road transportation generated about a third of total emissions. **Given that building energy and transportation sectors produce 93% of total emissions, the path to our ambitious 2030 emissions reduction goal necessitates a strategic focus on these sectors.** A more detailed summary of the 2018 GHG inventory is provided in **Appendix D. Greenhouse Gas Inventory and Analysis.**

Impact of Forests and Trees on the GHG Inventory

Historically, the County's GHG inventories have included emissions from buildings, transport, waste, and agriculture. These inventories did not consider emissions or removals of CO_2 from other land uses such as forests. Different land use types have different levels of carbon stocks, or stores of carbon in biomass, litter, dead wood, and soils. The net GHG effect of land use is estimated based on the change in these carbon stocks. In the United States, land use is a net sink where removals of CO_2 exceed emissions of CO_2, mostly due to forests and trees outside forests (collectively called forests and trees) that sequester carbon through photosynthesis.

Recent IPCC reports state that all mitigation pathways compatible with limiting global warming to 1.5°C also involve significant CO_2 removal from the atmosphere, highlighting the importance of maintaining and expanding the ability of forests and trees to capture and store carbon. These carbon sinks help to offset other sources of GHG emissions, including those derived from the combustion of fossil fuels.

To calculate the GHG impact of forests and trees on community GHG inventories, the average annual change (gain and loss) in forest and tree canopy as well as how much forest and tree canopy is unchanged over the GHG inventory cycle must be estimated. To enhance local GHG inventories, MWCOG calculated CO_2 emissions and removals due to forests and trees in the County from 2005 to 2020.The estimated CO_2 emissions are due to forest conversion and loss of trees while the CO_2 removals are due to CO_2 sequestration in existing forests and trees and the addition of new forests. This data showed that including forest and tree emissions and removals in the County's GHG inventories would decrease total annual emissions by approximately 7%, as local forest and tree CO_2 removals exceeded emissions.

However, MWCOG noted that there are significant uncertainties in the estimates. Typical GHG inventories of forests using similar approaches, including the national GHG inventory, report uncertainties in the net GHG balance that can be as high as ±45% (with 95% confidence). While uncertainties can be high, the estimates still provide useful information on the relative magnitude and importance of such GHG fluxes. As the forest and tree emissions data was not available until after the County-wide GHG analysis was complete, and due to the uncertainty of the data, the CESMP has not included forest and tree emissions or removals in the 2018 inventory, emissions forecasting, or primary GHG reduction scenario development. However, the plan does include actions to promote the preservation and expansion of forests and trees (see actions N.1, N.2, and N.3). Additionally, the CESMP discusses the emissions impact of forests and trees on meeting the 2030 GHG reduction goal in **Chapter 4 CESMP Actions**.

Greenhouse Gas Forecasts

While the 2018 inventory provides a recent snapshot of the County's GHG emissions, it's important to understand how the GHG emissions may look up to 2030 and 2050.

In an effort to better understand the potential trajectory of County-wide emissions and to assess the magnitude of GHG reductions necessary to reach our 2030 goal, we projected emissions from 2018 through 2050. This forecast paints a picture of a "business-as-usual" emissions scenario, illustrating how emissions could evolve if no additional climate actions are initiated at either local or national levels. The forecast takes into account regional and local growth indicators, such as increases in households, population, building square footage, employees, and vehicle miles traveled. While accurately forecasting GHG emissions is challenging due to the multitude of influencing variables, the County is committed to periodically updating these forecasts as more current information becomes available. This approach allows us to continuously reassess our strategies and actions in our mission to reduce emissions.
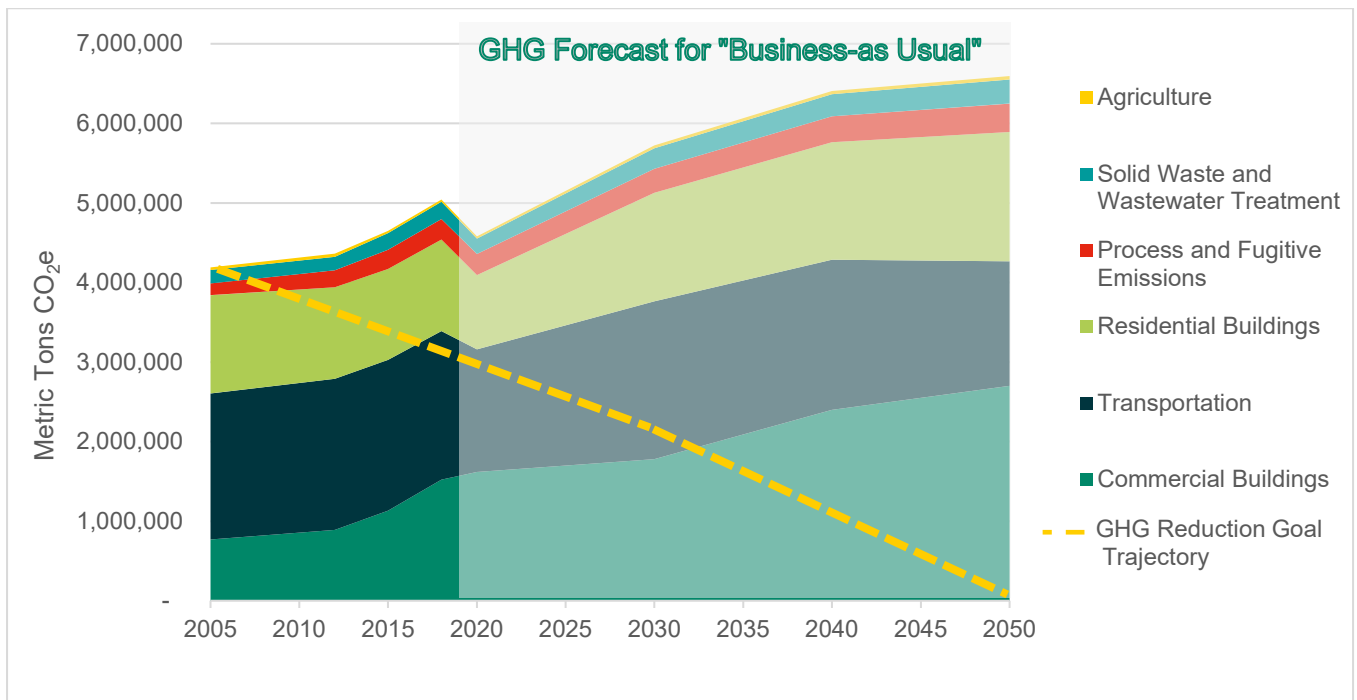
Figure 7. GHG Emissions Business-as-Usual Forecast and Target Trajectory

The forecasts illustrated in **Figure 7** show how emissions in each sector are estimated to change over time in a business-as-usual scenario from 2005 to 2050. The dotted line shows approximately where emissions levels should be to maintain a trajectory toward the County's goal of 50% GHG reductions compared to 2005 levels by 2030. The target trajectory line extends to carbon neutrality by 2050 for illustrative purposes only, as this is the target recommended by the IPCC though such a target has not yet been adopted by the Board of County Supervisors. The forecasts show that emissions are projected to increase by 37% from 2005 to 2030 and 57% from 2005 to 2050. The difference between the top forecast line (i.e., top of the colored chart) and dotted goal line demonstrates that ambitious climate action will be needed to meet the County's 2030 reduction goal and potential future 2050 reduction goal.

Impact of Data Centers

The GHG emissions forecasts include estimated emissions from new data centers to be added through the Digital Gateway project. Data centers are typically much more energy intensive than office buildings as they require substantial electricity to maintain and cool their servers. However, many data centers in the County have set corporate energy and emissions reduction goals. For example, some existing data centers in the County are already procuring 100% clean electricity for their operations. Many actions in the CESMP address new data center emissions and will help data centers meet their energy and emissions goals. The actions provided in **Appendix A**, including action E.1: Acquire Clean Electricity Sources for the County action, action E.2: Promote Renewable Energy Incentive Programs and Develop Additional Solar Incentives, action E.3: Incentivize Renewable Energy Use in Energy-Intensive Commercial Buildings, action, action E.4: Promote Existing Green Power Products, action B.1: Incentivize Energy Efficiency and Electrification Retrofits, action B.2: Propose Green Zoning Regulations, action B.3: Incentivize Energy Efficient and Electric New Construction, action B.4: Promote Energy Efficiency and Electrification Incentives, and action B.8: Implement Building Energy Benchmarking.

The County plans to…. [County staff to provide write up on how they may address data centers, limitations on influencing data center emissions, diesel generators]

2030 GHG Emissions Reduction Scenario

To understand what it will take to achieve the 2030 GHG reduction goal, the County developed a preferred GHG reduction scenario. A GHG reduction scenario represents a group of high-level technological strategies that are

needed to reach the 2030 reduction goal. Examples of technological strategies include switching electricity generation sources from fossil fuels to renewables, travel mode shifting from single-occupancy vehicles toward active and public transportation, and electrifying buildings. However, these strategies and their underlying implementation rates might be different than what is politically, financially, or publicly feasible. The purpose of these scenarios and strategies is to show **what it will take** for the County to reach its 2030 reduction goal, demonstrate where climate action is needed, and guide action development. The climate actions then show **what the County can do** to meet the reduction strategies and ultimately the 2030 goal. The relationship between reduction scenario, strategies, and actions is further illustrated in **Figure 8.**
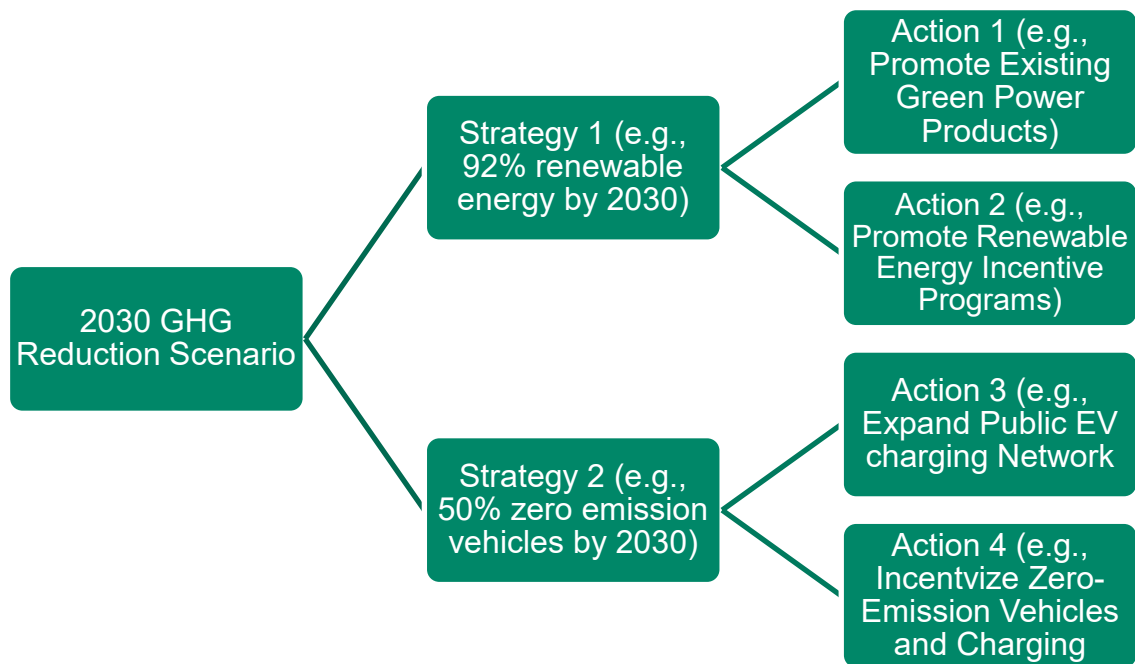
Figure 8. Example County Strategies and Actions to Reach 2030 Goal

GHG reduction scenarios can be represented by "wedge charts" as illustrated in **Figure 9.** The top line represents the emissions forecast and the bottom line shows the GHG goal trajectory. The colored wedges in between those two lines illustrate the magnitude of GHG reductions from each high-level technological strategy shown in the legend. Each wedge represents the emissions reduced through that strategy, with larger wedges representing greater emissions reductions. Any remaining emissions not addressed by GHG reduction strategies are shown in the hatched grey area at the bottom of the chart.
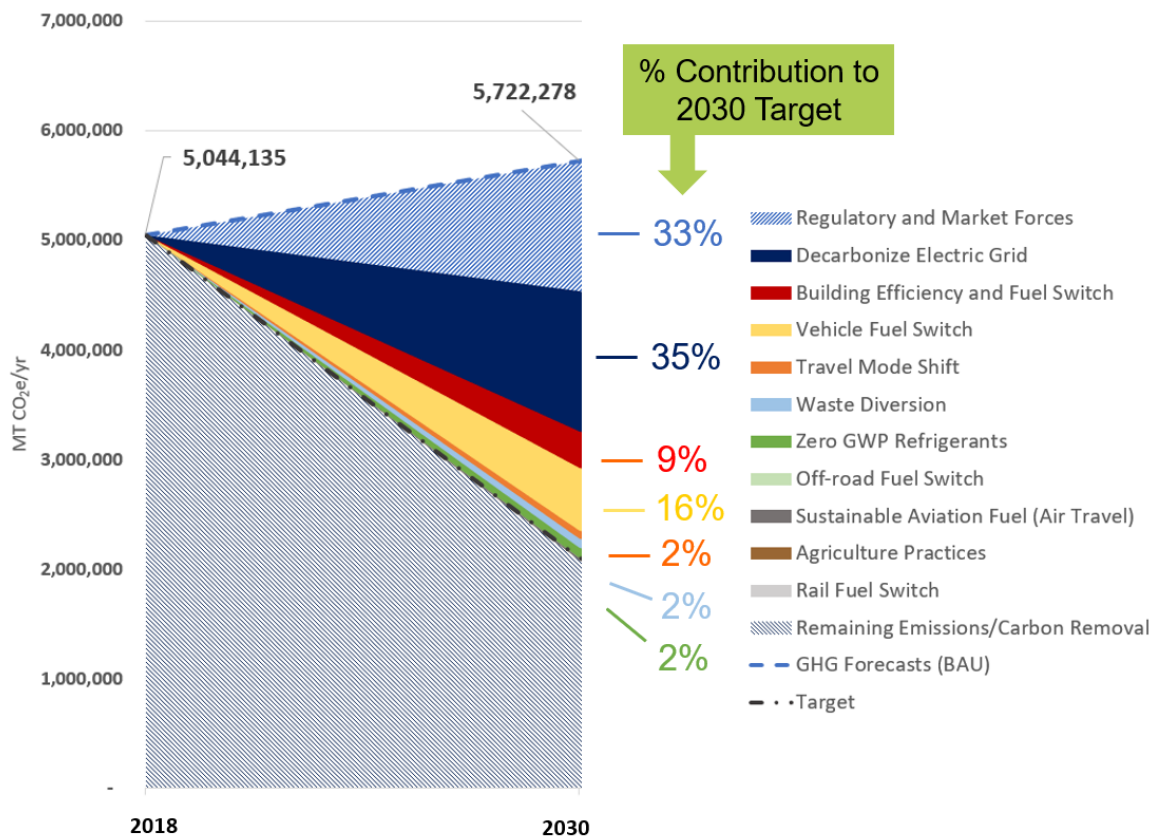
Figure 9. 2030 Greenhouse Gas Reduction Scenario

The top three strategies providing nearly 90% of the reductions needed to achieve the 2030 goal include:

- 92% of the electricity provided to the County is from clean energy sources

- 50% of vehicles are considered zero emission vehicles

- 40% of fossil fuel building systems are transitioned to highly efficient and electric options

The methodology for developing these strategies and a complete list of all of the strategies and the GHG reductions they provide are included in **Appendix D. Greenhouse Gas Inventory and Analysis.** Because all other sectors and strategies contribute a relatively small amount to total emissions, there is no path to 2030 goal achievement without incredibly aggressive progress in the three areas mentioned above: clean electricity, transportation & vehicle fuel, and building energy.

After establishing the preferred 2030 reduction scenario, the County developed a list of feasible actions it could pursue to meet these strategies (see **Chapter 4 CESMP Actions**). While the GHG reduction scenario and strategies shows **what it will take** to achieve the 2030 goal, the GHG actions shows **what the County can do** to achieve the strategies and ultimately the 2030 goal. However, because many of these emissions sources are out of the County government's direct control, County government action alone won't necessarily achieve each GHG strategy or the overall GHG reduction scenario. The ability to achieve these strategies may rely on significant external support from market factors and state- and national-level regulation. The County has identified where external assistance is needed to meet the GHG reduction strategies and its role in promoting these external forces through advocacy or partnerships in **Chapter 4 CESMP Actions**. Further discussion of how the County could consider forest and tree CO_2 removals and carbon offsets to meet the 2030 GHG reduction goal is included in **Chapter 4 CESMP Actions.**

Addressing Goals Related to GHG Emissions

The CESMP is meant to address how the County could meet the community-wide goal of 50% emissions reduction from 2005 levels by 2030 through local climate action. The County has also established three other emissions-related goals[4], including:

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[4] https://www.pwcva.gov/assets/2022-05/13-D.pdf

- Sourcing 100% of County-wide electricity from renewable sources by 2035

- Achieving 100% renewable electricity in County government operations by 2030

- Achieving 100% carbon neutrality in County government operations by 2050

The County defines renewable energy as any non-fossil fuel energy source, including solar, wind, hydro, biomass, and nuclear. Because the definition of renewable electricity can differ among communities, the CESMP uses the term "clean electricity" instead to mean any non-fossil fuel energy source.

Though achievement of these additional goals was not specifically analyzed in the CESMP, the climate actions developed in the plan can contribute to achievement of these goals. A qualitative discussion of how the plan actions can contribute to these goals is provided in **Chapter 4 CESMP Actions.**

Chapter 3 Vulnerability Assessment

The County has made the commitment to ensure we are prepared for the impacts of climate change. In line with this commitment, we've concentrated our efforts on understanding the susceptibility of our County's people and infrastructure to local climate hazards, paving the way for resilient action plans that meet the community's most pressing needs. The fruits of this undertaking were realized with the completion of a comprehensive vulnerability assessment in January 2023. This evaluation was designed with an emphasis on anticipating future conditions that could amplify existing vulnerabilities. A detailed report can be found in Appendix E. Vulnerability Assessment Report

In the context of our conversation, a "vulnerable asset" refers to an essential resource that forms the backbone of our community. These assets encompass a broad range of elements, including our critical infrastructures like transportation systems, public buildings, and utilities; natural resources such as parks, water bodies, and green spaces; as well as economic drivers like businesses, industries, and development projects. Moreover, these assets include the invaluable human capital that is our diverse and dynamic community members, who continually contribute to the growth and resilience of our County.

Our vulnerability assessment methodically catalogued pertinent assets, gauged their exposure to climate hazards, and assigned ratings for each asset's sensitivity and adaptive capacity. The succeeding chapter provides a comprehensive overview of the climate hazards relevant to our County, which assets are most prone to impacts, and offers a summary of the assessment results.

Under the leadership of our County Officials, Prince William County remains dedicated to these climate resilience efforts. We understand the importance of coordinated actions and continuous adaptations to face the ongoing challenges posed by climate change.

The results of the vulnerability assessment were used to assist in developing climate adaptation actions that consider natural hazards and the most vulnerable asset categories. Further details on action development, evaluation, and prioritization can be found in **Chapter 4 CESMP Actions.**

Climate Hazards

The County reviewed the following climate hazards to assess the vulnerability of the County's assets and vulnerable populations:

- Precipitation

- Temperature

- Drought

- Coastal flooding, sea level rise

- Earthquakes

- High winds/tornadoes.

As part of our dedication to maintaining the well-being of Prince William County, the County diligently appraised the present-day risks posed by various climate hazards. Looking towards the future, we have also assessed conditions related to precipitation, temperature, drought, and sea level rise for two prospective climate scenarios,

focusing on the years 2050 and 2075. The results of the climate hazard analysis were used to evaluate the vulnerability of various groups of County assets.

County Assets

The Vulnerability Assessment groups the County's assets into categories intended to align with FEMA's Community Lifelines. This approach aligns with the guidelines followed by Prince William County's Office of Emergency Management.

In this study, we have integrated FEMA's energy and hazardous materials lifeline categories. In addition, we've expanded the scope to include two more essential categories: our natural resources and socially vulnerable populations. These categories recognize the importance of our environment and underscore our commitment to inclusivity, ensuring that every resident's needs are acknowledged and addressed.

Each asset, integral to the fabric of our County, within these categories is meticulously defined and mapped out in Appendix E. Vulnerability Assessment Report. Below, we delve into the types of assets that underwent evaluation in our assessment. These assets are not just mere resources but the pillars of our community, the drivers of our economy, and the protectors of our way of life.

Types of County Assets and Infrastructure Evaluated for Vulnerability

safety and security	food, water and shelter	health and medical;
communications	transportation	energy and hazardous materials
natural resources	socially vulnerable populations	

Figure 10 below is an example of graphic showing the location of transportation infrastructure potentially vulnerable to climate change.
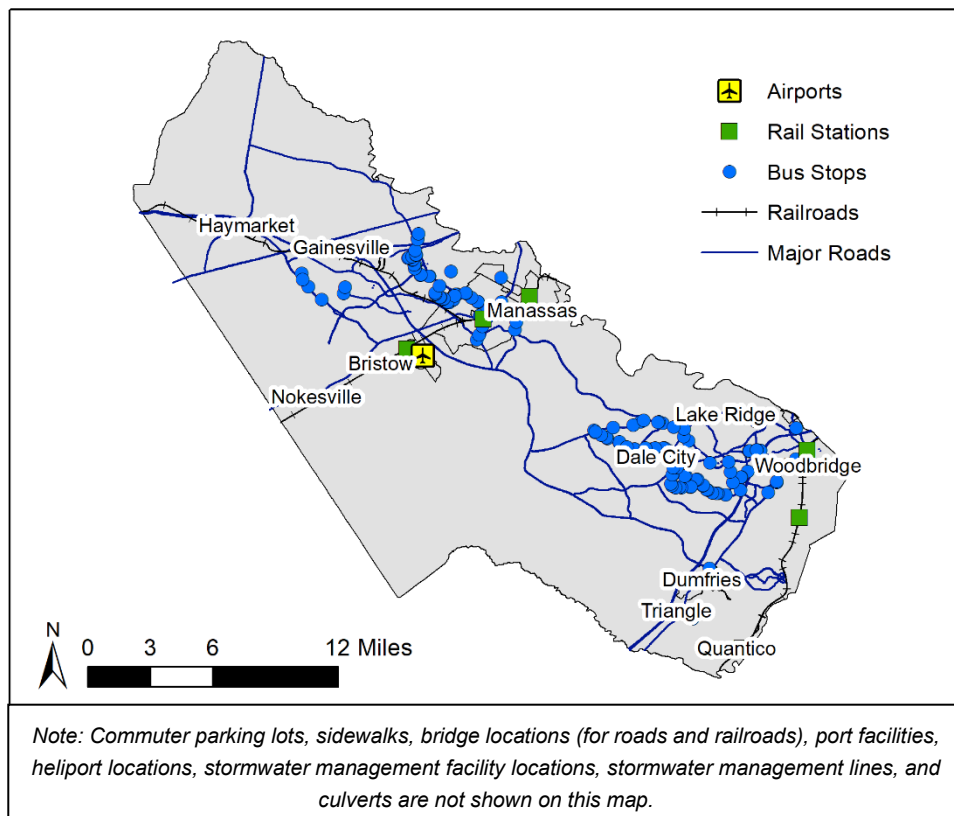
Note: Commuter parking lots, sidewalks, bridge locations (for roads and railroads), port facilities, heliport locations, stormwater management facility locations, stormwater management lines, and culverts are not shown on this map.

Though not fitting the traditional definition of an "asset" category, our assessment intentionally includes socially vulnerable populations as a crucial group. To demarcate these populations, we have adopted the use of Equity Emphasis Areas (EEAs), as delineated by a methodology developed by The National Capital Region Transportation Planning Board. In our continuous partnership for the prosperity of the community, both the MWCOG and Prince William County have recognized and utilized EEAs as a valuable planning tool. These tools are instrumental in helping us identify and prioritize areas with socially vulnerable populations. The boundaries of these EEAs are illustrated in **Figure .**
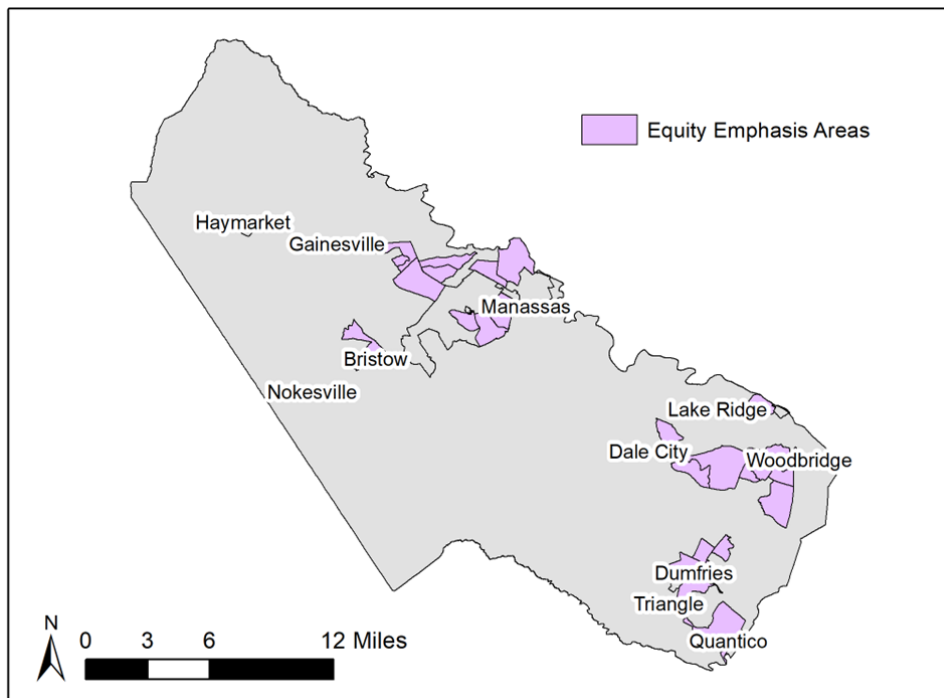
Figure 11. EEAs within Prince William County

Vulnerability Assessment

In our pursuit of safeguarding Prince William County's vital assets, our Vulnerability Assessment employed a thorough process to determine risk. This process encompassed the evaluation of exposure, sensitivity, and adaptive capacity for each asset category and each natural hazard. Here is a brief description of what each of these measures entails:

- **Exposure** quantifies whether an asset is affected by a climate hazard, and if so, the degree of impact.
- **Sensitivity** evaluates the extent to which an asset is impacted when exposed to a climate hazard.
- **Adaptive capacity** gauges the capability of an asset to adjust, recover, or resiliently respond to damage inflicted by climate hazards.

Based on these metrics, our assessment determined that the following climate hazards exert the most substantial impact on our assets:

1. Extreme Temperatures
2. Precipitation
3. Strong Winds/Tornadoes

The remaining three hazards scored low for all asset categories.

In our endeavor to quantify the vulnerability of Prince William County's crucial assets, we assigned numerical values to each rating. These were then added together to calculate vulnerability scores for each asset category, considering each natural hazard and future time horizon. This gave us an assessment of potential risks and challenges we face.

To further streamline our evaluation, the vulnerability scores within each asset category were amalgamated. This collective data was used to attribute a Low, Medium, or High combined vulnerability rating. These ratings offer a clear depiction of the potential risks for two future timelines - the years 2050 and 2075. The specifics of these vulnerability ratings are presented in **Table 4.**

Table 4. Summary of combined Vulnerability Ratings (2050 and 2075)

Asset Category	Combined Vulnerability Rating	
	2050	2075
Natural Resources	H	H
Socially Vulnerable Populations	H	H
Transportation	H	H
Energy & Hazardous Materials	M	H
Food, Water, and Shelter	M	M
Health and Medical	M	M
Safety and Security	L	L
Communications	L	L

The ratings detailed in **Table 4** offer us an understanding of how susceptible each asset category might be to specific future climate hazards. As a synopsis, our natural resources, socially vulnerable populations, and transportation systems emerge as the asset categories with the highest combined vulnerability ratings across all hazards. These ratings apply to both the projected scenarios of 2050 and 2075.

These findings guided us in crafting climate adaptation actions and helped assign their respective adaptation scores during the action development and prioritization process.

Chapter 4 CESMP Actions

The CESMP actions outlined in the plan signify a definitive step towards reducing emissions and adapting to climate change in the County. The plan takes root in the analysis of our GHG inventory and the Vulnerability Assessment discussed in Chapters 2 and 3. From the assessment, we identified our community's potential vulnerabilities to future climate hazards and highlighted areas where we could take effective action. We then crafted a series of proposed actions based on these findings. These potential actions underwent a rigorous evaluation process, where we assessed their benefits to our community, including potential emission reductions, community health benefits, and improvements to quality of life, as well as their feasibility considering our resources, authority, and policy context. The actions were then prioritized based on these evaluations, with an eye on their potential impact and our community's capacity to implement them. This integrated approach ensures that our plan is grounded in data, oriented towards action, and centered around the real needs and capabilities of our community, positioning Prince William County for a resilient and sustainable future.

Climate Action Development, Evaluation, & Prioritization

Action Development

The list of CESMP actions demonstrate **what the County can do** to reduce emissions and adapt to climate change. The first step in the action development process was to identify current policies and programs that support the 2030 GHG reduction scenario strategies and address local climate hazards, recognize jurisdictional limitations in the County's ability to influence these sectors, and determine areas of opportunity for new action development. During this process, the County identified sectors in which they have the authority to act and sectors in which they must rely on state, national, or market forces. The County then developed a list of new actions they could feasibly implement. If an action was already significantly planned or underway and did not need additional support or modification, it is considered an existing action and included in **Chapter 1.**

Action Evaluation

The evaluation of the plan's actions offers a more holistic understanding of each action's value to the community. This goes beyond just viewing each action from an emissions or climate risk perspective. The actions were evaluated using the Climate Action Selection and Prioritization (ASAP) tool. ASAP is a decision-making tool that helps users understand the trade-offs between primary benefits, co-benefits, and feasibility across a range of actions. The ASAP Tool is designed to support decision-making, not make decisions itself. By leveraging tools like ASAP, we ensure that every step we take towards a sustainable future is informed, strategic, and advantageous for our community.

During this evaluation process, all actions were evaluated for their impact on specific evaluation criteria. Each evaluation criterion was divided into one of three categories – primary benefits, co-benefits, and feasibility.

- **Primary Benefits:** An estimate of GHG reduction and climate hazard risk reduction resulting from the actions.

- **Co-benefits**: Benefits generated by climate actions beyond the primary benefits.

- **Feasibility**: How easy or difficult it is to implement the action.

At the heart of the County's CESMP is a fundamental commitment to curb GHG emissions and mitigate climate risk. These two aspects were the primary benefits considered in our action evaluation. The voices of the community are pivotal to our planning process. Hence, we sought extensive input from our stakeholders. County staff and our vibrant community, together, handpicked a set of co-benefit and feasibility criteria integral to our collective values. These key criteria, vital to our evaluation process, are detailed in **Table 5.**

Table 5. Action Evaluation Criteria

Criteria Category	Criteria Name	Criteria Definition
Primary Benefits	GHG Reduction Potential	An estimate of GHG reduction potential resulting from the action

	Climate Risk Reduction Potential	An estimate of climate hazard risk reduction resulting from the action
Co-Benefits	Organizational Diversity, Equity, and Inclusion	Impact on social, environmental, or economic disparities such as disproportionate levels of air quality, health impacts, access to transit, flood risk, energy burden etc.
	Resource Conservation	Impact on natural resources, such as air, water, raw materials, and the natural environment.
	Cost to Residents and Businesses	Additional costs or savings to residents and businesses.
	Local Employment	Impact on the employment rate, physical access to jobs, income and social mobility, and/or total number of jobs.
Feasibility	Funding Source Identified or Secured	Has full or partial public funding for this action been secured, or has a potential funding source been identified?
	Cost to the County	What is the magnitude of upfront, operational, and staffing costs to the County from the implementation year to 2030?
	Cost Savings to County	An initial investment that lowers costs paid by the County such that cost savings could be used to fund other climate change/adaptation programs.

Each action in our plan was assessed for its influence on each evaluation criterion. For the co-benefit criteria, actions were given a qualitative rating such as Very Positive, Somewhat Positive, or Neutral. All ratings were translated to "scores" in the ASAP tool to allow for the comparison of action impact, with a more positive score representing a more positive impact. After the actions were evaluated for their impact on the criteria, the action ratings were reviewed, modified, and vetted by stakeholder groups. The action scores then helped the County conduct a transparent and streamlined action prioritization exercise.

Action Prioritization

Action prioritization is a crucial step in the climate action planning process because it results in a more implementable and effective plan. In an ideal world, government entities would be able to begin pursuing all actions necessary to achieve carbon neutrality and climate resilience simultaneously, but the reality is that government entities have limited resources and many competing priorities. An action prioritization process that reflects the priorities of the community is more likely to be successful and therefore help meet objectives around emission reductions and adaptation.

Once the action evaluations were finalized, we turned to our stakeholder groups to weigh in on which actions should top our priority list and to share their insights on prioritization methods. We also extended the conversation to the broader community through a public survey and a Townhall meeting, further enriching our understanding of public priority actions. Considering this valuable feedback, the County conducted an action prioritization exercise. This process resulted in the identification of high, medium, and low priority actions, as defined in **Table 6.**

Table 6. Priority Level Definitions

Priority Level	Definition
High Priority	• Actions the County will focus on implementing immediately after CESMP adoption • Actions that are fleshed out with greater detail in this plan, including implementation roadmaps to guide County's initial steps on implementation
Medium Priority	• Actions that scored highly for primary benefits (GHG reduction and climate risk reduction) but were not included in high priority list • Actions that can serve as a starting point for future action development ideas after the County has completed a priority action or one is substantially underway
Low Priority	• Actions that address emissions sources within the County and fill in potential policy/programmatic gaps, but are estimated to have much lower GHG reduction or climate risk reduction impacts • Actions were not favored (or were disfavored) by stakeholder groups • During subsequent CESMP updates, County staff might elevate low-priority actions or develop new lists of additional actions that better achieve the County's goals than the current low priorities list

The following describes the County's method of action prioritization:

- Prioritize actions that scored highly across all evaluation categories, i.e., actions that produced high GHG or climate risk reduction, co-benefits, and feasibility scores.

- Prioritize actions that the stakeholder groups identified as high priority and integrate their suggested prioritization considerations and methods feedback.

- Prioritize other actions that produced high GHG reduction or climate risk reduction scores to reach 25 actions as reducing emissions and addressing climate risk are the main goals of the CESMP.

These draft priority actions were then reviewed by the stakeholder groups, who made suggestions for changes. The County team then integrated their feedback and finalized the 25 high priority actions, 23 medium priority actions, and 11 low priority actions. The high priority actions were then further developed and described in detail in **Chapter 4 .** Additionally, implementation roadmaps were developed for each high priority action in **Appendix F**.

Achieving County Goals

Government Carbon Neutrality Goal

100% Renewable Electricity Goals

Strategic and Comprehensive Plan Goals

How to Read the List of Actions

Climate Mitigation Actions

Climate Actions for the Community

Climate Actions for County Government

Climate Adaptation and Resiliency Actions

Opportunities for External Advocacy and Action

GHG Mitigation Advocacy and Action

Climate Adaption and Resiliency Advocacy and Action

Meeting the GHG Reduction Goal

Forest and Trees Removals

Carbon Offsets

Chapter 5 Implementation and Monitoring

Appendix A. Complete List of CESMP Actions

Sector	Actions	Action Priority	Cut GHG Emissions	Prepare for Climate Change	Use 100% Renewable Energy County-Wide by 2035	Become Carbon Neutral for County Government	Use 100% Renewable Energy in County Government by 2030
Energy	E.1: Acquire Clean Electricity Sources for the County	High	O		O	O	O
	E.2: Promote Renewable Energy Incentive Programs and Develop Additional Solar Incentives	High	O		O		
	E.3: Incentivize Renewable Energy Use in Energy-Intensive Commercial Buildings	High	O		O		
	E.4: Promote Existing Green Power Products	High	O		O		
	E.5: Install Solar on County Government Facilities	High	O		O	O	O
Buildings	B.1: Incentivize Energy Efficiency and Electrification Retrofits	High	O				
	B.2: Propose Green Zoning Regulations	High	O				
	B.3: Incentivize Energy Efficient and Electric New Construction	High	O				
	B.4: Promote Energy Efficiency and Electrification Incentives	High	O				
	B.5: Create Net-Zero Plan for County Government Facilities	High	O			O	
	B.6: Create All-electric Guidelines for New Construction of County Government Facilities	Medium	O			O	
	B.7: Create Policy to Increase Energy Efficiency in County Government Facilities	Medium	O			O	
	B.8: Implement Building Energy Benchmarking	Low	O				
Transportation	T.1: Improve Pedestrian and Bicycle Infrastructure and Enhance Connectivity	High	O				
	T.2: Incentivize Transit-Oriented Development	High	O				
	T.3: Expand Existing Programs that Reduce Single-Occupancy Vehicle Trips	High	O				
	T.4: Upgrade Public Transit Infrastructure	High	O				
	T.5: Incentivize Zero-Emission Vehicles and Charging	High	O				
	T.6: Expand Public EV Charging Network	High	O				

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Sector	Actions	Action Priority	Cut GHG Emissions	Prepare for Climate Change	Use 100% Renewable Energy County-Wide by 2035	Become Carbon Neutral for County Government	Use 100% Renewable Energy in County Government by 2030
	T.7: Adopt Zero- or Low-Emissions County Fleet	High	O			O	
	T.8: Encourage E-Bike and E-Scooter Adoption	Medium	O				
	T.9: Educate on Existing Zero-Emission Vehicle Incentives and Rebates	Medium	O				
	T.10: Promote Zero-Emission Bus and Rail Transition	Medium	O				
	T.11: Support Zero- or Low-Emissions County Government Contracting of Off-Road Equipment	Medium	O			O	
	T.12: Adopt County Government Zero-Emission Off-Road Policy	Medium	O			O	
	T.13: Discount Transit Passes for Residents	Low	O				
	T.14: Launch Electric Equipment Lending Program	Low	O				
Natural Resources	N.1: Adopt Natural Open Space Requirements	High	O	O			
	N.2: Launch Suburban and Rural Tree Planting Initiative	Medium	O	O			
	N.3: Update Tree Cover Regulations	Medium	O	O			
	N.4: Support Sustainable Farming Practices	Low	O				
Waste	W.1: Implement County-Wide Composting	Medium	O				
	W.2: Promote Sustainable Purchasing Policy	Medium	O			O	
	W.3: Mandate Commercial Food Waste Diversion	Low	O				
Adaptation	A.1: Develop Adaptation Plans for Critical Facilities	High		O			
	A.2: Understand Stormwater Flooding in Areas Outside of the Floodplain	High		O			
	A.3: Improve Power Resilience for Critical Infrastructure	High		O			
	A.4: Assess Shoreline Protection and Nature-Based Solutions	High		O			
	A.5: Restore Streams to Reduce Flooding	High		O			
	A.6: Incentivize Technology for Residents to Make Homes Adaptive	High	O	O			
	A.7: Plan Alternate Evacuation Routes for Flood-prone Areas	High		O			
	A.8: Expand Building Insulation Standards to Protect Against Extreme Heat	High	O	O			
	A.9: Protect Existing Buildings Against High Winds	Medium		O			

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Sector	Actions	Action Priority	Cut GHG Emissions	Prepare for Climate Change	Use 100% Renewable Energy County-Wide by 2035	Become Carbon Neutral for County Government	Use 100% Renewable Energy in County Government by 2030
	A.10: Protect County Infrastructure from Flooding	Medium		O			
	A.11: Incentivize Nature-based Solutions to Reduce Flooding in Residential Properties	Medium		O			
	A.12: Improve Water Infrastructure for Extreme Precipitation Events	Medium		O			
	A.13: Urban Heat Island Relief Program	Medium	O	O			
	A.14: Adopt Guidelines to Use Nature-based Solutions on County Government Construction	Medium		O			
	A.15: Improve Grid Resilience During Extreme Weather	Medium		O			
	A.16: Expand Tax Credits for Conservation of Natural Resources	Medium		O			
	A.17: Develop Plan to Preserve Estuaries and Wetlands To Reduce Flooding	Medium		O			
	A.18: Training for Community Members on Climate Change and Mental Health	Medium		O			
	A.19: Increase Protection from the Sun at Childcare Centers	Medium	O	O			
	A.20: Protect Existing Buildings Against Earthquakes	Medium		O			
	A.21: Incentivize Improved Cooling Equipment in Apartments	Low	O	O			
	A.22: Incentivize Businesses to Reduce Water Usage	Low	O	O			
	A.23: Protect Electrical Infrastructure from High Winds	Low		O			
	A.24: Expand Community Outreach for Education on Climate Change Adaptation	Low		O			
	A.25: Support Agriculture Resiliency	Low		O			

*Focus of the CESMP

Low

Appendix B. List of Stakeholder Groups Involved in CESMP Development

Figure 15 describes the composition and roles of the five primary stakeholder groups engaged throughout the plan development process.

Table 7. Primary Stakeholders

PWC Community Members	• Engaged through two town hall meetings at key milestones to review actions and draft CESMP • Town halls were advertised throughout the County and available to the public as virtual and in-person options
County Core Team	• Consisted of key staff from 13 County departments • Participated in monthly meetings with CESMP development team • Provided feedback from other stakeholder groups and made final decisions on incorporating stakeholder input into the plan
Sustainability Commission	• Public advisory body appointed by the Board of Supervisors tasked with advising on CESMP development • Commission also consists of non-voting utility and transportation representatives • Engaged four times throughout the planning process at key milestones
Technical Workgroups	• Consisted of technical and community organization representatives relevant to CESMP actions, nominated by Sustainability Commission and Office of Sustainability • Engaged through five workshops during action prioritization phase to better understand community impacts and how actions would feasibly be implemented
Board of Supervisors	• Responsible for CESMP adoption • Board of Supervisors was updated on plan development throughout planning process via the Office of Sustainability and the Sustainability Commision

Figure 16 outlines the members of the County Core team that participated in the development of the CESMP.

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Figure 12. County Departments Involved in Developing the CESMP

The Joint Environmental Task Force

Communication between the Prince William County Government and the Prince William County School (PWCS) system was important throughout the CESMP development process. Because the PWCS system operates separately from the County government operations, PWCS operations are not considered under the County government's direct influence. Therefore, PWCS energy use and emissions are not included under the County government climate goals of 100% renewable energy by 2030 or carbon neutrality by 2050. However, as PWCS emissions are included in the County-wide goals of 50% GHG emissions reduction by 2030 and 100% renewable energy by 2035, they were still a critical partner to engage in CESMP development. PWCS representatives were invited to participate in the CESMP workgroups. Notably, the Joint Environmental Task Force (JET) was developed to foster the relationship and increase communication channels to address climate change and environmental sustainability proactively and equitably. The JET was created on June 22, 2021, by the Board of County Supervisors. The JET's role will be to recommend to the Board of County Supervisors and to the School Board funding priorities that are identified by the CESMP.

Figure outlines the participants of the technical workgroups that helped to prioritize the actions..

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Figure 13. Complete List of Technical Workgroup Participants

Workgroup Participants

1 Buildings and Decarbonization

- Building Trades- GPI Consulting Engineering
- Virginia Pace Authority
- Northern Virginia Electric Cooperative
- Prince William Service Authority
- Prince William Residential Solar Taskforce
- Prince William County Schools
- George Mason University VA Climate Center
- Northern Virginia Community College
- Data Center Coalition
- Citizen's Climate Lobby
- Prince William Commercial Development Committee
- Northern Virginia Building Industry Associations - Developer Rep
- Northern Virginia Building Industry Associations- Builder Rep

2 Transportation and Land Use

- Virginia Railway Express
- Potomac and Rappahannock Transportation Commission
- Lake Ridge Occoquan Coles Civic Association
- Woodbridge Potomac Communities Civic Association
- Mid County Civic Association of Prince William
- HOA Roundtable
- Prince William Conservation Alliance
- Active Transportation Groups - Biking
- Northern Virginia Regional Commission
- Trails and Blueways Council
- Metropolitan Washington Council of Governments
- Prince William County Schools Transportation
- Prince William Economic Development
- Northern Virginia Building Industry Associations

3 Climate Adaptation and Resiliency for Vulnerable Population

- Virginians Organized for Interfaith Community Engagement
- Student Representative
- Community Partners in Equity and Inclusion
- Senior Citizen Advocacy
- Veteran's Commission
- Chesapeake Climate Action Network
- Institute for Public Health
- Tenants and Workers United
- Prince William Department of Social Services Rep for Homeless Populations

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Appendix C. Existing County Actions

The following is a list of actions, programs, and projects that are already underway by the County. These actions either make an effort to mitigate GHG emissions or improve climate resiliency and hazard mitigation in the County.

Existing GHG Mitigation Actions

Natural Resources
1. The County recently secured annual funding and a full time employee to expand upon an existing reforestation program. The program is now expanded to allow 10-acre non-agricultural lots to apply which is expected to substantially increase participation in the County.
2. In response to recent regulations, the County is currently working with the State on tree preservation requirements for new development.

Water
3. In 2022, the County's wastewater treatment plant's inefficient electric-resistance heating and conventional lighting was converted to high-efficiency lighting and high-efficiency heat pumps.
4. Plant effluent water reuse within the water treatment plant which helps to reduce potable water usage by 1.5 million gallons per day.
5. On-going customer water savings initiatives are in place such as public education and flyers inserts in bills. An on-going recommended watering program is in place which directs even and odd address for homes to water on different days
6. A Green Infrastructure Study grant received via MWCOG tasks a consultant to provide a clear roadmap to implementing green infrastructure into planned capital projects in the County, many of which already have dedicated funding. The project will also inform long term policy decisions through the review and recommendation of applicable policies, specifically into the Prince William Design and Construction Standards Manual. This will allow the County to include green infrastructure recommendations in future projects and help secure funding for the enhanced project scopes.

Transportation
7. There is a Commuter Choice funded Transportation Demand Management marketing campaign for the I-66 corridor and Transit Fare Buy Down Program for 5 OmniRide Bus Routes.
8. There are sidewalk and trail improvement efforts covered in the Capital Improvement Program. The current program includes three standalone bike/pedestrian projects and thirteen transportation projects that include bike/pedestrian facilities.
9. A First/Last Mile Study is being conducted at Neabsco Commuter Garage via MWCOG. A consultant did an analysis of a 1-mile walkshed of the garage and provided recommendations to provide pedestrian improvements and cost estimates. Ultimately, this will be on the Supervisor and the Board to take action to allow Transportation to pursue projects. Various recommendations included exploring micro-mobility: e-bikes/e-scooters, sidewalk connectivity, sidewalk improvements to include safety features, and desired paths (putting in trails where people are naturally walking). This County is about to receive the final document.
10. Yorkshire Corridor Improvements Study grant received via MWCOG tasks the consultant to provide actionable recommendations to build off existing planned improvements to make Route 28 a more walkable, transit-oriented corridor. This will include a gap analysis of first/last mile connections, review of planned project scopes and existing and future land use and recommendations for prioritized pedestrian, bicycle and/or micro-mobility connections and transit supportive infrastructure. This project will include coordination with Prince William County Government, the City of Manassas, the City of Manassas Park and OmniRide, which operates bus services on the corridor.
11. The Board recently approved providing a local match to the Woodbridge Pedestrian Bridge that will connect the Woodbridge VRE to a new development on the other side of Route 1. Transportation is beginning the design process of a pedestrian bridge over Route 15 in Gainesville. Staff is looking to find other sources of funding to allow the project to proceed beyond the design stage.
12. The County is adopting a new Mobility Chapter of the Comprehensive Plan which aims to reduce lane miles and focus on transit and non-motorized transportation
13. The County is updating the Transportation chapter of the Design and Construction Standards which will be informed by a Green Infrastructure planning study.

Waste
14. There are reuse and clothing and shoe collection programs at the Prince William County Landfill and the Balls Ford Road Compost facilities. The reuse program was recently reinstated in July 2022. The clothing program has collected 4,500 pounds through Calendar Year 2022.
15. There is a public outreach program promoting source reduction and reuse as part of on-going outreach and education programs. The County partners with Keep Prince William Beautiful on Fix-It Fairs.
16. The County promotes "grasscycling" (leaving grass clippings on the lawn) and backyard composting.
17. The County promotes backyard composting including the sale of low-cost compost bins, with a total of 31 bins sold in Fiscal Year 2022.

18. The County has plans to promote a food scraps recovery program with the commercial sector, expand residential organics collection to include food scraps, and expand their glass recycling drop-off collection program. A draft plan for this work was presented to the Board in Fall 2022.
19. Starting in October 2021, the County began implementing a year-round residential yard waste collection program. As off Calendar Year 2022, the yard waste program has diverted more than 2,000 tons from the County landfill to the Balls Ford Road Compost facility.
20. The implementation of five glass recycling drop-off centers has increased glass recycling from 17 to 575 tons from Calendar Year 2018 to 2021.
21. The County landfill currently captures methane.

Existing Renewable Energy Actions

1. Building Development has recently established a Residential Solar Task Force with industry members to provide education, receive feedback on permitting processes, and define opportunities to improve the processes. Recommendations from the task force will directly inform the County's streamlining actions.
2. A consultant is analyzing the feasibility of PPAs and solar installations for government facilities.

Existing Adaptation/Resilience Actions

Flooding
1. FEMA manages floodplain mapping for the County. OEM and Public Works are conducting a Flood Resilience Plan and supporting "small area plans" that develop mitigation actions for flooded areas and communities. This will also address, where able, future flooding risk.
2. Storm surge zones have already been mapped by FEMA and existing data shows critical infrastructure within this zone and the rest of the special flood hazard area.
3. The backbone of a County Automated Flood Warning system is now operational with four water depth gauges at key areas of riverine flooding. The system will gauge adjusted rainfall rates to identify flooding trends for each basin. There are future plans to add rain gauges, weather stations, and additional water level sensors to expand County-wide coverage. The system will support early warning capabilities and data collection to determine County-wide flooding trends. The County recently received a grant that will assist in building the rest of the system. The County is currently awaiting flood events to occur to test and validate the system before it is ready to be used. Improvements to the program could include expansion of staff needed to coordinate and validate data, and the addition of a hydrologist to expand predictive modeling capabilities.
4. The County plans to develop a County Flood Resiliency Master Plan pending grant funding approval. This plan will utilize existing data to identify flooding hazards in the County and assist in prioritization of flood mitigation projects.
5. The County Emergency Operations Plan outlines all aspects of response and recovery for the community to include all aspects of mass care, survivor support, public information, damage assessment, public reporting, etc. All aspects of the Emergency Operations Plan should continue to be supported and enhanced, where necessary to continue to support the community's needs.
6. The Ready Prince William community outreach and engagement program seeks to integrate existing community partners and volunteering efforts in preparedness, response, and recovery. OEM is actively working to enhance this program.
7. The County is actively waiting a class change from FEMA. The County plans to continue to participate in the Community Rating System program and actively find ways to maintain and enhance all eligible program areas to increase resilience and provide flood insurance discounts for residents who live in a special flood hazard area.
8. Identification of high-risk properties and encouragement of acquisition for property owners is currently managed by the County's Hazard Mitigation Workgroup, coordinated by OEM. By current County policy, the County will only consider acquisition of high-risk properties, not elevation or relocation.
9. Flood preparedness and flood insurance outreach currently occurs through Ready Prince William coordinated by OEM. Rebates or grants for flood resilience measures do not exist at the local level.
10. Many hazard risk assessment programs already exist in the County in regard to technical assistance for specific facilities, including universities, schools, day care centers, assisted living facilities, healthcare facilities, etc.
11. Nature-based flood control is a concept that should be incorporated into all flood mitigation activities, where relevant, and is something that the County's Hazard Mitigation Workgroup is aware of and working to incorporate, as needed. Nature-based solutions should not just be for lower-income individuals but utilized as a strategy for any facility or community vulnerable to flooding.

Extreme Heat
12. OEM has established warming and cool centers coupled with triggers and escalation levels. These locations are primarily the libraries throughout the community, but OEM has also established additional locations identified if libraries are not suitable to the needs of the incident, including the use recreation centers and other facilities. Extreme Heat procedure are currently in place. A comfort center plan for extreme heat/cold mass care support is in development by OEM. If a resident signs up for PWC Alerts, and opts into weather watches and warnings, they will receive notifications for heat advisories. This is supported by the County's Emergency Operations Plan.

Tornadoes
13. Community tornado safe rooms are targeted by FEMA for states and communities in tornado alley and other areas that have significant early warning of a tornado coming to allow individuals time to go to a community safe room. This is not feasible in the County, as tornadoes are relatively rare in this area and there is a very

short working time as they can occur very quickly from a severe thunderstorm cell. The preparedness messaging used instead is focused on teaching individuals how to identify a safe room in their house, place of work, etc. that they can quickly and safely get to should a tornado pop up quickly. This is a room on the lowest level of a building and the most interior room without windows.

Infrastructure Resiliency

14. The County is in coordination with Fairfax Water to secure supply, leading to better regional resiliency of water supply.

15. Action Strategy G3.5 in the Comprehensive Plan aims to prioritize improvements to vulnerable infrastructure as identified by Vtrans Vulnerability Assessment. This consideration is currently included as prioritization factor for transportation projects submitted for state funding. DOT has an active project, the Route 28 Bypass, in an area with existing flooding and is pursuing enhanced stormwater management measures to better prepare the area for future floods. Impact projects are funded by SMART SCALE (beginning Round 5 which funds projects in Fiscal Years 2026-2027) through the Virginia Office of Intermodal Planning and Investment.

16. The County implements watershed studies, stormwater retrofits, and small drainage improvement projects as needed. The County has undertaken a number of stream restoration projects to improve the quality of our local streams and waterways. The County's stream restoration program identifies projects through field inspections and watershed studies.

17. Public Works' is seeking funding to conduct detailed watershed studies for flood control to implement climate adaptation strategies, assess the adequacy and capacity of existing stormwater infrastructure, and propose DCSM changes for changes in precipitation patterns over the years.

18. PWCSA has an established pipe cured in-place pipe lining and Infiltration and Inflow reduction program to keep 1,150 miles of sanitary sewers operating at capacity.

19. PWCSA works with County businesses to prevent Fats, Oil and Grease from entering the sewer where FOG can cause blockage. The program conducts periodic inspections of business to maintain compliance and ensure routine maintenance of grease traps and interceptors.

20. PWCSA includes nutrient management plans in landscape contracts to reduce nutrient runoff.

21. PWCSA is in the design phase of a large design-build project for facility-wide improvements at the H.L. Mooney Advanced Water Reclamation Facility to replace/renew/refurbish assets. The project includes a new headworks to increase peak flow capacity at the plant.

22. The County maintains a Mutual Aid Debris Removal Operations Plan and Prince William County Debris Management Plan. The County maintains a contractor for debris management emergency response services. The County also maintains primary and secondary Monitoring Debris Management Contractors.

Appendix D. Greenhouse Gas Inventory and Analysis

Appendix D.1 Greenhouse Gas Inventory

Appendix D.2 Greenhouse Gas Reduction Strategies

Appendix D.3 Method for Developing GHG Emission Reduction Strategies

Appendix D.1 2018 Greenhouse Gas Inventory

MWCOG develops the County's GHG inventories every two to three years following guidance from the U.S. Community Protocol (USCP) – an inventory reporting protocol to guide U.S. local governments in calculating and reporting their community's GHG emissions.[5] MWCOG previously developed the County's inventories for 2005, 2012, 2015, 2018, and 2020. As the County's goal is to reduce County-wide GHG emissions by 50% from a 2005 baseline by 2030, the 2005 inventory represents the GHG emissions baseline against which the County measures its emissions reduction progress. Total emissions in 2005 were 4,190,056 MTCO₂e. In 2018, the County generated approximately 5,044,135 MTCO₂e – a **20% increase** from 2005 levels (see **Figure 18**). To progress toward the 50% reduction goal by 2030, 2018 County-wide emissions needed to show a 26% **decrease** below 2005 levels – which means emissions are not currently on track for goal achievement.

Impact of COVID-19 on GHG Emissions

While emissions have been steadily increasing annually since 2005, emissions decreased by 9% between 2018 and 2020 (though emissions in 2020 were still 9% higher compared to the baseline year of 2005). This is most likely due to the impacts of COVID-19 restrictions, such as reduced on-road travel or non-residential building energy use, though the exact magnitude of emissions impact from COVID restrictions cannot be precisely measured. Additionally, studies have shown that US-wide GHG emissions are returning to pre-pandemic levels, demonstrating that COVID impacts on emissions are most likely not permanent.[6]

Therefore, while a 2020 County GHG inventory exists, the CESMP references the 2018 inventory year for forecasting and emissions reduction calculations as it represents the most recent pre-pandemic community activity levels and provides a more accurate baseline for local GHG emissions analysis. Future GHG inventories will better reflect any long-term impacts of the pandemic on County-wide emissions.
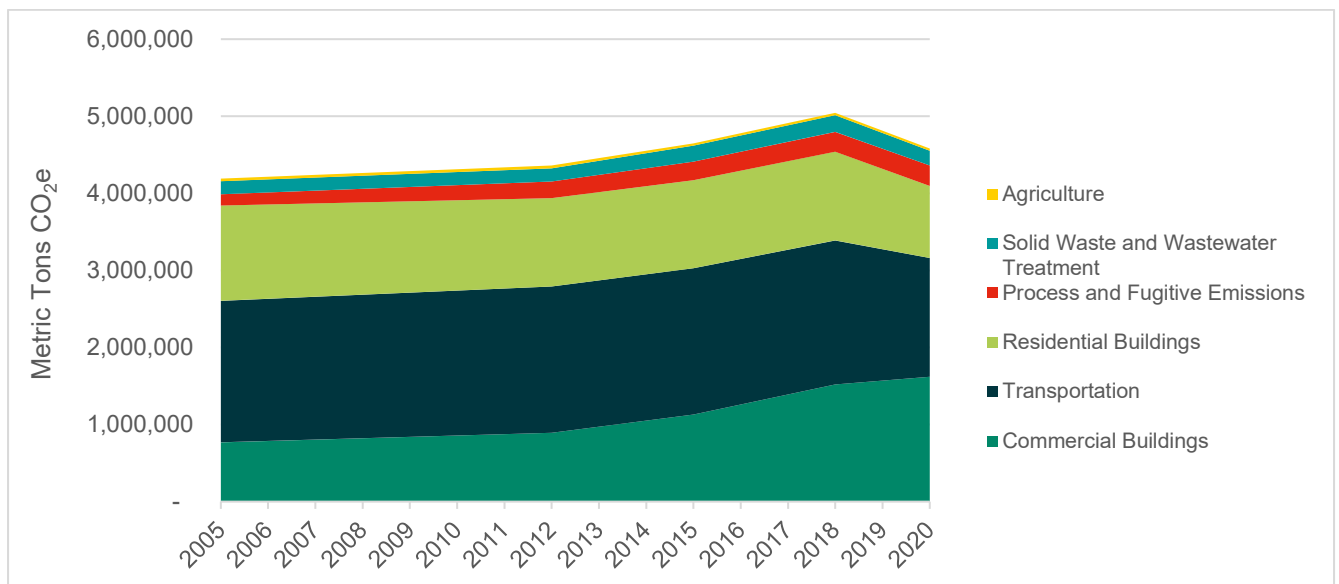

Figure 14. Prince William County GHG Emissions 2005 – 2020

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[5] https://www.mwcog.org/documents/2022/12/09/greenhouse-gas-emissions-inventories-methodology-guide-climate--energy-greenhouse-gas/
[6] https://rhg.com/research/us-greenhouse-gas-emissions-2022/#:~:text=Based%20on%20preliminary%20economic%20activity,compared%20to%20the%20previous%20year.

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Table 8. 2018 PWC GHG Emissions Inventory

Emissions Type	Emissions Activity or Source	2018 Emissions (MTCO$_2$e)	% of Total Emissions
Residential Energy	Electricity	724,067	14%
	Natural Gas	412,703	8%
	Fuel Oil	9,889	<1%
	Liquefied Petroleum Gas	7,150	<1%
Commercial Energy	Electricity	1,359,354	27%
	Natural Gas	157,959	3%
	Fuel Oil	2,621	<1%
	Liquefied Petroleum Gas	1,246	<1%
Transportation and Mobile Emissions	On Road Transportation	1,636,658	32%
	Passenger Air Travel	62,539	1%
	Rail Transportation	2,598	<1%
	Off Road Mobile Sources	164,404	3%
Process and Fugitive Emissions	Hydrofluorocarbon & Refrigerant Emissions	238,364	5%
	Natural Gas Fugitive Emissions	16,625	<1%
Solid Waste Treatment	Landfill Waste	214,717	4.3%
Agriculture	Enteric Fermentation	13,397	<1%
	Manure Management	1,461	<1%
	Agricultural Soils	15,051	<1%
Wastewater Treatment	Septic System Emissions	1,502	<1%
	Sewer System Treatment Emissions	1,160	<1%
	Sewer System Effluent Discharge Emissions	668	<1%
TOTAL		**5,044,135**	

Appendix D.2 Greenhouse Gas Reduction Strategies

2030 Greenhouse Gas Reduction Strategy	Percent of 2030 GHG Reductions Needed to Meet Goal
92% clean electricity	57%
50% of passenger and medium-duty vehicles are ZEV	24%
40% of HVAC systems and water heaters are highly efficient and electric	8%
57% HFCs replaced with low- or zero-GWP alternatives	4%
5% mode shift from passenger vehicles to active/public transport	2%
60% waste diversion rate	2%
100% high-efficiency lighting and appliances	1%
15% zero emissions off-road equipment	1%
20% reduction in aviation emissions	<1%
10% reduction in agriculture emissions	<1%

Appendix D.3 Method for Developing GHG Emission Reduction Strategies

The first step in developing the GHG reduction scenarios was to evaluate how external regulatory or market forces would impact emissions over time. Reductions from these forces are reflected in the blue hatched wedge at the top of the chart in Figure 9. These external forces include:

- Virginia's Renewable Portfolio Standard (RPS), which requires electricity generation from 30% renewables by 2030 for Phase I utilities and 41% for Phase II utilities.

- Market forecasts for electric vehicle (EV) adoption, where approximately 17% of passenger vehicles are assumed to be EVs 2030.

- Reductions in hydrofluorocarbons use under the Kigali Amendment, where industrialized nations like the United States must reduce production and consumption of HFCs to about 15% of 2012 levels by 2036.

- Market forecasts for electric off-road construction equipment, which are assumed to be 10% electric by 2030.

These external factors result in roughly 33% of the emissions reductions needed to meet the 2030 goal. The impact of these external forces may be large, but local action is still necessary to meet the 2030 goal.

Emissions Impact of Other External Regulatory and Market Forces

The emission impact of certain external regulatory or market forces, such as impacts from the Inflation Reduction Act (IRA) or the Infrastructure Investment and Jobs Act (IIJA), were not integrated into the County's GHG reduction scenario but could help to further reduce local emissions, especially in the electricity, buildings, and transportation sectors.

Enacted in 2022, the IRA is a federal law which aims to curb inflation by investing into domestic energy production while promoting clean energy, among other actions. The IIJA is a federal law enacted in 2021 that directs spending toward transportation, electric, and other infrastructure improvements. Because the IRA and IIJA provide US-wide funding and financing opportunities and do not require a discrete amount of emissions reductions or clean energy use, the emissions impact of these laws were not quantified in the emissions forecasts or included in the 2030 GHG reduction scenario. However, both the IRA and IIJA will likely help to reduce emissions in the County due to their promotion of clean energy, electric vehicles, and public transit. Studies have estimated the IRA will have minimal impact on transportation emissions by 2030 but could decrease emissions in the US power sector by roughly 50-60% by 2030 as compared to business-as-usual emissions.[7,8] However, these studies do not specifically analyze how these reductions will interact with any state's RPS, which requires a certain percentage of renewable energy and will therefore also decrease power sector emissions. Another study found that the IIJA could increase or decrease transportation emissions +/- 1% in 2030 compared to a base case scenario depending on the direction of investment.[9] At the time of the County's 2030 GHG reduction scenario development, IRA and IIJA impacts were not integrated into the EV market forecast study that was used to forecast external impacts on the County's transportation emissions. In the future, IRA and IIJA impacts may be integrated into both EV forecasts and Virginia renewable energy forecasts and could be used in County emissions forecasting updates. This could help the County better understand the overall impact of these laws on their future emissions and GHG reduction scenario.

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[7] Ramseur, J. L. (2023). U.S. Greenhouse Gas Emissions Trends and Projections from the Inflation Reduction Act. Congressional Research Service. https://crsreports.congress.gov/product/pdf/IN/IN12082
[8] Sherlock, M. F. (2023). Tax Credits for "Clean Electricity"—Projected Effects on CO2 Emissions and the Generation Mix. Congressional Research Service. https://crsreports.congress.gov/product/pdf/IN/IN12082
[9] Georgetown Climate Center. (2021, 12 16). Georgetown Law. Retrieved from https://www.georgetownclimate.org/articles/federal-infrastructure-investment-analysis.html

Though the IRA and IIJA will most likely help spur clean energy integration into the regional electrical grid and improve transportation infrastructure, they will not be enough to guarantee that the County achieves its 2030 GHG reduction goal or 2035 renewable energy goal. Therefore, including potential emissions reductions from the IRA, IIJA or other forces in the 2030 reduction scenario would not change the focus of actions presented in the CESMP. Because the CESMP is a living document, the emissions impacts of new measures and regulations can be monitored and incorporated in future GHG forecasting updates.

Building upon these external regulatory and market forces, multiple 2030 GHG reduction scenarios were developed to demonstrate what it will take to achieve the County's 2030 GHG reduction goal. After reviewing these scenarios, the County selected the preferred 2030 reduction scenario in order to show what it will take to reach the 2030 goal and guide climate action development.

Appendix E. Vulnerability Assessment Report

Appendix F. Implementation Plan

Appendix G. CESMP Actions Mapped to Strategic Plan and Comprehensive Plan Action Strategies

Actions	Comprehensive Plan Action Strategies	Strategic Plan Action Strategies
E.1: Acquire Clean Electricity Sources for the County	H5.9	SG2: C., SG2: E
E.2: Promote Renewable Energy Incentive Programs and Develop Additional Solar Incentives	H5.4, H5.6, H5.7, H5.9	SG2: C., SG2: E, SG2: F
E.3: Incentivize Renewable Energy Use in Energy-Intensive Commercial Buildings	H5.9	SG2: C., SG2: E
E.4: Promote Existing Green Power Products	H5.9	SG2: C., SG2: E
E.5: Install Solar on County Government Facilities	H5.9	SG2: C., SG2: E
B.1: Incentivize Energy Efficiency and Electrification Retrofits	H5.4	SG2: E
B.2: Propose Green Zoning Regulations	LU8.1, LU8.3, H5.2, H5.3, H5.4, H5.4, H5.10	SG2: B., SG2: E
B.3: Incentivize Energy Efficient and Electric New Construction	H5.3, H5.4, H5.4	SG2: B., SG2: E
B.4: Promote Energy Efficiency and Electrification Incentives	H5.4, H5.7	SG2: E
B.5: Create Net-Zero Plan for County Government Facilities		SG2: A., SG2: B., SG2: E
B.6: Create All-electric Guidelines for New Construction of County Government Facilities		SG2: A., SG2: B., SG2: E
B.7: Create Policy to Increase Energy Efficiency in County Government Facilities		SG2: A., SG2: B., SG2: E
B.8: Implement Building Energy Benchmarking		SG2: E
T.1: Improve Pedestrian and Bicycle Infrastructure and Enhance Connectivity	G3.9, G3.10, LU8.2, LU8.4	SG2: E, TM2: A
T.2: Incentivize Transit-Oriented Development	G3.9, G3.10, LU8.1, LU8.2, LU8.4, LU8.5, H5.2, H5.10	SG2: E
T.3: Expand Existing Programs that Reduce Single-Occupancy Vehicle Trips	G3.9, G3.10, LU8.2	SG2: E, TM4: A
T.4: Upgrade Public Transit Infrastructure	G3.9, G3.10, G3.11, LU8.2	SG2: E
T.5: Incentivize Zero-Emission Vehicles and Charging	G3.9, G3.10, RP3.1	SG2: E
T.6: Expand Public EV Charging Network	G3.9, G3.10, RP3.1	SG2: D., SG2: E
T.7: Adopt Zero- or Low-Emissions County Fleet	G3.9, G3.10, RP3.1	SG2: D., SG2: E
T.8: Encourage E-Bike and E-Scooter Adoption	G3.9, G3.10, LU8.2	SG2: E
T.9: Educate on Existing Zero-Emission Vehicle Incentives and Rebates	G3.9, G3.10, RP3.1	SG2: E
T.10: Promote Zero-Emission Bus and Rail Transition	G3.9, G3.10, G3.11, RP3.1, LU8.2	SG2: E

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Actions	Comprehensive Plan Action Strategies	Strategic Plan Action Strategies
T.11: Support Zero- or Low-Emissions County Government Contracting of Off-Road Equipment	G3.9, G3.10, RP3.1	SG2: E
T.12: Adopt County Government Zero-Emission Off-Road Policy	G3.9, G3.10, RP3.1	SG2: D., SG2: E
T.13: Discount Transit Passes for Residents	G3.9, G3.10, LU8.2	SG2: E
T.14: Launch Electric Equipment Lending Program		SG2: E
N.1: Adopt Natural Open Space Requirements		SG2: E, EC1: A., EC1: B., EC1: C., H5.2, H5.4
N.2: Launch Suburban and Rural Tree Planting Initiative		SG2: E
N.3: Update Tree Cover Regulations		SG2: E, EC1: A., EC1: B
N.4: Support Sustainable Farming Practices		SG2: E
W.1: Implement County-Wide Composting		SG2: E
W.2: Promote Sustainable Purchasing Policy		SG2: E
W.3: Mandate Commercial Food Waste Diversion		SG2: E
A.1: Develop Adaptation Plans for Critical Facilities	H5.2	
A.2: Manage Stormwater Flooding in Areas Outside of the Floodplain		EC5: B, EC5: C
A.3: Improve Power Resilience for Critical Infrastructure	H5.7	
A.4: Assess Shoreline Protection and Nature-Based Solutions		EC5: B
A.5: Restore Streams to Reduce Flooding		EC5: B
A.6: Incentivize Technology for Residents to Make Homes Adaptive		SG2: B, SG2: E
A.7: Plan Alternate Evacuation Routes for Flood-prone Areas		EC5: B
A.8: Expand Building Insulation Standards to Protect Against Extreme Heat		SG2: E
A.9: Protect Existing Buildings Against High Winds	H5.12	
A.10: Protect County Infrastructure from Flooding		EC5: B, EC5: C
A.11: Incentivize Nature-based Solutions to Reduce Flooding in Residential Properties	H5.2	
A.12: Improve Water Infrastructure for Extreme Precipitation Events	H5.2	
A.13: Urban Heat Island Relief Program	H5.2	SG2: E
A.14: Adopt Guidelines to Use Nature-based Solutions on County Government Construction	H5.2	
A.15: Improve Grid Resilience During Extreme Weather	H5.7	
A.16: Expand Tax Credits for Conservation of Natural Resources		EC1: A
A.17: Develop Plan to Preserve Estuaries and Wetlands To Reduce Flooding		EC1: A
A.18: Training for Community Members on Climate Change and Mental Health		EC5: D
A.19: Increase Protection from the Sun at Childcare Centers		SG2: E

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Actions	Comprehensive Plan Action Strategies	Strategic Plan Action Strategies
A.20: Protect Existing Buildings Against Earthquakes		
A.21: Incentivize Improved Cooling Equipment in Apartments	H5.4	SG2: B, SG2: E
A.22: Incentivize Businesses to Reduce Water Usage	H5.4	SG2: B, SG2: E
A.23: Protect Electrical Infrastructure from High Winds	H5.7	
A.24: Expand Community Outreach for Education on Climate Change Adaptation		EC5:D
A.25: Support Agriculture Resiliency		

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