

MONTGOMERY COUNTY CLIMATE ACTION PLAN

Building a Healthy, Equitable, Resilient Community

JUNE 2021



Acknowledgements

Thank you to the many people who contributed to the development of the Climate Action Plan, including technical workgroup members, the County’s Climate Planning Team and Climate Leadership Team, the Equity-Based Inter-Departmental Community Engagement Team, and the AECOM consulting team. This Plan—and its future development and implementation—represents a collaborative community effort, built upon the work and passion of many.


AECOM



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Hyperlinks to internal tables and figures are in **bold black** text.

Artwork

During fall and winter 2020, Montgomery County hosted a competition for climate change artwork to be featured in the Climate Action Plan. The winners were announced in April 2021 (***read the press announcement***). Winning artwork and other notable entries appear throughout the Climate Action Plan. The Montgomery County Climate Planning Team is grateful to all artists who submitted high-quality, creative entries to the art contest.

A fully ADA-complaint version of this document will be made available on the County website.

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Definitions

The table below provides definitions of key terms used in the Plan.

Table 1: Definitions of key terms

Term	Definition
Adaptive Capacity	The capability of people, systems, and assets to cope with a climate hazard
Baseline	Climate conditions or greenhouse gas (GHG) emissions snapshot with which to begin tracking adaptation or reduction progress
Biochar	A carbon-rich charcoal produced from the controlled burning of wood and plant matter
Carbon-free	Sources of energy that do not emit greenhouse gases, including wind, solar, and nuclear; used interchangeably with the term "decarbonized" in reference to energy types
Clean Energy	Energy from renewable, non-carbon-emitting sources; this excludes nuclear and biomass generation
Emissions Lock-In	Being locked into continued emissions from a fossil-fuel-based technology with a long useful life
Energy Burden	The percentage of household income that goes toward utility bills
Environmental Racism	The disproportionate impact of environmental hazards such as air pollution on people of color and "energy burden" - percentage of household income that goes toward utility bills
Environmental Stewardship	Increased creation, preservation, or restoration of natural environments
Exposure	Level of contact people, systems, and assets have with a climate hazard
Extrapolated	Inferred values for unknown data points, using extended graphed trends with known historical data
Fossil Fuels	Energy from finite, nonrenewable sources created by natural geologic processes, which include coal, natural gas, and oil
Gray Water	The relatively clean used water from baths, sinks, washing machines, and some kitchen appliances that is typically discharged for water treatment directly after use, but that can be reclaimed and reused for certain purposes
Interpolated	Inferred values for unknown data points, using trended known data for years before and after the desired data point
Micromobility	Transportation by lightweight, low-speed vehicles such as scooters or bicycles, either mechanical or electric
Mitigation	Reduction of annual GHG emissions from a source
Public Health	Increased life expectancy or reduced incidents of diseases or deaths attributed to air quality (indoor or outdoor), weather, poor sanitation, or lack of access to nutrients
Racial Equity	When race can no longer be used to predict life outcomes
Recurrence Interval	The probability that a given storm event will occur in any given year; also known as a return period
Resilience	Ability to withstand and recover from a climate hazard
Sensitivity	Level of negative impact to people, systems, and assets from a climate hazard
Social Justice	When all people have access to the same rights and systems, there is a fair distribution of resources, and life outcomes are improved for all groups

Table 1: Definitions of key terms (continued)

Term	Definition
Underrepresented Community	A community that is not represented in County or local leadership proportionately to its demographic percentage of the total County population
Vulnerability	Diminished capacity of an individual or group to anticipate, cope with, resist, and recover from the adverse impacts of stressors and shocks, including natural, human-made, and socially constructed hazards
Zero Emission Vehicles	Vehicles powered by electricity or other clean fuel technologies, including hydrogen fuel cells

Acronyms

°C	degrees Celsius
°F	degrees Fahrenheit
ADA	Americans with Disabilities Act
AFOLU	Agriculture, Forestry, and Other Land Use
AIM	American Innovation and Manufacturing
AR	Agricultural Reserve
ASAP	Action Selection and Prioritization
BEPS	Building Energy Performance Standard
BIPOC	Black, Indigenous, and People of Color
BRT	Bus Rapid Transit
C-PACE	Commercial Property Assessed Clean Energy
CAP	Climate Action Plan
CCE	Community Choice Energy
CDC	Centers for Disease Control and Prevention
CEAQAC	Climate, Energy, and Air Quality Advisory Committee
CEX	County Executive Office
CO ₂ e/CO ₂ e _q	carbon dioxide equivalent
CO ₂ e/yr	carbon dioxide equivalent per year
CSA	Community Supported Agriculture
CUPF	Community Use of Public Facilities
CURB	Climate Action for Urban Sustainability
DC Water	District of Columbia Water and Sewer Authority
DEP	Department of Environmental Protection
DGS	Department of General Services
DHCA	Department of Housing and Community Affairs
DNR	Maryland Department of Natural Resources
DOF	Department of Finance

DPS	Department of Permitting Services
EJ	environmental justice
EPA	U.S. Environmental Protection Agency
EV	electric vehicle
EVSE	electric vehicle supply equipment
FEMA	Federal Emergency Management Agency
FLEx	Forecasting Local Extremes
FRS	Department of Fire and Rescue Services
GCM	general circulation model
GHG	greenhouse gas
GIS	geographic information system
HB	House Bill
HFC	hydrofluorocarbon
HHS	Department of Health and Human Services
HOA	homeowner's association
HOV	high-occupancy vehicle
HVAC	heating, ventilation, and air conditioning
I-495	Interstate 495
ICLEI	International Council for Local Environmental Initiatives - Local Governments for Sustainability
IPCC	Intergovernmental Panel on Climate change
IPPU	Industrial Processes and Product Use
LPG	liquid petroleum gas
MARC	Maryland Area Regional Commuter
MCCPTA	Montgomery County Council of Parent-Teacher Associations
MCDOT	Montgomery County Department of Transportation
MCEDC	Montgomery County Economic Development Corporation
MCG	Montgomery County Government
MCGB	Montgomery County Green Bank
MCPD	Montgomery County Police Department
MCPS	Montgomery County Public Schools
MDE	Maryland Department of the Environment
MDOT	Maryland Department of Transportation
MDTA	Maryland Transportation Authority
M-NCPPC	Maryland-National Capital Park and Planning Commission
MS4	Municipal Separate Storm Sewer System
MSDE	Maryland State Department of Education
MT CO ₂ e	metric tons of carbon dioxide equivalent

MW	megawatt(s)
MWCOG	Metropolitan Washington Council of Governments
N ₂ O	nitrous oxide
N/A	Not Applicable or Not Available
NBS	nature-based solutions
NREL	National Renewable Energy Laboratory
OAG	Office of Agriculture
OCA	Office of the County Attorney
OEMHS	Office of Emergency Management and Homeland Security
OHR	Office of Human Resources
OIR	Office of Intergovernmental Relations
OLR	Office of Labor Relations
OMB	Office of Management and Budget
P3	Public-Private Partnership
Paris Agreement	Paris Climate Agreement
PIO	Public Information Office
PPA	Power Purchase Agreement
PSC	Public Service Commission
RCP	Representative Concentration Pathway
REC	Recreation Department
RECs	renewable energy certificates
RPS	Renewable Portfolio Standard
SERT	School Energy and Recycling Team
SHA	State Highway Administration
SOV	single-occupancy vehicle
SSL	Student Service Learning
SVI	Social Vulnerability Index
TBD	to be determined
TDM	Transportation Demand Management
TEBS	Department of Technology and Enterprise Business Solutions
Thrive 2050	Thrive Montgomery 2050 Plan
TMD	Transportation Management District
TNC	Transportation Network Company
TOD	Transit Oriented Development
tonne	metric tonne or roughly 1.1 U.S. tons
WMATA	Washington Metropolitan Area Transit Authority
WSSC	Washington Suburban Sanitary Commission
ZEV	zero emissions vehicle

Letter from the County Executive



Marc Elrich

We are facing a climate emergency. Montgomery County's climate goals—to reduce our communitywide greenhouse gas emissions 80% by 2027 and 100% by 2035—are among the most ambitious in the country and the world. This plan is Montgomery County's strategic roadmap to achieve our climate goals.

All of us know that this plan is ambitious. When the Council set these goals for addressing greenhouse gas emissions, it did not know HOW we would achieve them, but we knew we had to find a path TO achieve them. We also knew that setting more modest goals might be easier to achieve but would leave us far short of making the progress we must make. We opted for the harder path, and everything that is being discovered about the impact of climate change has only increased the urgency of our work. No blueprint for action came with the legislation the Council passed, so our immediate task was to convene residents' working groups. We have taken their recommendations and mapped out a path: evaluating strategies and setting forth a course of actions that we need to take.

The plan also includes strategies for climate adaptation and resilience. We are already feeling the impacts of climate change here in our County—hotter summers, increased flooding events, and more extreme storms. The strategies outlined in this plan focus on those in our community who are most vulnerable to the impacts of climate change, and identify opportunities and co-benefits to enhance racial equity while reducing emissions.

Because many Montgomery County residents have tremendous expertise in climate and energy issues, I tried to include as many knowledgeable and dedicated people as possible in the development of this plan. The hundreds of ideas generated by our residents are reflected throughout this plan. I am incredibly grateful to all of you who worked so hard and who carved out so many hours to lay the foundation for this important work.

The climate plan was developed in the midst of the COVID-19 pandemic, which has sharply highlighted the existing inequities in our own community. The pandemic has also created a global recession that will significantly constrain the County's fiscal capacity. We have no choice but to address COVID-19, climate change, economic disruption, and racial inequity simultaneously. Doing so makes great sense regardless of our fiscal circumstances because these issues are fundamentally intertwined and thus require integrated strategies that cut across sectors. We cannot address climate change without recognizing its disproportionate impacts on certain segments of our population. We cannot mobilize community members to reduce emissions if they are overwhelmed by COVID-19, and we cannot rebuild our economy without considering both racial equity and climate change.

Although the path ahead will not be easy, it will also be a path of opportunity—a path to improve our quality of life while reducing emissions, to address racial and public health disparities while implementing climate solutions, and to strengthen the bonds of community as we collaboratively forge a brighter future.

The recommendations outlined in the following pages reflect a future reimagined, one in which our buildings, transportation system, government processes, consumption patterns, and community engagement efforts are all realigned to meet our generation's greatest challenge. We need to do everything we can, and we need all hands on deck to tackle climate change. We must also be flexible and nimble in our approaches in order to take advantage of changes in technology and new opportunities that arise after the Climate Action Plan is published. This Climate Action Plan will be a living document that gives us the opportunity to make adjustments to actions through an annual review. This is important. Since we started this journey, there have been some important changes in terms of what's possible. A year ago, for example, Community Choice Energy did not exist, so we had no possibility of shifting the county's electric supply to renewables. Recently passed legislation now makes that possible, and we await the Public Service Commission's rule-making process, which will be completed in 18 to 24 months. This will free the County to shop for clean energy for the entire county.

Another change has been the speed of the shift toward electric or hydrogen vehicles, which makes it possible to create green mass-transit and which will find many of the key automakers moving to electric vehicles in this decade. Such a rapid shift was not envisioned when we wrote the Emergency Climate Mobilization resolution. And a third big change has been the falling price of batteries for electric storage, improving the prospects for clean, locally-generated energy and reducing reliance on the grid. I point these out because these three steps forward, change our path toward clean energy. As these and other technologies come on line, we are likely to find new opportunities to achieve our goals, opportunities that are not available on the market today. Our plan lays out what needs to be achieved, but we will continually be looking for improved opportunities to take advantage of more efficient and more affordable strategies. And, yes, because affordability impacts our speed of adoption, we are looking at more cost-effective ways to improve the economics of this work, as evidenced by the groundbreaking financing structure that is allowing the school system to move forward with electrifying their school bus fleet.

I am confident that our county will be a leader in addressing climate change and that the direction of innovation will work to our benefit. It is my hope that others will wake up to the urgency of our current situation and join us in trying to solve these challenges in the shortest time frame possible. Changes in Federal and State policies, the adoption of aggressive targets and a willingness to help fund the transition to clean energy will only help us achieve our goals.

Montgomery County, let's roll up our sleeves and write this groundbreaking next chapter together!

Our Vision for Building a Healthy, Equitable, Resilient Community



Clean Energy

Montgomery County uses and invests in clean, reliable, affordable electricity.

- Ensure broad access to affordable carbon free electricity.
- Create demand for clean energy jobs, secure funding to support clean energy, and optimize economic activity in clean energy.
- Expand renewable electricity generation and use of distributed energy resources.



Buildings

Montgomery County is home to resilient and efficient buildings.

- High-performance buildings should be equitably available to all County residents.
- Increase energy conservation and efficiency and decrease fossil fuel use in all buildings, with the County leading by example with its own building portfolio.
- Support sustainable, carbon neutral building design, improvements, and energy sources.
- Phase in building requirements while providing transparency to residents and businesses and developing the market knowledge to best meet those requirements.
- Expand access to incentives, financing, and programs to construct or upgrade to resilient, efficient commercial and residential buildings.
- Create demand for jobs and grow the workforce by transitioning to resource-efficient, low-carbon, resilient buildings.



Transportation

Montgomery County safely, affordably, and sustainably moves people and connects places.

- Transition to 100% zero emissions transportation and expand the supporting infrastructure.
- Provide clean, efficient, frequent, and reliable public transit.
- Reduce the use of personal automobiles and increase use of transit and active transportation options, such as biking, walking, and micromobility services, with safe, supportive infrastructure and land use, along with greater use of transportation demand management to achieve trip reduction.
- Introduce new technologies and approaches to transition to a green transportation system.



Carbon Sequestration

Montgomery County has conserved and enhanced its nature-based solutions, including forest, meadow, and wetland ecosystems, greenspaces, and trees, while reversing carbon dioxide emissions. The County is committed to continuing to enhance the wide array of benefits from these resources.

- Work across sectors and integrate nature-based solutions.
- Support and implement policies and strategies for land conservation.
- Retain, increase, and restore terrestrial ecosystems including forests, meadows, wetlands, green spaces, and urban trees.



Climate Adaptation

Montgomery County is equipped with the resources and infrastructure to withstand the impacts of climate change.

- Prioritize people and communities that are the most vulnerable and the most sensitive to the impacts of climate change.
- Provide suitable infrastructure and tools to reduce the risks and impacts of more extreme climate hazards.
- Protect public health from climate-driven impacts.



Climate Governance

Montgomery County is institutionalizing an organizational culture and structure that fosters creativity, cross-department collaboration, and innovation to implement systemic climate solutions.

- Align and orient staffing, technical capacity, processes, and decision-making to address climate change.
- Embed continuous improvement and accountability into ongoing work.
- Utilize all policy and process levers of government to spark the multiplier effect.



Public Engagement, Partnerships, and Education

Montgomery County's community members are empowered, engaged, and motivated to take action on climate change while striving for equity among all members of the community.

- Facilitate inclusive, community-driven civic leadership, particularly with residents who are Black, Indigenous or People of Color (BIPOC), low-income residents, and other communities most vulnerable to the impacts of climate change so that power and decision-making are shared and solutions are co-created.
- Build strategic partnerships among Maryland counties to shape ambitious state climate policies.
- Build strategic partnerships with municipalities to pilot innovative programs that can be replicated across the County.
- Empower youth to take action at home and in their community.
- Build community trust and partnerships with residents by amplifying their voices, listening to their concerns, and tailoring resources and support that are relevant to their day-to-day lives.



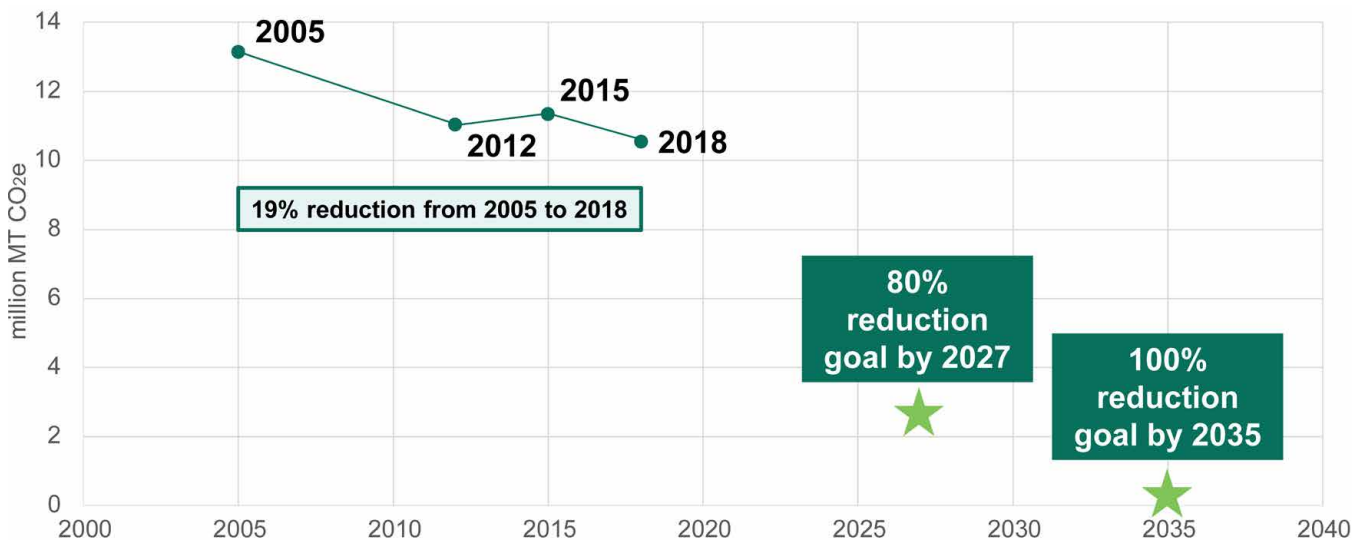
Executive Summary

The Climate Action Plan (CAP) (also referred to as "the Plan") is Montgomery County's strategic plan to cut greenhouse gas (GHG) emissions 80% by 2027 and 100% by 2035 compared to 2005 levels. The CAP also details the effects of a changing climate on Montgomery County and includes strategies to reduce climate-related risk to the County's residents, businesses, and the built and natural environment. The 86 climate actions included in the CAP outline the path to meet the County's ambitious climate goals while building a healthy, equitable, and resilient community.

The CAP was spurred by the Montgomery County Council's Emergency Climate Mobilization Resolution, which set the ambitious community-wide GHG emissions reduction goals compared with 2005 levels. The resolution recognized the existential threat that climate change poses

to human society and to natural ecosystems and called for Montgomery County to play a leadership role in modeling strategies to safeguard the planet.

Tackling climate change requires transforming the basic building blocks of modern society. Significant changes will be necessary in the way we generate and use energy, including how we heat and cool our homes, how we fuel vehicles, and how products we purchase are made and disposed of. Systemic societal changes such as these do not occur overnight. Nonetheless, the urgency of climate change inspires Montgomery County to serve as a model for other jurisdictions. Collectively, communities across the state of Maryland, the country, and the world must tackle climate action at the scale that is necessary to curb the cataclysmic social, environmental, and economic impacts of climate change.



Source: Metropolitan Washington Council of Governments (MWCOG) Montgomery County GHG Inventory

Figure ES-1: Montgomery County GHG emissions reduction progress and goals

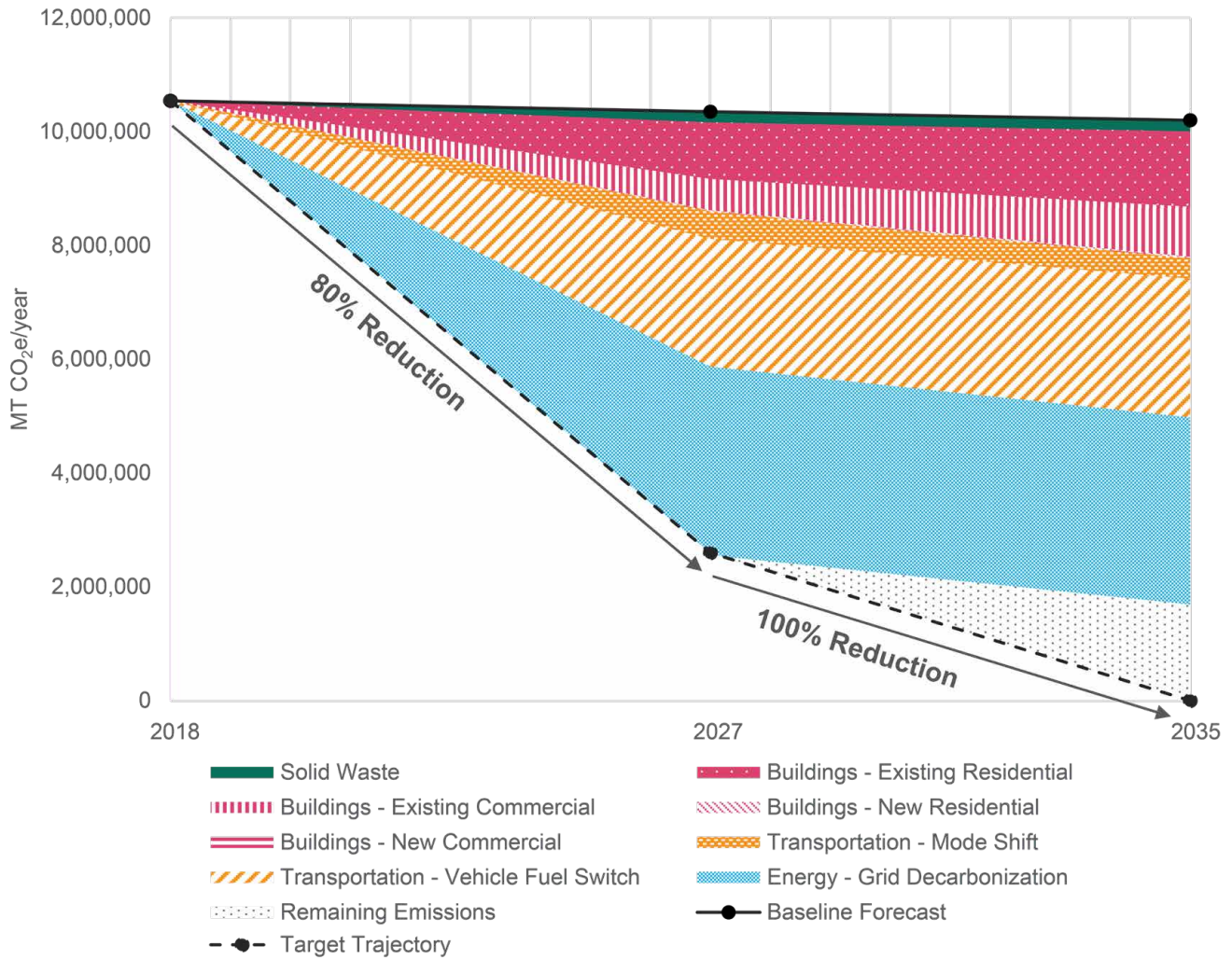


Figure ES-2: Montgomery County GHG emissions reduction pathway across the County’s major GHG emissions sectors

A Path to Meet Montgomery County's Zero Greenhouse Gas Emissions Goal by 2035

1. Reduce Emissions in the Energy, Buildings, and Transportation Sectors

Achieving the County's climate goals will require transitioning the electricity grid to decarbonized energy by 2030. The County will need to leverage a combination of energy conservation and efficiency and distributed renewable energy resources to reduce the amount of electricity consumed in the County that is provided from the electric grid while at the same time working diligently for a resilient, carbon-free electric grid. The County will need to deploy a combination of energy performance standards, legislative and code requirements, and incentives to support 100% building electrification by 2035.

The State of Maryland plays an important role in decarbonizing the grid. The extent to which the state leads on this has fundamental impacts for the County. If the County does not have to decarbonize the local grid, then it can focus its resources on other areas of GHG emissions reductions, such as making buildings more efficient. Absent State action, the County can become the electricity supplier to many customers in the County through a Community Choice Energy program, via the development of local renewable sources or by purchasing electricity and/or Renewable Energy Credits (RECs) (under defined terms) from renewable resources outside the County. The development of local resources would provide economic and health benefits in addition to reducing GHG emissions.

To reduce transportation emissions, 100% of private and public transportation options in the County will need to be electrified or use other zero emissions power sources by 2035. Mode shifting to transit and active (walking, bicycling, etc.) transportation will also be necessary to reduce private vehicle use. The County will need to support programs and resources,

such as educational campaigns and financing tools, to support electric vehicle (EV) adoption. An expansive, accessible public EV charging infrastructure network will be needed to support widespread EV adoption.

The CAP actions represent the most direct and effective actions the County can take to reduce GHG emissions. Depending on a variety of factors, a select combination of these actions may meet the County's GHG reduction targets or more actions may need to be added in the future if our emissions reductions are not on track. As the years go on, our knowledge will evolve, clean energy technologies will advance, and new opportunities will emerge that were not envisioned in the CAP. In addition, specific strategies to be implemented within each of the actions may vary over time based on current technology, staff and funding resources, and political and community will. The CAP is intended to be a living document that provides the County with the opportunity and flexibility to course-correct and adjust actions over time.

2. Center Racial Equity and Social Justice

Climate change affects everyone, but it does not affect all equally. Therefore, the CAP considers the racial equity and social justice implications of each climate action and identifies equity-enhancing measures designed to address these inequities. During further development and implementation of the actions in this plan, these equity considerations should be discussed and implemented in collaboration with the community.

3. Address Residual Emissions and Carbon Sequestration

Even with implementation of all the Plan actions, there will still be some residual GHG emissions from smaller emissions sources such as wastewater or remaining emissions from larger sources such as transportation that equate to approximately 17% of the total projected 2035 emissions. Given the County's ambitious goals, it is important for the County to first focus time and resources on implementing actions with the largest GHG emissions reduction potential.

Full elimination of the County’s GHG emissions in 2035 will involve implementing carbon sequestration actions identified in the Plan, cutting emissions in smaller emissions source areas, and exploring the use of new technologies.

Carbon sequestration can offset emissions by capturing and storing carbon dioxide from the atmosphere. The Plan identifies nature-based carbon sequestration actions, including retaining, managing, and expanding forests, wetlands, and grasslands, as well as individual trees and small groups of trees that comprise the urban forest. Carbon sequestration actions also include increasing carbon in soils and improving agricultural practices.

4. Reduce Climate Risk

The CAP identifies the County’s four largest and growing climate hazards: extreme heat, extreme precipitation, high winds, and drought. It projects the climate threats to the County through 2035, 2050, and 2100 for two different climate scenarios. The Plan includes actions the County should take to reduce the risk of negative impacts from climate change (“climate risk”) by enhancing the resilience of our community and infrastructure assets. The Plan also identifies actions that are impactful at both reducing GHG emissions as well as reducing climate risk. In particular, the Plan identifies communities in the County that are likely to have less ability to adapt to the impacts of climate change, as well as physical assets that are of critical importance that may be at higher risk.

5. Identify Ways to Pay for Climate Action

Montgomery County’s climate goals are among the most ambitious of any area in the country—and the world. Achieving the County’s zero emissions goal by 2035 will require implementing big ideas and small ideas alike—across all sectors of the community. Putting many of these ideas in place will require substantial financial resources, sometimes on the order of hundreds of millions of dollars or higher. Meeting the County’s climate goals will also require advocating for policy changes beyond the County’s borders. As the County implements

the CAP, it will be critical to find ways to mitigate the cost impacts to low- and moderate-income residents in particular to ensure that our most vulnerable residents are not impacted unfairly.

The sheer scale of the work that must be done means that Montgomery County will not be able to fully implement the CAP by relying on County Government resources alone. County Government revenues are not sufficiently large to single-handedly shoulder the cost of this extent of climate action. Implementing the actions outlined in the Plan calls for commitment from both the public and private sectors while simultaneously leveraging state and federal government resources.

6. Enhance Climate Governance

Combatting climate change requires an organizational backbone. The **Climate Governance Actions** section of the CAP includes actions to enhance climate change awareness, knowledge, and technical capacity among Montgomery County Government staff. The CAP also includes actions to institutionalize climate change considerations within Montgomery County Government processes and decision-making and actions to implement approaches to measure and report on progress. Implementing climate governance will also foster opportunities for creativity, collaboration, and innovation among County staff and community partners to implement climate solutions.

7. Partner with the Community in Climate Action

Engaging local residents and community organizations was key in developing the CAP. The actions and technical analysis presented in the Plan build upon the work of countless dedicated County employees, volunteer members of the climate workgroups, and community groups. Public engagement will continue to play an important role in implementing the CAP. Active engagement by residents and businesses is critical to the success of the CAP. To that end, the Plan includes actions to harness innovation and commitment within the community for climate action. The **Public Engagement, Partnerships, and Education Actions** section of the CAP includes

actions to enhance climate communications to the general public; standardize authentic and inclusive community engagement that creates new entry points for residents to be involved in climate action; strengthen state and regional coordination and collaboration; develop new strategic partnerships to galvanize support across key stakeholder organizations, communities, and jurisdictions; and provide increased opportunities for educating students about climate change and to empower them to take action at home and in their community.

8. Take the Next Steps

Montgomery County is already taking steps to implement some of the Plan's actions, while other actions will require additional analysis and detailed feasibility work prior to implementation. Further development and implementation of these actions will take continued community involvement and support in the months and years ahead. The County's approach to implementing the plan will evolve over time as new GHG reduction strategies emerge that were not envisioned in the CAP.

On an annual basis, the County will develop and release a climate work plan of the initiatives planned for the upcoming fiscal year in support of the CAP. Regarding the initiatives that will be undertaken in the upcoming year, the annual climate work plan will include the County's commitments, along with the available resources and staff capacity, as determined by the annual budgeting process.

The urgency of taking immediate action on climate change does not eliminate the need to ensure that the democratic principles and processes of this country and the community are adhered to. For example, public discourse and public input are necessary before new policies are adopted. As Christiana Figueres and Tom Rivett-Carnac, the architects of the Paris Climate Agreement (Paris Agreement) have stated, "all the measures to address climate change still require further maturation; none guarantee ultimate success."¹ Despite the uncertainties that lie on the horizon, Montgomery County must forge ahead to meet this challenge. Although

the path to meeting the County's climate goals will not be easy, it will also be a path of opportunity. The actions outlined in the CAP set forth the path to improving our health and quality of life, addressing racial disparities, and strengthening the bonds of community. As we set an example, we hope we will inspire other communities around the nation and the world to join us in collaboratively forging a safer and brighter future.

A comprehensive list of all CAP actions is provided in **Appendix A**.

What the CAP Addresses

- The Plan addresses both GHG reductions (carbon mitigation) as well as climate risk reduction (climate adaptation). It is an integrated mitigation and adaptation plan.
- The Plan serves as a strategic guide for the work the County will need to undertake between now and 2035 in support of its ambitious GHG reduction goals.
- The Plan is centered on Montgomery County—its geography and history, its residents and businesses, its political and community institutions and authorities. The Plan also discusses the points of leverage and intersection with stakeholders beyond the County's borders, such as other jurisdictions and the State's Public Service Commission.
- The Plan identifies Montgomery County's major GHG emissions sectors, including energy supply, buildings, and transportation, and lays out actions to directly reduce GHG emissions in these sectors.
- The Plan identifies the primary climate hazards impacting the County, including extreme heat, extreme precipitation, high winds, and drought. It includes actions to reduce the risk of negative impacts from climate change ("climate risk") by enhancing the resilience of our community and infrastructure assets.

- The Plan recognizes that not all actions can be implemented simultaneously and that judgment calls will need to be made regarding the sequencing of actions in light of resource constraints, public support, and other factors. To facilitate action implementation, the Plan provides multiple ways for readers and decision makers to compare and rank actions against one other:
 - » Identifies the primary benefit of each action (GHG emissions reduction, climate risk reduction, or both).
 - » Estimates the GHG emissions reduction potential for each action.
 - » Identifies the climate hazard that the action addresses.
 - » Assesses the level of feasibility to implement the action, based on estimates of the initial upfront costs to the County and to the private sector, and the level of County authority to implement the action.
 - » Estimates the level of impact the action would have on each of four co-benefits. The co-benefits assessed for each action are environmental stewardship, economic prosperity, public health, and racial equity and social justice. These co-benefits add an important—and difficult to calculate—dimension to the calculation of the costs and returns associated with taking a particular CAP action.
- In addition to rating each action for its racial equity and social justice impact (one of the four co-benefits), the Plan develops equity-enhancing measures for actions that are initially rated as having a less than “very positive” rating for racial equity and social justice.
- The Plan identifies actions related to governance and public engagement that are needed to support the implementation of the GHG emissions reduction and climate risk reduction actions.
- The Plan identifies personal or individual actions that residents and businesses can take to reduce GHG emissions and climate-related risk.

What the CAP Does Not Address

- The Plan is not a complete instructional guide or “recipe book” for action implementation. As actions are scheduled for implementation, additional analysis is being conducted in support of policy development.
- The Plan does not focus on actions that are outside of the County’s control to implement. This includes emission sources such as refrigerant emissions, which are under the purview of the state and federal government to regulate.
- The Plan itself is not an implementation plan with detailed costs and timelines. Identifying the exact costs and funding sources across all CAP actions is not possible due to current data limitations, which will need to be addressed during action implementation. In addition, the cost and timeline for bringing new technologies to scale (such as hydrogen fuel cell vehicles) is not yet known. As a companion to the CAP, on an annual basis the County will develop and release a climate work plan of the initiatives planned for the upcoming fiscal year in support of the CAP. The annual work plan will enable the CAP to be a living document and provide the County with the opportunity and flexibility to course-correct and adjust actions over time as technology evolves and additional funding becomes available. The annual work plan will include the County’s commitments to efforts that will be undertaken in the upcoming year, including the available resources and staff capacity for these efforts. The Plan itself does not dictate where funds will come from, as it is ultimately a political decision made by County elected officials.
- The Plan does not answer all questions that the community has about climate change and climate action. The state of knowledge regarding these issues will continue to evolve, and acting and planning on climate will be iterative processes. Data collection and planning efforts will continue

in the years ahead, in conjunction with the implementation of climate actions.

- This plan focuses on actions to reduce greenhouse gas emissions and climate-related risk. It does not address other environmental sustainability issues beyond those directly related to climate change.
- The Plan recognizes that land use planning impacts GHG emissions and climate-related risk. However, land use planning is not the central focus of the CAP. Thrive Montgomery 2050 Plan (Thrive 2050), the County's general plan, is the document that sets forth the land use vision for the County. Thrive 2050 encompasses broad, countywide policy recommendations for land use, zoning, housing, the economy, equity, transportation, parks and open space, the environment, and historic resources. County staff and Planning Department staff worked to ensure that the goals, policies, and actions recommended by Thrive 2050 and the CAP are complementary rather than duplicative.
- While recognizing that Montgomery County is not an island unto itself and that the County's efforts must be integrated with and complement the efforts of surrounding jurisdictions, the Plan does not attempt to solve climate change for all other jurisdictions. But we embrace the opportunity to share best practices so that the impacts of the County's efforts can extend beyond its border.

How this Plan is Organized

1. The **Background** chapter provides historical context for the County's climate initiatives. It includes an overview of the County Council Emergency Climate Mobilization Resolution, a timeline of County progress on climate policies and programs, the regional context for climate action, and the community engagement conducted as part of developing the CAP. This chapter also provides an overview of Thrive 2050 and the connections between land use planning and GHG emissions.
2. The **Racial Equity and Social Justice** chapter provides historical context and summarizes current conditions related to systemic racism and environmental injustices, particularly with regard to housing and homeownership, transportation, and energy.
3. The **Montgomery County Climate Conditions** chapter describes the major climate hazards in Montgomery County, using two different climate scenarios with projections through 2035, 2050, and 2100. This chapter also summarizes the results of the Climate Vulnerability Assessment, which analyzed the impact of climate hazards on a variety of community asset categories, including the built and natural environment as well as people.
4. The **Montgomery County Greenhouse Gas Emissions** chapter describes the County's community-wide GHG inventory, emissions reduction progress, and future GHG emissions reduction goals. This chapter also describes the analytical tools used to determine the County's GHG emissions reduction pathway and the emissions sources and sinks that fall outside of the GHG inventory, including carbon sequestration and consumption emissions.

5. The ***Paying for Climate Action Implementation*** chapter describes the financial tools that are already in use and that should be further leveraged to support the CAP, discusses the need to pursue actions that provide co-benefits, and describes the role of the Montgomery County Green Bank as a key partner in financing climate initiatives.
6. The ***Climate Actions*** chapter describes the analytical tool used to assess the impact of actions based on various evaluation criteria, including primary benefits, secondary co-benefits, and feasibility. This chapter also includes a legend on how to read the CAP action descriptions. In this chapter, each CAP action is described individually and grouped by sector: ***Clean Energy, Buildings, Transportation, Carbon Sequestration, Climate Adaptation, Climate Governance, and Public Engagement, Partnerships, and Education***. Equity-enhancing measures are identified for actions that are initially rated as having a less than “very positive” rating for racial equity and social justice.
7. The ***What Can I Do?*** chapter identifies personal or individual actions that residents and businesses can take to reduce GHG emissions and climate-related risk.
8. The ***Zero Waste Task Force Planning and Initiatives*** chapter describes the County’s efforts to reduce waste and increase recycling, which were explored by the Zero Waste Task Force.
9. The ***Remaining Emission Sources and Potential Reduction Strategies*** chapter describes some remaining emissions sources and potential GHG reduction strategies to address them. This chapter also describes several new technologies, currently under development, that may be able to contribute to future emissions reductions.
10. The ***Looking Forward*** chapter describes the structure of the annual work plan, which will include the County’s commitments to efforts that will be undertaken in the upcoming year, including the available resources and staff capacity for these efforts. This chapter also describes the forthcoming sustainable economic development study, which will serve as a companion to the CAP.

Climate Planning Principles

The Plan is a reflection of our fundamental values as a community, and its development was guided by the principles listed below. These climate planning principles will continue to guide the County in the development and implementation of the proposed CAP actions and in the monitoring of progress toward a zero-carbon future.

- Think transformationally – Big, out-of-the box thinking was encouraged; no idea was dismissed as being “impractical.”
- Advance racial equity and social justice – Actions that have the potential to exacerbate existing inequities should include corrective, neutralizing measures; to the extent possible, actions should advance racial equity and social justice.
- Use all levers of government – There are a multitude of strategic “pressure points” at our disposal that can have a multiplier effect. From our budgeting and procurement processes to our building codes, such levers should be used to spark cascading changes.
- Engage community members where they are – To be successful, the Plan must engage our residents and businesses. While climate awareness levels are relatively high in Montgomery County, we must devise climate solutions that tie to the day-to-day challenges faced by our community members, be it health, safety, equity, or financial stability.
- Work together – Truly comprehensive solutions are achieved by working together, both within government and with the private sector.
- Embrace our diversity – The County is fortunate to have many residents who come from different backgrounds, cultures, and locations around the world, with perspectives we welcome; let’s take advantage of that wealth of experience to introduce new ideas and concepts.
- Take risks – While safeguarding the use of taxpayer dollars is always paramount, we must cut new paths and be okay with the prospect of failing from time to time.
- Act while planning – The climate planning process has not been a substitute for immediate, ongoing, impactful action on climate change. The County is already making progress on policies and programs that make sense for us to pursue immediately.



Artists: Lumina and Jeremy Zhang (Age 13 and 8)



Artist: Alexandra Wu (Age 15)

Background



Background

For centuries, people have burned fossil fuels to meet their energy needs. Today, we use fossil fuels to power electric grids, propel automobiles, drive industry and manufacturing, and heat buildings and homes, all while emitting greenhouse gases (GHGs)—primarily carbon dioxide as well as methane, nitrous oxide, and fluorinated gases. These GHGs trap solar radiation in our atmosphere and warm the planet, and this warming of global temperatures has thrown natural weather patterns and ecosystem cycles off balance. From the collapse of ice sheets to the ignition of forest fires, the global effects of climate change are among the greatest threats to human and environmental well-being.

On Earth Day April 22, 2016, nations around the globe came together to sign the Paris Agreement, committing to limit temperature rise to below 2 degrees Celsius (°C) while striving to limit temperature rise to 1.5 °C.² International scientific consensus shows that an increase above 2°C would result in catastrophic climate disasters, including more extreme heat waves, weather events, droughts, sea level rise, flooding, and species extinction. In 2018, the United Nations' Intergovernmental Panel on Climate Change (IPCC) found that 2°C of warming is more dangerous than previously thought and that warming should be limited to 1.5°C to avoid these catastrophic impacts.³ The projected impacts of 2°C versus 1.5°C of heating include half a billion more people struggling to get enough to eat, double the number of people suffering from water scarcity, and dramatic increases in ecosystem loss. The IPCC found that limiting global warming to 1.5°C would require global net human-caused emissions of carbon dioxide to fall by 45% from 2010 levels by 2030, reaching net zero around 2050.

Nearly all countries, including the United States, joined in the collective commitment of the Paris Agreement to curb the cataclysmic social, environmental, and economic impacts of climate change. The United States subsequently withdrew from the Paris Agreement under the Trump administration and then rejoined the Paris Agreement as one of the first actions under the Biden administration. To play its part in the global effort, Montgomery County, Maryland, signed the **We Are Still In** and **America Is All In**⁴ joint declarations of support for climate action and adopted Resolution Number 18-974 on December 5, 2017, declaring a climate emergency and initiating a local mobilization effort to restore a safe climate and build a sustainable economy.⁵ Through the resolution, the County established a goal to reduce GHG emissions 80% by 2027 and 100% by 2035 from a 2005 baseline. The County joined with countries across the globe and jurisdictions across the United States to support meeting the requirements of the Paris Agreement, reducing the impacts of climate change, and securing a brighter, more equitable future for generations to come.

Although climate change affects everyone, it affects vulnerable populations disproportionately. At the local level, climate change affects Montgomery County through an interwoven web of social, environmental, and economic impacts. Extreme heat, severe storms, and drought are among the greatest climate threats to Montgomery County and can negatively impact the community as well as the transportation, utility, storm management, and agricultural systems that support it. These threats and their impacts can ultimately weaken the societal fabric, exacerbate chronic stresses, and decrease the community's ability to respond to acute shocks.

The lack of economic, health, and social resilience also creates barriers that make it difficult for climate-vulnerable communities, notably people of color and low-income populations, to benefit from actions that aim to reduce or eliminate climate risks. The Climate Action Plan (CAP) aims to put forth climate actions that reflect the County's racial, ethnic, linguistic, and cultural diversity and ensure that these actions are tailored to the needs of all of its residents, in particular those who are most vulnerable to climate change.



County Executive Marc Elrich unveils the County's FLASH bus rapid transit service in October, 2020.

Resolution No. 18-974: Emergency Climate Mobilization

Resolution No.: 18-974
Introduced: November 28, 2017
Adopted: December 5, 2017

**COUNTY COUNCIL
FOR MONTGOMERY COUNTY, MARYLAND**

Lead Sponsors: Councilmembers Elrich, Leventhal and Berliner
Co-sponsors: Councilmembers Rice, Katz, Riemer, Navarro and Hucker

SUBJECT: Emergency Climate Mobilization

Background

1. Current global warming of approximately 1 degree Celsius has triggered cataclysmic changes to the Earth. These changes include an accelerating collapse of the West Antarctic Ice Sheet, the thawing of the Arctic permafrost, an increase in mega-droughts, heat waves, super-storms, flash flooding, the migration of mosquito-borne diseases, the melting of glaciers, polar ice-sheet collapse, coral bleaching, the mass extinction of species, ocean oxygen loss, and sea level rise.
2. Climate change will cause an increase in water and food shortages, civil unrest, state failure, civil war and terrorism throughout the world, with no region or nation being immune to these effects, including Montgomery County.
3. There is a strong consensus among scientists that greenhouse gas emissions must be eliminated in a decade at most -- with a simultaneous global effort to remove excess carbon from the atmosphere -- to stabilize at or near the 1.5 C (2.4 F) threshold believed to provide a reasonable chance for the survival of human civilization and other complex life forms on this planet.
4. The federal government, national media, and civil society, including most climate organizations, have drastically underestimated the urgency of the climate and ecological crises, failed to accept that we face an unprecedented global emergency, and relied on failed strategies of gradualism.
5. We must together implement a massive emergency global mobilization effort to successfully eliminate greenhouse gas emissions and remove excess carbon from the atmosphere.
6. Each of us has the moral duty to safeguard the planet for future generations.

Page 2

Resolution No.: 18-974

7. Montgomery County has been a national leader in responding to the challenge of climate change, including establishing a goal of reducing greenhouse gas emissions in the County by 80% by 2050 compared to 2005 levels, yet now needs to do much more, much faster.

Action

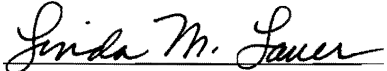
The County Council for Montgomery County, Maryland approves the following resolution:

The Montgomery County Council calls upon the national Administration, the Congress, the State, and other local governments to join Montgomery County, to use all available powers and resources to:

1. declare a climate emergency and initiate a massive global mobilization to restore a safe climate and build a sustainable economy; and
2. transform the climate by reducing greenhouse gas emissions by 80% by 2027 and reaching 100% elimination by 2035, and initiate large-scale efforts to remove excess carbon from the atmosphere.

The Montgomery County Council calls upon the Montgomery County Executive, Montgomery County Public Schools and Maryland-National Capital Park and Planning Commission to advise the Council over the next six months on specific methods for accelerating the County's greenhouse gas emissions reduction goal.

This is a correct copy of Council action.


Linda M. Lauer, Clerk of the Council

Montgomery County Progress

Montgomery County has been committed to significant GHG reduction and climate action for more than a decade, establishing in 2007 an initial goal of reducing GHG emissions 80% by 2050, as well as forming a Sustainability Working Group to identify recommended climate protection actions.

The Sustainability Working Group developed the 2009 Climate Protection Plan, which outlined 58 recommended climate actions in renewable energy, residential and commercial building energy efficiency, transportation, forestry and agriculture, long-term planning, and education and outreach.⁶ A number of the actions identified in the 2009 Climate Protection Plan have been implemented, including launching the Montgomery County Green Business Certification Program, joining the Capital Bikeshare network, and establishing a Commercial Building Benchmarking Program (the first county-level program of its kind in the nation).

Through the 2017 Emergency Climate Mobilization Resolution No. 18-974, Montgomery County committed to do more to mitigate climate change and its negative impacts on the County and the world. The resolution accelerated and deepened the County's previous GHG emissions reduction goal of 80% by 2050 to 80% by 2027 and 100% by 2035 from a 2005 baseline. To inventory existing climate efforts and identify ways to reach these higher goals, the County Executive formed a public sector Climate Mobilization Workgroup with representatives from the Departments of General Services, Environmental Protection, and Transportation; Montgomery County Public Schools; and the Departments of Planning and Parks within the Maryland-National Capital Park and Planning Commission. A Climate Mobilization Workgroup Report, which formed the initial foundation for the County's CAP, was released in June 2018.

The Timeline of Montgomery County Climate Action Progress highlights the actions that Montgomery County has taken to establish itself as a climate action leader and put itself on the path to elimination of GHG emissions.

With Resolution No. 18-974 and the Climate Mobilization Workgroup report⁷ as a foundation, the CAP is the next step in the County's path to 100% GHG emissions reduction. Montgomery County took a collaborative, community-centric, and data-driven approach to developing the CAP. The County's interdepartmental climate planning team included staff from the Department of Environmental Protection, Department of Transportation, Office of Emergency Management and Homeland Security, and the County Executive's Office. The climate planning effort is aligning with other County efforts, including the Thrive Montgomery 2050 Plan (Thrive 2050), by collaborating with other County departments and agencies, including the Office of Management and Budget, the Office of Racial Equity and Social Justice, the Montgomery County Planning Department, Montgomery County Public Schools (MCPS), Montgomery College, County Council staff, and the Departments of General Services, Permitting Services, Transportation, Health and Human Services, and Finance. To complement the CAP, the County will develop a separate Economic Development Report that will outline strategies for building a sustainable, resilient, and equitable local economy.

An action taking place concurrently with the development of the CAP is the update to the County General Plan, Thrive 2050, the County's blueprint and guiding policy document for future growth and development to improve economic health, equity, and environmental resilience (see [**Relationship Between the Climate Action Plan and the Thrive Montgomery 2050 Plan**](#)).

Montgomery County is the largest county in Maryland by population, and it is also one of the most diverse. However, many members of the community, especially people of color, tend to be underrepresented and have little or no ability to engage in the typical policy-making process. To address this, the County has recently made strides in increasing awareness of racial equity and social justice and in bringing these two areas to the forefront of the County's policy and decision-making. This commitment to equity has and will continue to permeate countywide plans, such as the CAP and the Vision Zero plan to reduce vehicle collisions on roads in the County.

Community-led groups such as the County's Climate Technical Workgroups shaped the actions set forth in the CAP. In addition, feedback was sought through racial equity and social justice workshops, community conversations generated by Resilience Ambassadors, surveys, art competitions and public review of the draft CAP (see [Engagement](#)).

While the County conducted considerable analysis and engagement to create the CAP, it is a roadmap for continued community collaboration to implement the priority climate actions and to turn the County's climate goals into reality.



In 2017, the Montgomery County Council unanimously passed the Emergency Climate Mobilization Resolution

Climate Action in the Region

While Montgomery County has the region's most ambitious goal to reach zero greenhouse gas (GHG) emissions by 2035, other jurisdictions in the region are also immersed in climate action planning and climate initiatives. The State of Maryland has a goal to achieve a 40% reduction in GHG emissions across the state by 2030 and to reach net-zero emissions by 2045. In February 2021, the Maryland Department of the Environment released the state's Greenhouse Gas Reduction Act Plan, which includes more than 100 actions to reduce emissions.⁸

The Metropolitan Washington Council of Governments (MWCOG), which consists of 24 cities and counties in the region, recently released its Climate and Energy Action Plan, which aims for a 50% reduction in GHG emissions by 2030 and an 80% reduction by 2050. Twelve of the MWCOG member jurisdictions are also signatories to the **We Are Still In** joint declaration for climate action.⁹

The National Capital Region Transportation Planning Board is engaged in a climate change mitigation study that is focusing on what needs to be done in the transportation sector to meet the region's GHG emissions reduction goals. The Transportation Planning Board is in the process of updating the transportation long-range plan, Visualize 2045. In the call for projects, each agency submitting projects for the long-range plan must address how the project will impact GHG emissions reduction as a screening metric.

The Washington Metropolitan Area Transit Authority (WMATA) is actively engaged in operating and investing in sustainable practices and efficient use of energy resources. The WMATA 2019 Annual Sustainability Report outlines its progress toward reducing GHG emissions.

As many residents and businesses take part in activities that cross jurisdictional borders, it is important to synchronize climate efforts. Regional collaboration not only creates a stronger network to tackle climate change issues, it also results in increased efficiencies in regional services, enabling jurisdictions to address problems that they may not be able to solve on their own.¹⁰ Climate collaboration can help the entire region reach its GHG emissions reduction goals more quickly.

Cross-jurisdictional climate collaboration already abounds. In 2021, the first-ever Capital area solar cooperative launched, enabling residents from 11 cities and counties in the region to go solar and install residential charging stations for electric vehicles.¹¹ The Montgomery County Green Bank's loan product for commercial businesses to install energy efficiency measures and renewables is now also available through the District of Columbia Green Bank. The District of Columbia was the first jurisdiction in the country to enact a Building Energy Performance Standard (BEPS) law, and Montgomery County and DC Department of Energy and Environment staff continue to share lessons learned and best practices for implementation of BEPS policies regionally. The Climate Action Plan includes several actions that are directly tied to cross-jurisdictional collaboration, including P-9 and P-11.

Relationship Between the Climate Action Plan and the Thrive Montgomery 2050 Plan

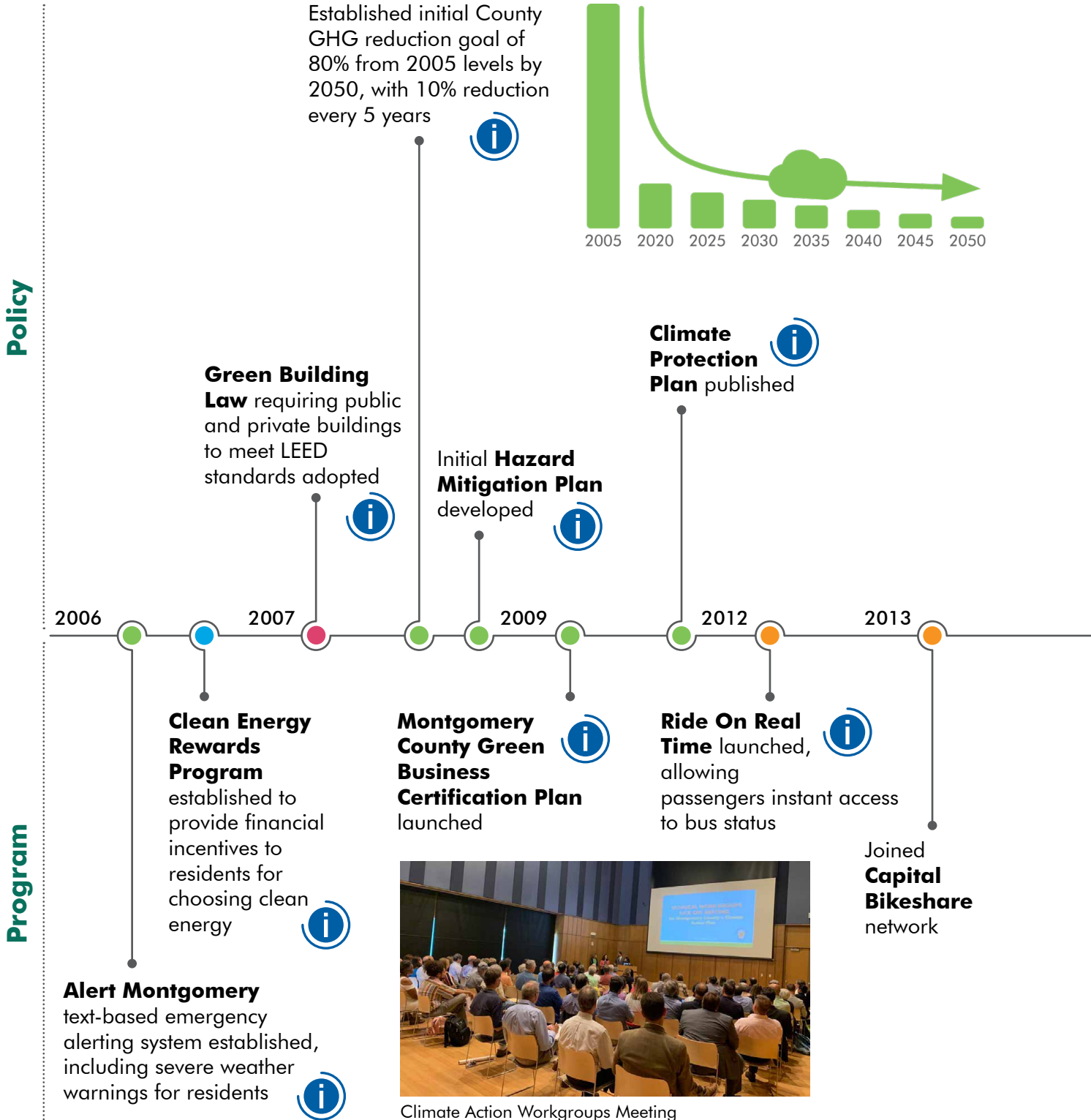
The CAP addresses the growing threat of climate change, focusing on GHG emissions, carbon sequestration, and adaptation to climate change, and it raises awareness of persistent inequities in our society. These issues are among those that prompted the Montgomery County Planning Board to initiate a comprehensive update of the County’s General Plan, an update known as Thrive Montgomery 2050 (Thrive 2050). This plan establishes three overarching goals for the County over the next 30 years: economic health, equity, and environmental resilience. It is a high-level document that focuses on long-range planning and policies to guide the physical development of the County, including where and how land will be preserved or developed for housing, office buildings, parks, agriculture, recreation, and transportation infrastructure.

Thrive 2050’s focus on the environmental resilience of the County’s built environment relates to such issues as floodplains, imperviousness, stream protection, and the Agricultural Reserve. Its policy guidance is broader than the CAP’s. Its recommended actions to be implemented over the coming years will have a major impact on the County’s environmental goals in general, in addition to the GHG emissions, carbon sequestration, and adaptation to climate change that are the focus of the CAP. County staff and Planning Department staff worked to ensure that the goals, policies, and actions recommended by Thrive 2050 and the CAP are consistent. Together these plans will create a comprehensive approach to climate change at the local level.



Thrive Montgomery 2050 community visioning

Timeline of County Climate Progress



Tree Canopy and Roadside Tree Laws adopted to mitigate for loss of trees during development



Trees planted through the Tree Montgomery program are funded by the Tree Canopy Law

2014

County purchased **first electric vehicle**

First protected bikeway opened along Woodglen Drive



Commercial Building Benchmarking program established (the first county-level program in the nation)



Expedited **Residential Solar Permitting** process developed

2015

Solar generation exempted from the County's Fuel Energy Tax

Montgomery County Green Bank established (the first county-level Green Bank in the nation)



Commercial Property Assessed Clean Energy (C-PACE) financing program launched



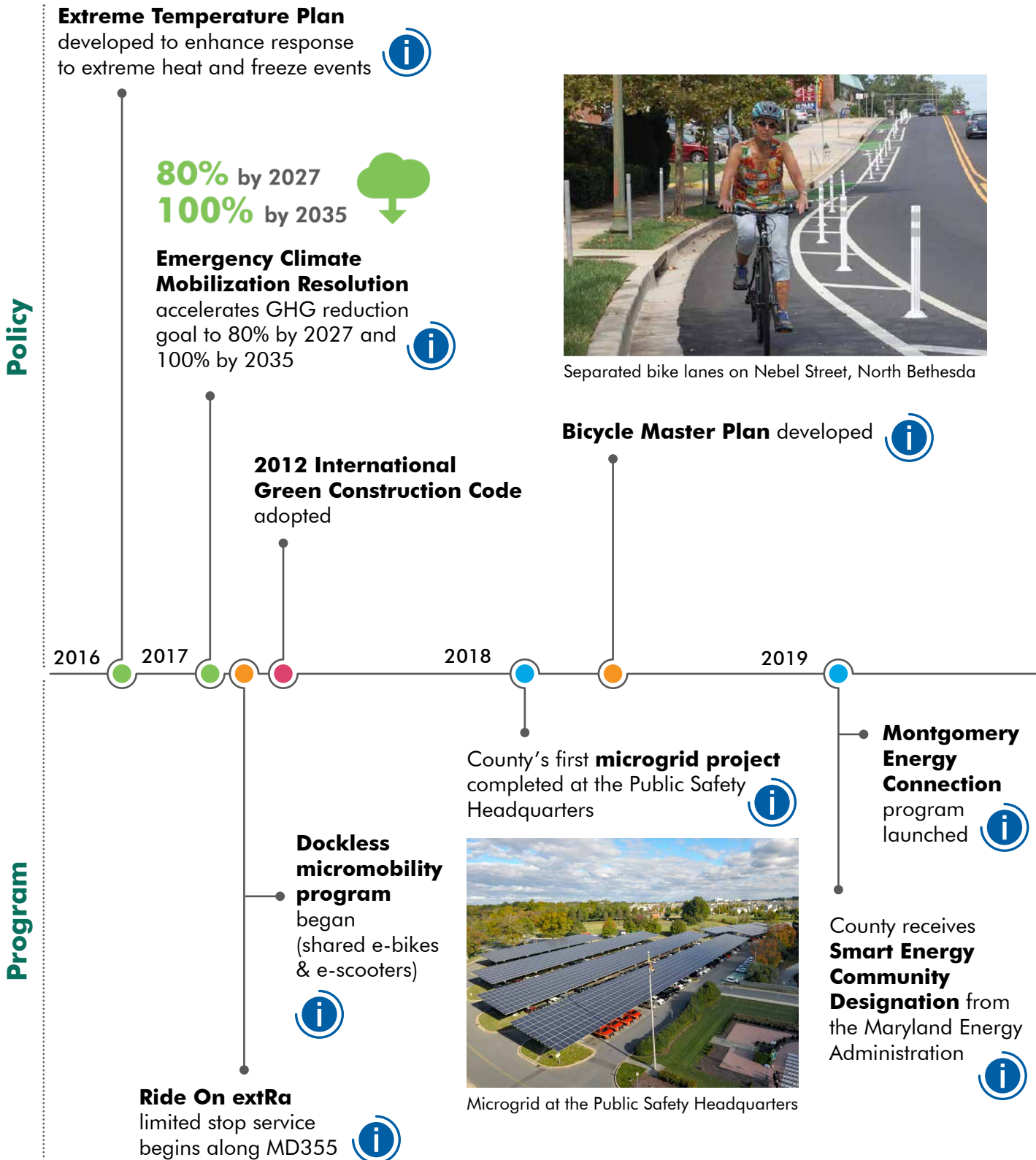
First EV charging stations installed in County parking garages



Policy

Program

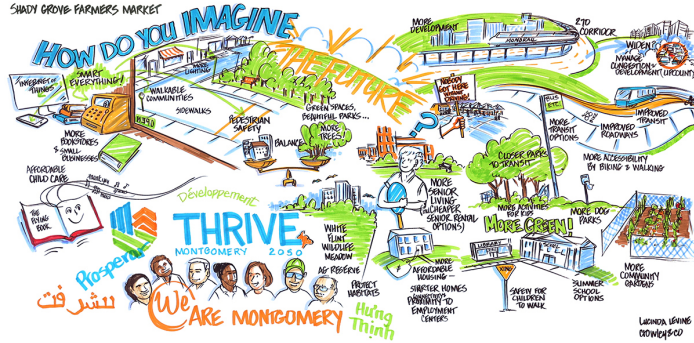
Timeline of County Climate Progress (continued)



Thrive Montgomery 2050 Plan, an update to the County's General Plan, gets underway



Climate planning process to reach zero emissions by 2035 began



Thrive Montgomery 2050 Vision

Racial Equity and Social Justice policy adopted



Tiffany Ward, Chief Equity Officer

Building Energy Performance Standards legislation introduced



Sustainable Economic Development Analysis started

2020

2021

First protected intersection in Mid-Atlantic region opens in Silver Spring



NextGen TDM - Enhanced Transportation Demand Management requirements for employers and developers adopted



First electric Ride On buses began service



FLASH Bus Rapid Transit service launched on US 29



Resilience Ambassadors program launched



First jurisdiction in Maryland to earn SolSmart Gold designation



Montgomery County Public Schools contract to convert all school buses to EVs approved



Ride On Flex debuts, providing on-demand public transit service



Revised Green Building Incentive Program established



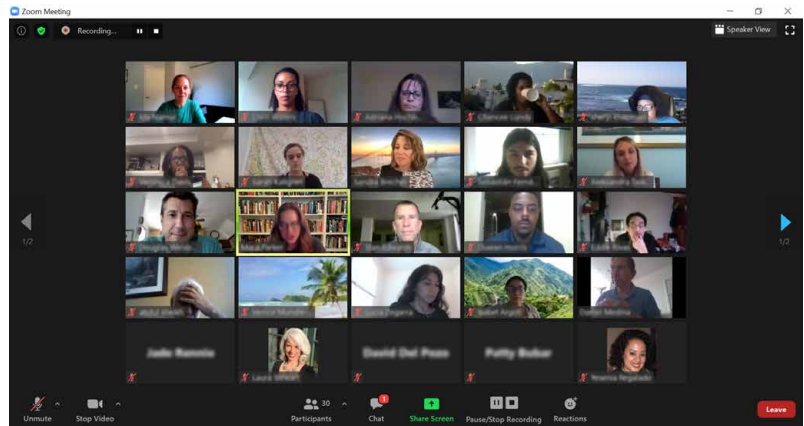
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Program

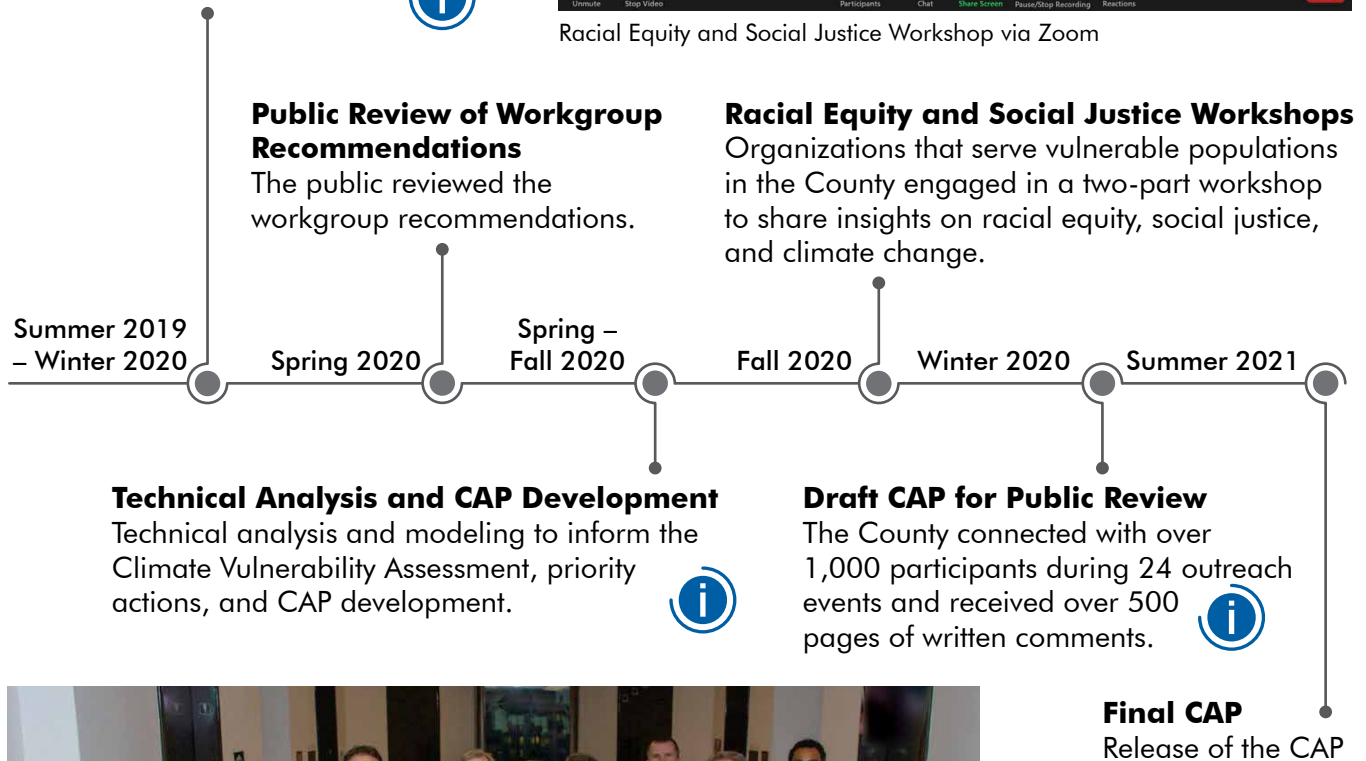
Timeline of CAP Development Process

Climate Workgroup Efforts

The County formed six technical climate workgroups—made up of County volunteers with area-specific expertise—focused on buildings, clean energy, transportation, climate adaption, carbon sequestration, and public engagement and education. Each workgroup developed and submitted recommendations to reduce GHG emissions while promoting equity.



Racial Equity and Social Justice Workshop via Zoom



Buildings Workgroup

Engagement

Engagement of local residents and community organizations was key in developing the CAP and will continue to play an important role in climate action development and implementation.

Figure 1 outlines the types of organizations represented in the CAP community engagement and plan development. The County engaged community members in CAP development in a variety of ways, including workgroups, workshops, special programs, and public document reviews.

Climate Technical Workgroups

In July 2019, the County convened a robust group of more than 150 community members, technical experts, and County staff members. They had three primary things in common: their background and expertise in climate and energy, their commitment to climate action, and their desire to build a better future for their Montgomery County neighbors. Community members participated in five technical workgroups and developed climate action recommendations in the following topic areas:

- Buildings
- Clean Energy
- Climate Adaptation and Carbon Sequestration
- Public Engagement and Education
- Transportation

The workgroups met over the course of 8 months to leverage their expertise and lived experience in Montgomery County. Both public and private sector perspectives were represented in the workgroups, as well as local community organizations. Workgroup members brought diverse areas of expertise and life experiences to the table. Workgroup members included attorneys, architects, economists, high school students, retired scientists, urban ecologists, science educators, and floodplain managers, to name a few. They collaborated on identifying, discussing, and developing climate action recommendations specific to Montgomery County. In total, the workgroups developed 894 action recommendations, which were organized by technical workgroup, overarching goal, and specific strategy. The recommendations of the

workgroups informed the actions set forth in this Plan. Specifically, the recommendations were reviewed and prioritized for their ability to reduce GHG emissions and reduce risks to the communities most vulnerable to the impacts of climate change.¹² The 894 action recommendations developed by the workgroups are provided in **Appendix B**.



Figure 1: Organizations engaged in CAP development

Racial Equity and Social Justice Workshops

In addition to the information gathered through the five technical workgroups, Montgomery County expanded its engagement to organizations that work with and serve vulnerable communities in the County. The County held a two-part Racial Equity and Social Justice Workshop in September 2020 with more than 20 community organizations spanning public health, economic development, environmental justice, civil rights, and religious areas. This broadened engagement enabled the County to begin to identify existing blind spots and barriers to implementation, incorporate diverse voices and perspectives into the development of the CAP, and start conversations with underrepresented communities that will continue through action development and implementation.

Resilience Ambassadors Program

The County launched the Resilience Ambassadors Program to facilitate meaningful conversations with underrepresented community members to help shape the CAP.¹³ The young people who served as Resilience Ambassadors expanded and deepened the County's engagement efforts by connecting with neighbors of all ages in their networks and bringing additional perspectives on climate resilience in the County. The program was created by the County's climate planning team, in partnership with Vision Zero. The Resilience Ambassadors participated in several trainings to learn about ongoing County initiatives related to racial equity, Vision Zero, transportation, energy, and health prior to engaging with the community. Equipped with this knowledge and their personal strengths and connections, the Resilience Ambassadors facilitated conversations and surveys covering quality-of-life issues such as equity, health, transportation, safety, climate, and energy justice with close to 130 community members.

The Ambassadors amplified the voices of Black, Indigenous, and People of Color (BIPOC), immigrant, and income-distressed communities by sharing insights from their conversations with the County. These insights have been incorporated throughout this Plan. In addition, the knowledge gained from these conversations will continue to help County planning teams determine how to

better serve these communities, enhance their strengths, and address their needs. A summary of the resilience conversations is provided in **Appendix E**.

Public Review of the Draft Climate Action Plan

The Draft Climate Action Plan (Draft CAP) was released in December 2020 for public review and comment. County staff provided a variety of opportunities for community members to review and comment on the Draft CAP. Due to the COVID-19 pandemic, engagement opportunities were held in virtual settings. More than 1,500 people participated in CAP outreach events, which included visiting a virtual informational room about the CAP or participating in 24 events about the Draft CAP. Community events served as an opportunity to provide an overview of the Draft CAP, collect feedback, and answer community members' questions. Several municipalities, including Rockville, the Town of Chevy Chase, Takoma Park, and Washington Grove, hosted sessions about the Draft CAP. Other community events involved the business community, a Virtual Climate Youth Town Hall with 100 young community members from elementary school to college age, faith organizations, community-based organizations, and County advisory groups. The County team also gave presentations on the Draft CAP to the County Council and the Planning Board. Social media was used extensively to get the word out about the Draft CAP, and a survey was translated into six languages to facilitate public review and comments.



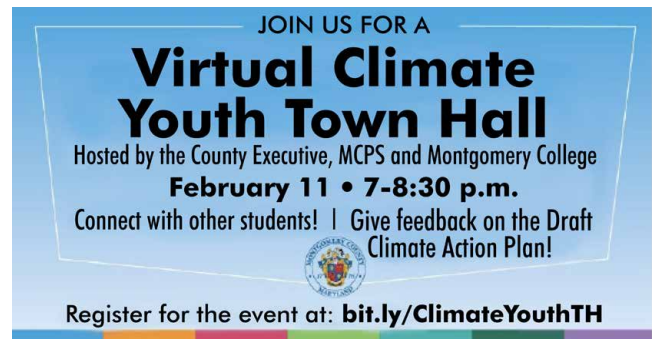
A screenshot of the CAP Virtual room

County staff appreciate the feedback provided by members of the community on the Draft CAP. The County and technical consultant team

considered each comment an opportunity to refine the final Plan. The County received more than 500 pages of written comments from over 75 commenters, including individuals, municipalities, businesses, community-based organizations, trade associations, and coalitions of multiple organizations. In addition to these written comments, the County also received more than 100 survey responses about the Draft CAP.

Given the demographics of the responses, there is a continuing need for the County to seek perspectives and input from a diverse cross section of the community. Approximately 15% of survey respondents preferred not to state their race or ethnicity; of those who did, just over 70% identified as White. As the County's proportion of White residents is 43%, the perspectives of BIPOC communities were underrepresented in the survey. Younger people were also underrepresented. Residents aged 24 and younger submitted 10% of the responses, and residents aged 45 and older were overrepresented, submitting 62% of the

responses. With regards to geographic diversity, the survey received responses from residents living in 26 of the County's 45 zip codes and thus covered just short of 60% of the County. A quarter of the survey responses came from residents living in just three zip codes (Wheaton, Silver Spring, and Rockville). For actions that the County will undertake to foster inclusive community engagement in conjunction with implementation of the Plan, see the **Public Engagement, Partnerships, and Education Actions** section of the CAP.



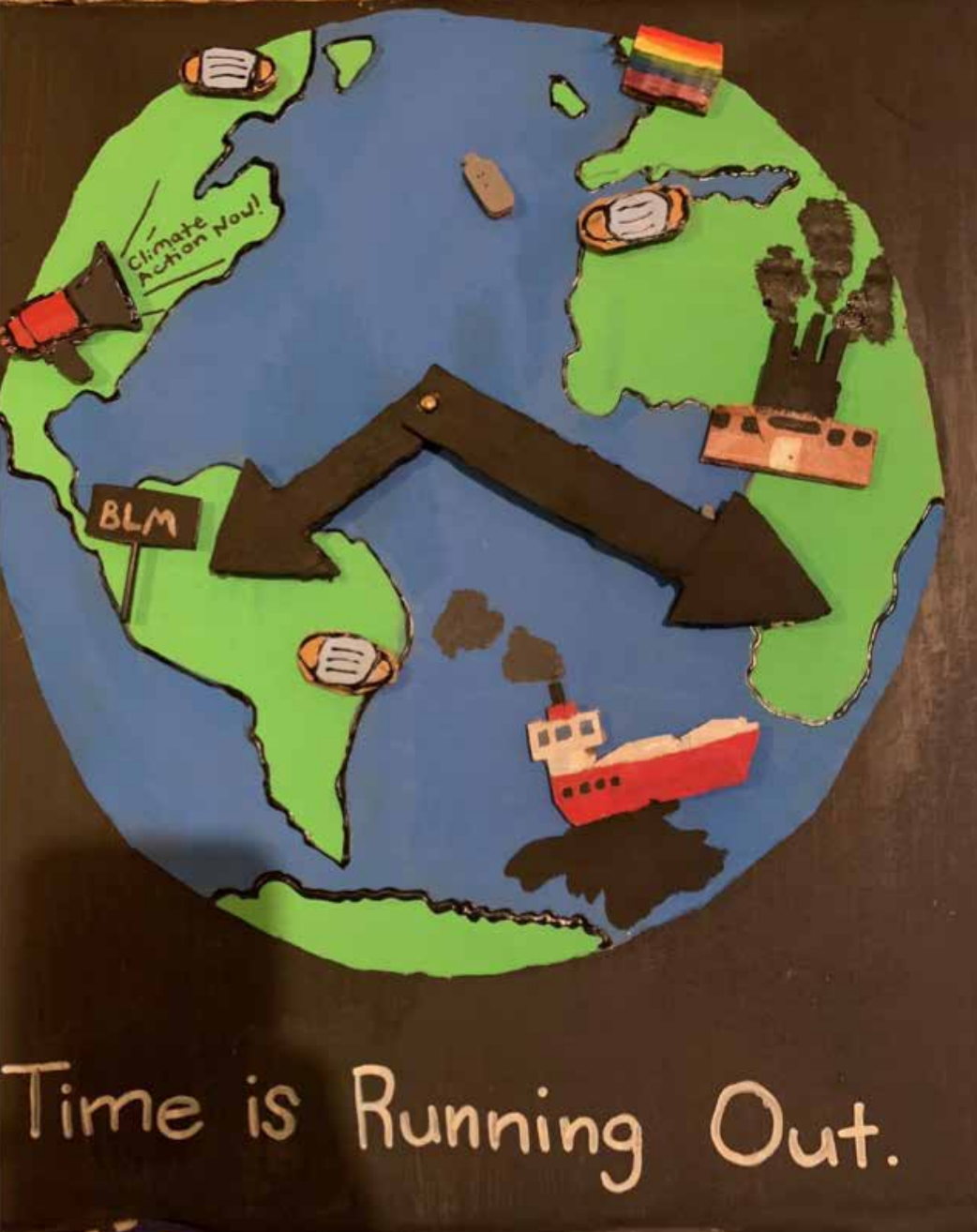
JOIN US FOR A
Virtual Climate Youth Town Hall
 Hosted by the County Executive, MCPS and Montgomery College
February 11 • 7-8:30 p.m.
 Connect with other students! | Give feedback on the Draft Climate Action Plan!
 Register for the event at: bit.ly/ClimateYouthTH

Virtual Climate Youth Town Hall announcement

The COVID-19 Pandemic and Climate Change

COVID-19 has been referred to by some experts as a “dress rehearsal” for climate change and “climate change on warp speed.” Others have discussed the fundamental importance of “flattening the curve” on both the spread of COVID-19 and greenhouse gas emissions to minimize the tragedy and damage. Indeed, COVID-19 and climate change share many similarities in terms of their societal impact and our response to the crises. Both affect virtually all aspects of our lives, are global in nature, involve an all-hands-on-deck effort, hinge on cooperation and selflessness, require responses based on science, disproportionately impact the most vulnerable, and result in wrenching and massive loss of life. Both overwhelm our management and emotional capacity, whether we are facing inundated hospitals, overwhelmed medical staff, or the devastating consequences of a hurricane, heat wave, or wildfire. As the height of the pandemic recedes, and the United States begins returning to normalcy from COVID-19, we must recognize that climate change is not going away anytime soon. Moreover, if we return to the “business as usual” approach to our way of life from an emissions perspective, the climate will become dramatically worse, with continuing tragic consequences.

The world is at an inflection point, and the decisions we make today—as individuals, a county, a nation, and a world—will determine our future in profound ways. Let us resolve to learn from the COVID-19 crisis and do all we can to proactively ensure that those most vulnerable to climate change are equipped to manage its impacts and bounce back from them; that we come together as a community to widen our circle of care and responsibility; that we respect the science and acknowledge the urgency with which we need to act; and that we support the sweeping and transformational changes that the climate crisis requires of us.



Artist: Laney Parker (Age 13)



Artist: Samantha Kent (Age 11)



Racial Equity and Social Justice



Racial Equity and Social Justice

Introduction

Climate change has widespread detrimental impacts—on public health, community assets, and the economy. Although all residents of Montgomery County will feel the impacts of climate change, certain groups will feel these impacts more acutely. This discrepancy is referred to as the “climate gap,” which essentially means that certain groups in society, such as people of color, low-income communities, new immigrants, international and domestic climate migrants, the elderly, and those with physical disabilities are disproportionately affected by climate change, yet have the least resources and less ability to cope with and respond and adapt to its impacts.

Many factors contribute to increased climate vulnerability, including:

- Poverty and lack of access to financial resources
- Age, disability and chronic illness
- Historical and systemic racism and environmental injustices
- Disparities in accessing health care and education
- Poor and inefficient housing and residential settings
- Lack of access to resources such as information, knowledge, and technology
- Limited social networks and connections
- Lack of access to critical services such as water, transportation, and energy
- Immigration status

These climate impact multipliers make communities that already face inequities even more vulnerable and susceptible to new shocks, as the COVID-19 pandemic has shown. The lack of economic, health, and social resilience also results in barriers that make it difficult for climate-vulnerable communities to benefit from actions that aim to reduce or eliminate climate risks. There are interconnections between climate change and factors that cause vulnerability in communities. As an example, extreme heat is even more severe for populations living in substandard housing that may not have air conditioning or households that cannot bear an increased financial strain for utility consumption. The impacts of climate change are exacerbated in these communities because they can lead to more distress, mental health issues, and displacement.

In considering these vulnerable groups, it is important to explore historical policies and practices that have contributed to disparities and perpetuated the severity of climate change impacts on vulnerable communities, and to understand the current conditions in Montgomery County. Through secondary research and conversations with community groups, the County has created the foundation for genuinely incorporating the concepts of racial equity and social justice into the climate planning process. Ultimately, the CAP aims to address and remedy historical injustices and unfair practices; institute climate actions that reflect the County’s racial, ethnic, linguistic, and cultural diversity; and ensure that these climate actions are tailored to the needs of all of the County’s residents, in particular those most sensitive to climate change and least able to adapt to it.

Furthermore, terminology related to groups of people in underserved and historically disenfranchised communities is ever-evolving. Throughout the CAP, the intent is to be respectful to the communities most impacted by climate change in Montgomery County. The communities that are most vulnerable include Black, Latino,

and low-income people; the elderly; people with underlying medical conditions; and people with physical disabilities. Racial equity is important to address historical harms and underinvestment in Black and Latino communities in the County, while social justice captures other populations that are also among the most vulnerable to the impacts of climate change. The terminology to describe all of these populations may change during the life of this CAP, but our commitment to ensuring they are included in actions stemming from this Plan does not.

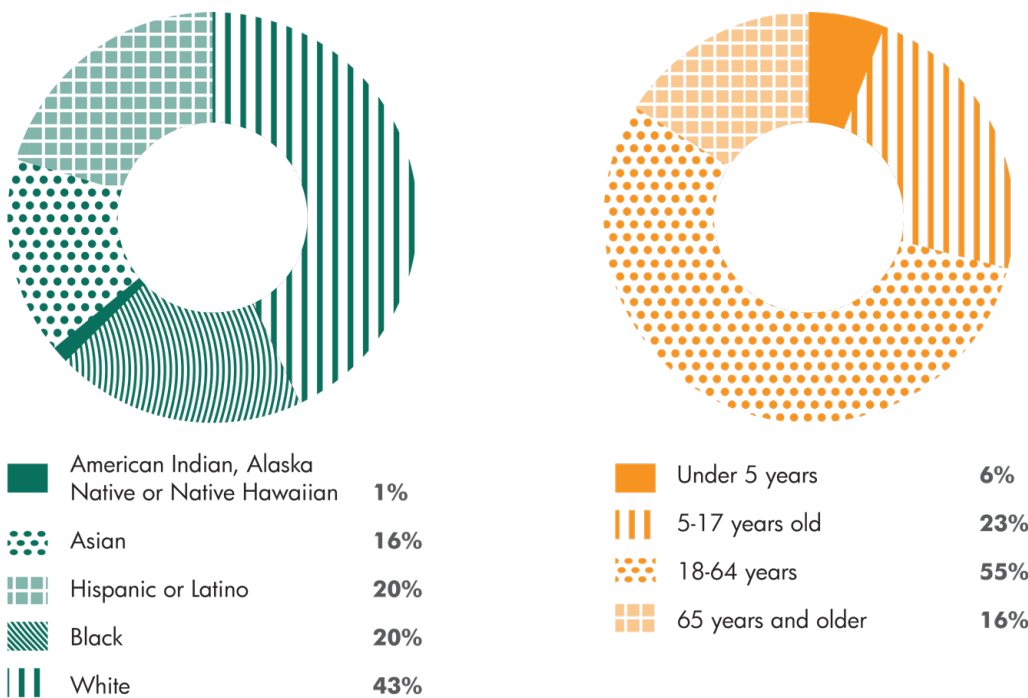
Montgomery County's Socioeconomic Profile

Montgomery County has been Maryland's most populous county since 1990. As of July 2019, the County's total population was 1,050,688. Montgomery County is also one of Maryland's most diverse counties. In 2019, people of color made up 57% of the County's total population (**Figure 2**), and this number is projected to

steadily increase to an estimated 63% by 2025 and to 73% by 2045.¹⁴

Montgomery County also has a large and diverse foreign-born population, making up 32.3% of the total population in 2019¹⁵ and contributing to the County's ethnic and linguistic diversity; 40% of the County's residents speak a language other than English at home,¹⁶ and the languages include Spanish, Mandarin, Hindi, Korean, Amharic, Farsi, and Vietnamese. In 2016, the County's largest foreign-born populations were from El Salvador (14%), China (8%), India (7%), Korea (4%), Ethiopia (4%), Vietnam (4%), Honduras (3%), Peru (3%), Iran (2%), and Guatemala (2%).¹⁷

Much of Montgomery County's population growth has been concentrated along major transit and transportation corridors, such as Interstate 495 (I-495) of the Capital Beltway, and near Metro stations. The areas with the highest population density include Takoma Park, Silver Spring, Bethesda, Germantown, Gaithersburg, Rockville, and Aspen Hill.¹⁸



Source: U.S. Census 2019

Figure 2: Racial and age composition of Montgomery County

The age distribution of the County's residents is also shown in **Figure 2**. The median age in 2018 was 39 years, in contrast to the median age of 34 years in 1990. Aging baby boomers are driving an increase in the County's median age as well as the median age of the County's older adult population (i.e., people over the age of 65). In 2019, this group made up 16% of the County's population and that percentage is estimated to increase to 21% by 2040.¹⁹ Conversely, there is a sizable youth population in the County—almost a quarter of the population is made up of 5- to 17-year-old residents.

Montgomery County is considered an affluent area that attracts well-educated residents with a high earning potential. For example, in 2019, 59% of adults over 25 years of age held a bachelor's or higher degree.²⁰ Montgomery County's labor force participation rate was 71.1% in 2019, ranking second in the metropolitan area of Washington, D.C., region in terms of its total labor-force size. In addition, the County's median household income is \$106,287, which is higher than that of Maryland as a whole.²¹

However, there are a number of less affluent communities in Montgomery County in which median income and unemployment rates vary by race. In 2016, White households in the County had the highest median income (\$122,291), while the lowest median income (around \$70,000) is among Blacks and Hispanics.²² This wealth gap of over \$50,000 is a disparity that can make a huge difference in a household's ability to prepare for and respond to the impacts of climate change. While people of color and vulnerable communities have experienced improvements regarding access to education, housing, employment opportunities, transportation, and health care over the past several decades, disparities between groups remain and must be addressed when developing or implementing community initiatives.

Systemic Racism and Environmental Injustice

The disproportionate impact of climate change on underserved communities in the United States correlates to a history of disinvestment and structurally racist practices. These practices have perpetuated the severity of climate change in vulnerable communities. Although similar reckonings have occurred before in different eras, this country is currently in a moment of racial reckoning that stems from never fully uprooting racism in the country—the genocide of Indigenous people and enslavement of Africans, which have served as the foundation for generations of discriminatory practices, inequality, income disparities, abusive policies, and increased health risks in these communities. This list, while not exhaustive, illustrates that every aspect of Indigenous and Black people's lives was shaped for generations by both overt and covert racism in the United States. Not only have Black and Indigenous people found themselves the recipients of unequal justice, this racist behavior is now targeted toward immigrants, particularly immigrants of color.

Maryland and Montgomery County are not exempt from this sordid national history. Although Maryland did not secede with other southern slaveholding states during the Civil War, the state did enact policies and participate in practices that exacerbated harm in Black communities. Jim Crow laws and former practices such as sharecropping, redlining, exclusionary zoning, restrictive racial deed covenants, siting of environmentally hazardous facilities, and destruction of neighborhoods to build the U.S. Highway System continue to have long-standing and detrimental impacts. This systemic and institutionalized racism developed as a result of a country that, while abolishing slavery, did not recognize Black and Indigenous people as equal citizens deserving of full humanity and economic prosperity.

As racial equity and social justice are interwoven throughout the CAP, it is important to understand historical practices and their associated traumas because they laid the foundation for the current state of disparities in the United States, including the disparities in Montgomery County, which are evident

in housing, infrastructure, land use, education, and health care. The following sections explore five key areas of racial inequity: housing and homeownership, energy, water, transportation, and health.

Inequity in Housing and Homeownership

Historical Background

After the abolition of slavery in the United States, many formerly enslaved Black people were forced into sharecropping. This legalized form of oppression, which did not end until the 1950s,

introduced new barriers to economic mobility and home ownership. For the few who were able to escape sharecropping in search of better opportunities, they found themselves discriminated against and unable to afford housing. Until the Fair Housing Act of 1968, discriminatory tools locked Black people out of the housing market, including outright refusal to sell to Blacks, racially restrictive deed covenants, and redlining Black neighborhoods from access to government loans and services (see **Figure 3**). These practices put Black people at a further disadvantage because for nearly 100 years they were locked out of participating in what has been deemed a wealth-building tool in the United States—homeownership.

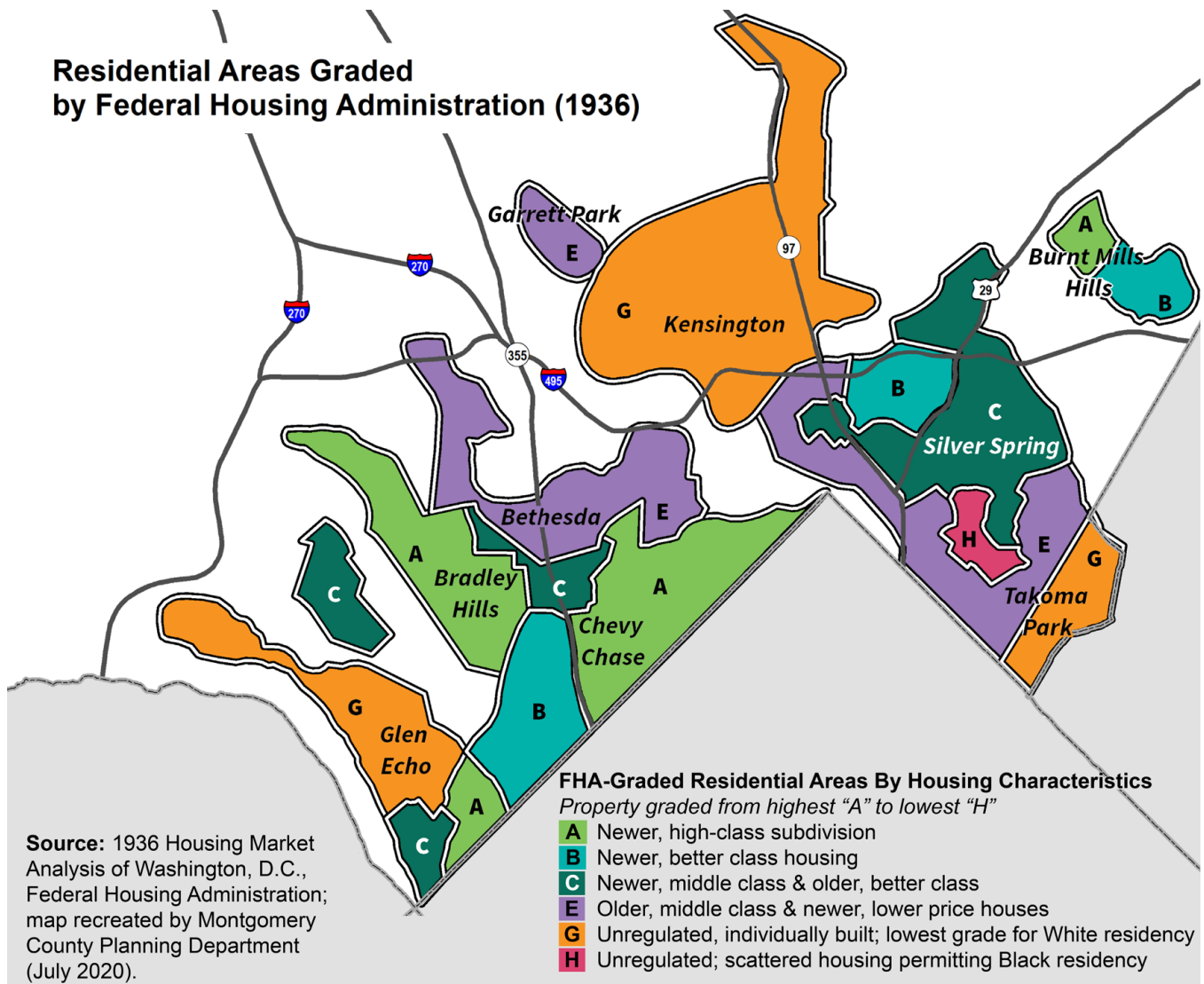


Figure 3: Recreated 1936 map showing "Approximate Location of Outstanding Commitments of the Federal Housing Administration" in Montgomery County, developed for Thrive 2050²³

Silver Spring, for example, like most down-County areas developed in the early twentieth century, was a sundown suburb where Black people could not own or rent homes due to racially restrictive deed covenants. It was marketed to white residents fleeing the District of Columbia.²⁴ Although Black people worked in Silver Spring for government agencies, they were not allowed to move and live there.²⁵ Similarly, Bethesda's Kenwood neighborhood deeds said: "land or any part thereof, shall never be sold, leased, or rented to, or placed in the possession of, or occupied by any person or persons other than those of the Caucasian race."²⁶

Meanwhile, nearby Lyttonsville—a town bearing the namesake of its original property owner, Samuel Lytton, a freed slave—became an enclave for Black families. Despite this, Lyttonsville had no paved roads, running water, or sewer connections until the 1960s.²⁷ This neglect was fueled by racist Jim Crow policies that have had lasting impacts. Poverty became concentrated in this area. Other Black County communities such as Scotland also did not have water, electricity, or paved roads until well into the 1960s.²⁸

What started out as a housing access issue in Montgomery County also became a housing affordability issue. Community revitalization in the 1960s spurred gentrification and displaced Black residents who could no longer afford the rising cost of living. In the 1970s, the County attempted to rectify its wrongs in discriminatory housing by passing the first zoning ordinance of its kind in the country. This ordinance required any development of more than 50 units to set aside at least 15% of the housing for low-income residents.²⁹ While new, affordable housing policies have been enacted in the County since then, housing affordability remains a pressing issue for many in Montgomery County.

Current Circumstances

Homeownership in Montgomery County is out of reach for many residents.

Homeownership in Montgomery County has declined since 1990, and only 65.4% of residents live in owner-occupied housing.³⁰ While household incomes have largely remained the same or in some cases decreased since 1990 (for example, both Hispanic and Black American median household incomes have declined from 1989 levels),³¹ house prices have increased (for example, the average sale value of a detached home in Montgomery County increased by 65% between 1997 and 2017). In 2017, Asian residents had the highest rate of homeownership (74.3%) in Montgomery County, followed by White (73.2%), Hispanic (49.1%), and Black (42.5%) residents.³²

A further burden for low-income and very-low-income households is the lack of affordable housing in Montgomery County—with demand outgrowing supply. The 2015 American Community Survey found that 67% of homeowners below the median income of \$98,314 spent more than 30% of their income on housing-related costs.³³ In addition, Montgomery County does not exercise countywide rent control for rented residences (although the City of Takoma Park does exercise rent control); thus, there is no limit on the amount a landlord can demand for leasing a home or renewing a lease.³⁴ This only adds to the financial uncertainty experienced by lower-income residents in the County and the burdens on them.

In 2018, the majority of low-income households in Montgomery County lived in multifamily homes (55%), followed by single-family detached homes (23%), single-family attached homes (17%), and small multifamily homes (5%).³⁵ Low-income households are also more likely to live in housing built before 1950, which may contain lead-based paint and require lead-safe work practices when installing energy efficiency measures. This increases the cost of energy improvements, putting them further out of reach for low-income households.

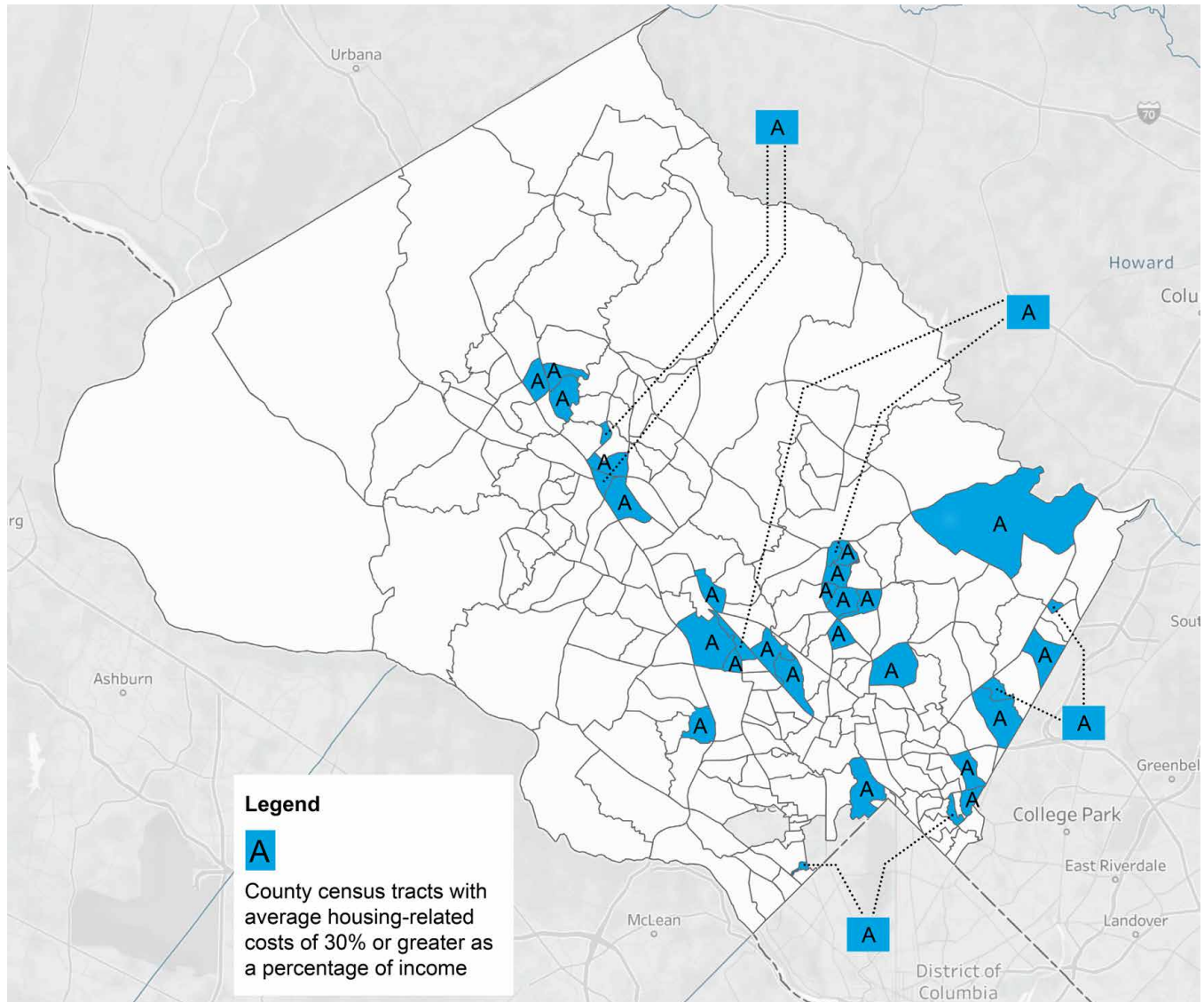


Figure 4: Montgomery County census tracts with average housing-related costs of 30% or greater as a percentage of income³⁶

Inequity in Energy

In Maryland, there is a relatively even split between energy used by the commercial, residential, and transportation sectors. In Montgomery County, the majority of low-income households use electricity as their main energy source for heating and cooling purposes (50%), followed by natural gas (45%) and fuel and propane (5%).³⁷ Of these households, 77% pay directly for their heating and cooling (i.e., the cost is not included in their rent) and therefore they are more sensitive to changing demands and the costs of these utility services. In addition, households that do not have utility costs included in their rent are more likely to use fuel

oil and propane, which are dirtier and more expensive than electricity or natural gas, as their main source of heating.³⁸

“
 In Montgomery County, 17% of households experience a high energy burden (i.e., energy bills exceed 6% of their annual income), while 9% of households live in energy poverty (i.e., energy bills exceed 10% of their annual income).³⁹
 ”

Many low-income households also experience an “energy burden,” defined as the percentage of household income that goes toward utility bills. Research by the American Council for an Energy-Efficient Economy⁴⁰ found that low-income, Black, Hispanic, and Native American households all face dramatically higher energy burdens than the average American household. In addition to lack of income and affordable energy bills, energy burdens can be influenced by many housing factors, such as poor insulation, outdated

appliances, and higher utility use needed to make a home more comfortable. High energy burdens can threaten a household’s ability to pay for energy and can force many families to have to choose between paying energy bills or purchasing other household necessities, such as food and medicine. See **Figure 5** for a map of energy burden in Montgomery County. High energy burdens are also correlated with greater risk for respiratory diseases, increased stress and economic hardship, and difficulty in moving out of poverty.⁴¹

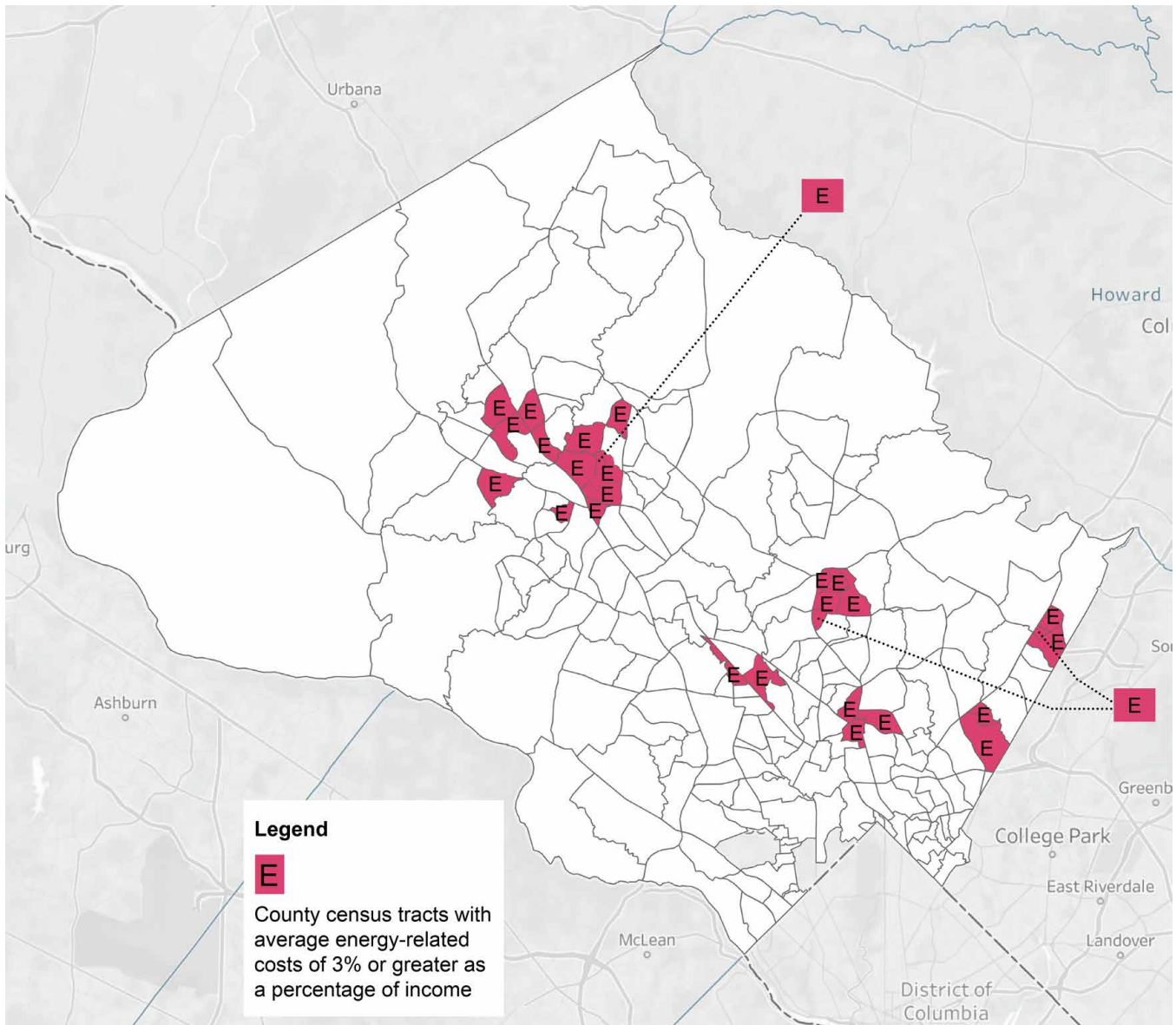


Figure 5: Montgomery County census tracts with median energy burden of 3% or greater as a percentage of income⁴²

Another major issue for low-income households is a lack of access to air conditioning and other cooling technologies. As the number of hot days increases as a result of climate change, the threat to climate vulnerable communities will also increase. For example, in Montgomery County, approximately 800 cases of heat-related illnesses were reported from May 22 through September 17, 2018.⁴³ Two key obstacles to cooling access are lack of financial resources and lack of homeownership. Recognizing the impact more frequent hot days can have on its

most vulnerable residents, Montgomery County approved its first “air conditioning bill” in February 2020, which requires property owners of rental units to maintain cooling systems in a safe and good working condition and to supply air conditioning service at 80°F or less during the summer months.⁴⁴ In addition to a lack of cooling and heating options in homes, many residents in Montgomery County highlighted the need for cooling and heating systems in public transit vehicles.

Housing, Energy, and Homeownership: Implications and Considerations

This background is important context because if people do not own their own homes, they are unable to make many decisions about improving their resilience and adaptation to climate change. Moreover, if landlords are required by law to make costly energy efficiency retrofits and and/or electrification conversions, this could adversely impact the availability or price of affordable housing and costs could be passed on to renters.

Furthermore, for those who are considered house poor (i.e., those who spend a large proportion of their total income on housing), their limited income may not allow them to participate in energy efficiency or resilience incentive programs that have an additional upfront cost burden (see **Figure 4**). Energy efficiency improvements are also likely to have much higher than average costs due to past deferred maintenance, the presence of lead-based paint, and more.

As the housing stock is upgraded to include high-efficiency and electric heating and cooling, the price of housing goes up, making it even more difficult for low-income community members to purchase homes and build wealth.

The prevalence of residents who experience an energy burden is significant. With an increasing number of high heat days already upon us and projected to get worse, this burden will only get worse without efficient cooling retrofits. Moreover, unless cooling retrofits are made financially accessible, low-income residents will be faced with the wrenching choice between running the air conditioner or dealing with the intense heat to save money. Similarly, low-income households who pay directly for their heating oil or propane and must deal with increased costs and pollution are also particularly vulnerable. The County must prioritize interventions that lower the energy burden, green the energy source, and facilitate accessible financing.

Inequity in Flood Impact

As detailed in the [Montgomery County Climate Conditions](#) chapter, urban flooding poses a risk to vulnerable communities because they are the least likely to have the resources to repair damage from flooding. In addition, as described in the aforementioned chapter, vulnerable populations tend to live in basement apartments, which are more prone to flooding. **Figure 19** illustrates where vulnerable communities live in the County along with areas of flooding. This information can be used to prioritize investments that would reduce the occurrences and impacts of flooding in these communities.

Inequity in Transportation

Transportation assets in this country have been used to bring people together as well as tear them apart. Adequate transportation can enable people to access jobs, health care, schools, food sources, recreation, and entertainment. However, transportation infrastructure for cars and sometimes rail has historically been located in minority communities in ways that not only break them up but also increase mobile GHG and fugitive emissions that exacerbate respiratory illnesses in these communities. Similarly, though on the opposite side of the spectrum, certain communities of color have historically been excluded from transportation mobility, including in Montgomery County.

Single-occupancy vehicle driving is the predominant commute mode for working County residents. In 2016, more than 65% of commuters chose to drive alone.⁴⁵ However, driving has decreased by 4% since 1990, as other forms of commuting and working have increased, such as walking and cycling to work and working from home. Working from home, or "teleworking," has increased significantly during the COVID-19 pandemic and will likely have lasting impacts on transportation patterns. And while the County has significantly expanded cycling and pedestrian infrastructure to improve access and safety, those facilities are still not widely available enough to induce the necessary shift in transportation patterns.

Public transit was the second preferred mode of transportation in Montgomery County in 2016; however, despite increases in public transit options, there was only a 3% increase in this commute mode use between 1990 and 2016. Montgomery County is largely covered by both the Washington Metropolitan Area Transit Authority (WMATA) Metrobus and County Ride On bus services. WMATA's Metrorail Red Line serves the major activity centers in the County, including Bethesda, Rockville, Shady Grove, Silver Spring, and Wheaton. The Purple Line, which is currently under construction, will provide light rail service in Montgomery County to areas such as Lyttonsville, Woodside, College Park, and Silver Spring. However, many areas remain underserved by rail, including the Route 29 corridor, Germantown, Clarksburg, and other areas in the northern and western part of the County.

Recent implementation of the FLASH Bus Rapid Transit (BRT)-like system along the Route 29 corridor provides greatly improved frequent transit service to that portion of the County. Implementation of a BRT network and other transit, such as the Corridor Cities Transitway, are planned to provide service to many of these areas.

The lack of a dense network of public transit options disproportionately impacts certain groups in the County. For example, Black residents are the most likely group to use public transit as a means to get to work (19.8%), followed by White (13.6%), Hispanic (12.8%), and Asian residents (11.7%).⁴⁶ In addition, Black residents are two times more likely to not own a vehicle in comparison to any other group in the County.⁴⁷ Therefore, Black residents rely on public transit options more than any other group in Montgomery County. Access to public transit options near homes, schools, and places of employment has been noted as a key issue by many residents. Other key issues include affordability, service quality, and timing issues resulting in long commutes.

Tobytown, which is situated near Potomac, is a historically Black neighborhood in a remote location, that for more than 30 years petitioned for bus service to connect their community with the rest of Montgomery County. Many people in this impoverished community could not afford to own vehicles, and the lack of transportation infrastructure, such as sidewalks or even paved shoulders, made it dangerous for people to walk to the closest bus stop 3 miles away.⁴⁸ The lack of access to reliable transportation made the community socially vulnerable because they could not readily access food, jobs, health care, or recreation. After several different approaches to providing transportation had been tried, and failed, in late 2016, the County instituted a new, though limited, bus route to serve the community.⁴⁹

While Tobytown faced transportation access disparities, other parts of Montgomery County that include BIPOC and new immigrant populations are dealing with the impact of congested roadways. As noted earlier, 65% of Montgomery County's residents commute by car and many of them drive alone. Most of these congested roadways carry thousands of cars per day and are routed through the communities that are most vulnerable to the impacts of climate change. Children that live 0.2 to 0.3 mile from a highway also experience exaggerated negative health outcomes, including asthma attacks, onset of childhood asthma, premature death, death from cardiovascular diseases, and cardiovascular morbidity.⁵⁰ Long-term exposure to traffic pollution can increase the risk of chronic obstructive pulmonary disease, dementia, poor cognition, and premature death. In addition to being exposed to negative health impacts, this same population is exposed to greater risk of pedestrian injury or fatality from vehicles, often exacerbated by the lack of vehicle and pedestrian infrastructure upgrades. This is evidenced in **Figure 6**, **Figure 7**, and **Figure 8** below, which show that the majority of BIPOC and low-income communities live near major roadways and that they are more likely to live in close proximity to

traffic. Additionally, 67% of Montgomery County's total population (697,892 people) lives in an area where the proximity to traffic is greater than the statewide median.

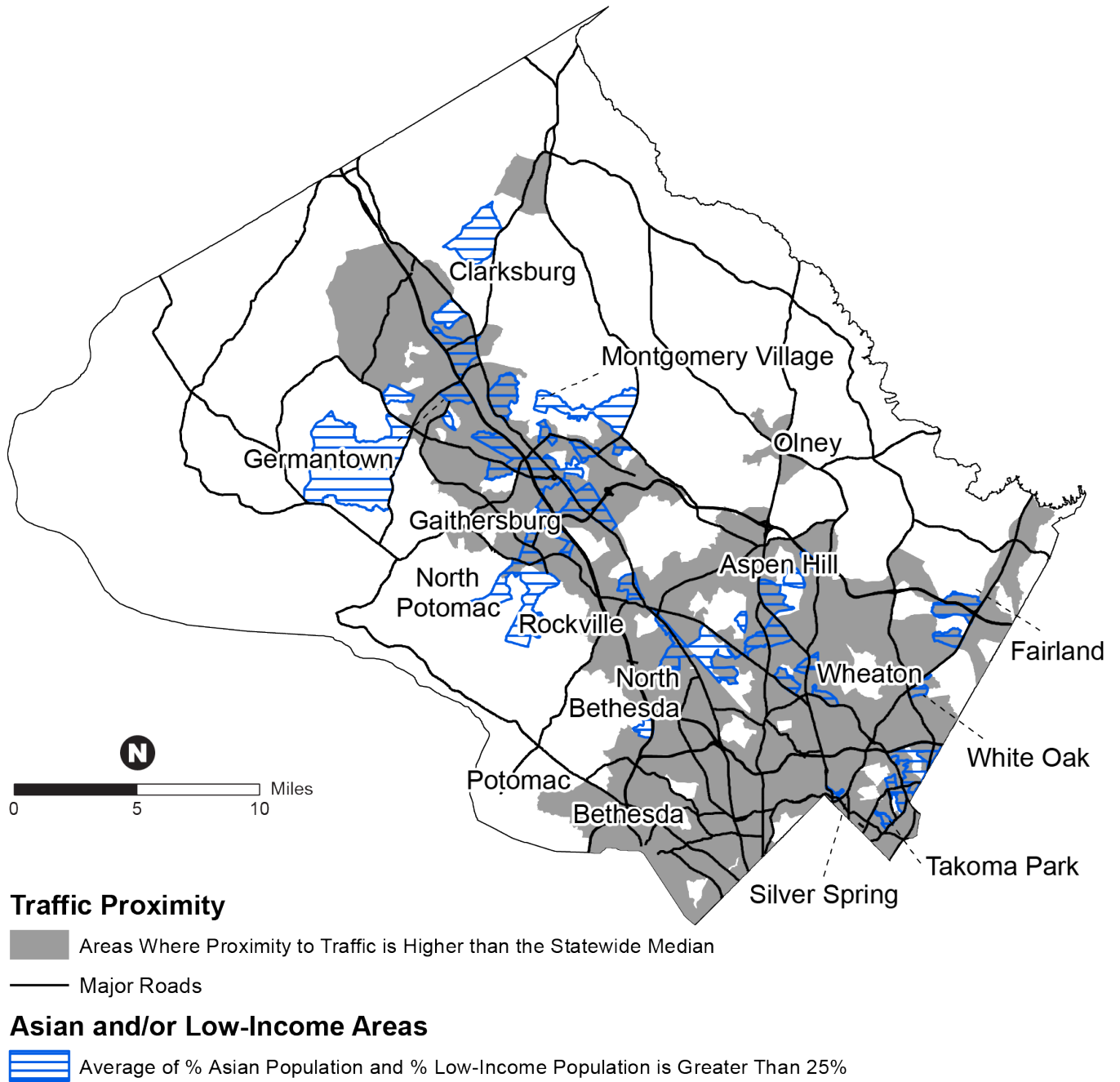


Figure 6: Traffic proximity to Asian population and low-income areas⁵¹

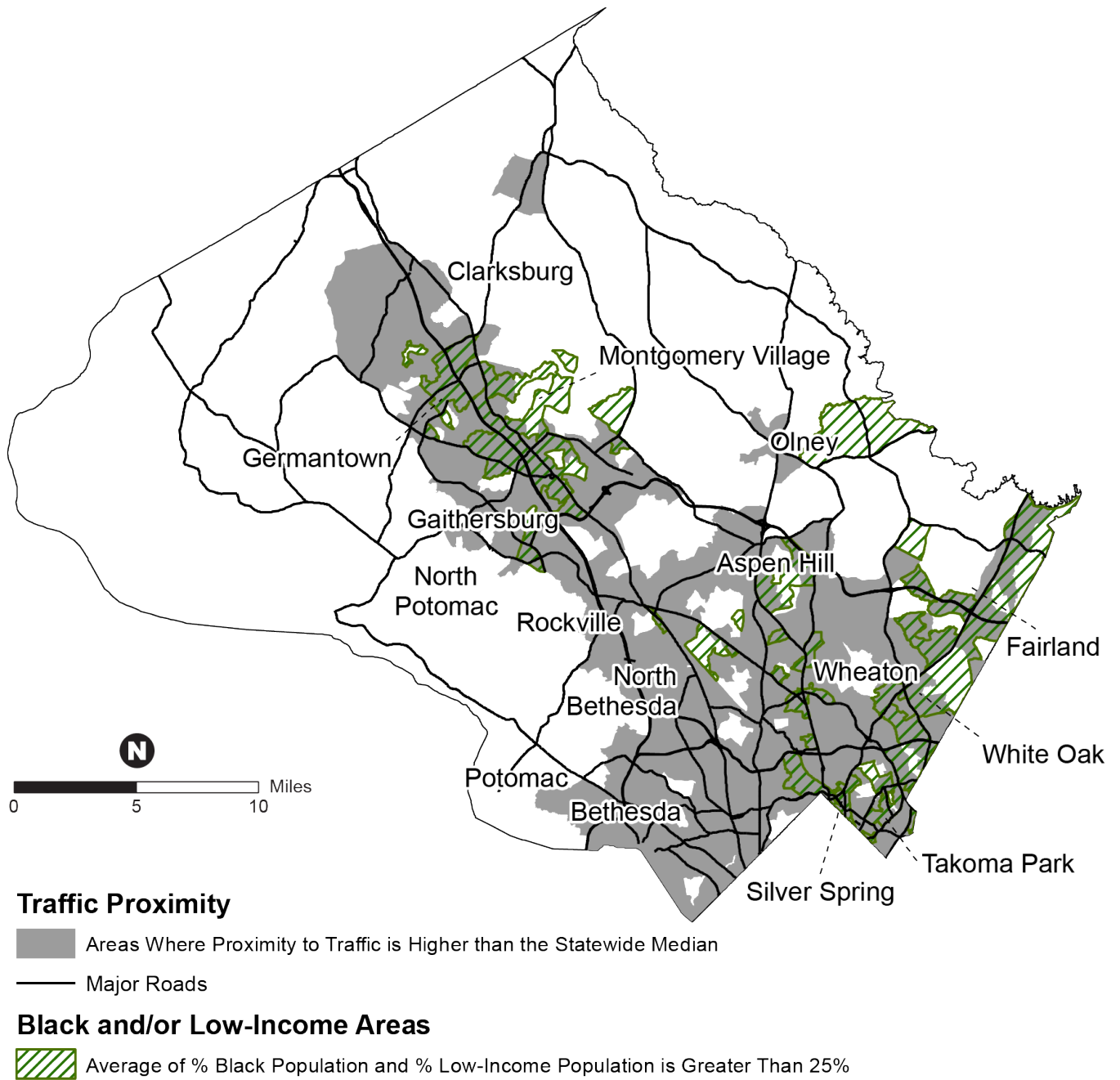


Figure 7: Traffic proximity to Black population and low-income areas⁵²

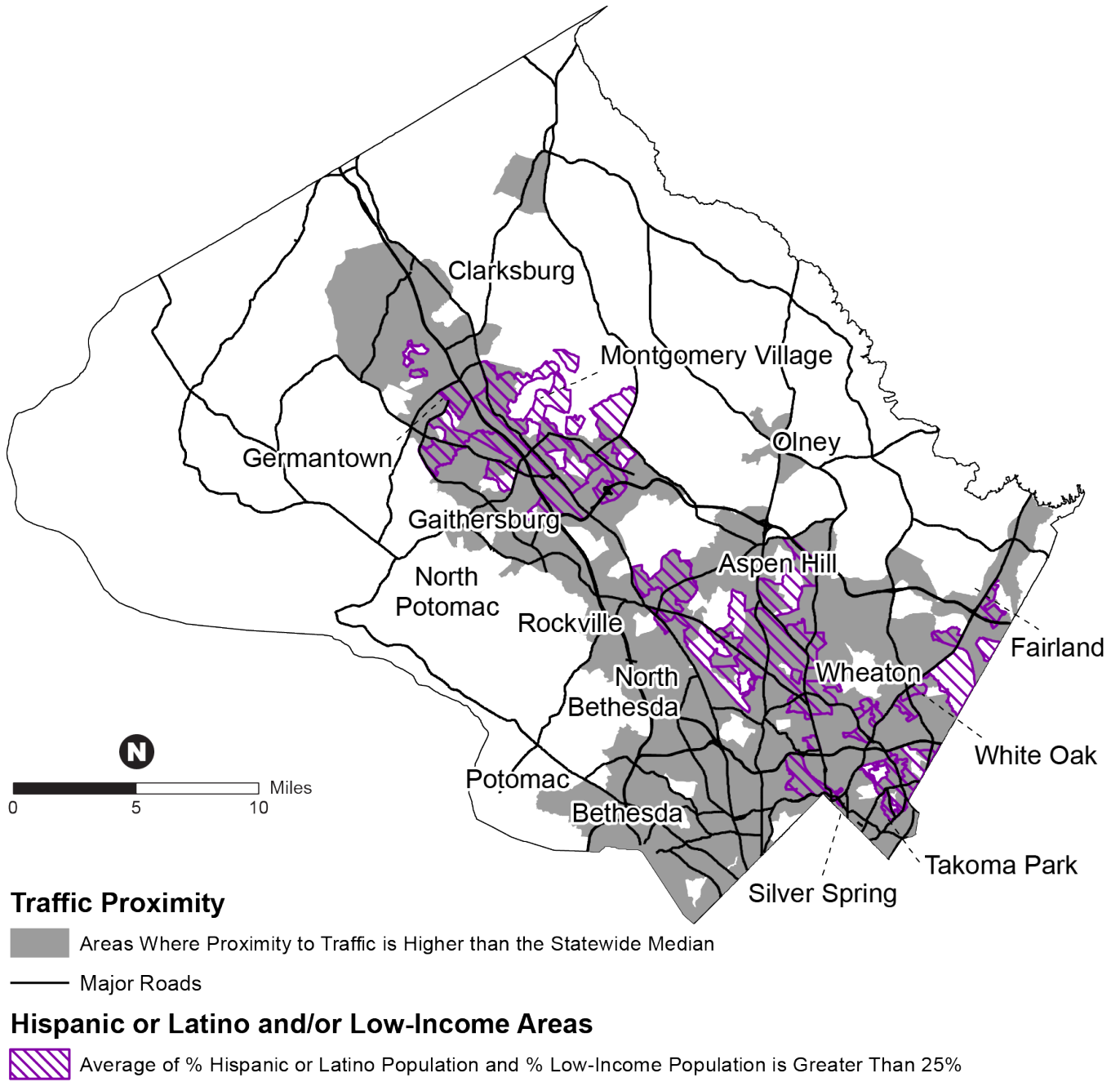


Figure 8: Traffic proximity to Hispanic or Latino population and low-income areas⁵³

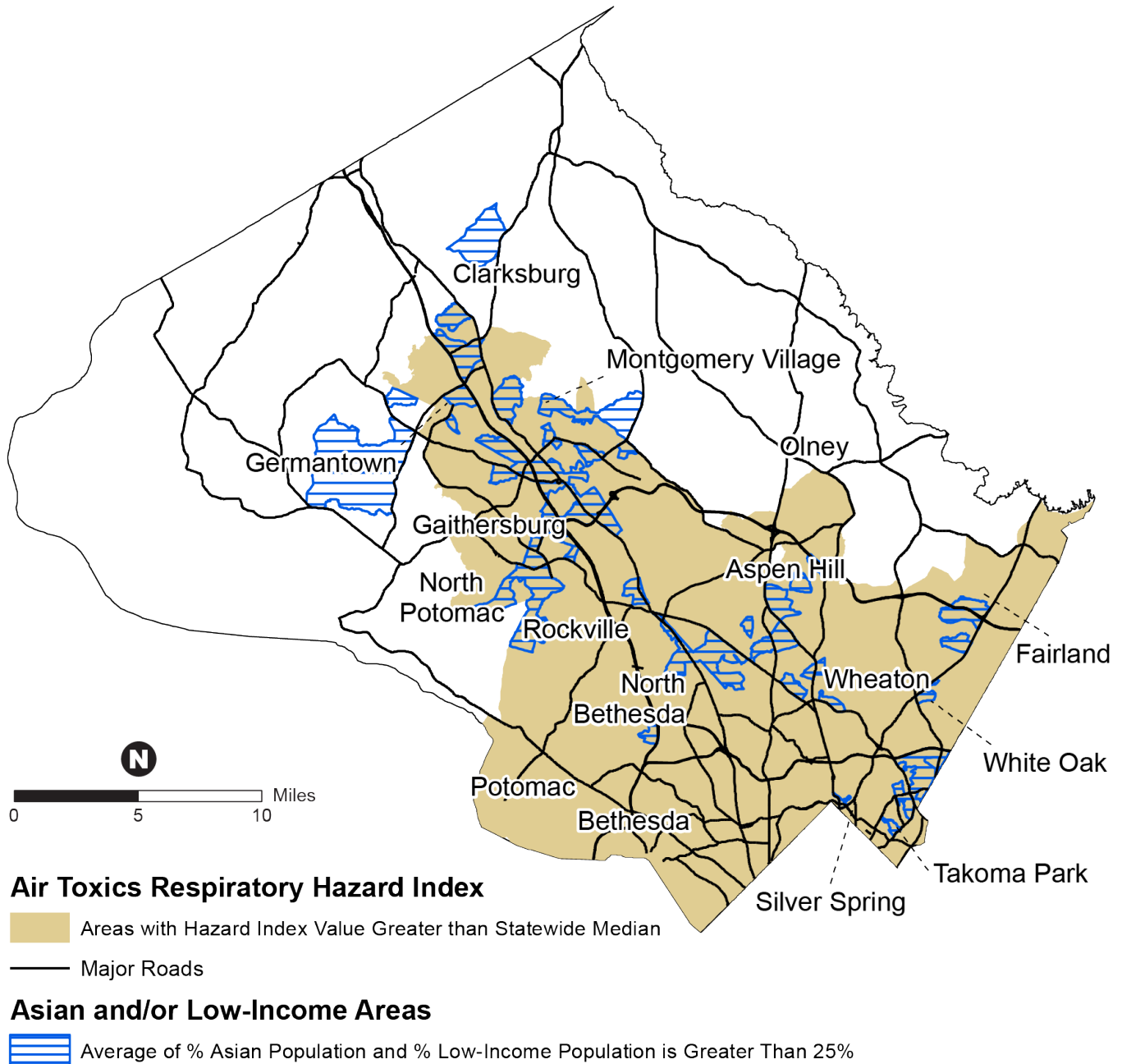


Figure 9: Air toxics respiratory hazards in relation to Asian population and low-income areas⁵⁴

Furthermore, **Figure 9**, **Figure 10**, and **Figure 11** demonstrate that these vulnerable communities face constant air pollution from vehicle emissions, which not only contribute to climate change but also cause and exacerbate respiratory illnesses. As described in the *Inequity in Health* section, vulnerable groups are already more susceptible to life-threatening diseases such as heart disease and diabetes, and living near congested roadways only worsens those

conditions. The National Air Toxics Assessment Hazards Index (NATA HI) evaluates the health impacts of combined pollutants rather than a single pollutant. **Figure 9**, **Figure 10**, and **Figure 11** show areas where the NATA HI is greater than the statewide median. The map shows that the overwhelming majority of BIPOC and low-income communities are not only impacted by traffic congestion but also by the pollution that is emitted from it.

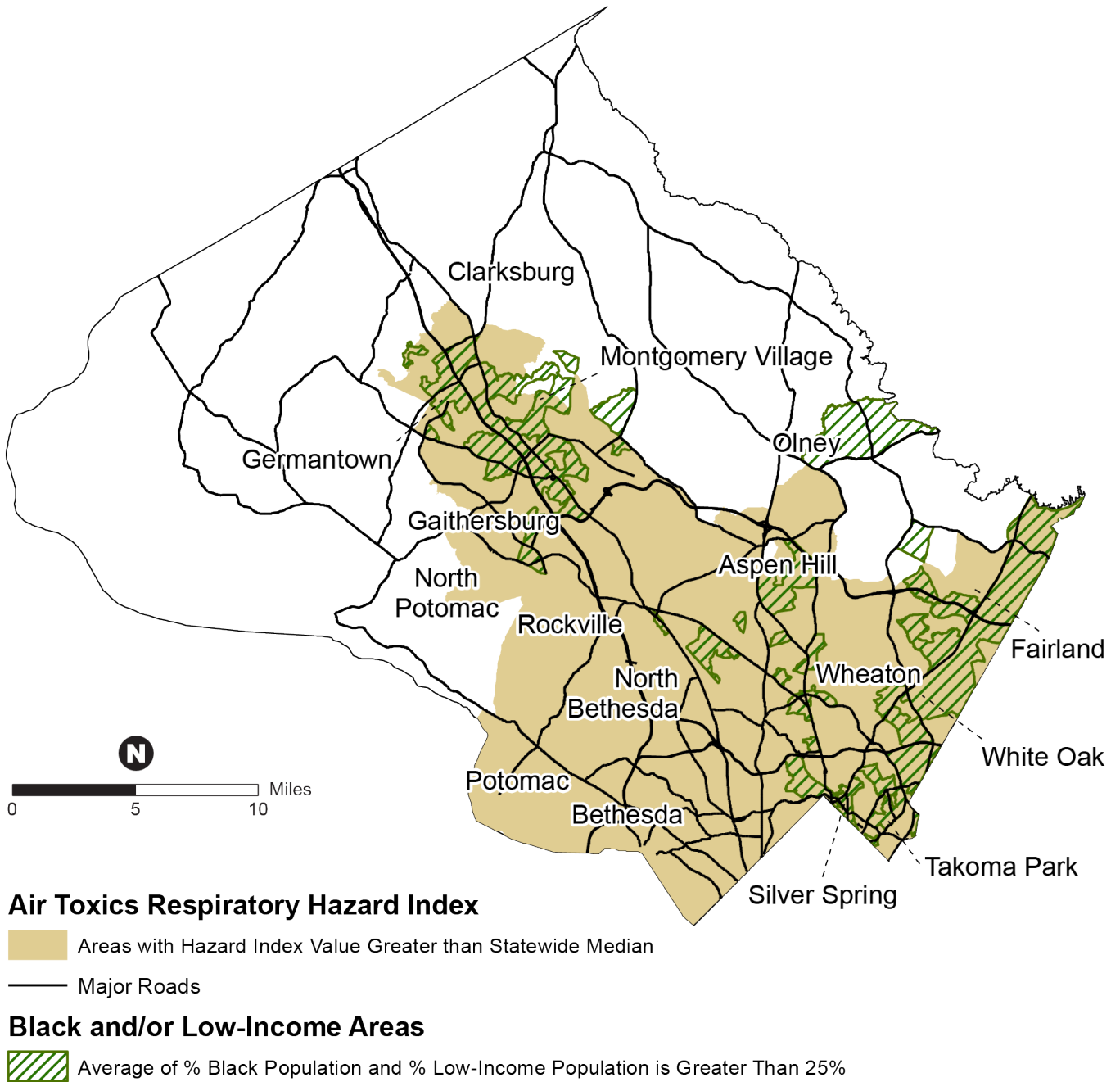


Figure 10: Air toxics respiratory hazards in relation to Black population and low-income areas⁵⁵

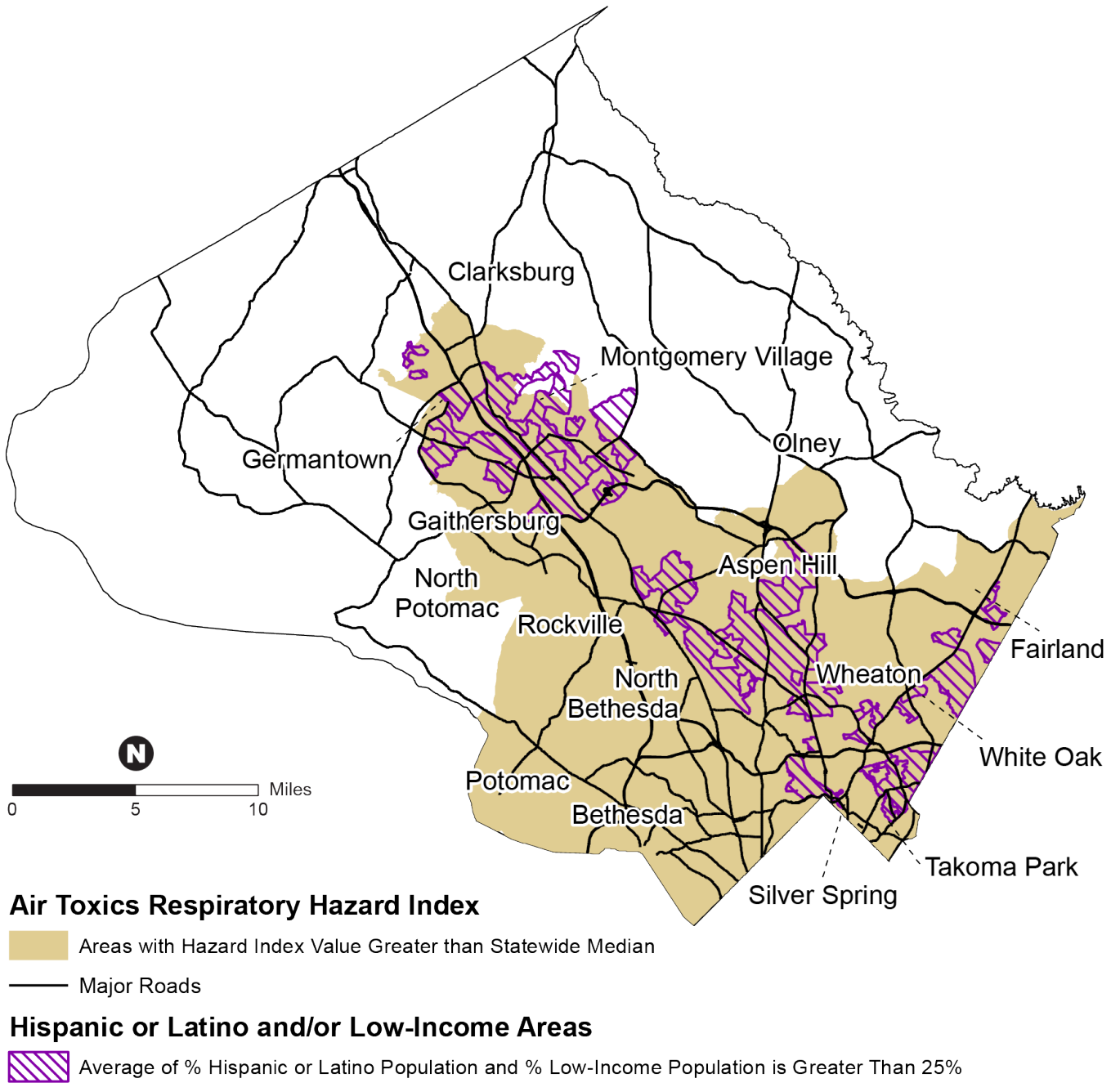


Figure 11: Air toxics respiratory hazards in relation to Hispanic or Latino population and low-income areas⁵⁶

Additionally, 83% of Montgomery County’s total population (863,942 people) lives in an area where the NATA HI is greater than the statewide median.

Transportation: Implications and Considerations

Access

Improving bus service requires that the County pay particular attention to areas similar to and including Tobytown, which has bus service, but the service is limited to every 1.5 hours and it is a 40-minute ride to the Metro station. Access to multimodal options could help alleviate these service delays.

Transit could also be made fare-free for low-income people, and major roads could have designated bus-only lanes to facilitate shorter commute times. Workers with irregular schedules who rely on transit face significant obstacles to use of transit. To address this inequity, the County could expand its use of new mobility technologies like virtual ride-hailing to provide flexible, on-demand services.

Electrification of private vehicles presents a considerable equity challenge, and the County must be very proactive in helping to make the purchase or lease of electric vehicles (EVs) and the associated charging infrastructure accessible to low-income communities. Policies and programs that could address this include “cash for clunkers” incentives and EV car-sharing (and broadened charging station infrastructure) programs, as discussed in Transportation Actions **T-3**, **T-7** and **T-10**.

Costs

Taxes on gasoline are used to fund federal roadway infrastructure, support state and local transportation priorities, and disincentivize vehicle usage. Gas taxes, however, are not income-dependent. Thus, low-wage earners pay the same tax on gasoline as middle- and high-wage earners. Low-wage earners are more likely to work shift jobs outside of public transportation operating hours; work in the gig economy as ride-hail or delivery drivers; and live in areas with little to no amenities, meaning they travel further to access quality amenities. A vehicle carbon/gas tax or VMT tax (**Action T-12**) should be structured in a way that does not have the unintended consequence of overburdening low-wage earners by causing them to spend a larger share of their income to purchase gasoline for essential use.

Pollution

Electrifying MCPS and County transit buses, particularly those used on the busiest routes, should be a top priority because this simultaneously reduces greenhouse gas emissions and addresses equity by providing better air quality to both passengers and residents in adjacent neighborhoods who have experienced disproportionate impacts from air pollution. To the extent possible, Black communities like Tobytown, given their history of discrimination, should also be among the first to receive electric buses.

Inequity in Health

Many racial and ethnic minorities face challenges in accessing medical care in the United States. When they do have access to medical care, research reveals systemic differences in the kind and quality of medical care received by different groups.⁵⁷ Many residents in Montgomery County have serious concerns about health and well-being. These concerns range from unaffordable and inaccessible health care to the lack of health care-related information and awareness-raising programs. For example, 7.8% of County residents do not have health insurance.⁵⁸ When this statistic is broken down by racial group, Hispanics make up the largest portion of residents without health insurance (19.4%), followed by Black (7.3%), Asian (5.8%), and White residents (3.8%). The situation in the County reflects a trend across the country, with Hispanics facing greater barriers to health insurance than any other racial group. Residents in Montgomery County experiencing chronic illness and disabilities in particular find the health care system challenging to navigate.

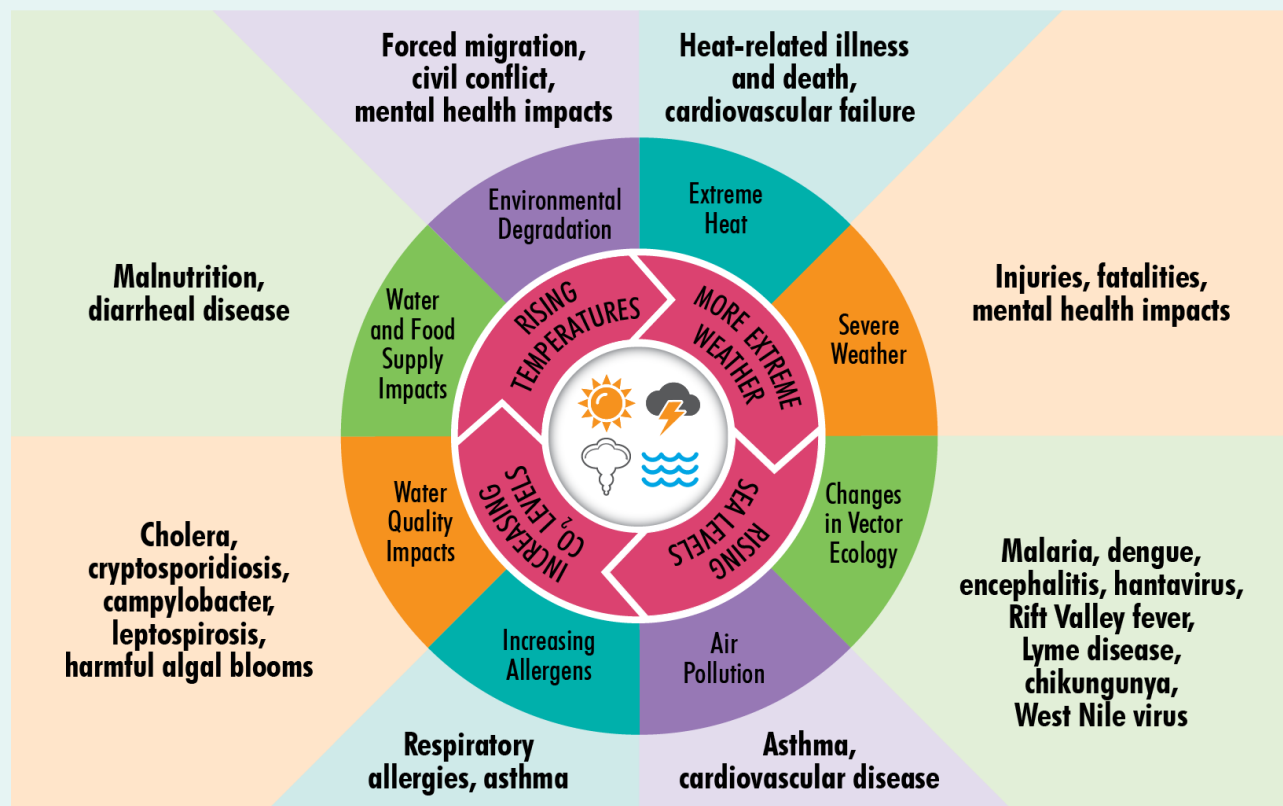
The conditions in which people are born, grow, live, work, and age – known collectively as the “social determinants of health” – significantly determine health outcomes. The **Montgomery County Zip Code Report** examined health factors and outcomes, including mortality, quality of life, behavior, clinical access, environment, and socioeconomic status. The report reveals significant disparities among zip codes.

When analyzing health factors, including health behaviors, clinical care, socioeconomic factors, and physical environment, the zip codes that scored the highest (beginning with the highest score) are 20861 (Ashton), 20816 (Bethesda), 20854 (Potomac), 20817 (West Bethesda), and 20815 (Chevy Chase). The five zip codes that scored lowest (beginning with the lowest score) are 20903 (Silver Spring), 20877 (Gaithersburg), 20906 (Aspen Hill), 20902 (Wheaton), and 20851 (Rockville/Twinbrook).

In overall scoring, which adds length of life and quality of life (for example, hospitalization rates, low birth rates), the zip codes that scored highest (beginning with the highest score) are 20816 (Bethesda), 20854 (Potomac), 20815 (Chevy Chase), 20861 (Ashton), and 20817 (West Bethesda). The five zip codes with the lowest score (beginning with the lowest score) are 20837 (Poolesville), 20877 (Gaithersburg), 20904 (Colesville), 20906 (Aspen Hill), and 20851 (Rockville/Twinbrook). The zip codes with lower rankings have higher percentages of BIPOC community members than the zip codes with higher rankings. It is no coincidence, therefore, that between 2016 and 2018, Black individuals were more likely to contract and die from diabetes, heart disease, and chronic respiratory illnesses than any other groups in Montgomery County.⁵⁹ Similarly, Latinos are currently 41% more likely to have diabetes than non-Latino Caucasians/Whites.⁶⁰

Health: Implications and Considerations

Climate change further exacerbates health challenges for people with pre-existing conditions and elderly populations. Extreme heat can cause severe illness and even death in people with cardiovascular or respiratory health issues. Furthermore, extreme heat increases pollen in the air, which can trigger asthma. Severe weather events can cause damage to housing and put a financial strain on homeowners and tenants. In some cases, extreme weather events can even cause displacement. These compounding issues can add stressors that impact the mental health of vulnerable populations. Low-wage earners are more likely to be employed in jobs with limited sick leave and that require in-person attendance. The health implications of climate change can cause a cascading and catastrophic impact on already vulnerable populations.



Source: Centers for Disease Control and Prevention. 2021. Climate and Health. Available: <https://www.cdc.gov/climateandhealth/effects/default.htm>

Environmental Racism

All of these factors that contribute to climate injustice connect to the broader category of environmental racism. Environmental racism is the disproportionate impact of environmental hazards such as air pollution on people of color. Environmental racism refers to the institutional rules, regulations, policies, and government and corporate decisions that deliberately target certain communities for locally undesirable land uses and lax enforcement of zoning and environmental laws. This targeting results in communities being disproportionately exposed to polluting industries and to toxic and hazardous waste. Environmental racism is caused by several factors, including intentional neglect, the alleged need for a receptacle for pollutants in urban areas, and a lack of institutional power and low land values in areas predominantly populated by historically marginalized communities.⁶¹

To address this, the State of Maryland established an Environmental Justice Commission in 2001; however, the commission has been decried by residents as only advisory in nature and lacking in substantive action.⁶² As of September 2020, only two of the 20 seats available on the Commission were occupied by representatives from the affected environmental justice communities, which the U.S. EPA defines as communities overburdened by environmental harms, and a quarter of the seats were vacant. In response to this criticism, amendments were made to the law governing the Commission in 2021 to expand representation of communities disproportionately affected by environmental and public health hazards, as well as to expand opportunities for communities around the state to participate in the Commission's activities. An effective Environmental Justice Commission would be beneficial for all counties, as environmental issues such as water quality and air pollution that happen in one county have the ability to impact adjacent counties.

In demonstrating a commitment to racial equity and social justice, Montgomery County led a community-inclusive process to develop a Racial Equity and Social Justice Policy that was formally

adopted in December 2019. In February 2020, the County confirmed a Chief Equity Officer who holds the responsibility of implementing the Racial Equity and Social Justice Policy. The County is also in the process of developing an Equity Assessment Map, using EPA's Environmental Justice Screening and Mapping Tool (EJSCREEN), to understand and address environmental justice concerns. With this Equity Assessment Map, the County will be able to conduct data-driven community assessments.

Other Dimensions of Equity and Social Justice

Vulnerable populations are often discussed in terms of race in environmental justice discussions. However, other groups, such as elderly populations and those suffering from physical disabilities, are also at risk from the impacts of climate change. Factors such as chronic health issues, living conditions, and mobility challenges can make these populations more sensitive to extreme heat, experience increased respiratory-related illnesses due to longer allergy seasons with more pollen in the area, and decrease their ability to be resilient in the midst of property damage from extreme weather events. Physical impairments may decrease a person's ability to respond to emergency alerts or to recognize dangerous situations such as flash flooding. These considerations are important when developing resilience and mitigation measures for elderly and disabled populations. Although there may be some exceptions, vulnerabilities within these population groups are similar to those experienced by BIPOC communities.

CAP Approach to Racial Equity and Social Justice

Historical wrongs have played a major role in how communities across Montgomery County are experiencing climate change now and in the future. Although indicators of pre-existing vulnerabilities such as age, race, gender, disability, and chronic health conditions cannot be changed, these characteristics must be considered when undertaking climate change and resilience planning.

Moreover, a study by the University of Leeds Sustainable Research Institute⁶³ finds that the top 10% of the population consumes 20 times more energy than the bottom 10%, primarily as a result of more flying and driving. And U.S. per capita lifestyle consumption is much greater than other G20 nations. While data are not available

for Montgomery County, it is fair to assume that significant disparities exist. In short, County residents who have contributed least to the climate problem are likely to suffer the greatest consequences.

For the CAP to achieve a desired and widespread positive impact, it was essential that climate action design and assessment incorporate consideration of racial equity and social justice principles (**Figure 12**). Social justice implies that harm has been addressed and corrected. To that end, racial equity is one tool to achieve social justice. In discussing and defining these two concepts, it is important to note that different communities are starting from different places. This lens is important for not only shedding light on areas of greatest need but also for strategic development of climate action implementation. The County will develop and deploy the CAP in ways that ensure its implementation makes significant progress toward achievement of racial equity and social justice.

Racial Equity

When race can no longer be used to predict life outcomes and outcomes for all groups are improved

- Transportation Equity
- Critical Infrastructure
- Planning and Zoning
- Food Security
- Emergency Management
- Green Jobs
- Inclusive Decision-Making
- Pollution-Emitting Sources
- Green and Safe Spaces

Social Justice

When all people have access to the same rights and resources and there is a fair distribution of resources

- Inclusion
- Meaningful Engagement
- Accessibility
- Education
- Minority Business Enterprises
- Partnerships
- Workforce Development
- Strong Community Partnerships and Ownership
- Capacity Building

Figure 12: Racial equity and social justice guiding principles

To ensure that equity is at the center of the CAP and its recommended actions, the County used the following approach:

1. **Secondary research** was analyzed to develop a robust understanding of the current condition in Montgomery County, including U.S. Census data and other relevant reports and studies. An overview of current conditions is presented in [**Montgomery County's Socioeconomic Profile**](#).
2. **Social vulnerability** was defined in the context of climate change, based on the Centers for Disease Control and Prevention (CDC) Social Vulnerability Index (SVI), and considered in the CAP.
3. **Engagement** with County and community organizations as well as community discussions with Resilience Ambassadors were undertaken to bring in additional, diverse voices to inform the development of equity-enhancing measures and to confirm priority actions and identify blind spots.
4. As part of the **co-benefits scoring method**, all actions were evaluated based on their contribution to Racial Equity and Social Justice.
5. **Equity-enhancing measures** were developed to supplement priority actions, to ensure actions truly responded to the key issues and priorities of Montgomery County's most climate vulnerable communities, to ensure that racial equity and social justice principles were considered when designing and finalizing actions, and to ensure that climate vulnerable groups were considered from a benefits perspective.

Highlights from Community Conversations

Figure 13 identifies the key issues highlighted during two meetings with County leaders that were focused on public health, racial equity, civil rights, immigrant communities, seniors, low-income communities as well as through 130 community conversations facilitated by County

Resilience Ambassadors during the Summer of 2020. The issues include several critical areas, such as community health and safety, housing, education and awareness, and accessibility. As annual CAP workplans and implementation strategies are developed, it is essential that these issues be addressed to advance racial equity or, at the very least, neutralize any adverse consequences.



Figure 13: Key community priorities

What We Heard



COVID-19 highlighted that people can change. There are people walking and biking... now imagine if they felt safe to do this regularly...."

"Tenants often feel powerless and are left to deal with real-life consequences that are created from flooding in their homes without having support from landlords."

"It is hard to prioritize climate change when you are in survival mode and just trying to get through day by day."

"Homeless people need to be protected from climate emergencies."



"Many people are out of work or earning less due to COVID-19, and there is an increasing trade-off between health and well-being, and cost."

"Many immigrant households have a certain fear or apprehension associated with the medical system... and may not know how to navigate it appropriately."



"People bring the trauma of the situations they left behind, and communities of color continue to deal with systemic racism. Trauma and mental health are key in all of this."

"Our government doesn't have enough representation. We need more Black and Brown voices in positions of power since the majority of the County is composed of People of Color."



Recommendations to Improve Community Engagement

By engaging with community members, the County received significant feedback on ways to improve communication and engagement between County officials and underrepresented community members. The key recommendations are listed below, and are captured in the **Public Engagement, Partnerships, and Education** actions.

Practice Proactive and Intentional Engagement

- Relationships with community members have historically been transactional in nature and need to be more intentional.
- There is a community preference for early and proactive—rather than late and reactive—engagement. Engage at a stage where the community can provide input such that it can shape plans or actions.
- Provide additional outreach opportunities and support residents in raising their voices. Suggestions include a suggestion box style website, regular community surveys, and newsletters and/or emails.
- Be prepared to provide solutions and resources for residents, and work with residents to develop solutions together.

Build a Connection

- Approach the community with the intent to listen.
- Take residents' concerns seriously and make good faith attempts to act on those concerns.
- Building relationships and trust requires time and effort, and the process cannot be rushed.
- Work with community leaders who have considerable understanding of and influence in the community.

Seek and Elevate Diverse Voices

- There is a tendency for feedback to be provided by the same group within the community. Suggested approaches include providing incentives for participation time (for example, stipends, gift cards, travel reimbursement) or offering dependent care services or food during meetings or engagement events. Similarly, representation from low-income communities on County advisory groups and commissions should be supported by compensating them for their time, travel, and computer needs in order to make participation feasible.
- Engage with diverse community organizations that focus on topics such as environmental justice, public health, civil and racial rights, faith issues, economic development, and other areas of community concern.

Practice Inclusive Engagement Strategies

- Use nontraditional methods to meet and engage with community members; for example, go to places where they live, ride, shop, or work as well as virtual meeting settings.
- Use shared and simple language to make the link between climate risks and other risks clearer and more prominent to the community (for example, highlight the health impacts and costs of climate change impacts).
- Ensure information is disseminated in the language(s) of the community (English and Spanish at a minimum; other languages could include Chinese, Hindi, Korean, Vietnamese, Farsi, French, and Amharic).
- Build campaigns and incentives based on people's cultural practices, such as growing food at home or in their gardens.

This understanding of racial equity and social justice in climate action planning is a fresh start from the way Montgomery County has approached previous planning efforts. It will take a paradigm shift across all sectors and community ownership to realize its effectiveness. The **Public Engagement, Partnerships, and Education Actions** section of this Plan provides further discussion on how Montgomery County residents of all backgrounds and ages can be part of this ongoing effort of inclusivity and environmental justice through initiatives such as the Community Justice Academy.



Artist: Violeta Ben Arias (Age 11)



Artist: Yoonah Suh(Age 18)

Montgomery County Climate Conditions



Montgomery County Climate Conditions

Climate Hazards

As part of the Climate Vulnerability Assessment (full report provided in **Appendix C**), the County team analyzed four climate hazards by comparing its historical climate baseline (based on a period of analysis from 1950 through 2005) to projected climate threats through 2035, 2050, and 2100 for two different climate scenarios. These climate scenarios consider greenhouse gas (GHG) concentration projections or Representative Concentration Pathways (RCPs) and are standardized by the Intergovernmental Panel on Climate Change (IPCC). The first climate scenario used for this assessment was RCP 4.5, which shows a stabilization scenario through climate adaptation strategies and technology, with a moderate GHG emissions increase until the middle of the twenty-first century followed by a leveling off of these emissions. The second climate scenario, RCP 8.5, shows a business-as-usual or worst-case scenario, with GHG emissions increasing through the end of the century. The analysis was completed using the Forecasting Local Extremes (FLEx) modeling tool. Developed by AECOM, the FLEx tool uses general circulation model (GCM) output that has been downscaled by research scientists to achieve higher spatial resolutions for future climate scenarios. The FLEx tool efficiently condenses the data into a few key statistics that help describe future hazard exposure to a local area. Although a countywide average may be useful for some applications, the differences between grid cells are considered to be statistically significant and are shown in the figures throughout this section of the report.

Findings from this analysis show that the four major climate hazards in Montgomery County are:

- Extreme temperature
- Extreme precipitation
- Drought
- High winds

The FLEx tool considered precipitation, temperature, and drought existing and projected conditions. Because future wind conditions are not part of the FLEx tool options, current wind hazards were used in the analysis.

Other natural hazards (for example, winter storms, earthquakes, high humidity) are not included in this report, but some of these hazards are discussed in Montgomery County's Office of Legislative Oversight (OLO) Report 2021-5 Measuring Climate Resilience – A review of Select Critical Infrastructure Sectors in Montgomery County. This climate study does not include an analysis of ecological impacts, such as changing habitat ranges for plants and animals, algal blooms in water bodies, or the spread of invasive species. Additional human health issues are included in the Maryland Climate and Health Profile Report (April 2016), such as waterborne illnesses, air quality, and changes in the spread of mosquito- and other vector-borne diseases. More discussion on the impacts on human health (physical and mental) are discussed in the **Racial Equity and Social Justice** chapter of this CAP.

Extreme Heat

Average annual temperatures are projected to increase significantly, and the greatest changes will occur in the summer and fall. Extreme heat is also projected to increase significantly. Heat waves are among the most dangerous natural hazards in the County. Their intensity and frequency are increasing due to climate change. Hyperthermia alerts are issued when the temperatures and/or heat index for at least part of the County is projected to be at least 95°F. Heat emergency alerts are issued when the temperatures and/or heat index for at least part of the County is projected to be at least 105°F for a period of at least 2 days or longer. Based on these planning needs, the extreme heat analysis for this study was focused on how climate change would impact the 95°F heat threshold. There are about 4 days a year in which the average temperature is above 95°F in the historical baseline period. That is expected to increase dramatically by the end of the century, as shown in the calendar graphic in **Figure 14**. By the year 2100, Montgomery County residents could experience almost two full months each year with temperatures reaching above 95°F (for the RCP 8.5 scenario). Even by 2035, we can expect to experience an average of 12 days each year with temperatures reaching above 95°F, three times more than the County is experiencing today. Although the extreme heat projections did not factor the impact of humidity into the heat index, it is expected that factoring in humidity would likely exacerbate impacts due to increased temperatures. This climate hazard is considered to have the highest impact on the County.

Projected increases to average temperatures and heat waves can be exacerbated by a phenomenon commonly referred to as the urban heat island effect. Urban heat islands can be defined as developed urban areas that experience consistently higher temperatures than surrounding areas with lower population density and more pervious ground cover (unpaved area that allows water to flow through) and vegetation. The urban heat island effect is the result of multiple factors often associated with urbanization, such as a concentration of

construction materials that absorb and store more heat than the natural environment and then re-emit that heat when temperatures would normally decrease, minimal or no evapotranspiration (transfer of water from land to the atmosphere) due to lack of exposed soil and vegetation, concentrated heat generation from air conditioning and vehicle exhaust, and diminished wind flow due to building placement and concentration. Although the urban heat island effect was not directly quantified as a part of the Climate Vulnerability Assessment, it would likely increase extreme temperatures experienced in urban areas, and the County recognizes the need for further study on this issue. **Figure 15** and **Figure 16** show the areas of the County with tree coverage and with impervious surfaces (paved roads or surfaces that do not allow water to pass through), outlining sections of the County with a Centers for Disease Control and Prevention (CDC) Social Vulnerability Index (SVI) of 50% or greater. The map in **Figure 16** shows that many of the areas of the County with the most vulnerable communities also have high concentrations of impervious surfaces, which contribute to the urban heat island effect and increased temperature.

Baseline									
4.5	1	4.5	2	4.5	3	4	5	6	7
8	9	10	11	12	13	14			
15	16	17	18	19	20	21			
22	23	24	25	26	27	28			
29	30	31	32	33	34	35			
36	37	38	39	40	41	42			
43	44	45	46	47	48	49			
50	51	52	53	54	55	56			
57	58	59	60						

4 days

2035												
4.5	1	4.5	2	4.5	3	4	4.5	5	4.5	6	4.5	7
4.5	8	4.5	9	4.5	10	4.5	11	4.5	12	13	14	
15	16	17	18	19	20	21						
22	23	24	25	26	27	28						
29	30	31	32	33	34	35						
36	37	38	39	40	41	42						
43	44	45	46	47	48	49						
50	51	52	53	54	55	56						
57	58	59	60									

12 days

2050													
4.5	1	4.5	2	4.5	3	4	4.5	5	4.5	6	4.5	7	
4.5	8	4.5	9	4.5	10	4.5	11	4.5	12	4.5	13	4.5	14
4.5	15	4.5	16	8.5	17	8.5	18	8.5	19	20	21		
22	23	24	25	26	27	28							
29	30	31	32	33	34	35							
36	37	38	39	40	41	42							
43	44	45	46	47	48	49							
50	51	52	53	54	55	56							
57	58	59	60										

16 - 19 days

2100													
4.5	1	4.5	2	4.5	3	4	4.5	5	4.5	6	4.5	7	
4.5	8	4.5	9	4.5	10	4.5	11	4.5	12	4.5	13	4.5	14
4.5	15	4.5	16	4.5	17	4.5	18	4.5	19	4.5	20	4.5	21
4.5	22	4.5	23	4.5	24	4.5	25	4.5	26	4.5	27	4.5	28
8.5	29	8.5	30	8.5	31	8.5	32	8.5	33	8.5	34	8.5	35
8.5	36	8.5	37	8.5	38	8.5	39	8.5	40	8.5	41	8.5	42
8.5	43	8.5	44	8.5	45	8.5	46	8.5	47	8.5	48	8.5	49
8.5	50	8.5	51	8.5	52	8.5	53	8.5	54	8.5	55	8.5	56
8.5	57	8.5	58	8.5	59	8.5	60						

28 - 60 days

4.5 Days above 95°F (RCP 4.5)

8.5 Additional days above 95°F (RCP 8.5)

Figure 14: Projected average number of days above 95°F in Montgomery County for GHG Representative Concentration Pathway (RCP) 4.5 and 8.5

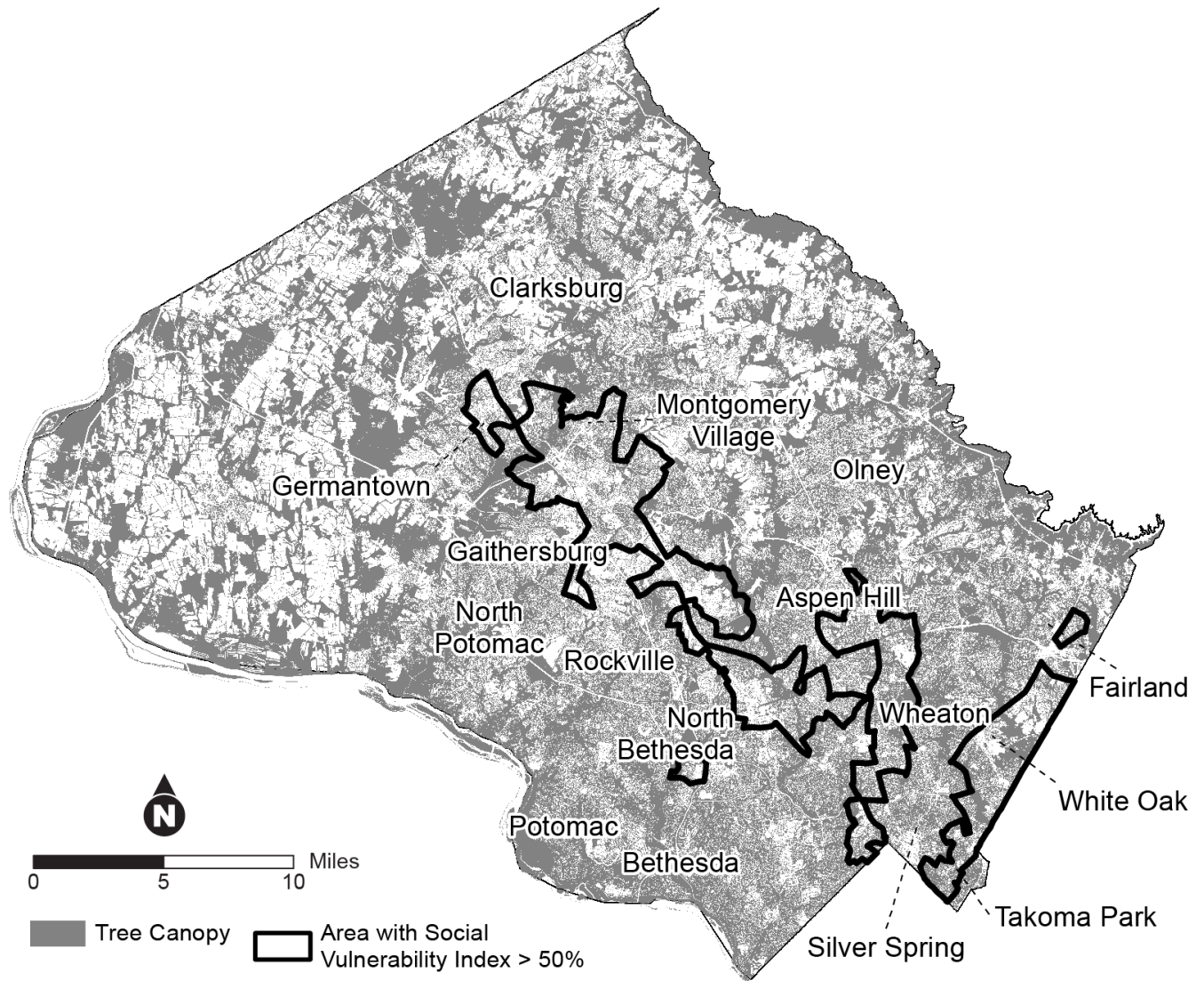


Figure 15: Tree canopy in Montgomery County, outlining areas ranked in the top 50% most vulnerable by the CDC Social Vulnerability Index

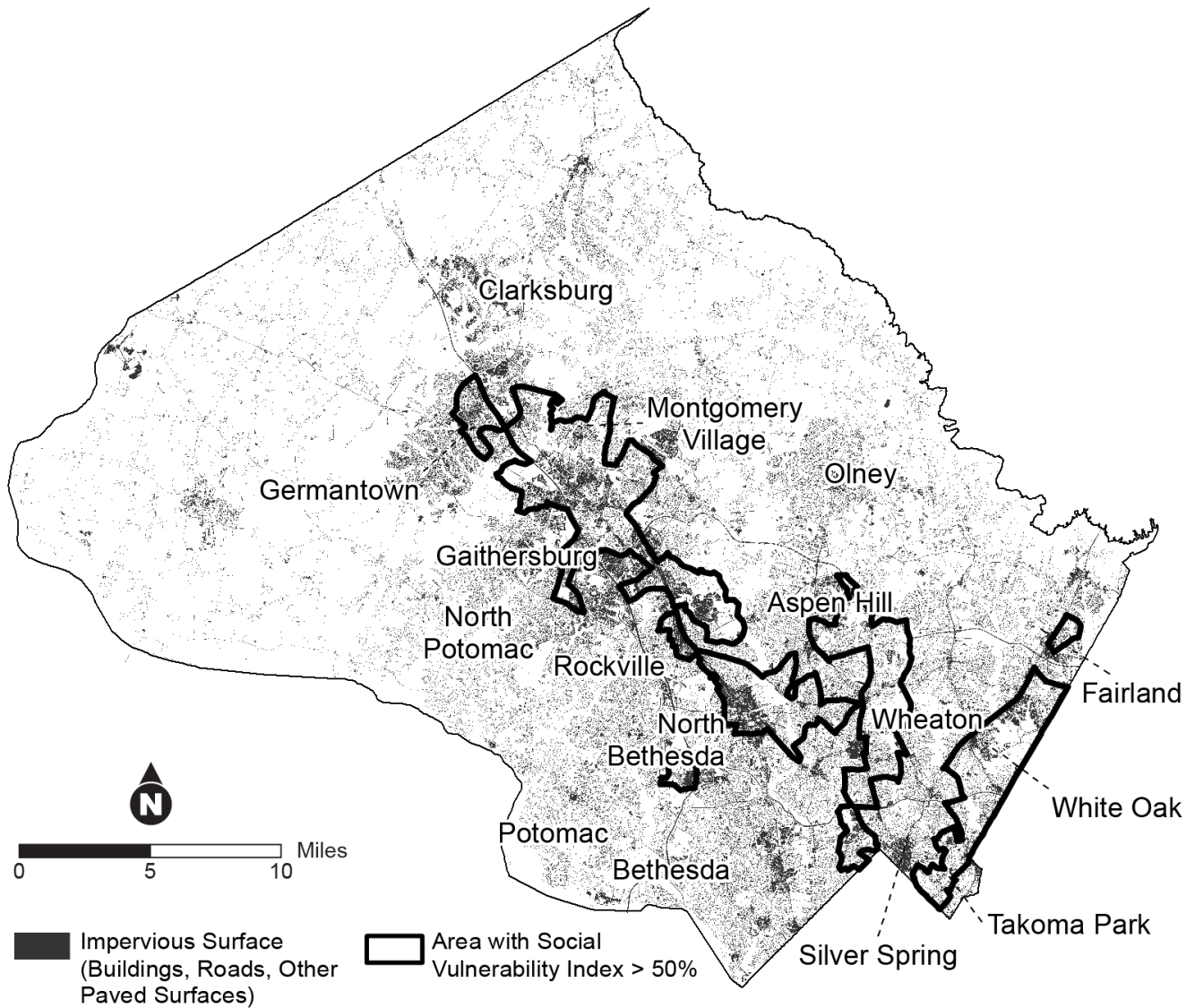


Figure 16: Impervious surface in Montgomery County, outlining areas ranked in the top 50% most vulnerable by the CDC Social Vulnerability Index

Drought

The County team evaluated future changes to drought by calculating the dimensionless monthly Palmer Drought Severity Index and then calculating the average annual number of months of mild (-1.0 to -2.0), moderate (-2.0 to -3.0), severe (-3.0 to -4.0), and extreme (-4.0

and lower) drought as defined by the National Oceanic and Atmospheric Administration (NOAA). Mild drought conditions are projected to decrease or stay the same in both RCP 4.5 and RCP 8.5, while the annual risk of moderate, severe, and extreme drought is projected to increase significantly by the year 2100, as shown in **Figure 17**.

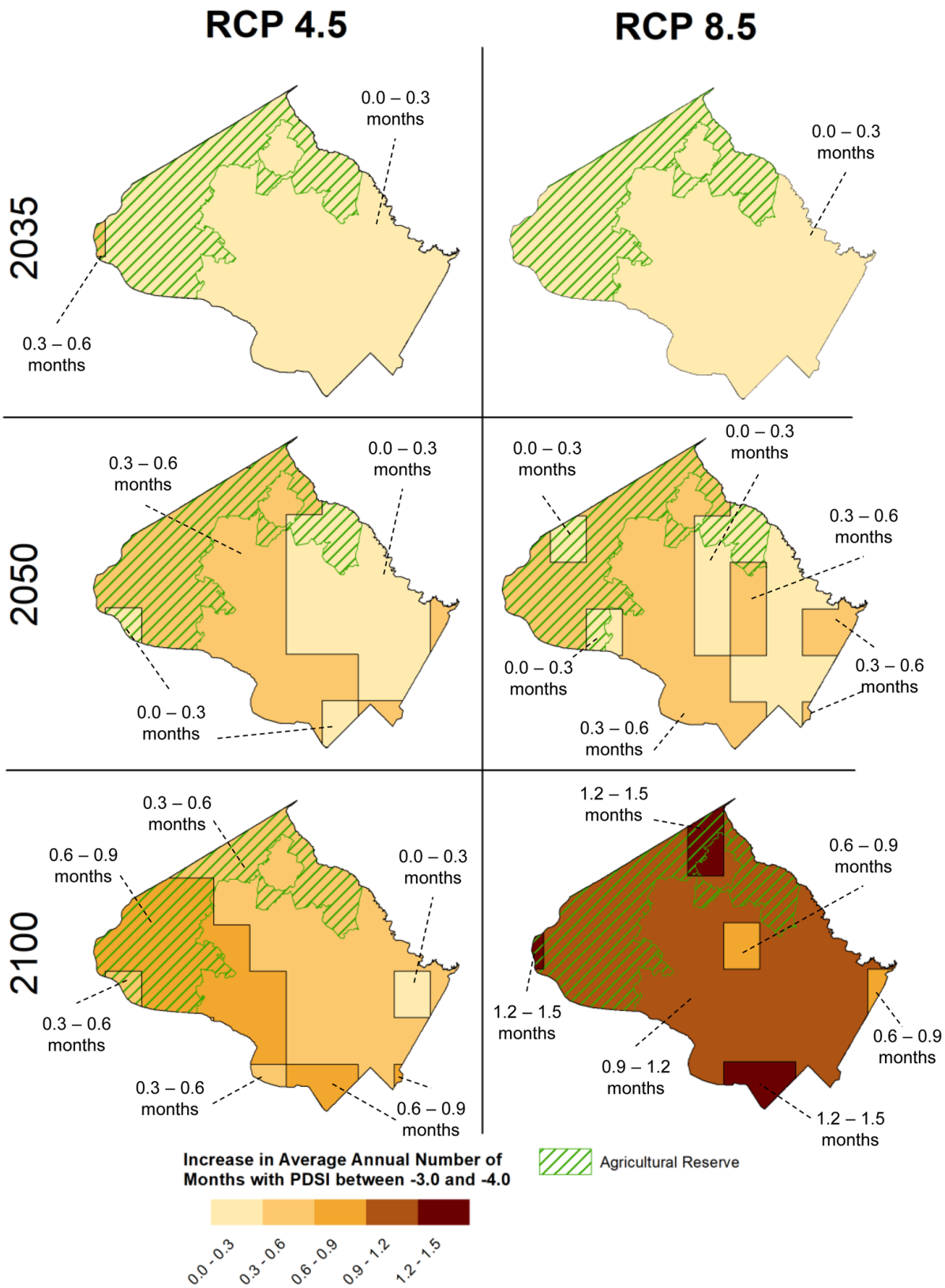


Figure 17: Projected increase in average number of months per year of severe drought (Palmer Drought Severity Index between -3.0 and -4.0) for 2035, 2050, and 2100, and climate scenarios RCP 4.5 and RCP 8.5 in Montgomery County

Extreme Precipitation

Montgomery County is not directly threatened by sea level rise. However, the County can expect to experience moderate increases in more extreme precipitation events and in precipitation totals in the future due to climate change. Increases in precipitation were determined for the RCP 4.5 and 8.5 scenarios for the years 2035, 2050, and 2100 for four recurrence intervals (1-year, 2-year, 10-year, and 100-year). A recurrence interval, or return period, is the probability that a given storm event will occur in any given year. For example, a 100-year event has a 1% chance of occurring every year and a 2-year event has a 50% chance of occurring every year. This means the 2-year (or 50% chance) event is much more likely to occur in any given year than a 100-year event. However, the more frequent events are much less impactful events; 2-year events may cause minor street or sidewalk flooding, whereas a 100-year event may cause flooding that closes entire streets and floods homes.

Table 2 shows the results of this analysis for the RCP 8.5 scenario for the 2050 and 2100 time frames, or the more extreme projections. To help compare expected future increases to the recurrence intervals, the equivalent current-day recurrence interval was calculated. So, the 100-year storm event in the RCP 8.5 scenario for the year 2050 would be equivalent to a 115-year storm event today. In other words, the frequency at which this event will occur remains the same, but the impact (or the size of the storm) will increase – larger storms will happen more frequently. The 100-year event in the RCP 8.5 scenario for the year 2100 would be equivalent to a 151-year event today. More frequent recurrence intervals (for example, 1-year, 2-year, and 10-year) are expected to have a smaller change in rainfall.

Another way that the County team analyzed extreme precipitation projections was by looking at the rainfall depth and intensity, which are associated with the percentage of total rainfall due to days with 95th percentile precipitation depth or greater. For the RCP 4.5 scenario, the County should expect a 2% increase in precipitation depth, or rainfall amount, by 2050 and a 5% increase by 2100. For the RCP 8.5 scenario, the County should expect a 4% increase by 2050 and a 7% increase is expected by 2100. This suggests that future rainfall events will be higher-intensity events, even though the amount of overall annual rainfall between present-day and 2100 is expected to increase only slightly.

It is important to note that the downscaled GCM precipitation output only provides simulated daily total values. Because of the Clausius-Clapeyron relation between temperature and pressure, as temperature increases the atmosphere can hold greater quantities of moisture, which leads to higher-intensity events. Thus, while 24-hour higher-frequency storm events (1-year, 2-year, and 10-year) are not projected to increase significantly in total depth of rainfall, it is very likely that the way these sub-daily precipitation events could result in increased flash flood risk. Unfortunately, the time resolution of the FLEx model output does not provide this level of detail in order to quantify changes to short duration (< 24-hour) rainfall intensities. However, **Figure 19** later in this chapter shows the anticipated increase in inches of rainfall for the 10-year storm event overlaid with County roads that currently frequently flood.

Table 2: Future changes to return period storms

Current		2050		2100	
Recurrence Interval	Precipitation for 24-Hour Storm (inches)	RCP 8.5 Equivalent Recurrence Interval	RCP 8.5 24-Hour Storm (inches)	RCP 8.5 Equivalent Recurrence Interval	RCP 8.5 24-Hour Storm (inches)
1-year	2.6	1-year	2.7	1-year	2.7
2-year	3.1	2-year	3.2	3-year	3.3
10-year	4.8	13-year	5.0	15-year	5.2
100-year	8.3	115-year	8.5	151-year	9.0

Increases in average storms as well as more intense storms can lead to flooding of culverts and roadways that are designed for current precipitation conditions. An expanded floodplain from increased rainfall can affect buildings that are located outside of the current floodplain. A recent example of the hazards of flooding occurred in Ellicott City, Maryland; while the city is outside of Montgomery County, it experienced catastrophic extreme flooding events in 2016 and 2018 that impacted the city's historic Main Street area, damaging infrastructure and buildings and leading to several deaths and multiple flood rescues. If extreme rainfall events and flash floods continue to increase, Montgomery County may need to expand its water rescue services.

High Winds

Hurricanes, tornadoes (rotating wind events), and derechos (straight-line wind events) can result in damage due to high-speed winds. Some initial analysis from the National Weather Service found an increase in the number of significant wind reports in the County, with an average of 25 reports per year prior to 2010 and with the average increasing to 44 reports per year in 2019. A significant wind report is defined as either being a measured wind gust greater than 58 miles per hour (mph) or a wind event causing damage, such as a tree falling into a house or damage to utility infrastructure. While the initial information shows a clear increase in damage to property, there was no increase in injuries or fatalities. However, high wind analysis was not included in the FLEx tool outputs because of limited data from future wind speed predictions. Therefore, the current design wind speeds for Montgomery County were obtained from the American Society of Civil Engineers' publication ASCE 7-16, Minimum Design Loads and Associated Criteria for Buildings and Other Structures, and they were included in the Climate Vulnerability Assessment.

Spatial Distribution of Climate Hazards

The statistically downscaled GCM output used in the Climate Vulnerability Assessment has a high enough spatial resolution to provide a glimpse into the possible spatial distribution of climate hazards throughout the County. **Figure 18** and **Figure 19** demonstrate possible spatial distributions of increased number of days >95°F per year and increases in the 10-year precipitation event in the RCP 8.5 climate scenario for the year 2050, respectively. Although spatial data are useful for identifying at a high level areas in the County that are especially vulnerable, it is important to acknowledge that spatial distribution of precipitation can be highly variable and difficult to model and predict, while temperature projections are generally considered to be more reliable and spatially consistent and for some applications, a countywide average may be more appropriate for the application.⁶⁴

Statistically downscaled GCM output relies on finding historical high-resolution spatial distributions of precipitation and temperature on a local scale that are analogous to the low-resolution GCM output that is calculated on a global scale.⁶⁵ In other words, historical spatial distributions of temperature and rainfall form the basis of these projections and, to some extent, limit the results. Using countywide average values of the projected climate hazards is the preferred approach for avoiding a false sense of precision.

Climate Vulnerability

The Climate Vulnerability Assessment analyzed the impact of climate hazards (extreme heat, extreme precipitation, drought, and high winds) on a variety of community asset categories, including the built and natural environment as well as people. This assessment is not exhaustive but is considered a crucial first step in identifying and prioritizing hazard adaptation for at-risk populations and assets. The vulnerability of each asset category was evaluated by hazard type based on exposure, sensitivity, and adaptive capacity.

The following categories represent key components of the County that were considered in the analysis:

- People and homes
- Transportation
- Critical and County resources (police stations, shelters, hospitals, schools, etc.)
- Utilities (water, wastewater, electricity, etc.)
- Stormwater management systems
- The Agricultural Reserve
- Parks, wetlands, and trees

Asset exposure to climate hazards was determined from the results of the FLEx tool (for temperature, precipitation, and drought) and from current wind data. For example, **Figure 18** shows the projected increase in the number of days per year with a temperature higher than 95°F for the projection years and climate scenarios, compared to the locations of existing emergency shelters. This map can help determine County areas that are likely to experience high heat and that are currently lacking an emergency shelter.

The sensitivity of the assets to the climate hazards was evaluated to determine, generally, how the hazard would impact the asset. If an asset can withstand the hazard conditions, the sensitivity would be low. For example, transportation assets are not particularly sensitive to drought conditions. But if the asset can be damaged by the hazard or the hazard exposure would leave the asset inoperable, the sensitivity would be rated as high. For example, transportation assets are sensitive to increased precipitation events that cause flooding that wash out roads or make them impassable by vehicles.

Adaptive capacity is the capability of people, systems, and assets to cope with a climate hazard. Flexibility and redundancy are adaptive ways to reduce the negative impacts from hazards. As seen during the COVID-19 pandemic, people are highly adaptable and will continue to be so as the climate changes. Adaptive capacity, however, relates not just to the human spirit but also to the resources available to people, such as more disposable income to make improvements to housing. Language barriers can prevent homeowners from finding out about County resources, such as incentive programs to provide support for resilience measures. The key to understanding adaptive capacity for people and homes is understanding the structural barriers that might prevent equitable adaptive solutions for all County residents.

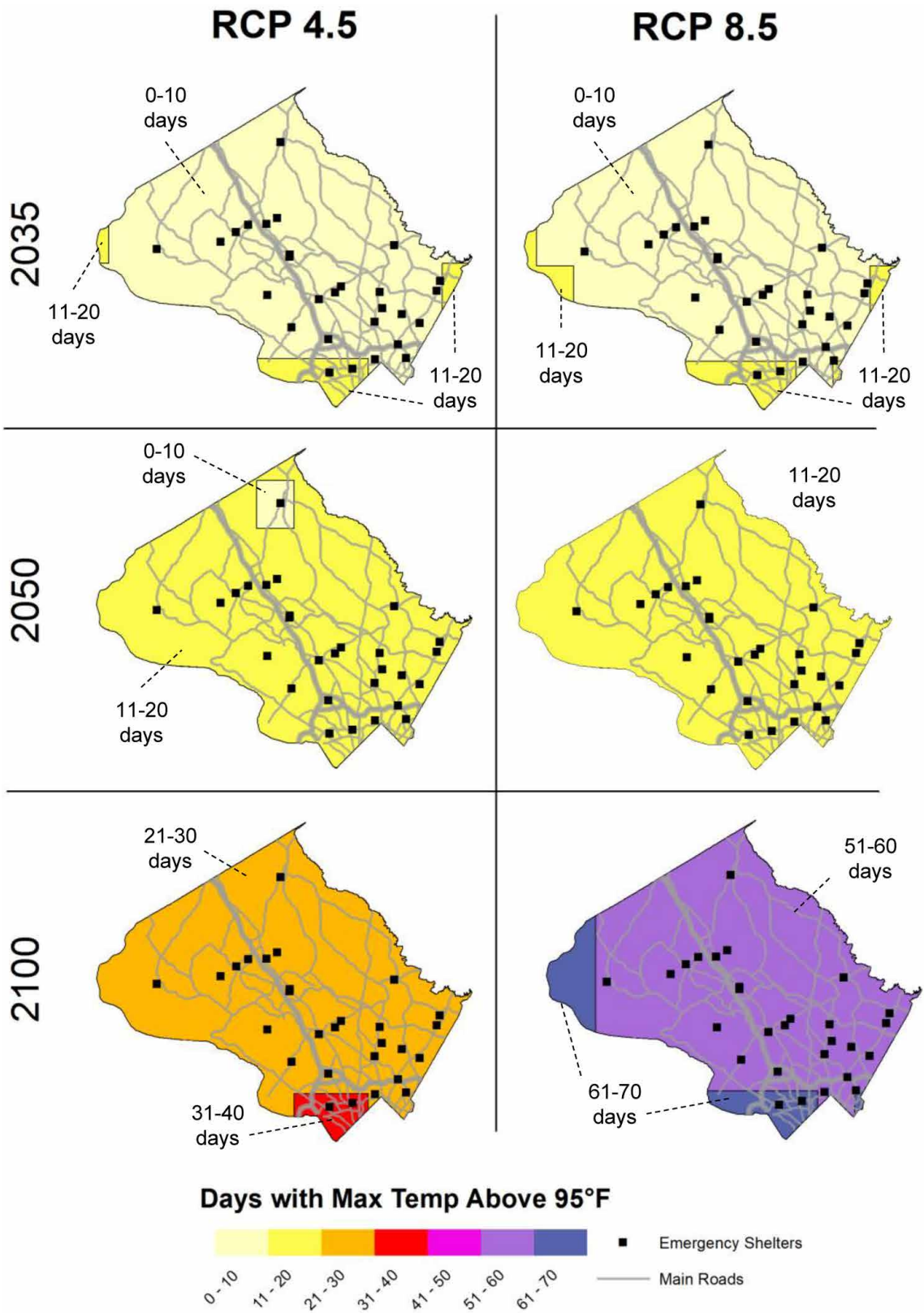


Figure 18: Projected increase in days per year >95°F for 2035, 2050, and 2100 and climate scenarios RCP 4.5 and RCP 8.5 in Montgomery County, with emergency shelters

The vulnerability assessment brings together the hazard exposure, sensitivity, and adaptative capacity information to better understand the County’s vulnerabilities. In addition, this assessment considered how climate change impacts different groups within society. The CAP considered different vulnerability factors that make certain groups within Montgomery County more susceptible to the detrimental impacts of climate change. The analysis was based on the indicators that the CDC SVI uses to determine vulnerability (**Table 3**)⁶⁶.

Table 3: CDC Social Vulnerability Index factors

SVI Theme	Social Factor
Socioeconomic Status	Below poverty
	Unemployed
	Income
	No high school diploma
Household Composition & Disability	Aged 65 or older
	Aged 17 or younger
	Civilian with a disability
	Single-parent households
Minority Status & Language	Minority
	Speak English “less than well”
Housing & Transportation	Multi-unit structures
	Mobile homes
	Crowding
	No vehicle
	Group quarters

Taking into account the CDC SVI and other local factors, the relevant climate vulnerable groups accounted for in the CAP include:

- Communities of color
- Income-limited households
- Single-headed households
- Immigrants
- Refugees
- Undocumented individuals
- Non-English speakers
- Elderly
- Socially isolated individuals
- Children
- Disabled
- Chronically ill, including those with asthma and cardiovascular and respiratory illnesses
- Individuals with mental health conditions and/or past trauma
- Individuals without medical insurance
- Renters
- Individuals living in informal settlements
- Homeless
- Individuals without home or renter’s insurance
- Service and manual labor workers
- Individuals without a vehicle
- Individuals without a computer, mobile phone, and/or working internet

As part of the Climate Vulnerability Assessment, the County spatially mapped social vulnerability based on the CDC SVI index across Montgomery County. **Figure 20** highlights the most vulnerable areas of the County according to the indicators listed in **Table 3**. Vulnerable groups located within these geographic areas of the County are most susceptible to disproportionately experiencing the effects of climate change.

Interrelated Problems and Integrated Solutions

Understanding where the County's most vulnerable groups are located can help prioritize mitigation and adaptation efforts and the corresponding equity-enhancing measures. For example, during the initial stages of the development of the CAP, staff from the County's Department of Health and Human Services discussed a particular neighborhood that was predominantly made up of elderly African American residents with restricted incomes who lived in older homes heated with fuel oil. These residents were concerned about both the high cost of heating oil and the poor indoor air quality that resulted from this heating method. Conversion to electric heating would reduce emissions exposure and utility costs for these elderly residents; however, this conversion may be cost-prohibitive for individuals on a fixed income who already spend more on utilities as a result of a more expensive heating source. This type of spatial and situational analysis is crucial during action development to identify where financial and resource support are needed to progress the County's GHG emissions and climate risk reduction goals while advancing racial equity goals.



Students plant rain garden at Olney Elementary School

Climate Migration

Human migration due to climate change may become one of the consequential challenges facing society in the coming decades. By 2070, the coverage of extreme hot zones like the Sahara Desert is projected to increase to one-fifth or 20% of total land globally compared to the present coverage of 1% of total land.⁶⁷ This climatic shift is anticipated to push people residing in Central and South America to move northwards, including into the United States. Already, climate-induced disasters such as flooding and drought in different parts of Guatemala have led to the collapse of the livelihoods of numerous Guatemalans, forcing many to move to cities or cross borders in search of food and shelter for survival.⁶⁸ Unsurprisingly, vulnerable communities, including children, bear the brunt of the impact because they are disproportionately affected by climate disasters.

A 2018 World Bank report estimated that there will be 143 million climate-change-driven internal migrants in Latin America, Sub-Saharan Africa, and Southeast Asia by 2050 in a worst-case scenario.⁶⁹ A climate migration modeling effort found that in the most extreme climate scenarios more than 30 million migrants may head toward the U.S. border over the next 30 years.⁷⁰ Unlike traditional refugees, climate migrants often lack the same privilege of government assistance with housing, job placements, and other temporary services to rebuild their lives.⁷¹

In addition to climate migrants coming to the United States from other countries, local/domestic climate migration is also anticipated. In 2017, 1.5 million Americans are estimated to have migrated to other parts of the country temporarily or permanently due to climate-induced disasters.⁷² Cities such as Houston, Baton Rouge, and Dallas became prime destinations for families in the aftermath of Hurricane Katrina in 2015. In addition, more than 135,000 Puerto Ricans moved to the mainland and resettled in Miami Dade County after Hurricane Maria in 2017.⁷³ Thirteen million Americans are projected to be displaced by 2100 due to submerged coastlines with 1.8 meters of sea level rise.⁷⁴ This may result in the largest migration in North American history, larger even than the Great Migration of Black Americans out of the South from 1916 to 1970.⁷⁵ Therefore, all levels of government should prepare actively for climate migration in the near future.

Montgomery County has a strong foundation in providing support to immigrants and people in need. The Gilchrist Immigrant Resource Center is a go-to place for information related to food, rental housing, immigration advice, and more.⁷⁶ The County can build on its previous work to anticipate and prepare for future waves of regional and international climate migrants.

The County is a primary destination for many unaccompanied migrant children and asylum-seeking families. As such, the County's Department of Health and Human Services (DHHS) and Montgomery County Public Schools (MCPS) are already planning for the anticipated influx of migrants. The County is convening an interagency cross-community team led by experts in the field to develop and implement an action plan that will ensure that the County is prepared to receive unaccompanied minors and migrant family units, that schools have the necessary services, and that supports are in place for receiving families.



The Gilchrist Immigration Resource Center connects Montgomery County's diverse communities with educational, economic, and civic resources

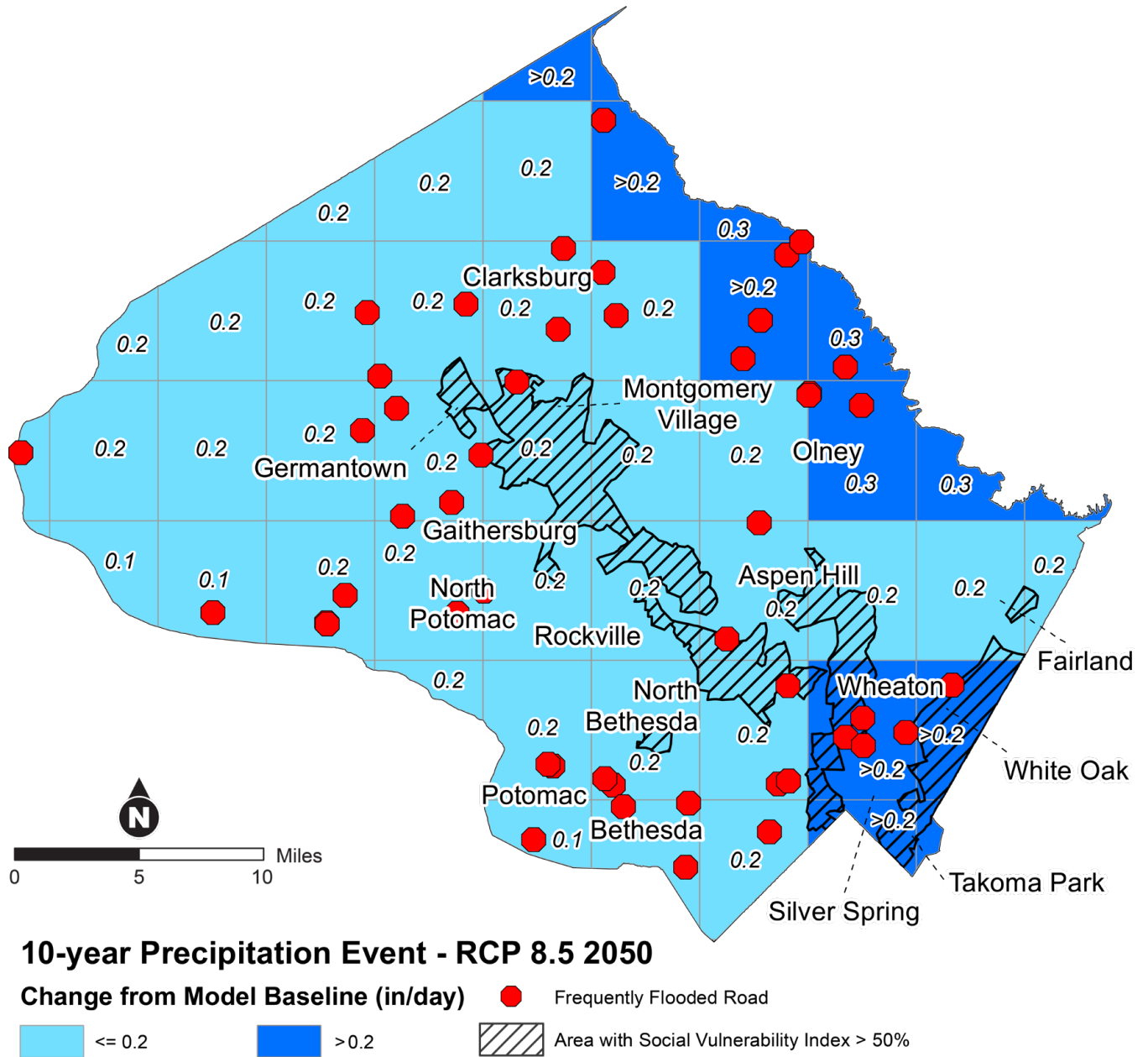


Figure 19: Projected increase in the 10-year precipitation event for 2050 and climate scenario RCP 8.5 outlining areas ranked in the top 50% most vulnerable by the CDC Social Vulnerability Index

Combining the hazard data, asset information, and SVI, priority areas can be identified. In **Figure 19**, the 10-year precipitation event from the RCP 8.5 scenario for the year 2050 is mapped with a record of frequently flooded roads. This information is combined with the SVI showing the areas of the County that are considered to have the more vulnerable half of the County's population. To prioritize action

areas, the focus should be on areas that intersect the darker blue flooding areas (showing the highest expected increases in nuisance or regular flooding), the hatched social vulnerability areas, and the red dots marking historic road flooding. Combining this and similar information will help the County prioritize actions to make the most vulnerable areas of the County more resilient to climate change.

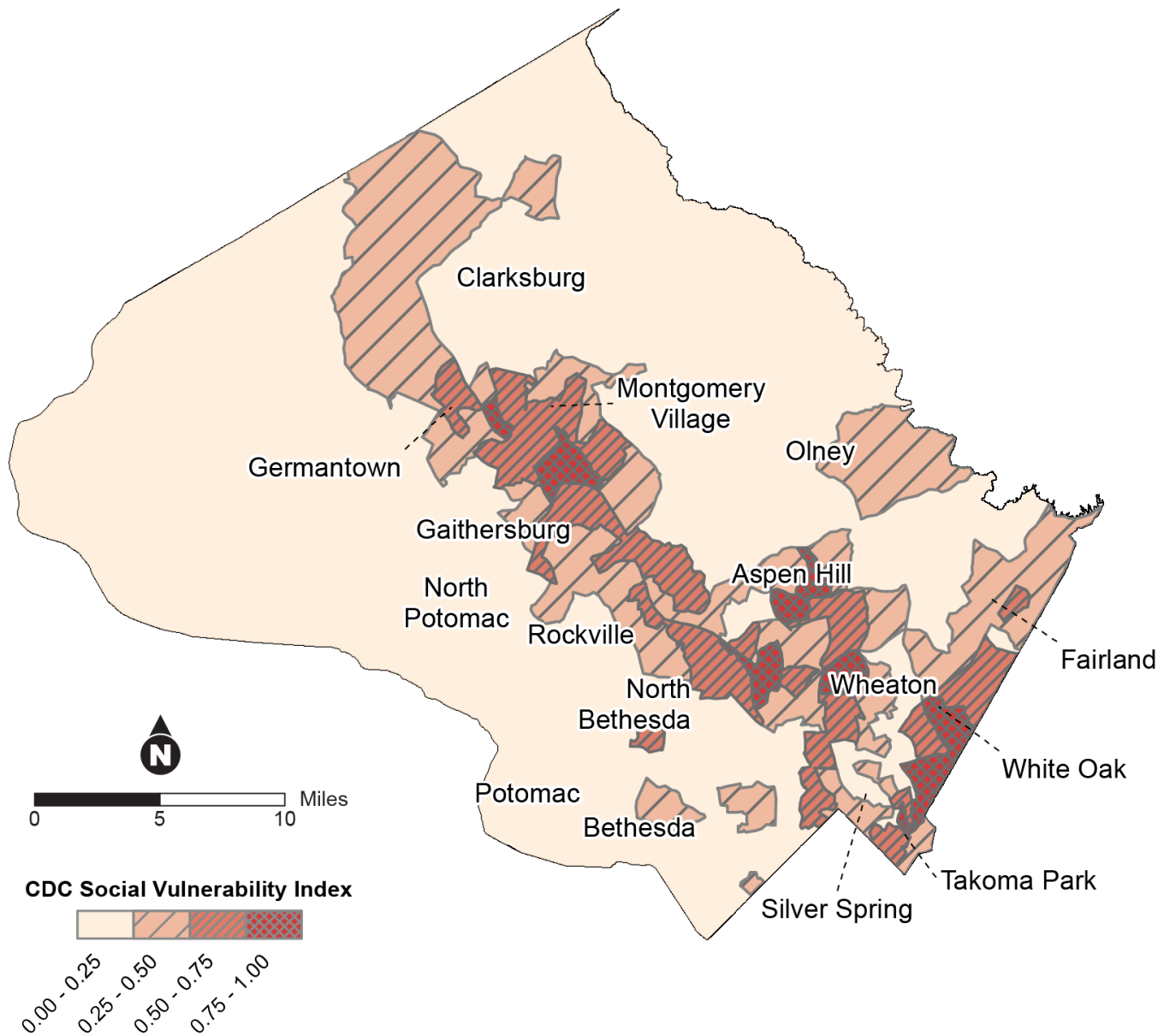


Figure 20: Social vulnerability in Montgomery County

Figure 21 shows the vulnerability ranking by major climate hazard to Montgomery County, based on a scale of low, some, or high vulnerability.

The most significant changes from today’s climate conditions compared to predicted future climate conditions appear to be related to extreme heat. Extreme heat poses great risks to human health and the natural environment, where agriculture and local plants and wildlife will struggle to adapt. Along with extreme heat, moderate to extreme drought is also expected to increase by the end of the century, impacting agriculture, water resources, and human health and well-being. Extreme precipitation is projected to show more modest increases, with the most frequent events (for example, the 1-year,

5-year, or 10-year return period storms) showing little to no change. The most extreme precipitation events also show the largest increases in intensity, which will result in more widespread and severe impacts when they do occur. Moreover, the vulnerable populations identified in this report, using the 2016 CDC SVI, will face greater impacts due to limited resources and access to adaptation and mitigation options.

	Exposure				Sensitivity				Adaptive Capacity			
	Precipitation	Temperature	Drought	High Winds	Precipitation	Temperature	Drought	High Winds	Precipitation	Temperature	Drought	High Winds
Transportation	H	H	L	S	S	S	L	S	S	S	L	S
Critical and Community Resources	S	S	S	S	S	L	S	L	S	S	L	L
Utilities	S	H	H	H	S	H	S	H	L	L	S	S
Stormwater Management	H	L	L	L	H	L	L	L	S	L	L	L
Agricultural Reserve	S	H	H	S	S	H	H	S	S	S	S	S
Parks and Wetlands	S	H	H	S	L	S	S	L	S	S	S	S
People and Homes	H	H	H	S	H	H	H	S	S	S	S	S

H	High vulnerability
S	Some vulnerability
L	Low vulnerability

Figure 21: Vulnerability ranking by asset category and hazard category

Impacts of Urban Flooding on Climate Vulnerable Communities

Climate change is increasing the frequency and intensity of floods, which pose another major climate risk in Montgomery County. In urban settings, there are more impervious surfaces and older municipal stormwater systems, and it is therefore increasingly difficult to manage high levels of rainfall and excess water. While flooding impacts residents from a wide range of demographics, it is most damaging to low-income, minority groups. Urban flooding disproportionately affects low-income residents and communities of color because the majority live in neighborhoods with little or no

green spaces to absorb water and in areas that have historically received less flood protection investment. In addition, these communities tend to live in basement or ground-floor apartments, which are hit hardest by urban flooding. For example, of the \$31 billion that the Federal Emergency Management Agency's (FEMA's) National Flood Insurance Program paid in flood damage claims between January 2010 and August 2019, nearly 20% was in zip codes where at least one-quarter of the residents are Black.⁷⁷ Although these communities are disproportionately detrimentally impacted, they have the least resources to manage the damage and disruption. Therefore, urban flooding highlights and further exacerbates inequities in income, housing, and the ability to adapt and respond to the impacts of increasing flooding.



Flooding was reported on multiple roads in Montgomery County.

Next Steps for Climate Vulnerability Assessment

While the Climate Vulnerability Assessment takes the first step in identifying vulnerable assets and communities within Montgomery County, further work is needed to adequately prioritize assets and select appropriate, site-specific adaptation strategies to reduce climate hazard risk. Many important assets were not included in this assessment, such as pharmacies, grocery stores, urgent care facilities, and childcare facilities, to name a few, and should be considered in future discussions. Community and stakeholder coordination will be critical to identifying and verifying the needs and vulnerabilities of both

assets and people. Furthermore, assessing social acceptance and political willingness for recommended climate actions could help in prioritization and implementation of the actions. There may be some actions where both communities and politicians in the County agree and others where the goal is the same but the process to achieve the goal is not in alignment. The success of the CAP may rely on understanding these dynamics within the County, and they should be evaluated in future assessments. In addition, future discussions about vulnerability should include not only community sensitivity to the impacts of climate change but also the community's ability to adapt to these threats.

Complex systems such as transportation, power, water, and sewer will require a more focused consideration if limited resources are to be allocated and used effectively. In addition, detailed hydraulic models should be used in conjunction with the projections of future extreme precipitation scenarios developed in this study in order to develop future conditions floodplains and to prioritize stormwater system improvements. For example, climate adaptation **Action A-11** includes elevating mechanical and electrical building equipment above the base flood elevation in areas of the County that frequently

flood and that show an expected increase in rainfall, particularly in more socially vulnerable communities (see **Figure 20**); however, a more detailed assessment would need to be conducted to determine which buildings in these flood-prone areas have equipment that is currently below the base flood elevation. As the County progresses with the action development process and detailed consideration of critical assets, the GIS layers as well as the countywide climate change projections developed through the Climate Vulnerability Assessment will help guide prioritization.

Impacts of Heat Waves on Climate Vulnerable Communities

Heat waves are among the most dangerous natural hazards in the County, and their intensity and frequency are increasing due to climate change. According to the World Health Organization,⁷⁸ the number of people exposed to heat waves increased by around 125 million between 2000 and 2016. Heat waves have widespread health and food security consequences, and place pressure on water, energy, and emergency services. However, heat waves disproportionately impact climate-vulnerable groups, such as the homeless and low-income households that lack shelter and air conditioning and the elderly, the sick, and children whose conditions (for example, cardiovascular and respiratory diseases) may worsen as a result of extreme heat. In 1995, a heat wave in Chicago led to 739 heat-related deaths and thousands of heat-related illnesses.⁷⁹ Most of these heat wave victims were low-income, elderly, or bedridden residents who lived alone and were without air conditioning. Later studies showed that of the different racial groups, Black residents were hit hardest. Social factors, such as living in homes and neighborhoods without adequate infrastructure, played a major role in making this group more vulnerable to the impacts of this heat wave.



A construction worker cools off at Canal Park in Washington, D.C. Extreme hot weather is expected to continue across much of the United States.

PHOTO: [Mark Wilson/Getty Images](#)

Climate Risk Reduction

While climate mitigation is more straightforward to measure and quantify in metric tons of carbon dioxide equivalent (MT CO₂e), climate adaptation requires a more qualitative, unitless approach. To assess the climate risk reduction of actions related to climate adaptation, the County team first developed scores from 1 (low) to 5 (high) for each of the County’s four major climate hazards—extreme heat, extreme precipitation, high winds, and drought—for:

- Likelihood – frequency at which the hazard is expected to occur
- Impact – consequence anticipated to people, assets, or services when the climate hazard occurs

The likelihood score is based on climate projections that look at both an improved climate future (RCP 4.5) and a “business as usual” case (RCP 8.5). The likelihood scores are based on how frequently this particular hazard is expected to occur compared to the other hazards analyzed in the County. These scores should be reviewed on a regular basis when updated climate estimates are available. The impact scores were a high-level analysis of the impacts on the project hazards. Multiplied together, the likelihood and impact scores provided an overall climate risk score by hazard, representing the maximum magnitude of risk that an adaptation action could reduce (**Table 4**).

For each of the priority climate adaptation actions, the team then developed scores from 0-19% (low) to 80-100% (high) for:

- Coverage – proportion of people, assets, or services impacted by the climate hazard that could be addressed by the action
- Effectiveness – degree to which the action will alleviate climate hazard impacts on the people, assets, or services addressed by the action

Multiplied together, the coverage and effectiveness scores provided an overall climate risk reduction potential score by action (see **Appendix F** for the climate risk scores for each action). The team used the initial climate workgroup action recommendations to develop a list of CAP actions that address the County’s largest climate hazards. The team then combined, modified, or added actions in order to create the final list of CAP actions that would most directly reduce climate risk. **Figure 22** shows which of the CAP actions were scored as having the highest climate risk reduction potential. The “Interaction Score” demonstrates whether the action also reduces GHG emissions.

Table 4: Climate risk (likelihood x impact) of major climate hazards to Montgomery County

Hazard	Likelihood	Impact	Climate Risk (Likelihood x Impact)
Extreme Heat	5	3	15
Extreme Precipitation	4	3	12
High Winds	3	2	6
Drought	3	2	6

■ Climate Risk Reduction Score

▨ Interaction Score

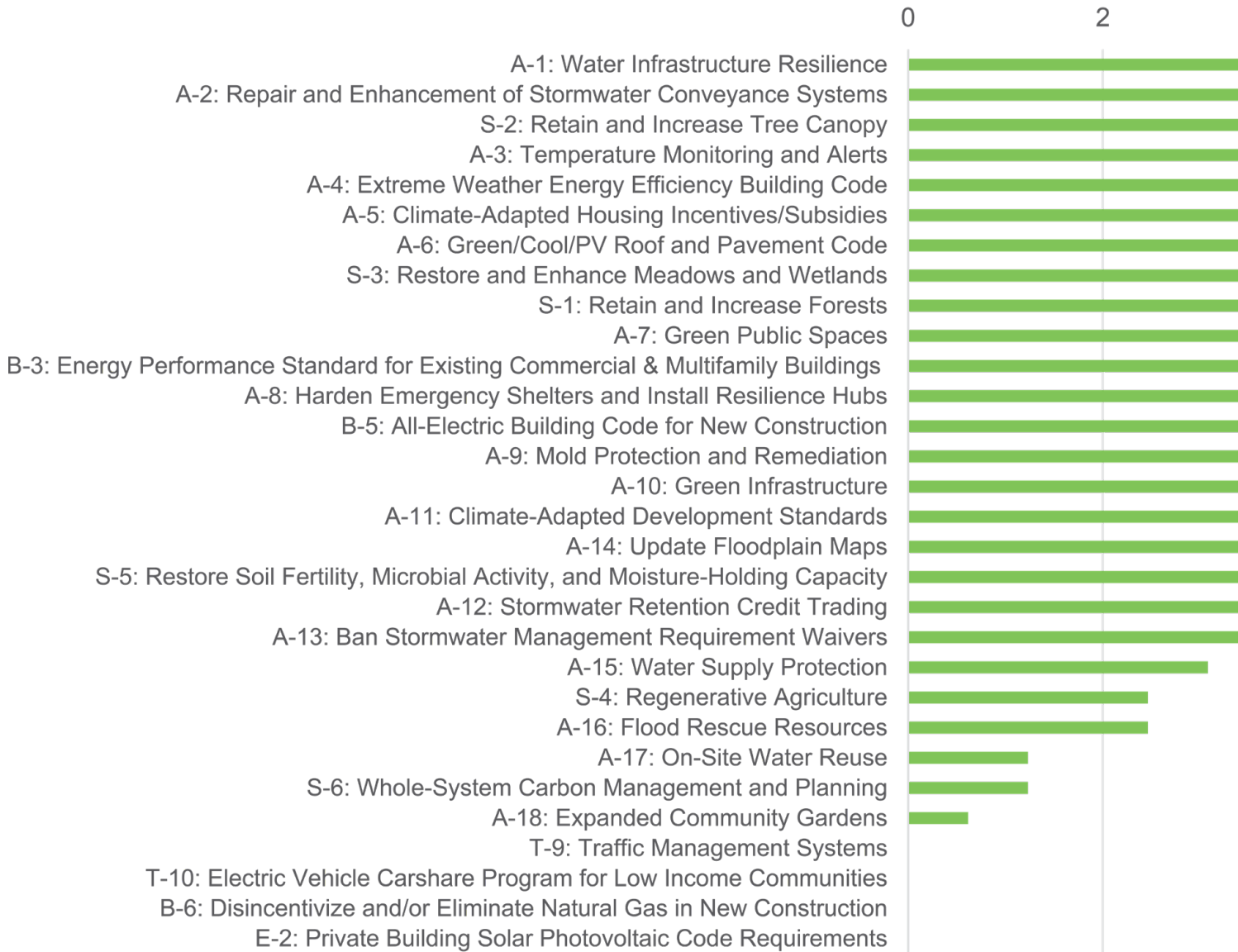
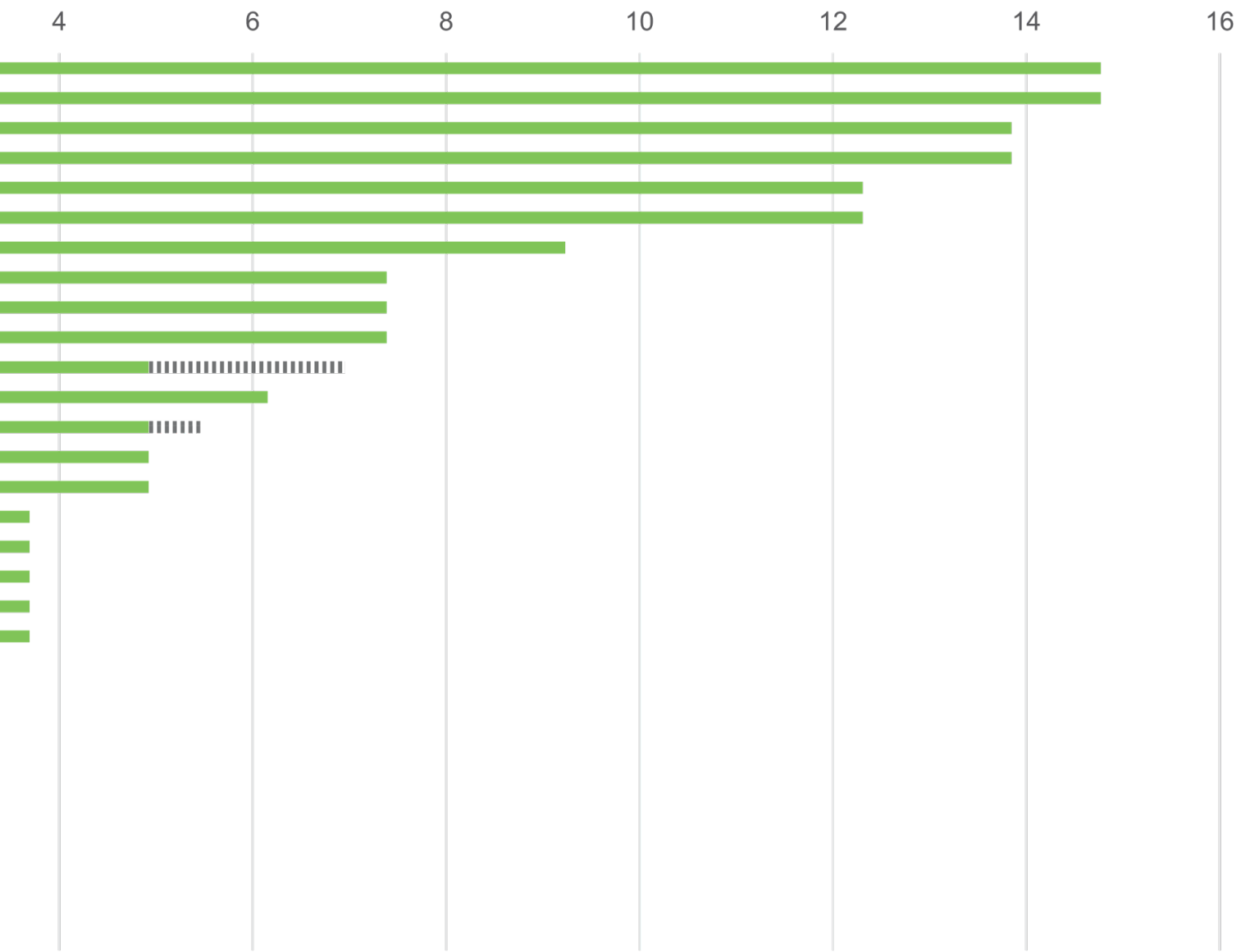
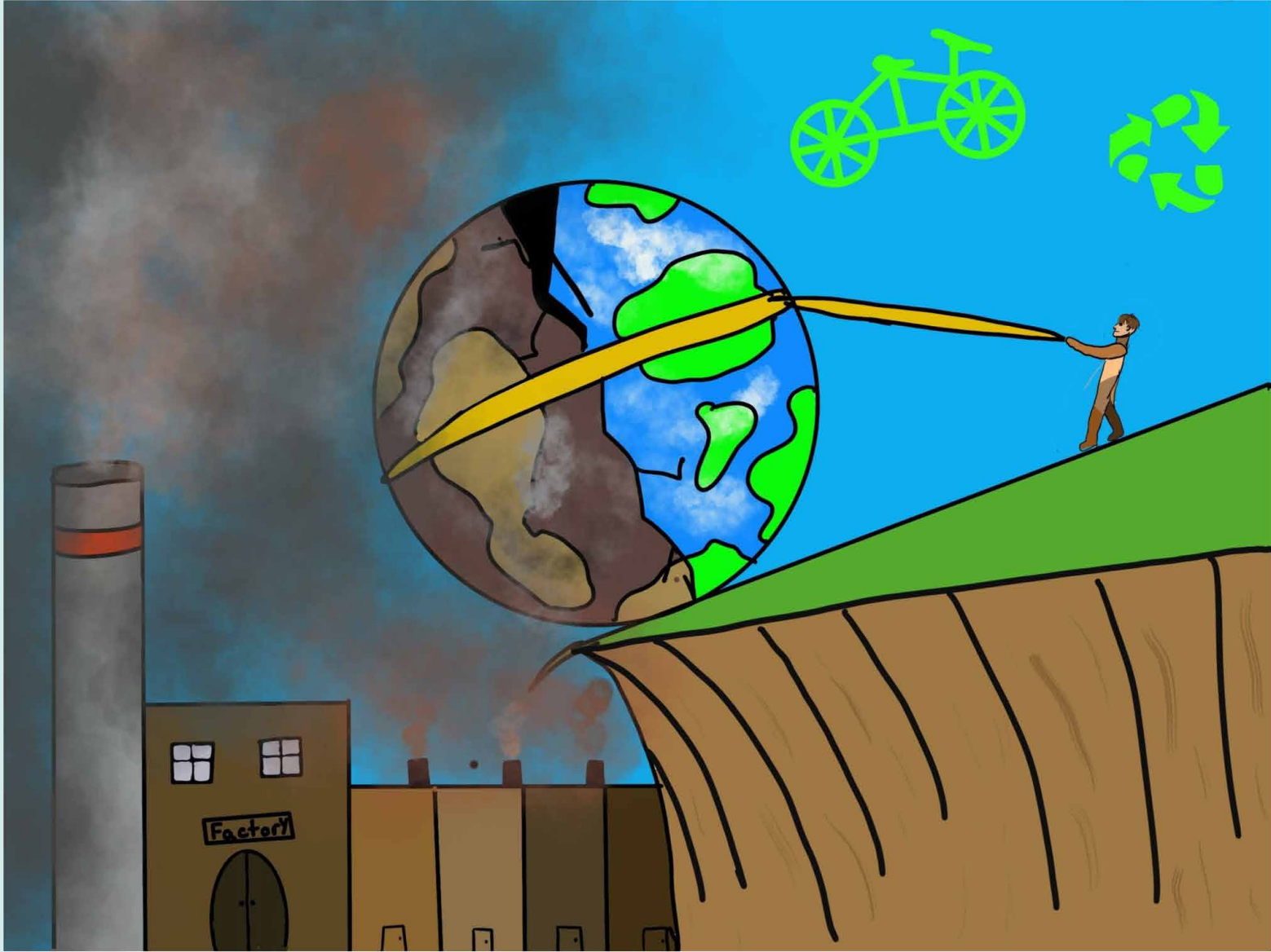


Figure 22: Climate adaptation actions with the highest risk reduction potential





Artist: Sophia Liang (Age 15)



Artist: Raegan Lentz (Age 12)

Montgomery County Greenhouse Gas Emissions



Montgomery County Greenhouse Gas Emissions

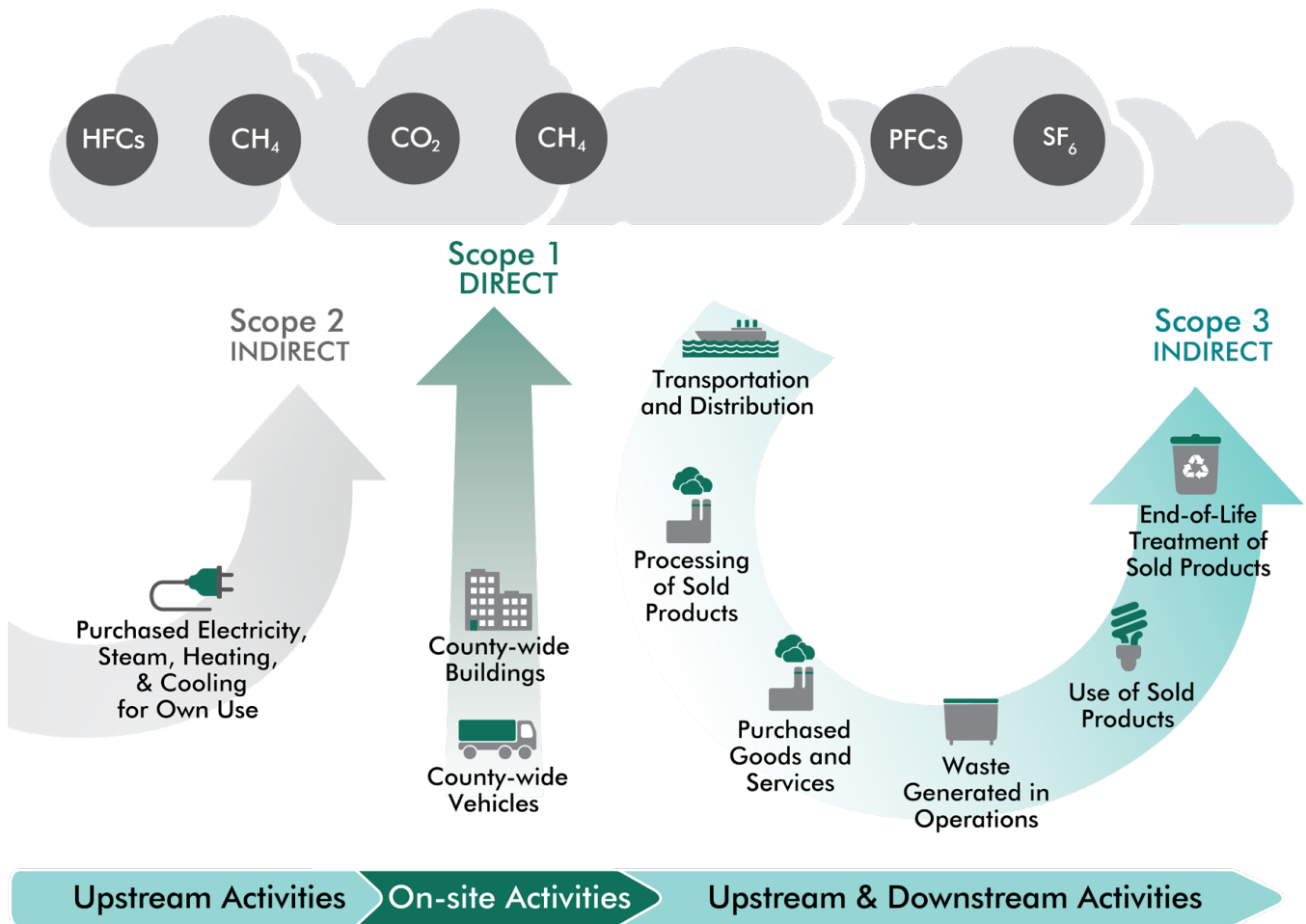


A pedestrian and cyclist take advantage of the County's protected crosswalk and bike lane intersections.

GHG Inventory and Projections

Montgomery County partnered with the Metropolitan Washington Council of Governments (MWCOG) to develop inventories of the County's GHG emissions. Inventories have been developed for 2005, 2012, 2015, and 2018, and are typically produced 18 to 24 months following the GHG inventory calendar year. MWCOG inventories have been verified as compliant with national and global protocols for GHG accounting. MWCOG follows the U.S. Communities Protocol as the methodology for these inventories. There are three types of GHG emission scopes (**Figure 23**):

- **Scope 1.** Emissions from direct activities located within a jurisdiction's geographic boundary (for example, on-site fuel combustion, in-boundary travel)
- **Scope 2.** Emissions from the generation of purchased electricity, steam, heating, and cooling consumed within a jurisdiction's geographic boundary, regardless of the location of the generation
- **Scope 3.** All other emissions that occur outside a jurisdiction's geographic boundary as a result of activities taking place within the jurisdiction or by the jurisdiction's residents (for example, emissions associated with the production of goods produced outside the jurisdiction but used by the jurisdiction's residents or businesses)

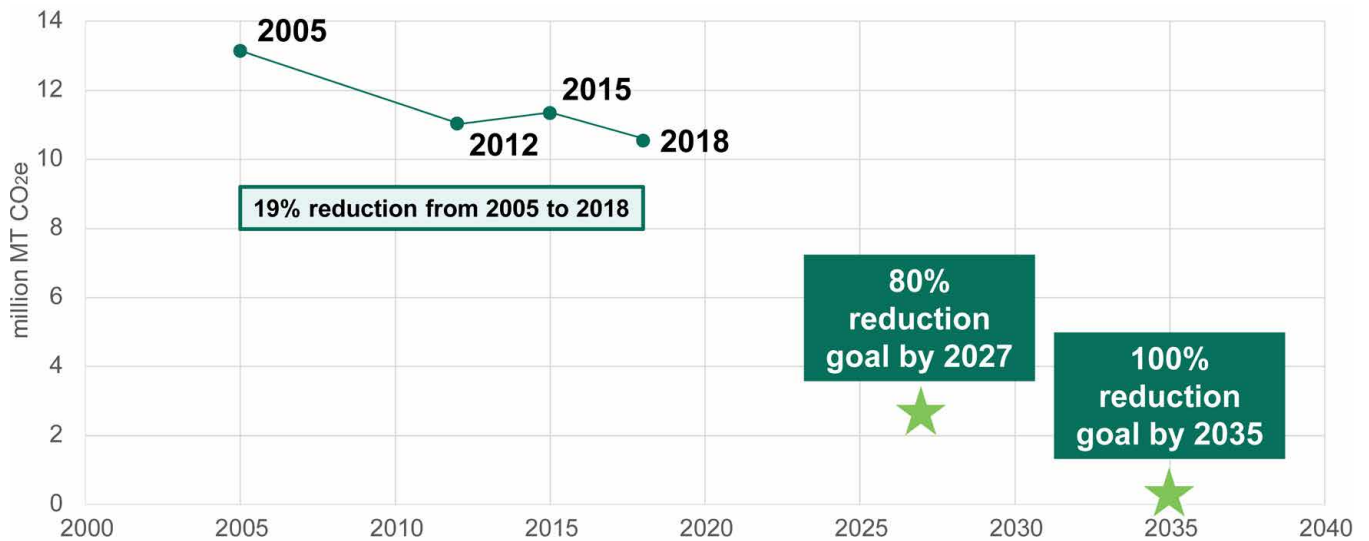


<https://ghgprotocol.org/standards/scope-3-standard>

Figure 23: Scopes of greenhouse gas emissions

The 2005 GHG inventory set a baseline of overall Scope 1 and Scope 2 emissions and emissions in the following subsectors: residential energy; commercial energy; transportation and mobile sources; water and wastewater; solid waste; process and fugitive emissions; and agriculture, forestry, and other land uses. As is typical for a community-wide GHG inventory, Scope 3 emissions are not captured in the

Montgomery County GHG emissions inventory. The 2012 and 2015 GHG inventories measured the County’s Scope 1 and Scope 2 emissions reduction progress against the 2005 baseline. In 2020, MWCOG finalized the County’s 2018 GHG inventory, which shows that measured emissions in the County dropped by 19% from 2005 to 2018, as shown in **Figure 24**.⁸⁰



Source: Metropolitan Washington Council of Governments (MWCOG) Montgomery County GHG Inventory

Figure 24: Montgomery County GHG emissions reduction progress and goals

The County used the 2018 GHG inventory (**Figure 25**) as a base year for understanding priority reduction opportunities and estimating the expected emissions reductions from implementing proposed climate actions. Even though the County’s GHG targets are set against a 2005 baseline, the County’s emissions profile has changed meaningfully since the original 2005 inventory. For example, a larger proportion of emissions are now generated by transportation, and process and fugitive emissions have increased. Using the 2005 inventory would not provide an accurate assessment of estimated future conditions. As shown in **Figure 25**, most of the County’s 2018 emissions, measured in metric tons of CO₂e per year (MT CO₂e/year), come from residential and commercial building energy use (50%) and community transportation (42%).

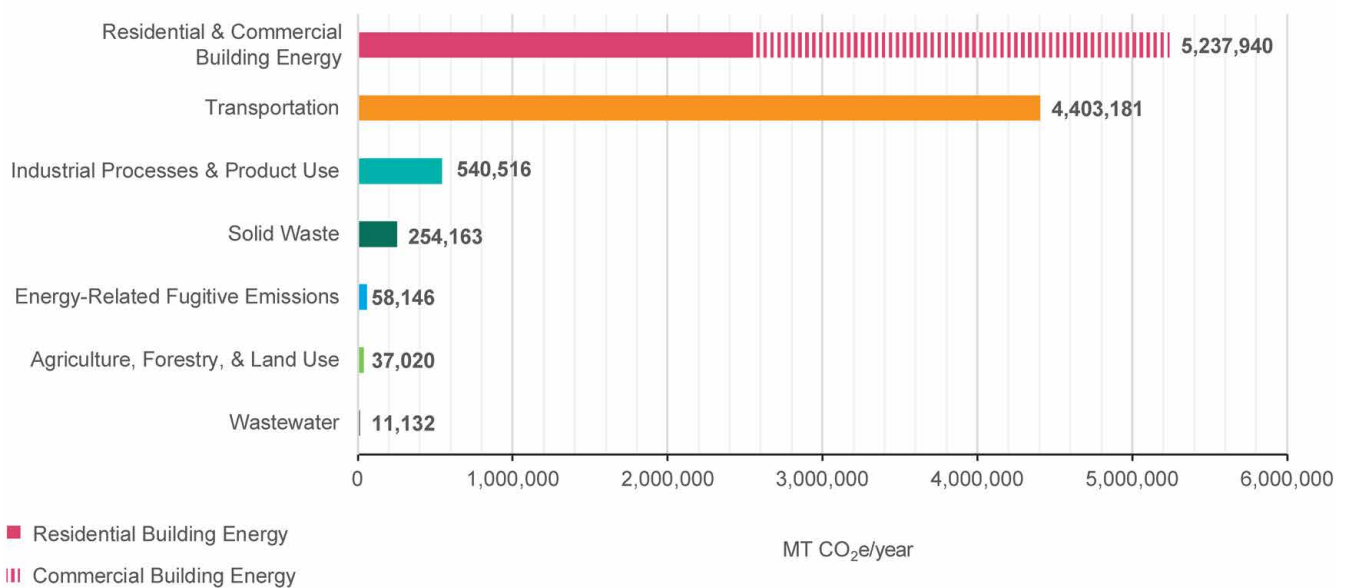
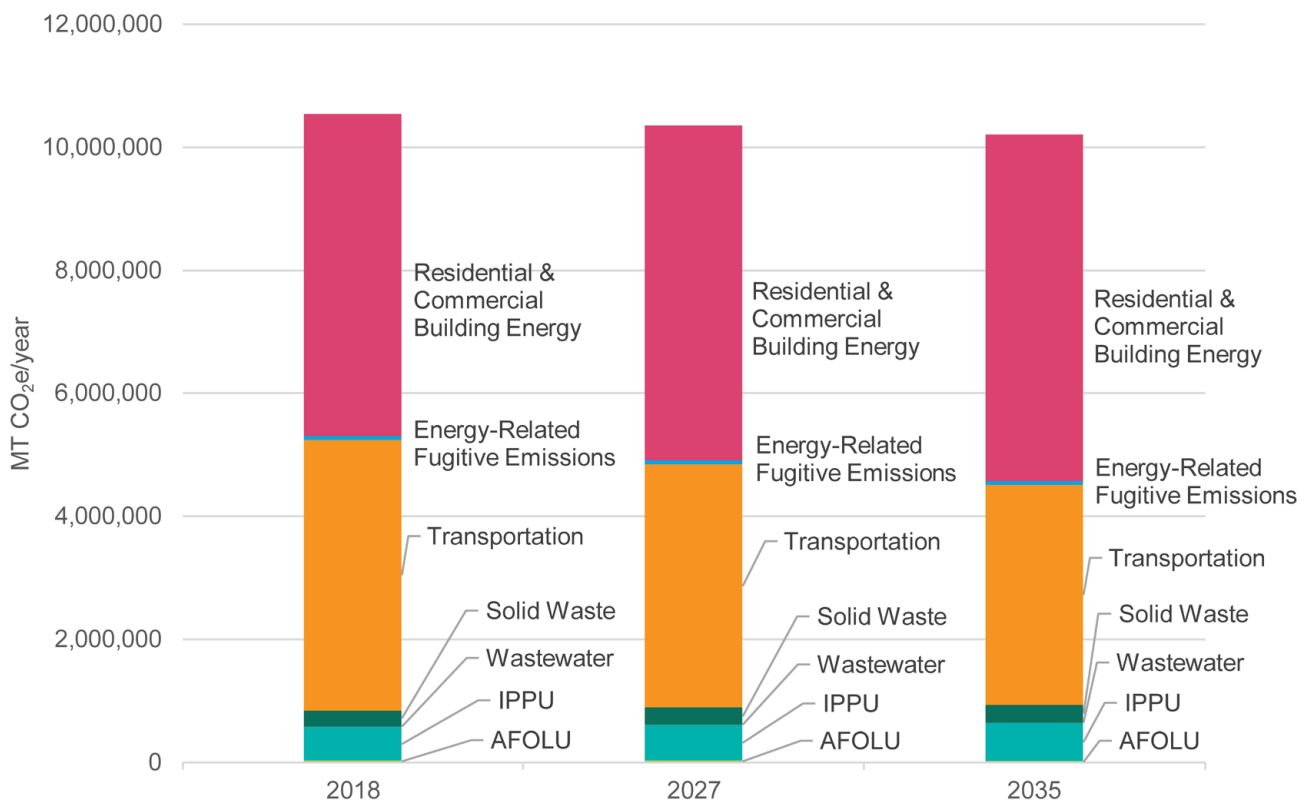


Figure 25: Montgomery County 2018 GHG inventory

Because the County’s goals are to reduce GHG emissions 80% by 2027 and 100% by 2035, it is important to look at anticipated emissions in those future years. Using MWCOG’s 2015-2030 emissions forecast analysis, the County team developed a forecasted baseline emissions scenario. This business-as-usual projection is a scenario in which no additional climate mitigation actions are implemented, except for anticipated vehicle efficiency changes from planned federal regulations and programs that will influence regional travel volumes. To estimate baseline emissions in the 2027 and 2035 goal years, the County team used the 2015-2030 forecasts to estimate the 2027 values and project the 2035 values.

Figure 26 shows how baseline emissions are projected to increase in all subsectors, except for on-road transportation and agriculture. Overall, business-as-usual emissions are estimated to decrease 2% by 2027 and 3% by 2035, compared to 2018 levels. Most of the County’s future emissions are estimated to come from residential and commercial building energy consumption, including electricity use (56% of emissions in 2035), and on-road vehicle use (28% of emissions in 2035), which are the County’s biggest reduction opportunity areas.



Note:
 IPPU = Industrial Processes and Product Use
 AFOLU = Agriculture, Forestry, and Other Land Use

Figure 26: Montgomery County baseline emissions forecasting 2018-2035

While the 2027 and 2035 emissions reduction goals of 80% and 100% are set against the 2005 GHG inventory baseline, the percent reduction goals for those years were re-calculated against the 2018 inventory to create a more current picture of the emissions reductions needed (see **Figure 27**). For example, a reduction of 75.4% below 2018 levels would achieve the same emissions as 80% below 2005 levels.

The County’s GHG emissions baseline forecast (represented by the solid line in **Figure 27**) and the desired level of GHG emissions in 2027 and 2035 (represented by the dashed line in **Figure 27**) demonstrate the magnitude of action needed to achieve the County’s ambitious climate mitigation goals.

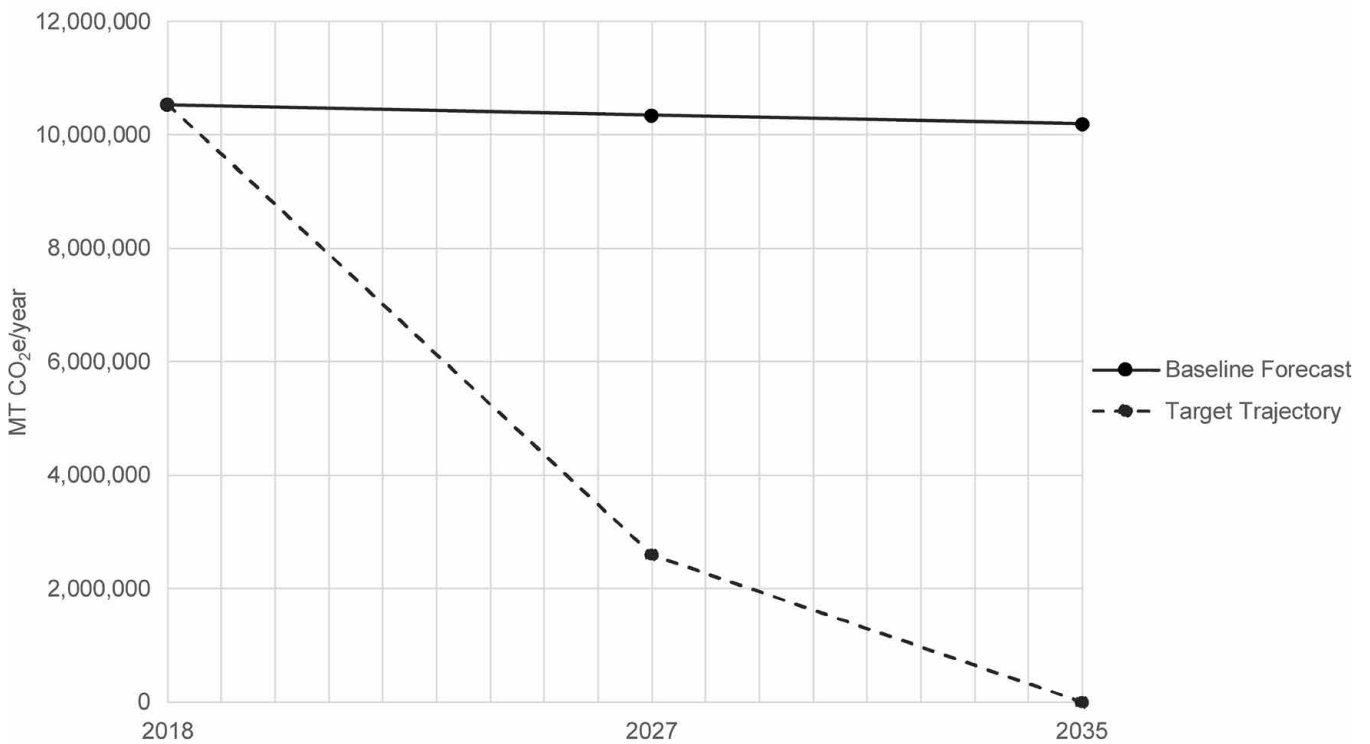


Figure 27: Montgomery County baseline emissions and emissions reduction target forecasts

GHG Emissions Reduction Pathway

The County team, led by the technical experts at AECOM, used the Climate Action for Urban Sustainability (CURB) tool to illustrate the magnitude of GHG reductions that would be necessary in each emissions sector to meet the County's goals. CURB is a data-driven emissions reduction scenario planning tool designed to help cities and counties quickly analyze emissions reduction opportunities from various technological strategies in the energy, building, transportation, and waste sectors.⁸¹ A collection of technological strategies selected in the tool is called a GHG emissions reduction pathway. A pathway shows one potential option for achieving a jurisdiction's GHG reduction targets. There could be a number of pathways depending on how different actions are implemented. CURB contains a wide variety of emissions reduction strategies; some specific examples include:

- Converting low-efficiency residential heating systems to high-efficiency systems
- Converting internal combustion engine car trips to bicycle trips
- Increasing the percentage of solar in the electricity supply

CURB uses a jurisdiction's GHG inventory and other data inputs to develop a high-level model of baseline emissions conditions to explain, in greater detail than the GHG inventory, what causes the jurisdiction's emissions. For example, the County's GHG inventory shows the amount of energy used in residential buildings. With sufficient data inputs, CURB could be used to estimate the specific end uses of that energy, such as lighting, space heating and cooling, and water heating, as well as to estimate the potential GHG reductions that could be achieved from different technology interventions to reduce energy use in these areas, such as converting low-efficiency fossil fuel heating systems to high-efficiency electric heat pumps.

However, to do an analysis of the GHG reduction impact of specific technological actions with a high degree of accuracy, it is necessary to have detailed information about the characteristics of the emissions sectors being modeled. For example, consider the example cited above of replacing fossil fuel heating systems with heat pumps in single-family homes. To understand the exact level of effort needed to achieve this in the County and the resulting GHG reduction impact, data would be needed on the total number of homes that currently have fossil fuel systems and the characteristics of those homes (for example, home type and size). Such data would have to be available for all the other building efficiency actions that could be undertaken (for example, lighting, cooling, water heating, building envelope improvements) and for each type of building (for example, single-family homes, townhomes, apartments, office buildings).

Because the County does not currently have this level of detailed data related to the building stock or to other emissions-producing sectors, CURB cannot be used to exactly characterize the emissions reduction potential of specific technological interventions in the County. Nonetheless, because the County has set a goal of eliminating all GHG emissions by 2035, CURB was still used to illustrate the magnitude of the reductions needed in each sector for the County to reach its goals by assuming that all sources of electricity are carbon-free, all building systems are powered by clean energy, and all transportation modes are zero emission.

The results of this high-level CURB modeling exercise are shown in the "wedge" diagram in **Figure 28**. The top solid line charts the forecasted baseline GHG emissions, or business-as-usual emissions, while the bottom dashed line charts the targeted emissions reduction levels. The colored wedges represent the magnitude of emissions reductions needed to help reach the County's goals. Each colored wedge represents a primary emissions source by sector (for example, buildings or transportation) and the collective reductions that will be needed from a set of

strategies within that sector, with larger wedges representing greater emissions reductions. The County needs to reduce the greatest amount of GHG emissions from electricity generation (blue), followed by transportation (orange) and then by the remaining building energy emissions associated with energy sources other than electricity (pink).

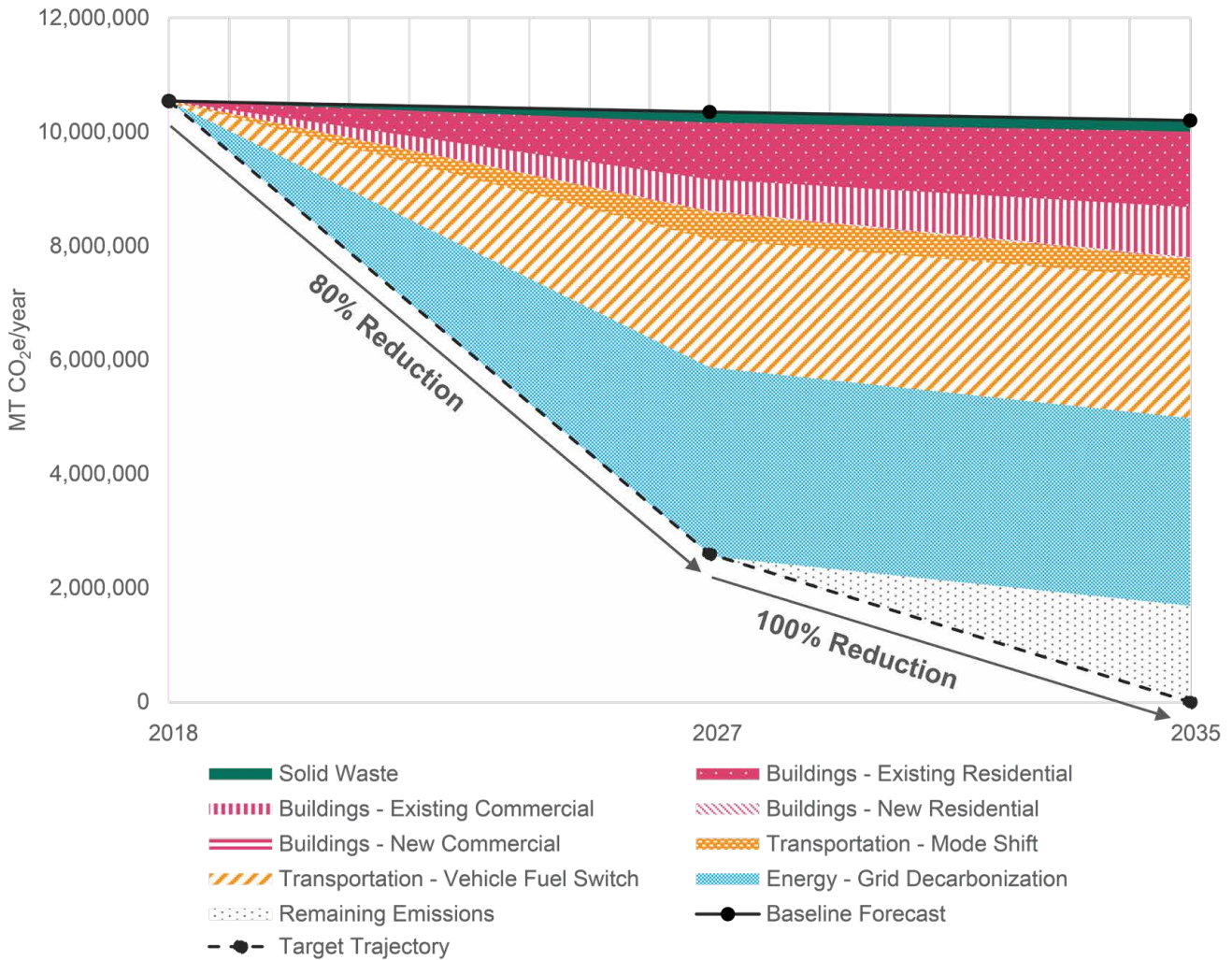


Figure 28: Montgomery County GHG emissions reduction pathway

The emissions reductions needed for the County to reach the 80% reduction target by 2027 and set it on the path to reaching carbon neutrality by 2035 are shown in **Table 5** (see the **Remaining Emissions** section for how the carbon neutrality

target can be met). This table lists the emissions subsectors, the quantity of reductions needed, and the technological changes assumed in CURB that would provide a pathway for meeting the County’s climate targets.

Table 5: Emissions reductions and corresponding technological assumptions needed to meet the County’s GHG reduction goals

Subsector	2027 GHG Reductions Required to Meet Goals (MT CO ₂ e)	% of Total 2027 Reductions	How Things Would Have to Change by 2027*	2035 GHG Reductions Required to Meet Goals (MT CO ₂ e)	% of Total 2035 Reductions	How Things Would Have to Change by 2035*
Electricity	3,315,000	43%	<ul style="list-style-type: none"> 86% of all electricity consumed is carbon-free 	3,288,000	39%	<ul style="list-style-type: none"> 100% of all electricity consumed is carbon-free
Existing Residential Buildings	996,000	13%	<ul style="list-style-type: none"> 85% of residential units with natural gas space and water heating have converted to electric heat pumps 25% of residential units have installed improved building envelopes 20% of residential units have installed low-flow water fixtures 	1,317,000	15%	<ul style="list-style-type: none"> 100% of residential units with natural gas space and water heating have converted to electric heat pumps 100% of residential units have installed improved building envelopes 100% of residential units have installed low-flow water fixtures

Table 5: Emissions reductions and corresponding technological assumptions needed to meet the County’s GHG reduction goals (continued)

Subsector	2027 GHG Reductions Required to Meet Goals (MT CO ₂ e)	% of Total 2027 Reductions	How Things Would Have to Change by 2027*	2035 GHG Reductions Required to Meet Goals (MT CO ₂ e)	% of Total 2035 Reductions	How Things Would Have to Change by 2035*
Existing Commercial/ Public Buildings	552,000	7%	<ul style="list-style-type: none"> 75% of commercial buildings with natural gas space and water heating have converted to electric heat pumps 15% of commercial buildings have installed improved building envelopes 50% of commercial buildings have installed low-flow water fixtures 	890,000	10%	<ul style="list-style-type: none"> 100% of commercial buildings with natural gas space and water heating have converted to electric heat pumps 100% of commercial buildings have installed improved building envelopes 100% of commercial buildings have installed low-flow water fixtures
New Construction	16,000	<1%	<ul style="list-style-type: none"> 100% of all new developments are energy efficient and all-electric, starting in 2022 	26,000	<1%	<ul style="list-style-type: none"> 100% of all new developments are energy efficient and all-electric, starting in 2022
Transportation - Mode Shift	487,000	6%	<ul style="list-style-type: none"> 15% reduction in private vehicle trips 	355,000	4%	<ul style="list-style-type: none"> 15% reduction in private vehicle trips
Transportation - Fuel Switch	2,245,000	29%	<ul style="list-style-type: none"> 85% of passenger vehicles are electric/zero emissions 100% of buses are electric/zero emissions 	2,439,000	29%	<ul style="list-style-type: none"> 100% of passenger vehicles are electric/zero emissions 100% of buses are electric/zero emissions

*Compared to 2018 base year

Remaining Emissions

Notably, the emissions reduction diagram in **Figure 28** shows a gap between the mitigation strategies and the 2035 target. This gap represents the remaining emissions that are not addressed through the recommended CAP actions and for which additional analysis is needed.

The remaining emissions represented include those from air travel, off-road vehicles and equipment, refrigerant use, agriculture, and wastewater treatment. Some of these emissions sources will be challenging for the County to reduce through direct local action, such as regulating the amount of air travel for residents and local businesses. Others have technological limitations that currently prevent complete emissions reductions, such as process emissions associated with wastewater treatment or agriculture-related emissions.

Future actions will have to be developed to address these emissions. The CAP should be viewed as a living document that requires future updates and monitoring. New technologies may be developed and deployed in the future that could help reduce these remaining emissions sources. During future CAP updates, the incorporation of new technological advancements and their application to the County's emissions sources will enable the remaining emissions analysis to be updated accordingly.

While the Emergency Climate Mobilization resolution calls for "reaching 100% elimination [of GHG emissions] by 2035," that should not preclude the County from pursuing carbon sequestration or carbon offset opportunities while new emissions reduction actions are formulated. Carbon sequestration aids in the reversal of carbon dioxide emissions by capturing and storing carbon dioxide from the atmosphere over the long term. Carbon sequestration is traditionally accomplished by expanding and preserving natural carbon sinks, including those found in forests and other green spaces. The County could pursue carbon sequestration projects inside or outside its boundaries to capture a portion of the remaining emissions that

cannot otherwise be reduced through available technologies (see the **Carbon Sequestration Actions** for examples).

In addition to pursuing direct carbon removal through sequestration, carbon offsets are reductions in GHG emissions made in order to compensate for, or to "offset," emissions made elsewhere. A carbon offset is a tradable certificate representing the reduction of one MT CO₂e. In general, offsets can be generated by capturing and destroying GHGs, which otherwise would have been emitted, by producing clean energy or by enabling carbon sequestration. The County could purchase an amount of certified carbon offsets that equals some or all of the remaining emissions. However, as offsets are not necessarily localized, County-based mitigation and sequestration actions should be prioritized.

These and other options for reducing the County's remaining emissions are discussed further in the **Remaining Emission Sources and Potential Reduction Strategies** chapter later in the CAP.

Important Emissions Areas Outside of the GHG Inventory

Carbon Sequestration in the County

As part of a 2020 pilot program with ICLEI – Local Governments for Sustainability, the County worked with a team of experts to **examine the role of forests and trees in the GHG inventory**.⁸² This pilot resulted in the creation of the Forest and Land Use Appendix of the U.S. Community Greenhouse Gas Protocol. This newly developed appendix was applied to County-specific data, and the resulting report illuminated the contribution of the County’s forests and trees to its carbon budget.

The report estimated changes in carbon sequestered and emitted based on changes in the amount of forest and tree canopy across the County from 2001 to 2011 and from 2011 to 2016 (these are years for which the County had accurate land use data). An estimated net 208,485 MT CO₂ per year was sequestered from the atmosphere during the 2001 to 2011 period, compared to an estimated net 499,758 MT CO₂ per year during the 2011 to 2016 period (see **Figure 29**; negative values represent CO₂ removal).⁸³ The later period showed that net sequestration on an annual basis more than doubled, primarily due to significantly less conversion of forests into development.

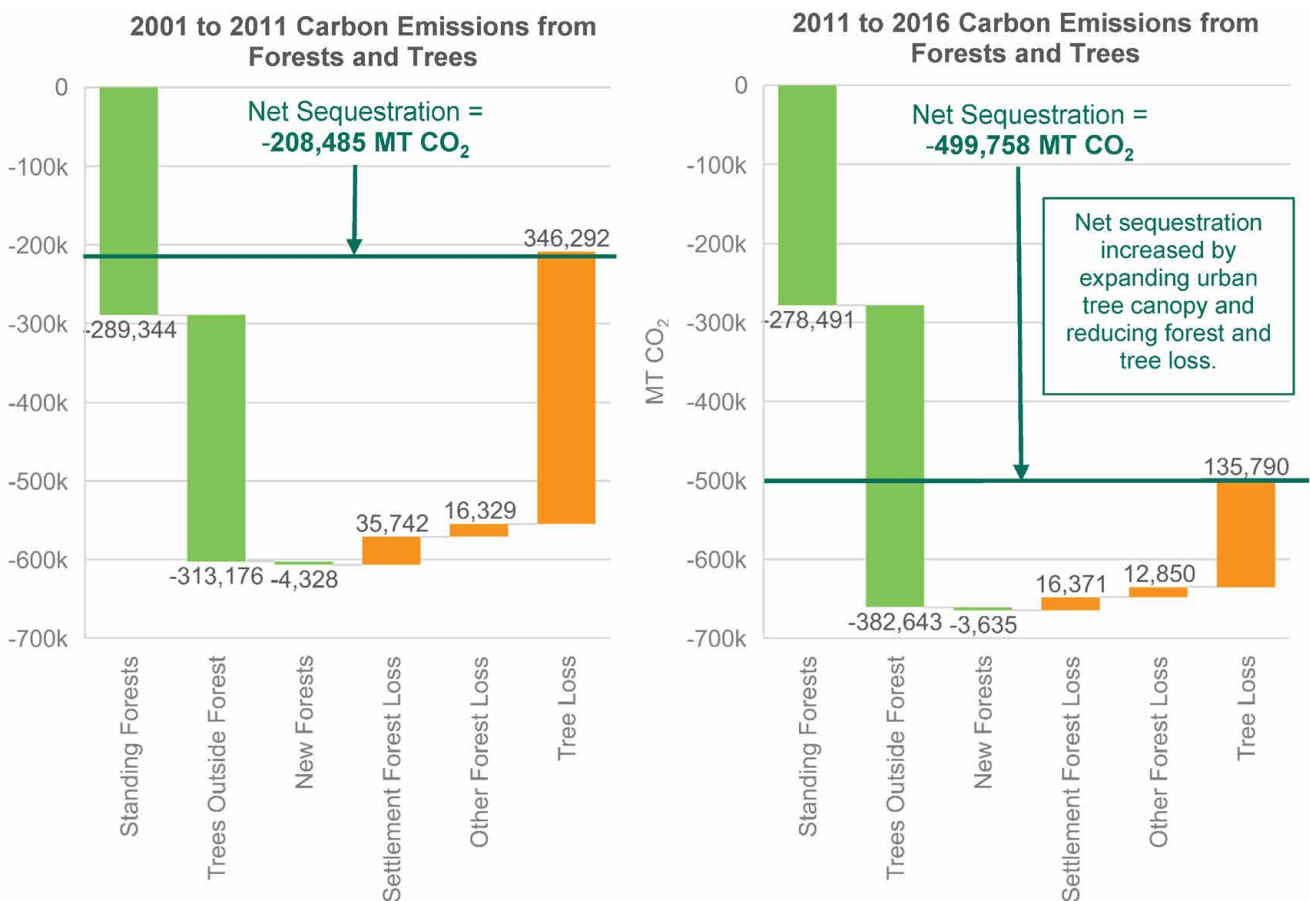


Figure 29: Montgomery County average annual GHG emissions from forests and trees

Because it is not required by GHG inventory protocols, the County does not currently report carbon storage changes that are based on land use in its GHG inventories. However, based on the recent carbon sequestration report mentioned above, the County has determined its net emissions for 2005 and 2015, including emissions from land use activities. The report shows that the protection of forests and aggressive tree planting can make a difference in overall net emissions. Gross emissions from energy use, transportation, and other measured

emissions in Montgomery County dropped 14% from 2005 to 2015. When forest and tree emissions and sequestration are added, the drop in net emissions increases to 16% (**Table 6**). In 2015, forests and trees provided an estimated net offset of 5.9% of the County’s emissions from energy use, transportation, and other sources. As GHG emissions from energy, transportation, and waste decrease over time, the percentage of carbon sequestered by forests and trees relative to the County’s total GHG emissions will increase.

Table 6: Forests and trees contribution to County GHG inventory 2005-2015

Emissions Type	2005 Emissions (MT CO ₂ e)	2012 Emissions (MT CO ₂ e)	2015 Emissions (MT CO ₂ e)	% Change 2005-2015
Sectors in County GHG Inventory				
Residential Energy	3,521,192	2,424,184	2,739,447	-22%
Commercial Energy	3,949,381	2,884,333	3,001,394	-24%
Transportation & Mobile Emissions	4,972,108	4,890,664	4,687,981	-6%
Water & Wastewater	11,993	11,376	10,979	-8%
Agriculture	52,190	48,440	41,914	-20%
Solid Waste	268,533	264,005	266,617	-1%
Process & Fugitive Emissions	369,260	519,885	596,167	61%
Total (Gross) GHG Emissions	13,144,657	11,042,886	11,344,499	-14%
Land Use Activity				
Forests Remaining Forests	-289,344	N/A	-278,491	4%
Forests Converted to Other Lands	52,071	N/A	29,221	44%
Other Lands Converted to Forests	-4,328	N/A	-3,635	16%
Sequestration from Trees	-313,176	N/A	-382,643	-22%
Emissions from Tree Loss	346,292	N/A	135,790	61%
Total (Net) GHG Removals	-208,485	-	-499,758	-140%
Total (Net) GHG Emissions	12,936,172	-	10,844,741	-16%

Reduction of 14% of **gross** emissions...

...refined to reduction of 16% of **net** emissions

It is important to note that there are significant uncertainties in these estimates. Typical GHG inventories of forests that used similar approaches, including the national GHG inventory, report uncertainties in the net GHG balance that can be as high as $\pm 45\%$ (with 95% confidence). In the results presented here, the most uncertain estimates involve emissions from land-use changes that are based on well-documented remote-sensing products, but on relatively few field observations from a statistical sampling of county forests. While uncertainties can be high, the estimates can still provide useful information on the relative magnitude and importance of such GHGs; subsequent analyses can also provide information on the directionality of emissions and removals from land management.

The County is currently working to update data on trees and forests for the 2018 GHG emissions inventory. This new information, combined with research on the sequestration potential of other land use types, will help the County better understand which actions can deliver the largest sequestration benefits, the impact on the remaining emissions gap in 2035, and what additional sequestration actions are needed. In addition to their contribution toward the County's GHG reduction goals, forest retention and aggressive tree planting also provide a wide array of co-benefits, including enhanced water and air quality, improved stormwater management, reduction of urban heat island effects, and wildlife habitat restoration and protection.

Consumption Emissions and Embodied Emissions

Consumption emissions are emissions that go into making goods or materials. Embodied carbon emissions is a related term that most commonly refers to the emissions associated with the production of building materials, such as concrete and steel. For example, if you purchase a product online that was manufactured overseas and then shipped to your home, that product's embodied carbon is the carbon emitted in producing it at a manufacturing plant as well as in transporting it by airplane, boat, or ground transportation to your home. The challenge with consumption emissions and embodied emissions is that they are typically excluded from GHG inventories because the emissions occur outside of the geographic boundary of the community and thus are difficult to reduce or regulate.

Consumption emissions and embodied emissions, which are Scope 3 emissions, are not captured in the Montgomery County GHG emissions inventory. However, a recent study issued by C40 Cities concludes these emissions for high-income cities are significant, and calls for a reduction of the climate impact of consumption by two-thirds within the next decade.⁸⁴ The C40 Cities study notes that "cities and urban consumers have a huge impact on emissions beyond their own borders since 85% of the emissions associated with goods and services consumed in C40 Cities are generated outside the city."⁸⁵ Consumption-based emissions for C40 jurisdictions would be 60% higher than production-based emissions, the current approach for inventorying GHG emissions.⁸⁶ Although Montgomery County is not a city and is not a member of C40 Cities, it fits the population size and socioeconomic profile of the North American cities represented in the study.

This Plan includes actions to begin measuring and reducing consumption emissions and embodied carbon emissions. See **Action G-8**, the **What Can I Do?** chapter, and the **Remaining Emission Sources and Potential Reduction Strategies** chapter.

Climate Poem

What a rare world we live in,
Just like the stars in the huge ceiling.
Everything can happen,
If we stay here doing nothing.
And that's what we are here for,
To take care of this world.

Climate change.
It sounds strange.
And global warming,
Nothing charming.

These are things that could change the world,
But not in a good way.
Since we will all be home,
Because of the burning hot.

Natural disasters are more frequent,
What can we do to stop them?
Everything will be destroyed,
And everyone will be annoyed.

Oh! Why did this happen?
If we did nothing.
I don't understand
Why people don't stand
Since this is our world.
All together,
Not separated.

Author: Elena Matas (Age 13)



CONSERVE OUR FUTURE



Artist: Faith Zhang (Age 16)

Paying for Climate Action Implementation



Paying for Climate Action Implementation

Montgomery County’s climate goals are among the most ambitious of any area in the country—and the world. As outlined in the CAP, achieving the County’s zero emissions goal by 2035 will require implementing big ideas and small ideas alike—across all sectors of the community. Each action identified in the Plan includes an estimate of the initial investment levels for both the County and private sector, which will provide some insight into the magnitude of the cost required for climate action (see the **Climate Actions** chapter for details on the approach used to assess costs). However, these estimates can vary greatly, depending on the magnitude and implementation details of each action. Putting many of these actions in place will require substantial financial resources, sometimes on the order of hundreds of millions of dollars or higher. The County is committed to advancing racial equity and prioritizing the needs of the most vulnerable communities in tackling climate change. As the County implements the CAP, it will be critical to find ways to mitigate the cost impacts to low- and moderate-income residents in particular to ensure that our most vulnerable residents are not impacted unfairly.

The sheer scale of the work that must be done community-wide to fully implement the CAP will require resources that the County alone does not have. County Government revenues are not sufficiently large to single-handedly shoulder the cost of this extent of climate action. Implementing the actions outlined in the CAP calls for commitment from both the public and private sectors while simultaneously leveraging state and federal government resources.

There are a variety of innovative financial tools that are already in use and that should be further leveraged, both by the public and the County Government where applicable, to support the CAP. These tools include:

- Commercial Property Assessed Clean Energy (C-PACE) financing for clean energy and energy efficiency measures
- EmPOWER Maryland utility rebates for energy efficiency measures
- State and federal grants and tax credits
- Montgomery County Green Bank products
- Traditional market-rate loans
- Power purchase agreements to support renewable energy generation
- County operating and capital improvement program budgets, which fund climate initiatives in departmental accounts and the Climate Change Non-Departmental Account

Due to resource constraints and competing County priorities, the County will need to creatively pursue actions that provide co-benefits. Expanding community gardens is a great win-win example, as it reduces emissions from food transportation, addresses food-chain disruptions, enhances food security for low-income residents, and sequesters carbon in the soil, assuming regenerative agricultural practices are used. The County will also need to explore additional revenue generating options to pay for solutions, such as the Fuel Energy Tax, as well as revenue sources specifically designed to fund climate action that advance racial equity and social justice, such as Portland, Oregon’s **Clean Energy Community Benefits Fund**. As a next step, **Action G-10** calls for convening economic and financial experts and community leaders on climate change to develop strategies to best finance the actions outlined in the CAP.

The implementation of CAP actions will take place over many years, and therefore not all of the funding will be identified or available immediately. The same resourcefulness and creative thinking that the community brought to bear when addressing the COVID-19 pandemic should also be harnessed in the context of both implementing and paying for climate action.

As identified in each action description, the majority of CAP actions have co-benefits that go beyond direct GHG emissions mitigation and climate risk reduction. Actions that have positive co-benefit scores for economic prosperity, for example, are anticipated to create economic opportunities related to reducing GHG emissions and to increase the County's resilience to the effects of climate change. Many actions are expected to support the development of local jobs, which would strengthen the County's tax base. Similarly, many CAP actions will result in financial savings to residents and business owners over the long term, such as lower utility bills as a result of implementing energy efficiency retrofits.

The County will work to ensure that the CAP is implemented in a way that provides access to opportunities for all residents, harnesses the innovation of its diverse entrepreneurs, and realizes the full economic potential of addressing climate change in a comprehensive way. For more information about the sustainable economic development study, see the **Looking Forward** chapter.

Many CAP actions also had high scores for co-benefits relating to public health, environmental stewardship, and racial equity and social justice. These co-benefits add an important—and difficult to calculate—dimension to the calculation of the costs and returns associated with taking a particular CAP action. In other words, it is not just about the dollars and cents; there are a whole host of other societal considerations that must also be weighed when determining the value or the “bang for the buck” of each action.

The cost of inaction on climate change must also be factored into decision-making. Studies have shown that the cost of inaction or of delaying climate action is higher than the cost of taking more immediate action.⁸⁷ GHG mitigation projects have been shown to save an average of \$6 in response and recovery for every \$1 spent.⁸⁸ In November 2015, the Center for Climate and Energy Solutions released a study on the cost of climate inaction in Maryland.⁸⁹ The study evaluated the anticipated impact of climate change on Maryland as well as on a broader region with respect to the following sectors: infrastructure, tourism, agriculture, and public health.

Although GHG emissions mitigation and climate adaptation measures can initially be costly, the costs of not responding to future climate impacts on County infrastructure and key economic sectors outweigh the present-day investment in climate action.

Montgomery County Green Bank

Montgomery County greatly benefits from the efforts of the Montgomery County Green Bank, the first county-level green bank in the country. The Green Bank is a publicly chartered 501(c)3 nonprofit dedicated to accelerating affordable energy efficiency and clean energy investments in Montgomery County. By partnering with the private sector and working collaboratively with the County Government, the Green Bank has a unique role in the building of a more diverse, equitable, and inclusively prosperous, resilient, sustainable, and healthy community.

The Green Bank was seeded with settlement funding provided to the County through the Exelon-Pepco merger. The Green Bank uses this seed and other grant funding to leverage private funds, enabling County residents, commercial property and businesses, and clean energy providers to access affordable and flexible capital for energy efficiency and clean energy projects.

By filling in gaps in the existing market, the Green Bank can support commercial buildings, affordable residential multifamily properties, and homeowners with installing clean energy and undertaking significant energy-saving systems improvements in buildings and on properties. The Green Bank has been involved in community solar project financing, which has allowed low- and moderate-income renters and homeowners to access the benefits of solar. By providing technical assistance to affordable rental and homeownership communities, the Green Bank is enabling these harder-to-reach communities to benefit from longer-term energy-saving improvements. The Green Bank also demonstrated its adaptability by quickly structuring a highly flexible small business energy savings loan program to support small businesses in responding to the impacts of COVID-19 on their businesses and operations.



Montgomery County Green Bank celebrates completion of a major energy savings project in Bethesda.

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Artist: Eleanor Larson (Age 6)



EUNICE EWUSIE



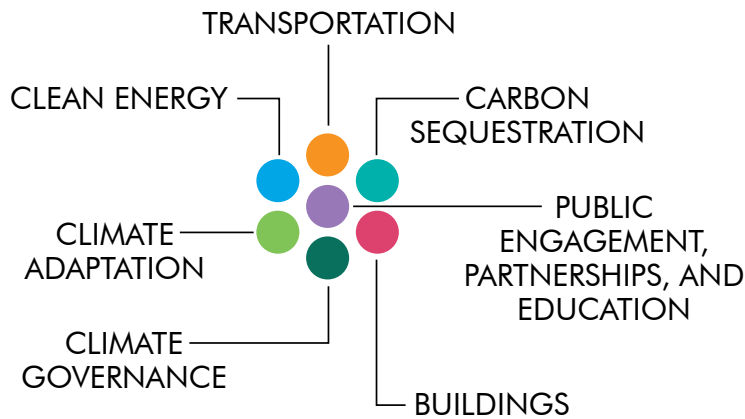
Artist: Eunice Ewusie (Age 14)

Climate Actions



Climate Actions

CAP LOGO KEY



The following sections outline the 86 climate actions proposed as part of the Climate Action Plan (CAP). The County team took the 894 actions that the climate technical workgroups developed and—through GHG inventory projections, emissions reduction strategy modeling, downscaled climate modeling, geographic information system (GIS) analysis, and co-benefits and feasibility criteria analysis—prioritized the actions with the greatest potential for directly reducing GHG emissions and/or climate risk.

The CAP proposes 86 actions across seven sectors—clean energy; transportation; buildings; climate adaptation; carbon sequestration; climate governance; and public engagement, partnerships, and education—of which 31 are aimed primarily at mitigating GHG emissions, 20 are aimed at reducing climate risk, and 35 are aimed at developing the organizational structure and community support to carry out this work. While there are many additional climate actions that can contribute to reducing County emissions, particularly at the individual and other emissions source levels (for example, solid waste or fugitive emissions), the actions presented would make the largest impacts within the seven sectors.

The CAP actions are presented by sector, in order of the highest GHG emissions reduction potential for the energy, buildings, and transportation sectors, and in order of high climate risk reduction potential for the climate adaptation and carbon sequestration sectors. It is important to keep in the mind that while the analysis of these actions is based on GHG emissions data, downscaled climate modeling, and GIS climate vulnerability assessments, action prioritization is also a qualitative process and should be revisited during action development to take into account additional considerations in the County. See **Appendix A** for a full list of all actions proposed in the CAP.

The success of these actions relies not only on the County’s direct commitments, but on collaboration with external entities as well as voluntary action by residents and businesses. It is crucial that the community participate in climate action in order to realize the maximum countywide impact.

Table 7, Table 8, and Table 9 show the technological assumptions made for meeting the 2027 and 2035 GHG reduction targets and their associated CAP actions. The technological

assumptions, such as 86% renewable energy by 2027 and 100% vehicle electrification by 2035, provide a pathway for what needs to be done to meet the County's emissions reduction targets of 80% by 2027 and carbon neutrality by 2035. The CAP actions, such as implementing solar-friendly building codes to promote renewable energy installations or offering EV incentives to promote vehicle electrification, are intended to promote or require implementation of these technological assumptions. The progress toward implementing the CAP's actions will be monitored through the annual climate work plan, and planned periodic inventories of the County's GHG emissions will track the County's progress toward its GHG reduction goals (see the **Looking Forward** chapter). If the actions are not on track or emissions are not declining in line with the County's carbon-neutral target, the actions will need to be updated or new actions will need to be added. The process of action monitoring and updating will also provide an opportunity to incorporate new technological developments, policy changes, climate science, and community priorities.

Even with implementation of all the CAP actions, there will still be some remaining GHG emissions from smaller emissions sources such as wastewater and from larger sources such as transportation, which equate to approximately 17% of total projected 2035 emissions. Given the large scale and quickly approaching deadline of the County's reduction goals, it is important for the County to first focus time and resources on implementing actions with the largest GHG emissions reduction potential. The County can then mitigate emissions from smaller sources or balance these emissions through carbon sequestration or, as a last resort, carbon offsets.

The CAP actions were developed to not only mitigate GHG emissions and adapt to climate change but also to advance racial equity and social justice, public health, environmental stewardship, and economic prosperity in Montgomery County. These actions collectively promote the County's Vision for Building a Healthy, Equitable, and Resilient Community.

Action descriptions are provided in detail by sector in the following sections. The **How to Read the CAP Action Descriptions** page presents a guide with legends for navigating the information in the action descriptions.

Table 7: How things would have to change and associated CAP actions (Energy)

How things would have to change by 2027*	How things would have to change by 2035*	Associated CAP Actions
<ul style="list-style-type: none"> • 86% of all electricity consumed is carbon-free 	<ul style="list-style-type: none"> • 100% of all electricity consumed is carbon-free 	E-1: Community Choice Energy Program E-2: Private Building Solar Photovoltaic Code Requirements E-3: Promote Private Solar Photovoltaic Systems E-4: Public Facility Solar Photovoltaic Installations and Groundwork E-5: Advocate for a 100% Renewable Portfolio Standard by 2030

*Compared to 2018 base year

Table 8: How things would have to change and associated CAP actions (Buildings)

How things would have to change by 2027*	How things would have to change by 2035*	Associated CAP Actions
<ul style="list-style-type: none"> • 85% of residential units with natural gas space and water heating have converted to electric heat pumps • 25% of residential units have installed improved building envelopes • 20% of residential units have installed low-flow water fixtures 	<ul style="list-style-type: none"> • 100% of residential units with natural gas space and water heating have converted to electric heat pumps • 100% of residential units have installed improved building envelopes • 100% of residential units have installed low-flow water fixtures 	B-2: Electrification Requirements for Existing Residential Buildings B-4: Electrification Incentives for Existing Buildings
<ul style="list-style-type: none"> • 75% of commercial buildings with natural gas space and water heating have converted to electric heat pumps • 15% of commercial buildings have installed improved building envelopes • 50% of commercial buildings have installed low-flow water fixtures 	<ul style="list-style-type: none"> • 100% of commercial buildings with natural gas space and water heating have converted to electric heat pumps • 100% of commercial buildings have installed improved building envelopes • 100% of commercial buildings have installed low-flow water fixtures 	B-1: Electrification Requirements for Existing Commercial and Public Buildings B-3: Energy Performance Standard for Existing Commercial and Multifamily Buildings B-4: Electrification Incentives for Existing Buildings
<ul style="list-style-type: none"> • 100% of all new developments are energy efficient and all-electric, starting in 2022 	<ul style="list-style-type: none"> • 100% of all new developments are energy efficient and all-electric, starting in 2022 	B-1: Electrification Requirements for Existing Commercial and Public Buildings B-5: All-Electric Building Code for New Construction B-6: Disincentivize and/or Eliminate Natural Gas in New Construction B-7: Net-Zero Energy Building Code for New Construction

*Compared to 2018 base year

Table 9: How things would have to change and associated CAP actions (Transportation)

How things would have to change by 2027*	How things would have to change by 2035*	Associated CAP Actions
<ul style="list-style-type: none"> • 15-25% reduction in private vehicle trips 	<ul style="list-style-type: none"> • 15-25% reduction in private vehicle trips 	<ul style="list-style-type: none"> T-1: Expand Public Transit T-2: Expand Active Transportation and Micromobility Network T-4: Constrain Cars in Urban Areas, Limit Major New Road Construction T-8: Transportation Demand Management and Telework Strategies T-9: Traffic Management Systems
<ul style="list-style-type: none"> • 75-85% of passenger vehicles are electric/zero emissions • 100% of buses are electric/zero emissions 	<ul style="list-style-type: none"> • 100% of passenger vehicles are electric/zero emissions • 100% of buses are electric/zero emissions 	<ul style="list-style-type: none"> T-3: Private Vehicle Electrification Incentives and Disincentives T-5: Zero Emissions Public Buses and School Buses T-6: Electrify County and Public Agencies Fleet T-7: Expand the Electric Vehicle Charging Network T-10: Electric Vehicle Car Share Program for Low-Income Communities
<ul style="list-style-type: none"> • Other Supportive Actions 	<ul style="list-style-type: none"> • Other Supportive Actions 	<ul style="list-style-type: none"> T-11: Off-Road Vehicle and Equipment Electrification T-12: Advocate for a Vehicle Carbon/ Gas Tax or VMT Tax T-13: Advocate for Rail Alternative Fuels

*Compared to 2018 base year

Action Prioritization

To prioritize climate actions, the County team and technical consultants used the **C40 Cities Action Selection and Prioritization (ASAP) tool**— a software tool that documents actions and provides outputs to support the climate action decision-making process through a comparison of action benefits and challenges. The ASAP tool is designed to support decision-making, not to make decisions itself. The results from the tool can be used to further assess and prioritize actions as well as communicate the actions' benefits and feasibility.

The ASAP process involves assessing the impact of actions based on multiple evaluation criteria:

- Primary benefits (for example, GHG emissions and/or climate risk reduction)
- Secondary co-benefits (for example, public health and economic prosperity)
- Feasibility (for example, authority level and financial need)

The resulting ASAP outputs allow for a streamlined action comparison. In the CAP, actions have been ordered by the magnitude of their primary benefits (actions with high emissions mitigation and climate risk reduction potential are listed first). The ASAP co-benefits and feasibility ratings are presented within each action and can be used for further action prioritization. See **Appendix F** for the ASAP rating assumptions for each action.

With regard to GHG mitigation, it is important to note that the ASAP tool is not a GHG quantification tool, but a support tool that allows users to compare actions against a set of evaluation criteria to determine which actions will have the greatest impact. With the ASAP tool, the actions related to clean energy, buildings, and transportation were assessed for their relative GHG reduction potential, using County data, relevant studies, and results from similar actions. To estimate an action's relative GHG reduction potential, each action was scored by the ASAP tool for the following impacts:

- Extent – the proportion of GHG emitters within the subsector that will be targeted by this action
- Reduction Potential – the potential for the technology, behavior change, or other change encouraged by the action to reduce emissions
- Uptake Potential – the proportion of targeted GHG emitters that will likely implement the technological/behavior change that the action promotes

Estimates of GHG mitigation impact typically result in a range of emissions reductions that vary according to the extent and uptake (adoption) of each action. Therefore, emissions reduction scores were developed using a specific set of tiered inputs for each impact (for example, 0-19% or 80-100%) to account for unknowns and variability in emissions impact. This results in an overall GHG Reduction Score, which is a relative measure of the potential for an action to reduce emissions based on its relationship to the County's GHG emissions inventory. These scores were then used to compare the GHG impact of each action to other potential actions, and to allow GHG reduction potential to be considered alongside action co-benefits and feasibility.

Figure 30 shows which of the CAP actions were scored as having the highest GHG emissions reduction potential. The "Interaction Score" shows if the action also reduces climate risk.

Note that some actions may result in overlapping emissions reductions. For example, eliminating natural gas use in new developments and adoption of an all-electric building code are both mechanisms to reduce the same emissions source: natural gas consumption in new buildings. Therefore, the estimated emissions reduction from each action would overlap and should not be added together. Because of this, plan implementation should consider which actions are bundled together and what their combined emissions reduction could be.



The MoCo Made initiative supports purchasing foods and vegetables from local farms in the County.

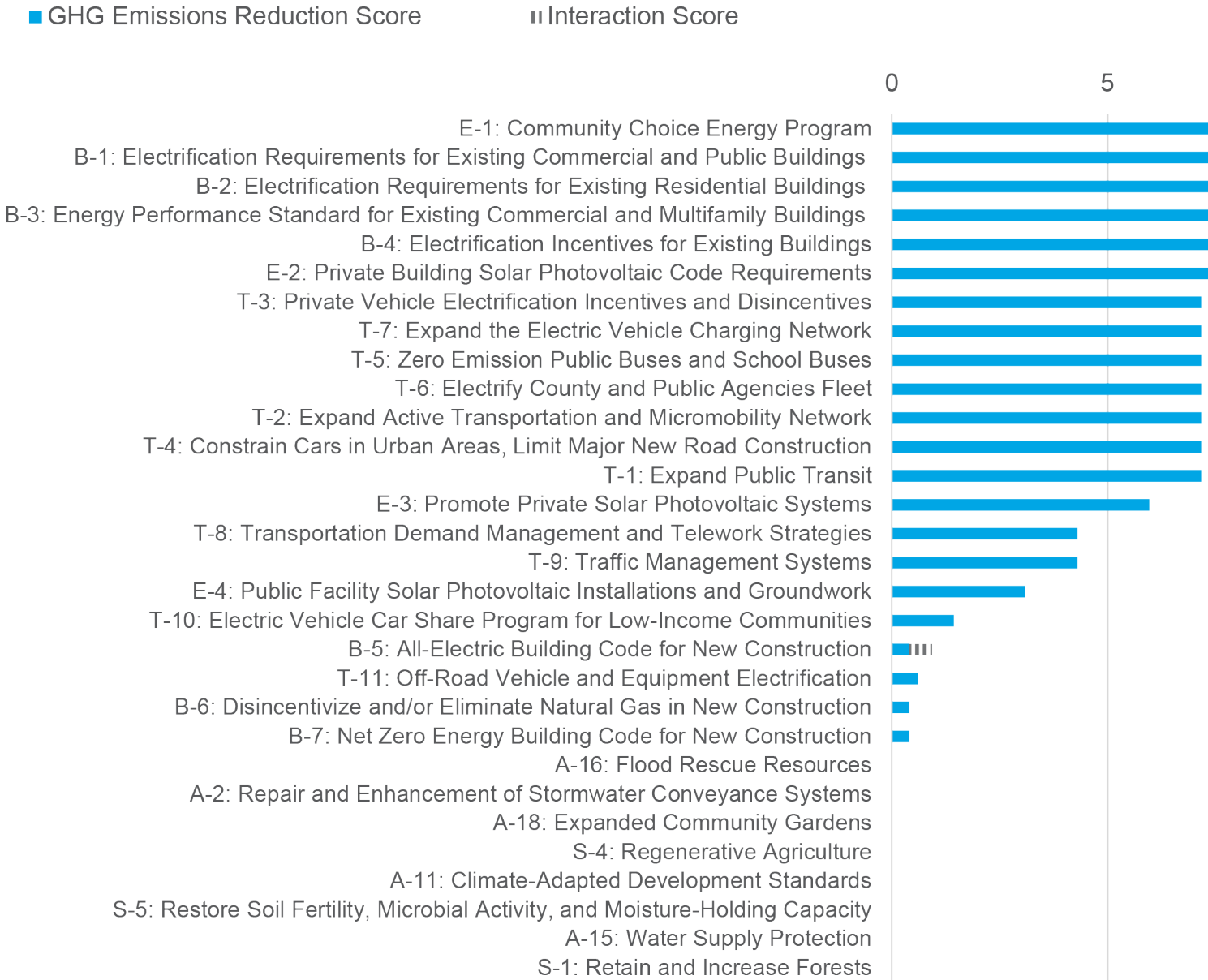
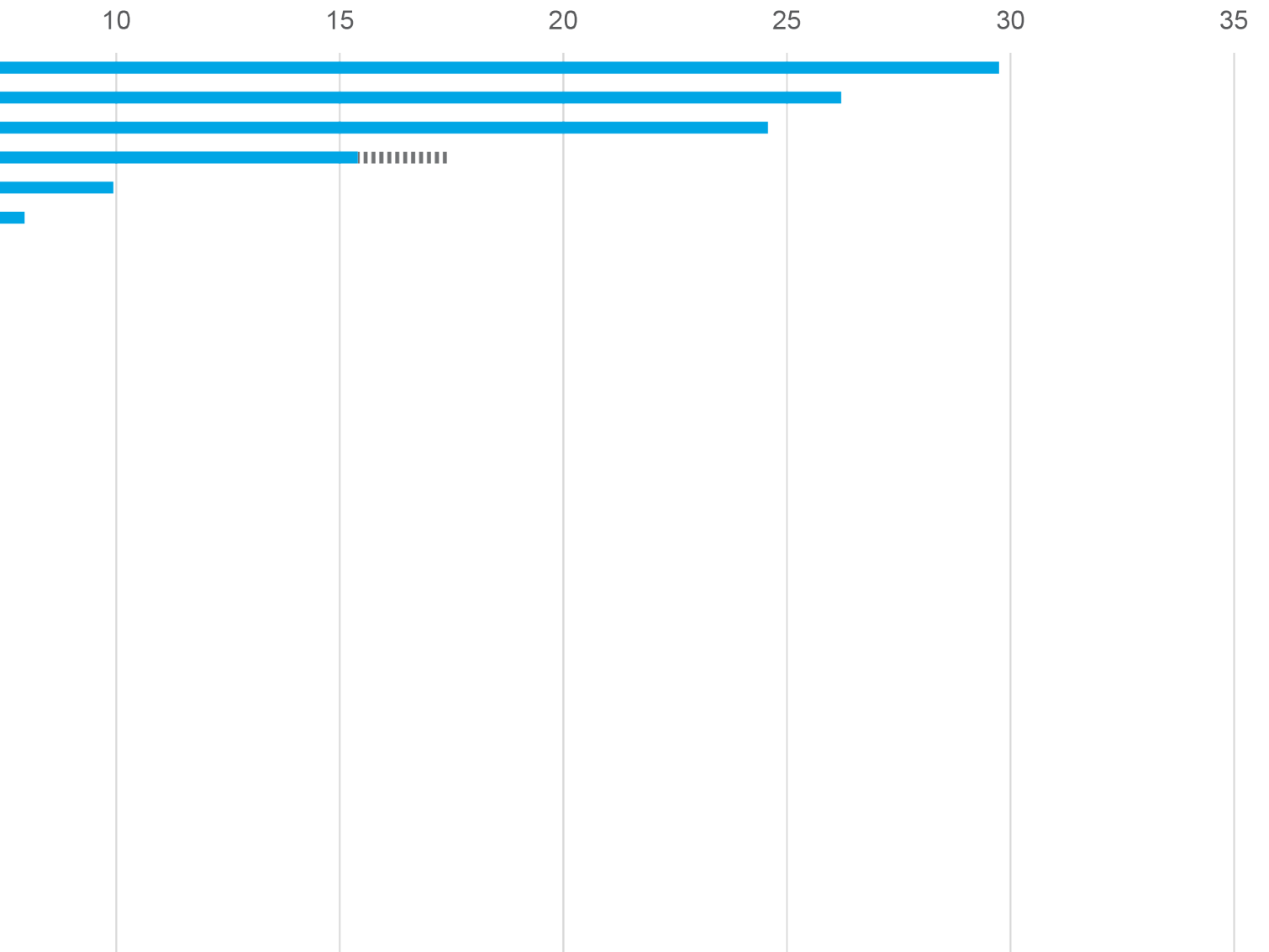


Figure 30: GHG mitigation actions with the highest emissions reduction potential



Evaluation of Co-Benefits and Feasibility

The County identified and defined important local co-benefits and feasibility criteria that reflect County and community priorities (**Table 10**). The qualitative assessment that followed was conducted by technical subject matter experts and members of the County’s climate team to identify and rank the strengths and weaknesses of the proposed CAP actions, using a Likert

scale approach. It is important to recognize that different people can reach different conclusions when assessing the co-benefits (strengths), weaknesses, and feasibility of implementing CAP actions. These subjective assessments are neither perfect nor final, but they highlight important impacts for consideration as the actions move forward in the climate planning process. See **Appendix F** for the impact ratings of each action.

Table 10: Co-benefit and feasibility evaluation criteria and definitions

CO-BENEFITS	FEASIBILITY CRITERIA
<p>▶ PUBLIC HEALTH Increased life expectancy or reduced incidents of diseases or deaths attributed to air quality (indoor or outdoor), weather, poor sanitation, or lack of access to nutrients</p>	<p>▶ COUNTY AUTHORITY Does the County have the legal authority to implement this action or would it need to be implemented by another entity, such as the federal government, a utility, or an agency outside of the County Government, or by the private sector?</p>
<p>▶ ENVIRONMENTAL STEWARDSHIP Increased creation, preservation, or restoration of natural environments</p>	<p>▶ INITIAL INVESTMENT - COUNTY Beyond any funding that is currently secured or identified, how much total additional County investment would be required to implement the action (initial upfront costs)?</p>
<p>▶ ECONOMIC PROSPERITY Increased employment rate, access to quality jobs (full-time versus temporary; high-paying versus low-paying), income and social mobility, and/or total number of jobs</p>	<p>▶ INITIAL INVESTMENT - PRIVATE Beyond any funding that is currently secured or identified, how much total additional private investment would be required to implement the action (initial upfront costs)?</p>
<p>▶ RACIAL EQUITY AND SOCIAL JUSTICE When race can no longer be used to predict life outcomes, when all people have access to the same rights and systems, when there is a fair distribution of resources, and when life outcomes are improved for all groups</p>	

Figure 31 shows the CAP actions with the greatest co-benefits (highest cumulative co-benefit scores, with very negative scoring as -2 and very positive scoring as 2). **Figure 32** shows the CAP actions with the highest feasibility in terms of existing County authority over the action's implementation and the lowest initial investment needed to implement the action. Feasibility scores in **Figure 32** are cumulative, with Outside County Authority scoring as -1, County Authority with Policy Change scoring as 0, and County Under Existing Policy scoring as 1; and with large initial investment scoring as -1, some investment scoring as 0, and low investment scoring as 1. While the County does not have direct control over actions with a negative authority rating, they have more direct control over actions with a positive rating. The more negative the investment score, the more money it will take to fund the action.

Figure 33 illustrates the primary benefits of each action (GHG reduction and/or climate risk reduction) and the co-benefits of each action together. Primary benefits are measured on the horizontal (X) axis, while co-benefits are measured on the vertical (Y) axis. The further an action is away from the intersection of the axes (within the positive area of the chart), the greater the benefit. For example, Community Choice Energy (Point A on the far right of the chart) has the potential to provide significant GHG reductions, but has limited co-benefits. Expanded community gardens (point RA in the top left of the chart) provides limited GHG reduction benefits, but substantial co-benefits. Increasing tree canopy (point UA in the top right of the chart) provides both substantial GHG reduction (through sequestration) benefits as well as significant co-benefits.

All charts can be used to aid future action prioritization.

- Public Health ■ Environmental Stewardship
- ▣ Economic Prosperity ▤ Racial Equity & Social Justice

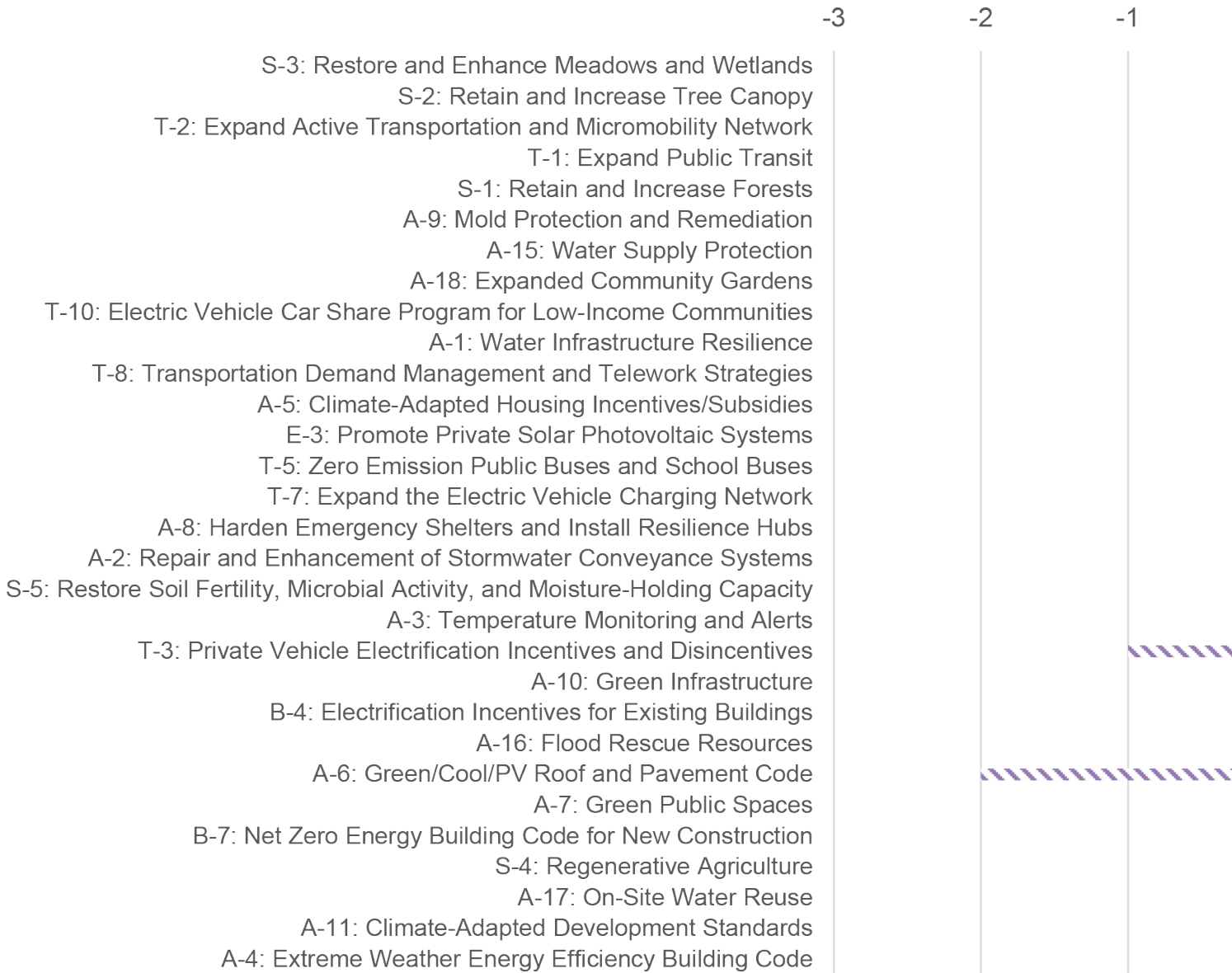
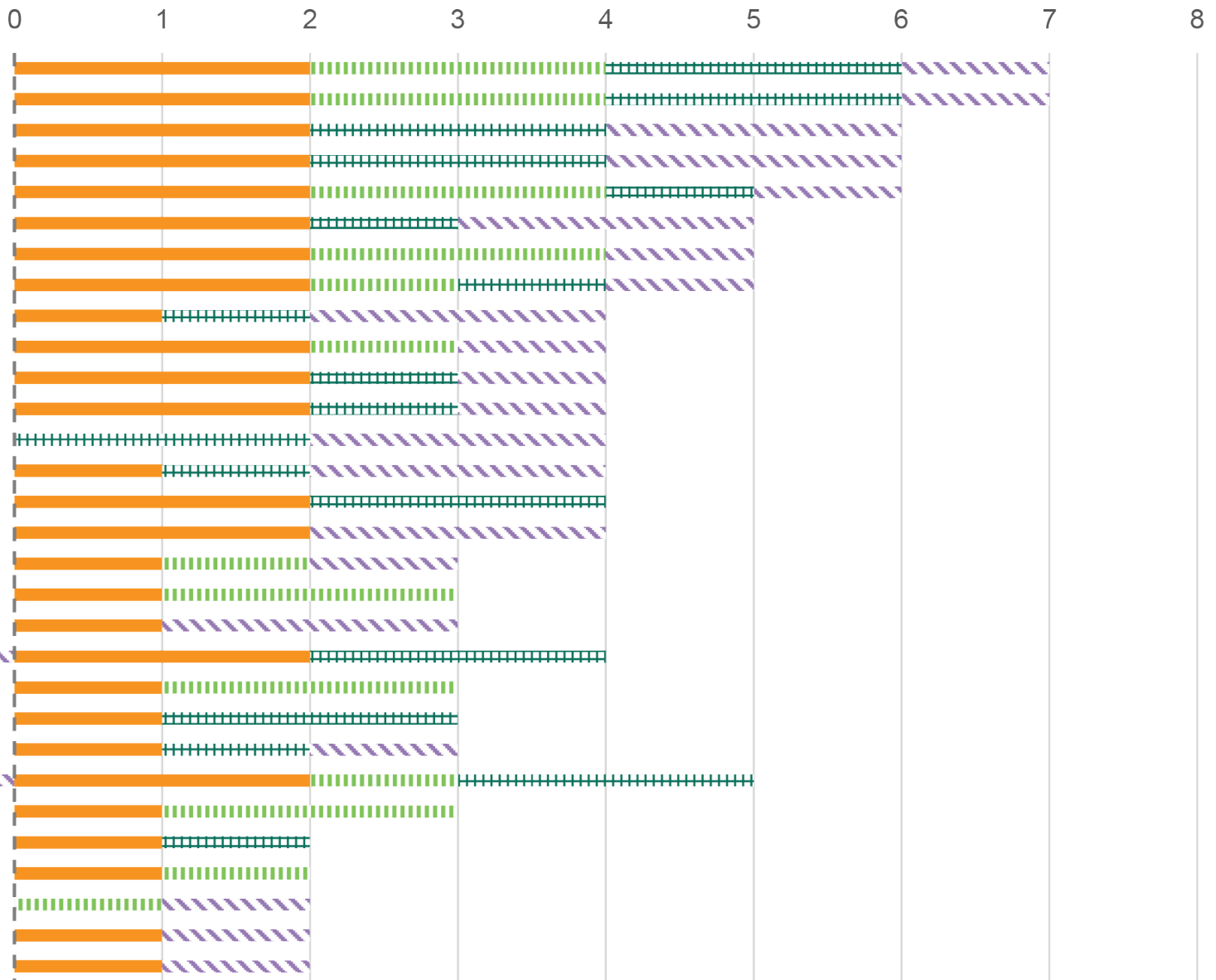


Figure 31: CAP actions with the greatest cumulative co-benefits



▄▄ County Authority

■ Initial Investment

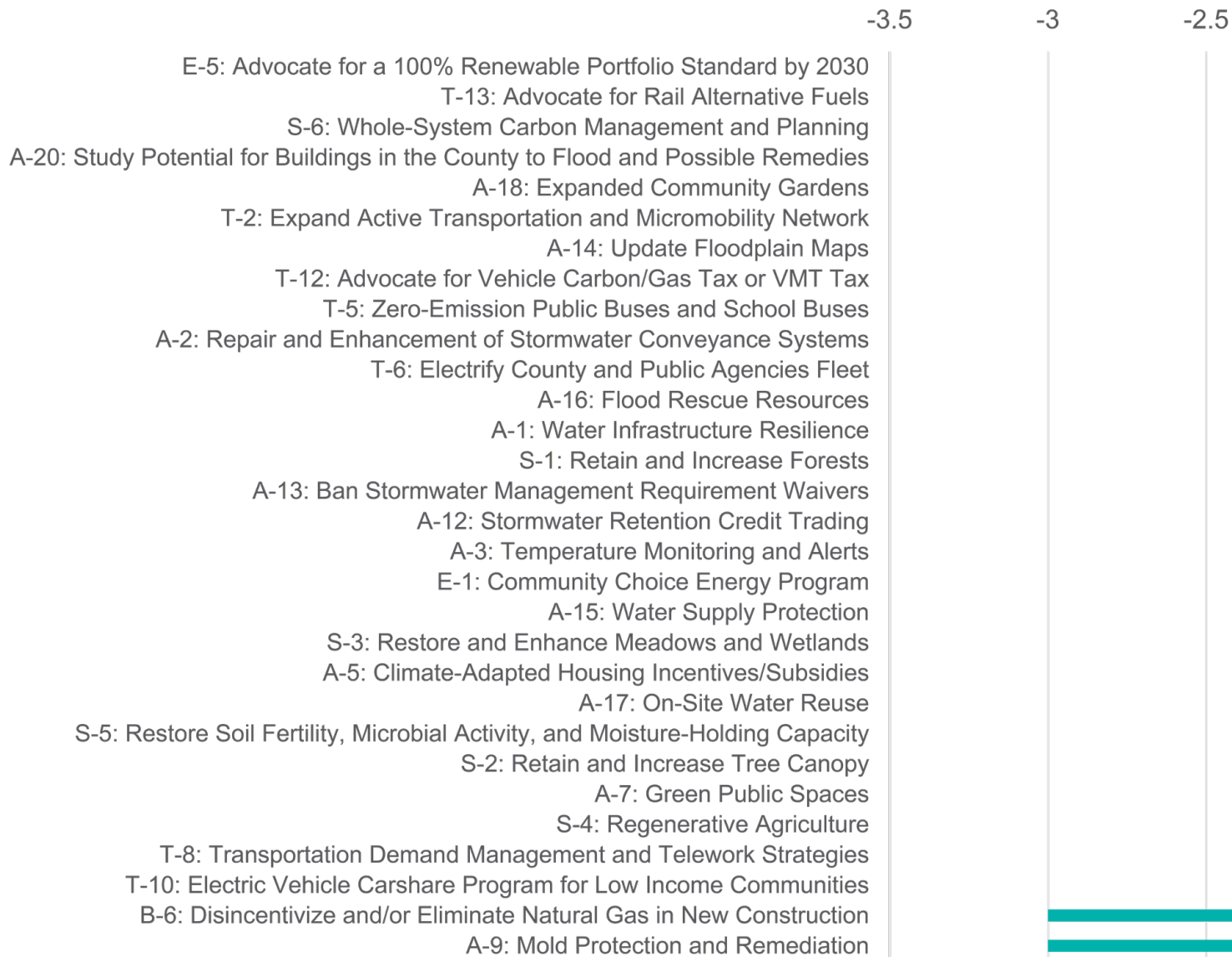
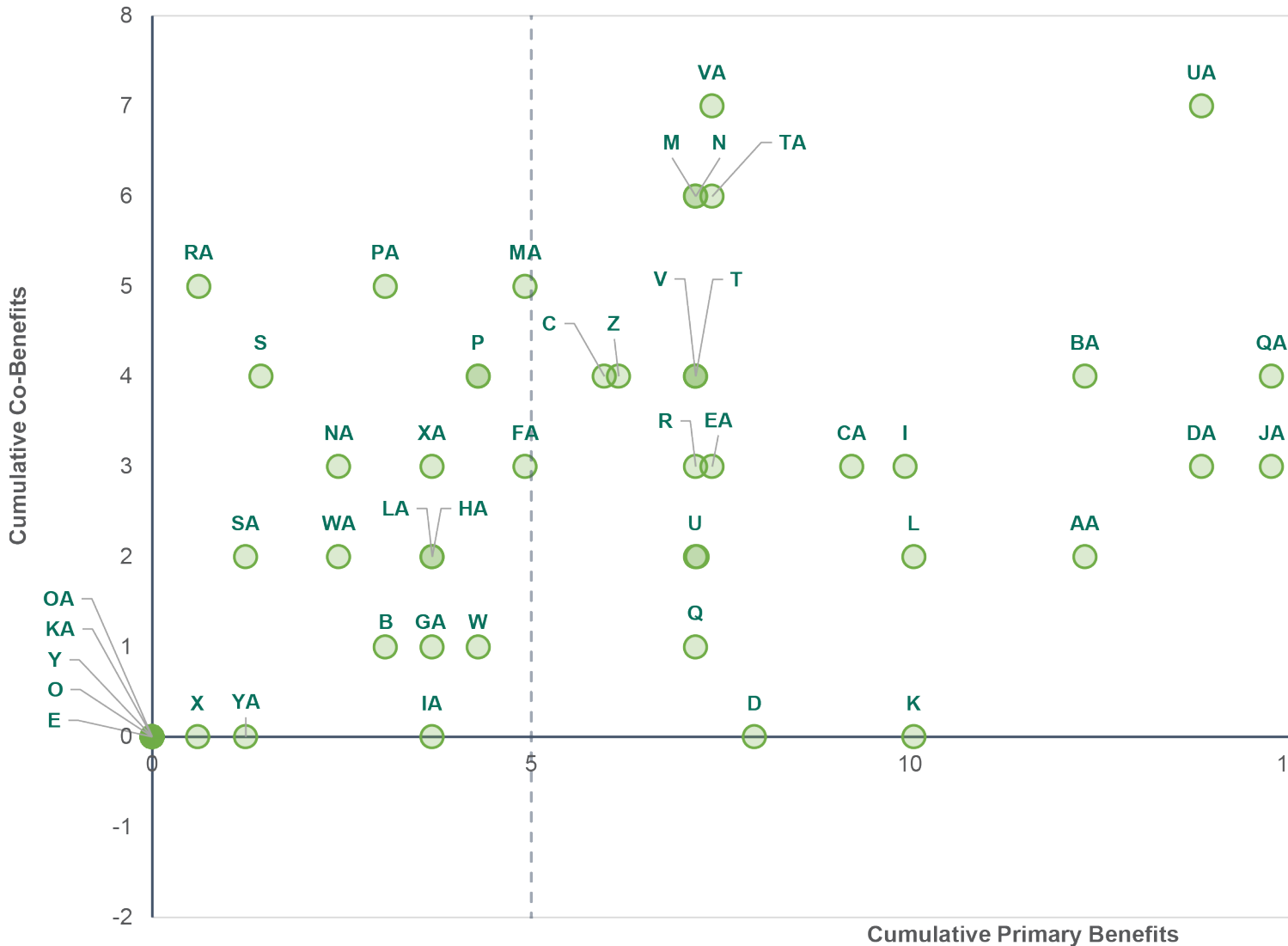


Figure 32: CAP actions with the highest County authority and initial investment feasibility

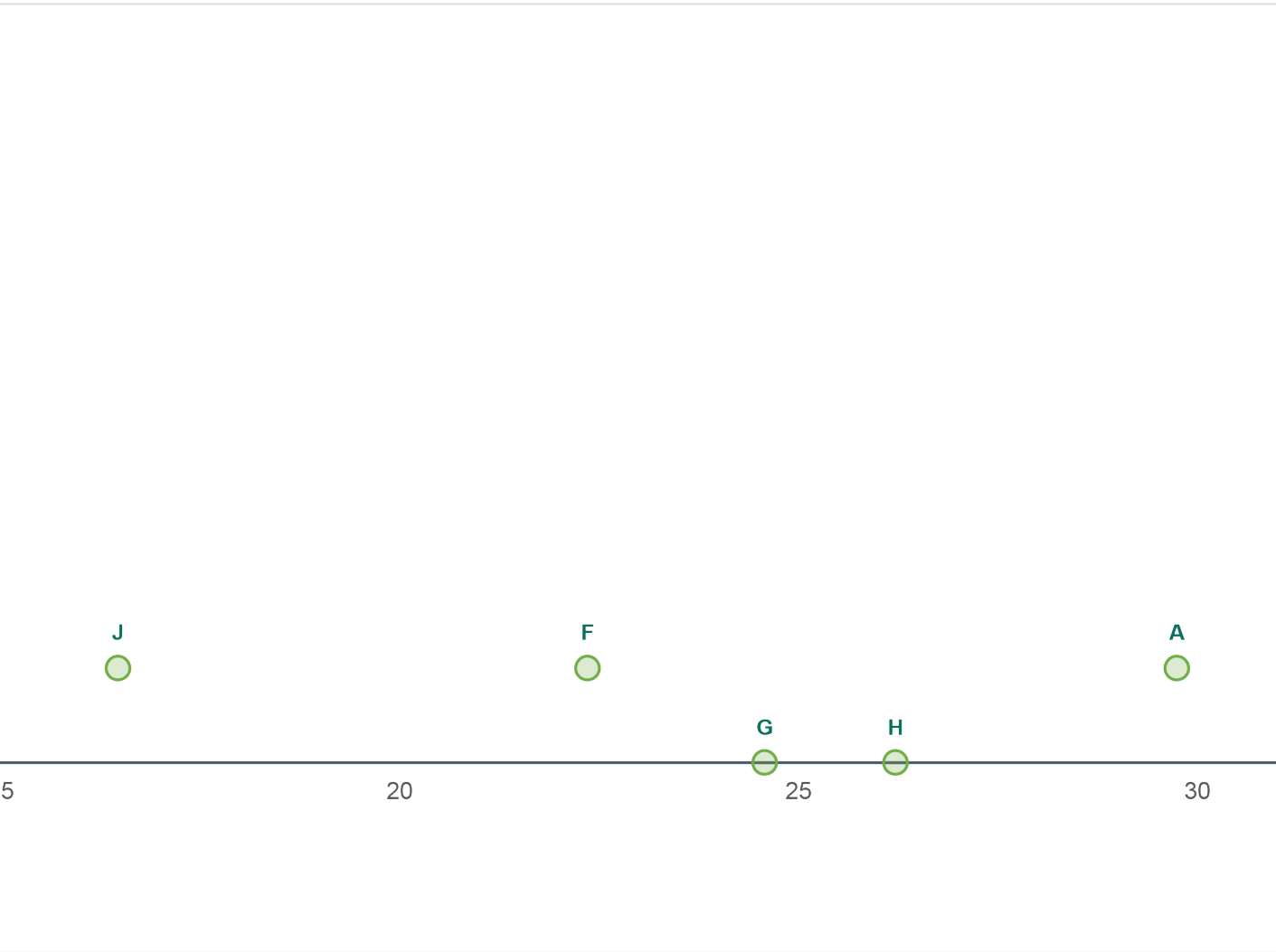




Action ID, Number and Name

<p>A E-1: Community Choice Energy Program</p> <p>B E-4: Public Facility Solar Photovoltaic Installations and Groundwork</p> <p>C E-3: Promote Private Solar Photovoltaic Systems</p> <p>D E-2: Private Building Solar Photovoltaic Code Requirements</p> <p>E E-5: Advocate for a 100% Renewable Portfolio Standard by 2030</p> <p>F B-3: Energy Performance Standard for Existing Commercial and Multifamily Buildings</p> <p>G B-2: Electrification Requirements for Existing Residential Buildings</p>	<p>H B-1: Electrification Requirements for Existing Commercial and Public Buildings</p> <p>I B-4: Electrification Incentives for Existing Buildings</p> <p>J B-5: All-Electric Building Code for New Construction</p> <p>K B-6: Disincentivize and/or Eliminate Natural Gas in New Construction</p> <p>L B-7: Net Zero Energy Building Code for New Construction</p> <p>M T-1: Expand Public Transit</p> <p>N T-2: Expand Active Transportation and Micromobility Network</p> <p>O T-12: Advocate for Vehicle Carbon/ Gas Tax or VMT Tax</p>	<p>P T-8: Transportation Demand Management and Telework Strategies</p> <p>Q T-4: Constrain Cars in Urban Areas, Limit Major New Road Construction</p> <p>R T-3: Private Vehicle Electrification Incentives and Disincentives</p> <p>S T-10: Electric Vehicle Car Share Program for Low-Income Communities</p> <p>T T-5: Zero Emissions Public Buses and School Buses</p> <p>U T-6: Electrify County and Public Agencies Fleet</p> <p>V T-7: Expand the Electric Vehicle Charging Network</p> <p>W T-9: Traffic Management Systems</p>
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Figure 33: CAP actions plotted for cumulative co-benefits and cumulative primary benefits



- | | | |
|--|--|--|
| <ul style="list-style-type: none"> X T-11: Off-Road Vehicle and Equipment Electrification Y T-13: Advocate for Rail Alternative Fuels Z A-8: Harden Emergency Shelters and Install Resilience Hubs AA A-4: Extreme Weather Energy Efficiency Building Code BA A-5: Climate-Adapted Housing Incentives/Subsidies CA A-6: Green/Cool/PV Roof and Pavement Code DA A-3: Temperature Monitoring and Alerts EA A-7: Green Public Spaces | <ul style="list-style-type: none"> FA A-10: Green Infrastructure GA A-13: Ban Stormwater Management Requirement Waivers HA A-12: Stormwater Retention Credit Trading IA A-14: Update Floodplain Maps JA A-2: Repair and Enhancement of Stormwater Conveyance Systems KA A-20: Study Potential for Buildings in the County to Flood and Possible Remedies LA A-11: Climate Adapted Development Standard MA A-9: Mold Protection and Remediation NA A-16: Flood Rescue Resources | <ul style="list-style-type: none"> OA A-19: Advocacy for Off-River Water Storage PA A-15: Water Supply Protection QA A-1: Water Infrastructure Resilience RA A-18: Expanded Community Gardens SA A-17: On-Site Water Reuse TA S-1: Retain and Increase Forests UA S-2: Retain and Increase Tree Canopy VA S-3: Restore and Enhance Meadows and Wetlands WA S-4: Regenerative Agriculture XA S-5: Restore Soil Fertility, Microbial Activity, and Moisture-Holding Capacity YA S-6: Whole-System Carbon Management and Planning |
|--|--|--|

How to Read the CAP Action Descriptions

ACTION NUMBER

ACTION NAME

ACTION DETAILS

Montgomery County CAP Transportation Actions • Climate Actions Introduction

T-8

Transportation Demand Management and Telework Strategies

Primary Benefit:	Co-Benefits:	Authority:	Development Stage:	Lead:	Contributor:
 GHG Mitigation – Low A	<p>B Racial Equity and Social Justice – Somewhat Positive</p> <p>Public Health – Very Positive</p> <p>Economic Prosperity – Somewhat Positive</p>	<p>D County – May Require Policy Amendment or New Policy</p>	<p>E In Progress</p>	<p>F MCDOT</p>	<p>G Businesses with 25 or more employees Developers of projects in TMDs, DPS, M-NCPPC</p>
		<p>C County: \$\$\$ Private: \$</p>			

Transportation Demand Management (TDM) includes strategies for reducing demand for road capacity, primarily during peak periods. **Specifically, TDM promotes using travel modes (public transit, bicycling, other micromobility modes, and walking) to replace single-occupancy vehicle (SOV) commuting; increasing the number of passengers in vehicles (carpooling and vanpooling); and eliminating some trips altogether (for example, through teleworking, compressed/alternative work schedules).**

Montgomery County has created Transportation Management Districts (TMDs) and adopted code revisions that require businesses with 25 or more employees throughout the County to submit TDM plans and annually report on TDM activities. New development projects in TMDs are required to include TDM-supportive components such as incentivizing biking and walking. TDM strategies include providing transit subsidies to employees commuting to those areas, bike storage and showers, and parking management strategies, such as reducing the amount of permitted parking, eliminating minimum parking requirements, using shared and market-rate parking, and unbundling of parking from commercial and residential sales or leases so that parking spaces are sold, leased, and priced separately from the development being sold or leased. Parking fees and parking “cash-out” programs can be part of

EQUITY-ENHANCING MEASURES

- Provide more active transportation amenities (secure bicycle storage, showers, connectivity).
- Prioritize communities for infrastructure improvements related to multimodal access where multimodal connectivity is missing and can increase connections to jobs.
- Conduct ongoing campaigns to raise awareness related to alternative transportation options. Ensure the awareness campaigns a developed in multiple languages.
- Increase access to quality internet connectivity for low-income residents/ households and areas of the County where broadband internet is not easily accessible.

the parking management strategies implemented at both public and private development projects. Revenues from parking fees can be used to support other modes, such as transit and biking. These strategies help to reduce local vehicle pollution, expand access to jobs, enhance employers’ recruiting efforts, and reduce costs for many households. Substantial mode shifting using TDM to increase the use of transit, biking,

A **Climate Risk Reduction** Climate hazard the action addresses.

- Extreme Heat
- Extreme Precipitation
- High Winds
- Drought

A **GHG Mitigation** Estimated level of emissions reduction. These reductions are projected out until 2035.

- High: >1,000,000 MT CO₂e
- Medium: 500,000-1,000,000 MT CO₂e
- Low: <500,000 MT CO₂e
- Enabling Action – action that does not have direct emissions reduction but is necessary to support actions with direct emissions reduction

B **Co-Benefits*** Level of impact the action would have on each of the four co-benefits.

- Very Negative
- Somewhat Negative
- Neutral
- Somewhat Positive
- Very Positive

C **Investment** Initial upfront costs beyond any currently secured or identified funding.

- \$: Low Initial Cost (Public: <\$100k, Private: <\$10M)
- \$\$: Some Initial Cost (Public: \$100k-\$1M, Private: \$10-\$100M)
- \$\$\$: Large Initial Cost (Public: >\$1M, Private: >\$100M)

EQUITY-ENHANCING MEASURES

Measures that if implemented would improve the racial equity and social justice co-benefit of an action.

ACTION DETAILS

D Authority Who has the authority to implement this action. For the purposes of this section, "County" is defined as County Executive branch departments and County Council. Independent public agencies, such as MCPS and M-NCPPC, are defined as "other public entities" for the purposes of this section.

- County – Can Be Implemented Under Existing Policy
- County – May Require Policy Amendment or New Policy
- Outside County – Requires County Collaboration with Other Public or Private Entities or Is Outside County Authority

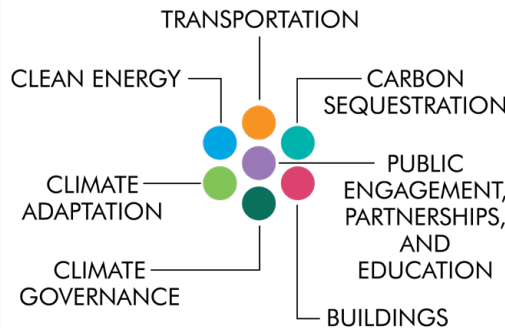
E Development Stage Current development stage for the action.

- In Progress (action is currently being implemented)
- In Development (action is currently in development)
- Planned (action will be implemented at a future date)
- Proposed (action is proposed)
- Exploration (action is being explored)

F Lead Lead County department or independent public agency that would be involved in action development and implementation.

G Contributor Contributor County department, independent public agency, or other entity that would be involved in action development and implementation

CAP LOGO



PRIMARY BENEFITS



GHG MITIGATION



CLIMATE RISK REDUCTION

ACTION SECTORS



CLEAN ENERGY



BUILDINGS



TRANSPORTATION



CARBON SEQUESTRATION



CLIMATE ADAPTATION



CLIMATE GOVERNANCE



PUBLIC ENGAGEMENT, PARTNERSHIPS, AND EDUCATION

***Co-Benefit Notes** Racial Equity and Social Justice: Each action was rated for its racial equity and social justice impact before equity-enhancing measures were developed. Ideally, if all equity-enhancing measures are implemented, the co-benefit rating for each action would then change to "Very Positive." If an action already had an anticipated "Very Positive" impact on racial equity and social justice, then typically no additional equity-enhancing measure recommendations were developed.

Enabling Actions Actions that are enabling in nature, such as advocacy, have not been scored for co-benefits, for example, Action E-5: Advocate for a 100% Renewable Portfolio Standard by 2030. However, we recognize that if the enabling actions are successful, the implementation of the action may have co-benefit impacts.

How to Read the Full List of CAP Actions Table

GHG Mitigation

Estimated level of emissions reduction. These reductions are projected out until 2035.

- High: >1,000,000 MT CO₂e
- Medium: 500,000-1,000,000 MT CO₂e
- Low: <500,000 MT CO₂e
- Level To Be Determined (TBD): Carbon Sequestration Actions – These actions sequester carbon and thus reduce GHG emissions; however, the level of emissions reduction cannot be estimated without further study.
- N/A: Climate Adaptation Action without GHG emissions reduction OR Enabling Action* (action that does not have direct emissions reduction but is necessary to support actions with direct emissions reduction)

Climate Risk Reduction

Climate hazard the action addresses.

- Extreme Heat
- Extreme Precipitation
- High Winds
- Drought
- N/A: GHG Mitigation Action without climate risk reduction OR Enabling Action* (action that does not have direct climate risk reduction but is necessary to support actions with direct climate risk reduction)

*Note: If an action is an Enabling Action, "N/A" will appear under GHG Reduction, Climate Risk Reduction, and all co-benefits.

Co-Benefits

Level of estimated impact the action would have on each of the four co-benefits – Racial Equity and Social Justice, Public Health, Environmental Stewardship, and Economic Prosperity – in Montgomery County

-- = Very Negative

- = Somewhat Negative

Neutral = Neutral

+ = Somewhat Positive

++ = Very Positive

Authority

Who has the authority to implement this action. For the purposes of this section, "County" is defined as County Executive branch departments and the County Council. Independent public agencies, such as MCPS and M-NCPPC, are defined as "other Public entities" for the purposes of this section.

- County – The County can implement the action under existing policy.
- County with Change – The County can implement the action but may require policy amendment or new policy.
- Outside County – Action implementation requires County collaboration with other public or private entities or is outside County authority.

Initial Investment Assessment

The initial investment required to implement each CAP action was assessed for both County Government and the private sector. The term "initial investment" refers to the initial upfront costs that are beyond any currently secured or identified funding. It is this initial, incremental cost that is the most important to estimate because it is the first barrier to implementation that needs to be overcome. The private sector cost assessment is an estimate of the cumulative cost for the private sector across the County; the assessment does not attempt to estimate the economic impact at the scale of individuals and individual businesses. Developing more precise and fine-grained cost assessments would require additional data inputs that were outside the scope of the CAP, and these assessments would depend on the manner in which the action is designed and implemented. For example, the exact cost to implement Action A-18, Expanded Community Gardens, will depend in part on the number of additional sites that are converted to gardens.

County Investment

Initial upfront costs beyond any currently secured or identified funding

- \$: Low Initial Cost (Public: <\$100k)
- \$\$: Some Initial Cost (Public: \$100k-\$1M)
- \$\$\$: Large Initial Cost (Public: >\$1M)

Private Investment

Initial upfront costs beyond any currently secured or identified funding

- \$: Low Initial Cost (Private: <\$10M)
- \$\$: Some Initial Cost (Private: \$10-\$100M)
- \$\$\$: Large Initial Cost (Private: >\$100M)

Lead

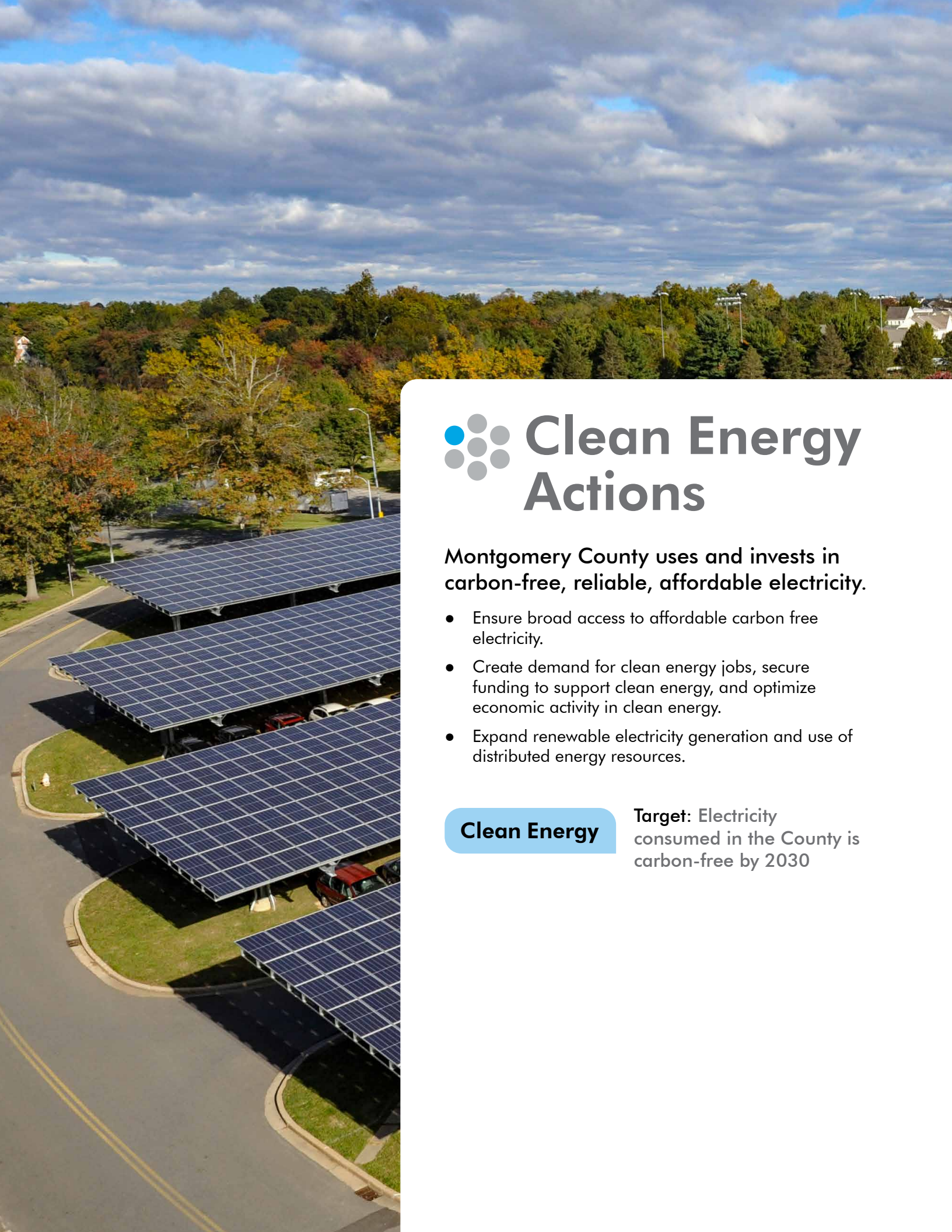
Lead County department or independent public agency that would be involved in action development and implementation

Contributor

Contributor County department, independent public agency, or other entity that would be involved in action development and implementation

Subsector

- | | |
|-------------------------------|---|
| E Clean Energy | A Climate Adaptation |
| B Buildings | G Climate Governance |
| T Transportation | P Public Engagement, Partnerships, and Education |
| S Carbon Sequestration | |



Clean Energy Actions

Montgomery County uses and invests in carbon-free, reliable, affordable electricity.

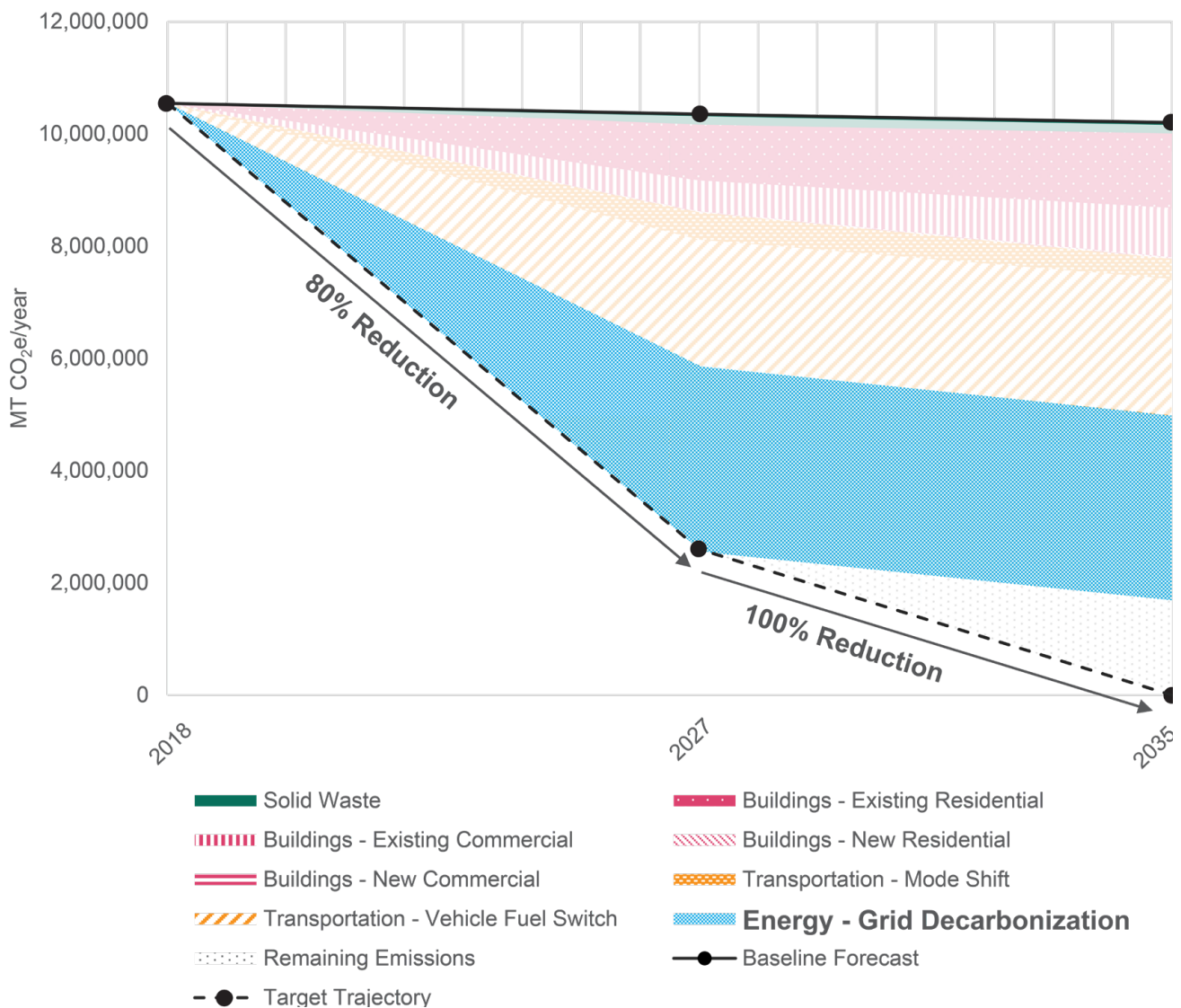
- Ensure broad access to affordable carbon free electricity.
- Create demand for clean energy jobs, secure funding to support clean energy, and optimize economic activity in clean energy.
- Expand renewable electricity generation and use of distributed energy resources.

Clean Energy

Target: Electricity consumed in the County is carbon-free by 2030



Clean Energy Emissions Reduction Pathway



This graph shows the approximate amount of greenhouse gas (GHG) emissions the County will need to reduce in the clean energy sector to meet its 2027 and 2035 climate goals, as modeled in Climate Action for Urban Sustainability (CURB). The actions presented in this section will help the County reduce GHG emissions in this sector toward its climate goals and are ordered by descending GHG emissions reduction potential.



Clean Energy

The electricity sector accounted for 30% of 2018 greenhouse gas (GHG) emissions in Montgomery County. By 2030, 100% of the electricity used in the County must be generated from carbon-free sources in order to support building and transportation targets and to meet the County's overarching goal to reduce GHG emissions 80% by 2027 and 100% by 2035. The majority of building and transportation actions depend on removing fossil-fuel energy sources and electrifying processes throughout the County. If the electricity consumed in the County is 100% carbon-free, then building and transportation electrification will help the County reach its zero emissions goal.

Achieving the County's energy target will involve leveraging demand reduction, energy efficiency, and distributed renewable energy resources to reduce the amount of electricity the County consumes from the electric grid and ensuring that grid electricity is from carbon-free sources. The three electric utilities (Pepco, BGE, and Potomac Edison) that serve the County could support the County's pursuit of a carbon-free electricity supply by providing 100% carbon-free energy to the grid. However, this is not currently planned under the state's Renewable Portfolio Standard (RPS), which mandates that the electricity supply be 50% renewable by 2030. If the utilities do not provide 100% carbon-free electricity to the grid, establishing an opt-out Community Choice Energy (CCE) program, which was recently authorized for Montgomery County under state law, would enable the County to offer a greater percentage of carbon-free electricity to residents and small businesses through direct purchase of electricity or the purchase of renewable energy certificates (RECs) from qualifying sources.

To reach this clean energy vision, the County will need to use the transition to carbon-free energy as a driver for increased social, environmental, and economic well-being. The County will need to ensure that clean energy sources are

accessible and affordable for all residents. This may involve supporting mechanisms such as financing strategies for clean energy efforts or education campaigns to deepen community understanding of renewable energy and energy efficiency. The County will also need to support clean energy career training and job creation to support the services that are needed to transition to clean energy.

As noted above, ensuring that the electricity consumed in the County is generated from carbon-free sources can be achieved by a mix of demand response and energy efficiency programs to reduce demand, distributed renewable energy resources such as small or community-scale photovoltaic (PV) systems, and the "greening" of grid-supplied electricity. There is no perfect formula for achieving this, and many challenges exist:

- Supply and stability of renewable electricity resources** – Additional renewable resources would have to be developed to meet the County's increased demand for electricity, particularly as the electrification of the buildings and transportation sectors increases. While some of this could be in the form of on-site or community solar, utility-scale development of wind and solar facilities will likely take place outside of the County. The legal, financial, and political issues that must be resolved during the development of these resources will be largely outside of the County's control. In addition, the reliability of the electricity supply will depend on the advancement of batteries or other storage technologies and/or on continued reliance on decarbonized baseload sources such as nuclear power, which was the source for more than 35% of the power provided by Pepco in the first half of 2020. Finally, issues such as the need to ensure the reliability of emergency backup generators and critical processes requiring uninterrupted power must be addressed.

- **Capacity of the electric grid** – The County will need strong, ongoing engagement with the Maryland General Assembly and the Maryland Public Service Commission (PSC). The County will also need to work collaboratively with utilities serving it to ensure that the electric grid has the capacity to meet increased demand for electricity as buildings and transportation systems are electrified, and to ensure that the grid can support the installation of distributed energy systems such as rooftop and ground-mounted solar.
- **Timing of electrification** – Electrification of buildings and transportation systems is clearly a benefit from a GHG perspective when the GHG profile of the electricity supply is less than alternative sources of energy. However, determining this transition point is not simple. For example, natural gas heating systems may currently have higher efficiencies and a lower carbon footprint than electric heating systems due to the current mix of fuel sources used to generate electricity. This may no longer be true in the future as electric heating technology improves and more renewable sources are added to the supply mix. Furthermore, the gas systems and infrastructure installed now are designed to last many years, potentially “locking in” the emissions from gas use beyond the point at which electric systems have a lower carbon profile. Another factor to consider is the introduction of new energy options, such as renewable and synthetic natural gas as well as hydrogen, and how they might fit into the County’s energy future.
- **Cost of electrification** – For new buildings and transportation systems, the initial and life cycle cost differences between total electrification and a mix of energy sources (electricity, natural gas, gasoline, diesel) are subject to many factors. But there is no question that the initial costs of electrifying existing systems that are not currently electrified can be significant, even if the life cycle costs may be lower. Overcoming this barrier will require significant resources and creative solutions.
- **Competing policy objectives** – As the Climate Action Plan (CAP) was being developed in 2020, an amendment to the County’s Zoning Code was debated and adopted that would allow greater use of solar in the County’s Agricultural Reserve (AR). Proponents of solar in the AR maintained that to achieve aggressive carbon reduction goals, solar must be installed throughout the County, including in the AR without local limitations. Opponents of solar in the AR felt that sufficient rooftops, parking lots, and other locations for solar exist in the County and that the benefits of the AR as a source of locally grown food and a carbon sink are vital parts of the County’s climate efforts. In addition, the issue involves balancing the rural character and aesthetic appeal of the AR with the County’s sustainability values. This debate (which is not unique to Montgomery County) highlights the competing policy objectives that will have to be evaluated as clean energy options are considered.

Studies recently completed for two major cities – Los Angeles through [*LA100: The Los Angeles 100% Renewable Energy Study*](#) and New York through [*Pathways to Carbon-Neutral NYC: Modernize, Reimagine, Reach*](#) – explore the complexity of decarbonizing energy supplies in great detail. The County can learn from these ambitious efforts. Clean energy actions are outlined in **Table 11**. The full set of Clean Energy Technical Workgroup recommendations from which the CAP clean energy actions were developed is provided in **Appendix B**.

Please refer to the [*Racial Equity and Social Justice*](#) chapter for more information on the historical context and current conditions associated with systemic racism and environmental injustices, and how these relate to energy.

Table 11: CAP clean energy actions

Action	GHG Reduction	Racial Equity & Social Justice	Public Health	Environmental Stewardship	Economic Prosperity	Authority	County Investment	Private Investment	Lead	Contributors
E-1: Community Choice Energy Program	High	Neutral	Neutral	Neutral	+	Outside County	\$\$	\$	CEX, DEP	OIR
E-2: Private Building Solar Photovoltaic Code Requirements	Medium	-	Neutral	Neutral	+	County with Change	\$\$	\$\$\$	DPS	DEP
E-3: Promote Private Solar Photovoltaic Systems	Medium	++	Neutral	Neutral	++	Outside County	\$\$\$	\$	DEP	DPS, MCGB, DOF
E-4: Public Facility Solar Photovoltaic Installations and Groundwork	Low	Neutral	Neutral	Neutral	+	County	\$\$\$	\$	DGS, MCPS, M-NCPPC	MCDOT, DPS, OAG, Revenue Authority, DEP
E-5: Advocate for a 100% Renewable Portfolio Standard by 2030	N/A	Neutral	Neutral	Neutral	Neutral	County	\$	\$	OIR, CEX	DEP

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E-1

Community Choice Energy Program

Primary Benefit:



GHG Mitigation – High

Co-Benefits:

Economic Prosperity – Somewhat Positive

Authority:

Outside County – Requires County Collaboration with Other Public or Private Entities or Is Outside County Authority

Investment Level:

County: \$\$
Private: \$

Development Stage:

Proposed

Lead:

CEX, DEP

Contributor:

OIR

The electricity consumed in Montgomery County is primarily generated by a mix of fossil fuel and nuclear resources. If the County is to achieve its building and transportation emission reduction targets and meet its overall 2035 emissions reduction target, the electricity consumed in the County will need to be generated by 100% carbon-free resources by 2030. As Maryland’s Renewable Portfolio Standard (RPS) only requires 50% renewable energy by 2030, the County will need to look at other options to reduce its electricity-related greenhouse gas (GHG) emissions.

An “opt-out” Community Choice Energy (CCE) program would allow the County to purchase renewable energy on behalf of electricity customers in the County. A CCE program would allow the County to aggregate the electric loads of residents and small businesses in order to negotiate more favorable terms with an electricity supplier or enable the direct purchase of power from a renewable generation source. In a CCE program, the electricity of participants would still be distributed by one of the three utilities (Pepco, BGE, and Potomac Edison) that serve the County. However, the CCE program would enable the County to choose an electricity supply that is greener than the default service provided by the local utilities. An opt-out CCE program would replace the basic service offered by the utilities, and residents and businesses would need to opt out if they did not want to participate. The Maryland General

Assembly adopted House Bill (HB) 768 during the 2021 session, which gives Montgomery County the right to create a CCE program.⁹⁰ Regulations governing the implementation of the program will be developed by the Public Service Commission (PSC), and a County CCE program could begin no earlier than December 31, 2023.

Through a CCE program, important energy decisions can be made at the local level rather than by an investor-owned utility or a for-profit competitive electricity supplier. In addition, a CCE program could potentially deliver price stability and cost savings to residents and small businesses. However, the impact of a CCE program depends on the level of participation in the program and the characteristics of the

EQUITY-ENHANCING MEASURES

- Balance the costs and percent of renewables in the electricity mix. If there is a premium associated with offering a higher level of renewable electricity, the County will need to consider ways to offset the cost premium for low-income residents.
- Develop and promote an awareness campaign on how to access the CCE program and its associated benefits. Ensure the awareness campaign is developed in multiple languages.

electricity offered through the program. Because Maryland is a “choice” state, electricity customers may purchase their electricity supply from any electricity retailer authorized by the PSC to sell electricity in the state. Some customers may choose to opt out of a CCE program if the cost of electricity offered under the program is not competitive with the default service from their utility or the cost offered by an authorized electricity retailer. The County will need to explore all available options for procuring the electricity supply offered under a CCE program in order to be cost competitive. This might include entering into contracts for the direct purchase of electricity from a renewable generator (or generators). For example, the Southeast and Mid-Atlantic Regional Transformative Partnership for Offshore Wind Energy Resources (SMART-POWER), recently formed by Maryland, Virginia, and North Carolina, may result in the opportunity to directly contract with an offshore wind developer for the purchase of electricity.

Another option would be to develop renewable resources within the County that could be part of the supply provided by the CCE program. For example, the GenOn’s coal-fired power plant in Dickerson was recently taken out of service and will be dismantled. The possibility of creating a large-scale renewable facility at this location has been raised, and the County could enter into a contract to directly purchase this power. The

development of a significant amount of large-scale renewable generation in Montgomery County would result in the creation of local jobs and would also provide public health benefits if fossil fuel-based generating capacity in the region was curtailed as a result of this development.

Some CCE programs have chosen to balance cost and the percentage of renewable electricity in the supply mix to ensure customers remain in the program.⁹¹ In these programs, the aggregating jurisdiction may buy electricity that has a higher renewable mix than required under the applicable RPS, but not so high that the cost of electricity supplied is not competitive with other options.

CCE programs may also provide ancillary services, such as energy efficiency programs that help customers reduce their energy costs, as an added benefit to participants.

“
We should choose cleaner energy to decrease pollution and improve my community’s health.
 ~ Resilience Ambassador Survey
 ”



Maryland Community Choice Energy Act introduction press conference



E-2

Private Building Solar Photovoltaic Code Requirements

Primary Benefit:



GHG Mitigation – Medium

Co-Benefits:

Racial Equity and Social Justice – Somewhat Negative
 Economic Prosperity – Somewhat Positive

Authority:

County – May Require Policy Amendment or New Policy

Investment Level:

County: \$\$
 Private: \$\$\$

Development Stage:

Proposed

Lead:

DPS

Contributor:

DEP

Electricity consumption from private buildings generates approximately 30% of the countywide emissions. Because the electric grid is powered primarily by a mix of fossil fuels and nuclear resources, continuing to rely on this electricity will not reduce building emissions enough to meet the County’s zero emissions goal. One method to decrease electricity emissions, increase resiliency, and reduce energy costs is to substitute the use of grid-provided electricity with on-site solar electricity.

To drastically increase the amount of solar photovoltaic (PV) use, the County will need to promote the adoption of solar PV on private buildings. To do this, a combination of voluntary measures and strict code requirements is needed. The County’s building code should be amended to require all new developments to install solar or meet solar-ready requirements, subject to appropriate and well-defined exemptions. In addition, a net-zero energy code requirement would promote both energy efficiency and renewable energy installations (see **Action B-7**). Through these requirements, the onus would primarily be on the developer, not the future owner, to install solar on new properties. In order to promote solar on existing buildings, any property owner who requests a permit for major roof alterations could be required to install solar or meet solar-ready building requirements.

Requiring solar installations on new or extensively modified buildings will create demand for jobs in the solar sector. However, given the financial investments associated with this action, solar costs are likely to be passed onto renters (both residents and small business owners) and new buyers, which may create affordability issues (especially for first-time buyers or those on a fixed income).

EQUITY-ENHANCING MEASURES

Ensure that the costs of installing solar and other adaptive technologies are not passed onto vulnerable groups, such as small and minority-owned business owners who are renting (commercial buildings) and low-income renters (residential buildings). Specific funds should be allocated to help vulnerable communities to pay for this in the future if it is required.



E-3

Promote Private Solar Photovoltaic Systems

Primary Benefit:



GHG Mitigation – Medium

Co-Benefits:

Racial Equity and Social Justice – Very Positive
 Economic Prosperity – Very Positive

Authority:

Outside County – Requires County Collaboration with Other Public or Private Entities or Is Outside County Authority

Investment Level:

County: \$\$\$
 Private: \$

Development Stage:

Proposed

Lead:

DEP

Contributors:

DPS, MCGP, DOF

Electricity consumption from private buildings generates approximately 30% of the countywide emissions. Because the electric grid is powered primarily by a mix of fossil fuels and nuclear resources, continuing to rely on this electricity will not reduce building emissions to the extent needed to meet the County’s zero emissions goal. Residents and commercial property owners can reduce their emissions, save money on their monthly electric bills, and increase their property values by installing solar PV panels.

Approximately 74% of the buildings in Montgomery County are solar-viable according to Project Sunroof.⁹² There are generally two primary barriers that limit the installation of solar PV systems. The first is a lack of awareness of the benefits of installing solar, coupled with confusion over how to find an appropriate installer, questions about solar contracts, concerns about how a system will affect roof performance, and other factors that lead to inaction on the part of both residential and non-residential property owners. The second barrier is how to pay for a solar PV system (not to mention a battery storage system to supplement a solar PV system), including overcoming potential initial upfront costs.

There are a variety of ways to pay for the installation of solar PV systems. While all of the options for paying for solar have positive payback at some point, some have greater upfront costs than others, limiting the options for some potential customers. **By providing solar incentives and access to cost-effective financing**

options, Montgomery County can help property owners overcome the financial barriers that prevent many property owners from moving forward with solar and reduce the payback period of solar installations. Incentives should be tailored to specific County land uses that are well-suited for solar, such as large commercial and multifamily properties, parking lot canopies, industrial properties, and brownfields (previously developed land that is not currently in use that may be potentially contaminated). Incentives should also support solar installations on the rooftops of small commercial businesses, non-profit properties, and residential homes, and greater assistance should be provided to low- and medium-income households. As solar technologies advance, consideration

EQUITY-ENHANCING MEASURES

- Create incentives such as tax credits and grants to support small commercial installations, minority-owned businesses, and low- and moderate-income households.
- Incentives should be progressive. That is, there should be a greater incentive for those with lower levels of income.
- Expand outreach on the benefits of solar photovoltaic (PV) systems to traditionally underserved communities.

could be given for more innovative solar PV systems, such as solar PV glass for windows. The continuation and expansion of federal and state-level tax credits for solar installations would support this action. A good discussion of various payments options (as well as a variety of other information on solar) is provided in the Maryland Energy Administration's publication [***A Maryland Consumer's Guide to Solar***](#). In addition, providing solar incentives will also help create local jobs in the solar sector.

The Montgomery County Green Bank (MCGB), a non-profit entity established by the County to promote clean energy and reduce the cost of energy efficiency and renewable energy projects, offers several options to property owners seeking affordable options for financing solar installations. MCGB's Clean Energy Advantage program provides flexible financing for solar (and energy efficiency) activities on residential properties, and the Commercial Loan for Energy Efficiency and Renewables and Commercial Property Assessed Clean Energy programs provide options for commercial, multifamily, and non-profit properties. MCGB's recent activities have included a focus on increasing adoption of solar in low- and moderate-income communities.

In addition, **incentives to make existing buildings "solar ready" (providing the proper electrical and physical infrastructure to support a future solar installation) can help property owners transition to solar when panel costs decrease and when installations become more financially feasible.** The County has already implemented expedited rooftop solar permitting and reduced permit fees for single-family detached residences. This practice should be expanded to other building types, such as multifamily and commercial properties. Reinstatement of the property tax credit for residential solar systems, which the County discontinued in 2011, would provide an additional incentive to install solar.

Among the strongest advocates for solar PV systems are owners of such systems. It is not uncommon to see solar spread through a neighborhood as homeowners that have installed solar talk to their neighbors about the benefits of their systems, advise on overcoming potential hurdles, and provide feedback on installers. Today, most systems are tied to a mobile phone app that allows real-time access to data that demonstrate how the system is



First solar energy system on a commercial property financed by Montgomery County's Commercial Property Assessed Clean Energy (C-PACE) financing program

performing, which is one of the most effective sales tools a solar advocate can easily share with neighbors. Montgomery County is currently partnering with Solar United Neighbors (SUN) on the fifth solar “co-op” in the County, which harnesses the buying power of a group of homeowners interested in installing solar to lower costs. However, another benefit of the solar co-op is that it gives potential solar customers the opportunity to learn the basics of solar installation, financing, maintenance, and other aspects of solar PV systems, which increases their comfort with the technology and the process for installing it. The County should expand efforts to educate residential, commercial, and non-profit property owners on the benefits of solar and provide educational support for all aspects of solar, particularly the financial aspects of solar systems.

Community solar systems provide an opportunity for those who cannot install solar on their own property due to site constraints or those who do not own property to take advantage of the benefits of solar. Through community solar, customers “subscribe” to a portion of an off-site solar array to offset all or a portion of the costs of their electricity. Community solar projects can be designed so that some portion of the system is set aside for limited-income customers who can receive subsidized electricity.

Related to the issue of solar on agricultural lands discussed above, **the County is exploring creation of a demonstration**

“agrivoltaic” project, which would co-locate solar with agricultural production (such as grapes or table crops), pollinator habitat, beekeeping, or animal grazing.

The County is looking to collaborate with the National Renewable Energy Laboratory (NREL) and the University of Maryland to establish a demonstration project that explores the viability of agrivoltaics in the mid-Atlantic region. The demonstration project would build on research NREL is conducting in other parts of the country.

As background for the discussion of potential solar opportunities in the Agricultural Reserve, the County did a high-level analysis of potential land available for solar. While this work provided some insight into land potentially available for solar in the Agricultural Reserve, a more robust, countywide analysis would be useful in identifying solar opportunities throughout the County. This more in-depth analysis could provide a ranking system to categorize sites based on economic, environmental, and social considerations. The results of this could be used to target outreach to properties with a high potential for successful solar deployment.

Finally, Maryland’s net metering law only allows for systems less than 2 megawatts (MW) in capacity, or 200% of the owner’s annual baseline electricity usage. It also sets a total state net metering program volume cap of 3,000 MW. Continued advocacy is needed at the state level to raise the project and program caps and increase the appeal of local solar.



.....
I’d like to be more consumer-educated about solar energy, because I often feel bombarded. What is the benefit of solar, and how does it compare with what I currently receive from my utility? Are the extra fees on my bills going to clean energy? It’s hard to know whether offers are legit or not. I would like helpful consumer information about what are the environmentally friendly power options outside of the utility.

~ Resilience Ambassador Survey





E-4

Public Facility Solar Photovoltaic Installations and Groundwork

Primary Benefit:



GHG Mitigation –
Low

Co-Benefits:

Economic Prosperity –
Somewhat Positive

Authority:

County – Can Be
Implemented Under
Existing Policy

Investment Level:

County: \$\$\$
Private: \$

Development Stage:

In Progress

Lead:

DGS, MCPS, M-NCPPC

Contributors:

MCDOT, DPS, OAG,
Revenue Authority, DEP

As of 2016, Montgomery County achieved carbon neutrality for government facilities and fleet vehicle operations through combined energy efficiency, renewable energy investment, and energy and renewable energy credit (REC) purchases. The County purchases RECs to offset the remaining greenhouse gas (GHG) emissions from its facilities and fleet; 100% of the County Government’s annual electricity consumption comes from clean wind generation.

Even with its carbon neutrality status, electricity bills alone cost the County more than \$27 million in 2017. Installing solar photovoltaic (PV) panels would not only reduce the County’s reliance on the electric grid, but also reduce energy costs and eventually eliminate the need for the County to purchase RECs. The County’s Department of General Services (DGS) has already installed more than 7 megawatts (MW) of solar PV panels on its facilities, and installation of an additional 6 MW is underway at the closed Oaks landfill, which will benefit low- and moderate-income residents. However, this only reduced County Government facility emissions by 1%. Additional cost savings and emissions reductions have been achieved through projects completed by Montgomery County Public Schools (MCPS), which has installed 4.2 MW of solar on its facilities, as well as by the Maryland-National Capital Park and Planning Commission (M-NCPPC).

The County will need to develop significantly more multi-site solar PV projects in order to green the electric grid, decrease the County Government’s dependence on fossil-fuel-based electricity, reduce electric bills, and support the expansion of community solar.

Increasing solar installations will also aid in charging electric vehicle (EV) fleets and reduce costs for charging needs. County parking lots may be ideal locations for solar panels because they provide both shade for vehicles and EV charging opportunities. Expanding solar on public facilities, including at MCPS and M-NCPPC facilities, will also help create local jobs in the solar sector.

EQUITY-ENHANCING MEASURES

Community solar installations sited at public facilities should prioritize benefits for low- and moderate-income residents, which is what the community solar installation at the closed Oaks landfill is doing.



E-5

Advocate for a 100% Renewable Portfolio Standard by 2030

Primary Benefit: Enabling Action	Co-Benefits: N/A – Advocacy	Authority: County – Can Be Implemented Under Existing Policy	Development Stage: Proposed
		Investment Level: County: \$ Private: \$	Lead: OIR, CEX
			Contributor: DEP

The path to zero greenhouse gas (GHG) emissions is completely reliant on the use of 100% carbon-free energy sources for electricity production. The electrification of buildings and vehicles will not produce the intended emissions reduction results if the electric grid is dependent on fossil fuels.

The most straightforward approach to cleaning the electric grid is to require utilities providing electricity in the state to generate their electricity from renewable sources. However, the current Maryland Renewable Portfolio Standard (RPS) requirement is 50% renewable by 2030, while Montgomery County’s zero emissions pathway requires a 100% renewable grid by 2030. If the State of Maryland implemented a 100% RPS, the County would be able to meet its carbon neutrality goal more easily. Absent changes to the RPS, the County must develop a robust opt-out Community Choice Energy program, as described in **Action E-1**.

Although the County cannot directly control the State’s RPS, it can advocate for its increase. **The County should lobby for a 100% RPS from Tier 1 resources that are carbon-free, such as solar and wind.** Supporting the increase in a green electric grid is a crucial step in meeting the emissions reduction goals of both the County and other jurisdictions in the state.



Solar array at M-NCPPC’s Maydale Conservation Park



Building Actions

Montgomery County is home to resilient and efficient buildings.

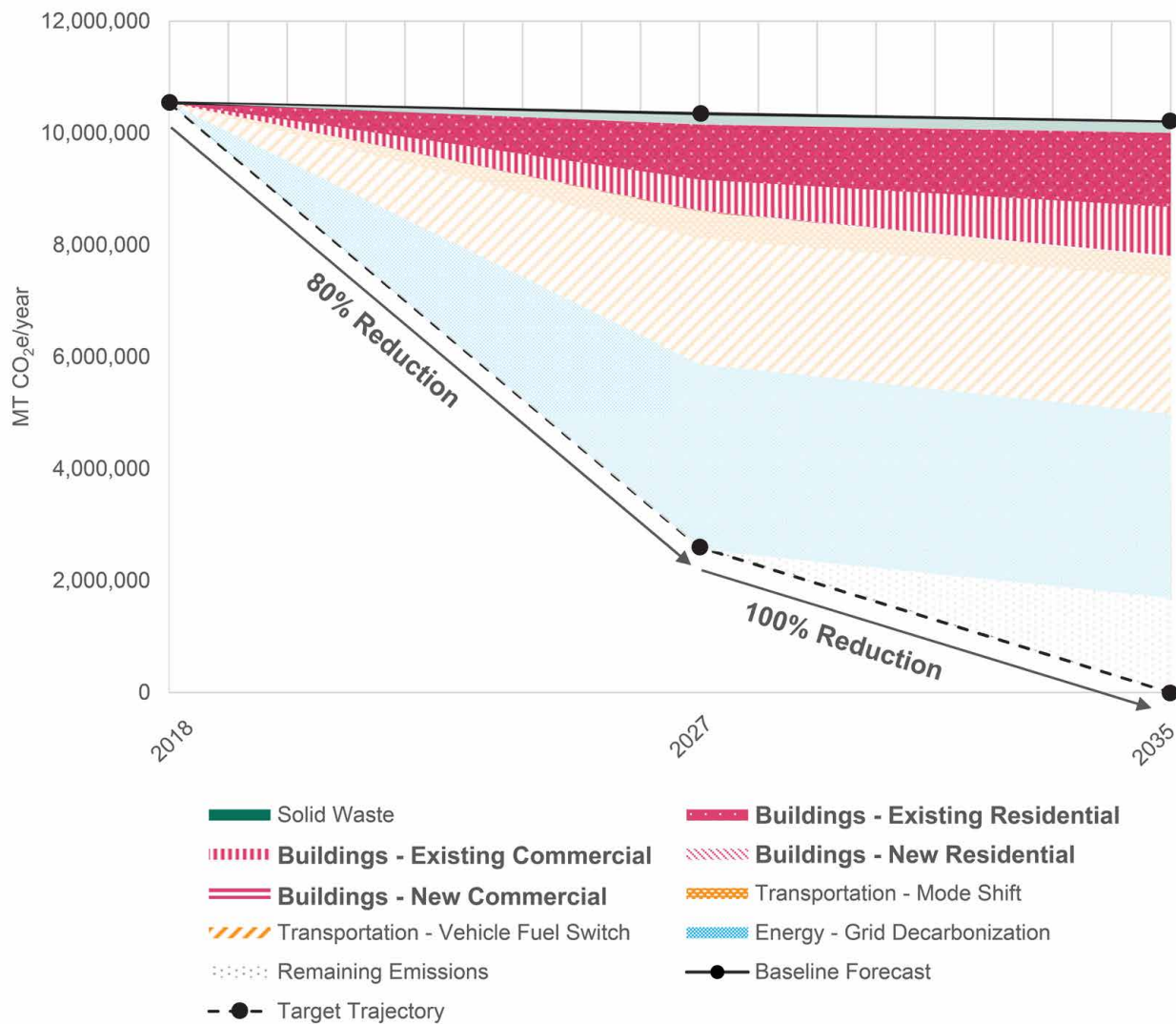
- High-performance buildings should be equitably available to all County residents.
- Increase energy conservation and efficiency and decrease fossil fuel use in all buildings, with the County leading by example with its own building portfolio.
- Support sustainable, carbon-neutral building design, improvements, and energy sources.
- Phase in building requirements while providing transparency to residents and businesses and developing the market knowledge to best meet those requirements.
- Expand access to incentives, financing, and programs to construct or upgrade to resilient, efficient commercial and residential buildings.
- Create demand for jobs and grow the workforce by transitioning to resource-efficient, low-carbon, resilient buildings.

Buildings

Target: Require newly constructed buildings to be all-electric. All new and existing buildings must be electrified or use carbon-free energy sources by 2035.



Buildings Emissions Reduction Pathway



This graph shows the approximate amount of greenhouse gas (GHG) emissions the County will need to reduce in the buildings sector to meet its 2027 and 2035 climate goals, as modeled in CURB. The actions presented in this section will help the County reduce GHG emissions in this sector and make progress toward its climate goals. The actions are ordered by descending GHG emissions reduction potential.



Buildings

In 2018, 50% of the County's greenhouse gas (GHG) emissions were generated from buildings, and the majority of these emissions came from processes using electricity (30% of total emissions) and natural gas (19% of total emissions). Building emissions are primarily generated by the use of electricity for space heating, cooling, lighting, and appliances; natural gas for space heating, water heating, and cooking; and other fossil fuels for space heating and emergency power needs.

To reach zero GHG emissions in buildings by 2035, all newly constructed and existing buildings in the County will need to conserve energy and water, use energy and water more efficiently, pursue electrification strategies, and rely on carbon-free energy sources. Programs targeting emissions reductions in the built environment should first focus on conservation and efficiency measures, such as insulation, windows, and mechanical systems that exceed base building codes and are readily available in the marketplace, and should consider whether space needs can be met with existing buildings instead of building new buildings to conserve materials. Prioritizing electrification, disincentivizing fossil-fuel-based energy use, and conducting emissions life cycle analysis to address embodied carbon in new construction and existing buildings can follow.

However, electrification strategies should not inadvertently increase emissions because of the electricity grid's fuel mix. Supplying 100% carbon-free energy is essential to ensure that increased reliance on electricity does not generate GHGs. In addition, any discussion about electrification of new and existing buildings in the County must consider an accurate assessment of current baseload power needs and the current state of electricity grid modernization and resiliency. The grid must be able to support new electric demand and be resilient enough to withstand natural and technological hazards. For our building stock to be resilient to climate change, the power supply those buildings rely on must also be resilient.

There is a natural sequencing of actions in the built environment presented in this Plan such that incentives precede requirements, but the ordering is subject to change (for example, funding availability, staff capacity, political will). The County will need to establish and implement programs, policies, and building codes to achieve different outcomes that successfully reach its emissions reduction targets for buildings. While the County can implement more stringent local codes than the state-adopted code, many of the life and safety codes must be adopted at the state-level before the County can make local amendments, and this presents a timing challenge at the County level. The County may also need to help building owners overcome the financial and technical barriers associated with certain requirements, such as the retrofitting of existing buildings for electrification efforts. Due to increased demand for more efficient new buildings and building retrofit projects, new jobs will be created, and specialized job training will need to be provided to support the transition to resource-efficient, low-carbon, resilient buildings.

The building-related actions included in this Plan can be achieved through a mix of prescriptive requirements and performance standards supported by technical assistance and incentive programs. Requirements are needed because some activities—such as continued use of natural gas—will prevent the County from reaching its GHG reduction goals. The use of performance standards for existing buildings is appropriate to give building owners the flexibility to achieve the applicable standard in the most cost-effective way possible; for some buildings this may mean extensive energy efficiency measures, while for others it may mean increased use of on-site clean energy. Similarly, the plan does not mandate specific efficiency measures because the appropriate measures will vary widely from building to building and an applicable performance standard can be met in a variety of

ways. Building actions are outlined in **Table 12**. The full set of Buildings Technical Workgroup recommendations from which the CAP buildings actions were developed is included in **Appendix B**.

Please refer to the **Racial Equity and Social Justice** chapter for more information on the historical context and current conditions associated with systemic racism and environmental injustices, and how these relate to housing and homeownership.

Table 12: CAP building actions

Action	GHG Reduction	Climate Risk Reduction	Racial Equity & Social Justice	Public Health	Environmental Stewardship	Economic Prosperity	Authority	County Investment	Private Investment	Lead	Contributors
B-1: Electrification Requirements for Existing Commercial and Public Buildings	High	N/A	- -	+	Neutral	+	Outside County	\$\$	\$\$\$	DPS, DGS, DHCA, MCPS	DEP
B-2: Electrification Requirements for Existing Residential Buildings	High	N/A	- -	+	Neutral	+	Outside County	\$\$	\$\$\$	DPS	DEP
B-3: Energy Performance Standard for Existing Commercial and Multifamily Buildings	High	Drought	-	+	Neutral	+	County with Change	\$\$\$	\$\$\$	DEP	DGS, DPS, DHCA, DOF, MCGB, OIR
B-4: Electrification Incentives for Existing Buildings	High	N/A	Neutral	+	Neutral	++	Outside County	\$\$\$	\$\$	DEP, DHCA	MCGB, DOF
B-5: All-Electric Building Code for New Construction	High	Drought	Neutral	+	Neutral	Neutral	Outside County	\$\$	\$\$	DPS, DGS	DEP
B-6: Disincentivize and/or Eliminate Natural Gas in New Construction	High	N/A	-	+	Neutral	Neutral	Outside County	\$\$	\$\$	DPS	DEP, DGS, OIR
B-7: Net Zero Energy Building Code for New Construction	High	N/A	Neutral	+	Neutral	+	County with Change	\$\$\$	\$\$	DPS, DGS, MCPS, DHCA	DEP, M-NCPPC



B-1

Electrification Requirements for Existing Commercial and Public Buildings

Primary Benefit:



GHG Mitigation – High

Co-Benefits:

Racial Equity and Social Justice – Very Negative
 Public Health – Somewhat Positive
 Economic Prosperity – Somewhat Positive

Authority:

Outside County – Requires County Collaboration with Other Public or Private Entities or Is Outside County Authority

Investment Level:

County: \$\$
 Private: \$\$\$

Development Stage:

Proposed

Lead:

DPS, DGS, DHCA, MCPS

Contributor:

DEP

Commercial buildings generate 26% of the total countywide greenhouse gas (GHG) emissions, primarily from the use of electricity and natural gas. Through the County’s local authority, there are specific legislative requirements and code mechanisms that can promote building electrification, which when paired with a carbon-free grid, can drastically decrease building emissions. However, the County’s ability to establish code requirements is dependent on the State’s building code adoption process, which affects the timing of the County’s adoption and implementation of code locally. Between now and 2035, there may only be one opportunity when electrified technologies can replace fossil-fuel-based ones in commercial and multifamily building system equipment at the end of its useful life.

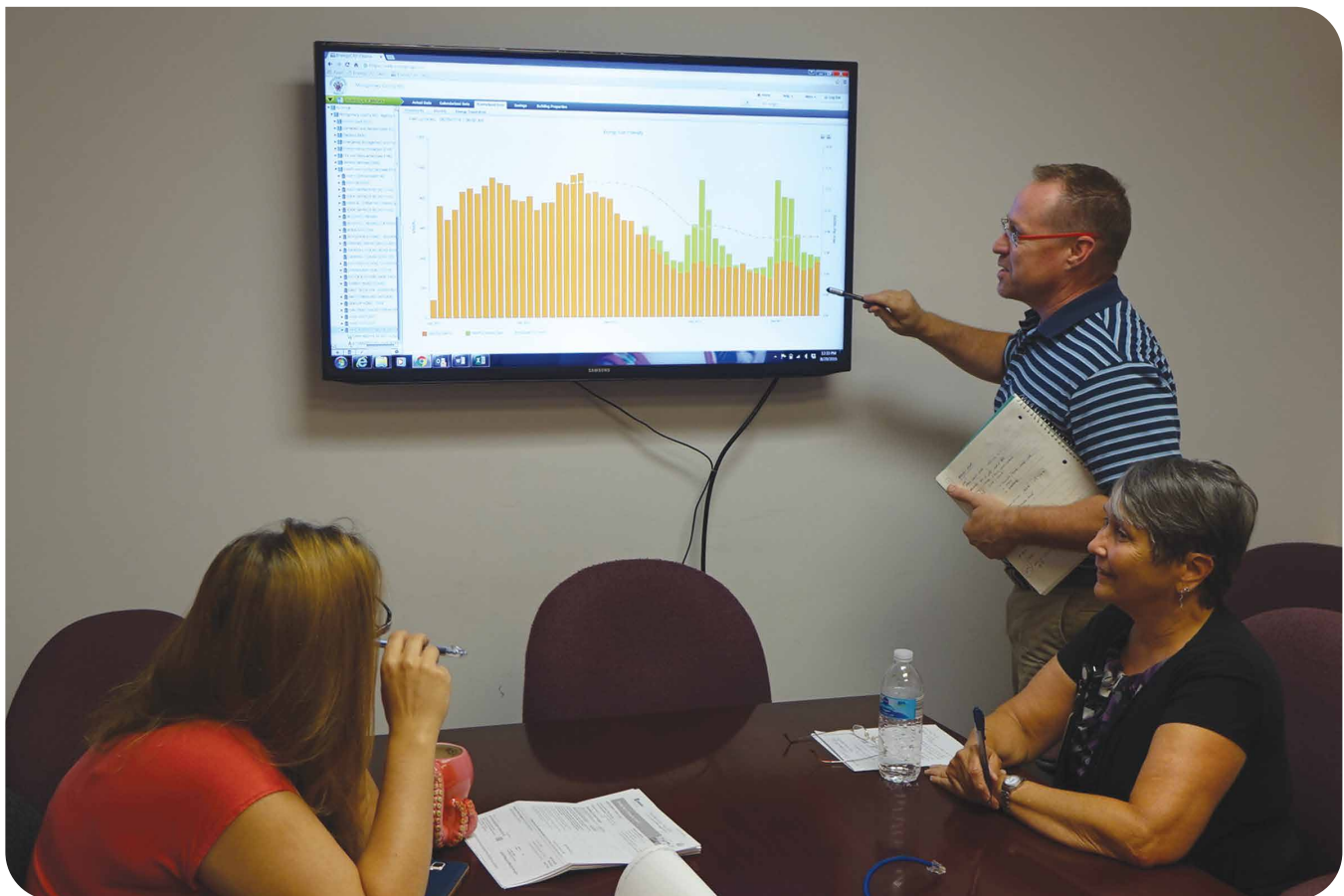
To kick-start the County’s approach to electrification, it is crucial that the County lead by example on the path to carbon neutrality, even though County facilities generate only 1% of the total community-wide emissions. **By electrifying public buildings, the County can demonstrate the technical feasibility of and its commitment to a carbon-free future.** The County has already established a continuous energy improvement program, participates in energy performance contracting, and has implemented green construction codes. These programs can be expanded to include widespread electrification targets.

Prior to implementing electrification requirements for existing buildings, the County should explore incentives in partnership with the electric utility companies to encourage early adoption and better market knowledge of electrification technology and practices. When pursuing electrification requirements, the County can explore a number of implementation options. One option is to **implement a point-of-sale or lease ordinance requiring building owners to replace fossil fuel equipment with electric options before a building is sold, leases are renewed, or new leases are signed after tenant turnover.** In addition, the County could stipulate that building owners undertaking major renovations or heating, ventilation, and air conditioning (HVAC)/ water heating replacement must electrify their equipment before being granted an occupancy or mechanical permit. Depending on the rate of building turnover, major renovations, and equipment replacement, these mechanisms can be powerful tools in reducing commercial building emissions during the natural cycle of real estate turnover.

Electrification leads to reduced on-site fossil fuel combustion, which in turn decreases local pollutants and improves indoor air quality, thus improving public health. In addition, electrification requirements will increase demand for local jobs in the building, electrical, and mechanical sectors, and the County may therefore need to advance training and education about electrification technologies to the market. However, electrification requirements may put a high financial burden on many small and minority-owned businesses if additional assistance is not provided.

EQUITY-ENHANCING MEASURES

- Develop an awareness campaign related to any legislation or codes addressing electrification, including what it means, how to access financial incentives (for example, subsidies), and what the benefits are of transitioning to electric appliances and equipment. Ensure a strong awareness campaign is developed in multiple languages.
- Provide technical and financial support to small and minority-owned businesses to replace fossil fuel appliances with electric options.



Montgomery County DGS staff reviewing energy trend data for County facilities.



B-2

Electrification Requirements for Existing Residential Buildings

Primary Benefit:



GHG Mitigation – High

Co-Benefits:

Racial Equity and Social Justice – Very Negative
 Public Health – Somewhat Positive
 Economic Prosperity – Somewhat Positive

Authority:

Outside County – Requires County Collaboration with Other Public or Private Entities or Is Outside County Authority

Investment Level:

County: \$\$
 Private: \$\$\$

Development Stage:

Proposed

Lead:

DPS

Contributor:

DEP

Residential buildings generate 24% of the total countywide greenhouse gas (GHG) emissions, primarily from the use of electricity and natural gas. The County has little direct influence over residential building operations, especially from single-family homes. **Although the County cannot require residents to immediately electrify their homes, there are specific legislative requirements and building code mechanisms that can help residents transition to an all-electric future over time.** The County’s ability to establish code requirements is dependent on the State’s building code adoption process, which affects the timing of the County’s adoption and implementation of codes locally.

Prior to implementing electrification requirements for existing buildings, the County should explore incentives in partnership with the electric utility companies to encourage early adoption and better market knowledge of electrification technology and practices. When pursuing electrification requirements, the County can explore a number of implementation options. The County could implement a point-of-sale or lease ordinance, requiring building owners to replace fossil fuel systems and equipment with electric options before the building is sold, leases are renewed, or new leases are signed after tenant turnover. **A point of sale electrification requirement can be paired with an energy audit ordinance, which would require resident sellers to conduct an energy audit and disclose the results before the sale.**

This would encourage energy-saving investments and demonstrate the preparedness of the building to meet potential future carbon-neutral requirements. Recent market research has shown that these energy disclosures do not negatively impact the real estate market. In addition, the County could stipulate that residents undertaking major renovations or heating, ventilation, and air conditioning (HVAC)/water heating replacement must electrify their equipment before being granted an occupancy or mechanical permit. Depending on the rate of housing turnover, major renovations, and equipment replacement, these mechanisms can be powerful tools in creating market demand, making electrified equipment

EQUITY-ENHANCING MEASURES

- Provide technical and financial support to income-limited households for replacing fossil-fuel appliances and equipment with electric options.
- Develop an awareness campaign related to any legislation or codes addressing electrification, including what it means, how to access technical and financial incentives, and what the benefits are of transitioning to electric appliances and equipment. Ensure the awareness campaign is developed in multiple languages.

more cost-effective over time, and improving the labor pool, thus reducing residential emissions gradually.

Electrification leads to reduced on-site fossil fuel combustion, which in turn decreases local pollutants and improves indoor air quality, thus improving public health. In addition, electrification requirements will increase demand for local jobs in the building, electrical, and mechanical sectors. However, costs associated with electrification may impact the availability

or price of affordable housing, and as there is no countywide rent control policy (although the City of Takoma Park does have a rent stabilization law), electrification costs in rental units are likely to be passed on to renters. **The County must explore a nexus between energy requirements and housing policy before implementing an electrification requirement on multifamily housing,** especially in cases where tenants are responsible for their own energy bills.



An external unit for a residential heat pump (left), next to a traditional HVAC unit (right).



B-3

Energy Performance Standard for Existing Commercial and Multifamily Buildings

Primary Benefit:



GHG Mitigation – High



Climate Risk Reduction – Drought

Co-Benefits:

Racial Equity and Social Justice – Somewhat Negative
 Public Health – Somewhat Positive
 Economic Prosperity – Somewhat Positive

Authority:

County – May Require Policy Amendment or New Policy

Investment Level:

County: \$\$\$
 Private: \$\$\$

Development Stage:

In Development

Lead:

DEP

Contributors:

DGS, DPS, DHCA, DOF, MCGB, OIR

Currently, Montgomery County’s Building Energy Benchmarking Law requires owners of nonresidential buildings over 50,000 square feet to benchmark their building energy use and report it to the County for public disclosure annually. On average, energy use in benchmarked buildings in the County has dropped 2% each year as a result of better awareness of energy waste in the buildings. For more buildings to realize energy savings through awareness, the County should reduce the Building Energy Benchmarking Law’s 50,000-square-foot minimum requirement and phase in additional building types, such as multifamily buildings. Multifamily buildings contain approximately 30% of Montgomery County’s total housing units, so reducing energy use in these units would not only cut emissions but improve indoor air quality and quality of life for thousands of residents. Transparency requirements alone do not generate the drastic emissions reductions needed in the commercial sector, but they build a strong foundation to develop “beyond benchmarking” or performance requirements for those buildings.

To realize deeper emissions reductions, the County will need to expand its Building Energy Benchmarking Law by adopting a building energy and water performance standard that phases in

smaller commercial and multifamily buildings over time. A performance requirement would encourage building owners to make energy efficiency improvements, while also giving them the flexibility to determine how to achieve these upgrades. Energy and water performance standard compliance could be measured in energy or water use intensity (the amount of consumption per square foot) or greenhouse gas reductions (metric tons of carbon dioxide equivalent). These standards should continually increase in stringency to ensure that existing buildings are set on a path toward decarbonization. The County should ensure that any performance standards that are established are consistent with new construction building code requirements, so that newly constructed buildings are set up for success in meeting future performance standards. Potentially negative impacts to historic properties and income-restricted tenants should be carefully considered when implementing a performance standard.

To meet these increasing energy and water requirements, many existing buildings will need to undertake deep energy retrofits. **The County will need to perform extensive education and outreach to the building owner community on how to comply with a performance standard and how to overcome the split-incentive issue (i.e.,**

owners pay for upgrades but tenants receive the energy bill reduction benefits).

The County will also need to educate and engage in outreach to others serving the building sector, including: energy service contractors, on technologies to meet the standard; financial institutions and lenders, on the value of upgraded buildings; and tenants, on the impacts to their homes, workplace, and utility bills.

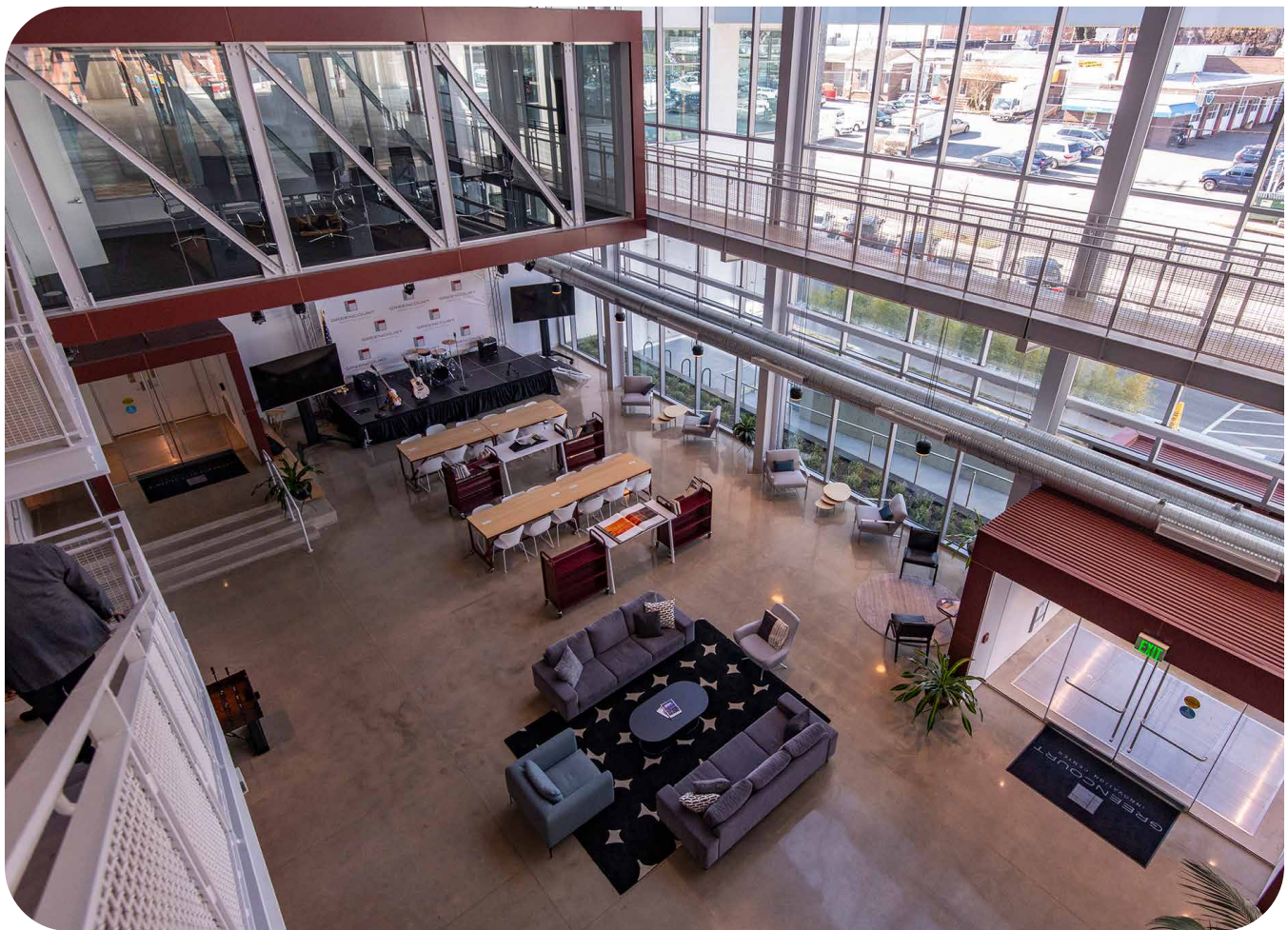
In addition, the County will need to promote existing state or utility incentives while providing its own options (for example, technical assistance programs, grants, tax rebates, fee reductions) for building owners. The Montgomery County Green Bank (MCGB) provides several options for commercial property owners seeking affordable options for financing the energy improvements needed to meet a performance standard. The MCGB completed pilot programs providing technical assistance to multifamily rental properties and common ownership communities to help them identify energy efficiency opportunities as well as options for implementing the identified improvements. In addition, the Maryland Energy Administration and the County's Commercial Property Assessed Clean Energy programs can be used to finance a wide variety of energy efficiency and renewable energy measures for commercial, multifamily, and non-profit properties. **As a first step, the County should promote and incentivize energy audits to help building owners better understand their existing energy performance and potential for energy reductions and subsequent financial savings.** These audits will be especially beneficial for small and minority-owned businesses in the County.

EQUITY-ENHANCING MEASURES

- Ensure that the costs of implementing building energy and water performance standards are not passed on to income-limited or vulnerable groups, such as small and minority-owned business tenants. Consider pairing performance standard assistance programs with a rent-freeze requirement, rent-control agreement, or other housing policy mechanisms to limit rent increases.
- For small and minority-owned businesses that own commercial buildings, the County can help provide more flexible and affordable compliance pathways as well as access to technical assistance and financial incentives, including tax rebates, subsidies, and affordable financing options.
- Develop a multilingual awareness campaign related to new energy and water performance standard requirements, including how these standards can affect different groups and what kind of support mechanisms are available.
- Establish appropriate fees for noncompliance with energy performance standards, which could go into a fund to help pay for technical assistance, energy audits, and retrofits in buildings owned by organizations that need financial assistance to meet the standards.

The Building Energy Benchmarking Law or performance standards could require energy and water performance ratings to be displayed on buildings or in real estate databases, much like restaurant health grades or green building labels, to increase transparency, encourage competition, and drive tenant demand. The County could also require property owners to provide educational information on the building's energy and emissions to tenants and visitors. Relatedly, the County could also pursue energy performance ratings on residential homes and rental units to increase energy efficiency upgrades, drive demand for green homes, and reduce emissions in the residential building sector, which makes up 24% of the County's emissions.

Energy performance requirements can lead to reduced on-site fossil fuel combustion, which in turn decreases local pollutants and improves indoor air quality, thus improving public health. However, because there is no County-wide rent control, building upgrade costs are likely to be passed on to residential or commercial renters without a rent-control policy in place. In addition, even if the County provides incentives such as grants or tax rebates to income-limited owners, the capacity and ability to access these financial incentives will vary.



Leadership in Energy and Environmental Design (LEED) Gold certified Greencourt Innovation Center in Rockville, MD, which includes energy efficiency measures such as light-emitting diode (LED) fixtures, high-efficiency mechanical systems, and a vegetative roof



B-4

Electrification Incentives for Existing Buildings

Primary Benefit:



GHG Mitigation – High

Co-Benefits:

Public Health – Somewhat Positive
Economic Prosperity – Very Positive

Authority:

Outside County – Requires County Collaboration with Other Public or Private Entities or Is Outside County Authority

Investment Level:

County: \$\$\$
Private: \$\$

Development Stage:

Proposed

Lead:

DEP, DHCA

Contributors:

MCGB, DOF

The upfront costs for existing building electrification can be daunting, and electrifying existing buildings cannot be accomplished without financial incentives and assistance programs. By offering a suite of technical assistance and incentives, such as grants, tax rebates, or fee reductions, Montgomery County can help residents and businesses pay for upfront costs and defray the marginal costs associated with fossil fuel equipment replacement, operation, and maintenance. As electrification code requirements may only target large equipment, such as space and water heaters, an appliance trade-in program could

target electric options for other gas appliances, such as stoves and clothes dryers. In addition, a technical assistance program could provide individual guidance to facilitate electrification retrofits for existing commercial and residential buildings and provide design assistance for any major renovations. **Electrification incentive programs typically see great success when supported by legislation and should be used in conjunction with any County code requirements.**

Increasing the energy efficiency of a building should be a prerequisite to building electrification. Energy audits, which are designed to identify opportunities for energy efficiency improvements, are a key first step to improving a building’s energy performance. Strong consideration should be given to incentives supporting energy audits, particularly if they are structured in a way that promotes implementation of improvements identified during the course of an audit and if they highlight electrification strategies. Programs to undertake energy efficiency improvements sponsored and incentivized by federal, state, and county governments and by utilities, non-profit organizations, and others have been available for years. However, these programs have not been offered in all building sectors equitably, and opportunities for significant improvements in building energy efficiency still exist, particularly in medium to small businesses, multifamily properties, and the residential sector.

EQUITY-ENHANCING MEASURES

- Ensure that income-limited or vulnerable groups receive priority or focused access to incentive programs. Any in-person outreach events, such as trade-in programs, must have equal representation in all areas of the County.
- Collaborate with utilities and the State of Maryland to ensure incentive programs include equity metrics, especially future cycles of EmPOWER Maryland.

Electrification leads to reduced on-site fossil fuel combustion which in turn decreases local pollutants and improves public health. In addition, incentives for building energy efficiency and electrification will increase demand for local jobs in the building, electrical, and mechanical sectors.



Montgomery County Energy Summit participant learning about EmPOWER Maryland utility incentives for energy-saving upgrades



B-5 All-Electric Building Code for New Construction

Primary Benefit:



GHG Mitigation – High



Climate Risk Reduction – Drought

Co-Benefits:

Public Health – Somewhat Positive

Authority:

Outside County – Requires County Collaboration with Other Public or Private Entities or Is Outside County Authority

Investment Level:

County: \$\$
Private: \$\$

Development Stage:

Proposed

Lead:

DPS, DGS

Contributor:

DEP

Allowing new buildings to use fossil fuel-based systems would lead to emissions “lock-in”—in other words, significant continued emissions over the lifetime of these fossil fuel-based building system technologies. These buildings would have to quickly replace their systems with electric options if Montgomery County is to meet its emissions reduction targets. Between now and 2035, there may only be one opportunity when electrified technologies can replace fossil-fuel-based ones in commercial and multifamily building system equipment at the end of its useful life. Replacing systems well before their end of life, such as structural and mechanical modifications to electrify heating, ventilation, and air conditioning (HVAC) systems, would be extremely costly to building owners.

To avoid emissions lock-in and reduce the need for future retrofits, the County’s building code can be updated to require all-electric new construction. The code could require all-electric HVAC and water heating systems and appliances, as well as high-efficiency building envelopes to reduce heating and cooling needs. Stringent water efficiency requirements could be included, which would also reduce building energy consumption. An all-electric code would eliminate future retrofitting costs in new developments and could help provide the building infrastructure needed for electric vehicles and solar installations.

The County should consider a phased and transparent long-range approach to more stringent code requirements—first, implementing an all-electric code requirement, followed by a net-zero energy code requirement (as described in **Action B-7**). The County’s ability to establish code requirements is dependent on the State of Maryland’s building code adoption process, which affects the timing of the County’s adoption and implementation of code locally.

Electrification would also lead to reduced on-site fossil-fuel combustion, which in turn would decrease local pollutants and improve indoor air quality, thus improving public health. If grid electricity is generated by 100% carbon-free sources, mandating all-electric new construction would eliminate any future emissions from new developments.

EQUITY-ENHANCING MEASURES

- Evaluate the need for financial incentives or financing to help overcome the increased initial costs associated with building under an all-electric code when applied to certain building types and building ownership.
- Offer technical assistance for all-electric code compliance for certain building types or owners.



B-6

Disincentivize and/or Eliminate Natural Gas in New Construction

Primary Benefit:



GHG Mitigation – High

Co-Benefits:

Racial Equity and Social Justice – Somewhat Negative
Public Health – Somewhat Positive

Authority:

Outside County – Requires County Collaboration with Other Public or Private Entities or Is Outside County Authority

Investment Level:

County: \$\$
Private: \$\$

Development Stage:

Proposed

Lead:

DPS

Contributors:

DEP, DGS, OIR

Natural gas consumption produces 19% of the countywide GHG emissions. These emissions will increase if Montgomery County continues to allow new developments to be built with natural gas infrastructure. Other jurisdictions have recently undertaken new approaches to reduce natural gas use and promote electrification, including incentives for choosing electric over fossil fuel technologies, state and local stretch codes that encourage electrification, disincentivizing and restricting natural gas end-uses, and ultimately banning natural gas in new developments entirely. By disincentivizing and eventually eliminating natural gas in new construction projects, jurisdictions can help avoid future emissions “lock-in” (in other words, committing to continued emissions from a fossil fuel-based technology with a long useful life), as well as costs for new natural gas infrastructure.

Currently, **local jurisdictions in the state of Maryland face an implied preemption that restricts natural gas bans at the local level.** In order for the County to consider a ban on natural gas in new construction, it will first need to advocate for changes at the state level, including **a modification to state law that removes preemption, an addition of a state electrification stretch code, or home-rule petitions to allow the County to pursue a natural gas ban.** Other local tools could be explored, such as the County’s local zoning authority, ability to enforce public health and welfare codes that relate to indoor

environmental pollution, or higher permitting fees for equipment and systems using natural gas. If the County is able to prevent natural gas use in newly constructed buildings due to health and safety code enforcement, exemptions for specific use types within commercial buildings could phase out over time as new technologies emerge, allowing the market to adjust to the elimination of natural gas.

Limiting natural gas would reduce on-site fossil-fuel combustion, which would in turn decrease local pollution and improve indoor air quality, and thus public health. However, a natural gas ban does not ensure new buildings will not install oil or propane gas heating or backup power systems. In addition, electric heating may be more expensive than natural gas heating, which could disproportionately impact income-limited communities.

EQUITY-ENHANCING MEASURES

Provide financial support to income-limited households that may experience high energy burdens and energy poverty as a result of switching to electric heating and other electric equipment. Programs to help pay for the cost differential between natural gas heating and electric heating technologies or the resulting utility bill increases could take the form of a tax credit, electric utility incentive, or other financial subsidy.



B-7

Net Zero Energy Building Code for New Construction

Primary Benefit:



GHG Mitigation – High

Co-Benefits:

Public Health – Somewhat Positive
 Economic Prosperity – Somewhat Positive

Authority:

County – May Require Policy Amendment or New Policy

Investment Level:

County: \$\$\$
 Private: \$\$

Development Stage:

Proposed

Lead:

DPS, DGS, MCPS, DHCA

Contributors:

DEP, M-NCPPC

A net-zero energy building is commonly defined as a building where the amount of energy consumed is equal to the amount of energy provided by on-site renewable energy sources, which are typically calculated over a calendar year. Net zero goes beyond an all-electric building by promoting the drastic reduction of energy use through energy efficiency and intelligent operations to fully meet the building’s needs through renewables. Although these buildings may still draw on the electric grid for portions of their power, they can also act as a distributed resource that the utility can draw on for extra power in times of need.

Due to advances in construction technologies and renewable energy systems, the once-ambitious idea of creating net-zero-energy buildings is becoming an increasingly achievable goal. There are a variety of analyses and case studies available that discuss the cost differential between net-zero buildings and “conventional” construction practices. As technology has improved and net-zero building techniques have been refined, this differential has shrunk over time. In addition, the reduced operating costs of more efficient buildings that produce energy on-site can make net zero buildings more affordable in the long run.

Net-zero-energy buildings are gaining momentum across the United States, and some jurisdictions have begun to incorporate net-zero-ready, zero-energy, zero-water, and zero-carbon stretch goals and requirements in their new construction codes. **Montgomery County will need to amend the building code to require all newly constructed commercial and residential buildings in the County to be net zero energy, starting with the 2030 code cycle.** The County’s ability to establish code requirements is dependent on the state’s building code adoption process, which affects the timing of the County’s adoption and implementation of code locally.

EQUITY-ENHANCING MEASURES

- Evaluate the need for financial incentives or financing to help overcome the increased initial costs associated with building under a net-zero code when applied to certain building types or ownership.
- Offer technical assistance for net-zero code compliance for certain building types or owners.

As the industry evolves to meet electric building needs, a net-zero building code can replace the County's all-electric building code if adopted before a net-zero code. A net-zero code would also promote local solar or geothermal installation and job growth, assist with electric vehicle (EV) integration, and reduce on-site fossil fuel combustion to improve public health. A net-zero code would result in net-zero emissions for all future developments and decrease stress on the electric grid. The County could also explore a code requirement that is inclusive of embodied carbon by focusing on material reuse in new buildings.

In order to lead by example and provide case studies for different building types, the County could require that all new public buildings be designed to net-zero standards before requiring the private sector to meet a net-zero code starting with the 2030 code cycle. In addition to changing the County's current design practices, this may require the County to revise its approach for budgeting for building design and construction by factoring in the total life cycle costs of net-zero buildings to account for the reducing operating costs associated with such buildings. A public net-zero energy requirement would demonstrate the feasibility of local net-zero construction, start fostering the market knowledge base for these skills, and promote the immediate development of renewable energy resources.



Net zero building codes encourage solar installation and job creation.



In February 2021, the Wheaton Office Building Project was the first government-owned building in Maryland to achieve LEED Platinum certification and includes an efficient mechanical system, solar panels, EV charging station sites, and high-efficiency water fixtures.



Transportation Actions

Montgomery County safely, affordably, and sustainably moves people and connects places.

- Transition to 100% zero emissions transportation and expand supporting infrastructure.
- Provide clean, efficient, frequent, and reliable public transit.
- Reduce use of personal automobiles and increase use of transit and active transportation options like biking, walking, and micromobility services with safe, supportive infrastructure and land use, along with greater use of transportation demand management to achieve trip reduction.
- Introduce new technologies and approaches to transition to a green transportation system.

Transportation

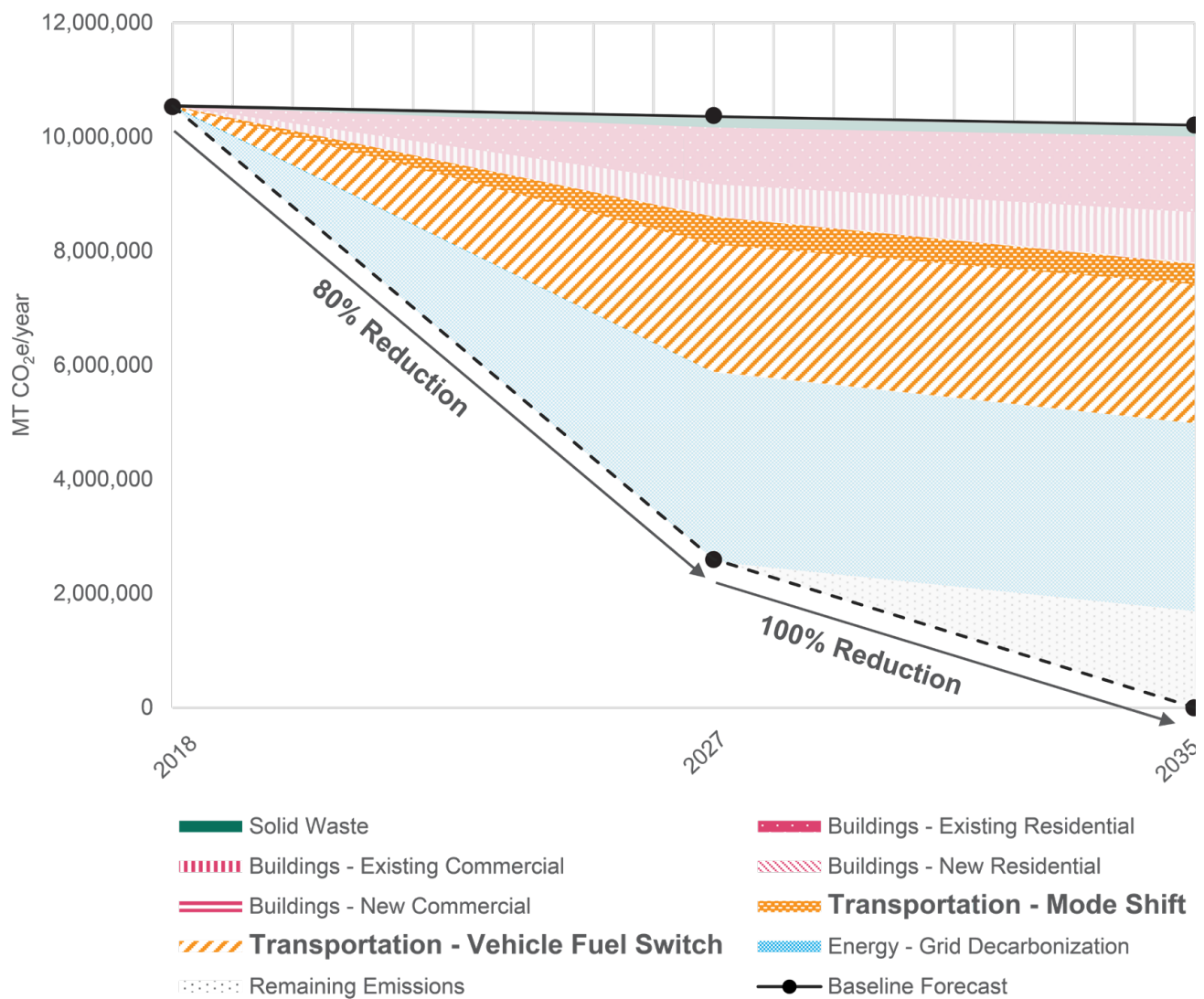
Target: 100% zero emissions transportation options, including all private and public vehicles (for example, cars, trucks, buses) by 2035.

Reduce private vehicle trips from 75% of total trips (the 2018 base level) to 60% by 2027.

Double the proportion of bus, rail, and bicycle trips (or offset any deficit with increases in other micromobility, walking or telework) over the 2018 base levels of total trips by 2035.



Transportation Emissions Reduction Pathway



This graph shows the approximate amount of GHG emissions the County will need to reduce in the transportation sector to meet its 2027 and 2035 climate goals, as modeled in CURB. The actions presented in this section will help the County reduce GHG emissions in this sector toward its climate goals and are ordered by descending GHG emissions reduction potential.



Transportation

In 2018, 42% of the County’s greenhouse gas (GHG) emissions came from the transportation sector, which includes on-road transportation, aviation, rail, and off-road vehicles. Emissions from on-road transportation, such as from cars and buses, accounted for 36% of 2018 emissions and offer the greatest opportunity for emissions reduction through electrification and trip reduction. Of the total trips taken in the County, private cars accounted for approximately 75%, buses 10%, rail 5%, walking 2%, taxi/ride hailing (for example, Uber and Lyft) 1%, and biking less than 1%.⁹³

To reduce transportation emissions and meet the County’s GHG reduction goal, 100% of private and public transportation options in the County will need to be powered by zero emissions technologies by 2035. In addition, the County’s electric supply must be 100% carbon-free by 2030 to ensure that transportation options powered by electricity produce zero emissions.

Throughout this plan, vehicle electrification is presented as the primary pathway of meeting the motor vehicle fuel switch goal, as it is the most common zero emissions vehicle (ZEV) option. However, strategies for meeting this fuel switch goal can include other forms of ZEVs, such as hydrogen fuel cell vehicles or other future technologies. Similarly, when an action calls for “electrifying vehicles,” the intent is to refer to using sustainable technology and clean energy solutions, in whatever ways those may evolve in the future – and not to physically “converting” existing internal combustion engine vehicles to electric power.

To achieve the County’s GHG reduction goals, private vehicle trips will also need to be reduced to 60% of total trips, which is a 15% reduction from the County’s 2018 vehicle mode share.⁹⁴ The proportion of bus, rail, and bicycle trips taken will need to double, with any deficit being offset by increases in teleworking and walking, to fill the

transportation needs created by the reduction in private vehicle ridership. It is also essential to use transportation demand management strategies to increase the proportion of transit, biking, walking, teleworking, and all other alternatives to single-occupant vehicle trips. Shifting how we travel is necessary to reduce the number of private vehicles on the roads and to reduce investments needed to electrify those vehicles. In connection with the effort to implement effective transportation demand management to accomplish this mode shift, it will be critical to implement supportive land use policies. The Thrive Montgomery 2050 Plan (Thrive 2050) update and the updates to area master plans that follow the principles established in Thrive 2050, will be key underpinnings to that effort.

While both vehicle electrification and mode switching are needed to reach carbon neutrality, electrification of vehicles is the primary focus of the 2035 transport emissions reduction pathway, producing 75–85% of the reductions needed. One reason for this is that the County already heavily supports a mix of land use types, infrastructure, and programs that promote active transportation for daily needs (for example, walking or biking to grocery stores) and has land use policies already in place to reinforce transit service extensions by locating housing and jobs near transit corridors. For example, the County promotes transit-oriented development in activity centers with robust transit service through master plans and the Zoning Ordinance. These policies will most likely be increased and expanded with the adoption of Thrive 2050, which will support long-term transformations in the community, reducing the distance residents need to travel for work, daily errands, and recreation while also helping to reduce the total number of daily trips.

However, changes to the built environment resulting from land use policies, extensions of transit services, and implementation of other non-auto infrastructure and programs all take

time to reach fruition – and the impacts on GHG emissions from those actions can take even longer to be realized. Meanwhile vehicle electrification can be implemented more rapidly and the impacts are immediate, so vehicle electrification strategies better align with the relatively short period of time the County has to achieve its 2035 target. In addition, implementation of supportive land use does not ensure that the vehicles used will produce zero emissions. Therefore, analysis of the factors most likely to reduce the County’s emissions within the given time frame indicates it will be necessary for the County to rely extensively on vehicle electrification in order to accomplish the bulk of the required GHG reductions from the transportation sector. Current and future supportive land use, increases in active transportation, expanded use of transportation demand management strategies, and the other mode shift actions called for in the transportation sector — these are all critical additional actions that are essential for reducing the remaining 15–25% of emissions needed from the transportation sector to enable full achievement of the County’s emissions reduction goals.

To achieve its transportation targets, the County will need to ensure that the appropriate programs, policies, and infrastructure are in place for the community to participate in both mode shifting, including use of transportation demand management measures, and transportation electrification efforts. The County will need to provide programs and resources, such as educational campaigns and financing tools, to support both transportation demand management strategies and electric vehicle (EV) adoption. An expansive, accessible public EV charging infrastructure network will be needed to enable widespread EV adoption. The implications for electric power demand loads and construction of new and expanded EV infrastructure will need to be evaluated. In addition, federal or state-level action to phase out the sale of gas-powered vehicles would support the achievement of the County’s transportation emissions targets. Fortunately, the market is also helping to drive that change, as evidenced by recent announcements by major

auto manufacturers of timetables for discontinuing manufacture of internal combustion engine (ICE) vehicles and conversion of their operations to exclusively manufacture EVs or other ZEVs. Reducing the number of new major road projects, when possible, would also benefit the effort to achieve the transportation emissions targets over the coming years – although it is important to note that the County does not have total control over such actions.

Transportation actions are outlined in **Table 13**. The full set of Transportation Technical Workgroup recommendations from which the CAP transportation actions were developed is provided in **Appendix B**.

Please refer to the **Racial Equity and Social Justice** chapter for more information on the historical context and current conditions associated with systemic racism and environmental injustices, and how these relate to transportation.

The Impacts of COVID-19

Over the past year and a half, the impacts of the COVID-19 pandemic on transportation choices have been unprecedented. The response to COVID from a transportation perspective has offered many lessons about how quickly behavior related to mode choices can change – with major reductions in commuting trips, dramatic declines in transit use and correspondingly dramatic increases in teleworking, walking and biking. Some transportation choices may persist even beyond the termination of COVID impacts. While a gradual return to a “new normal” with regard to transportation is anticipated, according to most forecasts, times of transition can also offer opportunities to solidify positive changes made during upheavals such as those from COVID. The parameters and actions discussed in this section reflect those assumptions.

Table 13: CAP transportation actions*

Action	GHG Reduction	Racial Equity & Social Justice	Public Health	Environmental Stewardship	Economic Prosperity	Authority	County Investment	Private Investment	Lead	Contributors
T-1: Expand Public Transit	Medium	++	++	Neutral	++	Outside County	\$\$\$	\$	MCDOT, WMATA, MDOT	MTA, M-NCPPC
T-2: Expand Active Transportation and Micromobility Network	Medium	++	++	Neutral	++	County	\$\$\$	\$	MCDOT	MDOT, M-NCPPC
T-3: Private Vehicle Electrification Incentives and Disincentives	Medium	-	++	Neutral	++	Outside County	\$\$\$	\$\$\$	USDOT, MDOT, MCDOT, DEP	MCGB, DOF
T-4: Constrain Cars in Urban Areas, Limit Major New Road Construction	Medium	-	++	Neutral	Neutral	Outside County	\$\$\$	\$	MCDOT, MDOT	Regional service centers, M-NCPPC
T-5: Zero Emissions Public Buses and School Buses	Medium	++	+	Neutral	+	County	\$\$\$	\$	DGS, MCDOT, MCPS	OMB
T-6: Electrify County and Public Agencies Fleet	Medium	Neutral	+	Neutral	+	County	\$\$\$	\$	DGS, M-NCPPC, MCPS	FRS, POL, OMB, MCDOT, OP, DEP
T-7: Expand the Electric Vehicle Charging Network	Medium	Neutral	++	Neutral	++	Outside County	\$\$\$	\$\$	MCDOT, DGS, DPS, M-NCPPC	DEP, WMATA, utilities
T-8: Transportation Demand Management and Telework Strategies	Low	+	++	Neutral	+	County with Change	\$\$\$	\$	MCDOT	Businesses with 25 or more employees, developers of projects in TMDs, DPS, M-NCPPC
T-9: Traffic Management Systems	Low	Neutral	+	Neutral	Neutral	Outside County	\$\$\$	\$\$\$	MCDOT, MDOT	SHA, municipalities
T-10: Electric Vehicle Car Share Program for Low-Income Communities	Low	++	+	Neutral	+	County with Change	\$\$\$	\$	DEP	MCDOT; car share companies

Table 13: CAP transportation actions (continued)

Action	GHG Reduction	Racial Equity & Social Justice	Public Health	Environmental Stewardship	Economic Prosperity	Authority	County Investment	Private Investment	Lead	Contributors
T-11: Off-Road Vehicle and Equipment Electrification	Low	-	+	Neutral	Neutral	County with Change	\$\$\$	\$\$\$	DEP, DGS, Procurement	USDOT, MDOT, MCDOT, MVA, Construction Industry, Landscape Businesses
T-12: Advocate for a Vehicle Carbon/Gas Tax or VMT Tax	N/A	Neutral	Neutral	Neutral	Neutral	Outside County	\$	\$	CEX, MCDOT, DEP	OIR, OCA
T-13: Advocate for Rail Alternative Fuels	N/A	Neutral	Neutral	Neutral	Neutral	County	\$	\$	MCDOT, MDOT/MDTA	OIR

* During the community’s review of the CAP, questions were raised about why the transportation sector is not projected to produce GHG reductions greater than the “medium” to “low” levels shown in this table. Overall, the transportation actions have lower GHG reduction potentials than the building actions. This is because the County has a higher amount of direct policy influence over buildings and a lower amount of influence over transport. While many of the building actions can require private electrification and energy reduction under certain circumstances, most of the transportation actions can only incentivize the private voluntary use of transit or EVs, which has a lower uptake potential and therefore a lower GHG reduction impact.



T-1 Expand Public Transit

Primary Benefit:



GHG Mitigation – Medium

Co-Benefits:

Racial Equity and Social Justice – Very Positive
 Public Health – Very Positive
 Economic Prosperity – Very Positive

Authority:

Outside County – Requires County Collaboration with Other Public or Private Entities or Is Outside County Authority

Investment Level:

County: \$\$\$
 Private: \$

Development Stage:

In Progress

Lead:

MCDOT, WMATA, MDOT

Contributors:

MTA, M-NCPPC

On-road vehicles generate 36% of total County emissions—the single largest source of emissions in the County. In 2018, approximately 75% of the trips taken in Montgomery County were by private passenger vehicles, while 15% were by public transit such as bus and rail.⁹⁵ Increasing the use of public transit would help to decrease the amount of private passenger miles traveled, reduce traffic, and improve local air quality.

Most people are willing to walk 10 minutes (approximately a half mile) to reach a public transit stop.⁹⁶ Currently, 75% of the residents in Montgomery County are within a half-mile walk to a transit stop. However, the frequency of service and the accessibility of these stops—including for those biking and walking, and for those with disabilities—are key factors in the extent to which residents are willing or able to use that transit service. **Increasing the frequency of transit service and addressing the first-mile/last-mile connections to transit are key factors in changing the predominant mode of travel in the County.** The success of these efforts is inextricably connected with land use policies. When combined with transit-serviceable development patterns, transit electrification and a renewable grid, expanding public transit can help residents neutralize their personal transportation emissions.

The County needs to double the amount of public transit trips taken from 2018 levels to help meet its climate goals. **One way to help achieve this is by expanding network**

service so that nearly 100% of residents are able to connect within a reasonable time and distance with a high-frequency transit stop. High-frequency service is defined as service every 15 minutes or less during peak periods throughout the week; in more densely developed areas service would need to be far more frequent. For most of the more densely developed portions of the County, that will mean riders are within a half of a mile or less of a high-frequency transit stop and can walk, bike, or take a short connecting ride. In lower-density areas of the County, riders may need to make a longer connecting trip to reach a high-frequency transit stop.

To accomplish the expansion of transit service envisioned, several actions will need to be taken, including the following:

- Implement all components of the Bus Rapid Transit (BRT) program and other express or limited-stop services, including MD 355, Veirs Mill Road, and the Great Seneca Transit Network. This action will require a substantial number of additional buses for these services.
- Explore creative funding models to support broad expansion of BRT and other transit services. The County has begun such efforts with regard to building out the BRT network.
- Restructure the local route network to support the BRT corridors and make the County’s bus operations system more efficient.

- Implement a pilot program of dedicated bus-only lanes on major roads, with highly visible pavement markings.
- Expand the Flex demand-responsive transit services program.
- Continue regional service planning efforts to improve shared corridor service levels.
- Expand Park & Ride facilities in outlying areas of the County, particularly in the Upcounty area.

Expanding affordability and transit access at both ends of the trip are important factors in increasing ridership, especially for vulnerable communities. The County currently provides free or discounted Ride On or Metrobus rides for children, seniors, and people with disabilities, but only during specific times. To increase accessibility and move toward achieving the transit ridership goals, the County could provide free or greatly reduced fare programs for Ride On and Metrobus for these groups to use every day of the week. The County could greatly increase transit access by adding BRT stops and directly connecting them to pedestrian and bicycle networks while ensuring that low-density areas are connected through demand response services and/or neighborhood circulators.

“

My commute could be a 15-minute drive, but it is 45 minutes by bus or 1 hour by train because I don't own a car. Most people can't afford to live near a Metro station. Better, more frequent public transit for areas not served by Metro would reduce commuting time for many of us and make transportation more equitable.

~ Resilience Ambassador Survey

.....”

EQUITY-ENHANCING MEASURES

- Expand free transit access to vulnerable groups, such as low-income residents.
- Expand on-demand bus transit throughout the day (with a goal of 24-hour service) and throughout Montgomery County so that more mixed-used housing and commercial projects have convenient access to nearby bus routes and transit stations. This action's feasibility and cost can be analyzed as a component of the transit restructuring study.
- Create dedicated bus lanes on major roads to support other transit modes and a future Bus Rapid Transit (BRT) network that prioritizes BRT in areas that are heavily congested, where there is a high prevalence of vulnerable communities, and where residents lack vehicles. Complete the development of BRT along the MD 355 and Veirs Mill Road corridors.
- Increase the use of rail transit through financial incentives such as fare reductions for vulnerable groups who use the Metrorail and Commuter Rail systems, and improve access for bicycles and pedestrians.
- Develop ongoing public campaigns to raise awareness regarding the free or reduced-cost Ride On transit programs, including information on how to access and benefit from them. Ensure awareness campaigns are developed in multiple languages.
- Affordable housing and the “missing middle” of housing types, such as duplexes and other multiplexes, are important components of land use policy that will enable the transit actions and other transportation actions to succeed. Many of these factors are being addressed in the Thrive Montgomery 2050 Plan and will need to be coordinated carefully with other actions implementing the Climate Action Plan.

However, adding transit stops and improving access may not increase ridership if service is slow or unreliable. **Other important factors in increasing ridership are travel time, frequency, and reliability.** Total travel time can be reduced by creating dedicated bus lanes, high-occupancy vehicle (HOV) or high-occupancy toll (HOT) lanes on County roads, including those within the state road system. High-frequency service can be achieved by adding more peak-hour buses or providing service throughout the day and evening. Reliability can be addressed through a combination of technical and operational improvements.

As rail and other transit incentive programs are underutilized, the County could increase both their value and their promotion. Through the County's transportation demand management program, employers could be required to provide transit incentives that are greater than the parking benefits they offer or be disincentivized from offering parking benefits. In addition, the County could expand flexible, demand-responsive transit services to serve neighborhoods near Metrorail stations and other major transit hubs.

The Maryland Area Regional Commuter (MARC) commuter rail system should be studied to explore options for making the system a more integral part of the County's and region's transportation network and to improve its function as a regional rail system. Providing more reliable, off-peak, and reverse services will enable MARC to attract more trips. The federal government would need to be involved in the process of expanding MARC service in coordination with CSX because they own the tracks.

A key underpinning to the success of public transit is appropriate land use densities and patterns, which are needed to create compact development patterns that enable these types of connections within reasonable distances and time commitments. The County will continue to provide for transit-oriented developments through the newly adopted County Growth Policy/Subdivision Staging Plan as well as the Thrive Montgomery 2050 Plan (Thrive 2050). In addition, the Bicycle Master Plan, Pedestrian Master Plan, micromobility and shuttle vehicles, and many other components of County policy, planning, and infrastructure all have a role to play in influencing land use and expanding public transit access. These planning efforts will support long-term transformations in the community to enhance access to high-quality transit, reduce the need for vehicle ownership, and shorten the number and length of private vehicle trips.

Improving the public transit system by increasing frequency, accessibility, and reliability, and expanding service schedules can also increase access to jobs for all residents, but especially benefits low-income communities, which rely more heavily on transit services. Improved transportation access is also important to alleviate barriers that impact food and job access, which are addressed in the **Montgomery County Food Security Plan** (Recommendation 10.2: Invest in new transportation resources and access programs.)

WMATA and Climate Action

Washington Metropolitan Area Transit Authority’s (WMATA’s) growth in ridership and service expansion have allowed for more compact developments in Montgomery County, and these developments have reduced the need for single-occupancy vehicle trips and thus greenhouse gas emissions. In addition, by promoting high-quality, more intensive development on and near WMATA-owned properties, WMATA is reducing sprawl and traffic congestion and preserving open space for recreational use and watershed protection. WMATA can continue to play an important role in combating climate change through purchasing zero emissions buses, providing electric vehicle charging at parking facilities, and creating new entrances to help bring a broader array of properties and uses within convenient distance of Metrorail stations. However, WMATA faces challenges similar to Montgomery County’s, and will need to acquire funding for large infrastructure improvements, navigate complex regulations, and address the transit needs of its many stakeholders.



Ride On and limited-stop Ride On extRa buses serve a County transit center



T-2

Expand Active Transportation and Micromobility Network

Primary Benefit:



GHG Mitigation – Medium

Co-Benefits:

Racial Equity and Social Justice – Very Positive
 Public Health – Very Positive
 Economic Prosperity – Very Positive

Authority:

County - Can Be Implemented Under Existing Policy

Investment Level:

County: \$\$\$
 Private: \$

Development Stage:

In Progress

Lead:

MCDOT

Contributors:

MDOT, M-NCPPC

Active transportation, such as walking or biking, is a zero emissions method of transport that produces large public health benefits. Micromobility is a term for small, lightweight personal vehicles that operate at slow speeds (under 10-15 miles per hour); the term encompasses pedal bikes, pedelec (electric pedal-assist) bikes, e-bikes, push-scooters and e-scooters. Micromobility vehicles can be either personally owned or shared as part of a public or privately owned network. Montgomery County is part of the Capital Bikeshare regional bikeshare system and also has a program underway offering shared e-scooters and e-bikes through private vendors under agreements with the County.

Coupled with the range of micromobility options, active transportation alternatives are a less expensive travel mode that many low-income households prefer and sometimes depend on – and thus can improve the transportation network by making it more efficient and equitable.

Active transportation works in tandem with supportive land use and transit policies to provide more options for emissions-free transportation by residents, businesses and their employees, and visitors.

Active transportation and micromobility, coupled with trail-oriented development, provides economic benefits as well by better connecting residents and employees to shops and services. In 2018, walking accounted for 2% of total trips

in Montgomery County, while biking accounted for only 0.6%. To encourage community members to shift from passenger vehicles to active transportation, the County will need to increase active infrastructure to support these modes of travel. Currently, the County has nearly 100 miles of bike lanes, bike-friendly shoulders, and separated bike lanes. **To drastically increase the amount of bike and micromobility trips, the County will need to grow the bicycle infrastructure network to 1,100 miles of bikeways, as called for in the [County’s Bicycle Master Plan](#).**⁹⁷ This would incorporate all forms of bike and other micromobility facilities, including on-street and separated bike lanes, side paths, trails, and neighborhood greenways, as well as bike, scooter, and other micromobility parking – and potentially charging facilities for the e-versions of each.

The County is already undertaking projects to increase this infrastructure, and the County Code includes requirements to provide these facilities as part of new development projects. In addition, a program for incentivizing existing private sector projects to install bike and scooter parking – and safe, clearly marked paths to reach them – could be implemented. Incentives for purchase or use of shared micromobility devices could also be offered. Assuming that adding bike lanes results in a proportional increase in ridership, the bicycle mode share (including all forms of micromobility) could increase to 6% of total trips.⁹⁸ Increasing



Capital Bikeshare provides active transit options throughout Montgomery County.

bicycle trips is also heavily dependent on the addition of protected bike lanes, which are much more effective at increasing ridership.

The County will also need to expand its pedestrian network and implement the Pedestrian Master Plan, which is currently in development, and ensure that Vision Zero factors are incorporated into the expansion effort. Over the past several years, the County has implemented a sidewalk construction program that has provided approximately 28,000 linear feet (about 5.5 miles) of additional sidewalks per year. While this rate of construction has sometimes been as high as 40,000 linear feet (7.5 miles) per year, the effort has now reached a point where many of the remaining projects are more complex and difficult to complete, requiring detailed

“
The lack of sidewalk maintenance makes it dangerous to walk and bike. This negatively impacts people who cannot afford to buy a car.

~ Resilience Ambassador Survey

..... ”

engineering studies and other more costly components. As a result, lower rates of sidewalk construction have been achieved in more recent years. Despite these challenges, the County may need to increase the rate of construction of these important pedestrian facilities if walking is to become an acceptable mode of travel for a larger number of the County’s residents, employees, and visitors in more of the County’s residential and commercial areas.

Improving and integrating micromobility services and infrastructure for shared and/or electric bikes and scooters can increase the safety and accessibility of these travel modes and promote the use of these services for first-mile/last-mile connections to transit, trips to local destinations, or for longer journeys. Micromobility has played an active role in accommodating essential workers and essential trips during the COVID-19 pandemic, and heightened sanitation procedures have been adopted to increase safety. As noted, the County also participates in the Capital Bikeshare program, which can be expanded by increasing the number of stations and bikes throughout the County, specifically in non-urban areas. The County should look for opportunities to partner with the private sector on creative approaches to funding the Capital Bikeshare system, such as through sponsorships. There also are many opportunities for incentivizing broader use of micromobility that the County can implement as the program expands.

To achieve its goals, the County would need to rapidly implement its bicycle and pedestrian master plans as well as the Vision Zero transportation safety initiatives. All of these plans, whether adopted or in draft form, support the principles included in this Climate Action Plan. If over time it becomes necessary to revise them to support other actions needed to achieve the climate goals, that can be done through plan amendments. The current Vision Zero Action Plan focuses on filling in significant gaps in connectivity and safety, prioritizing Capital Improvement Program (CIP) funds for those efforts. The County could also dedicate CIP funds to implement bicycle infrastructure and trail

projects that connect existing active transportation networks. **To this end, *Montgomery Park’s Countywide Park Trails Master Plan Amendment* could be updated and implemented to better integrate park trails into the County’s transportation system.**

The Department of Parks at the Maryland-National Capital Park and Planning Commission is working to take action to implement several supportive policies, including the following:

- Connecting park trails to other jurisdictions (i.e., neighboring counties and the District of Columbia)
- Enhancing the County’s current park trails through maintenance, wayfinding, and amenities, such as bike racks and fix-it stations
- Extending existing trails and adding connections (i.e., trail heads and trail spurs) to neighborhoods and activity centers

Transportation options have changed rapidly over the past decade and are likely to continue evolving as new technologies become available.

As planning proceeds, the need for flexibility in using transportation rights-of-way to facilitate operation of new, climate-friendly forms of transportation will become more important. Actions could include repurposing of travel and parking lanes for use as dedicated bus lanes, implementing wider “micromobility” lanes (permitting use for bikes, scooters and other types of low-speed vehicles), and providing more spacious sidewalks. Widening of public rights-of-way to accommodate these uses should be a last resort; rather, repurposing vehicular travel lanes should be the preferred approach wherever reduced vehicle travel makes that possible – similar to what has been done with the Shared Streets initiative. In addition, the County should continue to provide for a mix of land uses that encourage active transportation for daily needs (for example, walking or biking to grocery stores or to nearby transit). This planning will support long-term transformations in the community that would reduce the number and length of trips that residents take for work and daily errands.

Expanding the active transportation and micromobility network would increase public health through active lifestyles and reduced car pollution, expand access to jobs, and benefit low-income communities that may not own vehicles. Improving transportation access with active transportation measures is also important to alleviate barriers that impact food and job access. This is addressed in the ***Montgomery County Food Security Plan*** and is also referenced in ***Action T-1*** above. Care must be exercised to accommodate the disability community in the planning, design, and operations of these bicycle/pedestrian and micromobility projects.

EQUITY-ENHANCING MEASURES

- Existing shared micromobility programs for “unbanked” populations (people who are not served by banking or financial institutions), lower-income riders, and those who may not have access to smartphones should be enhanced and widely promoted through outreach, incentives, and education to ensure eligible users are aware of them and understand how they can be used safely.
- Provide more targeted education on Montgomery County’s bike and trail systems and how they connect to other modes of transportation and on the health-related benefits that biking and walking may provide.
- Inspect existing bike and pedestrian lanes across the County; restore damaged lanes and construct new lanes to safely connect more areas of the County.



T-3

Private Vehicle Electrification Incentives and Disincentives

Primary Benefit:



GHG Mitigation – Medium

Co-Benefits:

Racial Equity and Social Justice – Somewhat Negative
 Public Health – Very Positive
 Economic Prosperity – Very Positive

Authority:

Outside County – Requires County Collaboration with other Public or Private Entities or Is Outside County Authority

Investment Level:

County: \$\$\$
 Private: \$\$\$

Development Stage:

Planned

Lead:

USDOT, MDOT, MCDOT, DEP

Contributors:

MCGB, DOF

Electrifying private vehicles in Montgomery County is a crucial step in reaching the goal of zero greenhouse gas (GHG) emissions. Even though electric vehicles (EVs) are often cheaper to power than gas or diesel vehicles, the initial upfront costs are a major deterrent for most residents. Vehicle choice is personal and cannot be regulated by the County – the County does not have authority to ban internal combustion engine (ICE) vehicles. Instead the County needs to persuade the broader community to adopt EVs. Reaching the point where all private vehicles are electric will be difficult unless promotion is coupled with both large incentives and disincentives. **Providing a variety of incentives, such as grants, tax credits, priority or free parking, or high-occupancy vehicle, is critical to increasing the appeal of EVs.** For example, 10 of the top 12 major U.S. metropolitan areas with the highest EV uptake offered consumer incentives for purchase or lease of an EV, typically worth \$2,000 to \$5,000.⁹⁹ Other examples of potential incentives and disincentives are described here. Many more options exist and need to be evaluated, and others will be developed over time.

The County is currently exploring creation of an EV purchasing cooperative or group-buy program for residents, which would lower upfront costs. Establishing a Montgomery County Green Bank Car Loan that is paid back through fuel savings will also help residents address the initial costs. An “EV Freedom” program can

give income-qualified residents significant funds toward the purchase of an EV as well as ongoing consultation from an EV Advisor. A program like “Cash for Clunkers” would allow residents to trade in older gas vehicles for zero emissions vehicles or transit, e-bikes, and car/bike sharing or other micromobility vouchers. In addition, it is important that medium-duty and heavy-duty vehicles have programs to address and incentivize their replacement, and that private sector fleets – including those operated by churches, camps, and private schools – convert their vans, buses and other fleet vehicles to ZEV technologies.

Disincentives can also be a powerful tool in promoting electrification. The County could use variable tax and licensing fees to promote the electrification of taxis, Transportation Network Companies (TNCs), and car share and urban delivery vehicles. Montgomery County Department of Transportation’s Parking Management Division could limit contracts for parking to car share companies whose fleets are entirely or mostly EVs. With enabling state legislation enacted, the County could also mandate TNCs to require that a certain percentage of drivers use EVs or pay a penalty. This percentage could be increased every few years until the entire TNC fleet is fully electric. The implementation of large registration fees for gas- and diesel-powered vehicles would act as a disincentive for non-electric vehicle use. Any type of registration fee, such as a differential fee or a climate-oriented annual vehicle registration fee, would require coordination at the state level.

EV Market Conditions and County EV Targets

Electric vehicles (EVs) currently make up 1% of global car stock, with EV sales making up 2% of market share in the United States.¹⁰⁰ Research shows that 31% of the world's passenger cars will be electric by 2040.¹⁰¹ In the United States, the current administration's EV adoption goals and U.S. car manufacturers' targets for converting operations to EVs may greatly accelerate EV growth beyond global forecasts. In addition, EVs are estimated to reach manufacturing cost parity with fossil fuel vehicles by 2024, making them more accessible for drivers.¹⁰² In Montgomery County, the EV market mirrors the larger U.S. market, as EVs were estimated to generate less than 1% of total County vehicle trips in 2018. Further research is needed to determine the impact of U.S. market conditions and the specific incentives needed for Montgomery County to reach its ambitious goals of 85% EV trips by 2027 and 100% by 2035.

The County could also implement a revenue-neutral “feebate” program for fuel-inefficient cars, which acts as both an incentive and disincentive to promote the use of cleaner vehicles. A feebate program would collect a fee from owners of fuel-inefficient vehicles. The funds would then be used for rebates for EVs or charging equipment. The County could enact a feebate through property taxes. If property owners own an EV, have EV chargers installed, or have a certain percentage of EVs in their fleet, their property taxes would be decreased. If they do not, their taxes would be increased.

A robust, widely available EV charging network will be critical to promoting EV uptake and reducing range anxiety for prospective EV users. Components related to that companion effort are addressed with the actions discussed in **Action T-7** below regarding expansion of the EV charging network. In addition, extension of a Guaranteed Ride Home program similar to that offered in the Washington region for users of alternative transportation like transit and car/vanpooling could be considered.

Increasing the number of EVs in the County would create jobs in the EV infrastructure sector and would improve public health by reducing the amount of gas or diesel vehicle pollution. However, as use of fuel-inefficient cars is typically linked to affordability, certain incentives or disincentives like a feebate program may have a higher burden on low-income households. **The County’s EV incentive and disincentive programs will need to be closely coordinated with state and federal programs, and updated regularly to ensure the most efficient and equitable benefits for the community. These program and benefits will need to be widely promoted to ensure all communities have shared access to and an understanding of EV technologies.**



Private electric vehicle being charged at a County parking garage

EQUITY-ENHANCING MEASURES

- Expand use of private EVs through rebates and other incentives, ensuring that incentives and subsidies will vary such that all people on the socioeconomic ladder can benefit. Encourage programs offering used vehicles, including EVs, to low-income households, along with appropriate testing of the condition of vehicle batteries and other electrical components. Information on nearby charging options could also be provided.
- Incentives should be progressive (in other words, the incentive should be greater for those with lower levels of income). Incentives could also be extended for the purchase of used EVs.
- Consider subsidies for households whose occupations and income depend on the auto industry. This includes those who drive for a living, such as taxi drivers. Support may be needed for transitioning businesses and retraining workers whose jobs are impacted by the reduction in personal auto use and/or the switch to ZEVs. For example, small auto repair shops and auto mechanics may need assistance with transitioning to service EVs (to the more limited extent necessary versus gas-fueled autos). Some workers may benefit from assistance in identifying other occupations to which their skills might be transferable or in retraining with completely new skills.
- Study the impact of disincentives for fuel-inefficient cars on low- to moderate-income communities and ways to assist these communities in purchasing more fuel-efficient vehicles.
- A threshold for fuel-inefficient vehicles could be established on a sliding scale, based on the age of the vehicle. For example, a 2020 vehicle might have to achieve 35 miles per gallon, while a 2010 vehicle might be required to achieve just 30 miles per gallon. A flat exemption could be applied for vehicles over a certain age. This would help alleviate the burden on owners of used and older vehicles, who may be disproportionately low-income, but would maintain some requirements for those older, high-emissions vehicles.



T-4

Constrain Cars in Urban Areas, Limit Major New Road Construction

Primary Benefit:



GHG Mitigation – Medium

Co-Benefits:

Racial Equity and Social Justice – Somewhat Negative
Public Health – Very Positive

Authority:

Outside County – Requires County Collaboration with other Public or Private Entities or Is Outside County Authority

Investment Level:

County: \$\$\$
Private: \$

Development Stage:

Proposed

Lead:

MCDOT, MDOT

Contributors:

Regional Service Centers, M-NCPPC

While the average American commuter wastes 54 extra hours a year in traffic jams, the average commuter in the Washington, D.C. metropolitan area wastes nearly double that at 102 hours.¹⁰³ In addition, studies have shown that congestion contributes to excessive morbidity and mortality for drivers stuck in traffic and those living near major roadways. To address similar issues, some U.S. cities and many cities worldwide have passed legislation to limit or ban cars in city centers. These restrictions reflect the urgent need to curtail the rising urban car traffic and air pollution while increasing safety and accessibility for active transportation.

Montgomery County could constrain the use of cars in downtown commercial districts and open more areas in streets for pedestrians, bicycles, and outdoor dining. The County is already testing a similar measure with the Open Streets program, which the County has branded “Shared Streets.” The Shared Streets program supports outdoor dining and curbside retail in Wheaton, Silver Spring, and Bethesda and on-street walking and biking on nearly 6.5 miles of temporary neighborhood greenways. The program also offers temporary “block permits” at no cost to residents for short-term open-street setups on a rotating basis throughout the County. Considering the economic impacts of COVID-19, an urban car restriction may be more palatable, as the community has seen how these repurposed Shared Streets can be used for outdoor activities, safe dining, and

shopping options. Many of these uses could be extended by the County on a continuing basis as more public transit options are made available. **Priority for use of rights-of-way could be provided for transit (including bus-only lanes), pedestrians, bicycles, and Americans with Disabilities Act (ADA)-only parking.** In addition, other downtown on-street parking could be converted to green space. Some of these actions may be consistent with provisions of the Thrive Montgomery 2050 Plan (Thrive 2050) and also align with the County’s Vision Zero goal of eliminating serious and fatal injuries on its roads by 2030.

However, a severe limitation or total ban on vehicles could preclude many people from accessing essential services in downtown commercial districts, such as doctors, social services, court appearances, and entertainment. In the long term, however, reducing traffic volumes can make it easier to implement pedestrian plazas and to reallocate traffic lanes for buses and cyclists, which was the case when London implemented its congestion pricing program and reduced downtown traffic volumes by 18%.¹⁰⁴ Maintenance of deliveries of goods and services and impacts on property values as well as other economic and social impacts would need to be evaluated. For example, a ban or severe limitation could adversely affect ADA accessibility if other transport solutions are not provided and accessible. Permitting certain types of vehicles to access activity centers—such as

electric vehicles (EVs), taxis and Transportation Network Companies (TNCs), and ADA-related vehicles, and perhaps commercial vehicles essential for maintaining commerce and safety—while restricting or charging fees to most private autos could help transition those areas to less congestion and reduced emissions. Utilities may have a role to play in providing some of the technology available to implement congestion pricing and ways to exempt those and other types of users – including emergency responders and low-income residents. **Curbside management policies and enforcement techniques will be a critical component of such efforts.** Providing parking at the periphery of these areas may also be important as a way to make such efforts feasible, particularly during a transition period from predominantly private auto use. Parking in these areas will have to be carefully sited so as not to negatively impact residential areas surrounding central business districts. Parking pricing and changes to parking requirements under the County Zoning Ordinance may be additional tools that could be used to achieve similar objectives.

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I think science has shown that one of the big causes of climate change is all the cars on the road. And in Montgomery County, we have so many people commuting.

I don't know if Montgomery County can do anything to try to get some of these cars off the road. It was great at the beginning of the quarantine. The air was so much clearer and fresher because people weren't driving.

~ Resilience Ambassador Survey

.....”

Congestion pricing can be implemented as a more moderate alternative to limiting or banning cars in urban areas.

Congestion pricing shifts rush hour vehicle traffic to other transportation modes or to off-peak periods in order to improve traffic flow and reduce emissions. Montgomery County could implement congestion pricing on existing roads in the County and/or cordon charges for roads entering activity centers. Congestion pricing could be implemented by installing EZ Pass antennas every few miles on major roads. Residents could either purchase transponders to be automatically charged or be mailed a bill for road usage. All-electric vehicles could be exempt from any congestion fees to encourage their adoption, at least in the early stages of implementation. As most major roads in the County are state roads, the success of this program would depend in part on coordination with the Maryland Department of Transportation (MDOT). New highways should not be built to implement congestion pricing – it should be a strategy used on existing roads. The revenue generated from congestion pricing could be used to fund public transit, other transportation options, and electrification initiatives. A car ban or limit would not generate this additional revenue, but it would have a greater immediate impact on public health and emissions.

Congestion pricing will be evaluated for pilot testing in high-activity centers, including an assessment of the offsetting negative impacts. Close coordination with MDOT for state roads used to access those areas, with transit providers to ensure frequent non-auto access and with businesses and residents within and outside the cordoned area to address their concerns, will be necessary prior to any testing of this concept for a highly developed area in the County. Congestion pricing is already in use on roads in many areas of our region, including for travel on the Intercounty Connector within the County. Congestion pricing is one tool in the tool box and with the right accompanying programs (for example, reducing or eliminating fees for certain users; making parking available at the perimeter of a cordoned area with frequent shuttles to the center) may be less onerous than constraining

the total number of cars that can access a cordoned area.

While congestion pricing would reduce local vehicle pollution and improve public health, it could also create a disproportionate financial burden on low-income communities. Programs to address those impacts would need to be implemented. The County will also need to evaluate the impacts of congestion pricing on side streets and potential cut-through traffic issues.

The County's intent is to limit the number of new major road projects. However, the need for new major roads must be evaluated on a case-by-case basis, particularly with regard to support of transit systems and other projects necessary to accomplish the goals of the Climate Action Plan, Thrive 2050, and other key County and regional policies and plans. In addition, these decisions are not always within the County's control. For example, while County leadership did not support many aspects of the State of Maryland's plan for "managed lanes" on Interstate 495 and Interstate 270, that project still includes some of those elements because the County does not have final authority over such decisions by the State of Maryland.

EQUITY-ENHANCING MEASURES

- Implement congestion pricing incrementally.
- Ensure alternative travel modes provide Americans with Disabilities Act (ADA) access. Parking for ADA-related/authorized vehicles could be prioritized, supported by the curbside management program.
- Ban or limit high-emitting cars by implementing a phased approach in specific downtown commercial districts and implement new programs to support low-income drivers who cannot easily afford zero emissions vehicles.
- Explore ways to reduce the economic impact, particularly on low-income drivers, mechanics, and small businesses that currently rely upon the sale and maintenance of internal combustion engine vehicles.



MCDOT's Shared Streets program reduces vehicle emissions by temporarily adjusting uses of public spaces to provide for in-street activities such as biking, walking, and outdoor dining.



T-5

Zero Emissions Public Buses and School Buses

Primary Benefit:



GHG Mitigation –
Medium

Co-Benefits:

Racial Equity and Social Justice – Very Positive
Public Health – Somewhat Positive
Economic Prosperity – Somewhat Positive

Authority:

County - Can Be Implemented Under Existing Policy

Investment Level:

County: \$\$\$
Private: \$

Development Stage:

In Progress

Lead:

DGS, MCDOT, MCPS

Contributor:

OMB

Mode shifting from one fossil fuel-powered mode to another, such as from private vehicles to gas- or diesel-powered public transit, will greatly reduce emissions but will not completely negate them. The electrification of public transit buses, with the help of a renewable grid, will support Montgomery County in reaching zero transportation emissions. Electrification will also reduce maintenance costs, provide battery backup storage, improve public health, and expand public exposure to electric vehicle (EV) transport options. Other zero emissions technologies such as fuel cells may also become available to similarly reduce vehicle emissions in the future.

Currently, Montgomery County Department of Transportation’s (MCDOT’s) Ride On bus system serves 26 million passengers a year with a fleet of approximately 370 buses, 100% of which are clean diesel, compressed natural gas, or electric or hybrid electric. **Montgomery County will need to stop all purchases of non-electric buses by 2022 and electrify 100% of the transit buses and Montgomery County Public Schools (MCPS) school buses by 2027 to meet its emissions reduction targets.** This would entail transitioning all garages and service stations to a fully electric status and evaluating the need for additional EV bus charging facilities. In addition, as the County increases transit routes and frequency, prioritizing the use of electric buses will ensure bus emissions do not increase proportionately. Conversion of

Ride On’s fleet to zero emissions vehicles (ZEVs) would also support the transition to electric buses that is included in the Washington Metropolitan Area Transit Authority’s (WMATA’s) zero emissions bus program and recommendations from its Zero-Emission Bus Update, especially infrastructure charging requirements and engagement with utilities.

The County recently put its first four EV buses into service and has another 10 EV buses on order, with service expected to begin for those in fiscal year 2022. **The County is in the process of developing a fleet transition plan to achieve the County’s greenhouse gas (GHG) emissions reduction goal.** This plan will include the entire County vehicle and bus fleet but excludes fire trucks. An option for a bus-leasing approach using a public-private partnership (P3) is being explored and may offer a path to more expedited electrification.



My brother suffers from asthma and just walking outdoors can be a challenge to breathe. I want more energy efficiency and clean air.

~ Resilience Ambassador Survey





Unveiling event for a new electric Ride On bus in the County

The County is also exploring a variety of other ZEV technologies. For example, hydrogen fuel cell vehicles may become a viable option as that technology matures and may enable the County to achieve the same climate objectives. When replacing gas buses with electric or other alternative fuel options, the County will need to prioritize buses that travel the greatest distances and that serve vulnerable or underrepresented communities. Provision of adequate charging infrastructure is also a key component of the transition plan to ZEV buses, and the County will be constructing a microgrid at its Silver Spring bus depot to aid in these efforts. As part of the fleet transition plan, similar efforts will need to be explored for fueling at other depots, and a plan for mid-route recharging may need to be considered as well.

As pollution from school buses primarily affects children, electrifying school buses is crucial to protecting the County's youth. **MCPS has already developed a school bus fleet transition plan, solicited a budget-neutral electrification program approach, and selected a private-sector partner to**

enable conversion of the entire fleet. With this approach, budget neutrality is anticipated, and electrification can take place rapidly over the next full school bus replacement cycle. Similar arrangements may be possible for County Government and the transit fleet, although the characteristics of those types of bus operations are quite different from school buses. The County will explore partnerships with companies, agencies, and utilities whenever appropriate to achieve its fleet electrification goals. It is also important that other transit systems serving the County – including Maryland Transit Authority and WMATA – follow through on conversion of their fleets to ZEVs. Electrifying public buses would increase local jobs in EV infrastructure integration while improving public health through reduced bus pollution.



T-6

Electrify County and Public Agencies Fleet

Primary Benefit:



GHG Mitigation –
Medium

Co-Benefits:

Public Health –
Somewhat Positive
Economic Prosperity –
Somewhat Positive

Authority:

County - Can Be
Implemented Under
Existing Policy

Investment Level:

County: \$\$\$
Private: \$

Development Stage:

In Progress + Plan
Being Developed

Lead:

DGS, M-NCPPC, MCPS

Contributors:

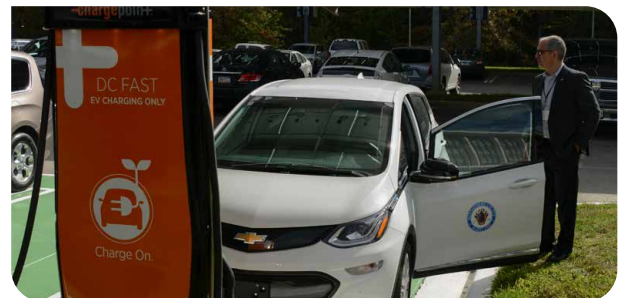
FRS, POL, OMB, MCDOT, OP, DEP

Montgomery County currently has a non-bus vehicle fleet of 2,437 vehicles. These include vehicles used for light-duty trips, such as sedans, and vehicles used for medium- and heavy-duty work, such as cargo vans and pickup trucks. This non-bus fleet includes 39 electric vehicles (EVs) and 224 hybrid vehicles, or roughly 1% and 9% of the total 2,437 vehicles, respectively. **In addition to the electrification of the bus fleet discussed in Action T-5, the County will need to reach 100% electrification of its non-bus fleet by 2027 in order to meet its zero greenhouse gas emissions target. The County is currently in the process of developing a fleet transition plan with a goal of meeting the County’s emissions targets.** To reach 100% fleet electrification, this fleet transition plan will need to address annual EV goals, purchasing policies, staff training for use and maintenance of EVs, and charging equipment needs. In addition, County garages and refueling facilities will need to be retrofitted with the proper EV charging infrastructure. Smart-charging or fast-charging systems could be installed to optimize energy consumption and reduce charging times. Charging equipment may need to be distributed in strategic locations across the County to enable recharging at various points during use in the field.

The County should also strive to pilot novel EV models for various vehicle types, such as trash trucks. In addition, all vehicles used for County contracts should be required to be electric where possible. Electrification of other agencies’ fleets

operating within the County – including Montgomery Parks, the Washington Suburban Sanitary Commission, other state or regional agencies — is also a critical component of this action. Like Montgomery County, many of these agencies have begun the process of researching and in some cases purchasing EVs for their fleets and require a variety of vehicle types.

It is important that expectations regarding the uptake of EVs be tailored to the availability of various types of vehicles to meet the needs of different functions. Budgets will need to reflect the needs for both EV procurement and training in the appropriate use of EVs. The County will explore partnerships with other agencies, companies, and utilities whenever appropriate to achieve its fleet electrification goals. Electrifying the County’s and other public agencies’ fleets would increase local jobs in EV infrastructure integration while improving public health through reduced vehicle pollution.



Charging a Montgomery County electric vehicle



T-7

Expand the Electric Vehicle Charging Network

Primary Benefit:



GHG Mitigation –
Medium

Co-Benefits:

Public Health –
Very Positive
Economic Prosperity –
Very Positive

Authority:

Outside County – Requires
County Collaboration with
other Public or Private Entities
or Is Outside County Authority

Investment Level:

County: \$\$\$
Private: \$\$

Development Stage:

In Progress

Lead:

MCDOT, DGS,
DPS, M-NCPPC

Contributors:

DEP, WMATA, Utilities

Drastically increasing electric vehicle (EV) use in Montgomery County by 2035 would not be possible without creating an expansive EV charging network. **Increasing the accessibility and speed of charging stations will help reduce range anxiety and encourage the use of EVs.** County facilities currently house 36 EV charging stations for fleet use and 20 stations for public use. Including the County charging stations, there are approximately 167 publicly available EV charging locations throughout Montgomery County.

Although the quantity of EV charging stations is not directly correlated with EV adoption, one study shows that leading EV markets experience 2% to 4% EV adoption when they provide at least 275 public charging stations per million population.¹⁰⁵ As Montgomery County has a population of approximately 1 million, it would need to provide roughly 7,200 public charging stations to encourage 100% EV adoption by 2035. Therefore, the County would need to significantly increase the number of publicly available EV charging stations to encourage complete vehicle electrification by 2035, though more precise modeling is necessary to understand the quantity needed.

The County is already taking multiple steps to expand EV charging infrastructure, including coordinating with Pepco under a Maryland Public Service Commission mandate to the utilities, working with other utilities serving the County, and issuing a Request for Proposal

through the County Department of General Services to expand charging infrastructure on County-owned property. In addition, the County Department of Transportation, in coordination with the Department of Permitting Services, has implemented a pilot program for curbside residential EV charging installations when a driveway or space for such equipment is not available within the adjoining private property.

The County will need to develop a County EV-Readiness Master Plan to identify how to overcome barriers to broad installation of electric vehicle supply equipment (EVSE), including expanding grid capabilities and strategies to incentivize EVSE installation, setting targets for the number of public and private charging stations, and coordinating with the utility companies.

Barriers to ensuring that a wide variety of vehicle types have access to charging stations should also be examined in this plan. **Using the framework laid out in the plan, the County could build on existing electrical infrastructure to cost-effectively expand the EV network, such as by mounting EV charging units on streetlights or installing them in proximity to streetlights.** There may be an opportunity to implement this in some areas where streetlights are being replaced in connection with other capital projects. In addition, the County’s goal of increasing solar installations has cross-cutting impacts because it can help create microgrids to provide network charging capacity.

The County could also encourage travel and transit by EV by collaborating with Washington Metropolitan Area Transit Authority on identifying transit EV charging infrastructure needs, financing and payment mechanisms, an implementation timeline, and possibly banks of outlets and chargers for private vehicle use in Metro parking garages. Fast chargers, or chargers that can provide more than 100 miles of driving range in 30 minutes, should be prioritized in strategic locations. However, the current cost of fast-charging stations is an impediment to their acquisition and installation. Rates charged at charging locations should be structured to encourage vehicle turnover so that more vehicles can use each charger.

Another large barrier to residential EV adoption is the need to install the proper home charging infrastructure. This is especially difficult in multi-unit buildings or rental properties where the infrastructure is controlled by the property owner. Under the County's current zoning ordinance, commercial and multi-unit residential development projects of certain types and sizes are required to provide EV chargers or charging-ready parking spaces. **To encourage more aggressive adoption of future EV charging infrastructure, the zoning ordinance could be expanded to require new single-family homes to install a 240-volt outlet and charger for fast charging use, multifamily housing and large parking facilities to install one EV charging station per every four parking spots, and all hotel parking spaces to be EV capable with one EV charging station per every 20 spots.**

The County could also extend its new construction EV charging requirements to existing buildings that are sold, leased, or undergo major renovations. Pre-sale requirements could dictate that residential or commercial buildings install EV chargers or outlets before sale. New rental procedures could require buildings to install chargers in parking spaces upon all new or modified leases. Any buildings undergoing major renovations could also be required to install charging equipment.

Unfortunately, EV charging equipment can be costly for building owners to install, especially if they must update their electrical panel or integrate extensive wiring—and can be even more costly if construction of an access point, driveway, or apron within the property is needed. There are several incentive programs in place to help reduce the cost to property owners, including federal and state programs. These include income tax credits, excise tax credits, and rebates. In addition, rebate programs are offered by all the utility companies operating in the County and the broader region.

EQUITY-ENHANCING MEASURES

- Ensure electric vehicle (EV) charging is distributed throughout Montgomery County in an equitable manner.
- Coordinate with adjacent counties and states to ensure that EV charging is available for Montgomery County residents crossing jurisdictional lines.
- Standardize EV charging ports (or the availability of multiple ports) to ensure all EV users have access to all EV charging stations.
- Incentives should be progressive (in other words, make sure the incentive for those with lower levels of income is greater).
- Focus on vulnerable groups that may need full or partial subsidies, especially households whose income depends on driving (for example, taxi drivers).
- Eliminate or reduce the County energy tax on electricity used for charging for low-income families that buy EVs.
- Explore mechanisms to facilitate sharing of residential charging equipment by groups of neighbors to help buy down the cost of installations.

To further address cost-barriers, the County could develop its own financial incentive program to help property owners overcome the initial costs associated with EVSE purchasing and installation, including electrical retrofits and permit fees.

The County could also consolidate information on all the various programs available to County residents in one centralized location on the County’s website. Currently, the County offers expedited permitting for EV charging stations. To increase the ease of implementation, the permitting process has been streamlined to a web-fillable form available on the Department of Permitting Services website. The process ensures that EV charging units are installed properly and in accordance with plans, with the safety of residents and others paramount.

Incentives should also be offered for workplace charging, which would increase the convenience and affordability for employee EV commuting. Subsidizing the purchase of home chargers in low-income and multi-unit housing is necessary to increase EV accessibility. Programs are being offered by the local utilities to reduce costs for these types of installations, but they have had very limited success. These programs should be examined to determine how to make them more appealing to commercial and multi-unit residential property owners. Expanding the EV charging network would increase local jobs in EV infrastructure integration while improving public health through reduced vehicle pollution.

Technology is evolving in a way that will likely make installation of EV charging much less costly in the future. In addition, there are many creative approaches the County may explore for partnering with the private sector to provide increased numbers of EV charging stations over the coming years. Private building owners currently have options for reducing the cost of EVSE through programs offered by utilities and low-cost loans. Other programs and creative financing approaches should open up additional opportunities in the future. New approaches can be explored as part of the County's EV-Readiness Master Plan. Impacts on housing affordability need to be carefully evaluated, but we cannot accept a future in which all buildings but those with affordable housing have on-site EV charging.

It must be noted that in order to achieve successful implementation of countywide vehicle electrification, the infrastructure in adjacent counties and states must be developed to accommodate regional travel. Providing a local EV charging infrastructure, with limited or inadequate EV range to travel through multiple states and access similar EV charging facilities, not only makes the transition to EVs difficult but adds a financial burden, especially on low-income EV owners, in the form of requiring the additional rental or ownership of internal combustion engine vehicles for trips that cannot be easily accomplished using EVs. The State of Maryland and other states along the Interstate 95 corridor are working to address this through coordinated planning.



I completely agree with the electric buses and cars. I’ve been very happy to see that in many of our community centers, we actually have electric charging stations.

~ Resilience Ambassador Survey





T-8

Transportation Demand Management and Telework Strategies

Primary Benefit:



GHG Mitigation – Low

Co-Benefits:

Racial Equity and Social Justice – Somewhat Positive
 Public Health – Very Positive
 Economic Prosperity – Somewhat Positive

Authority:

County – May Require Policy Amendment or New Policy

Investment Level:

County: \$\$\$
 Private: \$

Development Stage:

In Progress

Lead:

MCDOT

Contributors:

Businesses with 25 or more employees, Developers of projects in TMDs, DPS, M-NCPPC

Transportation Demand Management (TDM) includes strategies for reducing demand for road capacity, primarily during peak periods. **Specifically, TDM promotes using travel modes (public transit, bicycling, other micromobility modes, and walking) to replace single-occupancy vehicle (SOV) commuting; increasing the number of passengers in vehicles (carpooling and vanpooling); and eliminating some trips altogether (for example, through teleworking, compressed/alternative work schedules).**

Montgomery County has created Transportation Management Districts (TMDs) and adopted code revisions that require businesses with 25 or more employees throughout the County to submit TDM plans and annually report on TDM activities. New development projects in TMDs are required to include TDM-supportive components such as incentivizing biking and walking. TDM strategies include providing transit subsidies to employees commuting to those areas, bike storage and showers, and parking management strategies, such as reducing the amount of permitted parking, eliminating minimum parking requirements, using shared and market-rate parking, and unbundling of parking from commercial and residential sales or leases so that parking spaces are sold, leased, and priced separately from the development being sold or leased. Parking fees and parking “cash-out” programs can be part of

the parking management strategies implemented at both public and private development projects. Revenues from parking fees can be used to support other modes, such as transit and biking. These strategies help to reduce local vehicle pollution, expand access to jobs, enhance employers’ recruiting efforts, and reduce costs for many households. Substantial mode shifting using TDM to increase the use of transit, biking,

EQUITY-ENHANCING MEASURES

- Provide more active transportation amenities (secure bicycle storage, showers, connectivity).
- Prioritize communities for infrastructure improvements related to multimodal access where multimodal connectivity is missing and can increase connections to jobs.
- Conduct ongoing campaigns to raise awareness related to alternative transportation options. Ensure the awareness campaigns a developed in multiple languages.
- Increase access to quality internet connectivity for low-income residents/ households and areas of the County where broadband internet is not easily accessible.

walking, teleworking, and all other alternatives to SOV use for trips is critical to changing the County’s profile of greenhouse gas (GHG) emissions. TDM, implemented in tandem with supportive land use and transit policies, can reduce the number of private vehicles on the roads and the number requiring electrification to meet the GHG reduction targets.

The County’s TMD fees only apply to commercial developments and do not require multi-unit housing developments to contribute support for these programs. In addition, some TMDs do not have the necessary funding at all. The constrained resource inequities in program support limit the TDM program from fully accomplishing its goals of reducing road demand and increasing access for alternative forms of transportation. **While the County’s 2019 NextGen TDM legislation expands TDM programs beyond previously established TMDs to additional areas of the County and increases the effectiveness and enforceability of such programs, the County must further expand the NextGen TDM program by creating more TMDs, so most new projects throughout the County will be required to demonstrate how they will promote non-auto modes and achieve the County’s Non-Auto Driver Mode Share (NADMS) goals.** These efforts can reduce pedestrian, car, and bike conflicts and thus support the County’s Vision Zero goal to eliminate serious injuries and fatalities on the County’s roads by 2030. In addition, as

“

We should be requiring companies to commit to enabling our workforce to have the freedom to telework. It means less cars on the road and enables people to have flexibility and a work/life balance.

~ Resilience Ambassador Survey

.....”



County residents using a combination of alternative travel modes, including biking and public buses

part of the NextGen TDM legislation, County Government is also required, as an employer, to develop a comprehensive TDM plan. Transit subsidies, parking management, and telework policies are among the strategies that will be considered as part of that effort (see **Action G-13**).

Telework—working from home or another location remote from the primary worksite—can be a key TDM strategy used by employers to reduce their carbon and traffic congestion footprint. The Montgomery County Department of Transportation (MCDOT) has worked with employers to promote adoption of teleworking for many years, both independently and in conjunction with programs through the Metropolitan Washington Council of Governments (MWCOCG). MCDOT has conducted regular training sessions and webinars to inform employers and employees about the benefits of teleworking and to help establish effective teleworking policies and programs. Adoption of teleworking has increased exponentially during the COVID-19 pandemic. Both employers and employees found that teleworking is suitable for many types of positions and tasks. Efforts should be made to build upon the experiences of employers and employees in order to consolidate lessons learned and create even more effective teleworking programs on a permanent basis.

Commuter trips are the trips most amenable to TDM strategies like teleworking. However, commuter trips represent only about 20% of all vehicle miles traveled (VMT) in the region. If TDM is to work to accomplish the County's emissions reduction goals, new methods of applying it to non-work trips must be developed – and in particular new transit options should be made available for non-work trips in a way that enables riders to use transit to efficiently link trips with multiple stops and purposes.

The County has focused on NADMS as the primary metric for evaluating success in its TDM efforts. NADMS measures the percentage of trips made by various non-auto modes during certain times of day, usually peak hours for commuting. The County Council recently updated the NADMS goals for all areas of the County as part of its action on the County's growth policy. Another potentially useful approach to measuring changes in vehicle use is VMT. This metric is widely used as an indication of overall quantity of vehicle travel. It includes trips of all types, including those passing through an area as well as those originating in or destined for a certain area. The addition of VMT as a measure of TDM success in reducing SOV use will need to be evaluated in the context of current law and regulations. A Transportation Planning Board study is underway to examine how much VMT reduction would be necessary for the region to reach its climate goals.

COVID-19 and Telework

The COVID-19 pandemic has drastically increased the amount of teleworking around the United States. By the end of 2021, Global Workplace Analytics estimates that 25-30% of the total U.S. workforce will be teleworking.¹⁰⁶ If Montgomery County follows this trend, it could reduce its total transport emissions 4-6%. However, the presumed emissions cuts could be undermined if more people choose to move to the suburbs because they no longer need to commute frequently. This suburban sprawl could increase overall emissions, even if commuting emissions decrease.¹⁰⁷ Future transport modeling is needed to determine COVID-19's exact impact on Montgomery County's transportation emissions and how the County can continue to support low-carbon lifestyles.



T-9

Traffic Management Systems

Primary Benefit:



GHG Mitigation – Low

Co-Benefits:

Public Health – Somewhat Positive

Authority:

Outside County – Requires County Collaboration with other Public or Private Entities or Is Outside County Authority

Investment Level:

County: \$\$\$
Private: \$\$\$

Development Stage:

In Progress

Lead:

MCDOT, MDOT

Contributors:

SHA, Municipalities

Adaptive traffic control systems are traffic management strategies incorporating traffic signal timing changes or adjustments based on actual traffic demand rather than adherence to a fixed signal cycle. This is accomplished through hardware, such as in-pavement vehicle loops and cameras, that recognizes traffic demand and software that analyzes the data and intelligently manages traffic. These systems can reduce vehicle idling, travel time, and emissions while increasing travel time reliability and safety. The systems can also be programmed to prioritize transit as part of the effort to improve travel times and reliability. **Montgomery County is not only working to install fully adaptive traffic management systems on County roads, but is working in partnership with the Maryland Department of Transportation (MDOT) to install management systems on state roads.** Corridors that include Montrose Road and Montrose Parkway have been used for adaptive signal control systems evaluations, with the goal of deploying the optimal system on future corridors in the County. In addition, the County is partnering with MDOT to deploy the

selected adaptive signal control system on MD 108 as part of a second phase of evaluations in 2022. The County recognizes that adaptive traffic management systems are minimally effective when traffic volumes exceed a certain threshold in a corridor (oversaturated conditions).

Adding detection equipment and systems that prioritize the safety of all modes while effectively managing associated throughput would increase intersection safety. Equipping all intersections with passive pedestrian and bicycle detection, some of which may be incorporated in the adaptive detection equipment, eliminates the need to press buttons to cross intersections, giving cyclists and pedestrians automated priority similar to that given to autos. Changes to signal timing to slow traffic while maintaining movement may also be implemented using system technology, and this would benefit pedestrians, cyclists, and those using micromobility. These various traffic management systems would reduce local vehicle pollution and benefit public health.

EQUITY-ENHANCING MEASURES

Adaptive traffic management systems should prioritize the high-injury network and areas with a high prevalence of vulnerable communities.



First Mid-Atlantic Region protected intersection, located at Spring Street and Second Avenue



T-10

Electric Vehicle Car Share Program for Low-Income Communities

Primary Benefit:



GHG Mitigation –
Low

Co-Benefits:

Racial Equity and Social Justice – Very Positive
Public Health – Somewhat Positive
Economic Prosperity – Somewhat Positive

Authority:

County – May Require Policy Amendment or New Policy

Investment Level:

County: \$\$\$
Private: \$

Development Stage:

Exploration

Lead:

DEP

Contributors:

MCDOT, Car Share companies

Communities that bear the brunt of air pollution from vehicles also tend to be those with greater socioeconomic challenges. Residents in these communities are also the least able to afford new technology-based solutions such as electric vehicles (EVs). High upfront costs, decreased visibility, reduced public charging access, and difficulties with multifamily structures are all barriers to high EV adoption in Montgomery County.

Creating an EV car share program for low-income communities could address many of these issues. Car-sharing services allow individuals to use cars on a short-term, as-needed basis, paying only for the time they use the car and the mileage they drive.

These costs could be greatly reduced for low-income communities. Such a program would also help introduce EVs into communities with very little access to or familiarity with such technology and would encourage future EV purchases. Developing mechanisms to enable shared use of EV charging stations in areas where those stations are located within private control could be an additional component of these programs.

Low-income communities use transit services more frequently, so EV car share programs can help these communities meet the first- and last-mile challenge with a zero-emissions transport option. There may be areas of the County with limited parking that would have to be addressed

to accommodate an EV car share program. The County could consider partnering with housing providers to incentivize the availability of shared EV parking and the installation of EV charging, especially in communities where tenants depend on cars for commuting. To address the concerns regarding COVID-19 and other communicable diseases in shared vehicles, heightened sanitization procedures would need to be implemented.

These programs can be flexible as to market. While initially targeted at low-income households, which are the least likely to have access to EVs, the County could expand the sharing programs to moderate-income households or can even remove income requirements entirely based on demand and needs. All such programs may not need to be subsidized, and funds should be primarily targeted at lower-income populations. It should be noted that car share options provided by the private sector have declined in recent years due to the rise in Transportation Network

EQUITY-ENHANCING MEASURES

Develop a campaign to raise awareness of the EV car share program, including what it is, how to access it, and what the benefits are. Ensure the awareness campaign is developed in multiple languages.

Companies (TNCs) such as Uber and Lyft. There may be potential to work with taxi companies and/or TNCs to provide EV-based transportation to the public on a similar basis.

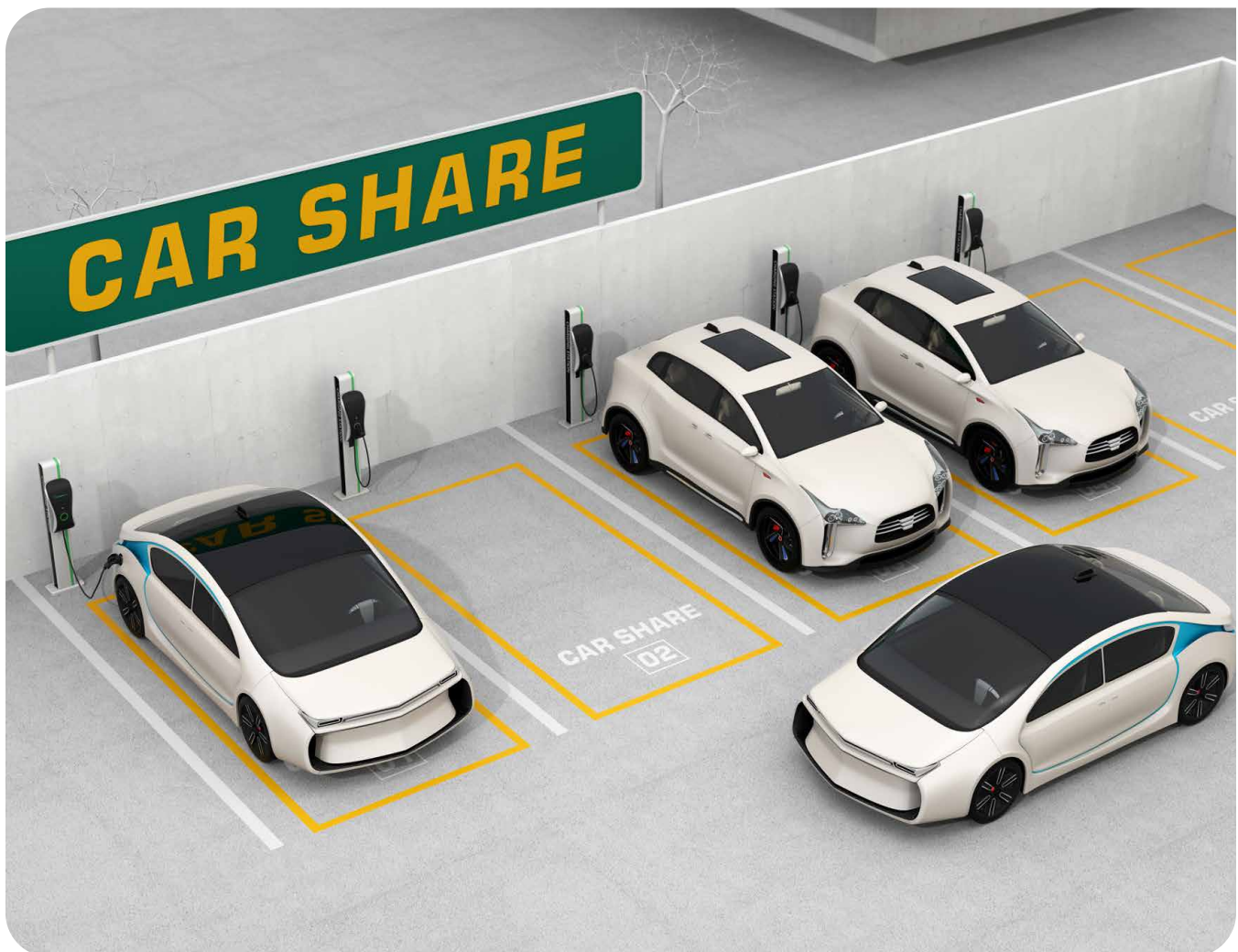
An EV car share program would help to reduce local vehicle pollution and create program implementation jobs.

“

I think electric vehicles should be affordable to low-income residents in order to decrease pollution in the County.

~ Resilience Ambassador Survey

..... ”



Electric Vehicle Carshare system with dedicated charging stations



T-11 Off-Road Vehicle and Equipment Electrification

Primary Benefit:



GHG Mitigation –
Low

Co-Benefits:

Racial Equity and
Social Justice –
Somewhat Negative
Public Health –
Somewhat Positive

Authority:

County – May Require
Policy Amendment or
New Policy

Investment Level:

County: \$\$\$
Private: \$\$\$

Development Stage:

Proposed

Lead:

DEP, DGS, Procurement

Contributors:

USDOT, MDOT, MCDOT, MVA,
Construction Industry, Landscape
Businesses

Off-road vehicles and equipment, such as those used for construction and landscaping, generate approximately 3% of the total transportation emissions in Montgomery County. Off-road vehicles can be difficult to electrify because they consist of complex machinery and are primarily used for heavy physical tasks other than transport. New off-road electric technologies are growing but need to be met with market demand to make them more viable. **To reduce off-road vehicle emissions, Montgomery County will need to promote electric or other zero emissions options for these vehicles by 2035.** The County is exploring hydrogen fuel cell technologies for its own off-road vehicles as well as other forms of zero emissions vehicle (ZEV) technologies. To achieve greater uptake of these technologies, the County should require projects benefitting from public funds to use the best available clean off-road vehicle technologies and adopt the goal of full off-road vehicle electrification by 2035.

The County is also considering legislation aimed at reducing and ultimately eliminating the use of combustion engine-powered leaf removal equipment. The County’s own landscape equipment inventory includes more electric-powered machinery for this purpose, and the Montgomery County Department of Transportation launched its first pilot program of an all-electric mowing crew in the 2021 mowing season. More electric and battery-

EQUITY-ENHANCING MEASURES

- Provide subsidies or extended time for compliance to small to medium businesses that fall under specific revenue thresholds to phase in off-road vehicles – and possibly required landscape equipment – over time.
- Incentives should be progressive (in other words, make the incentive greater for those with lower levels of income or those serving low-income neighborhoods).

powered equipment is becoming available for both household and professional use, and these actions by the County should help accelerate adoption of these cleaner, quieter options for landscape care.

Although using cleaner off-road vehicles and landscape equipment would reduce local air and noise pollution and improve public health, it could also increase operating costs and create logistical challenges around equipment charging, which would be particularly burdensome for small businesses.



T-12

Advocate for a Vehicle Carbon/Gas Tax or VMT Tax

Primary Benefit:
Enabling Action

Co-Benefits:
N/A – Advocacy

Authority:
Outside County – Requires County Collaboration with other Public or Private Entities or Is Outside County Authority

Development Stage:
Proposed

Lead:
CEX, MCDOT, DEP

Investment Level:
County: \$
Private: \$

Contributors:
OIR, OCA

Federal and state gas taxes assess a certain number of cents per gallon of fuel sold as a source of revenue for roads, bridges, highways, transit, and other transportation programs. By using enabling state legislation, some U.S. cities have implemented local gas taxes to fund transportation infrastructure projects. **A local gas tax ordinance levies a business license tax on fuel dealers for each gallon of motor vehicle fuel sold within the city or county, while a carbon tax targets the amount of greenhouse gas (GHG) emissions produced from the fuel used.** Currently, state law prohibits Montgomery County from imposing its own gas tax. Courts have ruled against County-imposed carbon taxes, and a prior effort to obtain State legislative approval for a County-based gas tax failed. **Therefore, further lobbying at the state level is needed to create enabling legislation for a local tax. The tax would be used to disincentivize inefficient gas- and diesel-powered vehicles while providing funds for transit and electrification projects.**

A local vehicle gas or carbon tax is not necessary for the County to meet its zero GHG emissions goal. The County could implement a road user charge, congestion pricing, or a local sales tax on gasoline (this would also require enabling state legislation). However, a vehicle gas or carbon tax would help generate the massive amount of funds needed to support the electric vehicle (EV), public transit, and active transportation

network improvements required to meet zero transportation emissions. It would also give the County more authority to use the revenue generated to implement targeted zero emissions transport actions. Although a tax would reduce local vehicle pollution and thus improve public health, it could also create a disproportionate financial burden on low-income communities.

The County can also support regional initiatives such as implementation of the Transportation and Climate Initiative (TCI).¹⁰⁸ This initiative is a regional collaboration of 13 northeast U.S. states, including Maryland and the District of Columbia, that seeks to address the transportation sector’s impacts on climate by committing to implement supportive policies. The TCI Program Memorandum of Understanding calls for a “cap-and-invest” program under which vehicle fuel wholesalers would pay the states for emissions allowances.

EQUITY-ENHANCING MEASURES

- Examine the impact that charging higher taxes in the downtown core or areas of congestion will have on vulnerable communities.
- Implement the carbon tax incrementally; consider sliding scale or tax rebates tied to household income levels.

The states would then direct the revenues to mass transit and electrification projects. While the State of Maryland has thus far not signed on to the TCI memorandum of understanding to further implement the TCI program, the District of Columbia and several states have done so, and Maryland should do so in the future.

Consideration could also be given to implementing a similar non-carbon-based tax on vehicle miles traveled (VMT) for each vehicle. In the County's annual operating budget, typically between one-quarter and one-third of the transit funding comes from the State Transportation Trust Fund (TTF), which is also the source of a significant portion of the County's road maintenance budget. The primary revenue source for the TTF is the gas tax. This highlights the importance of finding alternative revenue sources to support transit and road maintenance

in the future as EVs grow in numbers and use of gas-fueled internal combustion engines declines. A VMT tax would be a more equitable and effective tool than a carbon tax, as it would apply to vehicles of all types.

A VMT, gas, or carbon tax will require further study to determine the best implementation approach and must include an evaluation of the tax's impact on vulnerable communities as well as its impacts on businesses and the economy. While concerns have been raised about implementing such a tax, given the economic impacts of COVID-19, implementation of a VMT, gas, or carbon tax will likely occur well after the impacts of the pandemic are in the past. However, understanding the implications of various approaches will be essential before decisions are made about moving forward with this type of tax.



Congested roads typical of rush-hours in many areas



T-13 Advocate for Rail Alternative Fuels

Primary Benefit: Enabling Action	Co-Benefits: N/A – Advocacy	Authority: County – Can Be Implemented Under Existing Policy	Development Stage: Proposed
		Investment Level: County: \$ Private: \$	Lead: MCDOT, MDOT/MDTA
			Contributor: OIR

The use of the Maryland Area Regional Commuter (MARC) rail Brunswick Line in Montgomery County generates only 0.1% of the County’s total emissions. However, MARC runs on diesel, while other rail options, such as the light rail and Metrorail, are powered by electricity. As more residents and commuters are encouraged to reduce their personal vehicle use and shift to rail, rail service frequency should be improved; however, fuel consumption and therefore the emissions of commuter rail travel will increase over time as rail frequency increases.

Montgomery County would need to partner with the Maryland Department of Transportation (MDOT) to explore options for electrification or use of alternative

fuels for the commuter rail. Constraints of run-through service to other jurisdictions (for example, the District of Columbia, Virginia, other cities and states along the line) and the need for expansion may make this type of conversion challenging. However, this would not only decrease rail greenhouse gas emissions but also produce regional benefits by improving air quality across the communities served by rail.

EQUITY-ENHANCING MEASURES

Make rail electrification a requirement to provide definite benefits to vulnerable communities living near rail.



MARC Commuter Rail (Source: MW Transit Photos <https://www.flickr.com/photos/69735015@N04/28209221697/>)

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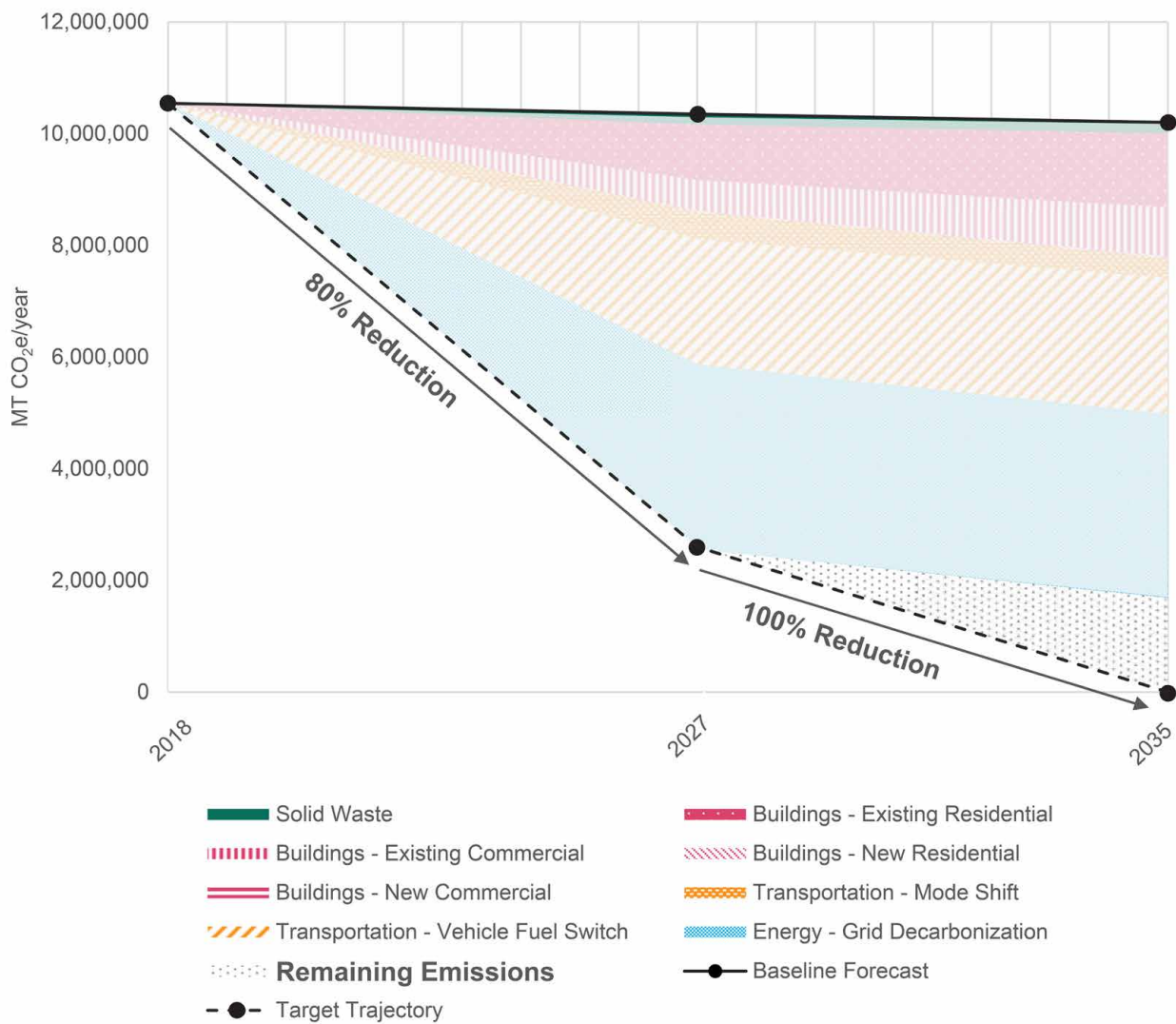


Carbon Sequestration Actions

Montgomery County has conserved and enhanced its nature-based solutions, including forest, meadow, and wetland ecosystems, green spaces, and trees, while reversing carbon dioxide emissions. The County is committed to continuing to enhance the wide array of benefits from these resources.

- Work across sectors and integrate nature-based solutions.
- Support and implement policies and strategies for land conservation.
- Retain, increase, and restore terrestrial ecosystems, including forests, meadows, wetlands, green spaces, and urban trees.

Remaining Emissions Reduction Pathway



This graph shows the approximate amount of remaining greenhouse gas (GHG) emissions the County will need to reduce to meet its 2035 carbon neutrality goal, as modeled in CURB. The actions presented in this section will help the County reduce these remaining GHG emissions.



Carbon Sequestration

Achieving the County's climate change goals cannot be accomplished through greenhouse gas (GHG) emissions reduction alone. In addition to reducing emissions, carbon sequestration already captures and stores carbon dioxide from the atmosphere. Carbon sequestration can be maximized through the retention, management, and expansion of nature-based systems, such as forests, wetlands, and meadows, as well as individual trees and small groups of trees that comprise the urban forest. It is essential for the County to prioritize retention of forests, wetlands, and meadows, as any loss of these carbon sinks will add carbon to the atmosphere. Sequestration can be further enhanced by increasing forest and tree canopies, increasing carbon stored in soils, and improving agricultural practices. These efforts to increase carbon sequestration and storage are collectively known as nature-based solutions (NBS). Enhancing and increasing these natural systems should be a priority. It will be essential to conduct detailed and robust assessments of existing systems in order to set meaningful and measurable goals for increased carbon sequestration through NBS.

Compared to most other strategies, NBS are relatively low-cost to implement and maintain and they increase in value over time. They provide multifaceted co-benefits that are essential for thriving communities. One of the more critical co-benefits of NBS is an increase in the overall resilience of communities because NBS support the ecological systems upon which we depend. For example, a well-distributed tree canopy in urban areas reduces summertime temperatures and provides winter windbreaks, thereby reducing energy consumption.

In addition to sequestering carbon and enhancing resilience, some of the co-benefits of conserving natural ecosystems include improved air and water quality, reduced impacts from the urban heat-island effect, improved stormwater management, and enhanced flood hazard management. In addition, NBS improve human health, reduce incidents of asthma by reducing air pollution, filter out particulate matter, encourage active lifestyles, reduce crime, and generally increase our sense of well-being.

Carbon sequestration actions are summarized in **Table 14**. The full set of Sequestration Technical Workgroup recommendations from which the Climate Action Plan (CAP) carbon sequestration actions were developed is provided in **Appendix B**.

Please refer to the ***Racial Equity and Social Justice*** chapter for more information on the historical context and current conditions associated with systemic racism and environmental injustices, and how these relate to carbon sequestration.

Table 14: CAP carbon sequestration actions

Action	GHG Reduction*	Climate Risk Reduction	Racial Equity & Social Justice	Public Health	Environmental Stewardship	Economic Prosperity	Authority	County Investment	Private Investment	Lead	Contributors
S-1: Retain and Increase Forests	Level TBD	Extreme Precipitation	+	++	++	+	County with Change	\$\$	\$	M-NCPPC	DEP, DPS
S-2: Retain and Increase Tree Canopy	Level TBD	Extreme Heat	+	++	++	++	County with Change	\$\$\$	\$	DEP, M-NCPPC	MCDOT
S-3: Restore and Enhance Meadows and Wetlands	Level TBD	Extreme Precipitation	+	++	++	++	County with Change	\$\$\$	\$	M-NCPPC	DEP
S-4: Regenerative Agriculture	Level TBD	High Winds	Neutral	+	+	Neutral	County with Change	\$\$\$	\$	OAG, M-NCPPC	DEP, MCGB
S-5: Restore Soil Fertility, Microbial Activity, and Moisture-Holding Capacity	Level TBD	Extreme Precipitation	Neutral	+	++	Neutral	County with Change	\$\$	\$\$	DEP	M-NCPPC, DHCA, OAG
S-6: Whole-System Carbon Management and Planning	Level TBD	Extreme Precipitation	Neutral	Neutral	Neutral	Neutral	County	\$	\$	DEP, M-NCPPC	OMB (CountyStat), DOF, WorkSource Montgomery

* While carbon sequestration actions will reduce County greenhouse gas (GHG) emissions, the level of emissions reduction is to be determined (TBD) and cannot be estimated without further study.

Quantifying GHG Emissions Reduction through Carbon Sequestration

Unlike quantifying carbon emissions from electricity, natural gas, transportation, or other sectors with discrete emission conversion factors such as those developed by the U.S. Environmental Protection Agency,¹⁰⁹ carbon sequestration is much more complex to quantify. One must account for factors such as the different varieties and maturities of trees and vegetation in Montgomery County as well as the soil types or wetland ecosystems in which they are planted, all of which impact the amount of carbon that can be sequestered. In addition, providing a baseline for sequestration can be challenging, since it is a measurement of negative emissions and is dependent upon natural systems as opposed to fixed infrastructure.¹¹⁰ There are significant uncertainties in these estimates, as discussed in the **Important Emissions Areas Outside of the GHG Inventory** section in the **Montgomery County Greenhouse Gas Emissions** chapter.

Scientific organizations and initiatives such as Project Drawdown are working to estimate the carbon sequestration potential of actions such as wetland restoration, forest restoration, and regenerative agriculture. These studies have generally concluded that regenerative agricultural practices sequester more carbon than traditional agricultural practices, mature forests sequester more carbon and avoid more emissions than young forests, and meadows and wetlands should be conserved and restored to optimize the County's carbon sequestration capacity.

Although the carbon sequestration potential of the recommended Climate Action Plan (CAP) actions has not been estimated, the County's land use activities can have a significant impact on remaining greenhouse gas (GHG) emissions, as described in the **Important Emissions Areas Outside of the GHG Inventory** section. The County is currently working to update the tree and forest sequestration data for the 2018 baseline inventory. This new information, combined with emerging research on the sequestration potential of other land use types, will help the County better quantify the sequestration potential of CAP actions in the future.



S-1

Retain and Increase Forests

Primary Benefit:



GHG Mitigation



Climate Risk Reduction –
Extreme Precipitation

Co-Benefits:

Racial Equity and Social Justice – Somewhat Positive
Public Health – Very Positive
Environmental Stewardship – Very Positive
Economic Prosperity – Somewhat Positive

Authority:

County – May Require Policy Amendment or New Policy

Investment Level:

County: \$\$
Private: \$

Development Stage:

In Progress

Lead:

M-NCPPC

Contributors:

DEP, DPS

Forests act as sinks for carbon dioxide emissions by sequestering and storing carbon in wood and soil. As with all nature-based solutions, it is essential for Montgomery County to prioritize the retention of existing forests to maintain the amount of carbon currently being sequestered annually and prevent emissions associated with tree loss. **The County must conserve existing forests rather than allow them to be converted into urban, suburban, or other non-forest areas.** Preventing the loss of any remaining forest land is critical, whether the loss is due to low-density sprawl in the Agricultural Reserve or the removal of small fragments of forest within high-density urban districts. Retaining forest land may require many tools, including design guidelines for redeveloping areas or public acquisition.

Retention of forests goes beyond limiting the loss of forests to urban sprawl, new infrastructure, or saving patches of trees in developed areas. Forests also need to be sustainably managed to ensure their long-term viability and increase their resilience to threats such as pests and invasive species. At the same time, management of pests themselves, such as the over-abundant populations of deer, gypsy moths and emerald ash borers, and pathogens including anthracnose and bacterial leaf scorch, is needed especially since these threats impact both forests and the urban canopy.

Supplemental plantings, including long-term maintenance to establish the new plantings, may be needed to maintain sufficient densities of trees within forests following disturbances by pests and other threats and should rely heavily on native species that are more likely be able to adapt to the County’s changing

EQUITY-ENHANCING MEASURES

- Prioritize the retention and expansion of all forests, particularly those in urban areas that provide access to residents living in vulnerable communities.
- Provide resources to maintain forest lands, including resources for sustainable management, invasive species management, and supplemental planting and forest establishment.
- Provide infrastructure improvements, such as transit stops, picnic tables, safe pathways, and lighting, to make urban forests truly accessible to all.
- Enhance the salvaged wood products industry in the County to increase job opportunities to retain and manage forests.

climate. For example, the over-abundance of deer and invasive species combined with the infestations of emerald ash borers that killed nearly all ash trees in the County have left some forests with insufficient numbers of mature trees and no seedlings to replace the dead ones.

Therefore, management, supplemental plantings, and maintenance are necessary to ensure the land remains as forest.

Existing programs, such as the Re-Leaf the Reserve Program,¹¹¹ should be expanded to augment actions to restore and enhance natural ecosystems.

These actions promote environmental stewardship and maintain, or even increase, carbon sequestration by forests. They should be applied to forests on County-owned properties, in parks, and on privately owned land. Outreach and education programs should be developed to raise awareness of the importance of forests as well as the need for sustainable forest management. The existing tree and forest conservation-related laws should be reviewed regularly to ensure they provide for adequate retention and mitigation and allow for sustainable management to meet the goals of the CAP. The County should enforce developer fees for tree removal to reduce the cost of implementing this action. The County will likely need to amend its land use and zoning laws and policies to implement this action.

One approach to implementing this action involves mobilizing private landowners – both residents and businesses – to work together to create contiguous microforests that are protected through conservation easements. Landowners could be incentivized through property tax reductions. Chandlers Yard in Baltimore exemplifies how neighbors can come together to create and protect shared green space.¹¹²

For this action to be successful, an accurate baseline measurement of the current percentage of forest cover in the County must be determined to enable the establishment of quantifiable goals and ensure accountability. Similar to the tree report cards developed by Casey Trees in Washington, D.C., baseline measurements should include details regarding the amount, distribution, health, and diversity in age and species of trees in County forests.¹¹³

Retaining well-managed forests has multiple co-benefits beyond carbon sequestration, including improved air and water quality, improved drinking water supplies, improved stormwater management, and enhanced biodiversity. Equitable access to nature, including forests, improves mental health and strengthens a community’s social fabric. This action promotes economic prosperity by creating job opportunities through forest stewardship planning, forest management, forest pest (including invasive species) management, and development planning and review activities.



Green spaces in my community help me feel like I’m surrounded by nature. They help me breathe cleaner air and escape the urban environment. I hope to see these spaces protected from future development that few people can afford to live in.

~ Resilience Ambassador Survey





S-2

Retain and Increase Tree Canopy

Primary Benefit:



GHG Mitigation



Climate Risk Reduction –
Extreme Heat

Co-Benefits:

Racial Equity and Social Justice – Somewhat Positive
Public Health – Very Positive
Environmental Stewardship – Very Positive
Economic Prosperity – Very Positive

Authority:

County – May Require Policy Amendment or New Policy

Investment Level:

County: \$\$\$
Private: \$

Development Stage:

In Progress

Lead:

DEP, M-NCPPC

Contributor:

MCDOT

Individual trees that are outside of forests also sequester and store carbon. **Montgomery County must retain and increase the tree canopy, which generally refers to trees outside of forests.** Tree canopy coverage is the area of land covered by the branches, twigs, and leaves of trees (see **Figure 15** for the County’s existing tree coverage). The collection of trees outside of forests, small groups of trees, and small remnant patches of forests in developed communities make up the urban forest. This action involves efforts to retain and plant trees on residential, commercial, and public properties.

The benefits of trees outside of forests, particularly those covering built surfaces, are as broad and important as the co-benefits of forests. Large-stature species of mature shade trees provide exponentially more co-benefits (including carbon sequestration) than smaller ornamental trees, and their retention must be prioritized. As with retaining forests, retaining the tree canopy allows for continued sequestration of carbon by trees and reduced emissions of carbon associated with their removal. As with adding forested land, retaining and adding tree cover in a built-out environment with competing interests presents significant challenges. For this action to be successful, an accurate baseline measurement of the current percentage of tree canopy in the County must be determined to enable the establishment of quantifiable goals and to

EQUITY-ENHANCING MEASURES

- Develop and implement an awareness campaign on Montgomery County’s various tree programs, including how to access them and what the associated benefits are.
- Develop educational materials in multiple languages.
- Prioritize the expansion of green corridors and green spaces in more urban areas where there is typically less tree cover and a higher concentration of vulnerable communities, which are more susceptible to urban heat island effects.
- Provide resources and training for urban forestry jobs, such as foresters, arborists, pruners, and landscape and nursery management experts, and for jobs in wood waste recovery and product development.
- Trees removed for property repairs and construction in public spaces should be replaced by the entity that removed the tree by default without requiring a request.

ensure accountability. Baseline measurements should include details regarding the amount, distribution, health, and diversity in age and species of trees in the canopy in parks and built-out environments. These would be similar to the tree report cards developed by Casey Trees in Washington, D.C.¹¹⁴

The County should focus on increasing the tree canopy by planting trees, particularly large shade trees, in areas where canopy cover is lacking, the amount of impervious surface is high, stream quality is poor, trees are being lost to development activity, or stormwater management is insufficient. The County should analyze and map communities that fall below tree canopy coverage goals, using tools such as the American Forests’ *Tree Equity Score tool* to prioritize enhancement and address inequities, with an emphasis on strategic provision of shade. Programs for long-term maintenance should also be developed.

In addition, green spaces, developed areas of local parks, and green infrastructure corridors should be planted with trees to the extent possible. Goals for percentage of area covered by a tree canopy should be set in the County’s master plans, and the County should strive to maximize canopy coverage and green space. Similarly, County-owned properties, public rights-of-way, and schools should be used to expand the tree canopy, and these enhancements must be reflected in Capital Improvement Program projects.

Preventing the loss of tree canopy is critical, whether the loss is due to development (in other words, conversion of land use), redevelopment (often referred to as “tear down and rebuild”), or natural causes such as storms, drought, or urban pollution. The County should adopt and continuously review applicable laws, incorporating the newest and best techniques to protect trees, forests, and soils when mitigation is required. The County should also continue to work with the State of Maryland to address stormwater management regulations that undervalue existing trees. To increase the

resilience of the County’s urban forest, long-term care is needed for routine maintenance, integrated pest management, watering during tree establishment and droughts, prevention and repair of storm damage, and replacement of trees removed. In addition, assistance with the removal of trees when they become hazardous could encourage retention of trees.

Retaining a diverse and well-distributed tree canopy provides a wide array of social and economic benefits, including reductions in energy use, enhanced business activity, reductions in the urban heat island effect, access to green space, microforests, and higher property values. The County should prioritize tree canopy increase and retention efforts along transit routes, especially those leading to food access points. These benefits and goals should be incorporated into the County’s master planning process. This action promotes economic prosperity by creating job opportunities through development planning and review, landscape and nursery management, and arboriculture activities.

“

Shade trees and trees in general help with keeping the area cooler.

Better tree coverage over houses and apartments to provide increased shading, including better shading over bus stops, might encourage more bus use and reduce traffic.

~ Resilience Ambassador Survey

.....”



S-3

Restore and Enhance Meadows and Wetlands

Primary Benefit:



GHG Mitigation



Climate Risk Reduction –
Extreme Precipitation

Co-Benefits:

Racial Equity and Social Justice – Somewhat Positive
Public Health – Very Positive
Environmental Stewardship – Very Positive
Economic Prosperity – Very Positive

Authority:

County – May Require Policy Amendment or New Policy

Investment Level:

County: \$\$\$
Private: \$

Development Stage:

In Progress

Lead:

M-NCPPC

Contributor:

DEP

Meadows and wetlands are also essential carbon sinks. Not only do these nature-based solutions (NBS) sequester and store carbon in the biomass, they also restore and build soils, provide habitat for declining species, and offer a wide array of co-benefits. **To increase the amount of carbon sequestered, Montgomery County and local partners should establish long-term plans to restore and enhance wetlands and meadows by 2035 in open spaces within the County, including parklands, sports fields and visitor centers.** Existing programs that support healthy conditions for meadows and wetlands should be expanded.

Because it is difficult to create these natural ecosystems, it is essential to establish and enlarge forested riparian and stream buffers, meadows, and wetlands. Supplemental planting to increase the density of native plants in ecosystems impacted by storms, disease, pests, and invasive species is also needed. Enhancing and creating forested wetlands should be included as part of this action where conditions support it, and equal weight should be given to retaining and expanding wetlands, given their value as carbon sinks and their positive co-benefit of flood mitigation. Long-term maintenance is needed to help ensure that newly planted projects become established in the face of the over-abundance of deer and invasive species.

Meadow retention and restoration are also essential. Not only do meadows sequester carbon, but they also restore and build soils, and provide much-needed habitat for the County’s declining meadow-dependent species, such as meadowlarks, goldfinches, shrews, voles, hawks, and many other species.

All establishment and restoration projects should rely heavily on native species that will likely be able to adapt to the County’s changing climate. All planting programs should implement planting plans with high numbers of stems per acre to increase the likelihood of successful establishment of plant communities. As part of this action, the County will need to review allowable plant management strategies across various habitat types and legislation around pesticides and other strategies.

EQUITY-ENHANCING MEASURES

Prioritize urban areas that are more accessible to residents, have more impervious surfaces and fewer natural resources, and are more prone to flooding.

This action promotes economic prosperity by creating job opportunities through development planning and implementation of programs, ecological restoration and landscape management, invasive species management, and arboriculture activities.



Balla Machree crop field with no-till wheat planted as a crop cover, a regenerative agriculture strategy.



S-4 Regenerative Agriculture

Primary Benefit:



GHG Mitigation



Climate Risk Reduction –
High Winds

Co-Benefits:

Public Health –
Somewhat Positive
Environmental
Stewardship –
Somewhat Positive

Authority:

County – May Require Policy
Amendment or New Policy

Investment Level:

County: \$\$\$
Private: \$

Development Stage:

In Progress

Lead:

OAG, M-NCPPC

Contributors:

DEP, MCGB

Montgomery County’s Agricultural Reserve, which was created to preserve farmland, has a unique and valuable role in providing local food and promoting carbon sequestration practices. **The County should work with local farmers to increase regenerative agriculture practices in the County.** Regenerative agriculture practices should be incentivized for farmers, such as: herbaceous field borders, reforestation in stream buffers, healthy soil practices (including use of compost on degraded soils), succession planting, cover crops, rotational grazing practices, no-till planting systems, and silvopasture systems (farms with forests that allow domesticated animals to graze and forage among them). These systems increase carbon sequestration on farmland while improving biodiversity, the water cycle, and natural ecosystems.

To support this, the County should work with the Montgomery County Green Bank to develop incentive financing and revolving loan funds to maximize local, sustainable agriculture efforts. In addition, the County is currently in conversation with the National Renewable Energy Laboratory for assistance in establishing an agrivoltaic demonstration site on County land to explore the viability of growing table crops and wine grapes (using regenerative agriculture practices) under and alongside ground-mounted solar panels. The goal of this demonstration is to advance the

science in the mid-Atlantic region so that farmers have more information regarding the risks and potential of agrivoltaics. Local farmers who lease private property or Maryland-National Capital Park and Planning Commission parkland should be included in these programs. The County will particularly need to incentivize the rebuilding of healthy soils in the conservation and stream valley parks and in the Agricultural Reserve, using transferable development rights (TDRs) in the Reserve.

EQUITY-ENHANCING MEASURES

- Launch this action through a pilot project partnership with local farmers to facilitate and incentivize the adoption of farming practices that are carbon-neutral and sustainable.
- To eliminate barriers to farming, prioritize incentives for lower-income farmers and Black, Indigenous, and People of Color (BIPOC) farmers based on need and in partnerships that encourage both tenant farmers and landowning farmers.

Strengthening the farmer-to-farmer information-sharing community, investing in the farm equipment rental program run by the Montgomery County Office of Agriculture (OAG), and supporting other programs to help farmers access resources will improve farming practices and reduce dependency on chemicals.

In addition, purchasing and replacing equipment through the farm equipment rental program, purchasing electric equipment, and replacing older equipment with all-electric options as they become available are important opportunities. The County should help create opportunities for farmers to sustainably harvest and sell products within the regional community in partnership with the Food Council, local farmer's markets, and community supported agriculture (CSA) programs.

The well-established farm community in the County is currently tracking existing regenerative practices that sequester carbon, most notably through forested buffers and herbaceous field borders. The County should work with the farm community to identify the current percentage of land being farmed using regenerative practices in order to establish a baseline, track progress, and create a target goal. This should include tracking the percentage of TDRs that have been sold to account for their implications for carbon sequestration. For this action to be successful in sequestering carbon as well as in encouraging local farmer participation, it will need to be further developed in close partnership with the County's agricultural community. For example, silvopasture systems—if not developed with appropriate resources for farmers—can be detrimental to commodity farmers because trees take up valuable crop ground and require regular maintenance. Likewise, livestock can damage trees and growing conditions in forests.

Food Security, Resilience, and Carbon Sequestration: Co-Benefits in Action

A changing climate will have devastating impacts on agriculture and food security as temperatures rise and rainfall patterns change. Sustainably farmed, local food has the co-benefits of sequestering carbon through the use of regenerative agriculture practices, reducing greenhouse gas (GHG) emissions associated with transporting agricultural products over long distances, and building greater self-sufficiency in the face of supply chain disruptions associated with climate change. The amount of agricultural land protected in Montgomery County through the Agricultural Reserve provides an enviable resource to address local food insecurity and help build community resilience. The County should work closely with the Montgomery County Food Council to maximize the potential for local food production, from the personal to the regional level. Subsidies and educational programs should be prioritized to expand community gardens, assist residents in growing their own food, establish edible microforests on public land, facilitate local food producers' ability to preserve and market their products, expand the County's [Land Link](#) program, and promote local food for all through the expansion of farmer's markets and community supported agriculture (CSA) programs. Resources and subsidy programs should be focused on providing affordable access to local food in food-insecure areas as an equity-enhancing measure. The County should provide incentives for farmers in the Agricultural Reserve to produce food crops for local-area consumption and encourage restaurants to purchase local produce. The County should develop a plan to expand shared processing facilities and shared commercial kitchens that allow for increased local food preparation and preservation.



S-5

Restore Soil Fertility, Microbial Activity, and Moisture-Holding Capacity

Primary Benefit:



GHG Mitigation



Climate Risk Reduction –
Extreme Precipitation

Co-Benefits:

Public Health –
Somewhat Positive
Environmental
Stewardship –
Very Positive

Authority:

County – May Require Policy
Amendment or New Policy

Investment Level:

County: \$\$
Private: \$\$

Development Stage:

In Progress

Lead:

DEP

Contributors:

M-NCPPC, DHCA, OAG

Healthy soils are an essential part of nearly all ecosystems, natural ones and built ones alike. In addition, healthy soils store carbon. To help restore and maintain the earth’s carbon, water, and energy cycles, the County should boost soil fertility, microbial activity, and moisture-holding capacity on all residential and agricultural properties throughout the County. By doing so, the County will maximize the carbon sequestration of its soils. **Montgomery County should consider implementing programs, policies, incentives, and investment of resources to support efforts to improve and manage soil health, such as biological nitrogen fixation, use of compost, or incorporation of cover crops.** The County will need to establish incentives, grant programs, and other financing options to support healthy soil efforts to sequester carbon.

For example, implementation of the County’s Strategic Plan to Advance Composting, Compost Use, and Food Scraps Diversion will be essential to enhance soil health.¹¹⁶ The plan includes specific recommendations for a diversified system for managing food scraps and food waste. All levels of composting must be implemented, including backyard, on-farm, and on-site composting, and collection of food scraps from the government, commercial, and residential sectors. The County will also need to establish

EQUITY- ENHANCING MEASURES

- Prioritize land that could be converted to community gardens, particularly in low-income and underserved communities.
- Coordinate with local partners to implement the Food Security Plan to divert food that can be consumed and used by food-insecure residents.¹¹⁵
- Provide financial support to low-income residents to build and maintain healthy soils in their yards and in local community gardens, and help designate and support those who will oversee garden management.
- Engage with residents to share the benefits of healthy soils, provide guidance on how to improve soil health, and ensure engagement efforts are undertaken in multiple languages.
- Ensure that municipal composting is available to apartment dwellers and community members who do not own land.

legislation in support of a countywide healthy soils program and review relevant state and local law to address the use of compost as a nutrient supplement for lawn care.

To expand efforts and amplify results, the County should launch a healthy soils campaign to engage and educate the public as well as other key stakeholders in the County. Building on the work of the Million Acre Challenge, the County should develop educational materials for farmers and gardeners on using winter cover crops and no-till practices, and on reducing or eliminating the use of chemicals to support and build healthy living soils that sequester more carbon than plowed and tilled soil.¹¹⁷ The County should also consider conservation easements which create large contiguous tracts and backyard buffers, and emphasize the associated tax benefits for residents.

The County should start an additional campaign to convert existing lawns into landscapes that better sequester carbon (for example, through biodiversity, composting, microforests, and food-producing gardens) and that provide added co-benefits to the community and the environment. The County should conduct a review of all local laws, including Homeowner's Association (HOA) covenants, to identify hurdles and develop template language for HOAs and local jurisdictions to support the goals of this action. Restoring soils in the County and planting native grass meadows will positively impact environmental stewardship by sequestering carbon, regenerating soil, and providing habitat for field and meadow species, in turn increasing wildlife biodiversity. To support this action and expand opportunities in green careers for local youth, including careers as tree climbers and licensed tree experts, the County should establish a partnership between the existing Conservation Corps and local educational institutions to offer training and develop expertise in green infrastructure, soil health, composting, and tree maintenance.



Improving soil health boosts carbon sequestration.



S-6

Whole-System Carbon Management and Planning

Primary Benefit:



GHG Mitigation



Climate Risk Reduction – Extreme Precipitation

Co-Benefits:

N/A – Planning Tool

Authority:

County – Can Be Implemented Under Existing Policy

Investment Level:

County: \$
Private: \$

Development Stage:

Proposed

Lead:

DEP, M-NCPPC

Contributors:

OMB (CountyStat), DOF, WorkSource Montgomery

Montgomery County should identify management and planning tools to strategically pursue whole-system, nature-based solutions that comprehensively measure societal and economic benefits along with carbon sequestration and biodiversity benefits. Through these tools, which would facilitate carbon management initiative planning, the County could leverage a multitude of opportunities related to innovative financing, education, job creation, and workforce development. As a sequestration project is being developed, these tools could help identify the full breadth of benefits associated with forests and trees and open up new funding and partnership opportunities as well as complementary outreach, education, entrepreneurial, and career development programming that currently exists or that should be developed.

The County is currently reviewing the new *Decision Support Tool* created by the Trust for Public Land in partnership with the Urban Drawdown Initiative. The tool is designed to help jurisdictions plan urban forest expansion projects, using overlay data such as flood zones, carbon sequestration, tree canopy, and impervious surfaces. The tool will help reveal and measure the broad environmental, health, economic, and equity-related benefits and, as a result, stimulate cross-departmental and cross-sector collaboration both within County

Government as well as across the community at large. The tool can be used by the Planning Department during the sector and master-planning processes. In addition, this tool can help to identify existing and complementary funding sources, such as those earmarked for water quality protection and stormwater management, that also sequester carbon. Innovative financing opportunities could also be revealed, including participation in programs such as City Forest Credits in which private investors purchase carbon offsets tied to tree planting, reforestation, and the retention and protection of threatened forests currently unprotected from conversion.

EQUITY-ENHANCING MEASURES

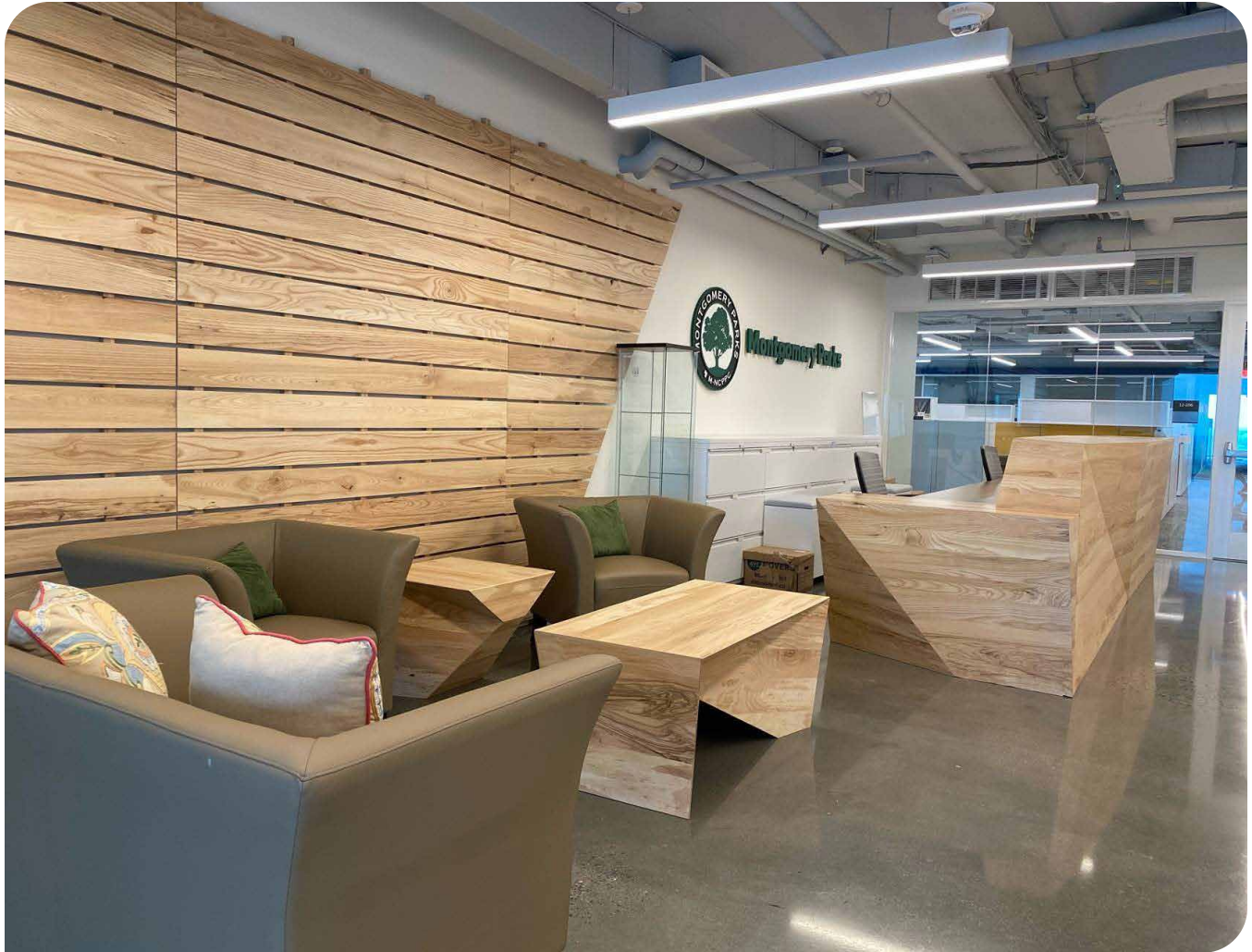
- Prioritize tree planting and management in more urban areas, where there is typically less tree cover and a higher concentration of vulnerable communities.
- Ensure workforce development is focused on groups experiencing high unemployment levels; promote jobs for these groups and provide new skills training.

To guide implementation for all the sequestration actions, the County should create a County Carbon Sequestration Task Force or Advisory Committee consisting of local experts and land stewards, as well as economic development and health professionals. The County should apply a whole-system approach to all restoration and sustainability efforts, from forests to meadows and wetlands.

Locking up Carbon in Salvaged Wood – A Whole-System Approach

Creating and supporting a local wood economy by salvaging “waste” wood from deconstruction projects, “fresh cut” wood from tree maintenance work, dead trees removed from public or private property, and cleanup in the wake of storms offers an exciting opportunity to generate jobs and “lock up” carbon by repurposing it into furniture and building materials. For example, the Montgomery Parks Arboriculture section’s Urban Wood Utilization project takes wood from dead trees removed on parkland and mills the wood with a portable bandsaw mill into lumber for use on Montgomery Parks projects. Montgomery Parks was able to use wood from thousands of ash trees killed by the emerald ash borer to provide lumber to construct unique furniture and architectural details at their new LEED Platinum headquarters building. The project is one component of Montgomery Parks’ larger Green Waste Recycling Program, which creates a closed-loop system to recycle 100% of the green waste generated in parkland. The [Baltimore Wood Project](#) is a good example of such an effort on a broader scale and could possibly be replicated countywide, building on Montgomery Parks’ existing efforts.

As a first step, Montgomery County should conduct a detailed assessment of the flow of waste wood, collecting data on the cycle of dead standing wood through to its final uses, whether as chipped wood, repurposed wood into commercial products, or other uses. This will provide insight into how much wood is collected by the County as well as by private companies, and help identify opportunities for increasing the use of salvaged wood for the highest durable goods possible (such as furniture production) and for decreasing carbon emissions from burning and rotting wood, creating a closed-loop, whole-system approach. Such information would also help the County understand the potential for the production of biochar, a charcoal produced from the controlled burning of wood and plant matter, which offers promising carbon sequestration benefits when used as a soil amendment. Storing carbon in salvaged wood has the added co-benefit potential for job creation in deconstruction, wood milling, and carpentry.



The new Montgomery Parks headquarters, outfitted with locally -sourced, salvaged ash wood that had to be cut down due to the ash borer beetle



SAVE
THE
BAY





Climate Adaptation Actions

Montgomery County is equipped with the resources and infrastructure to withstand the impacts of climate change.

- Prioritize people and communities that are the most vulnerable and the most sensitive to the impacts of climate change.
- Provide suitable infrastructure and tools to reduce the risks and impacts of more extreme climate hazards.
- Protect public health from climate-driven impacts.



Climate Adaptation Actions

Montgomery County’s Climate Action Plan (CAP) is an integrated plan designed to reduce greenhouse gas (GHG) emissions to slow the future impacts of climate change as well as reduce those impacts and adapt to those changes. The County and the entire globe are already experiencing the social, environmental, and economic impacts of a changing and more extreme climate. For this reason, the County must equip itself with the resources and infrastructure to withstand these impacts. Vulnerable populations disproportionately experience the impacts of climate change, and the County should therefore prioritize implementing adaptation actions that will support its people and communities that are the most vulnerable and sensitive to the impacts of climate change in terms of exposure, sensitivity, and adaptive capacity.

Specifically, the County must reduce the risks and impacts associated with its primary climate hazards: extreme heat, extreme precipitation, high winds, and drought. Extreme heat poses threats to human and animal health, natural resources and ecosystems, agriculture, and infrastructure. Extreme precipitation and high winds lead to damaged physical assets and ensuing human health threats, including mold growth and accumulation of dust and particulate matter. Drought is a threat to agriculture, natural resources, the urban landscape, and the water supply. Climate adaptation actions are outlined in **Table 15**.

Please refer to the **Racial Equity and Social Justice** chapter for more information on the historical context and current conditions associated with systemic racism and environmental injustices, and how these relate to climate adaptation.

Table 15: CAP climate adaptation actions

Action	Climate Risk Reduction	Racial Equity & Social Justice	Public Health	Environmental Stewardship	Economic Prosperity	Authority	County Investment	Private Investment	Lead	Contributors
A-1: Water Infrastructure Resilience	Extreme Precipitation	+	++	+	Neutral	Outside County	\$	\$	WSSC Water	DEP, municipalities, DC Water
A-2: Repair and Enhancement of Stormwater Conveyance Systems	Extreme Precipitation	+	+	+	Neutral	County	\$\$\$	\$	MCDOT	DPS, M-NCPPC
A-3: Temperature Monitoring and Alerts	Extreme Heat	++	+	Neutral	Neutral	County with Change	\$\$	\$	OEMHS	HHS
A-4: Extreme Weather Energy Efficiency Building Code	Extreme Heat	+	+	Neutral	Neutral	County with Change	\$\$\$	\$\$	DPS	DHCA, MCGB
A-5: Climate-Adapted Housing Incentives/Subsidies	Extreme Heat	+	++	Neutral	+	County with Change	\$\$\$	\$	DHCA, DEP	MCGB, DPS
A-6: Green/Cool/PV Roof and Pavement Code	Extreme Heat	--	++	+	++	County with Change	\$\$	\$\$\$	DPS	DHCA, MCGB

Action	Climate Risk Reduction	Racial Equity & Social Justice	Public Health	Environmental Stewardship	Economic Prosperity	Authority	County Investment	Private Investment	Lead	Contributors
A-7: Green Public Spaces	Extreme Precipitation	Neutral	+	++	Neutral	County with Change	\$\$\$	\$	DEP, MCDOT	DPS, M-NCPPC
A-8: Harden Emergency Shelters and Install Resilience Hubs	Extreme Heat	++	++	Neutral	Neutral	Outside County	\$\$\$	\$	HHS	DGS, OEMHS, MCPS, FRS, DPS
A-9: Mold Protection and Remediation	Extreme Precipitation	++	++	Neutral	+	County with Change	\$\$\$	\$\$	DHCA, DPS	DEP, MCGB
A-10: Green Infrastructure	Extreme Precipitation	Neutral	+	++	Neutral	County with Change	\$\$\$	\$\$	DPS, DEP	MCDOT, M-NCPPC
A-11: Climate Adapted Development Standards	Extreme Precipitation	+	+	Neutral	Neutral	County with Change	\$\$\$	\$\$\$	DPS	DGS, DEP
A-12: Stormwater Retention Credit Trading	Extreme Precipitation	Neutral	+	+	Neutral	County with Change	\$\$	\$	DEP	M-NCPPC, DPS
A-13: Ban Stormwater Management Requirement Waivers	Extreme Precipitation	Neutral	+	+	-	County with Change	\$	\$\$	DPS	M-NCPPC, DEP
A-14: Update Floodplain Maps	Extreme Precipitation	Neutral	Neutral	Neutral	Neutral	County with Change	\$\$	\$	DPS, OEMHS	M-NCPPC
A-15: Water Supply Protection	Drought	+	++	++	Neutral	County with Change	\$\$\$	\$	DEP, WSSC Water, M-NCPPC	Municipalities
A-16: Flood Rescue Resources	Extreme Precipitation	+	+	Neutral	+	County	\$\$\$	\$	FRS, MCPD, MCDOT	DGS, OEMHS, PIO, municipal police departments
A-17: On-Site Water Reuse	Drought	+	Neutral	+	Neutral	Outside County	\$\$	\$	DPS, WSSC Water	Municipalities
A-18: Expanded Community Gardens	Drought	+	++	+	+	County with Change	\$	\$	M-NCPPC	MCPS, OAG, HHS
A-19: Advocacy for Off-River Water Storage	N/A	Neutral	Neutral	Neutral	Neutral	Outside County	\$	\$\$\$	DEP, WSSC Water	OIR
A-20: Study Potential for Buildings in the County to Flood and Possible Remedies	N/A	Neutral	Neutral	Neutral	Neutral	County	\$\$	\$	DEP, OEMHS	DPS



A-1

Water Infrastructure Resilience



Primary Benefit:



Climate Risk Reduction – Extreme Precipitation

Co-Benefits:

Racial Equity and Social Justice – Somewhat Positive
 Public Health – Very Positive
 Environmental Stewardship – Somewhat Positive

Authority:

Outside County – Requires County Collaboration with Other Public or Private Entities or Is Outside County Authority

Investment Level:

County: \$
 Private: \$

Development Stage:

Proposed

Lead:

WSSC Water

Contributors:

DEP, Municipalities, DC Water



Water and wastewater supply and treatment depend on reliable distribution systems, such as pumps, to move water where gravity flow is not possible. **Montgomery County should increase the resilience of water and wastewater pumps by physically hardening them from flooding, by ensuring proper access for emergency crews (particularly in storm events), and by tying them to backup electrical generation that is either dedicated to the pumps or connected to building backup generation.** The County should first conduct a comprehensive assessment of all water and wastewater pumping stations in Montgomery

County for baseline conditions and risk of energy disruption. The County should then prioritize pump resilience projects by age of the pumping infrastructure and risk exposure. Implementation of this action will require close coordination with the Washington Suburban Sanitary Commission (WSSC) and other municipal water and wastewater utilities. The County should implement a review process to ensure that infrastructure meets or exceeds current stormwater management standards each time infrastructure is exposed for repairs or reconstruction. This action would promote public health by increasing the resilience of the County’s potable water supply and wastewater distribution.



Students paint County storm drains to promote water quality protection and infrastructure resilience.



A-2

Repair and Enhancement of Stormwater Conveyance Systems

Primary Benefit:



Climate Risk Reduction – Extreme Precipitation

Co-Benefits:

Racial Equity and Social Justice – Somewhat Positive
 Public Health – Somewhat Positive
 Environmental Stewardship – Somewhat Positive

Authority:

County – Can Be Implemented Under Existing Policy

Investment Level:

County: \$\$\$
 Private: \$

Development Stage:

Ongoing

Lead:

MCDOT

Contributors:

DPS, M-NCPPC

Montgomery County’s storm drain infrastructure is aging, and many of the metal pipe culverts, which channel water under roads or trails to facilitate stormwater runoff while protecting surfaces from erosion and flooding, were installed in the 1960s through the 1990s and have reached the end of their useful life. The County developed an asset inventory of its culverts with condition assessments and recently launched a funding program for both systematic and emergency replacement of these pipes and culverts.¹¹⁸

Continued identification and repair of damaged or failing culverts and outfalls in the County will help ensure the long-term performance and safety of roads and trails that County residents rely on for driving, walking, and biking—particularly as residents are encouraged to shift from single-occupancy vehicles to active transit modes. The County review process mentioned as part of **Action A-1** should identify progress in infrastructure repairs in vulnerable areas of the County so that they are brought to parity with other areas. **In addition, the County should consider upsizing drainage infrastructure**

in flood-prone areas – being mindful of the natural ecosystem as well as regulatory requirements related to potential impacts to 100-year floodplain elevations for downstream properties – to accommodate the increased volume, intensity, duration, and frequency associated with climate change. The County should encourage management of stormwater on-site to reduce runoff and extend the useful life of culverts.

Repairing and enhancing stormwater conveyance systems (including culverts and outfalls) promotes public health by increasing the safety of roadways and paths, and they support environmental stewardship by facilitating the natural watershed. This action also promotes racial equity and social justice by improving the safety and connectivity of transportation routes in the County.



Some roads, especially during storms, dip low, and they have flash flooding. If there are certain areas that are more prone to flash flooding, the County needs to warn people or stay on top of those places when there are major storms.

~ Resilience Ambassador Survey



EQUITY-ENHANCING MEASURES

Earmark culvert and outfalls funding for areas most in need (for example, areas that lack appropriate infrastructure), especially if they are in or near vulnerable communities.



A-3

Temperature Monitoring and Alerts

Primary Benefit:



Climate Risk Reduction – Extreme Heat

Co-Benefits:

Racial Equity and Social Justice – Very Positive
Public Health – Somewhat Positive

Authority:

County – May Require Policy Amendment or New Policy

Investment Level:

County: \$\$
Private: \$

Development Stage:

Proposed

Lead:

OEMHS

Contributor:

HHS

Montgomery County’s existing Emergency Operations Plan accounts for heating and cooling centers, and the Extreme Temperature Plan accounts for extreme temperature alerts and communications and is already updated once or twice a year. This plan outlines four levels of extreme temperature alerts and the criteria for issuing these alerts, which are issued by the Office of Emergency Management and Homeland Security (OEMHS). The Department of Health and Human Services (HHS) is responsible for checking in with health care facilities, nursing homes, and shelters to ensure that systems are operational or address challenges prior to an extreme temperature event; however, temperature and air quality alerts and communications should be incorporated into public emergency plans.¹¹⁹ **To enhance the County’s Extreme Temperature Plan procedures, the County could also deploy a uniformly distributed network of small temperature and humidity sensors (HOBO loggers or their equivalent) to monitor heat and accurately report extreme temperatures through the alert systems. The County could also host urban heat campaigns on hot summer days with community partners.** This effort involves equipping volunteers with heat-sensitive devices to collect data related to heat intensity and distribution in the County.

There are opportunities to partner with the National Integrated Heat Health Information System, the National Oceanic and Atmospheric Administration, and the Centers for Disease Control and Prevention (CDC) on this effort.

The County could also collaborate with county CDC and the State of Maryland Health Department to adopt expanded health surveillance and early warning systems to monitor and predict climate change impacts.

This action could reduce extreme heat-related and extreme cold-related mortality and illness, and thus would promote public health. It would also promote equity by collecting data on temperatures across the County and by fairly distributing heating and cooling center options to residents across the County during extreme temperature events.



It’s hard to breathe with the humid weather. People can pass out and end up in the hospital with high bills.

~ Resilience Ambassador Survey





A-4

Extreme Weather Energy Efficiency Building Code

Primary Benefit:



Climate Risk Reduction – Extreme Heat

Co-Benefits:

Racial Equity and Social Justice – Somewhat Positive
Public Health – Somewhat Positive

Authority:

County – May Require Policy Amendment or New Policy

Investment Level:

County: \$\$\$
Private: \$\$

Development Stage:

Proposed

Lead:

DPS

Contributors:

DHCA, MCGB

Energy demand (the rate of electricity that customers draw from the grid) can spike during extreme weather events, particularly during periods of extreme heat and heightened air conditioning use. During extreme climate events, it is important that grid electricity be prioritized for critical facilities (for example, nursing homes, and hospitals) that need electricity to sustain life.

The County should consider adopting building codes that require new or renovated non-critical facilities to install measures for shaving residential building energy consumption by a certain percentage during extreme weather events.

Consideration should be given to incorporating resiliency measures into the International Green Construction Code. Energy demand management through automated building controls, microgrids, and/or battery storage can reduce overall demand from the electric grid, conserving available electricity supply for critical services (for example, ventilators, and medication refrigeration) or to be rerouted to areas with damaged distribution lines or electrical equipment. The County should target enforcement of these new building codes in areas that are the most susceptible to climate hazards (see **Appendix C**) and that have critical

facilities and aging infrastructure. This action would promote public health by reducing the risk of harm from electrical outages or a strained electrical supply, and it would promote racial equity and social justice by prioritizing electricity during extreme weather events for the vulnerable populations who need it most (for example, the sick or elderly who rely on electricity for cooling, medical equipment, medication refrigeration, and other needs).

EQUITY-ENHANCING MEASURES

- Adopt county codes and standards requiring climate-adapted housing and development in targeted susceptible areas or areas with critical facility power needs.
- Develop an incentive and/or subsidy program for financial support to landlords and low-income homeowners to retrofit buildings with energy efficiency adaptive technologies (see **Action A-5**).



A-5

Climate-Adapted Housing Incentives/Subsidies

Primary Benefit:



Climate Risk Reduction – Extreme Heat

Co-Benefits:

Racial Equity and Social Justice – Somewhat Positive
 Public Health – Very Positive
 Economic Prosperity – Somewhat Positive

Authority:

County – May Require Policy Amendment or New Policy

Investment Level:

County: \$\$\$
 Private: \$

Development Stage:

Proposed

Lead:

DHCA, DEP

Contributors:

MCGB, DPS

To support installation or retrofits of buildings with climate adaptive technologies, Montgomery County should consider providing incentives or subsidies for residents of low-income housing and rental properties to reduce energy and water use, reduce waste heat, and minimize urban heat gain. Climate adaptive technologies can include green roofs, energy-efficient air conditioning and refrigeration systems, operable windows for natural ventilation, battery storage with solar photovoltaics to replace traditional fossil fuel-based generators, or electric backup power to air conditioning to maintain safe indoor temperatures and humidity levels during extreme heat events or power outages caused by hot weather. The County should collaborate with the existing Water Quality Protection Charge rebate program to subsidize climate-adaptive measures that promote water quality (for example, green roofs) through existing funding sources. The program should prioritize promotion and subsidizing of the installation of energy-efficient air conditioning in low-income housing and rental properties, particularly properties without air conditioning or with underperforming air conditioning, to reduce the risk from extreme heat. Many of these recommendations could be incorporated into the County’s International Green Construction Code and incorporated into the proposed Sustainability Permit concept. The Department of Permitting Services (DPS) is currently working to obtain authorization through emergency legislation that would enable it to implement processes such as continuous commissioning through a Sustainability

Permit, which already incorporates green roofs and electric backup power for air conditioning. This approach will give DPS the authority to verify climate adaptive technology system effectiveness beyond the initial installation evaluation.

This action would promote public health by supporting measures that would lead to improved indoor air quality and reduction of impacts from weather hazards. The action would increase economic prosperity by kick-starting jobs to install climate adaptation housing measures. In addition, this action would support racial equity and social justice by helping low- or moderate-income residents or property owners to afford installing climate adaptation measures in residential buildings.

EQUITY-ENHANCING MEASURES

Prioritize incentives for buildings with aging, inefficient infrastructure in targeted low-income areas that are the most susceptible to climate change (for example, buildings in the floodplain or in an urban heat island).



Everyone needs adequate heating and cooling in our homes.

~ Resilience Ambassador Survey





A-6

Green/Cool/PV Roof and Pavement Code

Primary Benefit:



Climate Risk Reduction – Extreme Heat

Co-Benefits:

Racial Equity and Social Justice – Very Negative
 Public Health – Very Positive
 Environmental Stewardship – Somewhat Positive
 Economic Prosperity – Very Positive

Authority:

County – May Require Policy Amendment or New Policy

Investment Level:

County: \$\$
 Private: \$\$\$

Development Stage:

Proposed

Lead:

DPS

Contributors:

DHCA, MCGB

Montgomery County should update its residential and commercial building code to require all existing and new roofs to be (1) green roofs, with native plants or vegetables and soil deep enough to support them, (2) house solar photovoltaic (PV) systems tied to the building, or (3) cool/albedo roofs. The building code should prioritize green roofs or rooftop solar PV panels over cool roofs. Due to limitations in scale and regulation of residential roofs, this would most likely be implemented in commercial settings. In addition, the County should update the residential and commercial building code to require all paved surfaces to be cool or cool permeable pavement, but with an awareness that a high Solar Reflectivity Index on ground and pedestrian surfaces can be a nuisance or even hazardous to visibility. Performance goals

should be incorporated into code requirements for permit approval. For example, qualifying cool roof materials should have a minimum initial solar reflectance¹²⁰ and a minimum thermal emittance and owners who build green roofs or permeable pavement should be required to submit a plan and schedule for regular maintenance. The County should update the International Green Construction Code to require the Department of Permitting Services to periodically review a site inventory and plant list. The County follows the State’s Department of Natural Resources program for native and invasive species.

This action would promote public health by reducing the urban heat island effect (when urban areas have more extreme temperatures than their natural surroundings because of



When there’s new office buildings, put in the mandate that you have to have a green roof to help absorb some of the rainwater.

~ Resilience Ambassador Survey



EQUITY-ENHANCING MEASURES

Provide financial assistance via incentives or subsidies to low-income households, small and minority-owned businesses, and others who may lack the financial means to upgrade their roof or pavement. Incentives should be progressive (in other words, there should be a greater incentive for those with lower levels of income).

building materials and impervious pavement that cannot absorb solar heat). The action would improve environmental stewardship by increasing urban greening, stormwater management, and distributed renewable energy. Also, this action would promote economic prosperity by creating jobs in solar PV systems and green and cool roof

installation and maintenance. This action would negatively impact racial equity and social justice because adhering to codes would require costly investments and upgrades. The County would need to provide financial support to low-income households and small and minority-owned businesses through subsidies or other means.



Among other benefits, green roofs reduce the urban heat island effect and increase urban greening.



A-7

Green Public Spaces

Primary Benefit:



Climate Risk Reduction – Extreme Precipitation

Co-Benefits:

Public Health – Somewhat Positive
 Environmental Stewardship – Very Positive

Authority:

County – May Require Policy Amendment or New Policy

Investment Level:

County: \$\$\$
 Private: \$

Development Stage:

Proposed

Lead:

DEP, MCDOT

Contributors:

DPS, M-NCPPC

Montgomery County should update green public space and streetscape design standards to require cool-colored permeable surfaces, wider bike lanes and sidewalks, and a substantial percentage of vegetation cover, which can include canopy cover trees, understory trees suitable for planting in stormwater management facilities, planter boxes, rain gardens, grass swales, and wide, vegetated rights-of-way that retain and filter stormwater. Each new area master plan undertaken should address the appropriate shading and cooling of public spaces to reduce the urban heat island effect. The County Department of Environmental Protection leads an ongoing Green Streets project to promote low-impact development strategies to reduce and filter stormwater, and the Department of Transportation also includes Green Street design standards.¹²¹

Green public spaces and streetscapes provide multiple public health benefits, including reduced heat island effects, improved air quality from increased urban greening, improved pedestrian and biker safety, access to food and gardens, and improved water quality from greater stormwater management and natural water filtration. In addition, green streetscapes benefit environmental stewardship by managing stormwater flow, expanding urban greening, and increasing access to nature.

EQUITY-ENHANCING MEASURES

- Target green infrastructure practices to areas with the most need and allow residents in areas with the most need to submit a request to determine if their properties qualify.
- Trees removed for property repairs and construction in public spaces should be replaced by the entity that removed the tree by default without requiring a request.



A-8

Harden Emergency Shelters and Install Resilience Hubs

Primary Benefit:



Climate Risk Reduction – Extreme Heat

Co-Benefits:

Racial Equity and Social Justice – Very Positive
Public Health – Very Positive

Authority:

Outside County – Requires County Collaboration with Other Public or Private Entities or Is Outside County Authority

Investment Level:

County: \$\$\$
Private: \$

Development Stage:

Proposed

Lead:

HHS

Contributors:

DGS, OEMHS, MCPS, FRS, DPS

Providing key, centralized resource hubs for residents via emergency shelters and resilience hubs can be a more feasible alternative to hardening (in other words, strengthening infrastructure to better withstand hazards) an entire community against changing climate. **Montgomery County will need to harden existing emergency shelters, homeless shelters, and cooling centers (for example, relocate or elevate shelters in flood-prone areas or add building envelope measures to protect shelters from flood and wind hazards) as well as expand the number of extreme weather emergency shelters to support County residents whose homes are damaged in weather events or who do not have homes.** By improving and increasing the County’s network of emergency shelters and cooling centers, the County can better ensure that there are adequate facilities and protections for homeless and displaced populations during extreme cold, extreme heat, or severe storm events.

To support residents whose homes are still structurally sound but that lose utility service in weather events, the County should consider installing resilience hubs.

Resilience hubs are public facilities such as schools, libraries, recreation centers, community centers, parks or open space with a microgrid —a system of distributed energy resources (for example, solar photovoltaic and battery backup) that can island from the grid and provide continuous power during outages. Resilience hubs provide a reliable source of electricity, potable water, and heating

EQUITY-ENHANCING MEASURES

- Prioritize placement of shelters and resilience hubs based on need and the vulnerability of communities (for example, the homeless are one of the most vulnerable groups impacted by extreme weather, given their exposure). Ensure that shelters and resilience hubs are designed with an emphasis on safety and that there are personnel dedicated to making all temporary residents or users feel safe and secure. Shelters should focus on the entire experience of the resident.
- Resilience hubs should also include charging stations for life-saving medical equipment and potable water.
- The County should consider adding more shelters to strengthen services in vulnerable areas. **Figure 34** shows the location of existing shelters in the County in communities with social vulnerability concerns (a Social Vulnerability Index [SVI] greater than 0.5). These are general locations, and the specific sites will need to be defined in the future, but this illustrates that there is a potential need for more shelters in areas with an SVI greater than 0.5.

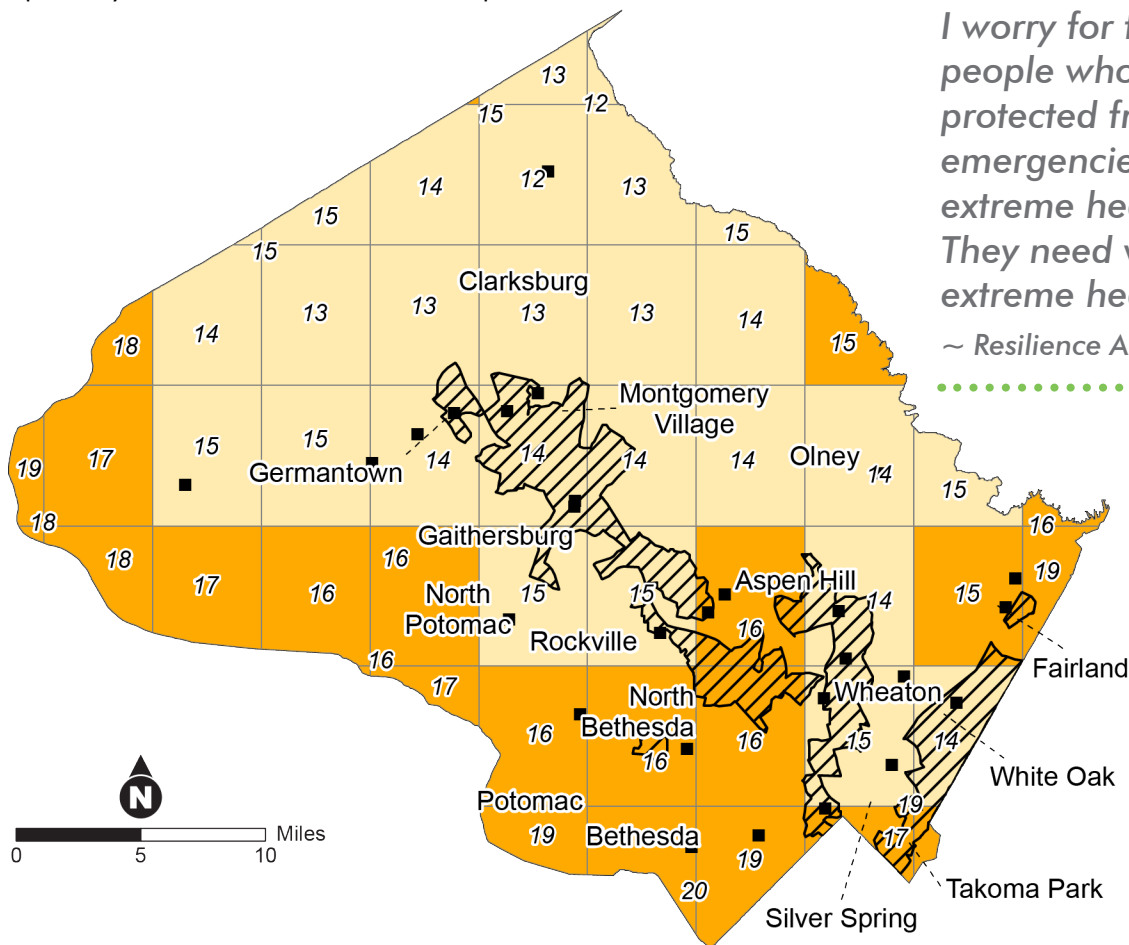
and cooling. At the hubs, residents can access essential resources (for example, electricity for charging cell phones or clean water for those with broken distribution pipes), while they continue to use their home infrastructure. The County should explore various uses for resilience hubs, such as hubs for temporary food distribution during emergencies.

During extreme heat events, resilience hubs can provide life-saving cooling to community members who are vulnerable to heat (for example, elderly populations). If the County decides to install resilience hubs in schools, the County will need to collaborate with Montgomery County Public Schools to identify schools that are optimally located outside of the floodplain and

then retrofit the selected schools with microgrids and adequate utility and security resources.

Both emergency shelters and resilience hubs can augment the resilience of a community while leveraging existing infrastructure. This action would positively contribute to public health by providing continued essential services to residents for communication, sanitation, and refrigeration (for example, for medicines). In addition, it would have a positive racial equity and social justice impact by supporting vulnerable groups that lack shelter, heating, or cooling, or whose homes or utilities are impacted by hazard events.

“
I worry for the homeless people who need to be protected from climate emergencies, especially extreme heat and cold. They need water during extreme heat.
 ~ Resilience Ambassador Survey
 ”



Days with Max Temp Above 95°F - RCP 8.5 2050
 Increase from Model Baseline (days) ■ Emergency Shelters
 10 - 15
 15 - 20
 Area with SVI > 50%

Figure 34: Projected increase in days per year >95°F for 2050 and climate scenario RCP 8.5 outlining areas ranked in the top 50% most vulnerable by the CDC SVI, showing existing County emergency shelters



A-9 Mold Protection and Remediation

Primary Benefit:



Climate Risk Reduction – Extreme Precipitation

Co-Benefits:

Racial Equity and Social Justice – Very Positive
 Public Health – Very Positive
 Economic Prosperity – Somewhat Positive

Authority:

County – May Require Policy Amendment or New Policy

Investment Level:

County: \$\$\$
 Private: \$\$

Development Stage:

Proposed

Lead:

DHCA, DPS

Contributors:

DEP, MCGB

Mold growth is a persistent health issue in buildings without humidity control. Extreme flooding often comes to mind when considering precipitation hazards, yet nuisance flooding and the ensuing mold growth pose a larger, more regular threat to the health and safety of Montgomery County residents. **The County should adopt a building code that requires landlords to install protections against building flooding (particularly in basements) and to reduce mold within a specific time frame after flooding events.** Flood and mold protections can include requiring construction with Federal Emergency Management Agency-approved flood-damage-resistant materials,¹²² requiring dehumidification to maintain building humidity below 70%, stipulating regular heating, ventilation, and air conditioning (HVAC) system duct and filtration cleaning and maintenance, or requiring door and window sealants to protect against stormwater intrusion. The County could enforce these requirements as part of drainage design criteria and building permitting and/or as part of rental housing licensing and inspections. The County should develop an incentive program to provide financial support to those landlords who may have difficulty with financing for procuring and installing stormwater drainage systems and building floodproofing.

This action would positively impact public health by reducing exposure to mold and associated pulmonary health issues. This action would also create job opportunities for stormwater management and mold protection and remediation services. In addition, this action promotes racial equity and social justice by helping ensure that all residents are protected from exposure to mold and by reducing the economic harm incurred by remediating mold growth.

EQUITY-ENHANCING MEASURES

- Require landlords to install protections against basement flooding and to reduce mold issues in housing within a certain time frame after being identified by the Office of Landlord-Tenant Affairs. Provide financial assistance for landlords that demonstrate need.
- Develop an educational campaign on the issue of basement flooding and mold. Make sure that the awareness campaign and materials are developed in multiple languages.



A-10 Green Infrastructure

Primary Benefit:



Climate Risk Reduction – Extreme Precipitation

Co-Benefits:

Public Health – Somewhat Positive
 Environmental Stewardship – Very Positive

Authority:

County – May Require Policy Amendment or New Policy

Investment Level:

County: \$\$\$
 Private: \$\$

Development Stage:

Planned

Lead:

DPS, DEP

Contributors:

MCDOT, M-NCPPC

Montgomery County should adopt codes to require green infrastructure practices for new and existing properties, including native plantings, rain gardens, green corridors, runoff retention, and other nature-based ways to reduce and naturally filter runoff on private and public properties. Natural green solutions such as organic grass are preferable to artificial materials such as synthetic turf. The County should also adopt codes to limit impervious concrete surfaces, especially in County-funded projects. For example, sidewalks, driveways, and parking lots should be constructed to reduce runoff, ponding, and flooding that overwhelm the storm sewer system. To support a green infrastructure code update, the County should expand its existing RainScapes program, which promotes and provides technical assistance and financial rebates for conservation landscaping that reduces stormwater runoff and maximizes carbon sequestration.¹²³

Efforts should be made to cooperate with the Planning Department’s existing Green Infrastructure map, which is focused on connecting gaps in existing green corridors to create networks of natural resources that support air quality, water quality, flood control, stormwater attenuation, wildlife corridors, habitat, and passive recreation. This action could be developed and implemented in conjunction with actions promoting gray water reuse and green roof installations. The County should explore

ways to incorporate stormwater management standards for landscapes at the time of property transfer.

Increased green infrastructure would improve water quality beyond required Municipal Separate Storm Sewer System (MS4) Permit levels through increased water retention and filtration and would improve air quality through filtration from additional trees and vegetation. In addition to increasing water and air quality, green infrastructure would reduce the urban heat island effect, contributing to improved public health. The County should explore whether stronger requirements than the State’s MS4 Permit need to be implemented.

This action would promote environmental stewardship by supporting the natural watershed, preserving the quality of stream and river habitats, and increasing vegetation in urban areas. The Department of Transportation’s Capital Improvement Program projects the need to continue including green infrastructure and identifying opportunities to expand the use of green infrastructure to support this action.



A-11 Climate-Adapted Development Standards

Primary Benefit:



Climate Risk Reduction – Extreme Precipitation

Co-Benefits:

Racial Equity and Social Justice – Somewhat Positive
Public Health – Somewhat Positive

Authority:

County – May Require Policy Amendment or New Policy

Investment Level:

County: \$\$\$
Private: \$\$\$

Development Stage:

Proposed

Lead:

DPS

Contributors:

DGS, DEP

Most building codes in the United States—including Montgomery County’s code, which is adopted from the International Building Code—require design of facilities to the 100-year flood, which is set by National Flood Insurance Program (NFIP) flood maps. These maps show the risk of flooding from riverine drainage areas. Overland flooding is expected to become worse in future years because precipitation events will become higher intensity events that can overwhelm infrastructure and when combined with impervious cover, cause flooding. As sea level rises and precipitation events increase with climate change (see **Figure 35**), the 100-year flood (the flood event with a 1% chance of occurring annually) is becoming more common. What is more, NFIP flood maps are not updated on a regular, chronological basis. To counter this, municipalities such as Austin, Texas, and Washington, D.C., which are in areas prone to increased flooding and extreme precipitation, are redesignating their 500-year storm as their 100-year storm to increase new construction infrastructure resilience.

Another climate adaptation measure beyond updating the design flood event is elevating mechanical and electrical equipment above the base flood elevation. This was a key lesson learned from Hurricane Sandy in 2012. During Hurricane Sandy, critical electrical equipment (for example, breaker boxes, building connections, elevator service, and/or backup generators) located in basements or on the ground floor of buildings was inaccessible because of the flooding and was also damaged by the water.

To account for increased precipitation and more intense storms, the County should update building codes to require stormwater design to the 500-year storm. The County should also require floodproofing, mechanical and electrical equipment to be located above the base flood elevation, and backup electrical and water feeds. At a minimum, the County should require implementation of these building code updates for existing and new critical facilities, including emergency shelters and resilience hubs. Updating the building code to account for changing climate and to incorporate lessons learned from historical extreme weather events is a proactive way to increase community resilience. The County should also eliminate exceptions that allow altering elevations in order to build in the floodplain. The County should provide financial support mechanisms for retrofitting existing buildings to landlords who may have difficulty financing these retrofits.

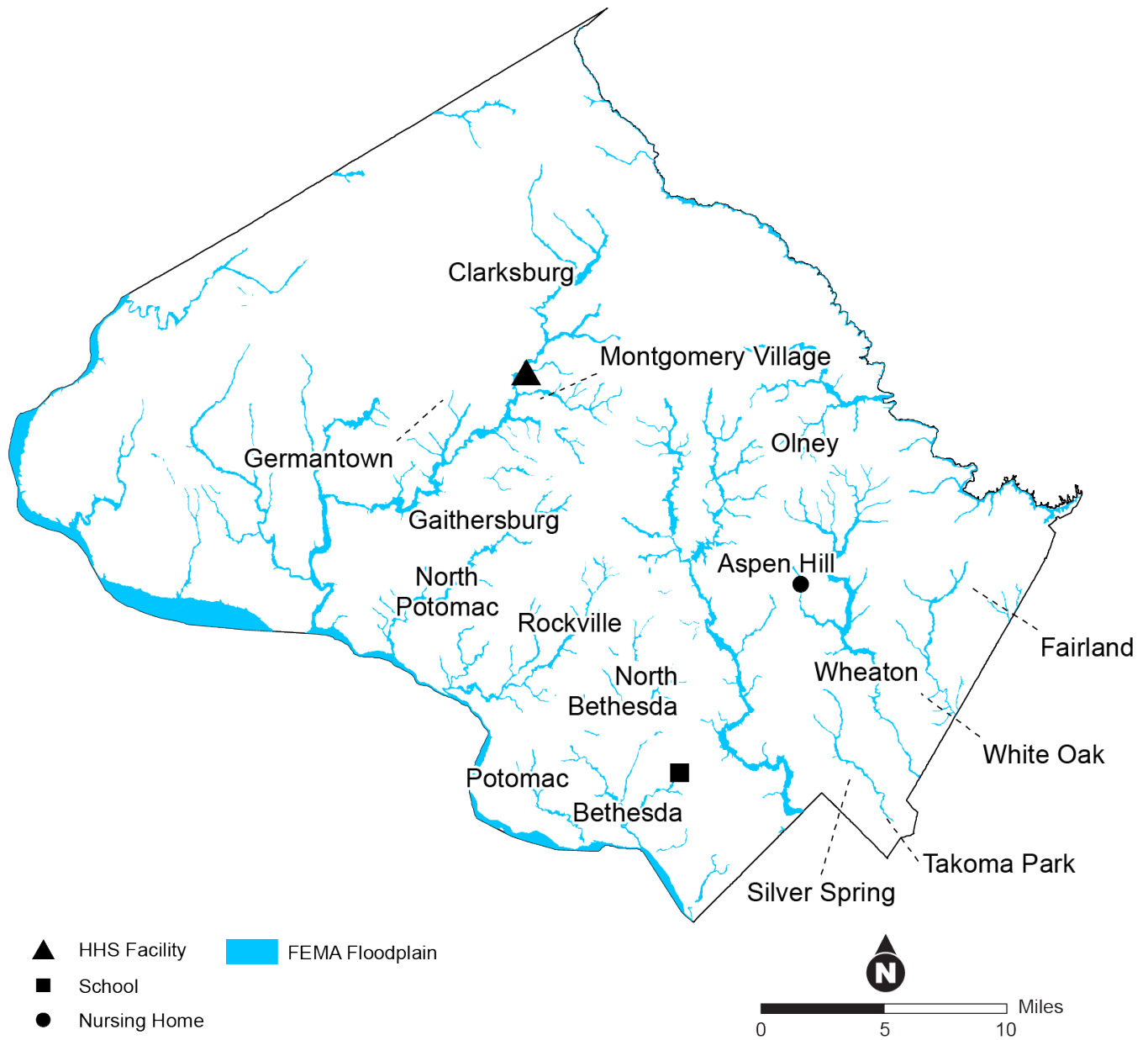


Figure 35: Critical Montgomery County facilities within the floodplain (three total)

Action G-7 covers updating statistics and maps in order to account for climate change in County plans, codes, operations and policies, including building and infrastructure codes.

This action would promote public health by protecting, at a minimum, critical infrastructure from extreme precipitation damage, thus reducing County residents' risk of harm or death from extreme flooding events.



A-12 Stormwater Retention Credit Trading

Primary Benefit:



Climate Risk Reduction – Extreme Precipitation

Co-Benefits:

Public Health – Somewhat Positive
 Environmental Stewardship – Somewhat Positive

Authority:

County – May Require Policy Amendment or New Policy

Investment Level:

County: \$\$
 Private: \$

Development Stage:

Proposed

Lead:

DEP

Contributors:

M-NCPPC, DPS

In 2014, Washington, D.C., launched a Stormwater Retention Credit Trading Program that allows development projects to meet a portion of the District's stringent stormwater management requirements by purchasing credits for stormwater retained on other property that exceeds its own requirements.¹²⁴ The trading program incentivizes voluntary installations of green infrastructure, such as rain gardens or bioswales, which slow stormwater runoff and naturally filter stormwater.

Montgomery County could establish its own Stormwater Retention Credit Trading program to enable third-party project developers to earn revenue for reducing stormwater runoff by installing green infrastructure or removing impervious surfaces. The trading program could be managed in conjunction with the Water Quality Protection Charge incentive program to offer a suite of credit and revenue funding opportunities for stormwater management projects.

This action would contribute to public health by reducing runoff flooding from impervious surfaces and by improving water quality through natural stormwater filtration. This action would also promote environmental stewardship by supporting the natural watershed and increasing urban greening if rain gardens or water-retaining native vegetation are planted.

EQUITY-ENHANCING MEASURES

Structure a stormwater retention credit program such that more credit or incentives are given for retaining stormwater on or near the development site. Stormwater retention credit trading programs can allow developers who are unable to install or afford on-site stormwater management enhancements to comply with regulations by buying stormwater retention credits and installing green infrastructure off-site; however, this can lead to unintended consequences, such as supporting economic development in more affluent communities at the expense of development in low-income communities. If the program is not equitably structured, developer targeting can result in a loss of land available for economic development projects in low-income communities.



A-13

Ban Stormwater Management Requirement Waivers

Primary Benefit:



Climate Risk Reduction – Extreme Precipitation

Co-Benefits:

Public Health – Somewhat Positive
 Environmental Stewardship – Somewhat Positive
 Economic Prosperity – Somewhat Negative

Authority:

County – May Require Policy Amendment or New Policy

Investment Level:

County: \$
 Private: \$\$

Development Stage:

Proposed

Lead:

DPS

Contributors:

M-NCPPC, DEP

In 2007, the State of Maryland passed the Stormwater Management Act, which required developed areas to mimic “woods in good condition” land (to properly capture, filter, and manage stormwater flow).¹²⁵ To meet the requirements of this act, in 2010 Montgomery County incorporated environmental site design standards into its building code. These standards require developers to capture a set amount of stormwater on-site, using a combination of stormwater management system options, including rain barrels, pervious pavement, rain gardens, and landscaping; however, stormwater management waivers are provided in certain cases.¹²⁶ The County also does not require stormwater management for minor land-disturbing activities.¹²⁷ Because County infrastructure projects sometimes receive waivers, this will have cost implications, such as more extensive use of existing rights-of-way for stormwater mitigation improvements.

The County should develop a portfolio of methods to address stormwater, including evaluating storm drain capacity, minimizing impervious surfaces, and revising the building code to ban stormwater management requirement waivers for new construction or renovated sites. In addition, the County should revisit the definition of minor land-disturbing activities to ensure that all development that impacts the watershed is monitored and is balanced by installing stormwater management systems.

This action promotes public health by reducing the risk of harm from erosion or flooding, and it promotes environmental stewardship by supporting the natural watershed and urban greening.



A-14 Update Floodplain Maps

Primary Benefit:



Climate Risk Reduction – Extreme Precipitation

Co-Benefits:

N/A – Enabling Action

Authority:

County – May Require Policy Amendment or New Policy

Investment Level:

County: \$\$
Private: \$

Development Stage:

Proposed

Lead:

DPS, OEMHS

Contributor:

M-NCPPC

Montgomery County’s floodplain maps are set using National Flood Insurance Program Federal Emergency Management Agency floodplain maps, but not all areas in the County are included. **The County should update its floodplain maps to the 30-acre watershed and map small drainage areas that are currently unmapped. The County should ensure that development permits are not issued without a Natural Resources Inventory that includes the requirement to delineate (in other words, map) unmapped floodplains in the vicinity of the proposed development.** By increasing the accuracy and coverage of its floodplain maps and using these maps in permitting and urban planning, everyone in the County will be

able to better prepare for and design to avoid flood hazards. As floodplain maps are updated to the 30-acre standard, the areas impacted will increase in size, affecting Department of Transportation Capital Improvement Program projects and increasing stormwater management demands.

This action promotes racial equity and social justice by equally mapping the entire County, which will increase transparency through the availability of data for flood mitigation design and maintenance. Requiring unmapped floodplains in the vicinity of proposed development to be mapped would help expedite inclusive mapping of all areas in the County.



A-15 Water Supply Protection

Primary Benefit:



Climate Risk Reduction – Drought

Co-Benefits:

Racial Equity and Social Justice – Somewhat Positive
 Public Health – Very Positive
 Environmental Stewardship – Very Positive

Authority:

County – May Require Policy Amendment or New Policy

Investment Level:

County: \$\$\$
 Private: \$

Development Stage:

Proposed

Lead:

DEP, WSSC Water, M-NCPPC

Contributors:

Municipalities

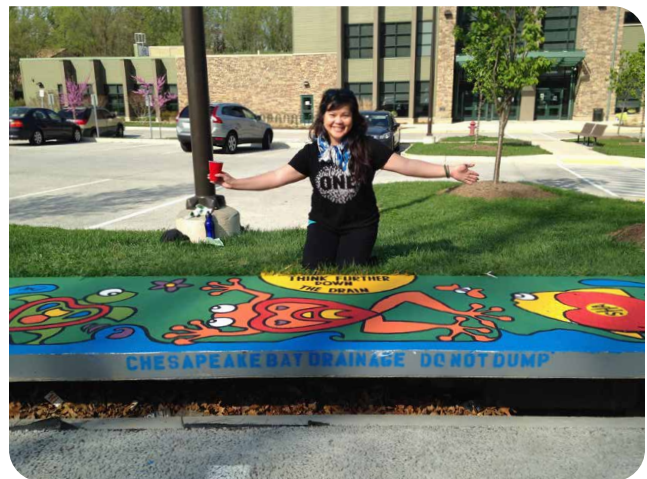
Montgomery County should protect existing water supply aquifers and watersheds by increasing land protections and stream corridor revitalization efforts.

The Washington Suburban Sanitary Commission Department of Water (WSSC Water) provides the majority of public water and sewer service in Montgomery County.¹²⁸ Most of WSSC Water’s public water supply comes from the Potomac River, followed by the Patuxent River. The Town of Poolesville sources its water from municipal groundwater wells, fed by a sole source aquifer. Stream corridor revitalization efforts could include banning or capping fertilizers or conducting regular watershed flow maintenance to decrease sediment build-up, remove bacteria, and reduce excess nutrients. Land protection measures could include forest conservation and stream restoration as well as stormwater management requirements to naturally filter harmful substances and better regulate flow. Protective measures should be put in place for all water supply sources listed above as well as for Little Seneca Lake in Black Hill Regional Park and the Monocacy River and Anacostia River, which flow into the Potomac River.¹²⁹

The Montgomery County Department of Environmental Protection (DEP) and the Maryland-National Capital Park and Planning Commission (M-NCPPC) have their own biological monitoring programs that continue to monitor and protect watersheds and measure the effectiveness of stormwater management retrofits.

To protect the county's drinking water infrastructure, the County should prioritize restoration work on streams based on each stream's relative position to the County's drinking water supply.

This action positively contributes to public health by increasing water supply resilience and protecting drinking water sources. It contributes to environmental stewardship by protecting watersheds and water bodies in the County.



Storm drain painting designs to encourage watershed stewardship.



A-16 Flood Rescue Resources

Primary Benefit:



Climate Risk Reduction – Extreme Precipitation

Co-Benefits:

Racial Equity and Social Justice – Somewhat Positive
 Public Health – Somewhat Positive
 Economic Prosperity – Somewhat Positive

Authority:

County – Can Be Implemented Under Existing Policy

Development Stage:

Proposed

Lead:

FRS, MCPD, MCDOT

Investment Level:

County: \$\$\$
 Private: \$

Contributors:

DGS, OEMHS, PIO, municipal police departments

Montgomery County should assess and increase flood first-response resources, including swift-water rescue, vehicles that can navigate high water, and the trained personnel available to respond to flood events. The County should install automated roadway sensors for roads prone to or at risk of flooding. Immediately before and during extreme precipitation events, these sensors could emit alerts to drivers driving on or planning to drive on such roads, either physically via caution signs and lights and/or online via Google Maps or other map navigation applications and through the Alert Montgomery alerting system. Proper implementation of this action will require close coordination with the Office of Emergency Management and Homeland Security (OEMHS).

This action would increase public health by minimizing residents’ risk of drowning or harm during flood events. Investing in additional flood first-response personnel and in installing physical and/or web-based automated roadway sensors would create job opportunities. Finally, this action would promote racial equity and social justice by increasing resources for flood rescue and support across the County.

EQUITY-ENHANCING MEASURES

- Develop an educational campaign on flood risks. Ensure the educational campaign is developed in multiple languages.
- Compare the location of vulnerable communities with existing flood emergency response routes and resource locations to ensure that vulnerable communities will be adequately served in flood events. For example, **Figure 36** shows the location of roads that often flood near areas of social vulnerability concern (SVI greater than 0.5), which tend to be close to Silver Spring and Wheaton. Improvements in these intersections to reduce their flooding potential will benefit mobility in these communities.

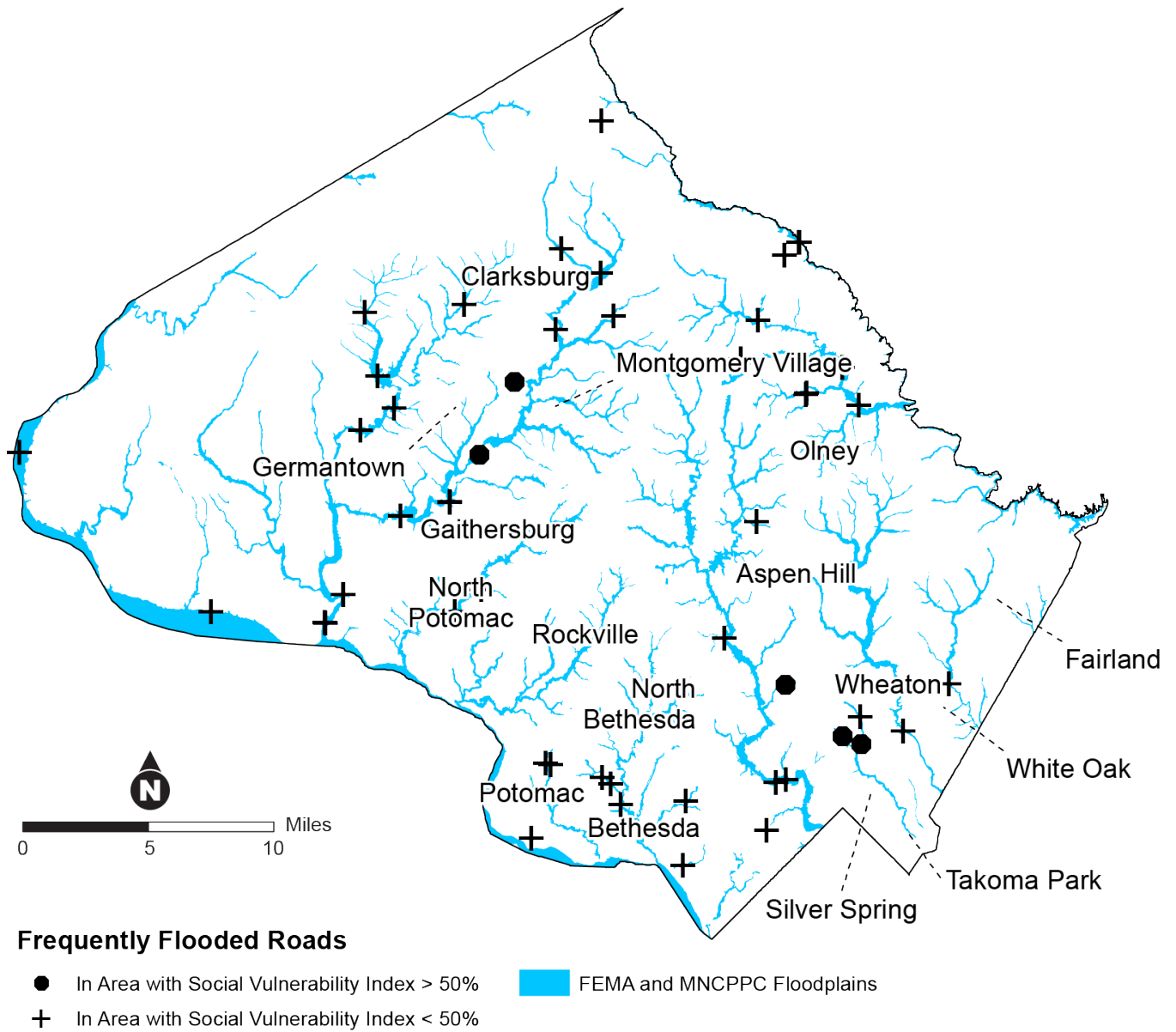


Figure 36: Location of roads in the County that experience frequent flooding, near areas of social vulnerability concern



A-17 On-Site Water Reuse

Primary Benefit:



Climate Risk Reduction – Drought

Co-Benefits:

Racial Equity and Social Justice – Somewhat Positive
 Environmental Stewardship – Somewhat Positive

Authority:

Outside County – Requires County Collaboration with Other Public or Private Entities or Is Outside County Authority

Investment Level:

County: \$\$
 Private: \$

Development Stage:

Proposed

Lead:

DPS, WSSC Water

Contributors:

Municipalities

Gray water is the relatively clean used water from baths, sinks, washing machines, and some kitchen appliances that is typically discharged for water treatment directly after use. **Ideally, Montgomery County should modify the building code to allow for gray water reclamation and reuse in residential and commercial buildings to provide an auxiliary water supply and reduce demand on the County’s treated potable water supply and well water.** The County could require on-site reuse of water from gray water or from collected rainwater for irrigation in new and existing residential and commercial buildings, for toilet flushing in new residential and commercial buildings, and for certain industrial processes that do not require high-quality potable water. Along with this action, the County should expand existing Department of Environmental Protection programs (for example, the County’s RainScapes Program) and develop additional programs for water capture and reuse to encourage and provide resources for on-site water reuse. Currently the County does not have authority over gray water or water efficiency measures; that authority lies with Washington Suburban Sanitary Commission Department of Water (WSSC Water). The Department of Permitting Services (DPS) is

currently drafting language for an emergency bill to enable DPS to have authority over these items through the International Green Construction Code. The recommendations in this action should be added to the International Green Construction Code. The County would need to coordinate with WSSC Water and other municipal water/wastewater utilities for safe implementation of this action after authority is obtained and, with DPS, develop a streamlined permitting process.

This action would promote environmental stewardship by reducing strain on the watershed, and it would positively impact racial equity and social justice by reducing water costs and increasing water resilience.

EQUITY-ENHANCING MEASURES

Prioritize building code implementation and water capture and reuse program resources and marketing in areas that are most susceptible to drought or in areas that are not connected to the potable water supply (for example, rural areas that are reliant on personal water wells).



A-18 Expanded Community Gardens

Primary Benefit:



Climate Risk Reduction – Drought

Co-Benefits:

Racial Equity and Social Justice – Somewhat Positive
 Public Health – Very Positive
 Environmental Stewardship – Somewhat Positive
 Economic Prosperity – Somewhat Positive

Authority:

County – May Require Policy Amendment or New Policy

Investment Level:

County: \$
 Private: \$

Development Stage:

Proposed

Lead:

M-NCPPC

Contributors:

MCPS, OAG, HHS

Community gardens offer accessible, affordable land for residents to connect with nature and to grow food for personal consumption or to sell locally. Montgomery County has an existing community gardens program with 12 gardens across the County and more than 600 local gardeners who grow vegetables and flowers in rented individual plots and maintain the gardens through community workdays.

The County should partner with communities and organizations such as the Montgomery County Conservation Corps to create and promote more community-run gardens in urban and suburban areas as one way to combat food insecurity in the County and to reduce farm-to-table distance. By expanding the number and location of community gardens, more County residents would have a way to feed themselves and their families and could take advantage of increased connection to nature, connectivity with a community of gardeners, a potential source of income, and fresh, local, and affordable food.



I want to see a community garden for my community to grow closer together.

~ Resilience Ambassador Survey



EQUITY-ENHANCING MEASURES

- Create and promote more community gardens in areas where residents face food insecurity because of affordability and lack of access. Prorate annual plot rental fees based on income levels. Allocation of plots should prioritize low-income applicants.
- Provide gardening education, seeds, and gardening equipment in these same target areas.
- Develop an awareness campaign to promote community gardens, including how to access them, their associated benefits, and the support services that are available. Develop awareness campaign materials in multiple languages.
- Provide incentives to property owners for the development of community gardens, such as those implemented in San Diego, California.¹³⁰



A-19 Advocacy for Off-River Water Storage

Primary Benefit: Enabling Action	Co-Benefits: N/A – Advocacy	Authority: Outside County – Requires County Collaboration with Other Public or Private Entities or Is Outside County Authority	Development Stage: Proposed
		Investment Level: County: \$ Private: \$\$\$	Lead: DEP, WSSC Water
			Contributor: OIR

Community water resilience largely depends on the availability and quality of the potable water supply. Most of Montgomery County’s potable water comes directly from the Potomac and Patuxent rivers.¹³¹

The County should support the creation of off-river water storage and/or recover aquifers no longer in use to increase the resilience of the drinking water supply.

This action will require coordination with regional water supply utilities and federal and state regulators. One possible future location for off-river storage is the Travilah Quarry in Rockville—a crushed stone quarry that is planned to eventually be a water supply reservoir with a capacity to supply the region with raw water during times of drought. With an estimated 60 more years of useful life, the Travilah Quarry may be infeasible in the immediate term for off-river water storage; however, the County could assess and advocate for similar solutions in viable locations.

This action would promote public health by adding redundant water supply in case of water contamination or deficit in any of the County’s three major water sources. Building off-river water storage would also create jobs and thus promote economic prosperity. This would also indirectly benefit vulnerable groups by increasing the resilience of the County’s potable water supply. Note that **Action A-15**, which focuses on protection of the water supply, would support this action.

EQUITY-ENHANCING MEASURES

Ensure off-river water storage is near vulnerable groups, such as poor rural communities.



A-20

Study Potential for Buildings in the County to Flood and Possible Remedies

Primary Benefit:

Enabling Action

Co-Benefits:

N/A –
Enabling Action

Authority:

County – Can Be
Implemented Under
Existing Policy

Development Stage:

Proposed

Lead:

DEP, OEMHS

Investment Level:

County: \$\$
Private: \$

Contributor:

DPS

While building code and permitting climate adaptation measures can protect new or retrofitted buildings, existing buildings remain susceptible to extreme precipitation events. **Montgomery County should evaluate the potential of existing buildings in the County to flood. The County should commission a study to identify issues, challenges, and best practices regarding flood-prone homes.** The study should consider various options, including retrofits, low-interest loan programs, buyouts, and/or the possibility of a cooperative flood insurance fund for low-income homeowners. The study should also include information resources for homeowners.

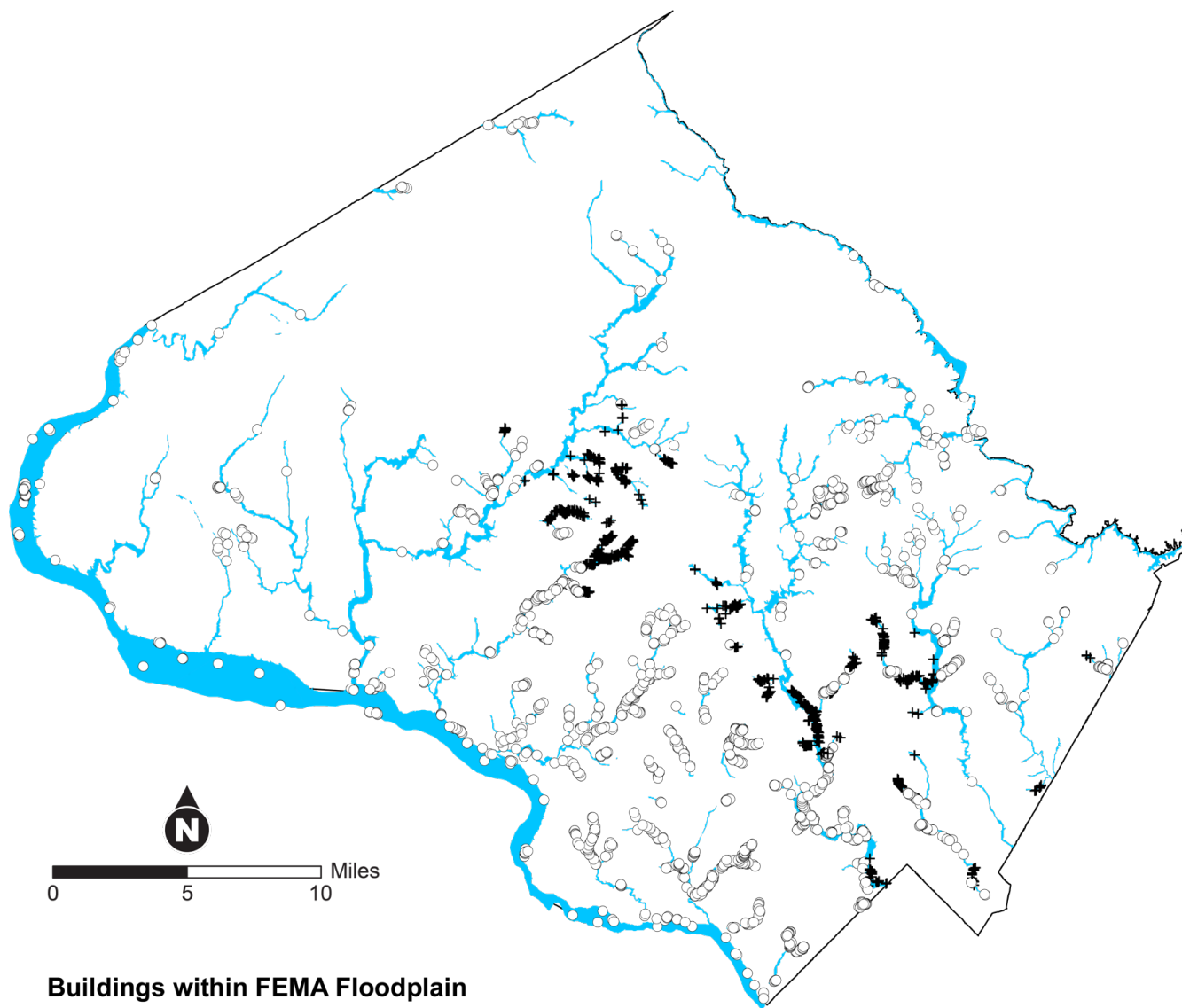
This measure would explore flood protection options for businesses and residences or potentially remove residences from the risk of harm from catastrophic flooding. If retrofits are pursued, the County should consider and reduce potential unintended consequences. For example, if building doors and cracks are sealed, increased stormwater drainage should be added so that runoff water has a route to flow away from the building property.

This action promotes racial equity and social justice by exploring options for residents who are vulnerable to extreme flooding and assessing equitable ways to reduce the risk. For example, vulnerable residents in these areas may not be able to afford flood insurance, in which case relocation may be a more effective way to reduce their risk.

Action G-16 recommends conducting more fine-tuned climate resilience assessments in order to develop climate resilience projects to harden or relocate key assets in the County.

EQUITY-ENHANCING MEASURES

Ensure programs are conducted in an equitable manner. Provide extra support for vulnerable groups in the form of moving assistance or financial training. **Figure 37** shows areas of social vulnerability concerns (Social Vulnerability Index [SVI] greater than 50%) within the Federal Emergency Management Agency floodplain that may contain houses eligible for buyouts. **Table 16** shows the percentage of buildings in the County within the floodplain and in areas of social vulnerability concerns. These areas are primarily located in the urban core of the County and along the Interstate 270 corridor.



Buildings within FEMA Floodplain

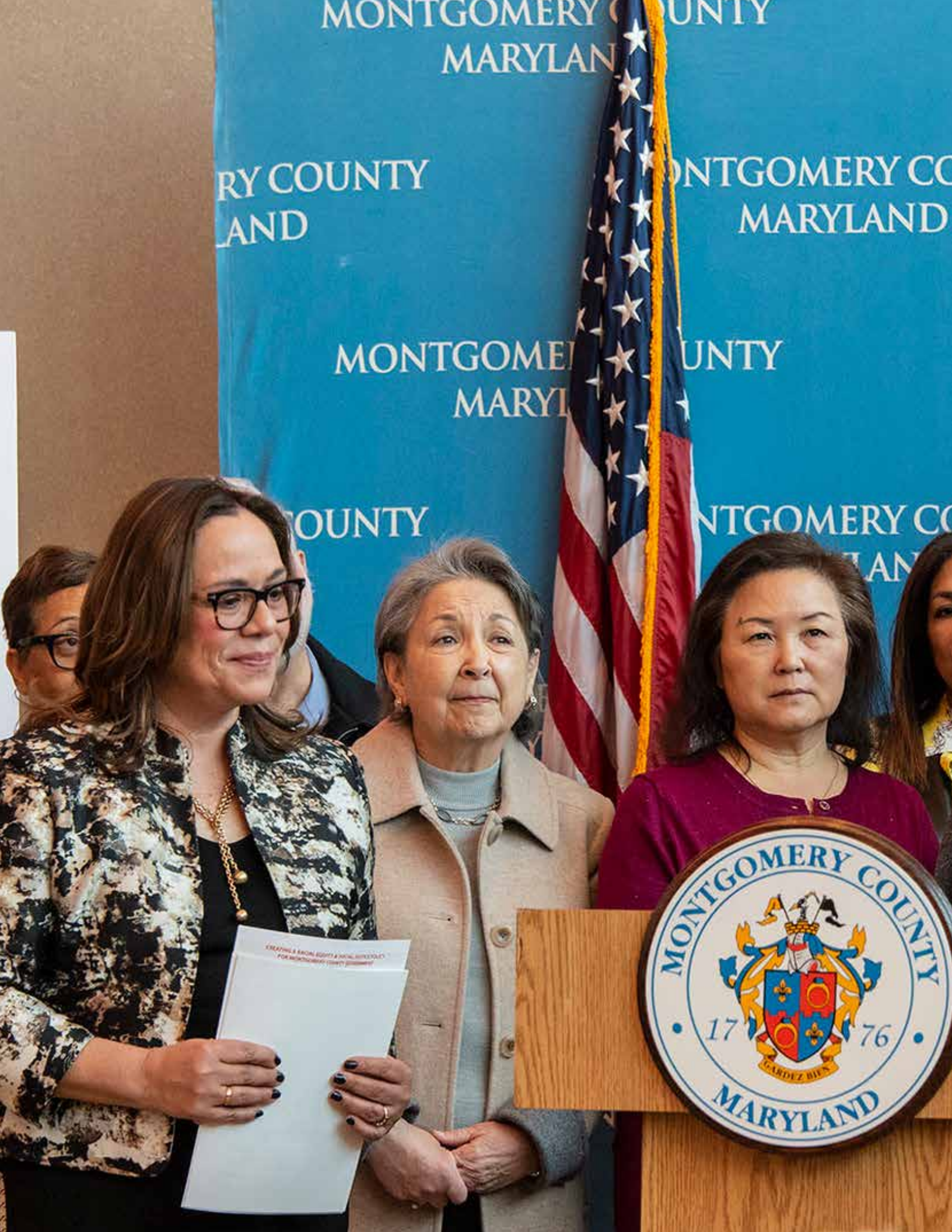
- + In Area with Social Vulnerability Index > 50%
 - In Area with Social Vulnerability Index < 50%
- FEMA Floodplain

Figure 37: Buildings in the County within the floodplain and in areas of SVI > 50%

Table 16: Buildings in Montgomery County within the floodplain and in areas of SVI > 50%

	Building Count	Percentage of Total Buildings in County within Floodplain (Total: 3,726)	Percentage of Total Buildings in County (Total: 404,057)
Buildings in Floodplain and Area with SVI > 50%	1,299	35%	0.32%
Buildings in Floodplain and Area with SVI < 50%	2,427	65%	0.60%

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Climate Governance Actions

Montgomery County has institutionalized an organizational culture and structure that fosters creativity, cross-departmental collaboration and innovation to implement systemic climate solutions.

- Align and orient staffing, technical capacity, processes and decision-making to address climate change.
- Embed continuous improvement and accountability into ongoing work.
- Use all policy and process levers of government to spark the multiplier effect.



Climate Governance Actions

Combatting climate change requires an organizational backbone. Climate governance refers to organizational structure and culture, staffing, and technical capacity as well as processes and decision-making that will strengthen Montgomery County's role as a climate leader. The actions in this section will help to institutionalize climate change considerations in Montgomery County Government (MCG) operations. Implementing climate governance will also foster opportunities for creativity, collaboration, and innovation among MCG staff and community partners to implement climate solutions.

MCG has a small team of interdepartmental staff working on climate issues. To successfully achieve Montgomery County's climate goals, the ranks of MCG staff who work directly on climate issues must be expanded; at the same time, the resources across all of County Government and the community must be leveraged to support this cause. Climate governance actions are outlined in **Table 17**. The full set of Technical Workgroup recommendations from which the CAP climate governance actions were developed is provided in **Appendix B**.

The climate governance actions fall into three broad categories:

- Enhance climate change awareness, knowledge, and technical capacity among MCG staff.
 - » Actions **G-1, G-2, G-3, G-4, G-6**
- Foster opportunities for creativity, collaboration, and innovation among MCG staff and community partners to implement climate solutions.
 - » Actions **G-5, G-6, G-12**; also the public engagement, partnerships, and education actions
- Institutionalize climate change considerations into MCG processes and decision-making, and implement approaches to measure and report on progress.
 - » Actions **G-7, G-8, G-9, G-10, G-11, G-12, G-13, G-14, G-15, G-16**

The following overview presents how MCG is currently structured to facilitate climate initiatives across departments:

- **Climate Change Officer:** This position serves in the Office of the County Executive and provides overarching leadership and coordination of climate initiatives across MCG.
- **Climate Planning Team:** This is an interdepartmental team consisting of staff at the Department of Environmental Protection (DEP), the Department of Transportation (DOT), Office of Emergency Management and Homeland Security (OEMHS), and the Climate Change Coordinator. This team is responsible for the development of the Climate Action Plan (CAP) and public engagement and outreach functions related to climate action. Climate interns and fellows also participate in the Climate Planning Team.
- **Climate Leadership Team:** This group consists of directors and key staff from 15 County departments and independent agencies, and several municipalities. The group meets bimonthly, and meetings are facilitated by the Climate Change Coordinator. Meetings offer an opportunity to share information, troubleshoot questions, brainstorm ideas, and identify opportunities for collaboration. See **Action G-12** for additional details.

- Issue-Specific Inter departmental Meetings:** The Climate Change Coordinator facilitates issue-specific recurring meetings for departments to delve deeper into specific topics, including electric vehicles, energy efficiency, and net-zero building codes. The CAP calls for additional issue-specific meetings, including **Action P-19** (cross-departmental partnership with MCPS), coordination meetings with the Thrive Montgomery 2050 Plan team in the Planning Department, and **Action P-11** (partnership with federal agencies that have a footprint in the County).
- Climate Ambassadors:** Ambassadors are staff representatives from departments who are working to green their department's day-to-day operations, promote a culture of sustainability, and facilitate greenhouse gas (GHG) emissions reductions. Climate Ambassadors convene quarterly and meetings are facilitated by members of the Climate Planning Team. See **Action G-6** for additional details.
- Climate, Energy, and Air Quality Advisory Committee:** Consisting of 15 appointed County residents, the Climate, Energy, and Air Quality Advisory Committee (CEAQAC) advises the County Executive and County Council on issues related to climate, energy, and air quality.¹³² CEAQAC provides recommendations to promote and implement immediate and long-range policies and programs aimed at meeting the County's climate goals, promoting more efficient energy use in the community, and striving for healthy indoor and outdoor air quality. This group of volunteers meets monthly and receives staff support from DEP. See the **Public Engagement, Partnerships, and Education Actions** section for additional ways that the County interacts with the community on climate initiatives, and see **Action P-6** for additional details about CEAQAC.

The County Executive and County Council also play pivotal roles in providing vision, leadership, resources, and oversight for implementing climate action. Through the climate governance actions outlined in this section, as well as through future actions not yet anticipated, it is expected that the current organizational structures for implementing climate initiatives will need to expand and evolve over time.

Please refer to the **Racial Equity and Social Justice** chapter for more information on the historical context and current conditions associated with systemic racism and environmental injustices, and recommendations to improve diversity, equity, and inclusion in climate governance.

Table 17: Climate governance actions

Action	Authority	Lead	Contributors
G-1: Build Awareness among All Montgomery County Government Staff about Climate Change	County	DEP	CEX, OHR, DGS, M-NCPPC, MCPS, Montgomery College
G-2: Establish a Climate Change Academy to Integrate Climate Change Training into the Professional Development of Montgomery County Government Staff	County	OHR, DEP	CEX, Office of Racial Equity and Social Justice, DGS, Montgomery College, DNR, M-NCPPC, MCPS
G-3: Incorporate Climate Competencies into Montgomery County Government Job Descriptions and Performance Plans	County	OHR	All departments, unions
G-4: Identify and Create New Positions that Are Needed for the County Government to Prepare for and Respond to Climate Hazards, Implement Climate Adaptation Measures, and Reduce Greenhouse Gas Emissions	County	OMB, OHR	All departments
G-5: Establish a Cross-Departmental Climate Innovation Lab to Develop, Fund, and Implement Climate and Resiliency Initiatives	County	CEX (Office of Innovation)	DEP
G-6: Designate Climate Ambassadors within Each County Department	County	CEX, DGS, DEP	All departments
G-7: Evaluate and Update County Planning, Policy, Codes, and Operations Activities to Account for the Risks of Climate Change Impacts and Prioritize the Needs of Vulnerable Residents	County	CEX, OEMHS	All departments, M-NCPPC, MCPS, Montgomery College
G-8: Evaluate and Update County Procurement, Planning, Policy, and Operations Activities to Reduce Greenhouse Gases	County	CEX, DEP, PRO	All departments, M-NCPPC, MCPS, Montgomery College
G-9: Incorporate Climate Considerations into the County's Budgeting Processes	County	OMB, CEX, DEP	All departments
G-10: Develop Financing Strategies for Implementing Climate Actions and Incorporate Climate Considerations into County Finance Practices	County	DOF	OMB, MCGB, DEP, CEX, Board of Investment Trustees
G-11: Develop Climate, Energy, Health, and Racial Equity Metrics and a Data-Driven Assessment and Reporting Process	County	DEP, TEBS, OMB (CountyStat)	HHS (African American Health Program, Latino Health Initiative, Asian American Health Initiative), County advisory committees, OMB
G-12: Formalize the Climate Leadership Team to Guide the Implementation of Climate Plan Actions	County	CEX	All departments, independent agencies, and municipalities
G-13: Update the County's Teleworking and Transit Benefit Policies to Encourage MCG Staff to Reduce Vehicle Miles Traveled	County	OHR, DOT	DEP, TEBS, OLR, OCA, CEX (Office of Innovation), DGS, unions
G-14: Establish Montgomery County Government Carbon Fund for Air Travel	County	DOF	DEP
G-15: Consolidate County Climate Data	County	TEBS, OMB(CountyStat)	DEP, OEMHS, DOT, DPS, M-NCPPC, MCPS
G-16: Conduct Climate Vulnerability Detailed Assessments	County	DEP, OEMHS	DOT, DPS



G-1

Build Awareness among All Montgomery County Government Staff about Climate Change



Lead: DEP **Development Stage:** Planned

Investment Level: County: \$ Private: N/A **Contributors:** CEX, OHR, DGS, M-NCPPC, MCPS, Montgomery College



In 2020, the County engaged the Association of Climate Change Officers to gather feedback from County staff about their awareness and knowledge of climate change. **The survey results will provide a baseline of information for enhancing staff knowledge of climate change, its impacts, and the role of County departments and agencies in combatting climate change.** Examples of actions the County should take to continue to build awareness of climate change among all staff include dissemination of required training modules about climate change, incorporation of the County’s climate change goals into new employee orientation manuals, and ongoing dissemination of climate change information in employee newsletters. Existing training and leadership forums for County staff, such as the quarterly Montgomery County Government managers’ meetings, should also be leveraged for this purpose.



G-2

Establish a Climate Change Academy to Integrate Climate Change Training into the Professional Development of Montgomery County Government Staff

Lead:

OHR, DEP

Development Stage:

Proposed

Investment Level:

County: \$ Private: N/A

Contributors:

CEX, Office of Racial Equity and Social Justice, DGS, Montgomery College, DNR, M-NCPPC, MCPS, Montgomery College

In the summer of 2020, approximately 170 Montgomery County Government (MCG) staff participated in a climate change training series designed to build a foundational understanding of the risks and opportunities that climate change poses for County operations, residents, and businesses. **Future trainings can become a standardized part of professional development and leadership development by establishing a Climate Change Academy to train County staff and elected officials.** The Climate Change Academy will enable all staff to have a foundational understanding of the risks and opportunities that climate change poses for County operations, residents, and businesses. Training topics can include approaches to reduce departments’ carbon footprints, green purchasing, climate resilience, and the nexus between climate change and racial equity. The Climate Change Academy can offer trainings, host expert speakers through a regularly scheduled climate forum, and organize cross-departmental tours to showcase climate change initiatives occurring in all sectors and departments of the County, and should provide incentives and recognition for staff to participate. The Climate Change Academy should also incorporate fundamental elements of climate and energy justice into racial equity trainings.

The County should explore ways to expand the Climate Change Academy to the entire community. The County can leverage existing resources, such as the [Maryland Climate Leadership Academy](#) and can partner with local universities and community colleges to leverage existing educational programs. There are also opportunities to use existing online resources and webinars offered through Maryland state agencies and accredited distance education institutions.



G-3

Incorporate Climate Competencies into Montgomery County Government Job Descriptions and Performance Plans

.....

Lead:	Development Stage:
OHR	Proposed

Investment Level:	Contributors:
County: \$ Private: N/A	All departments, unions

.....

Many existing job positions in County Government have a role in assessing and responding to climate change, even if the connection to climate change is not explicitly spelled out in the job description. For example, staff in positions related to risk management, emergency management, logistics management, and finance make decisions and take actions that impact how Montgomery County prepares for and responds to climate hazards or make decisions that may impact the County’s greenhouse gas (GHG) footprint. **A comprehensive review of Montgomery County Government (MCG) job descriptions should be conducted to identify those that are “climate-relevant,” and climate competencies and credentialing requirements should be incorporated into these job descriptions.** Staff who fill climate-relevant positions should be encouraged and supported in undertaking the necessary training to fulfill the credentialing requirements for attaining climate competency. Performance plans for climate-relevant positions should include objectives related to the climate change aspects of the job. In addition, the competency section of all performance plans should incorporate climate change and racial equity. The County should also develop a values statement that includes climate change and should disseminate the statement to all MCG employees as well as emphasize it during new employee orientation.



G-4

Identify and Create New Positions that Are Needed for the County Government to Prepare for and Respond to Climate Hazards, Implement Climate Adaptation Measures, and Reduce Greenhouse Gas Emissions



Lead: OMB, OHR
Development Stage: In progress

Investment Level: County: \$\$\$ Private: N/A
Contributors: All departments



To effectively combat climate change, the County Government should establish new climate-relevant positions. For example, to improve the County’s efforts to respond to, prevent, and mitigate risks for flooding, a staff member with hydrologic expertise is needed to educate the public about changing flood risk and to encourage flood insurance program participation. This position would also help dam owners prepare for the impacts of climate change and would develop data such as geographic information system (GIS) data for better understanding and articulating the County’s changing flood risk. This is just one example of the climate-relevant positions needed across County Government. Climate-relevant positions like this should be inventoried and prioritized in the annual budget process. An alternative approach would be to reclassify existing vacant positions so that these new climate-relevant positions could be established without impacting the County’s budget. This action is critical because many of the actions identified in the Climate Action Plan require additional staffing resources in order to be implemented.



G-5

Establish a Cross-Departmental Climate Innovation Lab to Develop, Fund, and Implement Climate and Resiliency Initiatives



Lead: CEX (Office of Innovation)
Development Stage: In development

Investment Level: County: \$ Private: N/A
Contributor: DEP



In 2019, Montgomery County Government (MCG) established **Innovation@MCG**, a resource for making rapid improvements to government processes and systems to better serve the County. Innovation Accelerator Courses guide MCG staff through a structured problem-solving process to make small improvements a reality. **There is an opportunity to build on the successes of Innovation@MCG by creating (or virtually co-locating) a Climate Innovation Lab that uses similar principles to achieve climate results.** Staff who develop and implement innovative climate solutions would be recognized through a newly established Climate Awards program. To incentivize departments and staff to undertake this work, the County should identify financial incentives and provide recognition through, for example, a dedicated innovation fund or monetary rewards for participants.



G-6

Designate Climate Ambassadors within Each County Department

Lead:	Development Stage:
CEX, DGS, DEP	In progress

Investment Level:	Contributors:
County: \$ Private: N/A	All departments

The role of the Climate Ambassadors will involve mobilizing staff to green their department’s day-to-day operations, promote a culture of sustainability, work as a team with other ambassadors to assess their department’s impacts on climate change, and facilitate deep emissions reductions across all departments. Climate Ambassadors can also help facilitate engagement with department colleagues about climate change to seek their ideas and input. The Department of Environmental Protection and the Department of General Services have already laid the groundwork for such an effort through a branded Work Green initiative with various resources, tools, and engagement materials. Climate Ambassadors can also leverage climate change training and information that is developed through **Actions G-1** and **G-2**. Departments should have the flexibility to structure the Climate Ambassador’s efforts to meet their needs; for example, larger departments may find it helpful to select multiple ambassadors who work as a team. When there are vacancies, department leadership should consider backfilling positions with staff whose expertise relates to climate change and resilience and who could serve as Climate Ambassadors (see **Action G-4**). The County should integrate the efforts of the Climate Ambassadors with the work of the Climate Leadership Team (see **Action G-12**).



G-7

Evaluate and Update County Planning, Policy, Codes, and Operations Activities to Account for the Risks of Climate Change Impacts and Prioritize the Needs of Vulnerable Residents

Lead:

CEX, OEMHS

Development Stage:

Proposed

Investment Level:

County: \$\$ Private: N/A

Contributors:

All departments, M-NCPPC, MCPS, Montgomery College

County departments’ essential services, plans, codes, and processes must account for the risks of climate change. These include, but are not limited to, Montgomery County standards, codes, policies, and plans related to hazard mitigation, emergency response, public health, transportation, residential services, parks and landscaping, stormwater management, and buildings. For example, as historical references to rainfall and water flow become outdated, updates will need to be incorporated into design requirements. **The County’s essential services, plans, and processes must also prioritize the needs of our most vulnerable residents as we prepare for the risks of climate change.** These include the needs of children, the elderly, those with underlying health conditions, and economically disadvantaged communities. Departments are encouraged to undergo available climate change trainings, consult with County advisory committees, and engage with community members to reach the best solutions. To report progress on these and other efforts to reduce greenhouse gas emissions and increase resilience, departments should include continuous improvement and monitoring plans in their annual performance reports.



G-8

Evaluate and Update County Procurement, Planning, Policy, and Operations Activities to Reduce Greenhouse Gases

Lead:

CEX, DEP, PRO

Development Stage:

Proposed

Investment Level:

County: \$\$ Private: N/A

Contributors:

All departments, M-NCPPC, MCPS, Montgomery College

Choices made throughout Montgomery County Government have the potential to negatively or positively impact the County’s greenhouse gas (GHG) emissions. **Departments should establish approaches to ensure they are factoring emissions potential and equity into their decision-making and procurement processes.** This action includes establishment of a climate impact statement to evaluate all pending bills, budgets, plans, and land use decisions. This action also includes establishing an environmentally preferable purchasing policy and green specifications for Requests for Proposals, and establishing and managing a procurement incentive program for green products, services, and business operations. This includes the development of specifications for low-embodied carbon building materials and requirements for contractors to develop their own GHG inventories and account for their Scope 3 emissions. Green specifications should also cover sustainable food purchasing.

Climate-related contracts should require equity-enhancing measures that proactively engage and improve the socioeconomic conditions of communities disproportionately impacted by systemic inequities, such as low income, race, and/or immigration status, and communities considered most vulnerable to the impacts of climate change. To facilitate more widespread use of its green procurement specifications, the County should publicize these specifications as a resource for the private sector. In addition, to further drive the market in this space, the County should look for opportunities to engage with local commercial anchor institutions in a shared approach to green specifications. One model is the solar co-op, which leverages bulk purchasing power to get discounted pricing on solar panels. To report progress on these and other efforts to reduce GHG emissions, departments should include continuous improvement and monitoring plans in their annual performance reports.

“ I want to see resources available to the people who need it. ”
 ~ Resilience Ambassador Survey



G-9

Incorporate Climate Considerations into the County’s Budgeting Processes

Lead:	Development Stage:
OMB, CEX, DEP	In progress

Investment Level:	Contributors:
County: \$ Private: N/A	All departments

In 2020, Montgomery County convened a workgroup of community experts to develop recommendations for incorporating climate considerations into the operating and capital budgeting processes, including budgeting for both the short and long term. During the FY22 operating budget development season, the Office of Management and Budget (OMB) introduced incremental steps to link climate considerations into the budgeting process for County departments, including collecting information on climate change through its budgeting system (BASIS Program Proposal Module), asking departments to identify Climate Ambassadors, and providing information on budget requests that support climate action.

As a result of the FY22 budget development process, departments that had not previously considered the connections between their programs and climate change have begun doing so. Other recommendations by the workgroup, which are currently being pursued, include training for Climate Ambassadors and departmental staff involved in preparing and managing budgets, as well as a pilot process with one or two departments to help develop and hone a more robust process in fiscal year 2023 and beyond. These short-term actions form a foundation for more in-depth, longer-term approaches that move toward more quantitative assessments. The County should reconvene the workgroup as needed in order to chart out the next steps in climate budgeting.



G-10

Develop Financing Strategies for Implementing Climate Actions and Incorporate Climate Considerations into County Finance Practices

Lead: DOF	Development Stage: In development
Investment Level: County: \$\$ Private: N/A	Contributors: OMB, MCGB, DEP, CEX, Board of Investment Trustees

Fully implementing the actions in the Climate Action Plan (CAP) will require leveraging resources from both the public and private sectors through traditional and innovative funding streams. **Montgomery County should establish a working group of economic and financial experts and community leaders on climate change to develop strategies to best finance the actions outlined in the CAP.** The workgroup should identify existing public funding streams that are best suited for supporting the climate actions, innovative partnership structures such as the EV leasing model deployed by Montgomery County Public Schools, philanthropic sources that can be approached for funding support, as well as prospective new taxes that could be used to advance racial equity goals, such as Portland, Oregon’s Clean Energy Community Benefits Fund, which was passed in 2018 with overwhelming local support.¹³³ Examples of potential funding sources that should be examined include the Transportation Climate Initiative, green bonds issuance, fuel energy taxes,¹³⁴ as well as EmPOWER Maryland program funds, which can be adjusted in each 3-year program cycle by the Maryland Public Service Commission.

The Montgomery County Green Bank (MCGB), a contributor to this action, is an important partner in leveraging private sector capital for climate initiatives (for more information about MCGB, see the **Paying for Climate Action Implementation** chapter). Expanding the role of MCGB to serve as the County’s Resilience Authority is another way to help finance projects focused on addressing the impacts of climate change, including flooding and other resilience activities. In addition, the County should incorporate climate considerations into County finance practices and policies, including divestment of fossil fuels.



G-11

Develop Climate, Energy, Health, and Racial Equity Metrics and a Data-Driven Assessment and Reporting Process

Lead: DEP, TEBS , OMB (CountyStat)	Development Stage: In development
Investment Level: County: \$\$ Private: N/A	Contributors: HHS (African American Health Program, Latino Health Initiative, Asian American Health Initiative), County advisory committees, OMB

The County will regularly measure and report on its progress in implementing the actions outlined in this Climate Action Plan (CAP). The County will define metrics of success in consultation with the Climate Energy and Air Quality Advisory Committee and other County advisory committees. Metrics should include those related to greenhouse gas (GHG) reductions, to resilience to the impacts of climate change, and to the intersection of racial equity and climate change (for example, energy burden, access to cleaner transportation options, capacity to adapt to high heat days and more intense storm events, level of green economic development). The County should proactively engage underrepresented communities to share data and findings in multiple languages and facilitate accessible, culturally relevant forms of feedback.

The task of defining metrics will look different based on the type of action, so the County has the potential to employ the use of geographic information system (GIS) layers, data dashboards, story maps, and a variety of other tools to assess progress. While some data relevant to accomplishing the actions may have time lags, information will be updated as it becomes available. The County’s community-wide GHG emissions inventory, for example, is currently only updated once every several years; this work is performed by the Metropolitan Washington Council of Governments on behalf of its member jurisdictions. Some climate data may not be available for tracking, so the process of defining metrics will acknowledge data gaps and identify innovative ways to collect data. These include real-time sensors, “citizen science” efforts, and crowdsourcing. Metrics will be used not only to track progress, but also to make course corrections and adjustments to climate actions. The United Nations’ indicators for the Sustainable Development Goals provide a framework that the County can take inspiration from.¹³⁵ CountyStat, the County’s performance management and data analytics team, should assist with the development of metrics, monitoring, and evaluation approaches to help ensure that climate actions are delivering results.

On an annual basis, the County will develop and release a climate work plan of the initiatives planned for the upcoming fiscal year. The annual work plan will enable the CAP to be a living document and provide the County with the opportunity and flexibility to course-correct and make adjustments to actions over time as technology evolves and additional funding becomes available. For more information about the annual work plan structure, see the *Looking Forward* chapter of the CAP.

The County will also develop a robust web page with dashboard elements that will provide regular status updates for residents and County departments on the implementation of actions. In addition to providing access to the latest data, the web page will serve as an interactive platform for broad outreach and provide tools people can use, climate change presentations, and other related resources. On a quarterly basis, the Climate Planning Team will brief the County Executive on the progress of plan implementation.



G-12

Formalize the Climate Leadership Team to Guide the Implementation of Climate Plan Actions

Lead:

CEX

Development Stage:

In development

Investment Level:

County: \$ Private: N/A

Contributors:

All departments, independent agencies, and municipalities

The Climate Leadership Team consists of leadership and key staff from various Montgomery County departments, independent agencies, and municipalities that play important roles in combatting climate change through their programs, services, and operations. **The Climate Leadership Team should be expanded to include additional departments and formalized through an Executive Order.** In addition to sharing information and identifying opportunities for collaboration, the Climate Leadership Team should be charged with providing strategic guidance on the implementation of actions identified in the climate plan, including determining the sequencing of actions, assessing and making improvements to the interdepartmental and intradepartmental flow of information about climate initiatives, and monitoring the progress of implementation. Climate Leadership Team meetings create opportunities for County staff to hear from, and coordinate with, state officials and others working on climate initiatives. The County’s COVID-19 recovery framework can serve as a model for the coordination of climate efforts. The Climate Leadership Team should also explore other models to facilitate the coordination and implementation of climate actions, including assessing the need for a new Office of Climate Initiatives within Montgomery County Government.



G-13

Update the County’s Teleworking and Transit Benefit Policies to Encourage MCG Staff to Reduce Vehicle Miles Traveled

Lead:

OHR, DOT

Development Stage:

In development

Investment Level:

County: \$ - \$\$ Private: N/A

Contributors:

DEP, TEBS, OLR, OCA, CEX (Office of Innovation), DGS, unions

The global pandemic has accelerated the shift to teleworking. Up to 35% of Montgomery County Government (MCG) employees are currently teleworking at some point each week—a major increase from pre-pandemic levels. Teleworking contributes to a reduction in greenhouse gas (GHG) emissions by reducing vehicle miles traveled. **The County should normalize teleworking beyond the pandemic by implementing a long-term teleworking policy. The County should also implement a transportation demand management (TDM) plan for MCG by comprehensively reviewing and updating its transit benefit policies and employee parking policies so that they align with the County’s climate goals.** The TDM plan must include the incentives, policies, or outreach needed to increase the number of MCG employees commuting to work through modes other than driving an automobile. Policies to be explored include establishing a parking cash-out; expanding financial incentives for employees who choose to commute via walking, biking, and transit; installing additional bicycle parking infrastructure in MCG office locations; and providing flexible options to employees who rely on a variety of transportation modes. Independent agencies should also be encouraged to implement similar policies.



G-14

Establish Montgomery County Government Carbon Fund for Air Travel

Lead:

DOF

Development Stage:

Proposed

Investment Level:

County: \$ Private: N/A

Contributor:

DEP

The global pandemic has accelerated the shift to virtual meetings and virtual conferences. **To the extent that Montgomery County Government staff must use air travel for work-related purposes, the greenhouse gas (GHG) emissions associated with air travel should be mitigated through the establishment of a County carbon fund.** An add-on fee for each flight would be deposited into the carbon fund, which would be periodically invested in local mitigation and sequestration programs. This effort will be in addition and complementary to other GHG mitigation and sequestration actions in the Climate Action Plan.



G-15 Consolidate County Climate Data

Lead: TEBS, OMB (CountyStat)	Development Stage: Proposed
Investment Level: County: \$\$ Private: N/A	Contributors: DEP, OEMHS, DOT, DPS, M-NCPPC, MCPS

The Climate Action Plan (CAP) was developed in collaboration with many different Montgomery County departments and agencies to gather the necessary climate data, from geographic information system (GIS) layers to County statistics. It took significant time and communication to gather these various pieces of data for both the Climate Vulnerability Assessment and the CAP. **The County should develop a consolidated location where climate and statistical data from the various departments and agencies can be uploaded and shared to expedite planning and development for climate initiatives.** As an example, data on rainfall intensity, duration, and frequency for storm events should be shared across departments. Creation of a central climate data storage location—either on a Montgomery County Government-wide server (such as dataMontgomery) or a secure Cloud location—should be accompanied with development of a data upload log and assignment of at least one data maintenance point of contact for each department or contributing team. To the greatest extent possible, data should be made publicly available for community members to view and download. The County should also draw on existing modeling and scenario planning tools for analyzing climate data.



G-16 Conduct Climate Vulnerability Detailed Assessments

Lead: DEP, OEMHS	Development Stage: Proposed
Investment Level: County: \$\$ Private: N/A	Contributors: DOT, DPS

The Climate Vulnerability Assessment (**Appendix C**) outlines from a downscaled modeling approach the projected increase in climate hazards and exposure, sensitivity, and adaptability of County assets to those increasing hazards. **The County should conduct more fine-tuned assessments to identify current and future climate hazards and vulnerabilities, to identify hotspots, and to pinpoint key assets.** This effort complements the heat-mapping campaign described in **Action A-3**. “Citizen science” tools, as described in **Action G-11**, can also support this effort.





Public Engagement, Partnerships, and Education Actions

Montgomery County's community members are empowered, engaged, and motivated to take action on climate change while striving for equity among all members of the community.

- Facilitate inclusive, community-driven civic leadership, particularly with residents who are Black, Indigenous or People of Color (BIPOC), low-income residents, and other communities most vulnerable to the impacts of climate change so that power and decision-making are shared and solutions are co-created.
- Build strategic partnerships among Maryland counties to shape ambitious state climate policies.
- Build strategic partnerships with municipalities to pilot innovative programs that can be replicated across the County.
- Empower youth to take action at home and in their community.
- Build community trust and partnerships with residents by amplifying their voices, listening to their concerns, and tailoring resources and support relevant to their day-to-day lives.



Public Engagement, Partnerships, and Education Actions

The degree to which community members are actively engaged and participating in efforts to reduce greenhouse gas (GHG) emissions and build climate resilience is critical to the Climate Action Plan’s (CAP’s) success. To that end, the County must enhance climate communications to the general public and public support; standardize authentic and inclusive community engagement that creates new entry points for residents to be involved in climate action; strengthen state and regional coordination and collaboration; develop new strategic partnerships to galvanize support across key stakeholder organizations, communities, and jurisdictions; and develop increased opportunities for students to participate in climate change education and experiences, and empower them to take action at home and in their community.

As part of the climate planning process, the County convened members of organizations outside the traditionally defined environmental sector to broaden participation. Representatives from the faith community, health research and service providers, social justice and racial equity advocacy organizations, immigrant advisory boards, commissions on women and seniors, as well as County officials from the Department of Health and Human Services (African American

Health Program and Latino Health Initiative) came together to identify stakeholder concerns and possible co-benefits of climate action. In addition, County Resilience Ambassadors conducted nearly 130 conversations focused on quality-of-life issues (for example, COVID-19, traffic safety, and racial equity) and how they intersect with and can be exacerbated by climate change (see below).

To be clear, a paradigm shift in community engagement is required, and the County must move toward a model that is more inclusive, participatory, and community-driven. Such an effort will deepen community trust, understanding, and partnership, and help open avenues to enhance participation for implementing climate action. Public engagement, partnership, and education actions are outlined in **Table 18**. The full set of Technical Workgroup recommendations from which the CAP public engagement, partnerships, and education actions were developed is provided in **Appendix B**.

Please refer to the **Racial Equity and Social Justice** chapter for more information on the historical context and current conditions associated with systemic racism and environmental injustices, and recommendations to improve community engagement.

Table 18: Public engagement, partnerships, and education actions

Action	Authority	Lead	Contributors
P-1: Undertake Vigorous Public Outreach Campaign Aimed at Empowering the Public with Information on How to Reduce Emissions and Adapt to the Impacts of Climate Change	County	DEP, OEMHS, PIO	Community Engagement Cluster, Regional Service Directors, HHS, MCPS, M-NCPPC, civic and business community
P-2: Conduct an Outreach Campaign that Uses Evidence-Based Communications Strategies	County	DEP, OEMHS, PIO	Community Engagement Cluster, Regional Service Directors, HHS, MCPS, civic and business community
P-3: Form a Climate Change Communication Coalition	County	DEP, PIO	All departments, MCPS, Montgomery College, M-NCPPC, civic and business community

Action	Authority	Lead	Contributors
P-4: Enhance County Websites to Focus More Sharply on Climate Change	County	PIO	All departments
P-5: Establish a Community Justice Academy in which Graduating Community Ambassadors Representing their Neighbors Conceive and Co-Create Integrated Health, Equity and Quality-of-Life Solutions Directly Applicable to their Communities	County	DEP	Office of Racial Equity and Social Justice, HHS, DOT, Climate Leadership Team
P-6: Use the Climate, Energy, and Air Quality Advisory Committee as a Resource to Advise the County on Performance Metrics and Plan Implementation	County	DEP	Climate Leadership Team
P-7: Facilitate Ongoing Input from Community Members on the CAP’s Implementation	County	CEX, DEP	DOT, OEMHS, PIO, Community Engagement Cluster, Regional Service Directors, MCPS, M-NCPPC
P-8: Engage County Artists through Public Art Installations to Raise Awareness, Discussion, and Action on Climate Change	County	DEP	Arts and Humanities Council, Regional Service Directors, civic and business community, M-NCPPC
P-9: Support the Efforts of Community Organizations, Businesses, Municipalities, and Associations that Promote and Operationalize Equitable Climate Action	County	DEP	Montgomery College, public libraries, civic and business community, M-NCPPC
P-10: Establish a Statewide Coalition of Local Governments and Youth Groups Focused on Advancing Ambitious State Climate Policy by Collectively Advocating their Positions before the State Legislature, the Public Service Commission, and the Utility Companies	County	CEX	OIR, DEP
P-11: Establish Partnerships with Federal Agencies Located within the County’s Boundaries on GHG Mitigation and Climate Resiliency Efforts	County	CEX	MCEDC, DEP
P-12: Advocate for the Continued Integration of Climate Change Education into the Existing School Curriculum	County	MSDE, MCPS	DEP
P-13: Develop a Standardized Climate Change Curriculum across Public Schools and Recommend the Same for Private Schools and Home Schools	County	MSDE, MCPS	DEP
P-14: Provide Professional Development for Educators on Climate Change Topics	County	MCPS	Montgomery College, DEP
P-15: Use School Gardens or Other Outdoor Learning Facilities as a Jumping-Off Point to Address a Multitude of Climate-Related Topics	County	MCPS	DEP, M-NCPPC
P-16: Develop Increased Opportunities for Students to Participate in Climate Change Learning Experiences Outside of the Classroom	County	MCPS	Local universities, non-profits, public libraries, Maryland Association for Environmental & Outdoor Education, (MAEOE), M-NCPPC, municipalities
P-17: Develop Sustainability Goals for Schools to Reach and Provide Incentives to Do So	County	MCPS	DEP
P-18: Encourage Climate Change Action at Home	County	MCPS	DEP, MCCPTA
P-19: Establish Cross-Departmental Partnership to Facilitate Implementation of Climate Goals at County Schools	County	MCPS	DEP, M-NCPPC, CUPF, DPS

Public Engagement and Outreach



P-1

Undertake Vigorous Public Outreach Campaign Aimed at Empowering the Public with Information on How to Reduce Emissions and Adapt to the Impacts of Climate Change

Lead:

DEP, OEMHS, PIO

Development Stage:

Planned

Investment Level:

County: \$\$ Private: N/A

Contributors:

Community Engagement Cluster, regional service directors, HHS, MCPS, M-NCPPC, civic and business community

While 84% of Montgomery County residents surveyed in 2020¹³⁶ believe that global warming is happening (compared to 72% nationwide) and 73% believe that it is mostly caused by human activities (compared to 57% nationwide), County household carbon footprints are relatively high compared to the national average,¹³⁷ and are much higher than the vast majority of other countries. **A community-wide culture of sustainability, collective responsibility, and support for ambitious climate action needs to be encouraged so that community members act on a personal level to reduce their carbon footprints and build climate resilience.** This would entail ongoing, frequent and widespread community outreach reinforced by visible, symbolic statements of commitment and support in public buildings and by engaging signage in public places and in public service announcements on buses, digital billboards, as well as unlikely places such as traffic tickets.

Electrification will be a focus of climate actions, and information to help residents understand electrification options is needed. Likewise, community engagement focused on air travel can help people consider alternatives. Residents and businesses must have access to information and resources that enable them to protect their families and homes from the impacts of climate change, such as tips on high-heat preparedness and information about the **National Flood Insurance Program**, which provides insurance to help reduce the socioeconomic impact of floods. Encouraging the purchase of flood insurance and providing subsidies to low-income households that cannot afford it should be a top priority. To achieve broad resonance, messaging must be culturally relevant, translated into multiple languages, and conducted on a regular basis, and must include various forms of media and approaches to ensure accessibility for diverse audiences. To support these outreach efforts, the County can establish a program for local researchers and practitioners to share their climate expertise with the public in various forums.



P-2

Conduct an Outreach Campaign that Uses Evidence-Based Communications Strategies

Lead:

DEP, OEMHS, PIO

Development Stage:

Planned

Investment Level:

County: \$ Private: N/A

Contributors:

Community Engagement Cluster, Regional Service Directors, HHS, MCPS, civic and business community

Evidence-based communication strategies are based on evidence and peer-reviewed research, including journal research, assessments, focus groups, and surveys, to better understand targeted audiences. **By ensuring that Montgomery County communication expenditures are based on evidence-based tactics and messaging, outcomes will achieve a greater return on investment and deliver tangible results.** Particular attention should be given to framing climate action as a personal health issue for ourselves and our children’s future health, which, some recent research suggests, is likely to create greater resonance, have wider appeal, and be more effective in motivating action. For example, messaging should emphasize how *climate solutions are health solutions* and immediately improve the health of local residents and protect their children’s future health. The health framework can also be applied to the local economy, since a healthy economy is one that is constantly innovating and evolving to meet the needs of its community and is resilient to macro-level forces (for example, supply chain disruptions). The health framework also helps communicate that climate solutions support the local economy through improved productivity and decreased health care costs. For additional discussion on the linkages between health and climate change, see the *Racial Equity and Social Justice* chapter of the CAP. The County, in collaboration with diverse community-based organizations, should identify the top three to five most impactful climate actions that individuals and institutions can take as well as the barriers impeding action, and then create engagement campaigns tailored to specific audiences.


P-3

Form a Climate Change Communication Coalition

Lead:

DEP, PIO

Development Stage:

Proposed

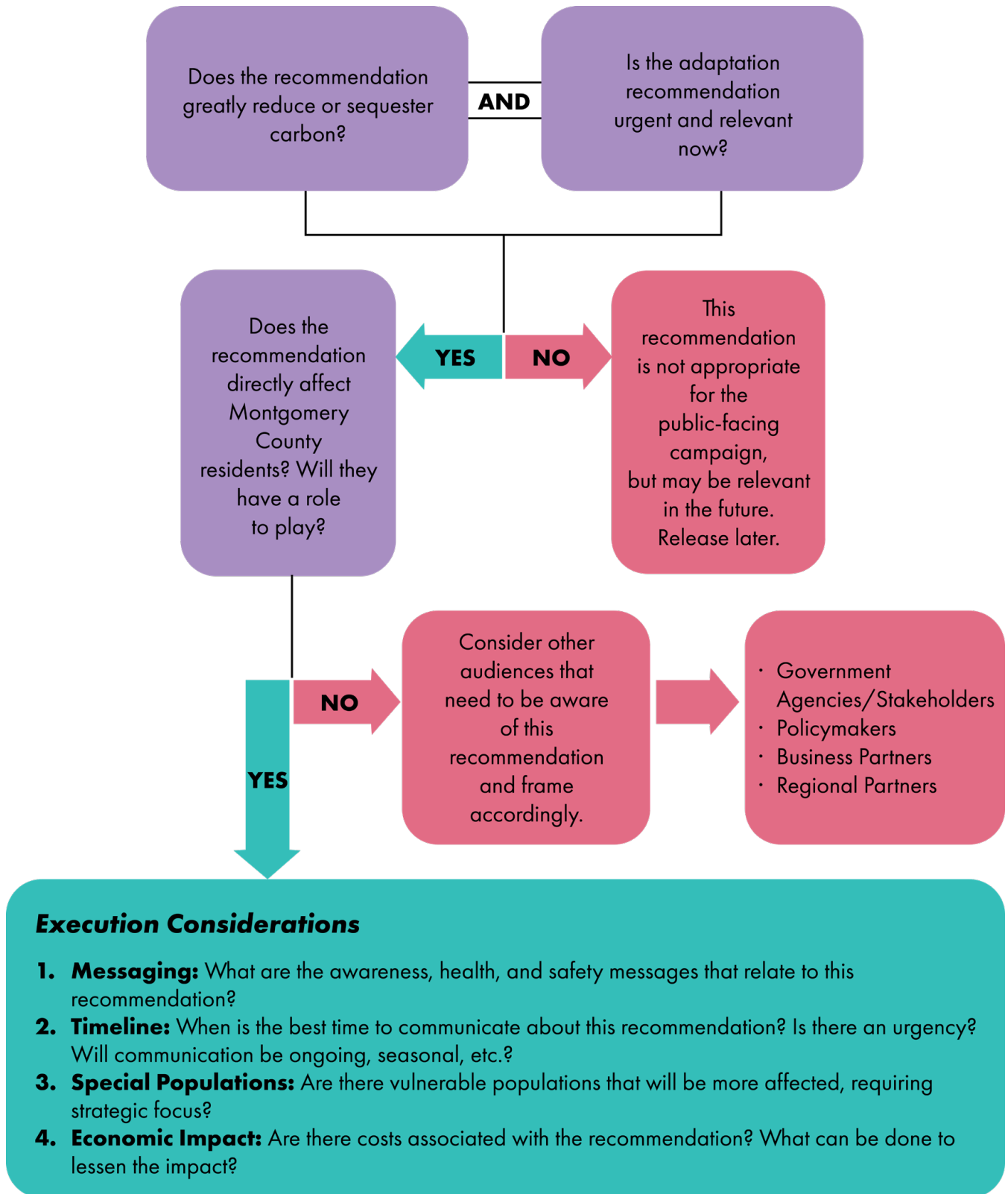
Investment Level:

County: \$ Private: N/A

Contributors:

All departments, MCPS, Montgomery College, M-NCPPC, civic and business community

All Montgomery County departments and agencies should appoint a representative to the Climate Change Communication Coalition and encourage civic and business associations and networks to appoint representatives as well to develop a coordinated communication and outreach strategy and action plan. It is particularly important to involve local public health institutions, clinics, and academic programs, given their understanding of the health-climate-equity nexus as well as their broad reach. Communication students from Montgomery College, the Universities at Shady Grove, and the University of Maryland should also be engaged in this effort. The Climate Change Communication Coalition would be responsible for developing, coordinating, and disseminating information on climate change so that all sectors of our society can better understand climate change and have easy access to information, resources, and support. Resources and information should be translated into multiple languages to ensure accessibility for the County's diverse population. The Climate Change Communication Coalition would also be responsible for recognizing civic, residential, and business leaders through an annual Climate Leaders Award Program.



Execution Considerations

1. **Messaging:** What are the awareness, health, and safety messages that relate to this recommendation?
2. **Timeline:** When is the best time to communicate about this recommendation? Is there an urgency? Will communication be ongoing, seasonal, etc.?
3. **Special Populations:** Are there vulnerable populations that will be more affected, requiring strategic focus?
4. **Economic Impact:** Are there costs associated with the recommendation? What can be done to lessen the impact?

Figure 38: Climate Change Communication Coalition basic process flow diagram

The basic process flow diagram above helps the Climate Change Communication Coalition determine which activities are communicated in outreach campaigns.

Graduates of the Community Justice Academy would be Community Ambassadors serving as information and advocacy bridges representing their communities to build resilience; advance racial equity, health and quality of life; encourage carbon-reducing behavior; and identify and co-create solutions in partnership with the County. Such a model is premised on a “participatory action research framework” in which solutions are devised through the participation by, and lived experiences of, stakeholders so that interventions are fully “owned” by the community. Such an approach draws on the work and philosophy of a number of organizations, including Movement Generation, Movement Strategy Center, the Greenlining Institute, and the Partners Advancing Climate Equity initiative.

Although the Community Justice Academy will be shaped and implemented through a partnership with community-based organizations (CBOs), the program will likely include training components focused on asset and needs assessments, community decision-making, advocacy, and accessing resources and funding. The initiative will also likely build on existing County-funded programs, such as the Latino Health Initiative, African American Health Program, Community Advocacy Institute, Montgomery College’s new Social Justice Inclusive Leadership Institute, and the Resilience Ambassadors program led by young adults, which was piloted during the summer of 2020. In addition, the program will likely include the **Climate Stories Ambassadors** project, which is expected to kick off during late summer or early fall of 2021. This project’s primary intent is to profile the perspectives and concerns of underrepresented communities. It is important that both Community Ambassadors and CBO partners be formally compensated for their time and expertise. As the Community Justice Academy and Community Ambassadors become more established, the County should establish a Community Justice Grant Fund to financially support community-developed projects.

“ I want to see more efforts to bring people together to talk about difficulties facing communities of color. I want people of color to be able to receive the same benefits of everyone else. ”

~ Resilience Ambassador Survey



P-6

Use the Climate, Energy, and Air Quality Advisory Committee as a Resource to Advise the County on Performance Metrics and Plan Implementation

Lead: DEP	Development Stage: In progress
Investment Level: County: \$ Private: N/A	Contributor: Climate Leadership Team

The Energy and Air Quality Advisory Group was amended by legislation in 2020 to include “Climate” in its name and mission. **The County should seek advice and guidance from the Climate, Energy, and Air Quality Advisory Committee (CEAQAC) on policy and program development and to identify areas and methods for encouraging community participation in climate-related efforts; to identify innovative climate programs, policies, and technologies; and to recommend the development of educational programs and materials.** CEAQAC will work closely with other County advisory committees to help guide the Climate Action Plan’s evolution and implementation.

“ To make sure climate change resources are available to the public, the County should host climate justice/racial justice events that celebrate diversity and educate communities on the impacts that climate change could have on them. ”
 ~ Resilience Ambassador Survey



P-7

Facilitate Ongoing Input from Community Members on the CAP’s Implementation

Lead:

CEX, DEP

Development Stage:

In progress

Investment Level:

County: \$ Private: N/A

Contributors:

DOT, OEMHS, PIO, Community Engagement Cluster, regional service directors, MCPS, M-NCPPC

Montgomery County has put in place monthly “virtual office hours” to foster ongoing dialogue with members of the community on climate issues. As the Climate Action Plan moves into the implementation stage, it is important to continue to offer multiple avenues for members of the public to stay engaged and for the County to hear about their needs and ideas. **The County should consider a variety of means to obtain ongoing input from community members, including office hours, meetings, town halls, climate assemblies, and surveys.** Given the high percentage of County residents from other countries, not only should the County implement multilingual and culturally appropriate approaches to outreach, it should also tap into residents’ knowledge of successful sustainability innovations outside the United States that can be adapted and implemented locally.

“ *It is challenging for all community members to have their voices heard if they are not able to speak English. We need surveys in multiple languages.* ~ Resilience Ambassador Survey ”



P-8

Engage County Artists through Public Art Installations to Raise Awareness, Discussion, and Action on Climate Change

Lead:

DEP

Development Stage:

In progress

Investment Level:

County: \$\$ Private: TBD

Contributors:

Arts and Humanities Council, regional service directors, civic and business community, M-NCPPC

While technological improvements, financial incentives, and progressive policies will be essential to meeting Montgomery County’s climate goals, such interventions are insufficient on their own. A heightened sense of responsibility must animate our community so that we are emotionally engaged, internalize an environmental ethic, and truly feel the exigencies of our time. Art has the power to conjure these feelings in a way that graphs, data, and scientific analyses cannot. **The County should build on its recent collaboration with the Arts and Humanities Council of Montgomery County through the Sustainable Environmental Public Art Project Initiative to build a broad partnership of arts organizations committed to sponsoring local artists and installing permanent public art that helps stimulate community reflection, discourse, and action on climate change.** Projects should be installed throughout the County in areas strategically located to maximize exposure and impact. To inspire awe and generate community buzz and awareness, new permanent art works should be installed annually, at least for the next several years.

Partnership and Coalition Building



P-9

Support the Efforts of Community Organizations, Businesses, Municipalities, and Associations that Promote and Operationalize Equitable Climate Action

Lead:

DEP

Development Stage:

In progress

Investment Level:

County: \$ - \$\$ Private: TBD

Contributors:

Montgomery College, public libraries, civic and business community, M-NCPPC

Montgomery County Government cannot get all the work done alone. **For the County to meet its ambitious climate change goals, it must nurture, broaden, and leverage partnerships on numerous levels.** For example, this could include empowering “home-grown,” community-based innovations through competitive grants to local social entrepreneurs. It could also include helping educational institutions like Montgomery College and public libraries to organize book club discussions, host lectures, and establish and deliver open enrollment climate change courses for residents, businesses, and relevant professionals in particular. For example, health professionals would benefit from enhanced understanding of the health effects of climate change on the elderly, on those with underlying health conditions, and on economically disadvantaged populations.

Similarly, many County municipalities have expressed interest in supporting the Climate Action Plan by piloting climate initiatives so that the County could subsequently refine and implement interventions more broadly. The County should develop a competitive grant fund for municipalities to catalyze experimentation, innovation, and analysis of related data, encouraging a range of interventions to ensure a diversity of promising practices. Building in friendly competition among municipalities, including prizes and public recognition, can make serious work fun and engaging. The County should also take advantage of the substantial, available expertise of its residents, including retired professionals, scientists, and scholars who could be tapped by businesses, municipalities, civic groups, and the County to advance its climate work. The **Montgomery County Volunteer Center** could be used to recruit and place experts. Supporting a network of partners across a broad swath of sectors and geography, coupled with expert volunteer support, will spark innovation, help open avenues to participation, and generate collective action.

“ *It makes me happy to know that my community cares about one another and rallies around each other, especially in times of need.* ”
 ~ Resilience Ambassador Survey



P-10

Establish a Statewide Coalition of Local Governments and Youth Groups Focused on Advancing Ambitious State Climate Policy by Collectively Advocating their Positions before the State Legislature, the Public Service Commission, and the Utility Companies

Lead: CEX
Development Stage: In development

Investment Level: County: \$ - \$\$ Private: N/A
Contributors: OIR, DEP

State authority over energy sources and transmission is very significant, as many key decisions are made in the General Assembly and the Public Service Commission. It is therefore essential to influence the adoption of ambitious state goals and policies for Montgomery County to meet its greenhouse gas reduction targets. To effectively influence state decisions, specific expertise in energy policy and the regulatory process as well as significant time for Public Service Commission and legislative meetings are required, but neither the expertise nor the time are sufficiently available at the local level. **It is therefore essential that the County create a coalition of jurisdictions interested in proactively educating one another on key issues and opportunities, and banding together to influence and shape progressive and innovative state climate policy (for example, the 100% renewable portfolio standard).** Several jurisdictions in different states have formed effective lobbying coalitions to advance ambitious climate policies at the state level. This includes the **Colorado Communities for Climate Action**, the **Local Government Sustainable Energy Coalition in California**, the Virginia Energy and Sustainability Peer Network, and others.

Building on established County youth groups, a similar youth-led coalition should work on a parallel track. Since the younger generation will bear the greatest burdens associated with climate change, they have greater moral authority in asserting intergenerational justice and are thus potentially more likely to transcend political divisions. Such a coalition can also work with other states to lobby the federal government as well. A particular lobbying effort should focus on the provision by federal agencies of updated mid-Atlantic precipitation, including rainfall intensity, frequency, and duration, so that the County can more effectively conduct flood forecasting, manage stormwater runoff, update floodplain maps, and amend building and zoning codes.

Schools and Education



P-12

Advocate for the Continued Integration of Climate Change Education into the Existing School Curriculum

Lead:

MSDE, MCPS

Development Stage:

In progress

Investment Level:

County: TBD Private: N/A

Contributor:

DEP

While science and social studies include climate change curriculum at various grade levels in Montgomery County’s public schools, further integration of climate change education across the content areas will enable students to learn how climate change connects with other topics about which they are learning, both in the classroom and in their communities. **County agencies can work together with Montgomery County Public Schools to augment existing, identified climate change lessons through campaigns or monthly messaging.**

Given Maryland State Department of Education (MSDE) requirements and time constraints, a stand-alone course focused on climate change may not be practical. Instead, curriculum writers should identify opportunities to integrate climate change education into a variety of other subjects to increase student exposure to the varied issues within the topic of climate change. For example, students should have an opportunity through the science curriculum to analyze data and draw conclusions about climate science. Language arts classes can incorporate climate literature into class reading, and social studies classes can incorporate community service projects and stewardship practices as students learn about the ways that different communities are impacted by and responding to climate change. MSDE dictates curriculum content and standards for public school systems and needs to be involved in this work.



P-13

Develop a Standardized Climate Change Curriculum across Public Schools and Recommend the Same for Private Schools and Home Schools

<p>Lead: MSDE, MCPS</p> <p>Investment Level: County: TBD Private: N/A</p>	<p>Development Stage: Proposed</p> <p>Contributor: DEP</p>
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With the knowledge that the Maryland State Department of Education dictates curriculum content and standards for public school systems, climate change education should be an expectation of all schools across Montgomery County. Integrating a K-12 climate change curriculum and tailoring it to the grade level of students is essential to ensure foundational knowledge in the related disciplines as students grow in their ability to understand complex climate issues. For example, students will learn the difference between weather and climate in early grade levels, but not until a few years later will they dig deeply into the climate data evidence for climate change.

As discussed in **Action P-12**, climate change curriculum should reach beyond science, and embrace other content areas. The social and historical context of climate change needs to be taught and the climate change curriculum should include discussions of environmental justice, racial equity, and the disproportionate effects of climate change on vulnerable members of the community.

Using established content standards, teachers have the freedom to tailor instruction to the needs of their specific classes, and this offers opportunities to build in climate change education and engagement with age-appropriate and interesting climate change content in books, reading materials, and specialized programs in language arts and other non-STEM (Science, Technology, Engineering, and Math) subjects, particularly during the K-2nd grade years. This, in turn, can serve as a catalyst for reading groups and writing assignments. Students in middle school and high school should be exposed through the curriculum to career pathways and experiences that showcase the wide variety of jobs and careers in fields that will help address or solve climate change issues. Internship and apprenticeship opportunities should be expanded to link more high school students with Montgomery College and the Universities at Shady Grove.



P-14

Provide Professional Development for Educators on Climate Change Topics

Lead:

MCPS

Development Stage:

TBD

Investment Level:

County: TBD Private: N/A

Contributors:

Montgomery College, DEP

Teachers of all content areas need to be prepared with an understanding of the concepts of climate change and the pedagogy to bring that knowledge to students. Educators require professional development focused on the climate change content they will teach to their students. For example, a Grade 2 teacher may be introducing weather, but needs to know what climate is and be able to answer students’ questions and concerns in a way that is appropriate to their grade level. These topics can be uncomfortable and disheartening if they not addressed through a hopeful lens and teachers are not armed with examples of solutions and good habits students can adopt.

Professional development can equip educators to effectively teach students about the threats and impacts of climate change while encouraging students to think about their role in helping to combat climate change. Within Montgomery County Public Schools, professional development related to environmental justice has already begun, and includes how to manage difficult discussions and tough questions. In addition to the need to teach climate change, it is imperative that educators feel comfortable in their knowledge of climate change concepts when they interact with parents or guardians to explain the curriculum and answer questions. **Professional development opportunities should also be made available to educators in private schools and home schools in the County.**



P-15

Use School Gardens or Other Outdoor Learning Facilities as a Jumping-Off Point to Address a Multitude of Climate-Related Topics

Lead:

MCPS

Development Stage:

In progress

Investment Level:

County: \$\$ Private: N/A

Contributors:

DEP, M-NCPPC

School gardens offer a pathway for educators to teach students about topics as varied as climate change, ecology, earth science, food systems, business management, community engagement, nutrition, and history. Gardens are also an experiential platform for teaching students about where their food comes from and where it goes if it is not eaten. While some school gardens can be used for growing food, creating native or pollinator gardens achieves a similar goal of hands-on learning about the environment. **Growing the very successful Department of Environmental Protection (DEP) RainScapes program would increase the number of high school students learning about climate change as they nurture perennials in greenhouses for use in new landscape conservation areas.** Since 2009, 3,000 high school students have provided close to 20,000 native plants for RainScape gardens. Montgomery County Public Schools (MCPS) **Outdoor Environmental Education Programs** provides guidance and processes for creating and using perennial and container gardens in the classroom. While a number of MCPS schools have school gardens, most do not because they lack a person or champion who can take on the extra work and hours of creating and managing a garden. Thus, a major hurdle for increasing the use of instructional gardens at schools is the necessary skill and work involved in creating and building a school garden program. A solution to this problem is to fund regional school garden coordinators who would oversee the creation and maintenance of these small outdoor learning school gardens. With more gardens in place at schools, MCPS curriculum writers could include the use of gardens to address a wide variety of learning objectives. In addition, a program should be developed that facilitates opening school gardens to the community during the summer when schools are not using them. A goal should be for every student to have an experience learning in a school garden between kindergarten and Grade 12. Aware that there may be potential site limitations, partnering with an off-site facility should be considered to provide all students access to a hands-on garden learning experience.

There are other school systems that have been successful with this model, including Washington, D.C. **School Gardens Program**. The existing **DEP RainScapes for Schools program** could be more fully developed and supported. Since 2009, this program has provided school garden projects to a limited number of schools and has operated a native plant growing program for the past decade with the specific goal of introducing students at the high school level to opportunities for jobs related to green infrastructure, including growing plants and designing green infrastructure gardens. MCPS could fully support horticulture as a career path for students because most high schools already have greenhouses and could send teachers to training so that they are equipped to teach about the role of plants in carbon sequestration, green infrastructure in climate resilience, and stormwater tools such as rain gardens in a context-based rather than lecture-based format. Another feature of many school sites is an outdoor learning space. Funding for many of these existing outdoor learning areas has come through Parent Teacher Association (PTA) funds. To ensure equity and benefit many more children, funding should be identified from a government agency for the creation of these spaces which provide places to sit, plants and gardens to observe, and cover from the sun.



P-16

Develop Increased Opportunities for Students to Participate in Climate Change Learning Experiences Outside of the Classroom

Lead:

MCPS

Development Stage:

Proposed

Investment Level:

County: \$\$ Private: N/A

Contributors:

Local universities, nonprofits, public libraries, Maryland Association for Environmental & Outdoor Education (MAEOE), M-NCPPC, municipalities

Schools can leverage opportunities for students to learn outside of a formal classroom setting and simultaneously demonstrate sustainable, low-carbon practices. For example, like schools in the City of Berkeley, California,¹³⁹ Montgomery County Public Schools (MCPS) can participate in the meat-free **Green Monday** campaign and/or adopt sustainable procurement practices through the **Good Food Purchasing** Program. Schools can also expand outdoor opportunities through garden and structured environmental lessons. MCPS provides three meaningful systemic watershed environmental experiences as part of its science curriculum, one at each grade band, using the outdoors as a laboratory. Thus, in Grade 5, MCPS students are engaged in a learning unit called “Our Neighborhood, Our World,” in which they examine their own school yard to map water flow, look for erosion and pooling of water, and devise mitigation strategies.

In addition, schools can also build on existing Science, Technology, Engineering, and Math (STEM) nights, the County STEM festival, and the Maryland Association for Environmental & Outdoor Education **Green Schools Program** to increase awareness and help inform and empower students about climate change. Additional resources include the City of Rockville’s nature center and Maryland-National Capital Park and Planning Commission’s four nature centers and nature classrooms located across the County, where these types of educational experiences take place and can be expanded upon. **Outdoor Environmental Education Programs** manages the systemic Grade 6 Outdoor Education program and uses the outdoors as a classroom to connect students to their local environment through the “Our Watershed, Our World” unit.

At the culmination of this experiential learning, students complete an environment-focused Student Service Learning (SSL) project as part of their Maryland State Department of Education SSL requirement needed for graduation. In high school biology, all students participate in the third meaningful watershed environmental experience, which is focused on biodiversity in the local watershed. All schools have school-based School Energy and Recycling Teams (SERTs) that are composed of students and staff who work to promote and implement environmental conservation. MCPS should continue to expand the SERTs. School functions and field trips are also opportunities to facilitate climate change conversations among students and families. The community at-large can serve as an important resource for students to learn about climate change outside of the school setting. Local universities, nonprofits, and libraries can partner with schools to host lectures and roundtables with climate professionals, offer hands-on climate learning opportunities such as environmental film competitions, and provide internship opportunities, all of which introduce students to climate issues and environmental career options.

“ *It’s so great to see how we students are creating positive change.* ”
 ~ Resilience Ambassador Survey


P-17

Develop Sustainability Goals for Schools to Reach and Provide Incentives to Do So

Lead:

MCPS

Development Stage:

Proposed

Investment Level:

County: \$\$ Private: N/A

Contributor:

DEP

Schools serve as hubs for the community, and school-based sustainability projects are highly visible. The school building itself can serve as a laboratory for climate learning and climate action. To that end, the **School Energy and Recycling Team** has a website that allows all Montgomery County public schools to see and use their recycling and energy data. **Using this data, schools should develop yearly sustainability goals to show students easy ways to live more sustainably and to recognize their progress and impact throughout the year.** These goals could include decreased waste, implementing a composting program, actively recycling, and turning off the lights when they are not in use. Montgomery County Public Schools (MCPS) is already deeply involved in moving students toward an understanding of sustainability through the Maryland Association for Environmental & Outdoor Education **Green Schools Program**.

MCPS has a target of 50% of its schools reaching certification as Maryland Green Schools within the next 3 years and a long-term goal of 100% by 2035. A celebration of Maryland Green Schools occurs every year at an annual event, and new and recertified schools receive recognition from state and County officials. School-specific motivators, incentives, and stipends for the intensive work of the educators completing the Maryland Green School application may be a way to keep an equitable mindset for the sustainability achievements of every school. When students are making sustainable choices at school, they are more likely to bring those habits home with them and effect change in their own communities.



P-18 Encourage Climate Change Action at Home

<p>Lead: MCPS</p> <p>Investment Level: County: \$ - \$\$ Private: N/A</p>	<p>Development Stage: Proposed</p> <p>Contributors: DEP, MCCPTA</p>
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Given the reach of Montgomery County’s school system and its existing networks, resources, and communication channels, it is critical that they be leveraged to enhance understanding of climate change and inspire action and preparation in households throughout the County. Information learned in the classroom and through extracurricular activities and school environmental awareness efforts should tie to concrete actions that individuals and households can take to reduce their emissions and prepare for the impacts of climate change. For example, Montgomery County Public Schools and the Montgomery County Council of Parent-Teacher Associations (MCCPTA) can make climate change resources in multiple languages available so that students can share information with their parents and siblings. MCCPTA could also organize fundraisers that are eco-friendly to reinforce an environmental ethic, and school administrators can use existing touchpoints, like Back to School Night and STEM and science fair nights, to help prepare families for high heat days, storm events, and other climate hazards.

In partnership with [Linkages to Learning](#) and other partners, culturally relevant climate adaptation and resilience workshops should be developed for parents, starting at Title 1 schools. In addition, involving student organizations that focus on climate change and environmental justice can be a way to increase the number of students motivated to engage in school initiatives. This involvement may also encourage students to take these initiatives home with them and positively influence their peers, friends, families, and local community about steps that can be taken to live more sustainably. Other opportunities include lending out books on climate change to share at home, encouraging parents to read aloud with their young children, and increasing the use of Maryland State Department of Education mandated Student Service Learning to connect students to their role in living and acting sustainably.

An equity lens must be applied because not all students have the same resources to take steps to reduce their family’s environmental impact, and some families already have a significantly lower carbon footprint than the County average. **Incorporating strategies that work for a variety of living situations and income levels is necessary to ensure that all students can identify opportunities to participate in sustainability goals outside of school.** For example, low-income families might not be able to purchase electric vehicles or install solar panels on their houses, but they might have reduced carbon footprints relative to high-income households because of more frequent use of public transit, limited air travel, or consumption patterns. In short, low-carbon lifestyles should be encouraged regardless of family circumstances so that all students and their families can identify opportunities to participate in a way that works best for them.



P-19

Establish Cross-Departmental Partnership to Facilitate Implementation of Climate Goals at County Schools

Lead:

MCPS

Development Stage:

Proposed

Investment Level:

County: \$ Private: N/A

Contributors:

DEP, M-NCPPC, CUPF, DPS

There are both challenges and opportunities related to integrating environmental and climate goals on school grounds. The co-siting of stormwater retention with school gardens, for instance, requires collaboration from multiple planning, permitting, and approving bodies. Ideas such as the co-location of stormwater features and outdoor classrooms have the potential to boost the educational impact of this work. Communicating the installation of stormwater retention sustainability features on school sites to the Montgomery County Public Schools (MCPS) Outdoor Environmental Education Program Office (OEEP) would foster the development of educational opportunities for educators, staff, and students.

Funding, including stipends for teachers, should be made available for the Department of Environmental Protection and the MCPS OEEP to collaborate on professional learning for school educators and facilities teams at the selected schools. This professional development for educators should focus on content knowledge related to stormwater issues and management, and ideas about how to use these sites for student learning. Likewise, the development of outreach messages to MCPS students and families about climate action can benefit from a cross-departmental team of communications and equity experts. **A cross-departmental team that meets on a recurring basis should be established to strategically coordinate climate change efforts related to County schools.**

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Trying

*I once saw a bird,
Flying above my head.
Trying so desperately to
Catch a bit of air.
Instead it caught a heavy,
Heavy thick smoke— where?
Where did we stop to care?
Care about fighting for the fragile,
Helpless lives who need us so gravely.
These creatures who are often agile,
Are now slowing their pace in the valley.
When? When will the voices
Of those shouting “Enough!”
Will wake a wave, so strong-
It will clear the sky.*

*Hence I'm trying, like the bird.
I'm picking up the wasted—
Replacing them with bread.
I'm trying to limit my consuming,
Yet myself alone is not yet blooming—
Thus the community plants the roots,
'Till the change will come;
And the dirt, gold will become.*

Author: Shani Glassberg (Age 15)

What Can I Do?



What Can I Do?

While we often think of GHG emissions as emissions coming from major energy consumers such as utilities or public transit systems, **all of us** can reduce our carbon footprints and be better environmental stewards.

The CAP calls for both system-level changes as well as personal action to address emissions sources and uplift racial equity and social justice in areas such as transportation, buildings, energy, climate adaptation, and carbon sequestration.

You may ask yourself, “What can my family, friends, and I do in our everyday lives to combat climate change and create a more resilient Montgomery County?” A great place to start is to identify your current carbon footprint and commit to actions to reduce your own impact by following the steps in **Figure 39**.

STEPS

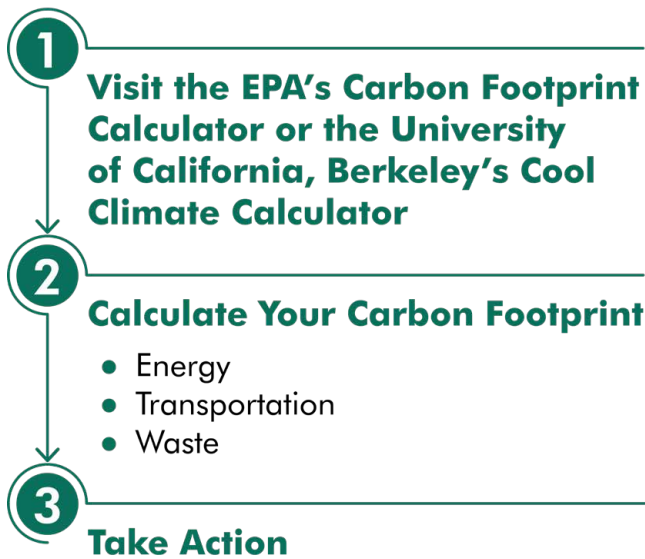


Figure 39: Identify your carbon footprint

Step 1: Visit the EPA's Carbon Footprint Calculator or the University of California, Berkeley's Cool Climate Calculator

Carbon footprint calculators such as the Environmental Protection Agency's (EPA's) **Carbon Footprint Calculator** or the University of California, Berkeley's **Cool Climate Calculator** allow users to calculate their carbon footprint, compare their carbon footprint to other U.S. households, and identify actions to reduce their personal energy consumption.¹⁴⁰

Step 2: Calculate Your Carbon Footprint

To calculate your personalized carbon footprint, start by entering the number of people in your household and your zip code before answering entering key information to estimate your home energy, transportation, and waste carbon footprints. To calculate your footprint in each of these three areas, the calculator requests information to determine your current emissions and provides prompts to guide actions to reduce emissions.

- **Energy.** To determine your current emissions, indicate your household's primary heating source as well as your average monthly utility bill cost for natural gas, electricity, fuel oil, and propane. To commit to actions to reduce your emissions, follow the guided prompts to save energy on heating and cooling, lighting, appliances, electronic devices, and washing and drying clothes.
- **Transportation.** To determine your current emissions, input the number of vehicles in your household as well as each car's miles traveled and average gas mileage. To find

out how you can reduce your transportation emissions, answer questions related to vehicle maintenance, miles traveled, and purchasing a car with higher gas mileage.

- Waste.** To determine your current emissions, indicate if your household recycles aluminum and steel cans, plastic, glass, newspaper, or magazines. To make plans to reduce your emissions, mark what materials you would like to start recycling that you do not already recycle.

Step 3: Take Action

Based on your information, and depending on the calculator you select, the tools will generate your overall carbon footprint and break down your emissions of carbon dioxide per year into various categories, such as: energy, transportation, waste, shopping, and food. The calculator will also show you how your impact compares to similar households in the United States. Based on the commitments you entered to decrease your household GHG emissions, the calculator generates what your carbon dioxide reduction and cost savings would be after you took your planned actions. See the example display on the right from the University of California, Berkeley's Cool Climate Calculator.

In addition to the actions recommended through the carbon footprint calculators, please consider the actions below that you, your household, or business can take to reduce emissions and build resilience.

Name	Tons saved	Dollars saved / year	Upfront cost	Status
<input checked="" type="checkbox"/> More efficient vehicle	4.4	\$1,366	\$2,000	Select <input type="checkbox"/>
<input checked="" type="checkbox"/> Purchase alternative fuel vehicle	5.4	\$1,691	\$17,000	Select <input type="checkbox"/>
<input checked="" type="checkbox"/> Purchase electric vehicle	6.9	\$1,948	\$15,000	Select <input type="checkbox"/>
<input checked="" type="checkbox"/> Purchase hybrid vehicle	4.4	\$1,366	\$15,000	Select <input type="checkbox"/>
<input checked="" type="checkbox"/> Telecommute to work	1.0	\$545	\$0	Select <input type="checkbox"/>
<input checked="" type="checkbox"/> Ride my bike	0.5	\$165	\$0	Select <input type="checkbox"/>



Source: University of California, Berkeley's Cool Climate Calculator. Available: <https://coolclimate.berkeley.edu/calculator>

Actions to Lower Your Carbon Footprint

1. **Walk more:** Walking has no negative impact on the environment – but a great positive impact on you – and you can even **Plog** (pick up litter) while you are walking around to help keep our streets and neighborhoods clean. The International Journal of Behavioral Nutrition and Physical Activity recommends 10,000 steps for increased health benefits – but any amount of walking is better than no walking at all.
2. **Take a bike to your destination:** There are more than 80 Capital Bikeshare stations distributed across many parts of the County. Bikesharing is short-term bike rental – you can see how it works and where you can get a bike by visiting the **Capital Bikeshare website** or simply going to a bikeshare station kiosk. You can either pay online or at a kiosk with a credit card for a one-time ride or buy a membership. A Capital Bikeshare membership includes access to over 4,500 bikes and over 500 bike stations throughout the Washington, D.C. metropolitan area. There are e-bikes and dockless options available through the CaBi system as well. And the Capital Bikeshare For All program provides free bikeshare memberships – no credit card required – to those who meet income eligibility requirements.
 - » **Get on a Bike:** Riding a bike is healthy, fun, and a low-impact form of exercise for all ages, and biking has no carbon impact on the environment. For those who can purchase a bike, we recommend checking out local vendors in the County. If you need some assistance, MCDOT works with local organizations like Rockville Bike Hub and Bikes for the World to provide residents with bikes. MCDOT also runs BikeMatch MoCo to help match bike donors with recipients – both adults and kids. Go to www.montgomerycountymd.gov/commute for information.

COUNTY RESOURCE: Commuter Services

Implementing an ongoing telework program for those on your staff who are able to work remotely can be a major component of reducing your business's carbon footprint – and can save you money, too. Free nationally recognized consulting services are available from MCDOT/Commuter Services to help you every step of the way – just contact them at (240) 777-8380 or commuter.services@montgomerycountymd.gov.

- » **Bike and Bus:** All Ride On and Metrobus vehicles have bike racks on the front of the bus – or for the Flash bus on Route 29, inside the bus. Biking part way and riding the rest continues to be a great way to make all your important connections in Montgomery County, get into shape, and protect the environment...all at the same time.
3. **Use public transportation:** Along with reducing air pollution, public transportation is also more fuel efficient per passenger mile, which contributes to an overall decrease in the amount of energy necessary for transportation. From Ride On (including Ride On extRa, Ride On Flex and Flash) to Metrobus to Metrorail, there are options to help you get everywhere in the County. Check with Commuter Services for any type of help you need related to taking transit: www.montgomerycountymd.gov/commute or (240) 773-8747.

4. **Combine errands:** If you are driving, save errands for one car trip, combine trips with friends, schedule trips to avoid rush hour traffic, and patronize one-stop shopping centers. Consider using car-sharing services (short-term car rental) rather than buying or leasing your own car. If you do not use your car very often, you may be able to save a lot of money by just renting a car from a car-sharing service or rental car agency when you need one for heavy-duty errands or trips where transit or other modes do not work as well.
5. **Service Your Car:** When your engine runs at peak efficiency, it reduces pollution. Change your oil regularly. Check air filters. Pay attention to that check engine light! Make sure your tires are properly inflated to the manufacturer's specifications. Low tires require more energy to move and maintain speed, which causes your engine to work harder—and you burn more fuel.
6. **Switch to electric or hybrid:** If you drive and are ready to upgrade your vehicle, consider replacing your gas-powered car with a new or used electric vehicle. Even if purchasing your next vehicle is a few years away, you can start planning now by learning about your options. There may be federal and state tax credits available.
7. **Telework one day (or more):** The Washington, D.C. area is consistently ranked as one of the top 10 worst cities for traffic. This is one good reason to leave the car parked 1 day a week (or more if possible!) – and another reason is to protect the environment. If you are an employer in the County, Commuter Services can help you set up a smoothly functioning telework program with the assistance of a nationally recognized consultant – free of charge. If you are an employee wanting to do more teleworking, Commuter Services has information and assistance available for you as well.
8. **Vacation closer to home:** Air travel is a big contributor to GHG emissions. Instead of flying to a location far away, look into vacation locations within driving, bus trip, or rail distance and take a vacation there. Or better yet, take a "staycation" and take in all that Montgomery County has to offer!
9. **Carbon offset your flights:** Carbon offsets are voluntary programs where people can pay to "offset" or make up for the emissions that their flights produce. The easiest option is to offset directly with the airline when you book your flight. You just pay an extra fee on top of the flight cost, which is donated to a carbon offset program. There are also third-party programs, so make sure you do your research.

Actions to Lower Your Carbon Footprint: Home Electricity Usage

1. **Schedule a home energy assessment:**

Everyone in Maryland who pays their utility bill qualifies for home energy assessments. There are two options: (1) Quick Home Energy Checkup (QHEC) – there is no additional cost for this program, and it is a great option for renters as well as homeowners. This 45- to 60-minute checkup consists of a contractor coming into the home (there are some virtual options) and providing the resident with energy-saving measures such as LED light bulbs and a high-efficiency shower head. (2) Home Performance with ENERGY STAR® Audit – this is ideal for homeowners, since it costs \$100 for the assessment and is more comprehensive than the QHEC. This 2-hour audit includes a door blower test and provides residents with a list of recommended home retrofits to make their home energy efficient.

2. **Switch to LED lighting:** Making the switch to LED light bulbs offers significant energy savings over incandescent, halogen, and compact fluorescent alternatives. On average, LEDs consume 80% less energy than incandescent light bulbs. Make sure when you recycle those compact fluorescent bulbs that you **recycle right**.

3. **Pay attention to your thermostat:**

Industry recommendations suggest you set your thermostat to 68 degrees in the winter and 78 degrees in the summer. Installing a programmable thermostat may be an option. Programmable thermostats can help make monitoring easy and human error-free. One suggestion is to set the thermostat to the suggested setting while you're awake and then lower it while you're asleep. Lowering your thermostat 10 to 15 degrees for 8 hours can reduce your heating bill by 5% to 15%.

4. **Use your appliances at the right time:**

During the day, many people use their computers, electronics, and lights, creating peak demand. Using larger appliances at off-peak times of day can lower peak demand. In addition to shifting your energy usage, consider adjusting the way appliances are used by taking actions like the following: wash clothes with cold water and make sure you have a full load, use a lower heat setting on the dryer and use a dryer ball to help cut energy costs, and run the dishwasher only when it is full and scrape instead of pre-rinsing the dishes.

COUNTY RESOURCE: Montgomery Energy Connection

Montgomery Energy Connection

is a program of Montgomery County that was created to be your link to energy savings. On this website, you will find information to help lower your utility bill, assistance to help pay your utility bills, information about switching to renewable energy sources, and other helpful hints about energy usage.

Use the Program Finder tool by inputting your housing type, zip code, household size, and household income to find out what programs are available to you.



5. **Unplug small appliances when not in use:** Make sure electronics are turned off when not in use or set them to sleep mode to avoid vampire loads. Use power strips to uniformly shut off power to devices. Unplug chargers and other small appliances (like the coffee pot) when you are done using them. The energy costs of plugged-in appliances can really add up, and unplugging these devices could save you \$100 to \$200 a year.
6. **Take shorter showers:** Switching to a 5-minute shower can cut water use by almost half. Not only that, but by reducing the amount of hot water used in the shower, users can conserve water as well as the energy used to heat the water.
7. **Invest in ENERGY STAR® appliances:** By choosing ENERGY STAR®, a typical household can save more than \$575 on their energy bills and still enjoy the quality and performance they expect. At the end of your appliance's useful life, transition to electric appliances in anticipation of the electric grid becoming greener.
8. **Switch to clean energy:** Maryland is a choice state, meaning that you can buy your electricity from many different sources, including renewable energy sources such as wind and solar. Many suppliers offer green electricity for purchase by Montgomery County residents, but their offerings can be difficult to compare – due to differing terms, conditions, and other relevant considerations. Green-e is the trusted global leader in clean energy certification. They make it easy for businesses and individuals to purchase verified clean energy with confidence and for consumers to choose sustainable products and services.

COUNTY RESOURCE: Paying for Projects: Montgomery County Green Bank

This publicly chartered non-profit organization is dedicated to accelerating affordable energy efficiency and clean energy investment in Montgomery County. They have programs for residents and businesses. Visit <http://mcgreenbank.org/> for financing options.

9. **Switch to renewable energy:** As solar PV systems are expected to have lifetimes of 25 years or more, it is important for residents to have a good understanding of all aspects of the decision to “go solar.”
 - » **Participate in Community Solar:** Community, or shared, solar makes it possible for anyone with an electric bill to access solar energy, even if they can't put it where they live. Residents receive the same benefit as installing solar panels on their roofs by subscribing to a large commercial project in the same utility area. Find more information at www.MontgomeryEnergyConnection.org
 - » **Join a Solar Co-op:** A solar co-op is a group of residents who come together in order to get better pricing and service on home solar installations. Members receive expert advice and guidance, removing much of the hassle of do-it-yourself installation. Solar co-ops make installing a solar system easy. The County has helped over 200 residents through this process since 2016.

- » **Install solar panels or a solar hot water heater:** The Maryland Energy Administration created a booklet entitled ***A Maryland Consumer's Guide to Solar***. If you're a Maryland resident considering solar power (also known as photovoltaics or PV), this guide will equip you with information you need in order to make sound decisions.
- » **Go Geothermal:** Installing a geothermal or geothermal pump is another option for switching to clean energy. This system takes advantage of the stable temperatures of the soil by transferring heat stored in the earth into your home during the winter and transferring it out of your home and back into the ground during the summer. Geothermal systems can be initially expensive to install but typically pay off within 10 years.

10. **Plant trees:** Because trees use carbon dioxide to build their trunks, branches, roots, and leaves, they are natural carbon absorbers and help to clean the air. In fact, one mature tree can absorb up to 48 pounds per year! ***The Tree Montgomery*** program provides residents with shade trees.

Actions to Lower Your Carbon Footprint and Build Resilience for Your Business

1. **Schedule an energy audit:** An energy audit can help determine your baseline energy use and offer a clear outline for ways to save energy at work. Quick Energy Checkups (QECs) include a service provider visiting your business, making recommendations, and installing energy-efficient devices. Your service provider will install up to \$250 worth of these energy-efficient devices at no cost to you.
2. **Benchmark your energy use:** You can't manage what you don't measure, so tracking your energy use with a benchmarking tool (such as EPA's ENERGY STAR® Portfolio Manager) can help identify energy savings opportunities in your building and compare your performance against your peers.
3. **Switch to LED lighting:** Making the switch to LED light bulbs offers significant energy savings over incandescent, halogen and compact fluorescent alternatives. On average, LEDs consume 80% less energy than incandescent light bulbs.
4. **Invest in ENERGY STAR® appliances:** Before you buy or lease appliances, check to see if they are ENERGY STAR®-rated. An ENERGY STAR®-rated appliance has been evaluated and deemed energy efficient, which can save you money and help you manage your small business energy costs, especially in the long run. Choose electric (as opposed to gas) appliances if possible – this will become increasingly important as the electrical grid becomes cleaner.
5. **Install programmable thermostats:** Your building may not be open 24 hours a day, so a programmable thermostat will help regulate the temperature in your building.
6. **Look for deep retrofit opportunities:** Major systems upgrades such as HVAC upgrades, insulation, and window replacements, require planning and capital costs, but can provide a bigger return on investment with higher energy savings. Financing opportunities are available with EmPOWER Maryland incentives, Commercial Property Assessed Clean Energy (C-PACE) financing, and the Montgomery County Green Bank.
7. **Think outside the building:** Are you in control of the landscaping around your business? If so, you have a great opportunity to create energy savings for your small business with energy-efficient landscaping. Strategically planting trees to block winds or provide shade on hot summer days can help reduce your heating and cooling costs. Another way to reduce your carbon

footprint is to reduce the lawn area by half; many corporate lawns can be successfully transformed into low-maintenance planting beds that can include trees, native flowers and groundcovers and that will require routine, but not weekly, maintenance. Other options would be to both reduce your carbon footprint and add voluntary stormwater management through installation of a RainScapes Rain Garden or Conservation Landscape.

8. **Become a Certified Green Business:**

The Green Business Certification Program helps businesses to green their day-to-day operations through the provision of tools, incentives, inspirational ideas, collaboration, and leadership opportunities

Visit: <http://www.mcgreenbiz.org/>.

9. **Plan for emergencies:** The Montgomery County Office of Emergency Management's Business Preparedness page has resources for creating an Emergency Action Plan, a Business Continuity Plan, and "go-kits" for your business, and for implementing trainings and drills for employees to prepare for extreme weather events and emergencies

Visit: https://www.montgomerycountymd.gov/OEMHS/plan/busprep.html#_Build_a_Kit.

https://www.montgomerycountymd.gov/OEMHS/plan/busprep.html#_Build_a_Kit.

Actions to Lower Your Carbon Footprint: Daily Actions

1. **Be the change:** Extend your efforts by sharing knowledge with your friends and family about reducing carbon footprints and emissions. Start the conversation through word of mouth or social media about how you and others are taking action to reduce your impact.
2. **Be an advocate:** Get involved politically at the municipal, county, state and federal levels. While personal actions are important, the systemic change necessary to address climate change requires both governmental solutions (legislative and regulatory) and business reforms. So write to your elected officials and use your wallet and voice to encourage businesses to green their operations and impact. Since climate change knows no borders, it's important that your advocacy also extend beyond Montgomery County.
3. **Buy less stuff:** Reduce and reuse is always the best bet. The **Buy Nothing Project** allows people and communities to narrow the single-use materials or convey stuff that has never been used to other working hands, through gifting and sharing between group members. Shop at secondhand stores, thrift stores, and yard sales, and through Craigslist, Freecycle, and bartering. Use the County's wonderful public libraries.
4. **Buy local:** Support your local economy by buying local. The MoCo Made initiative was first launched in fall 2017 in partnership with the Montgomery County Economic Development Corporation to highlight our County's vibrant local food and beverage sector. Locally sourced products and food have a lower carbon footprint because they take fewer modes of transportation to get to your home and have lower amounts of embodied carbon. Consider buying locally sourced plants for your garden. Local native plant sales in the spring are a good way to support small growers and benefit the environment by planting native plants. We have some wonderful small-business nurseries that also offer great plants.
5. **Gift differently:** Reduce your carbon footprint when buying gifts by giving experiences, gifting greener, giving back, buying local, and remembering the 3Rs (Reduce/Reuse/Recycle) when buying and wrapping gifts. Montgomery County features an annual event called Gift Outside the Box (<https://www.montgomerycountymd.gov/DEP/gift-greener.html>), but you can gift greener year-round.

6. **Know your water use:** Every drop counts! Whether you're on public water or have your own well, the benefits of conserving water add up. If you're on a municipal water meter, your water bill will go down. If you're on a well, you'll have water for drier times of year like late summer and early fall. Regardless of the source, you'll save money on the electricity it takes to pump and heat water. According to the U.S. Department of Energy, heating water can account for 12% of a home's annual energy use, and energy usage is part of our carbon footprint.
7. **Meatless Mondays:** What we eat and how it is produced can have a huge impact on the environment. The impacts of intensive meat production operations include deforestation, air and water pollution, and GHG emissions. Opting for Meatless Mondays is one solution for those of us who find it hard to go 100% meat-free! Every Monday, choose a vegetarian meal over a meal that includes meat. There are endless possibilities beyond salad, and it's an easy and delicious step to reduce your carbon footprint. Meatless Mondays is also a great opportunity to educate yourself a little more about ALL your food, how it's grown, how it's processed, and the impacts it has on the environment around it.
8. **Start composting:** Composting enriches soil, helping it retain moisture, and suppresses plant diseases and pests. Composting also reduces the need for chemical fertilizers and encourages the production of beneficial bacteria and fungi that break down organic matter to create humus, a rich nutrient-filled material. Compost facilitates improvements in soil health, which in turn, allows more carbon to be sequestered in our soils through the interaction of plants and fungi and bacteria in the soil. If you do not produce sufficient compost, top-dress your beds with compost rather than relying on chemical fertilizer and leave your leaves in planting beds, only mulching the front edges to create a neat appearance.
9. **Participate in RainScapes:** *RainScapes* is both an approach and a program on how to create environmentally friendlier landscape solutions at your home, business, or faith-based organizational grounds. RainScapes are focused on working with natural systems, such as native plants that are adapted to our native soils; amending, not replacing soils; and shaping the ground to capture and slow down runoff so it can soak in, help the plants grow, and create a beautiful, healthy habitat. These gardens do not need chemical fertilizers or potable water, and they will have a lower carbon footprint than landscapes that rely on mechanical tools for maintenance, such as lawn mowers or leaf blowers.
10. **Shop at a Farmers Market or Join a CSA:** Farm-fresh food, smiling faces, a sunny sky (hopefully!) — what better way to stock up for your week's meals? The produce, cheeses, breads, eggs, flowers, and even meats that you find at Montgomery County's farmers markets are fresher and travel a shorter distance than similar grocery store products. Community Supported Agriculture (CSA) refers to a once-a-week or biweekly box full of local fruits and veggies that are in season delivered to your door or that you pick up. You can find more information at <https://montgomerycountymd.gov/agservices/farm-to-table.html>.
11. **Stop the junk mail and use paperless billing:** How much of the mail in your mailbox do you really want to look at, and how much goes straight to the recycling bin? The average American receives 41 pounds of junk mail every year, and according to the EPA, only 40% of mail is recycled. Not just that, but it has to be delivered to your home and that is contributing to our carbon footprint. From now on, say NO to junk mail. Go to <https://www.catalogchoice.org/> for more information.

Actions to Increase Climate Resilience

1. **Purchase flood insurance:** It is important to note that home insurance does not cover flooding and homeowners, regardless of whether or not they are in a Federal Emergency Management Agency (FEMA) floodplain area, are still at risk of flooding, especially in areas undergoing redevelopment. Even if you do not live in a designated floodplain (most flooding occurs outside of FEMA floodplain areas), you can buy FEMA flood insurance at a modest price. The **Maryland Insurance Administration** provides information on the types of insurance available as well as assistance on complaints related to your claims. The **National Flood Insurance Program** is another great resource providing information on the cost of flooding, flood maps, insurance coverage, lowering flood risks, and purchasing insurance.
2. **Flood-proof your home:** Go to the National Flood Insurance Program's website to evaluate your risk and then, depending on what you learn, make improvements, such as elevating your HVAC equipment, which is often located in the basement; making sure windows and doors are watertight; enhancing stormwater management on your property through the County's **RainScapes Program**; and installing a sump pump if your home is an older one and a French drain to divert water away from your house. Encourage neighbors to decrease rather than increase impervious cover (including converting driveways to pervious pavement), and if necessary, alert the Department of Permitting Services if flooding results from nearby redevelopment.
3. **Stay informed about high heat days and intense storms:** Register with the **Alert Montgomery System**, which provides accurate and immediate emergency notifications from Montgomery County to your cell, work, or home phones via text, email, or voice message.
4. **Build an emergency preparedness kit:** Be prepared for climate disasters by having basic household items on hand, such as non-perishable food, water, a battery-operated radio, a flashlight, first aid materials, extra batteries, and a backup of critical files on a thumb drive or other media).
5. **Reduce health risks:** Plant shade trees to reduce summer heat; don't overexert in hot weather, avoid waters with a blue-green "paint" slick, which is a sign of harmful algal blooms (and don't let children or dogs enter waters with blooms), and be mindful of insect-borne disease from mosquitos and ticks.
6. **Build community connections and support systems:** Be aware of vulnerable neighbors, especially during high heat days, and check in on them to offer assistance and comfort. Be aware of community shelters and cooling centers, and ensure pets are hydrated and have access to cool areas. Another wonderful opportunity is to join or start one of the many County-supported "**villages**" designed to foster social connections and mutual, neighbor-to-neighbor voluntary support, such as providing transportation to medical appointments, grocery shopping, doing household repairs, and cooking meals. If you live in Silver Spring, become a member of the **Silver Spring Time Bank** to strengthen community ties by giving and receiving services without exchanging money, or start a time bank in your community.



Artist: Chayse Graydon (Age 18)



Artist: A



mi Hernandez (Age 16)

Zero Waste Task Force Planning and Initiatives



Zero Waste Task Force Planning and Initiatives

The County's GHG inventory includes the emissions associated with the disposal of solid waste, which accounted for only 2% of Montgomery County's GHG emissions in 2018. Nonetheless, it is an important area for continued improvement in both emissions reduction and environmental stewardship.¹⁴¹ The emissions from collecting and transporting solid waste and recyclables are accounted for under transportation emissions, while emissions associated with sorting and processing these materials are captured under building emissions.

The Maryland Department of the Environment requires each jurisdiction in Maryland to prepare and maintain a comprehensive plan for managing waste in the County.¹⁴² This plan, updated regularly, is commonly known as the County's Ten-Year Solid Waste Management Plan (Ten-Year Plan). Prior to the latest proposed update to the Ten-Year Plan, a seven-member task force was formed to provide advice and guidance on how best to maximize waste reduction, reuse, recycling, and sustainable management of all materials across the entire integrated waste management system, including all programs, facilities, operations, initiatives, and services.¹⁴³ The task force worked closely with DEP, and its resulting recommendations formed the basis for a proposed update to the Ten-Year Plan, which is focused on making continued progress on reducing waste and increasing recycling.¹⁴⁴ This plan highlights the policies and programs that are necessary for a robust waste management system. The initiatives included in this update are summarized below.¹⁴⁵

Reduction and reuse of waste sources:

Reducing waste is the key to moving closer to zero waste. The Ten-Year Plan describes many opportunities to divert waste, noting that some actions have been taken already but more needs to be done. Specific actions with GHG reduction

implications that are laid out in the plan include banning single-use plastic bags; revisiting existing county laws and regulations banning materials to implement more opportunities to address other non-recyclable materials, such as #5 plastics and plastic silverware; increasing efforts to curb food waste; and modifying the Transfer Station to transform it into a modern Resource Recovery Park with more opportunities for reuse and recycling of textiles and mattresses.¹⁴⁶

Address physical infrastructure needs: The Ten-Year Plan describes several initiatives that are foundational to making any significant progress in achieving improvements to the County's solid waste collection, recycling, and diversion goals. These initiatives include:

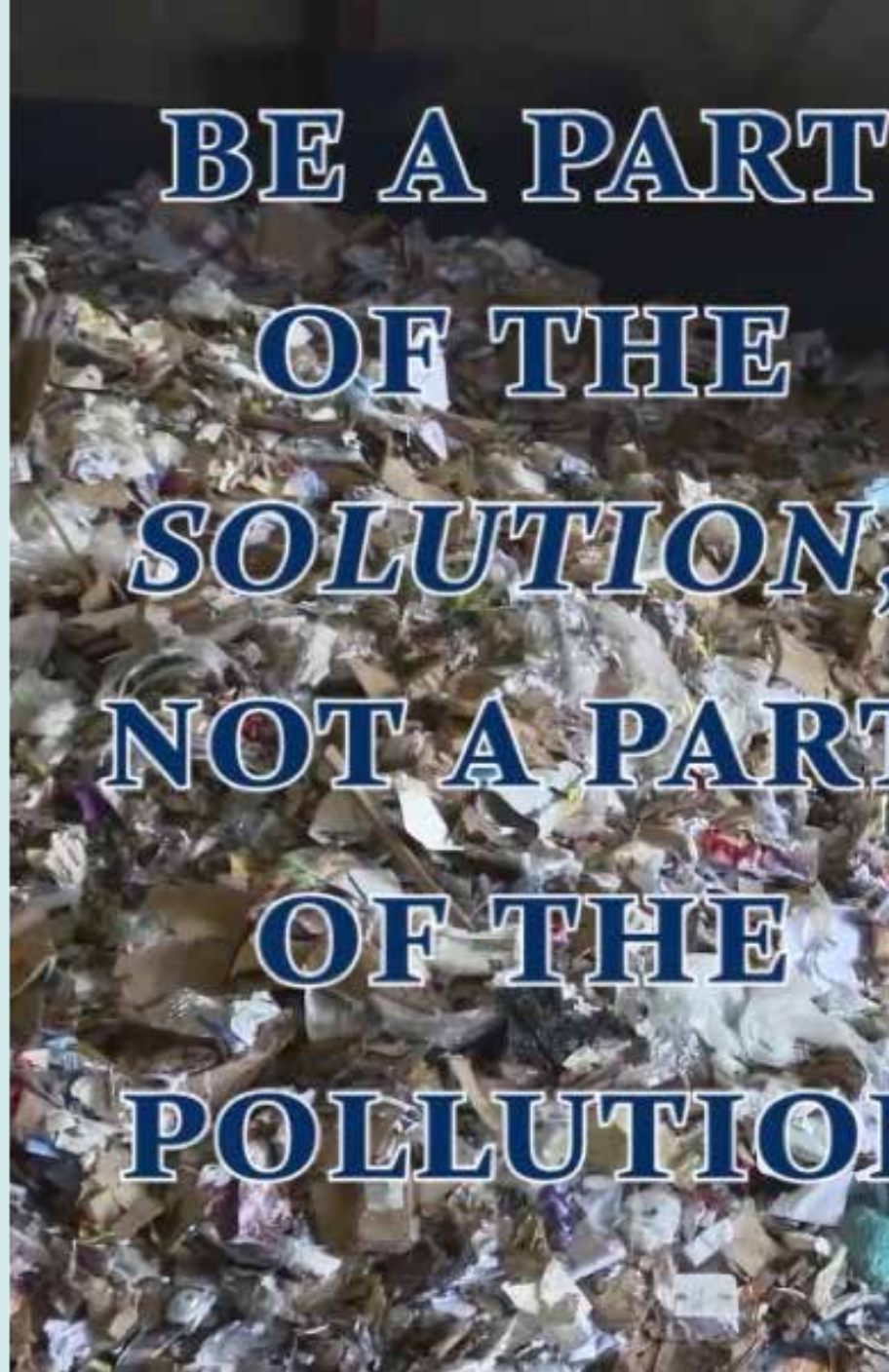
- Modernization of the Materials Recycling Facility to ensure processing capacity for the large volume of recyclables received from residents. Modernization includes the use of optical sorters, robotics, and other technological improvements.
- Modification of the Transfer Station to provide safer access for the thousands of vehicles using the facility as well as to increase opportunities for reuse and recycling.
- Planning for the waste disposal methods of the future, including reaching the goal of closing the Resource Recovery Facility by 2026.
- Developing processing capacity for composting of organics, particularly food waste. DEP is initiating a review of the options, which include expanding the Dickerson composting facility to accept food scraps, building an anaerobic digester, and relying on private capacity being built in the region.

Recycle more materials: The Ten-Year Plan contains many initiatives to improve recycling. These initiatives include:

- Trash disincentives such as Pay as You Throw programs that charge residents more for trash. Providing a larger recycling bin along with a smaller and more expensive trash pickup also encourages increased recycling. According to the Ten-Year Plan, the County will initiate a pilot Pay as You Throw program.
- Trash collection by the County in Sub District B may provide an opportunity to improve recycling and reduce GHG emissions through reduced waste pickup as well as fewer trash trucks on the routes every day.
- Composting of food waste includes curbside pickup from residences and businesses in the near future, with the banning of organic food waste from the trash pickup for commercial entities as the eventual goal. This policy change depends on the County’s having broader access to processing capacity.



Participants at an open house for the zero waste initiative



Artist: Karish Wahi (Age 14) [Link to Video](#)



Remaining Emission Sources and Potential Reduction Strategies



Remaining Emission Sources and Potential Reduction Strategies

To fully achieve zero GHG emissions by 2035, the County will need to implement mitigation strategies for addressing small emissions sources in combination with local carbon sequestration. This chapter describes the remaining emissions sources and potential GHG reduction strategies for each. This chapter also describes several new technologies that are currently under development that may be able to contribute to future emissions reductions.

Remaining Emission Sources and Reduction Strategies

Hydrofluorocarbon and Refrigerant Emissions

Hydrofluorocarbon and refrigerant emissions contributed to over 5% (approximately 5.1%) of Montgomery County's emissions in the 2018 GHG inventory. Hydrofluorocarbons (HFCs) are a type of gaseous short-lived climate pollutant (SLCP) that impacts global temperatures much more quickly and, in the case of some gases, thousands of times more powerfully than carbon dioxide.¹⁴⁷ However, HFCs have a short atmospheric life, making their reduction a key strategy to mitigate climate change.¹⁴⁸

¹⁴⁹ Both private and commercial refrigerators; freezers, including laboratory freezers; and air conditioning units commonly use HFCs as refrigerants. HFCs are attracting increased attention at the national and international level. Signatories to the Paris Agreement must now account for SLCPs, including HFCs, in their plans to meet the stated goal of raising global temperatures no more than 1.5°C. With the rejoining of the Paris Agreement

and the inclusion of the American Innovation and Manufacturing (AIM) Act of 2020 in the Consolidated Appropriations Act of 2021, domestic actions around HFCs have recently been increasing. AIM requires U.S. companies to cut the production and use of HFCs by 85% by 2036.¹⁵⁰ The legislation also preempts states, or a political subdivision of a state, from issuing more stringent HFC restrictions for a period of 5 years. The Biden administration has also expressed support for the Kigali Agreement, a 2016 amendment to the Montreal Protocol. This is particularly important because China and India have indicated they will sign on to the Kigali Agreement once the United States does.¹⁵¹

With this federal action in place, further production and use of HFCs will be reduced. However, Montgomery County has a role to play in reducing HFC emissions by ensuring air conditioners, freezers, and other HFC-containing equipment are recycled appropriately. In addition, incentives may encourage the replacement of equipment with more energy-efficient, non-HFC coolant models.

Fugitive Emissions

In the 2018 Montgomery County GHG inventory, fugitive emissions from natural gas distribution pipelines constituted approximately 0.5% of total community-wide emissions. Natural gas pipeline leaks are caused by corrosion, material defects, and joint/fitting defects or failures.¹⁵² Methane is the predominant GHG emitted from natural gas pipeline leaks, but nitrous oxide (N₂O) is also emitted. Leaks are detected through the soil oxidation rates of methane. Leaks from cast iron and unprotected steel pipeline main and service lines contribute 33% of total distribution segment emissions despite representing the fewest miles of any piping material.¹⁵³ Best practices for avoiding fugitive emissions include replacing cast iron and

unprotected steel pipes with plastic or protected steel, using flexible insert liners, and conducting assessments of leak volume.¹⁵⁴

The Trump administration relaxed the federal standards that address fugitive methane emissions from the oil and gas industry. However, under President Biden, action is expected to be taken to strengthen controls on methane, and the U.S. Senate has taken action to revert to the 2016 rule related to methane established by the EPA under the Obama administration.¹⁵⁵ In response to the relaxation of federal regulations, MDE adopted standards to control methane emissions from natural gas facilities in the state.¹⁵⁶ Actions proposed include requirements to mitigate methane emissions through fugitive emissions detection and repair.

Agriculture Emissions

Greenhouse gas emissions from the agriculture sector make up approximately a third of a percent (0.35%) of the County's 2018 GHG inventory. The majority of GHG emissions from the agriculture sector originate from soil fertilization. Most of these emissions are of N_2O , a potent GHG. There are a variety of strategies available to reduce N_2O emissions from agriculture, some of which have already been mandated by the State of Maryland, including regulating the amounts of nitrogen used on agricultural fields, limiting the months in which fertilizer usage is allowed, and subsidizing cover crops.¹⁵⁷

Specific recommendations to reduce GHGs from the agriculture sector include implementing nitrification inhibitors,¹⁵⁸ which "keep soil nitrogen in a form useable by crops for a longer period of time, applying microbes that allow crops to fix their own nitrogen, which can replace fertilizer application for some crops, implementing processes to manufacture synthetic fertilizers from renewable energy sources, and more precise fertilizer management."¹⁵⁹ Consistent use of cover crops like soybeans, which is already common practice in the state of Maryland, can decrease emissions from fertilizer by adding nitrogen to the soil while also reducing polluted runoff and

soil erosion.¹⁶⁰ Other practices to reduce GHGs from the agriculture sector, such as regenerative agriculture, are addressed in the **Carbon Sequestration Actions** section.

Wastewater Emissions

Greenhouse gas emissions from the wastewater sector comprise a tenth of a percent (0.1%) of the County's 2018 GHG inventory. The electricity used in this sector is included in the emissions from electricity consumption. There are two wastewater treatment plants located in Montgomery County. The Seneca Water Resource Recovery Facility treats an average of 14.8 million gallons of wastewater daily. The Damascus Water Resource Recovery Facility treats an average of 0.8 million gallons of wastewater daily. The majority of the County's wastewater flow goes to the District of Columbia for treatment at the DC Water Blue Plains Advanced Wastewater Treatment Plant. The GHG emissions from the County's wastewater that is treated by DC Water are not captured in the County's GHG inventory; instead, these emissions are captured in the District of Columbia's GHG inventory.

GHG emissions relating to wastewater mostly occur during the wastewater treatment process. During the treatment of wastewater, processes of nitrification and denitrification occur at the microbial level in order to remove ammonium from the wastewater. These processes in turn release N_2O into the atmosphere, the third biggest contributor to climate change after carbon dioxide and methane. A recent study has shown that wastewater treatment plants are the prime source of N_2O from anthropogenic sources, contributing to both climate change and air pollution.¹⁶¹

Limiting emissions of N_2O has proven to be difficult; however, there have been several design strategies in wastewater treatment plants that have reduced emissions. These design features include "influent flow balancing, high recycle rates, and large bioreactor volumes." While Montgomery County's main carbon emissions relating to wastewater are due to N_2O emissions, studies are still inconsistent on concrete ways to

actively decrease these pollutants. Laboratory studies have indicated that applying a longer solid retention time decreases N_2O production, but this will need to be trialed on a larger scale before this strategy becomes available for implementation.¹⁶² Future research will focus on “both the quantification and reduction of N_2O emissions from various full-scale wastewater treatment plants. In addition, future studies will reveal the fundamental processes involved in N_2O production by both nitrification and denitrification.”¹⁶³

Other Potential Reduction Strategies

Emerging Technologies for Carbon Capture and Storage

There is a growing interest in carbon capture and storage technologies. At present, carbon capture, use and storage technologies, both engineered and biological, are being innovated, but they are not yet economically viable. A more favorable environment for carbon capture, use, and storage technologies can come about through a reduction in carbon capture costs; creation of a regulatory framework to incentivize accounting of carbon capture, use, and storage costs; and technology innovations that use carbon dioxide as a valuable feedstock in products. Enhanced oil recovery, which is the most mature carbon capture technology, increases the efficiency of large-scale industrial plants and refineries. Approximately 90% of the carbon dioxide usage currently being captured in the United States is achieved through this method. In the growing carbon technology start-up space, the “carbon capture to value” model is the sector most heavily backed by venture capital. Products emerging from the carbon technology space include fuels, chemicals, and building materials.

For a local jurisdiction like Montgomery County, focusing on carbon farming is the most viable option right now. By adopting nature-based solutions such as composting, biochar, and other

smart agriculture practices addressed in the **Carbon Sequestration Actions** section, the County can contribute positively to reducing its GHG emissions. As carbon capture, use, and storage technologies grow and transform in the next decade,¹⁶⁴ the County can then participate in innovative practices to decarbonize. On the policy side, the County can advocate for policies that incentivize corporations¹⁶⁵ to adopt carbon-negative products by pricing the externalities of carbon emissions.¹⁶⁶

Emerging Renewable Energy Technologies and Methods

There are a number of up-and-coming solar technologies and innovative mounting locations that the County should explore for adoption, if they are found to be cost-effective. Solar panels mounted on utility poles work both as energy sources as well as data collectors, allowing utility companies to monitor the grid, respond more efficiently to energy demand, and detect problems. This approach also increases the efficiency of solar and allows generation to be more localized.¹⁶⁷ One example of this technology is New Jersey’s PSE&G solar installations, a \$200 million project that mounted 175,000 solar panels on utility poles and produces 40 MW for approximately 6,000 homes annually.

Another innovative solar mounting location is within highway rights-of-way. Leasing the right-of-way can be a source of income or a cost-saving measure for MDOT, and rights-of-way are efficient locations for solar as they are usually close to electrical loads and free from development.¹⁶⁸ The Federal Highway Administration created a briefing book that includes an overview of renewable energy highway projects, possible business models, funding sources, regulatory requirements, case studies, and sample pilot projects.¹⁶⁹ Through public-private partnerships, MDOT has been siting solar panels in the rights-of-way since 2012. It has eight solar array facilities producing 5.5 million MW of power annually.¹⁷⁰

Another solar siting possibility is within highway noise barriers (also known as PV noise barriers). First deployed in Switzerland in 1989, PV noise barriers are found in several countries,¹⁷¹ and this technology does not require additional dedicated land.¹⁷² Two additional options have proved less efficient: solar-paved roadways (roads and sidewalks) and solar-paved bikeways, which are made of thin, heavy-duty, skid-resistant PV pavers applied directly over existing pavement. Georgia's Department of Transportation installed 50 square meters of solar roadway to power a visitor information center.¹⁷³

Unfortunately, solar roadways are about 20 times less efficient than standard solar panels. Solar bikeways work similarly; the most prominent example is the SolaRoad in the Netherlands, which cost \$3.7 million for 230 feet of on the ground solar panels.¹⁷⁴ A less aesthetically pleasing but more efficient method for solar bikeways would be solar hanging above the bikeway, as in South Korea, where a solar bike path runs through a highway and shields bikers from the sun.¹⁷⁵ Similarly, solar fabric can shield the public from the sun while at the same time generating power. Solar fabric combines flexible solar panels with fabric to create a canopy that generates electricity. It can be used in outdoor parks (as umbrellas), to cover parking lots and generate electricity for EV charging, or to shield riders on bike paths.

Additional emerging solar technologies, such as solar shingles, windows, and trees, need further development and testing to become commercially viable. Solar windows can be easily incorporated into a traditional building design. Although the older type of solar windows using quantum dots were too expensive for cost-effective installation, it set the precedent for perovskite solar cells, which are almost as efficient as silicon solar panels.¹⁷⁶ The U.S. NREL has forged a public-private consortium, dubbed the US-MAP (for US Manufacturing of Advanced Perovskites Consortium), that aims to fast-track the development of low-cost perovskite solar cells for the global marketplace.¹⁷⁷ Solar skin is a purely aesthetic technology that works as an overlay to transform the look of any solar panel to blend in

with the homeowner's roof. It is not cost-effective, although it could incentivize some homeowners to make the switch.¹⁷⁸ Solar shingles are an option for roofing tiles; they are very durable and built for all weather. Companies have begun to create solar shingle products that are not significantly more expensive than traditional solar panels. This technology uses "thin-film" solar that is "grid-tied" or designed for structures already connected to the power grid. Solar shingles are currently available in Maryland and can be subsidized by some state incentives.¹⁷⁹

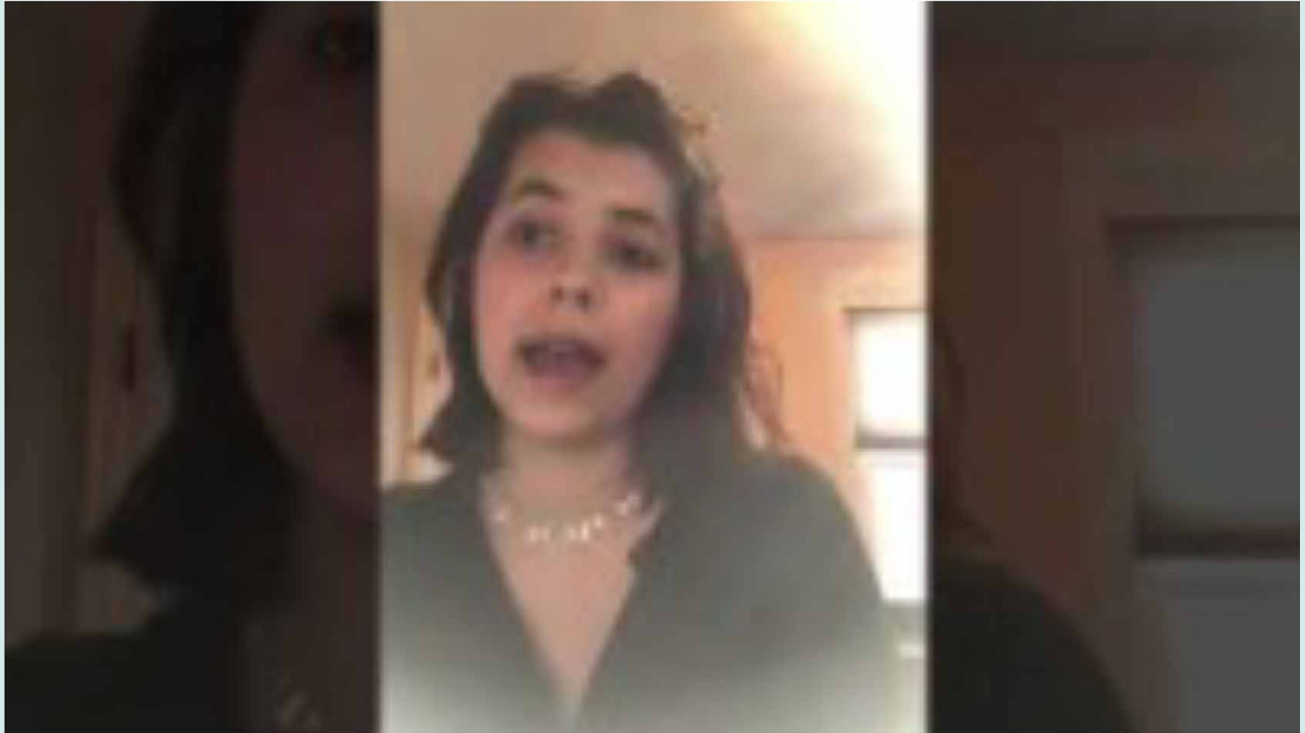
Consumption Emissions

Consumption-based and embodied carbon emissions are not captured in the Montgomery County GHG emissions inventory, which is conducted in accordance with ICLEI's U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions. A consumption-based emissions inventory could be used to promote the importance of conscious consumption and to educate members of the public on which products have an outsized effect on GHG emissions. In addition, results can be used to develop an embodied carbon policy framework and implement programs that target the most pressing consumption-based emission sources.

Rooftop to Rooftop

*She climbed from rooftop to rooftop
Perched herself onto branches, yearning
For the same upward climb
Once: barren city of a world above
Now: haven of life
Her senses set alight
With a newfound, emerald clarity
She held close to her the waters of nature's reserves
Light of a harnessed star
Airs from an unadulterated sky
Ingredients to life in their raw forms
She grew lush gardens from the rooftops
Soil-turned stone
And reached every rooftop
Every color, every hue of marked stone
Never once missed
Because even the most barren of stone
Even the most neglected of roofs
Could be cultivated into the most fertile of soils
That others could reach with childlike-grasp
And enjoy nature's fruition
While giving just as much - even more - back
Because the rules of the rooftops were simply put
Bring airs clarified in their own right
Unfiltered light of day, seeping into electric bulbs
Water - ingredients H₂O - nothing more, nothing less
And life will bring life
Once: barren city of a world above
Now: haven of life*

*Author: Avani
Ambardekar (Age 15)*



One Earth

Sure, I grew up with an environmentalist as a dad. But sometimes it's still hard to believe that our planet is dying. That we only have 20 years to reverse the damage we've created. That we may never see a living tiger ever again. That my favorite place ever, California, could go under water. But I can't turn away. I had to keep watching our planet instead of walking away from the tv because I saw walruses fall to their death. I have to keep educating myself because if I don't, I could forget how much the earth needs to heal. How much the animals need us to think about them. But most importantly, I could forget how much we all need each other so we can fight for our futures every single day until our home is healthy again.

Artist: Lillian Weisburger (Age 20)

[Link to Video](#)

Looking Forward



Looking Forward

Annual Work Plans

Implementation of the CAP will take place over many years. It is not realistic or feasible to simultaneously implement all CAP actions immediately. Some actions can be developed and implemented fairly quickly, while other actions may require multiple years of development prior to start-up.

As called for in action G-11, on an annual basis the County will develop and release a climate work plan of the initiatives planned for the upcoming fiscal year in support of CAP implementation. The annual climate work plan will enable the CAP to be a living document and provide the County with the opportunity and flexibility to course-correct and make adjustments to actions over time as technology evolves and additional funding becomes available. Regarding the initiatives that will be undertaken in the upcoming year, the annual climate work plan will include the County's commitments, along with the available resources and staff capacity, as determined by the annual budgeting process.

The components of the annual climate work plan include the following sections:

- Budget and staffing:** Will provide a summary of approved funding sources available in the upcoming fiscal year and will highlight changes to the County's climate staffing, such as new funded positions to support CAP implementation.
- "Front burner" CAP actions:** Will provide an overview of each CAP action that the County is actively working to implement during the upcoming year. This section may be replaced with a web-based climate action dashboard, as called out in action G-11.
- Racial equity and social justice:** Will describe the steps the County is taking to ensure equitable CAP implementation and to make sure that everyone in the County has a role to play and that everyone shares in the benefits of climate action.
- Legislative and regulatory policy agenda:** Will provide an overview of the County, state, and federal legislative and regulatory issues that the County plans to actively work on in support of CAP implementation in the upcoming year.
- What's new:** Will provide an update on any technological, scientific, and other changes and innovations that relate to the CAP, as well as any adjustments needed to CAP actions.

The annual climate work plan will be published on the County's Climate website:
www.montgomerycountymd.gov/Climate.

Sustainable Economic Development

Beginning in 2021, the County intends to work with an expert contractor, community-based organizations, MCEDC, and business associations to produce a companion to the CAP, outlining strategies for building a carbon-free, resilient, and equitable local economy. The intent of this analysis is to ensure that the CAP is implemented in a way that provides access to opportunities for all residents, harnesses the innovation of diverse entrepreneurs, and realizes the full economic potential of addressing climate change in a comprehensive way. In addition, the analysis will feed into and help inform MCEDC's development of the County's Economic Development Strategic Plan.



Closing Remarks



Adriana Hochberg

Assistant Chief Administrative Officer and Climate Change Coordinator

The Climate Action Plan came together during a global pandemic. A team of dedicated County staff and technical consultants stayed focused on getting the job done amidst social distancing and quarantines while juggling virtual education and child care for young family members, and while witnessing a country struggling to come to terms with racial inequities of its past and present. The efforts of the climate team were enhanced by community members who contributed their time, expertise, and lived experiences to help us craft a plan that reflects the unique needs and realities of Montgomery County.

We recognize that developing the Climate Action Plan is just the beginning of the work. The Plan is not going to reduce emissions by itself. Rather, this Plan is a springboard for climate action in the months and years ahead. Implementing many of the actions in this plan will require community conversations, marshalling private and public resources, advocating for policy changes beyond the County's borders, and difficult decisions.

This Plan will strategically guide us in tackling the climate emergency head on. It has provided clarity on the actions that are the most impactful for Montgomery County to reduce our greenhouse gas emissions and the actions that offer the greatest co-benefits. The Plan has also helped us understand that heat followed by flooding are the two greatest climate hazards we need to be concerned about in Montgomery County in the years to come.

The climate emergency is a challenge that no one in the world has solved—yet. So, we must move forward with both tenacity and flexibility to implement the actions identified in the plan. We must be willing to take risks and to experiment with new approaches, and learn—quickly—from our successes and failures, and from the successes and failures of others. As the years go on, our knowledge will increase, clean energy technologies will advance, and new opportunities will emerge that were not envisioned in the Plan. We recognize that as the state of knowledge evolves, our strategies must evolve along with it.

Just as the Plan has answered important questions, it has also posed additional questions. To name just a few: How can we begin to measure the community-wide greenhouse gas impact of our personal consumption decisions? How can a community equitably transition away from natural gas and other fossil fuels? Future work will be required to answer these and other questions, and the answers to these questions will spark additional inquiries. Combatting the climate emergency is an iterative process of planning and doing, asking and answering.

The creativity and partnerships forged in the development of the Plan are the same characteristics that will be required to implement the Plan's actions. Getting Montgomery County to equitably achieve a zero emissions future will take all of us working together. I look forward to getting this work done with you.

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Building a Healthy, Equitable, Resilient Community

JUNE 2021

MONTGOMERY COUNTY,
MARYLAND GOVERNMENT

101 Monroe Street,
Rockville, MD 20850

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