

# DRAFT Community Energy and Sustainability Master Plan

Prince William County, Office of Sustainability

13 September 2023

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# Glossary

Term	Definition
Adaptation	The process of adjustment to actual or expected climate and its effects
Carbon offset	Carbon offsets represent the reduction or removal of greenhouse gas emissions that compensate for emissions emitted somewhere else
Climate action	An action that reduces greenhouse gas emissions or climate risk
Climate change	A change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer
Climate mitigation	Reducing emissions of and stabilizing the levels of heat-trapping greenhouse gases in the atmosphere
Greenhouse gas reduction scenario	A greenhouse gas reduction scenario represents a group of high-level technological strategies that are needed to reach a greenhouse gas reduction goal
Greenhouse gas reduction strategy	Greenhouse gas reduction strategies are high-level technological strategies that help meet a greenhouse gas 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
Greenhouse gas	Gases in the earth's atmosphere that trap heat
Resiliency	The capacity of social, economic, and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity, and structure, while also maintaining the capacity for adaptation, learning, and transformation
Sequestration	Process of capturing and storing atmospheric carbon dioxide
Vulnerability	The propensity or predisposition to be adversely affected

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# Acronyms

<b>Acronym</b>	<b>Definition</b>
ASAP	Action Selection and Prioritization
°C	degrees Celsius
CCA	community choice aggregation
CESMP	Community Energy and Sustainability Master Plan
CH <sub>4</sub>	methane
CO <sub>2</sub>	carbon dioxide
CO <sub>2</sub> e	carbon dioxide equivalent
CPA	comprehensive plan amendments
C-PACE	Commercial Property Assessed Clean Energy
DCSM	Design and Construction Standards Manual
DRPT	Department of Rail and Public Transportation
EEA	equity emphasis area
EM	Emergency Management
EV	electric vehicle
°F	degrees Fahrenheit
FEMA	Federal Emergency Management Agency
FY	fiscal year
GHG	greenhouse gas
GWP	global warming potential
HFC	hydrofluorocarbon
HOA	homeowners association
HVAC	heating, ventilation, air conditioning
IIJA	Infrastructure Investment and Jobs Act
IPCC	Intergovernmental Panel on Climate Change
IRA	Inflation Reduction Act
JET	Joint Environmental Task Force
MTCO <sub>2</sub> e	metric tons of carbon dioxide equivalent
MWCOG	Metropolitan Washington Council of Governments
N <sub>2</sub> O	nitrous oxide
NOS	natural open space
NOVEC	Northern Virginia Electric Cooperative
PPA	Power Purchase Agreement
PRTC	Potomac and Rappahannock Transportation Commission
PWC	Prince William County
PWCS	Prince William County School
PWCSA	Prince William County Service Authority
RECs	renewable energy certificates
RPS	Renewable Portfolio Standard
SUP	special use permits
TOD	transit oriented development

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ZEV	zero-emission vehicle
VDOT	Virginia Department of Transportation
VPPAs	Virtual Power Purchase Agreements
VRE	Virginia Railway Express

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# Letter from County Executive

# Executive Summary

On November 17, 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 actions the County government could take to contribute to the achievement of these goals. We recognize that climate change is not a distant problem, but one that impacts our citizens and resources directly. The increasing effects of our changing climate include, but are not limited to, more severe and persistent heat waves, poor air quality from wildfires, greater risk of power outages, more heat-related illnesses, and storm damage from flooding and high winds. This warming of our climate is caused primarily by the burning of fossil fuels to produce electricity, heat our homes and businesses, and power our vehicles. Our county's climate is changing, and it is directly related to human activities.

According to the Environmental Protection Agency, sea levels are expected to rise between one and four feet along the Virginia coast in the next century.<sup>1</sup> Climate change in Virginia manifests as erosion of its beaches and barrier islands, saltwater intrusion, intense tropical storms and hurricanes with more flooding and bigger storm surges throughout the state, increased rainfall with exacerbated coastal and inland flooding, loss of important coastal ecosystems, harmful effects on farming and fishing, and increased dangerously hot days. These effects are already being realized. Compared to 100 years ago, Virginia is experiencing 30 more evenings each year above 68 degrees and Virginia's portion of the Chesapeake Bay has seen approximately 4.5 more inches of rain annually.<sup>2</sup> Virginia was affected by 82 of the 290 U.S. billion-dollar disaster events that occurred between 1980 and 2020.<sup>3</sup>

We recognize the time for action is now. The goals that guide our recommended actions are:

1. **Cut Greenhouse Gas (GHG) Emissions County-Wide by 2030:** Reduce GHG emissions county-wide to 50% below 2005 levels by 2030
2. **Use 100% Renewable Electricity County-Wide by 2035:** Source 100% of the county-wide electricity from renewable sources by 2035<sup>4</sup>
3. **Use 100% Renewable Electricity in County Government Operations by 2030:** Achieve 100% renewable electricity in the County government operations by 2030<sup>5</sup>
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

Achieving these goals would require unprecedented, aggressive action. This plan presents a list of actions recommended for the County government to take, with 25 actions that have been prioritized for immediate execution. In many cases, the actions will be initially driven by the County government 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 topic areas in which significant action is needed: electricity, buildings, transportation, natural resources, and adaptation. These high priority actions and the goals they contribute to are listed in **Table 1** below. A longer list including medium and low priority actions is provided in [Error! Reference source not found.](#)

<sup>1</sup> <https://19january2017snapshot.epa.gov/sites/production/files/2016-09/documents/climate-change-va.pdf>

<sup>2</sup> <https://www.chesapeakebay.net/news/blog/a-new-report-gives-virginia-a-realistic-view-of-the-future>

<sup>3</sup> <https://statesummaries.ncics.org/chapter/va/>




<sup>4</sup> For renewable electricity goals, we define renewable electricity as electricity coming from any non-fossil fuel energy source, including solar, wind, hydro, geothermal, biomass, and nuclear

<sup>5</sup> PWC does not consider the county's schools a part of county government operations



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**Table 1. CESMP High Priority Climate and Resiliency Actions**

Topic Area	CESMP High Priority Actions	Related Goal #
Electricity	E.1: Acquire Clean Electricity Sources for the County 	1, 2, 3, 4
	E.2: Promote Renewable Energy Incentive Programs and Develop Additional Solar Incentives	1, 2
	E.3: Incentivize Renewable Energy Use in Energy-Intensive Commercial Buildings	1, 2
	E.4: Promote Existing Green Power Products	1, 2
	E.5: Install Solar on County Government Facilities	1, 2, 3, 4
Buildings	B.1: Incentivize Energy Efficiency and Electrification Retrofits	1
	B.2: Propose Green Zoning Regulations	1
	B.3: Incentivize Energy Efficient and Electric New Construction	1
	B.4: Promote Energy Efficiency and Electrification Incentives	1
	B.5: Transition to Net Zero County Government Facilities	1, 2, 4, 5
Transportation	T.1: Improve Pedestrian and Bicycle Infrastructure and Enhance Connectivity	1
	T.2: Incentivize Transit-Oriented Development	1
	T.3: Expand Existing Programs that Reduce Single-Occupancy Vehicle Trips	1
	T.4: Upgrade Public Transit Infrastructure	1
	T.5: Incentivize Zero-Emission Vehicles and Charging	1
	T.6: Expand Public EV Charging Network	1
	T.7: Adopt Zero- or Low-Emissions County Fleet 	1, 4
Natural Resources	N.1: Adopt Natural Open Space Requirements	1, 5
Adaptation	A.1: Develop Adaptation Plans for Critical Facilities	5
	A.2: Manage Stormwater Flooding in Areas Outside of the Floodplain	5
	A.3: Improve Power Resiliency for Critical Infrastructure 	5
	A.4: Implement Shoreline Protection and Nature-Based Solutions	5
	A.5: Restore Streams to Reduce Flooding	5
	A.6: Incentivize Technology for Residents to Make Homes Adaptive	1, 5
	A.7: Plan Alternate Evacuation Routes for Flood-prone Areas	5

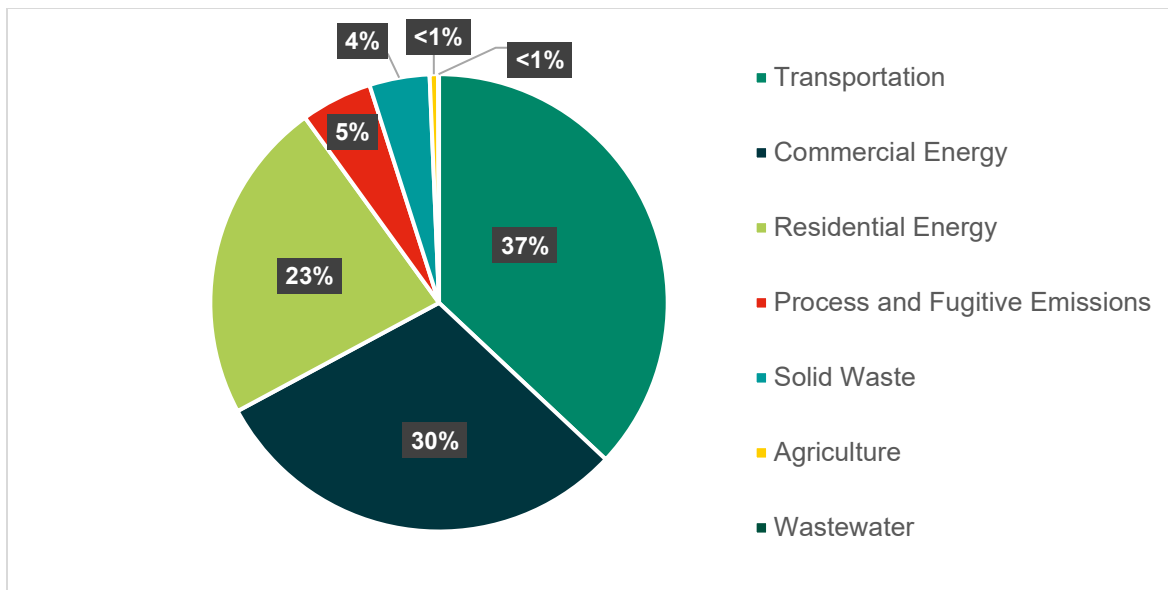
**Alignment with County Plans:** The recommended actions in the CESMP align with and contribute to meeting the goals and action strategies in our Comprehensive Plan and 2021-2024 Strategic Plan (see [Error! Reference source](#)

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not found.). As part of CESMP development, county emissions were projected to 2050 utilizing the County's growth projections that were provided in the Comprehensive Plan. This included projected population growth, vehicle miles traveled, and commercial building growth. In working towards meeting the Climate Mitigation and Resiliency goals, the CESMP is recommending implementation of many of the Smart Growth action strategies already included in the Comprehensive Plan and Strategic Plan.

**Plan Structure:** The CESMP reviews the county's GHG emissions and climate vulnerability context, outlines what it will take for us to reach our goals, and establishes what we can do to meet these goals through local climate actions. The CESMP divides our 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 further 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. These inventories are created every two years by the Metropolitan Washington Council of Governments (MWCOCG). The 2018 inventory with the county's primary GHG emissions-producing sectors is show in **Figure 1** below. A detailed explanation of why we utilized the 2018 inventory for our baseline instead of the 2020 inventory is provided in **Error! Reference source not found..**



**Figure 1. 2018 Community-wide Emissions by Sector**

**Climate Vulnerability Assessment:** We assessed our county's vulnerability to current climate hazards from extreme temperatures, precipitation, coastal flooding and sea level rise, drought, 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 describe what we 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 limitations in our ability to influence these sectors, and determine areas of opportunity for new action development. We 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 government; and cost savings to the County

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government. After gathering stakeholder feedback, we conducted an action prioritization exercise to organize actions into high, medium, and low priority categories.

**Meeting the GHG Reduction Goal:** To understand what it would take to achieve the 2030 GHG reduction goal, we developed a scenario made up of a mix of strategies needed to reach the 2030 goal. When developing this scenario, we first evaluated how external regulatory or market forces would impact emissions over time. These forces include factors like expected electric vehicle (EV) adoption or technology improvements that are projected to help reduce emissions without additional County action. These external factors result in nearly 32% of emissions reductions needed to meet the County's 2030 GHG reduction goal.

Building on these external regulatory and market forces, we selected a set of strategies to show what it would take to reach the 2030 GHG goal and to guide climate action development. Two important strategies identified to meet the 2030 goal include ensuring over 90% of the electricity used in the county comes from clean energy sources (e.g., solar, wind, hydropower, nuclear, biomass, and geothermal) and that half of passenger and medium-duty vehicles traveling within the county are electric or produce zero-emissions. These two strategies are estimated to produce about 80% of the total GHG reductions needed to meet the 2030 goal.

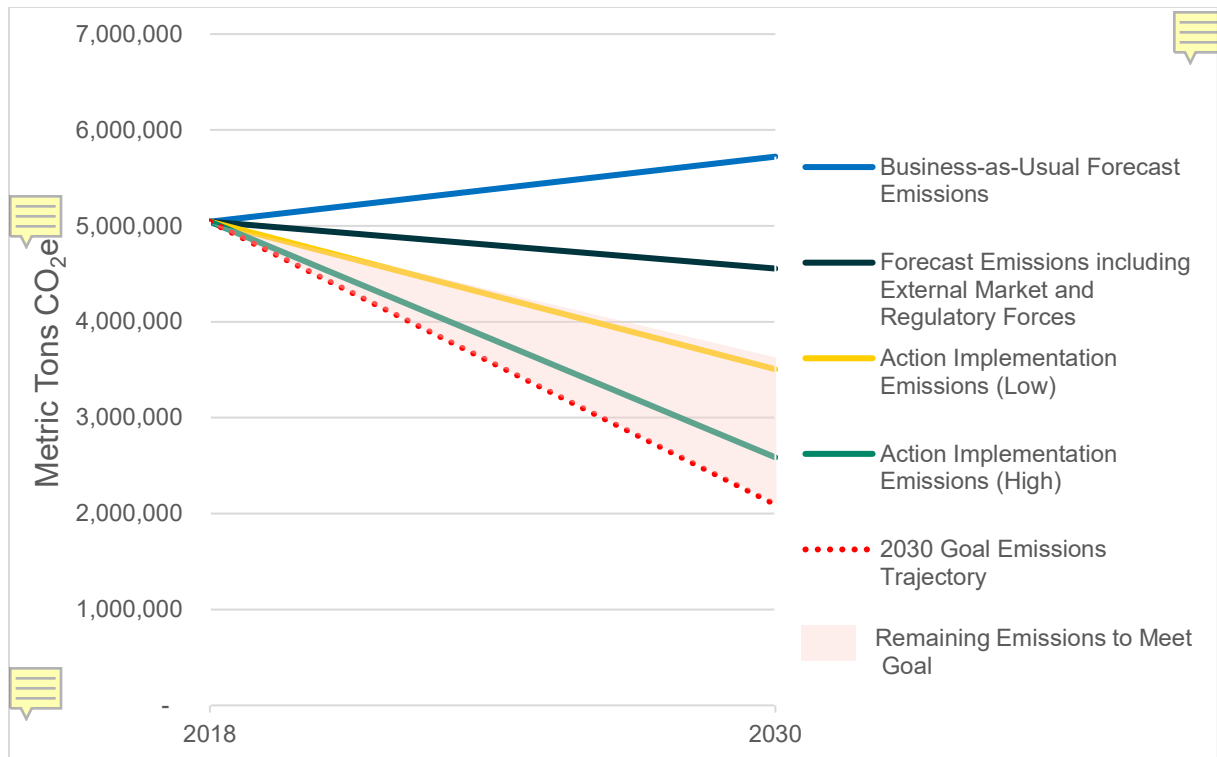
With the County government's lack of control over county-wide emission sources, it will not be possible to meet all of the goals through County government action alone. Looking at **Figure 2**, the bottom dotted red line shows the 2030 county-wide GHG reduction goal trajectory (2,100,000 MTCO<sub>2e</sub> in 2030), and the black line is the projection of where emissions will be if the county takes no action, minus the reductions from external market forces (4,600,000 MTCO<sub>2e</sub> in 2030). To meet the 2030 county-wide GHG reduction goal, the county would need to reduce emissions by about 2,500,000 MTCO<sub>2e</sub> in 2030.

The middle yellow and green lines in **Figure 2** show the potential range of emissions reduction impact from CESMP actions. For example, if there is high collective community participation for some actions, this may result in higher emissions reductions while less participation may result in lower emissions reductions. Looking at this range, if we implement all actions listed in the CESMP, we estimate a gap in reductions needed to meet the 2030 goal of about 500,000 – 1,400,000 MTCO<sub>2e</sub> (shown as the shaded pink area).

This gap could potentially be bridged with the help of significant external support, such as contributions from market factors, state- and national-level regulation, incorporating forest and tree carbon fluxes into our GHG inventories, or potentially through the purchase of high-quality carbon offsets. However, it is important to emphasize that the acquisition of carbon offsets would be our last resort as the first line of action should always be focusing on direct emissions reductions.



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**Figure 2. GHG Reduction Potential and Remaining Emissions**

The intent of the CESMP is to build upon what we already have been doing in energy conservation, decarbonization, and adaptation to climate change. Our county is already making progress towards the Climate Mitigation and Resiliency goals. Among many actions, our county currently captures landfill methane to generate electricity and we are building out a new renewable natural gas facility; we established a Residential Solar Task Force to streamline the permitting processes; we began procuring EVs and building out charging infrastructure; we built an automated flood warning system; and we coordinate community outreach and preparedness engagement through the Ready Prince William program. For a full list of actions the county has already taken, see [Error! Reference source not found.](#)

With timely implementation of the high priority actions in the CESMP, we can continue to build upon the County's successes and put ourselves in a position to strive towards meeting the Climate Mitigation and Resiliency goals to the best of our ability.

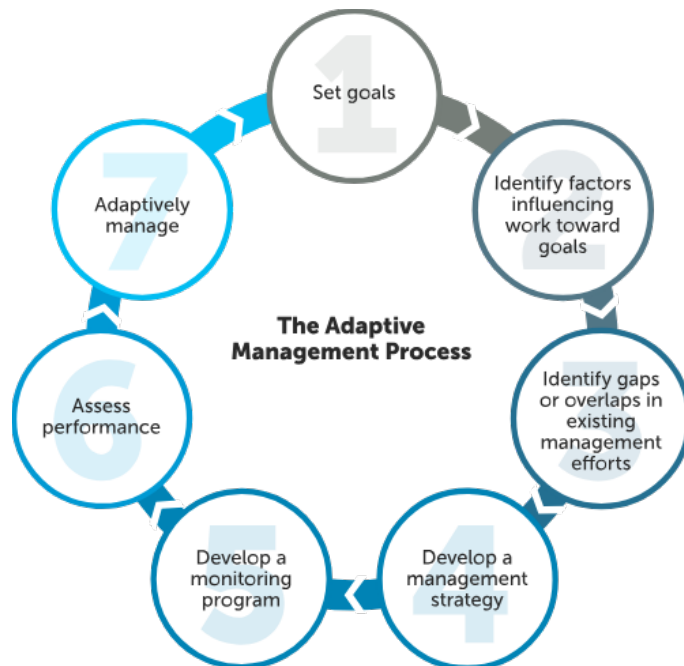
**Next Steps:** In addition to the specific actions identified through the analysis described above, the CESMP includes three foundational program-wide sustainability initiatives designed to improve the County's ability to monitor and implement the plan:

1. **Implementation of an "Adaptive Management" approach** that improves our ability to make decisions in the face of uncertainty and complexity
2. **Assessments for Climate Mitigation and Resiliency impacts** performed by the county to provide data on a project's impact on greenhouse gas emissions, renewable and fossil energy mix, and climate resiliency metrics
3. **Institutional capacity-building** to support sustainability, including staffing capacity to pursue federal grants for green programs and capacity for communication and outreach that will engage residents and businesses in the voluntary measures recommended in the CESMP.

**Adaptive Management:** Implementation of the CESMP will be dynamic effort that will require taking an Adaptive Management approach of continuous data collection, analysis, and reassessment. Adaptive Management is an intentional and iterative approach designed for decision making in situations characterized by volatility (rapid change), uncertainty, complexity, and ambiguity. The County intends implement the CESMP through a process similar to the

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one employed by the Chesapeake Bay Program, shown in **Figure 3** below, to making decisions and adjustments in response to rapidly evolving technologies, policies, strategies, and funding opportunities. Note that stakeholder input is a continuous element of the process.



**Figure 3. Adaptive Management Process**<sup>6</sup>

As a next step, we will need to develop a system for annually assessing the impact of the proposed actions towards meeting the climate mitigation and climate resiliency goals. This work has already begun through the development of Implementation Roadmaps for the 25 high priority actions (see Error! Reference source not found.). The roadmaps identify the County government departments that will lead implementation; supporting partners; implementation steps; action cost range; and high-level performance indicators (which will form the basis of the monitoring and performance assessment steps). This appendix also includes a description of additional cost saving considerations for the action. These are general descriptions as many actions would require further analysis of feasibility studies to determine exact savings. When budget requests are made for the actions, more specific cost savings information will be included.

The implementation roadmap actions are fluid and may change as the county's emission sources, funding sources, and department roles change. They are not a requirement for lead departments to complete each implementation step or a guarantee that all actions will be implemented. They are simply a recommended starting point to begin action. Given the complexity and magnitude of the systems we are managing, we need to act now with the best current information available. The Office of Sustainability will have an oversight role in guiding and tracking action implementation, but actual action implementation will be led by the respective departments.

As a part of the adaptive management approach, we expect that methodologies for analysis of the County's emissions will continue to evolve over time. In the future, we expect to incorporate forest carbon sequestration, assess how commercial building owners and businesses may use renewable energy to reduce their carbon intensity, forecast clean energy growth in the electric grid, account for the effects of the Federal Inflation Reduction Act (IRA) on the carbon intensity of the electric grid and electric vehicles, and conduct a more detailed analysis of the effectiveness of smart growth measures.

Additionally, we recommend incorporating the social cost of carbon in the methodology as a metric for quantifying action impact. The social cost of carbon is an estimation of the cost in dollars of either negative implications of

<sup>6</sup> Source: <https://www.chesapeakebay.net/what/what-guides-us/decisions>

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adding a ton of carbon emissions to the atmosphere, or the benefit of reducing a ton of carbon emissions. For example, the EPA currently estimates the social cost of reducing a ton of carbon in 2030 to be around \$230<sup>7</sup>. If the county were to meet the 2030 goal of reducing emissions by 50% from a 2005 baseline, the benefit to society would be valued at an estimated \$322M per year.



**Assessments for Climate Mitigation and Resiliency Impacts:** The county currently conducts environmental reviews for rezonings, comprehensive plan amendments (CPAs), special use permits (SUPs), and major road projects. These reviews rate projects in terms of their conformance to goals of the Comprehensive Plan, Strategic Plan, Schools Plan, and other county planning documents, as well as compliance with environmental regulations.

In the future, County staff recommends that the Board consider amending relevant County regulations and policies, consistent with applicable law, to assess greenhouse gas emissions, to assess renewable and fossil energy mix, and to assess climate resiliency metrics. This would provide additional information about the potential environmental impacts of specific rezoning and special use permit (SUP) applications, Capital Improvement Program (CIP) projects, and Comprehensive Plan Amendments (CPAs) on the community based on the Board's adopted Climate Mitigation and Resiliency goals.

The Office of Sustainability is requesting an Environmental Analyst position to assist with developing and/or reviewing these assessments.

**Institutional Capacity:** To implement the CESMP, one of the necessary first steps is to build up institutional capacity to execute the foundational elements of the plan. This includes key activities such as increasing staff capacity to pursue federal grants for green programs and the capacity for communication and outreach that will engage residents and businesses in the voluntary measures recommended in the CESMP.

To begin implementation, the Office of Sustainability is hiring a Climate and Energy Manager to provide the necessary support to begin to stand up projects and programs for the high priority actions in the CESMP. The County will also utilize the \$1.04M in Capital Improvement Program Projects (CIP) funding that has been allocated by the Board via Resolutions 21-663 and 22-573 for the CESMP to kick-start actions that are related to County infrastructure. The following CIP projects are recommended for consideration as first steps:

Capital Improvement Program Projects:

- Installing solar on buildings identified in FFM feasibility study (Action E.5)
- Feasibility study for electrification of County-owned buildings (Action B.5)
- Transition of high-pressure sodium streetlights to LED (estimated 200 streetlights) (Action B.7)

In addition to the CIP funds that have already been allocated for CESMP implementation, the following budget requests for FY25 would provide the institutional capacity needed for the first year of implementation:

General Fund FY25 Budget Requests:



- Sustainability Communications and Outreach Manager– Manage grant writing opportunities and communications with the public, including campaigns about available resources and incentives
- Environmental Analyst – Stand up the Adaptive Management system for analyzing progress towards the Climate Mitigation and Resiliency goals. This would include development and review of assessments for impacts of major projects on Climate Mitigation and Resiliency goals, and tracking CESMP implementation costs and savings.

Lastly, we recommend that the CESMP is incorporated into the Comprehensive Plan through an amendment to the Comprehensive Plan, and that the action strategies of the CESMP are incorporated into the County's next Strategic Plan. This step would help fulfill the mandate in Board Resolution 20-773 to "incorporate into the Comprehensive

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<sup>7</sup> [“Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review”: EPA External Review Draft of Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances](#))

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Plan goals of 100% of Prince William County's electricity to be from renewable sources by 2035, for Prince William County Government operations to achieve 100% renewable electricity by 2030, and for Prince William County Government to be 100% carbon neutral by 2050". This would also support implementation of the many sustainability strategies already established in the Comprehensive Plan and 2021-2024 Strategic Plan.

