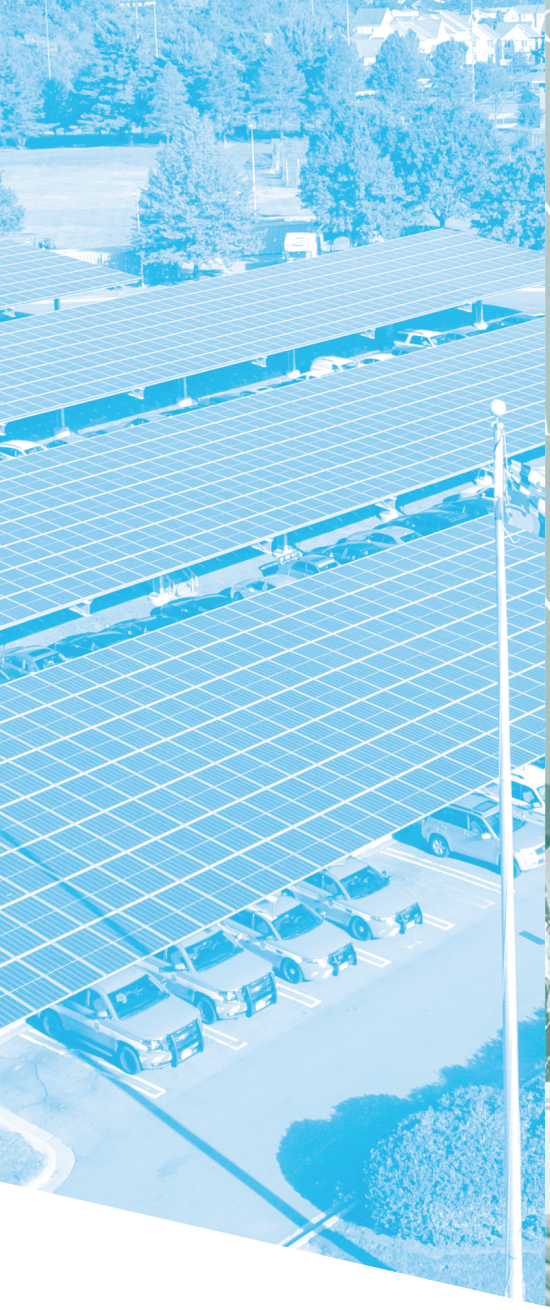

MONTGOMERY COUNTY CLIMATE ACTION PLAN

Building a Healthy, Equitable, Resilient Community

PUBLIC DRAFT

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.

Images

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Hyperlinks

Hyperlinks to sites outside of the document appear in ***bold, italicized, blue text*** and the icon on the timeline. Hyperlinks to text within the document appear in ***bold, italicized, black text***.

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Definitions

The table below outlines 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 to begin tracking adaptation or reduction progress against
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	Environmental racism is 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
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
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

Acronyms

°C	degrees Celsius
°F	degrees Fahrenheit
ADA	Americans with Disabilities Act
AFOLU	Agriculture, Forestry, and Other Land Use
ASAP	Action Selection and Prioritization
BEPS	Building Energy Performance Standard
BRT	Bus Rapid Transit
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_2e/CO_2eq	carbon dioxide equivalent
CO_2e/yr	carbon dioxide equivalent per year
CUPF	Community 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
DOT	Department of Transportation
DPS	Department of Permitting Services
DTS	Department of Technology Services
EJ	environmental justice
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
GIS	geographic information system
HHS	Department of Health and Human Services
HOV	high-occupancy vehicle
HVAC	heating, ventilation, and air conditioning
I-495	Interstate 495
IPPU	Industrial Processes and Product Use
LPG	liquid petroleum gas
MARC	Maryland Area Regional Commuter
MCCPTA	Montgomery 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
MCPS	Montgomery County Public Schools
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_2e	metric tons of carbon dioxide equivalent
MW	megawatt(s)
MWCOG	Metropolitan Washington Council of Governments
OCA	Office of the County Attorney
OEMHS	Office of Emergency Management and Homeland Security
OHR	Office of Human Rights
OIR	Office of Intergovernmental Relations
OLR	Office of Labor Relations
OMB	Office of Management and Budget
OP	Office of Procurement
P3	Public-Private Partnership
Paris Agreement	Paris Climate Agreement
PIO	Public Information Office
POL	Police Department

PPA	Power Purchase Agreement
PV	photovoltaic
RCP	Representative Concentration Pathway
REC	Recreation Department
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
Thrive	Thrive Montgomery 2050
TMD	Transportation Management District
TNC	Transportation Network Company
TOD	Transit Oriented Development
tonne	A metric tonne or roughly 1.1 US tons
WMATA	Washington Metropolitan Area Transit Authority
WSSC	Water Washington Suburban Sanitary Commission

Letter from County Executive

Marc Elrich

We are facing a climate emergency. Montgomery County's climate goals—to reduce our community-wide 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.

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 prioritize 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.

I wanted to include as many knowledgeable and dedicated people as possible in the development of this plan. Many Montgomery County residents have tremendous expertise in climate and energy issues. I decided to tap the community and their expertise in the County's climate planning work. 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. Given limited resources, we have no choice but to address COVID-19, climate change, economic disruption, and racial inequity simultaneously. But 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.

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. Please let us know what you think of the draft plan so that we can incorporate your thoughts into the final plan, and please submit your vision for a healthy, clean, and equitable County, through the ***County climate website***. This is, after all, your plan, and we need your help in creating the future we all desire.

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

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.

Breewood Bioretention Basin, which increases stormwater infiltration in the Sligo Creek watershed before it drains into the Breewood Tributary

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 zero-carbon electricity.
- Create 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.

- Increase energy efficiency in all buildings, with the County leading by example with its own building portfolio.
- Support sustainable, carbon-neutral building design and improvements.
- Expand access to financing and programs to construct or upgrade resilient, efficient buildings.
- Create 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.

- Introduce new technologies and approaches to greening the transportation system.
- Electrify vehicles and expand the supporting infrastructure.
- Provide clean, efficient, frequent, and reliable public transit.
- Increase active transportation options like biking and walking, and micromobility services, with safe, supportive infrastructure.

Carbon Sequestration

Montgomery County has preserved and enhanced its nature-based solutions, including forest and wetland ecosystems, greenspaces, and trees, while reversing carbon dioxide emissions.

- 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, wetlands, green spaces, and urban trees.

Montgomery County CAP

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 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.

- Create authentic and inclusive community engagement, particularly with Black, Indigenous, and People of Color residents and communities most vulnerable to the impacts of climate change.
- Build strategic partnerships among Maryland counties to result in ambitious state climate policies.
- Empower youth to take action at home and in their community.
- Build community trust and partnerships with residents, and provide them with relevant tools and resources.

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 87 climate actions outlined in the CAP outline the path to meet the County's ambitious climate goals while building a healthy, equitable, and resilient community.

Call for Action

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.

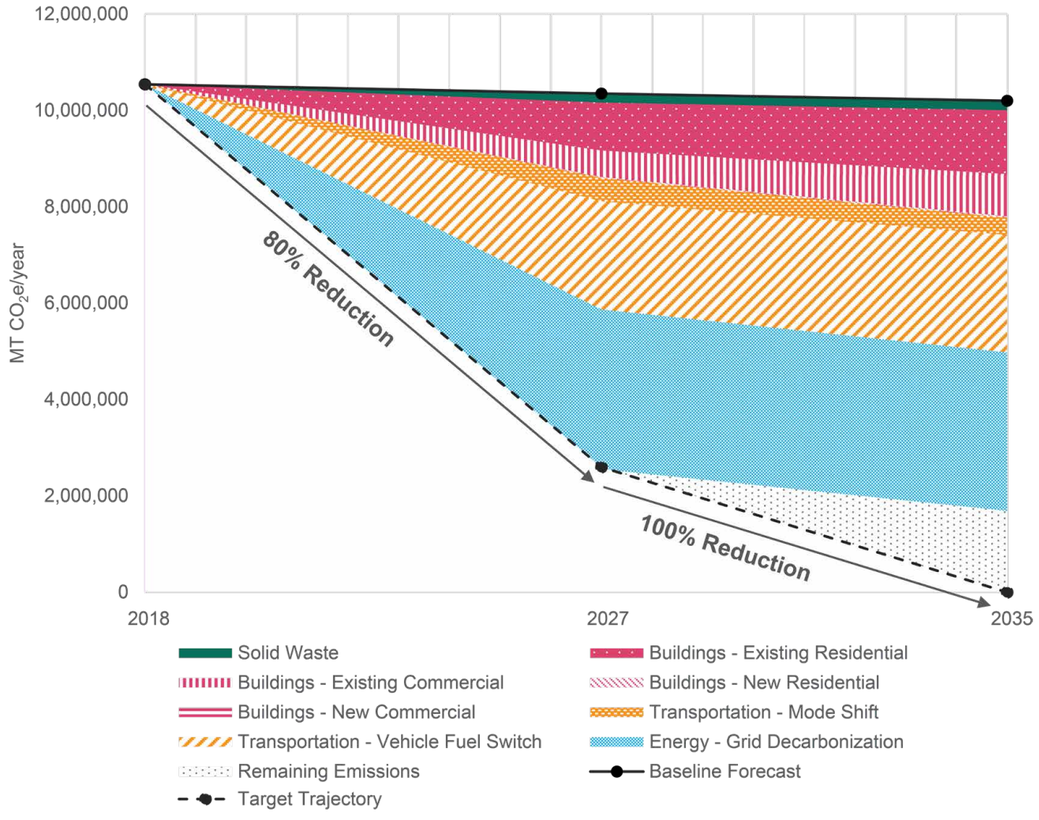


Figure ES-1: Montgomery County GHG emissions reduction pathway across the County's major GHG emissions sectors

The Plan's Approach

The Climate Action 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 defines an emissions reduction pathway to show how the County can meet its 80% reduction by 2027 goal and come close to meeting its 100% reduction by 2035 goal.

Actions in Energy, Buildings, and Transportation Sectors

Achieving the County's climate goals will require transitioning the electricity grid to clean energy by 2030. The County will need to leverage both energy 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 carbon-free electric grid. To reduce GHG emissions from the residential and commercial building sector, the County will need to deploy a combination of energy performance standards, code requirements, and incentives to support 100% building electrification by 2035.

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.

Addressing 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 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.

Reducing Climate Risk

The Climate Action Plan identifies the County's four largest and growing climate hazards: extreme heat, extreme precipitation, high winds, and drought. The Plan includes actions the County can 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.

Racial Equity and Social Justice

Climate change affects everyone, but it does not affect all equally. Therefore, the Climate Action Plan 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 addressed in collaboration with the community.

Governance
Combatting climate change requires an organizational backbone. The CAP includes actions to help institutionalize climate change considerations in Montgomery County Government operations and decision-making. Implementing climate governance will also foster opportunities for creativity, collaboration, and innovation among County staff and community partners to implement climate solutions.

Public Engagement
The success of the CAP will be based largely on the degree to which community members are actively engaged and participating. To that end, the Plan 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.

Building the Plan and Ongoing Efforts
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. Montgomery County is already taking steps to implement some of the Plan 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. As new opportunities and GHG reduction approaches emerge that were not envisioned in the CAP, the County's approach to implementing the Plan will evolve over the years.

Resources
Montgomery County's climate goals are among the most ambitious anywhere 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.

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 leveraging state and federal government resources.

Path to a Brighter Future
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 lay the path to improve our health and quality of life, address racial disparities, and strengthen the bonds of community as we set an example we hope will inspire other communities around the nation and the world to join us in collaboratively forging a safer and brighter future.

Climate Planning Principles

The plan is a reflection of our fundamental values as a community, and its development was guided by the following principles. 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, whose 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.***

This space is reserved for local art work from winners of the County's art contest.

Calling all artists and climate justice activists!

Montgomery County is hosting a competition for artwork to be featured in the County's climate action plan. What photos, drawings, poems, digital art, and memes (yes, we meant it, memes) invoke the need to protect your community from climate change? Help us to harness your creativity to sound the alarm about the climate emergency. Art is an incredibly important tool that will engage all County residents from a variety of backgrounds. Through this contest, we hope to reach those who might not have previously been engaged in the climate planning process, especially those from marginalized backgrounds who will be disproportionately impacted by changes in climate. The deadline for the contest in Sunday, January 31, 2021. For more information, please visit ***the art contest website***.

Background

Montgomery County CAP
Background

Background

For centuries, people have burned fossil fuels to meet our energy needs. We use fossil fuels to power electric grids, propel automobiles, drive industry and manufacturing, and heat buildings and homes, all the 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 Climate Agreement (Paris Agreement), committing to limit temperature rise to below 2 degrees Celsius (°C) while striving to limit temperature rise to 1.5 °C.[1] Nearly all countries, including the United States, joined in this collective commitment to curb the cataclysmic social, environmental, and economic impacts of climate change. The U.S. subsequently withdrew from the Paris Agreement under the Trump Administration. To play its part in the global effort, Montgomery County, Maryland signed the ***We Are Still In*** joint declaration 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.[2] Through the resolution, Montgomery County (County) established a goal to reduce GHG emissions 80% by 2027 and 100% by 2035. 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 most vulnerable to climate change.

County Executive Marc Elrich unveils the County's FLASH bus rapid transit service

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.

Montgomery County CAP Background

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 over a decade, establishing in 2006 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.[3] 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. To inventory existing climate efforts and identify ways to reach these higher goals, the County Executive formed a 10-person 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.

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 report[4] 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 inter-departmental 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 Thrive Montgomery 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, Montgomery College, County Council staff, and 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 Montgomery 2050 (Thrive 2050), the County's blueprint and guiding policy document for future growth and development to improve economic health, equity, and environmental resilience (see Thrive Montgomery 2050).

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 communities of color, tend to be underrepresented and have little or no ability to engage in the 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 County-wide 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, community members engaged in racial equity and social justice workshops, the Resilience Ambassador program and survey, art competitions, and the public review process to contribute to the development of the CAP (see **Engagement**).

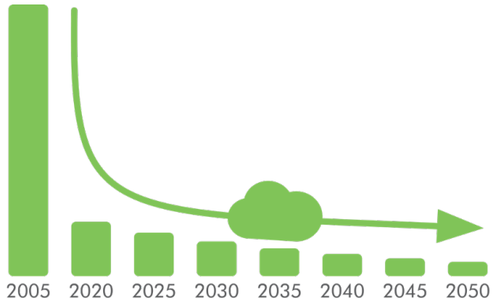
While the County conducted considerable analysis and engagement to create the CAP, it is a roadmap for continued community collaboration to implement the priority climate actions and to turn the County's climate goals into reality.

Thrive Montgomery 2050

The growing threat of climate change and an increased awareness of persistent inequities in our society addressed in the Climate Action Plan (CAP) are among the changes that have also prompted the Montgomery County Planning Department to initiate a comprehensive update of the County's General Plan. Titled *Thrive Montgomery 2050*, this plan has established three overarching outcomes for the County over the next 30 years: economic health, equity, and environmental resilience. The plan, now a Public Draft under review by the Montgomery County Planning Board, will provide policy guidance covering a wide variety of topics affecting county residents' quality of life along with recommended actions for General Plan implementation over the coming years. The timing of the General Plan update, which overlaps with the drafting of the County's CAP, enables these two major planning efforts to coordinate with, and complement, each other.

While Thrive Montgomery 2050 focuses more on long-range land use issues and general policy guidance, the CAP focuses on immediate and long-term specific actions to remediate climate change, reduce greenhouse gases, and foster community equity. The ***Thrive Montgomery 2050 Public Hearing Draft Plan***, published in October 2020, will be revised by the Planning Board, and sent to the County Council in April 2021 as a new draft for the Council's review and adoption during the summer, and will include goals and policies throughout that are designed to address climate change and to promote societal equity and economic growth. With the release of the Draft CAP, Planning and CAP staff will work together to ensure that recommendations are consistent from plan to plan, and that action items are coordinated and comprehensively address climate change mitigation, adaptation, and resilience, and create a more just and equitable society.

Timeline of County Climate Progress



Policy

Established initial County GHG emissions reduction goal of 80% from 2005 levels by 2050, with 20% reduction every 5 years.

2006

2007

Green Building Law adopted requiring public and private buildings to meet LEED standards

2009

County's initial ***Hazard Mitigation Plan*** developed

2012

Montgomery County ***Climate Protection Plan*** published

2013

Program

Clean Energy Rewards Program established to provide financial incentives to residents for choosing clean energy

Montgomery County Green Business Certification Plan launched

Ride On Real Time launched, allowing passengers instant access to bus status

County joins ***Capital Bikeshare*** network

Climate Action Workgroups Meeting

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

Separated bike lanes on Nebel Street, North Bethesda

Policy

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

2014

Emergency Climate Mobilization Resolution accelerates GHG reduction goal to 80% by 2027 and 100% by 2035

80% by 2027
100% by 2035

2015

Extreme Temperature Plan developed to enhance response to extreme heat and freeze events

2016

Bicycle Master Plan developed

2017

2018

Program

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

Expedited ***Residential Solar Permitting*** process developed

Solar generation exempted from the County's Fuel Energy Tax

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

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

County's first microgrid project completed at Public Safety Headquarters

Microgrid at the Public Safety Headquarters

Timeline of County Climate Progress (continued)

Thrive Montgomery 2050 Vision


Tiffany Ward, Chief Equity Officer

Policy

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

Climate planning process to reach zero emissions by 2035 begins

County adopts ***Racial Equity and Social Justice*** policy

2019

2020

Program

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

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

Resilience Ambassadors program launches

Revised ***Green Building Incentive Program*** established

First electric RideOn buses begin service

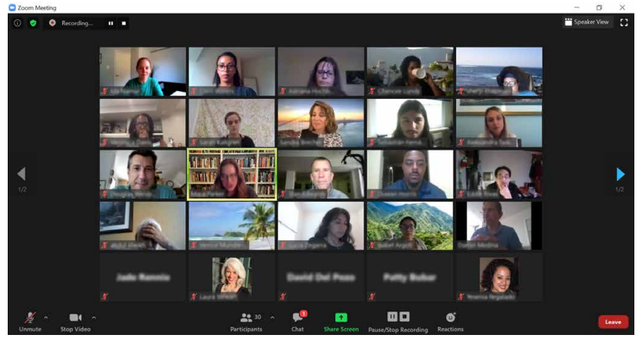
Montgomery Energy Connection program launches

County receives ***Smart Energy Community Designation*** from the Maryland Energy Administration

FLASH Bus Rapid Transit service launches on US 29

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

Summer 2019 – Winter 2020

Spring 2020

Public Review of Workgroup Recommendations
The public reviewed the workgroup recommendations.

Spring – Fall 2020

Technical Analysis and CAP Development
Technical analysis and modeling to inform the Climate Vulnerability Assessment, priority actions, and CAP development.

Fall 2020

Racial Equity and Social Justice Workshops
Organizations that serve vulnerable populations in the County engaged in a two-part workshop to share insights on racial equity, social justice, and climate change.

Winter 2020

Draft CAP for Public Review
Public review of the Draft CAP

Spring 2021

Final CAP
County approval and release of the CAP


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 CAP community engagement and plan development. The County engaged community members in CAP development through the following ways.

Climate Technical Workgroups

In July 2019, Montgomery 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 a 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 eight months to leverage their expertise and lived experience in Montgomery County. Both public and private sector perspectives were represented on 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 communities most vulnerable to the impacts from climate change.[5]

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.[6] 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, 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. 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 with close to 130 community members covering quality-of-life issues such as equity, health, transportation, safety, climate, and energy justice issues. The Ambassadors amplified the voices of Black, Indigenous, People of Color, immigrant, and income-distressed communities by sharing insights from their conversations with the County. Insights gained from the resilience conversations have been incorporated throughout this Plan. Additionally, the knowledge gained from these conversations will continue to help County planning teams determine how to better serve these communities, uplift their strengths, and address their needs. A summary of the resilience conversations is available in **Appendix E**.

This space is reserved for local art work from winners of the County's art contest.

Calling all artists and climate justice activists!

Montgomery County is hosting a competition for artwork to be featured in the County's climate action plan. What photos, drawings, poems, digital art, and memes (yes, we meant it, memes) invoke the need to protect your community from climate change? Help us to harness your creativity to sound the alarm about the climate emergency. Art is an incredibly important tool that will engage all County residents from a variety of backgrounds. Through this contest, we hope to reach those who might not have previously been engaged in the climate planning process, especially those from marginalized backgrounds who will be disproportionately impacted by changes in climate. The deadline for the contest in Sunday, January 31, 2021. For more information, please visit ***the art contest website***.

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 within society, such as people of color and low-income communities, are disproportionately adversely 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 decent 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

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.

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.

Systemic Racism and Environmental Injustice

The disproportionate impact of climate change on underserved communities in the U.S. 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, the U.S. 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 because of both overt and covert racism in the U.S. 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 slave-holding 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, as they laid the foundation for the current state of disparities in the U.S., including the disparities in Montgomery County, which are evident in housing, transportation, land use, education, and health care. The following sections explore three key areas of racial inequity: housing and homeownership, access to transportation, and environmental racism.

Inequity in Housing and Homeownership

After the abolition of slavery in the U.S., 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 did make it off the plantation in search of better opportunity, 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 2**). 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.

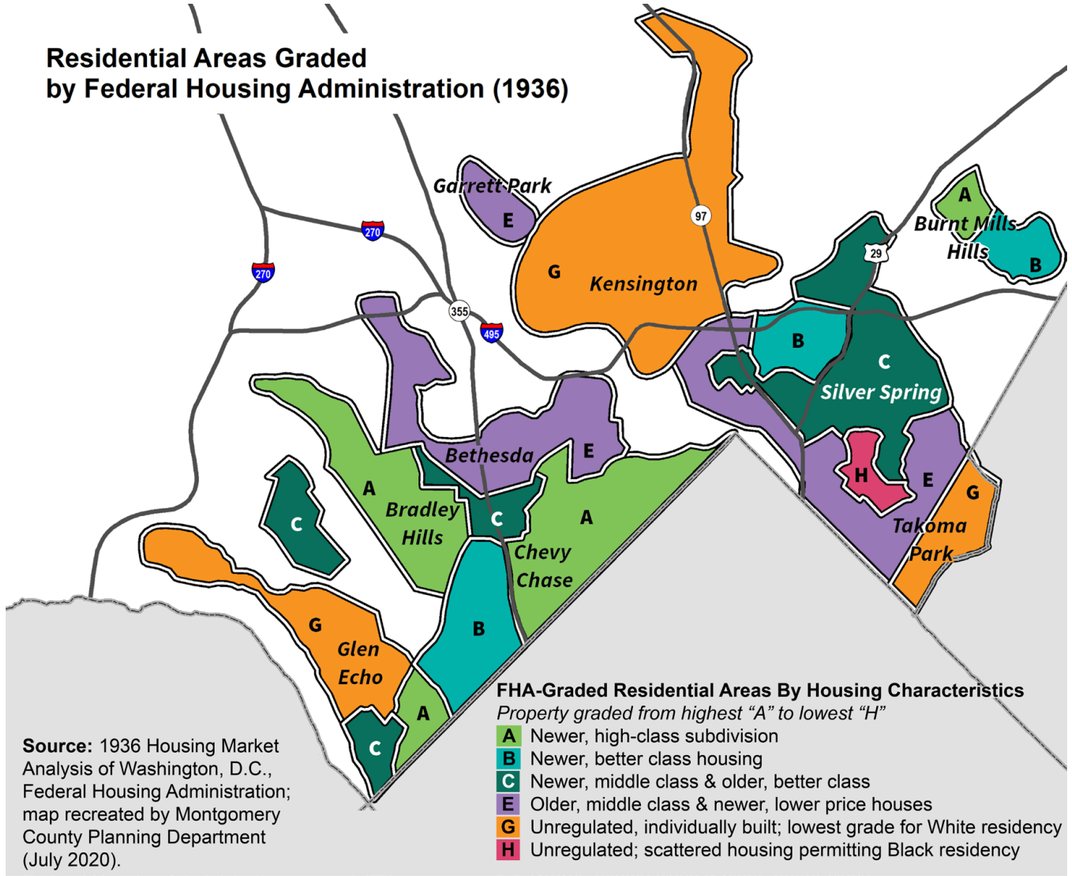


Figure 2: Recreated 1936 map showing "Approximate Location of Outstanding Commitments of the Federal Housing Administration" in Montgomery County, developed for Thrive 2050[7]

Specifically, in Montgomery County, Silver Spring 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.[8] Although Black people worked in Silver Spring for government agencies, they were not allowed to move and live there.[9]

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.[10] This neglect was fueled by racist Jim Crow policies that have had lasting impacts. Poverty became concentrated in this area.

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.[11] While new, affordable housing policies have been enacted in the County since then, housing affordability remains a pressing issue for many in Montgomery County.

Homeownership in Montgomery County is out of reach for many residents. Homeownership for Whites and Asian or Pacific Islanders is about 75% while homeownership for Hispanics is 50% and Blacks 44%.[12] 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.[13] 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. 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 3**).

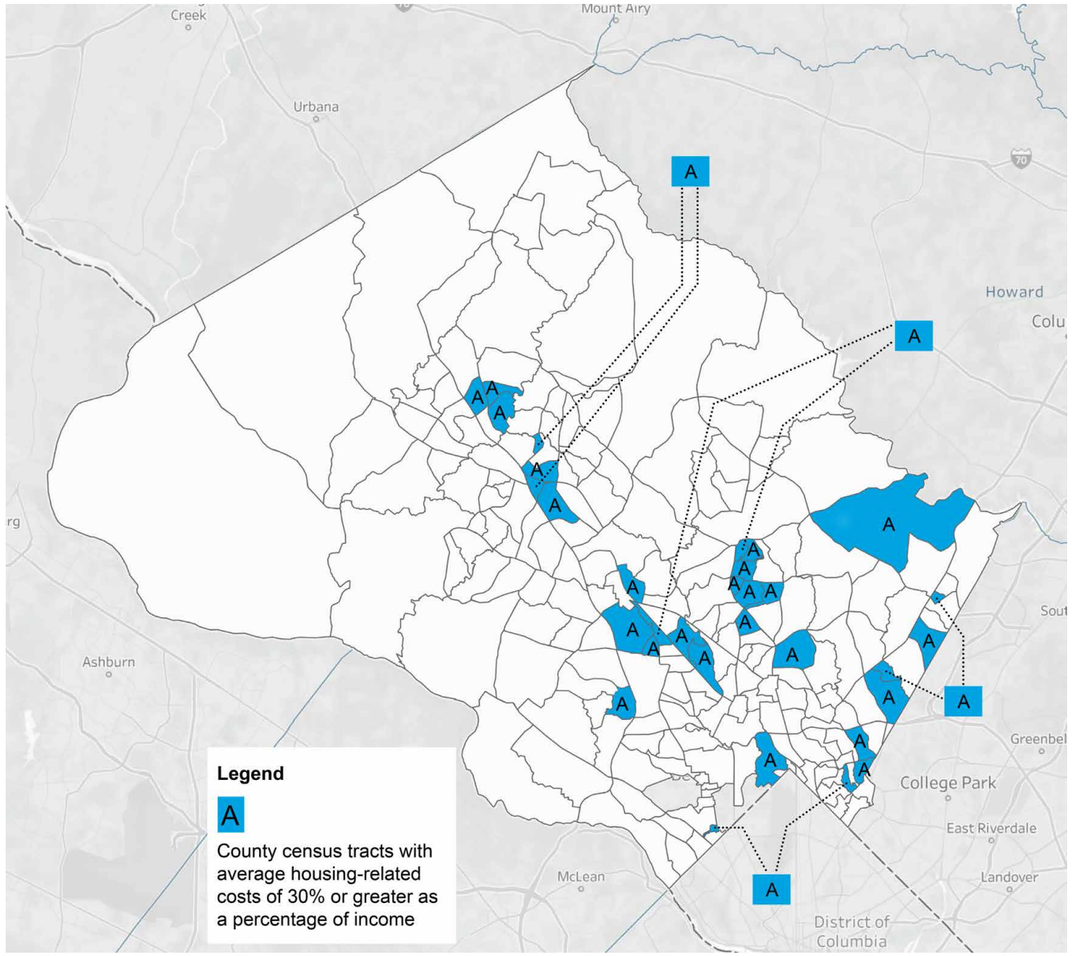


Figure 3: Montgomery County census tracts with average housing-related costs of 30% or greater as a percentage of income[14]

Inequity in Access to 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. In a county that boasts robust rail and bus service for public transportation, Montgomery County has historically shut out certain communities from transportation mobility.

> *It's time for America to reckon with the role that highway projects too often play in ripping apart underprivileged communities around the country, In the first 20 years of the federal interstate system alone, highway construction displaced 475,000 families and over a million Americans. Most of them were low-income people of color in urban cores.*[15]
> *~ Former Transportation Secretary Anthony Foxx, Address at the Center for American Progress*

Tobytown, which is situated near Potomac, is a 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.[16] 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 bus route to serve the community.[17]

While Tobytown faced transportation disparities, other parts of Montgomery County that include Black, Indigenous, people of color, 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 communities that are most vulnerable to the impacts of climate change. Children that live 0.2 to 0.3 miles 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.[18] 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 lack of vehicle and pedestrian infrastructure upgrades.

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 Health section, vulnerable groups are already more susceptible to life-threatening diseases such as heart disease and diabetes, and living near congested roadways only worsen those conditions. Access to multimodal and electric transportation options across the County could help alleviate these detrimental health outcomes.

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.[19]

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.[20] In addition, of the 20 seats available on the Commission, only two are occupied by representatives from the affected environmental justice communities, which the U.S. EPA defines as communities overburdened by environmental harms. As of September 2020, a quarter of the seats remain vacant. Because of this lack of representation by environmental justice communities and the lack of substantive action by the commission, it is not clear if the State of Maryland is adequately addressing these issues as residents had hoped. 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.

Montgomery County's Socioeconomic Profile

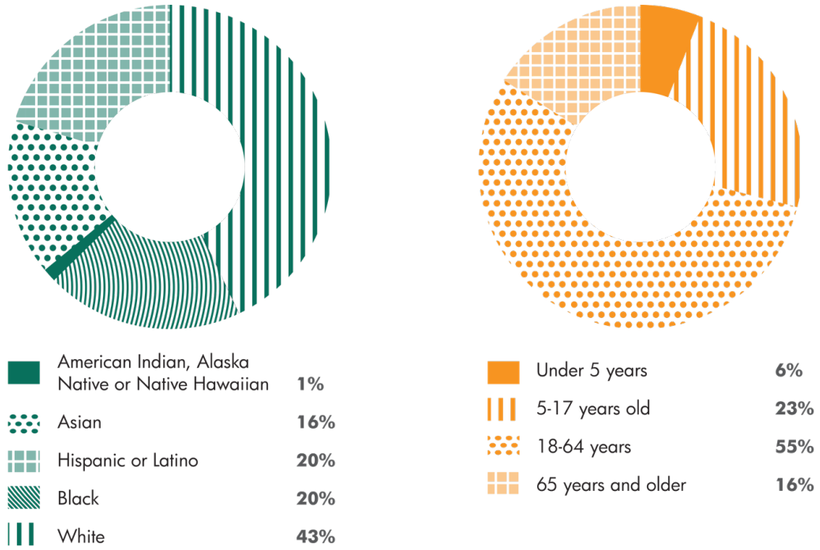
While people of color and vulnerable communities have experienced improvements regarding access to education, housing, employment opportunities, transportation, and health care over the past several decades, disparities between groups remain. The sections below portray the current situation in Montgomery County regarding key areas of life, with a focus on vulnerable groups.

Demographics

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 comprised 57% of the County's total population (**Figure 4**), and this number is projected to steadily increase to an estimated 63% by 2025 and to 73% by 2045.[21]

Montgomery County also has a large and diverse foreign-born population, comprising 32.3% of the total population in 2019[22] and contributing to the County's ethnic and linguistic diversity; 40% of the County's residents speak a language other than English at home,[23] including 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%).[24]

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.[25]



Source: U.S. Census 2019

Figure 4: Racial and age composition of Montgomery County

The age distribution of Montgomery County's residents is shown in **Figure 4**. 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., 65+). In 2019, this group made up 16% of the County's population and that percentage is estimated to increase to 21% by 2040.[26] Conversely, there is a sizeable youth population in the County—almost a quarter of the population is made up of 5- to 17-year-old residents.

Income and Employment

Montgomery County is considered an affluent area that attracts well-educated residents with high earning potential. For example, in 2019, 59% of adults over 25 years of age held a bachelor's or higher degree.[27] Montgomery County's labor force participation rate was 71.1% in 2019, ranking second in the metropolitan area of Washington, DC, 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.[28]

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), followed by Asian ($101,830), Hispanic ($70,100), and Black ($69,313) households.[29] In 2017, Black residents in the County experienced the highest unemployment rates (5.6%), followed by Hispanic (4%), and Asian and White (both at 2.3%).[30] In addition, a sizable portion of the County's population lives in poverty (7%), and this is an almost two-fold increase since 1989 (4%).[31]

Homeownership and Housing

Homeownership in Montgomery County has declined since 1990, and only 65.4% of residents live in owner-occupied housing.[32] While household incomes have largely remained the same or in some cases decreased since 1990 (e.g., both Hispanic and Black American median household incomes have declined from 1989 levels),[33] house prices have increased (e.g., 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.[34]

A further burden for low-income and very-low-income households is the lack of affordable housing in Montgomery County—with demand outgrowing supply. In addition, Montgomery County does not exercise County-wide 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.[35] 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%).[36] 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.

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 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 Economy[40] 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]

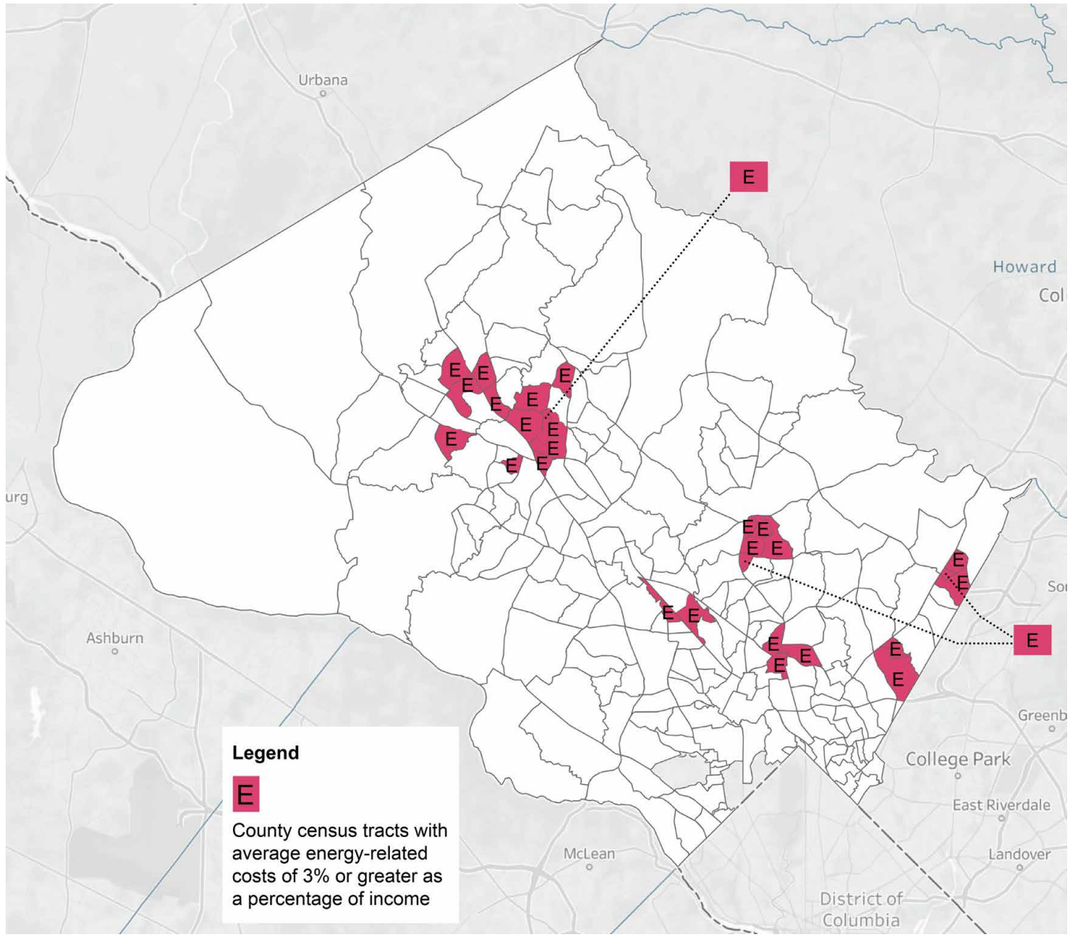


Figure 5: Montgomery County census tracts with median energy burden of 3% or greater as a percentage of income[42]

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 increase 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.

Transportation

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 in prevalence, 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. However, there is a lack of cycling and pedestrian infrastructure, and many residents in Montgomery County have noted safety as a key concern.

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 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 Montgomery 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.

Water

Residents and businesses in Montgomery County use a combination of public water and sewer services and private, on-site services (wells and septic systems). This distinction largely depends on location. Households in more densely populated areas of the County are typically connected to public centralized water and sewerage systems (e.g., in the Downcounty region adjacent to the I-495 portion of the Capital Beltway and along the major transportation corridors in the Upcounty area), while households in more rural settings are more likely to have private, on-site water systems.[48]

Key factors to determining access to quality and safe drinking water include race and income. Recent studies have found that nearly one in two adults and one in four children in the U.S. do not drink tap water on a given day. This situation is pronounced in communities of color and low-income populations. These communities are more likely to be in rural areas with water contaminants and in older housing prone to lead contamination. An additional issue is distrust in tap water, which is heightened among immigrants from countries where tap water is unsafe to drink. Even if the water is safe to drink, if it tastes bad, is discolored, or is dispensed from an old, dirty tap, many communities will consider it unsafe, will therefore not drink it, and will buy bottled water instead. In Montgomery County, the annual cost of water and sewage for low-income households was $573, $18 higher than the state average of $555.[49]

The health of Montgomery County's streams, rivers, and lakes is important both for drinking water quality in the County and downstream to the Chesapeake Bay as well as for communities that depend on fishing in local water bodies as a food source for themselves and their neighbors. The Maryland Department of the Environment (MDE) has identified at least one impairment in each of the County's eight major watersheds (i.e., the watersheds do not meet MDE-regulated minimum water quality standards due to excess bacteria, nutrients, and polychlorinated biphenyls).[50] Although MDE releases fish contaminant advisories, the advisories are not always well advertised, so people who rely on local fish for food may not be aware of the water impairment health risks.

Health

Many racial and ethnic minorities face challenges in accessing medical care in the U.S. In instances when they do have access to medical care, research reveals systemic differences in the kind and quality of medical care received by different groups.[51] 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.[52] 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 U.S., 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.

Certain groups are also more susceptible to illnesses. For example, 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.[53]

Racial Equity and Social Justice Approach

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.

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 6**). 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
- Strengthen Community Partnerships and Ownership
- Capacity Building

Figure 6: 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's (CDC's) Social Vulnerability Index (SVI), and considered in the CAP.
3. **Engagement** with County and community organizations as well as community discussions with Resilience Ambassadors was undertaken to bring in additional, diverse voices to inform the development of equity-enhancing measures and to ground-truth 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

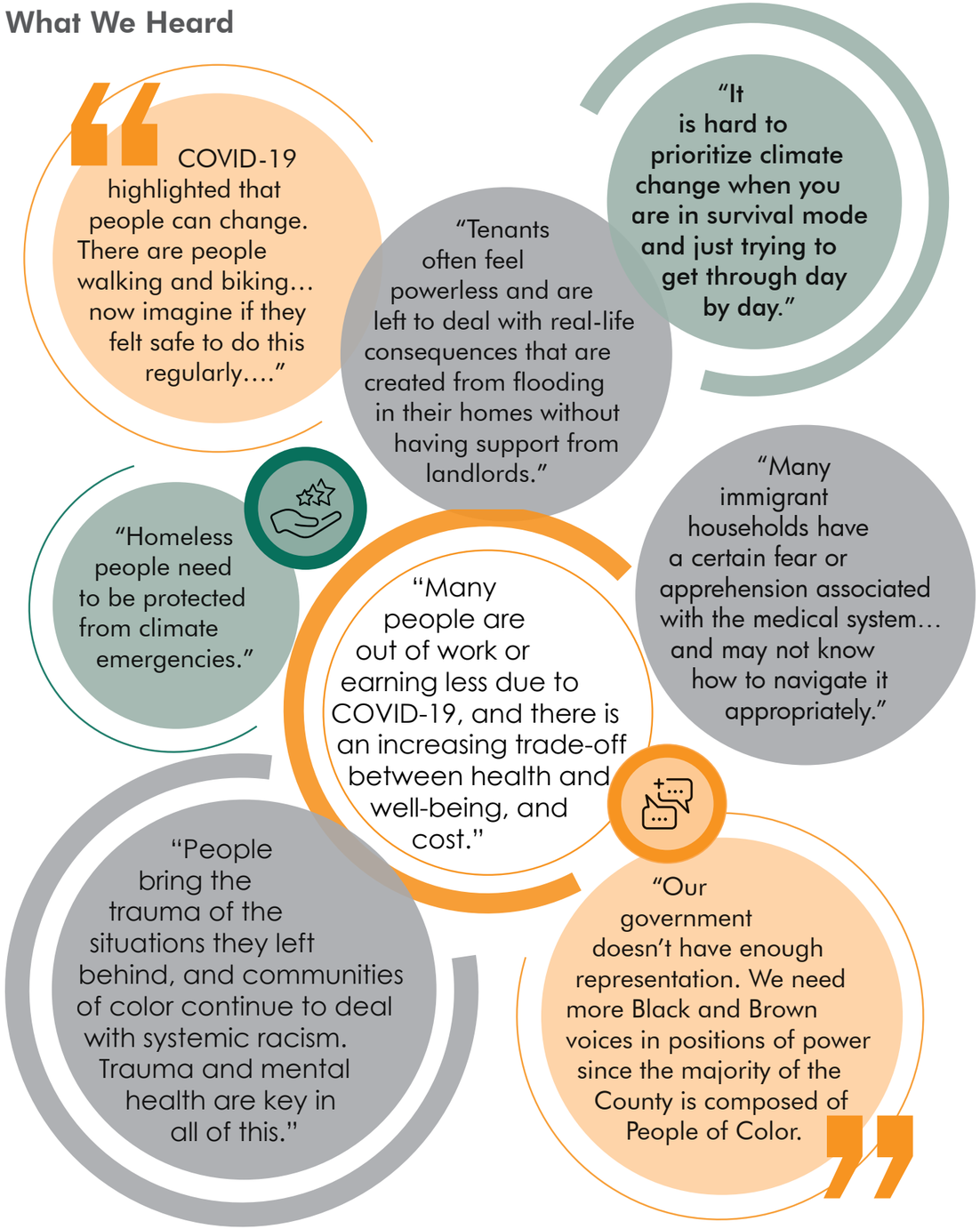
Table 2 identifies the key issues and priorities highlighted during engagement with County communities and Resilience Ambassadors, and includes several critical areas, such as community health and safety, housing, education and awareness, and accessibility. The key priorities identified through community conversations outline an approach for addressing key issues in the County as the CAP actions are further developed.

Table 2: Key community issues and priorities

Key Issues
• Lack of financial resources and job opportunities
• High cost of technology (upfront and maintenance)
• Lack of education and/or awareness of climate change and public health
• Insufficient and inequitable community engagement
• Misinformation due to language barriers
• Lack of homeownership, home, and/or renter's insurance
• Disincentivized landlords
• Eviction and/or fear of eviction
• Homelessness and lack of affordable housing and County-wide rent control
• Neighborhood segregation
• Lack of access to alternative sources of power
• High utility costs
• Lack of vehicle ownership
• Insufficient public transportation options and public transit accessibility
• Safety concerns while on public transit or walking; dangerous sidewalk and crosswalk infrastructure
• Proximity to pollutant-emitting sites, including pollution from vehicles
• Lack of health insurance and/or high medical costs
• Mental health issues and past trauma
• Chronic health issues and disabilities
• Childcare and early childhood education concerns
• Food insecurity
• Pests and mold
• Outdated and failing community and school infrastructure
• Lack of opportunities for disabled and homeless residents
• Distrust of government and misunderstanding of systems, and concern about lack of representation at high levels of government
• Neighborhood segregation and education inequities; gentrification
• Flooding concerns
• Extreme heat and disproportionate exposure to frontline workers

Key Priorities
• Additional resources for underserved populations
• Increased awareness of climate change and its impacts
• Improved language accessibility and transparency in communications
• Community empowerment, living to one's full potential
• Community "suggestion boxes" to amplify voices
• Rental assistance
• Greater landlord accountability
• Insulation, and access to heating and cooling technologies
• Affordable housing and rental assistance for those in need and County-wide rent control
• Improved public transit
• Electric public transit vehicles
• Bike paths and better, safer pedestrian infrastructure
• Clean and safe green public spaces
• Promotion of physical and mental well-being
• Consideration of Indigenous and alternative methods of conservation
• Resources for community gardens
• Better learning environments for children
• County-community partnerships and more types of outreach
• Use of existing community ambassadors
• Safety enforcement
• Consideration of bold and innovative ideas
• Overcome existing stereotypes and stigmas
• Solution-oriented actions
• More opportunities for disabled and homeless residents
• Increased diversity within the County and celebration of the County's diversity
• Sense of community and place
• Supportive, welcoming and humane culture

What We Heard



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 the local community. 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 (e.g., stipends, gift cards, travel reimbursement) or offering dependent care services or food during meetings or engagement events.
- 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 more prominent and understandable to the community (e.g., 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 space is reserved for local art work from winners of the County's art contest.

Calling all artists and climate justice activists!

Montgomery County is hosting a competition for artwork to be featured in the County's climate action plan. What photos, drawings, poems, digital art, and memes (yes, we meant it, memes) invoke the need to protect your community from climate change? Help us to harness your creativity to sound the alarm about the climate emergency. Art is an incredibly important tool that will engage all County residents from a variety of backgrounds. Through this contest, we hope to reach those who might not have previously been engaged in the climate planning process, especially those from marginalized backgrounds who will be disproportionately impacted by changes in climate. The deadline for the contest in Sunday, January 31, 2021. For more information, please visit ***the art contest website***.

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 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. The first climate scenario, Representative Concentration Pathway (RCP) 4.5, shows a stabilization scenario through climate adaptation strategies and technology, with a moderate GHG emissions increase until the middle of the twentieth 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 global 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.

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.

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. There are about four days a year where 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 illustrated in the calendar graphic in **Figure 7**. 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. 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

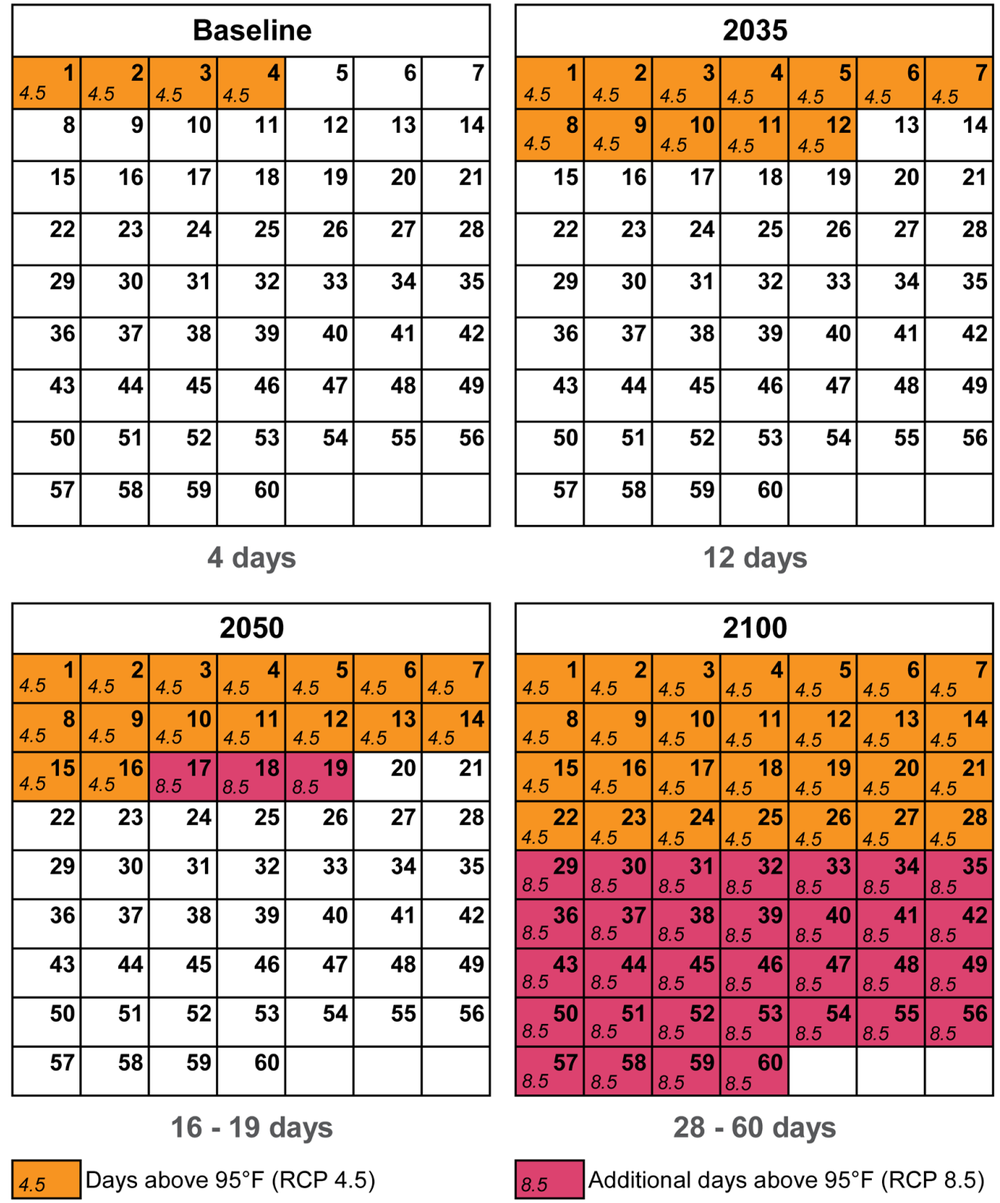


Figure 7: Projected average number of days above 95°F in Montgomery County

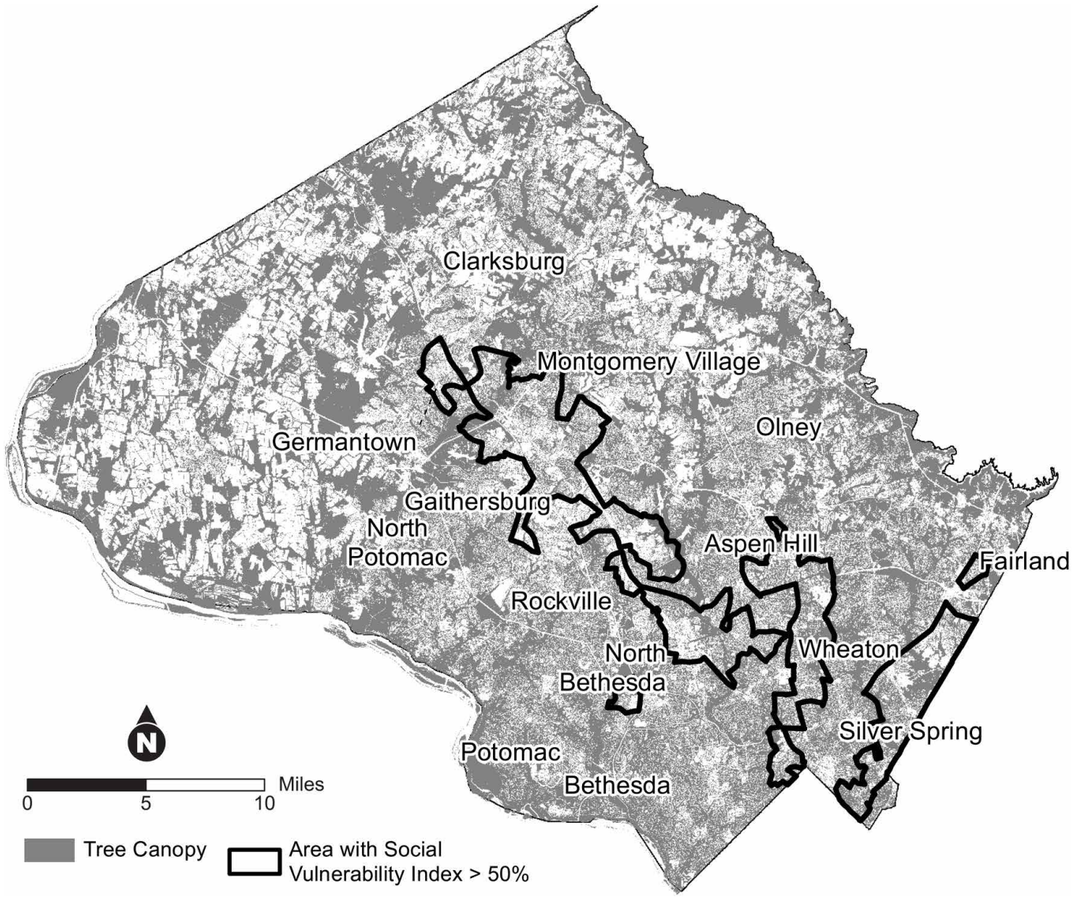


Figure 8: Tree canopy in Montgomery County, outlining areas ranked in the top 50% most vulnerable by the CDC social vulnerability index

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. The urban heat island effect was not directly quantified as a part of the Climate Vulnerability Assessment, but it would likely increase extreme temperature experienced in urban parts of the County.

Figure 8 and **Figure 9** show the areas of the County with tree coverage and with impervious surfaces (paved roads are surfaces that do not allow water to pass through), outlining sections of the County with a CDC social vulnerability index (SVI) of 50% or greater. The map highlights that many of the areas of the County with the most vulnerable communities also have high concentrations of impervious surfaces, which contributes to urban heat island effect and increased temperature.

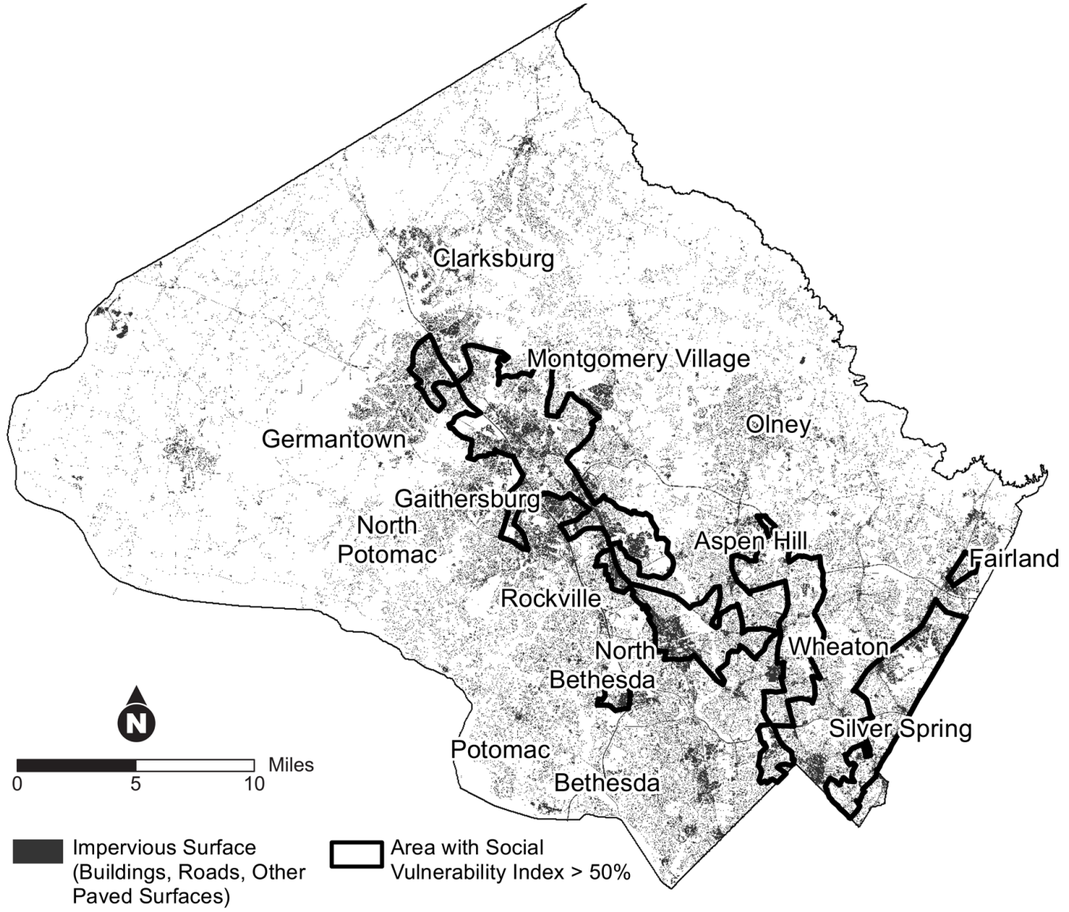


Figure 9: Impervious surface in Montgomery County, outlining areas ranked in the top 50% most vulnerable by the CDC social vulnerability index

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 10**.

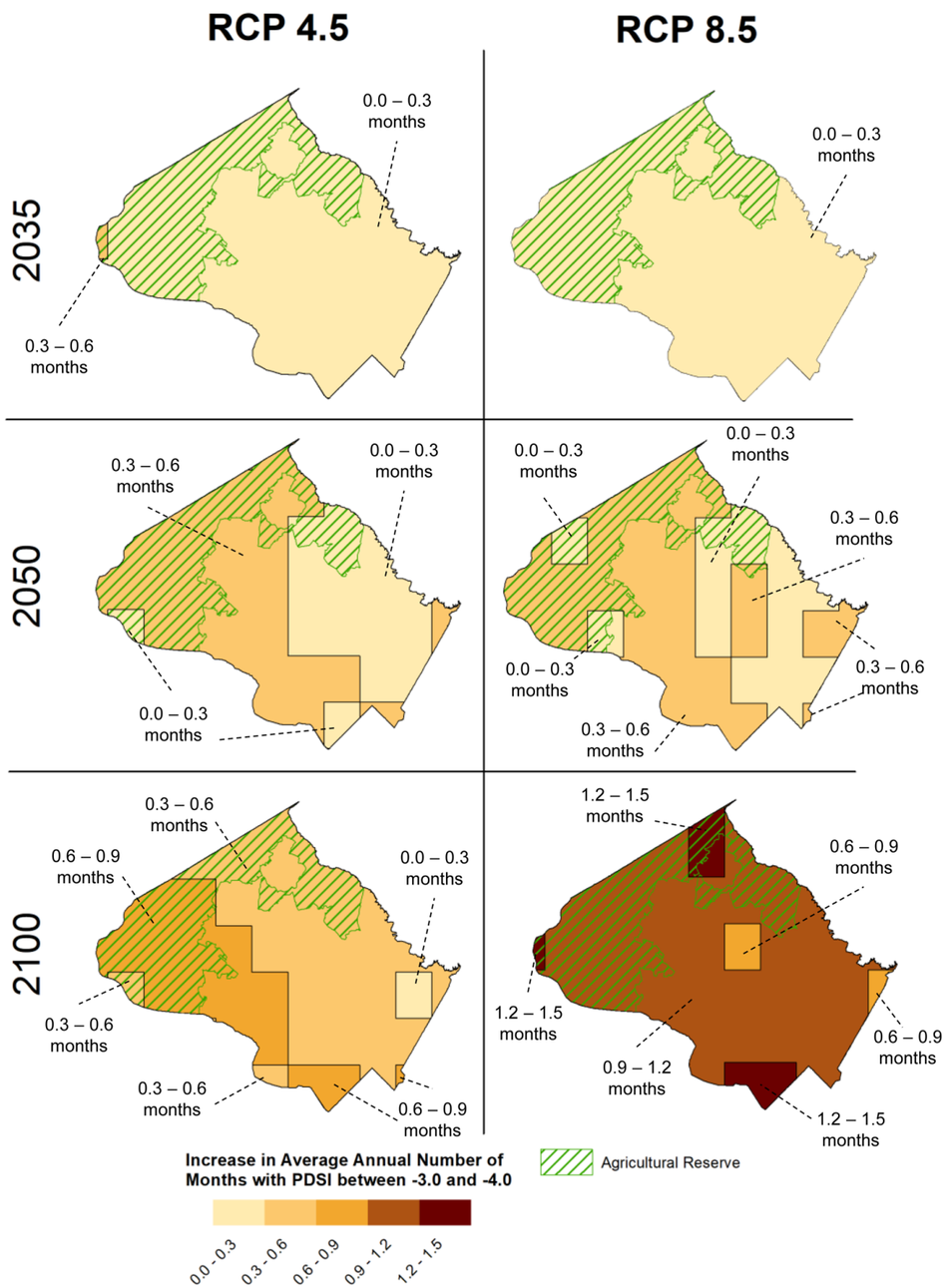


Figure 10: Projected increase in average number of months per year of severe drought (Palmer Drought Severity Index between -3.0 and -4.0) for 2035, 2050, and 2100, and climate scenarios RCP 4.5 and RCP 8.5 in Montgomery County

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 internal, or return period, is the probability that a given storm event will occur in any given year. **Table 3** shows the results of this analysis for the RCP 8.5 scenario for the 2050 and 2100 timeframes, 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. And 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 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, 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 will occur 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 12** later in this chapter shows anticipated increase in inches of rainfall for the 10-year storm event overlaid with County roads that are currently frequently flood.

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. As 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, impacting infrastructure and buildings and leading to several deaths and multiple flood rescues. Additional extreme rainfall events and flash floods can present a need for increased water rescue services in Montgomery County.

Table 3: 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

High Winds

Hurricanes, tornadoes (rotating wind events), and derechos (straight-line wind events) can result in damage due to high-speed winds. These are not included in the FLEx tool outputs because of limited data from future wind speed predictions. However, the current design wind speeds for Montgomery County were obtained from the American Society of Civil Engineers' publication ASCE 7-17, *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

In addition to the County-wide average climate statistics presented in the previous section, the statistically downscaled GCM output used in the Climate Vulnerability Assessment has high enough spatial resolution to provide a glimpse into the possible spatial distribution of climate hazards throughout the County. **Figure 11** and **Figure 12** demonstrate possible spatial distributions of increase in the number of days >95°F per year and increase in the 10-year precipitation event in the RCP 8.5 climate scenario for the year 2050, respectively. Although this spatial data is useful for identifying at a high level especially vulnerable areas in the County, 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.[54]

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.[55] In other words, historical spatial distributions of temperature and rainfall form the basis of these projections and, to some extent, limit the results. Using County-wide 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 and 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 adaptative 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 11** 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 that are currently lacking an emergency shelter.

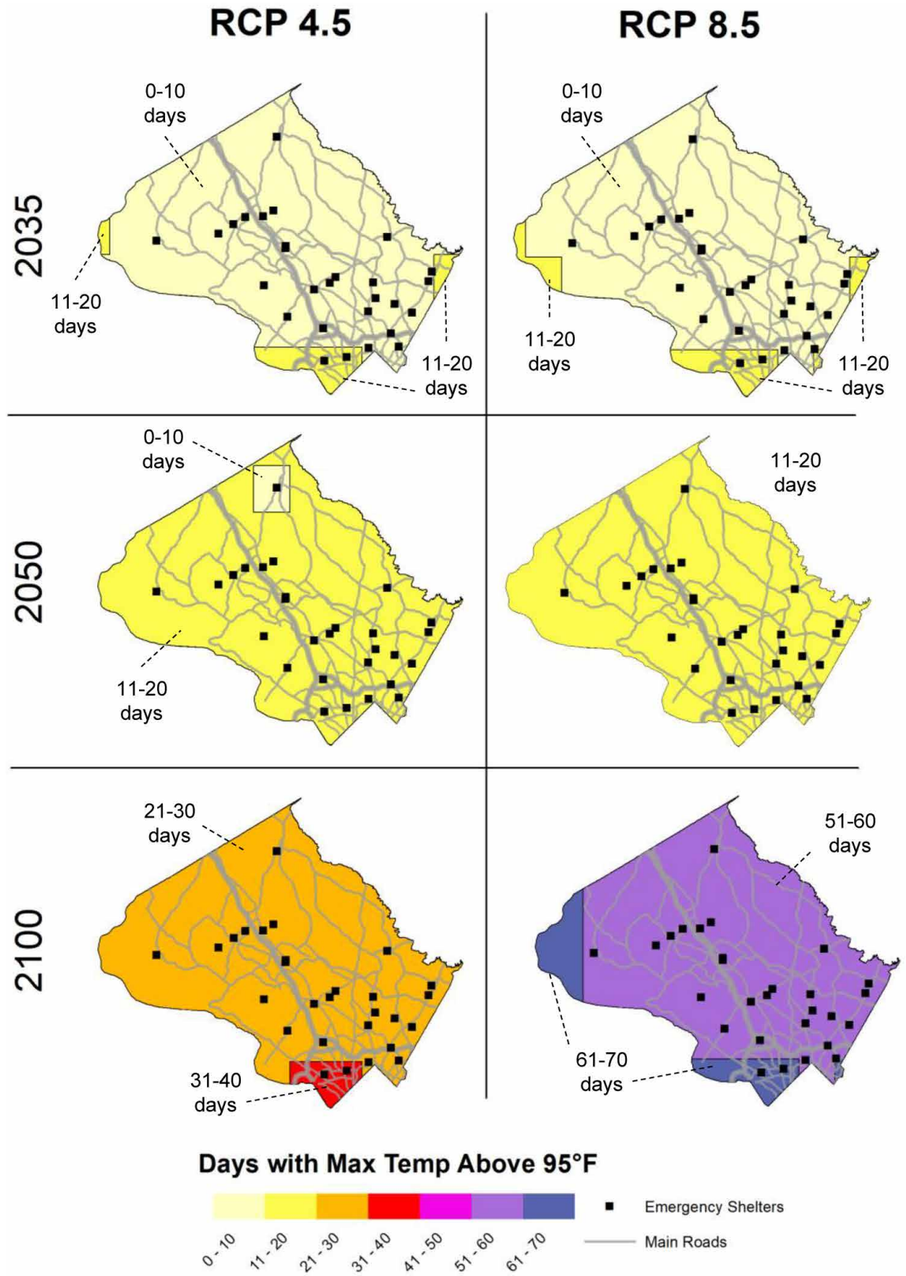


Figure 11: Projected increase in days per year >95°F for 2035, 2050, and 2100 and climate scenarios RCP 4.5 and RCP 8.5 in Montgomery County, with emergency shelters

The **sensitivity** of the assets to the climate hazards were 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.

The vulnerability assessment brings together the hazard exposure, sensitivity, and adaptative capacity information to better understand the County's vulnerabilities. Additionally, 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's SVI uses to determine vulnerability (**Table 4**)[56].

Table 4: Centers for Disease Control 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's SVI index across Montgomery County. **Figure 13** highlights the most vulnerable areas of the County according to the indicators listed in **Table 4**. Vulnerable groups located within these geographic areas of the County are most susceptible to disproportionately experiencing the effects of climate change.

Understanding where the County's most vulnerable groups are located can help prioritize mitigation and adaptation efforts and 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 reduce 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.

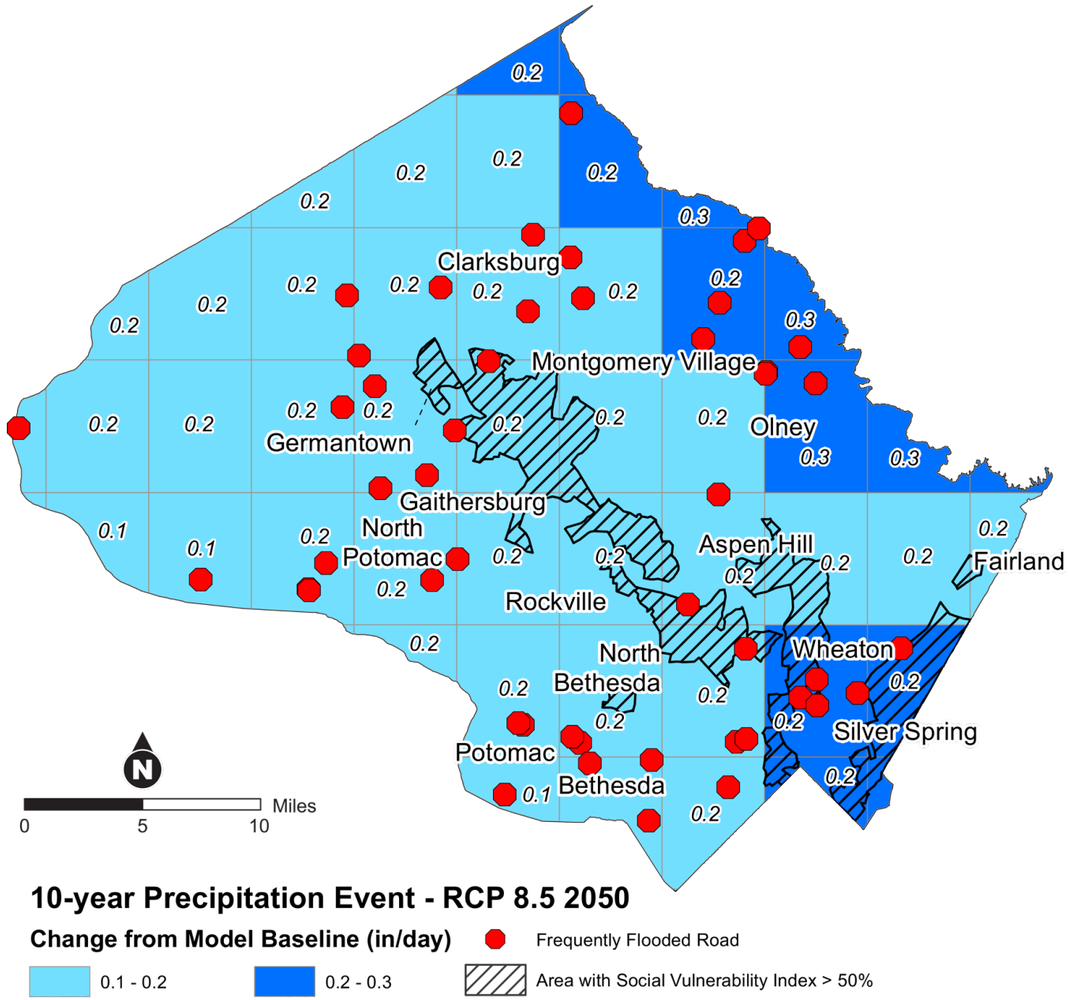


Figure 12: Projected increase in the 10-year precipitation event for 2050 and climate scenario RCP 8.5 outlining areas ranked in the top 50% most vulnerable by the CDC social vulnerability index

Combining the hazard data, asset information, and social vulnerability index, priority areas can be identified. In **Figure 12**, 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 social vulnerability index showing the areas of the County that are considered 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 gray 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.

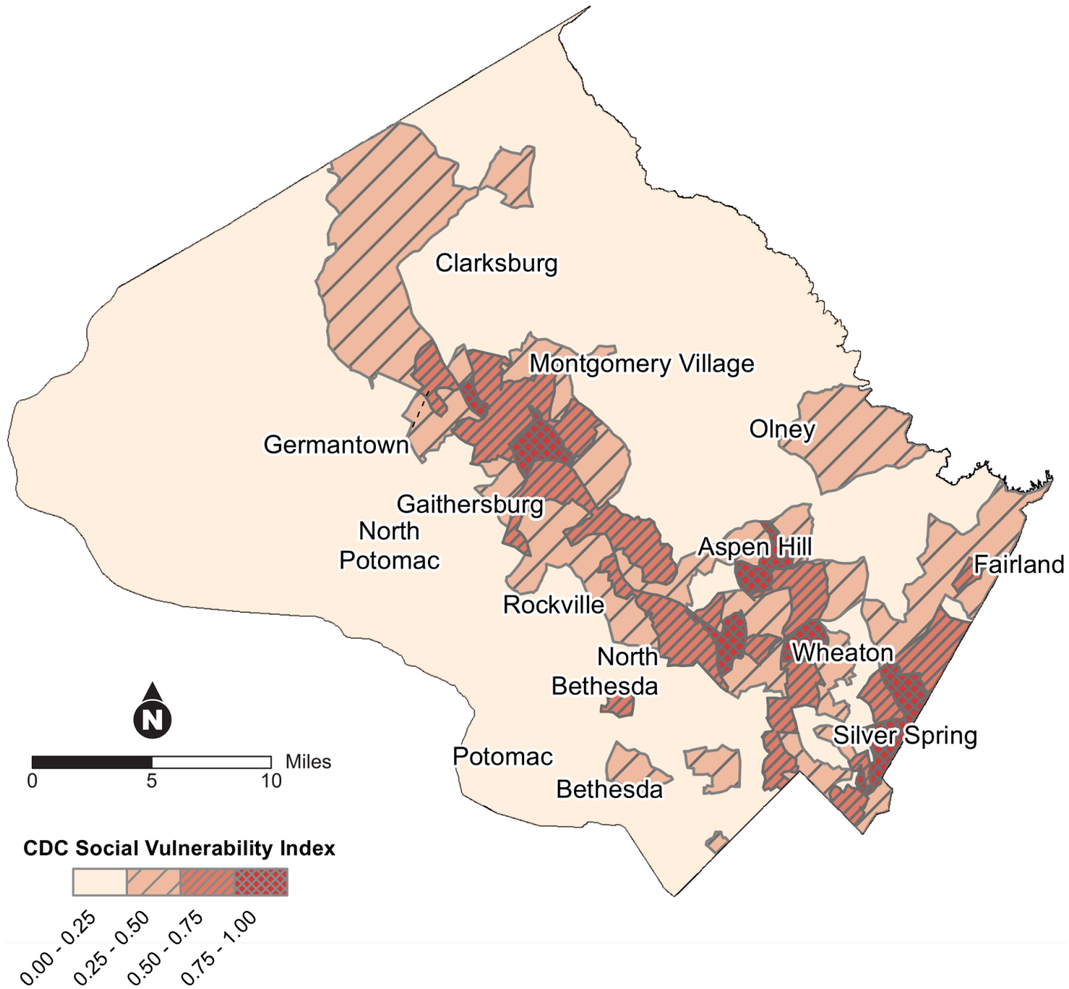


Figure 13: Social vulnerability in Montgomery County

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,[57] 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.[58] 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., on July 19. Extreme hot weather is set to continue across much of the U.S. over the weekend.

PHOTO: ***Mark Wilson/Getty Images***

Figure 14 shows the vulnerability ranking by major climate hazard to Montgomery County, based on a scale of low, some, or high vulnerability.

Assets	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 14: Vulnerability ranking by asset category and hazard category

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 CDC's 2016 SVI, will face greater impacts due to limited resources and access to adaptation and mitigation options.

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 the lowest-lying urban areas, 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.[59] 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 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 ground-truth the needs and vulnerabilities of both assets and people. 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. Additionally, 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, one of the climate adaptation CAP actions is to elevate mechanical and electrical building equipment above the base flood elevation in areas of the County that frequently flood and that show expected increase in rainfall, particularly in more socially vulnerable communities (see ***Figure 13***); 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 County-wide climate change projections developed in through Climate Vulnerability Assessment will help guide prioritization.

Climate Risk Reduction

While climate mitigation is more straightforward to measure and quantify in metric tons of carbon dioxide equivalent (MT CO_2e), climate adaptation necessitates 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

Based on the downscaled climate modeling and analysis, the team estimated the following likelihood and impact scores for the four 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 5**).

Table 5: Climate risk (likelihood x impact) of major climate hazards to Montgomery County

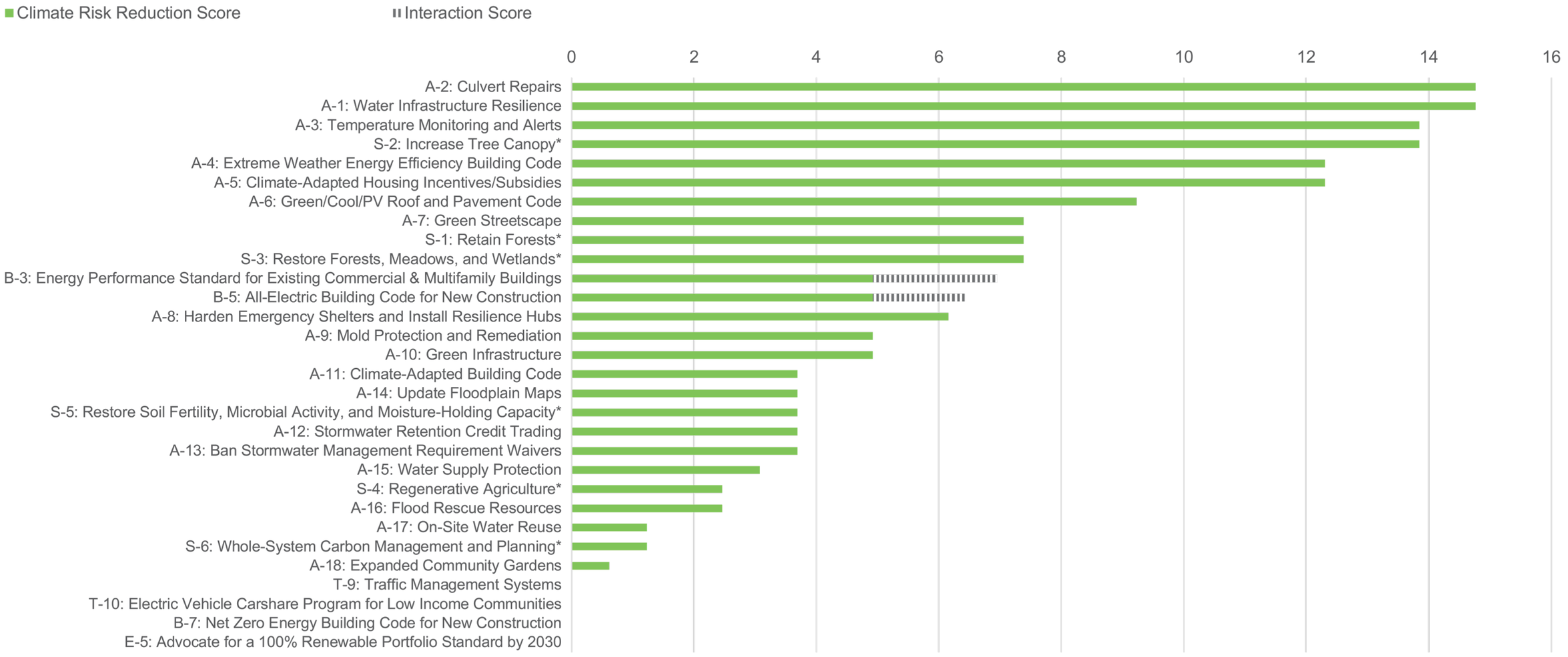
Hazard	Likelihood	Impact	Climate Risk (Likelihood x Impact)
Extreme Heat	5	3	15
Extreme Precipitation	4	3	12
High Winds	3	2	6
Drought	3	2	6

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. 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 15** 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.

Montgomery County CAP
Montgomery County Climate Conditions



* While the sequestration actions' GHG mitigation cannot be estimated at this time, they do have an interaction score, reducing both climate risk and GHG emissions.

Figure 15: Climate adaptation actions with the highest risk reduction potential

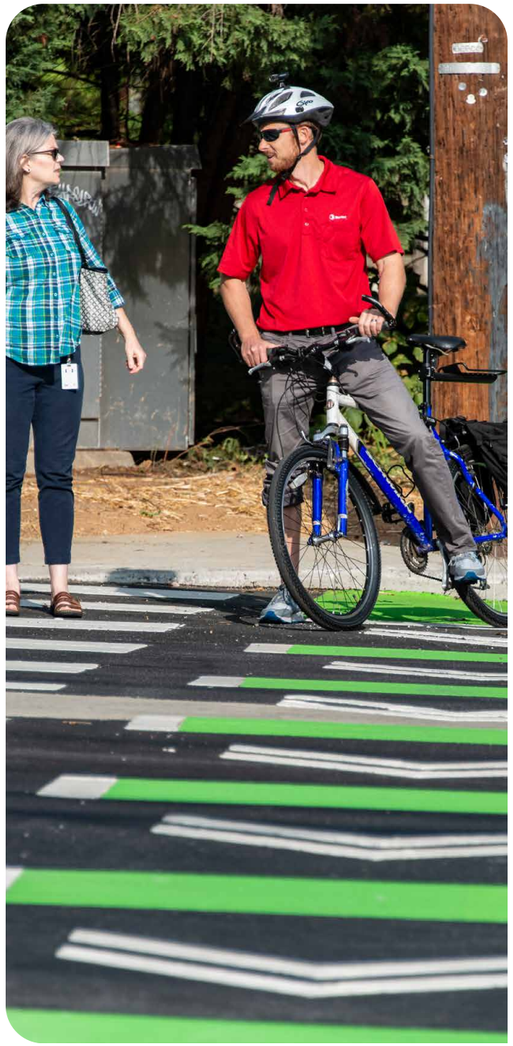
This space is reserved for local art work from winners of the County's art contest.

Calling all artists and climate justice activists!

Montgomery County is hosting a competition for artwork to be featured in the County's climate action plan. What photos, drawings, poems, digital art, and memes (yes, we meant it, memes) invoke the need to protect your community from climate change? Help us to harness your creativity to sound the alarm about the climate emergency. Art is an incredibly important tool that will engage all County residents from a variety of backgrounds. Through this contest, we hope to reach those who might not have previously been engaged in the climate planning process, especially those from marginalized backgrounds who will be disproportionately impacted by changes in climate. The deadline for the contest in Sunday, January 31, 2021. For more information, please visit ***the art contest website***.

Montgomery County Greenhouse Gas Emissions

Montgomery County Greenhouse Gas Emissions

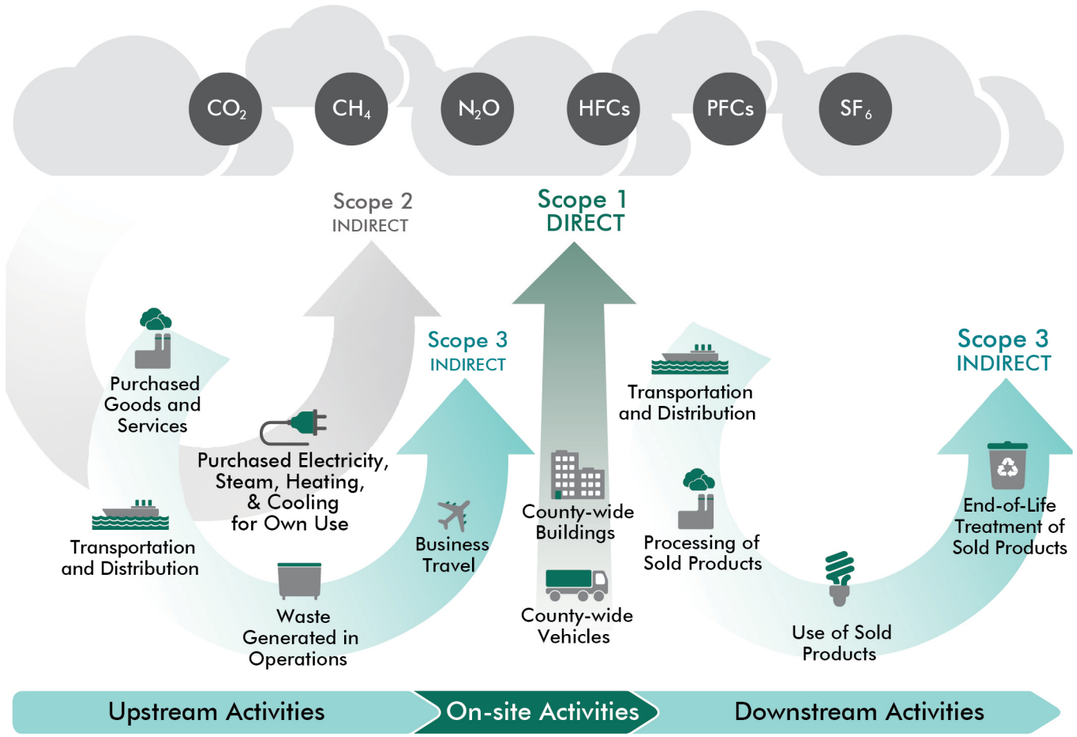


A pedestrian and cyclist take advantage of the County's protected crosswalk and bike lane intersections.

GHG Inventory and Projections

Montgomery County partnered with the Metropolitan Washington Council of Governments (MWCOG) to develop GHG inventories of County emissions. GHG inventories for Montgomery County have been developed for the years 2005, 2012, 2015, and 2018. The 2005 GHG inventory set a baseline of overall 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. Consumption emissions from making goods or products and embodied emissions associated with building materials are Scope 3 emissions and are not captured in the Montgomery County GHG emissions inventory. There are three types of GHG emission scopes (**Figure 16**):

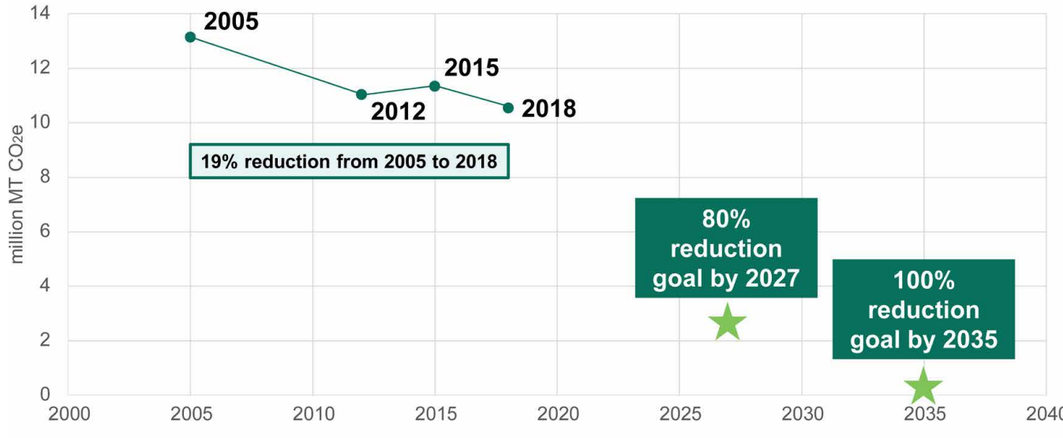
- **Scope 1**. Emissions from direct activities located within the geographic boundary (for example, on-site fuel combustion, in-boundary travel)
- **Scope 2**. Indirect emissions from the generation of purchased electricity, steam, heating, and cooling consumed within the geographic boundary
- **Scope 3**. All other emissions that occur outside the emissions boundary as a result of activities taking place within the geographic boundary (for example, air travel and out-of-boundary waste disposal)



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

Figure 16: Scopes of greenhouse gas emissions

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 developed the County's latest 2018 GHG inventory, which shows that measured emissions in the County dropped by 19% from 2005 to 2018, as illustrated in **Figure 17**.[60]



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

Figure 17: Montgomery County GHG emissions reduction progress and goals

The County used the latest 2018 GHG inventory (**Figure 18**) as a base year for understanding priority reduction opportunities and for estimating the expected emissions reduction 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 18**, most of the County's 2018 emissions in annual metric tons of CO_2e per year (MT CO_2e/year) come from residential and commercial building energy use (50%) and community transportation (42%).

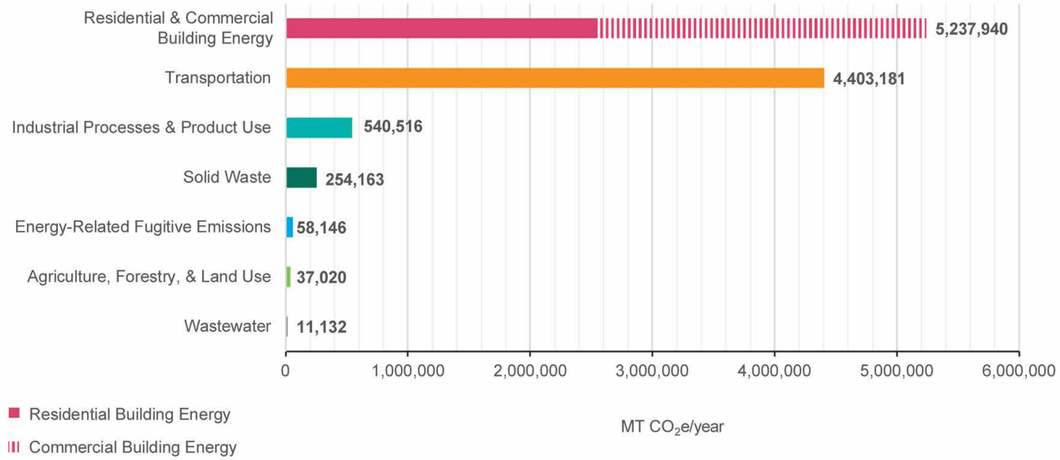
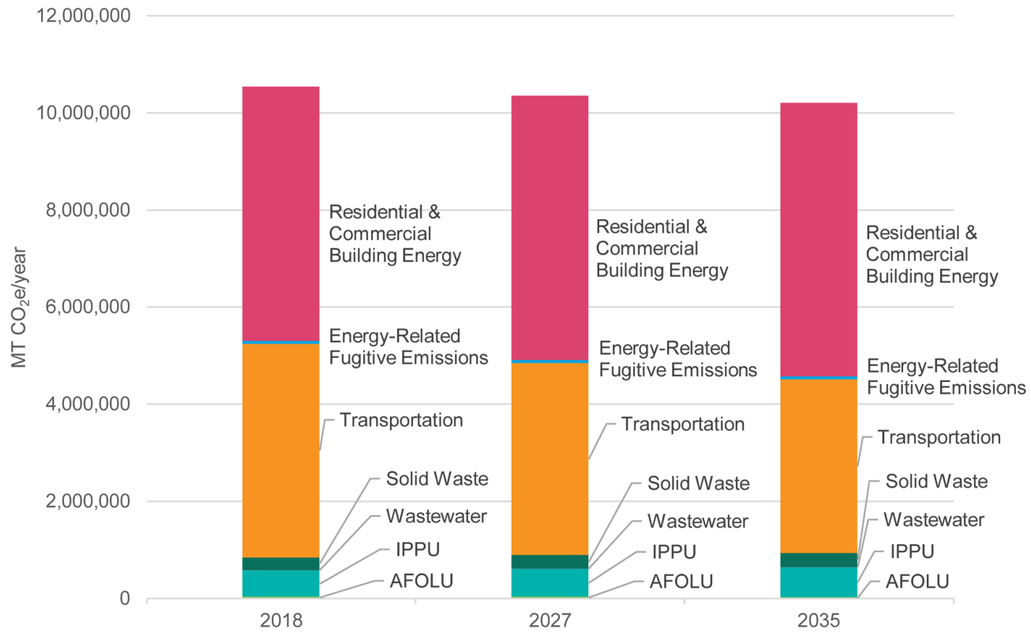


Figure 18: Montgomery County 2018 GHG inventory

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 implementing planned federal regulations and programs that will influence regional travel volumes. The forecast scenario illustrates expected GHG emission levels if no climate actions are implemented. To estimate 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 19 shows how 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 (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 19: Montgomery County emissions forecasting 2018-2035

The County used the ***Climate Action for Urban Sustainability (CURB) C40 Cities tool*** to determine which emissions reduction strategies would be required to achieve the County's GHG targets. CURB is a data-driven emissions scenario planning tool designed to help cities and counties quickly analyze emissions reduction opportunities from various energy, building, transportation, and waste technological strategies.[61] The strategies identified by the CURB tool are referred to as an "emissions reduction pathway." Significant reductions (represented by the dashed line in **Figure 20**) will be required to achieve the County's goals, as a comparison with the County's forecasted emissions demonstrates (represented by the solid line in **Figure 20**).

The County's GHG emissions baseline and its expected emissions in 2027 and 2035 demonstrate the magnitude of action needed to achieve the County's ambitious climate mitigation goals.

Figure 20: Montgomery County baseline emissions and emissions reduction target forecasts

Note: While the 2027 and 2035 emissions reduction goals are set against the 2005 GHG inventory baseline, the team calculated the corresponding percent reduction below the 2018 inventory for use in the CURB analysis. A reduction of 75.4% below 2018 levels would achieve the same emissions as 80% below 2005 levels.

GHG Emissions Reduction Pathway

The County team used the CURB tool to analyze projected emissions and identify sector-specific mitigation opportunities. After the County team entered the base year GHG inventory and projected emissions to 2027 and 2035 in the CURB tool, the team modeled an emissions reduction pathway of high-level strategies to reach the 80% by 2027 and 100% by 2035 reduction targets. The wedge diagram in **Figure 21** shows the County's emissions reduction pathway toward the 2027 and 2035 goals. The top solid line charts the forecasted baseline GHG emissions, or business-as-usual, 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 targeted emissions goals. Each colored wedge represents a primary emissions source by sector (for example, buildings or transportation) and the collective reductions from a set of strategies within that sector, with larger wedges representing greater emissions reductions. For example, the County needs to reduce the greatest amount of GHG emissions from electricity generation (blue), followed by transportation (orange), and followed by private building energy (pink). The primary high-level strategies identified in each wedge of the County's emissions reduction pathway scenario are listed in **Table 6** through **Table 10**.

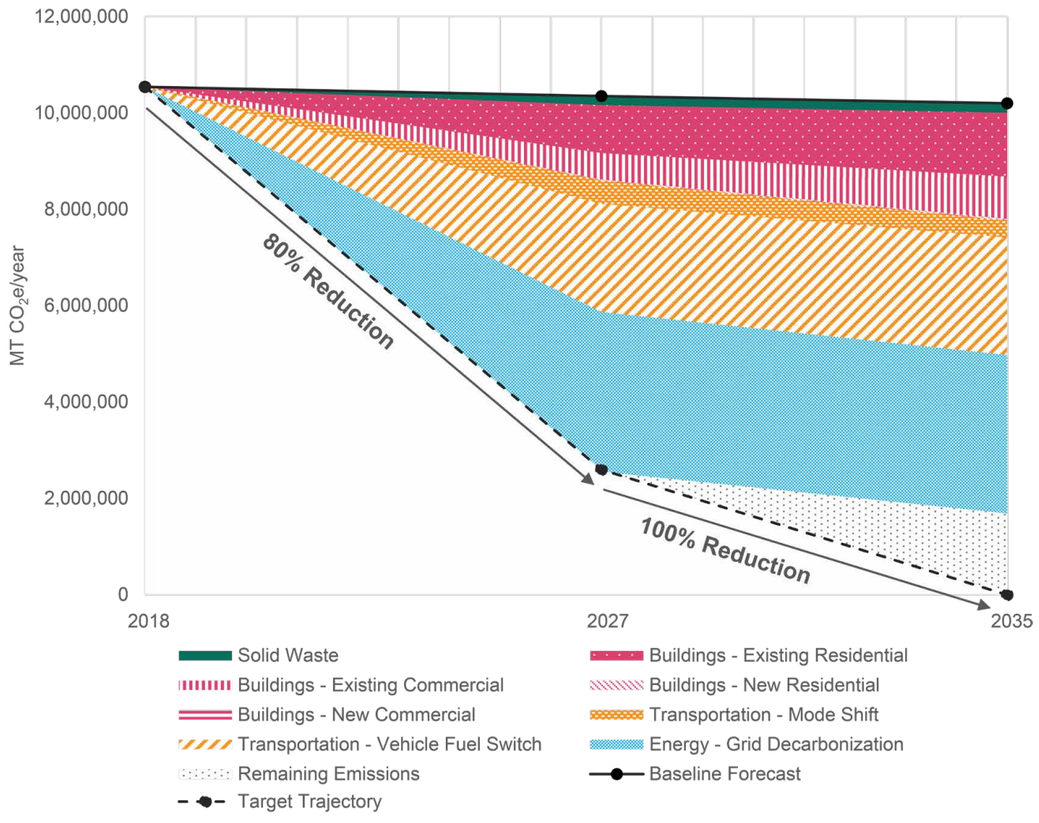


Figure 21: Montgomery County GHG emissions reduction pathway

The team then matched the initial climate workgroup action recommendations to their corresponding high-level reduction strategies modeled in CURB (see **Figure 22** below). The team combined, modified, or added actions in order to create the final list of CAP actions that would most directly achieve the County's 80% and 100% GHG reduction goals. **Table 6** through **Table 10** demonstrate how the final CAP actions map to each high-level CURB strategy.

The CAP actions related to clean energy, buildings, and transportation were then assessed for their individual GHG reduction potential using County data, relevant studies, and results from similar actions. To quantify an action's GHG reduction potential, each action was scored 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

Estimations of GHG mitigation impact typically result in a range of emissions reductions that vary according to the extent and update (adoption) of each action. Therefore, emission reduction scores were developed using a specific set of tiered inputs (for example, 0-19% or 80-100%) to account for unknowns and variability in emissions impact. In addition, some actions may result in overlapping emissions reductions. For example, a natural gas ban in new developments and 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 could not be added together. Because of this, plan implementation should consider which actions would be bundled together and what their combined emissions reduction would be.

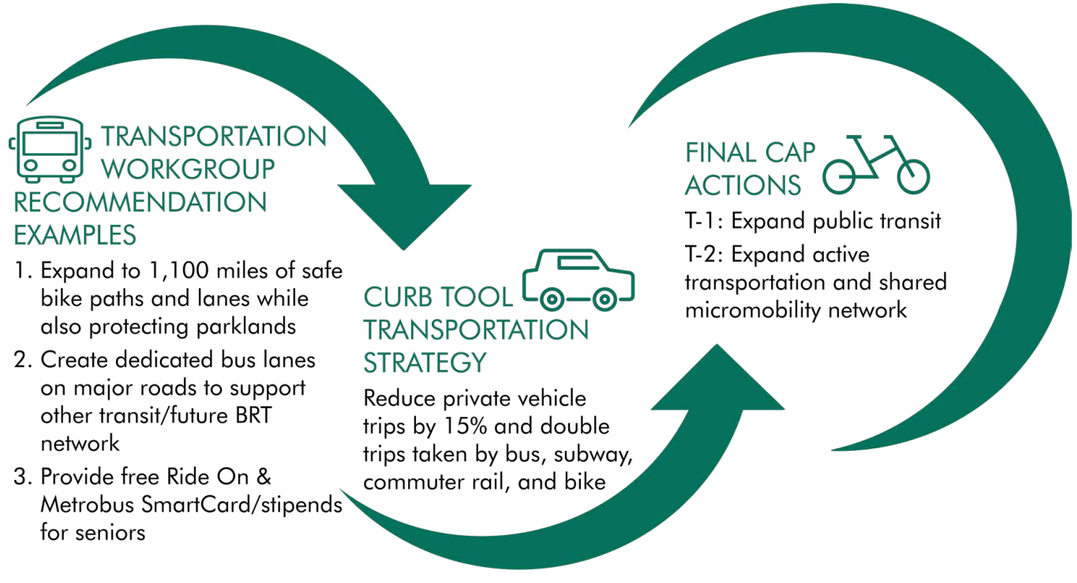


Figure 22: CAP action development process example

Table 6: CAP GHG mitigation actions mapped to CURB tool emissions reduction strategies ***(Existing Buildings)***

Subsector	CURB Emissions Reduction Strategy	Target Year Uptake Goal 2027	Target Year Uptake Goal 2035	CAP Actions
Residential	Electric heat pumps for space and water heating	85% of residential units	100% of residential units	B-2: Electrification Code Requirements for Existing Residential Buildings B-4: Electrification Incentives for Existing Buildings
	Improved wall/roof insulation and double glazed low-E windows	25% of residential units	100% of residential units	
	Low-flow water fixtures	20% of residential units	100% of residential units	
Commercial	Electric heat pumps for space and water heating in all commercial buildings	75% of commercial buildings	100% of commercial buildings	B-1: Electrification Code 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
	Improved wall/roof insulation and double glazed low-E windows in offices, retail stores, hotels, and hospitals	15% of targeted buildings	100% of targeted buildings	
	Low-flow water fixtures in hotels and hospitals	50% of targeted buildings	100% of targeted buildings	

Table 7: CAP GHG mitigation actions mapped to CURB tool emissions reduction strategies ***(New Construction)***

Subsector	CURB Emissions Reduction Strategy	Target Year Uptake Goal 2027	Target Year Uptake Goal 2035	CAP Actions
Residential	New residential buildings have electric heat pumps for space and water heating, advanced insulation and triple-glazed windows, low-flow fixtures (all electric, action starting in 2022)	100% of new residential units	No change	B-1: Electrification Code Requirements for Existing Commercial and Public Buildings B-5: All-Electric Building Code for New Construction B-6: Ban Natural Gas in New Construction B-7: Net Zero Energy Building Code for New Construction
Commercial	New commercial buildings have electric heat pumps for space and water heating, advanced insulation and triple-glazed windows, low-flow fixtures (all electric, action starting in 2022)	100% of new commercial buildings	No change	

Table 8: CAP GHG mitigation actions mapped to CURB tool emissions reduction strategies ***(Solid Waste)***

Subsector	CURB Emissions Reduction Strategy	Target Year Uptake Goal 2027	Target Year Uptake Goal 2035	CAP Actions
Solid Waste Management	Ensure no paper waste is sent to landfills and no plastic waste is incinerated	100% paper and plastic waste	No change	See ***Zero Waste Task Force Planning and Initiatives*** section

Table 9: CAP GHG mitigation actions mapped to CURB tool emissions reduction strategies ***(Electricity)***

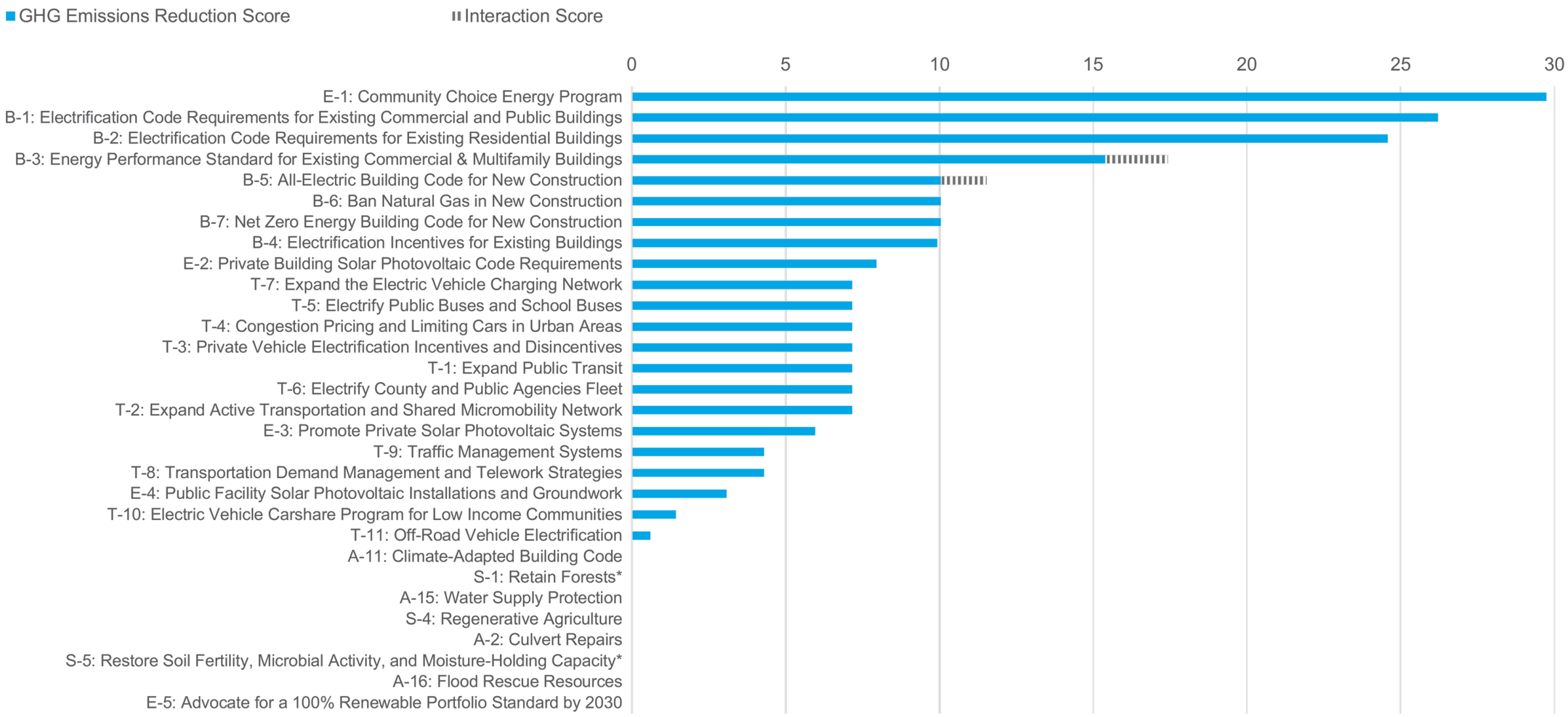
Subsector	CURB Emissions Reduction Strategy	Target Year Uptake Goal 2027	Target Year Uptake Goal 2035	CAP Actions
Renewable Energy	County-wide electricity consumption generated from zero-emission sources	86% renewable grid	100% renewable grid	E-1: Community Choice Energy Program E-2: Private Building 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

Table 10: CAP GHG mitigation actions mapped to CURB tool emissions reduction strategies ***(Transportation)***

Subsector	CURB Emissions Reduction Strategy	Target Year Uptake Goal 2027	Target Year Uptake Goal 2035	CAP Actions
Passenger Mode Shift	Reduction of private automobile trips	15% private vehicle trip reduction	No change	T-1: Expand Public Transit T-2: Expand Active Transportation and Micromobility Network T-4: Congestion Pricing and Limiting Cars in Urban Areas T-12: Advocate for a Vehicle Carbon Gas Tax
Vehicle Fuel Switch	Electrification of passenger automobiles and trucks	85% of passenger vehicles	100% of passenger vehicles	T-3: Private Vehicle Electrification Incentives and Disincentives T-5: Electrify Public and School Buses T-6: Electrify County and Public Agencies Fleet T-7: Expand the Electric Vehicle Charging Network T-8: Transportation Demand Management and Telework Strategies T-9: Traffic Management Systems T-10: Electric Vehicle Car-share Program for Low Income Communities T-11: Off-Road Vehicle Electrification Incentives T-13: Advocate for Rail Alternative Fuels
	Electrification of taxis and standard buses	100% of buses and taxis	No change	

Montgomery County CAP Montgomery County Greenhouse Gas Emissions

Figure 23 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.



* While the sequestration actions' GHG mitigation cannot be estimated at this time, they do have an interaction score, reducing both climate risk and GHG emissions.

Figure 23: GHG mitigation actions with the highest emissions reduction potential

Remaining Emissions

Notably, the emissions reduction diagram in **Figure 24** shows a gap between the mitigation strategies and the 2035 target. This gap represents the "remaining" emissions that are either not addressed through CAP actions or that cannot be modeled in the CURB tool to estimate the County's reduction potential. This balance of remaining emissions represents the additional GHG emissions reduction needed—beyond implementing the CAP actions that can be modeled in CURB—for the County to reach its goal.

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.

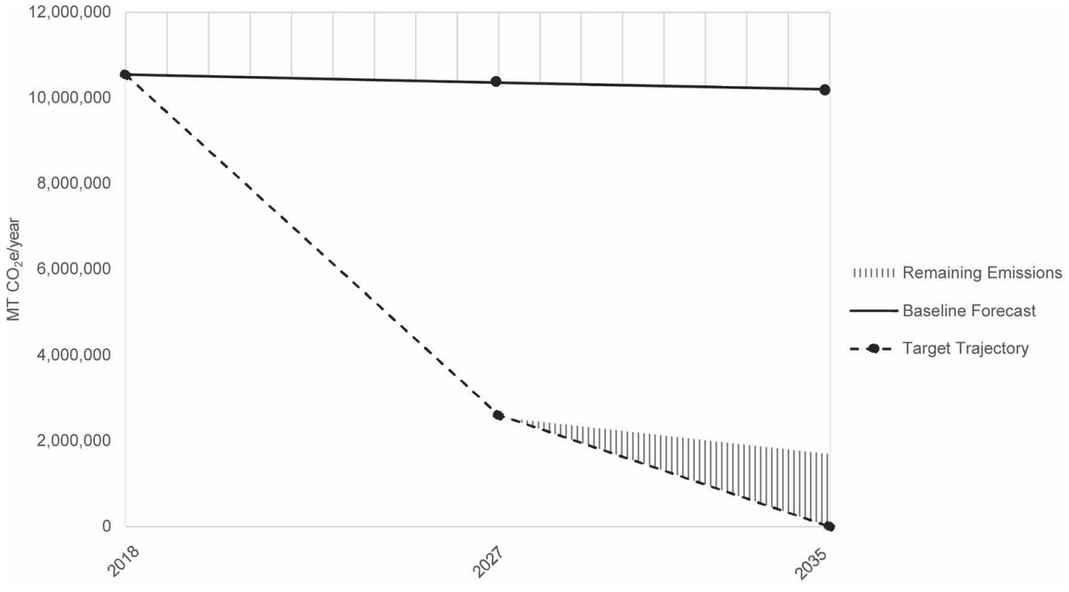


Figure 24: Remaining emissions potential

However, there are several options the County can pursue to address these remaining emissions with regards to the carbon neutrality target, including:

1. Carbon Sequestration
2. New Technologies/Future Actions
3. Carbon Offsets

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 green spaces and wetlands. 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*** section for examples).

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, such as electric commercial airliners, or new climate planning tools may be available to help estimate GHG reductions from a broader set of local actions. During future CAP updates, the County will consider new technological advancements and their application to the County's emissions sources, and then update the remaining emissions analysis accordingly.

Finally, 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 CO_2e. In general, offsets can be generated by capturing and destroying GHGs that 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 directly 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

CURB was not designed to measure emissions reductions from carbon sequestration practices such as reforestation and tree planting, nor emissions additions from the loss of forests and trees due to land use changes such as the conversion of forests to development. However, 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***.[62] 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 Montgomery 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. An estimated net 213,643 metric tons of carbon dioxide per year was sequestered from the atmosphere during the 2001 to 2011 period, compared to an estimated net 501,161 metric tons of carbon dioxide per year during the 2011 to 2016 period (see **Figure 25**, with negative values representing CO_2 removal).[63] The later period showed that net sequestration on an annual basis more than doubled, primarily due to significantly less conversion of forests into development.

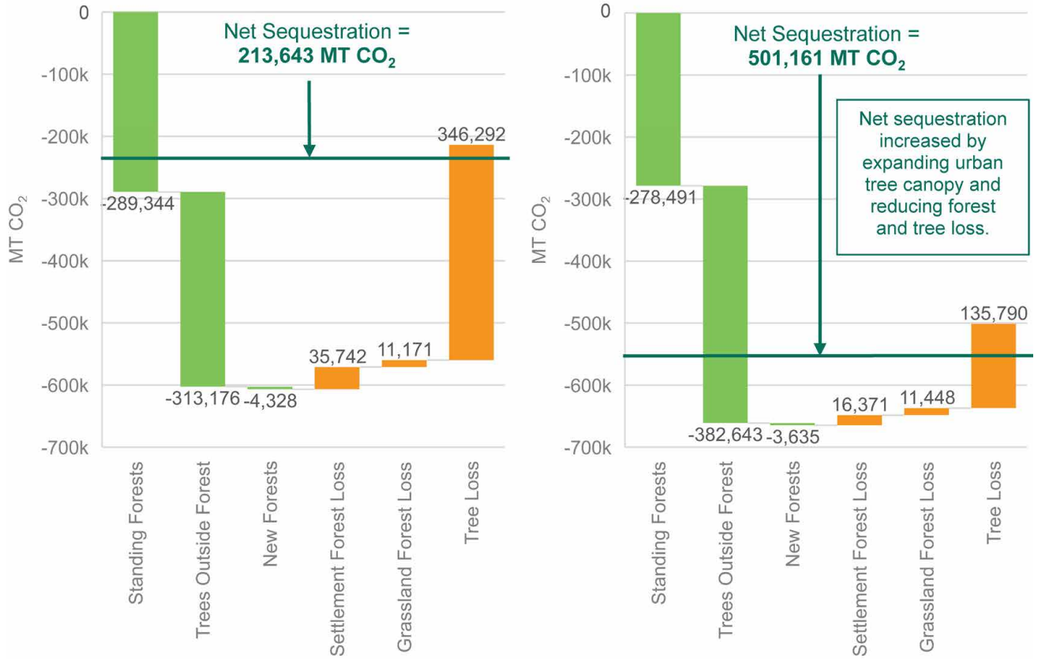


Figure 25: Montgomery County average annual GHG emissions from forests and trees

Because it is not required by GHG inventory protocol, the County does not currently count carbon sequestration by trees and forests toward meeting its GHG reduction goals. The County has, although, determined its net emissions from 2005 and 2015 including land use activities. The report reveals that the protection of forests and aggressive tree planting can make a difference in overall net emissions. Gross emissions from energy, transportation, waste, and agriculture in Montgomery County dropped 14% from 2005 to 2015. When forests and trees emissions and sequestration are added, the drop in net emissions increases to 16% (**Table 11**). In 2015, forests and trees provided an estimated net offset of 5.9% of the County's emissions from energy, transportation, and waste.

Table 11: Forests and trees contribution to County GHG inventory 2005-2015

Emissions Type	2005 Emissions ($MT CO_2e$)	2012 Emissions ($MT CO_2e$)	2015 Emissions ($MT CO_2e$)	% 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	**-213,643**	-	**-501,161**	**-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

The County is currently working with ***ICLEI – Local Governments for Sustainability*** to update data on trees and forests for the 2018 GHG emissions inventory. This new information, combined with baseline inventory data, will provide a strong scientific basis for enhancing existing regulations, policies, and programs to retain and increase forests and trees across the County. 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. 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 effect, 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 which most commonly refers to the emissions associated with 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.[64] 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."[65] Consumption-based emissions for C40 jurisdictions would be 60% higher than production-based emissions, the current approach for inventorying GHG emissions.[66] 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 that are represented in the study.

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

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

This space is reserved for local art work from winners of the County's art contest.

Calling all artists and climate justice activists!

Montgomery County is hosting a competition for artwork to be featured in the County's climate action plan. What photos, drawings, poems, digital art, and memes (yes, we meant it, memes) invoke the need to protect your community from climate change? Help us to harness your creativity to sound the alarm about the climate emergency. Art is an incredibly important tool that will engage all County residents from a variety of backgrounds. Through this contest, we hope to reach those who might not have previously been engaged in the climate planning process, especially those from marginalized backgrounds who will be disproportionately impacted by changes in climate. The deadline for the contest in Sunday, January 31, 2021. For more information, please visit ***the art contest website***.

Climate Action

Climate Action Introduction

The following sections outline the 87 climate actions proposed as part of the Climate Action Plan. 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 87 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 36 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.

By pursuing the proposed CAP actions, the County will be on the path to meet its 2027 and 2035 emissions reduction goals. However, 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 County-wide impact. 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 how to navigate the information in the action descriptions.

Even with implementation of all the CAP 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, 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 Prioritization

To prioritize climate actions, the 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), and
- Feasibility (for example, authority level and financial need).

The resulting qualitative and quantitative ASAP outputs allow for streamlined action comparison. In the CAP, actions have been prioritized in order of their primary benefits (emissions mitigation and climate risk reduction potentials). The ASAP co-benefits and feasibility ratings are presented within each action and can be used for further action prioritization.

Evaluation Criteria

The technical consultants used the ASAP tool to evaluate the climate actions for GHG emissions and/or climate risk reduction as well as the co-benefits and feasibility criteria important to Montgomery County (**Table 12**). The County identified and defined important local co-benefits and feasibility criteria that reflect County and community priorities. The qualitative assessment that followed was conducted by technical subject matter experts and members of the County's climate team to identify and rank using a Likert scale approach the strengths and weaknesses of the proposed CAP actions. It is important to recognize that different people can reach different conclusions when assessing the co-benefits (strengths), weaknesses, and feasibility of implementing of 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.

Table 12: Co-benefit and feasibility evaluation criteria and definitions

CO-BENEFITS	FEASIBILITY CRITERIA
► **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	► **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 national government, a utility, or an agency outside of the County Government, or by the private sector?
► **ENVIRONMENTAL STEWARDSHIP** Increased creation, preservation, or restoration of natural environments	► **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)?
► **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	► **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)?
► **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	

Figure 26 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 27** 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 27** 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. The County does not have direct control over actions with a negative authority rating, while 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 28** compares actions by charting them according to both their primary and co-benefits. Actions in the upper right of the chart have both large primary and co-benefits. Actions in the bottom left have low primary and co-benefits. All charts can be used to aid in future action prioritization.

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Montgomery County CAP Climate Action

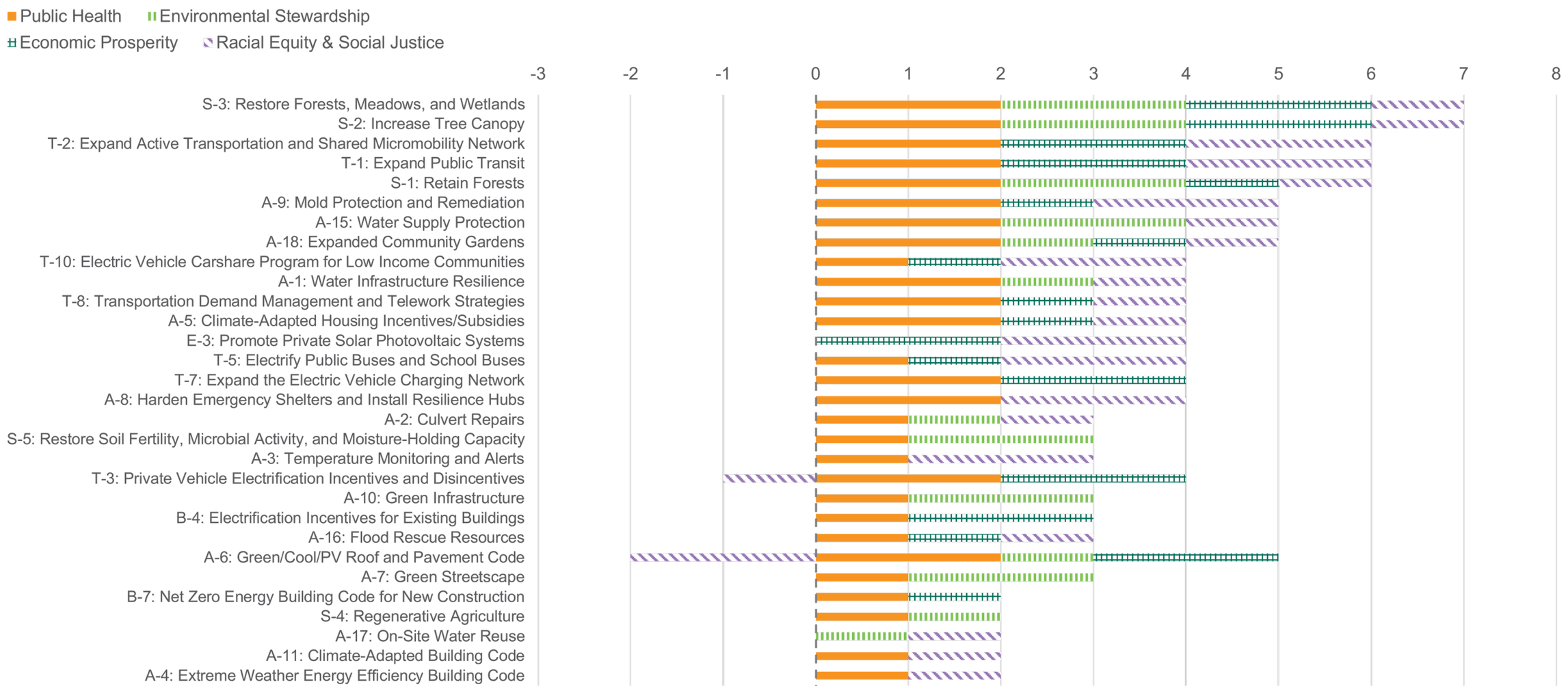
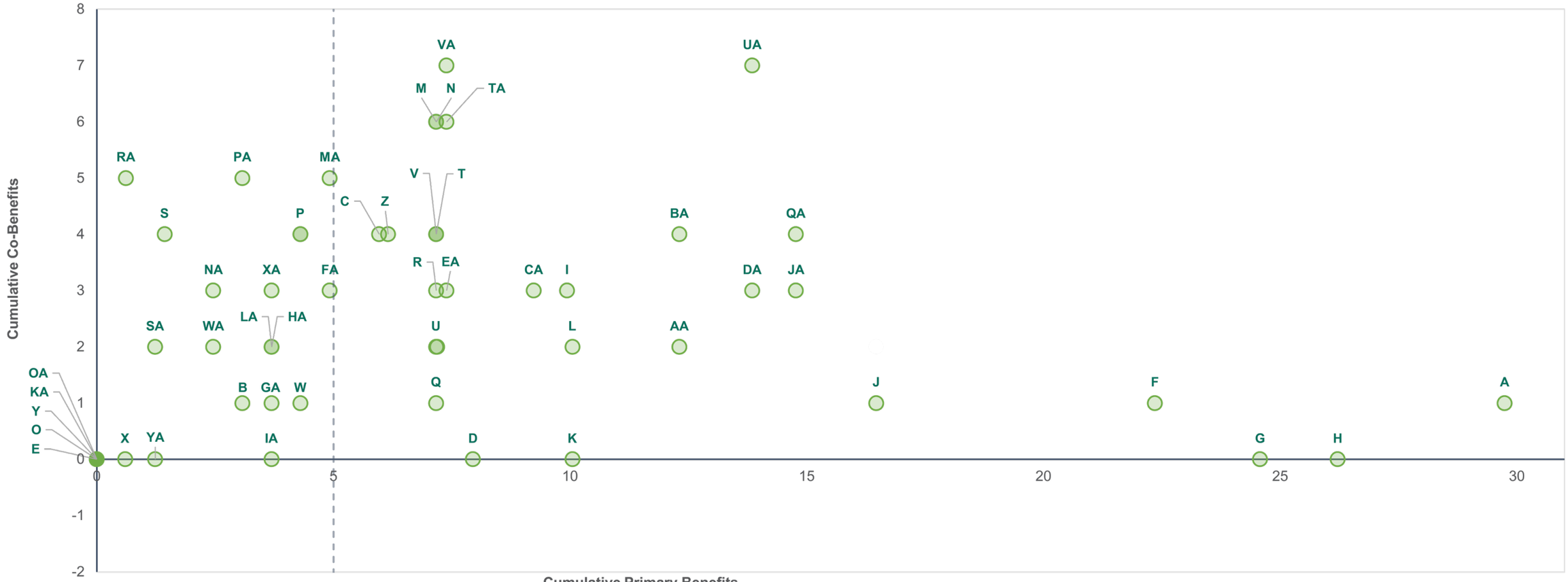


Figure 26: CAP actions with the greatest cumulative co-benefits

Figure 27: CAP actions with the highest county authority and initial investment feasibility



Action ID, Number and Name

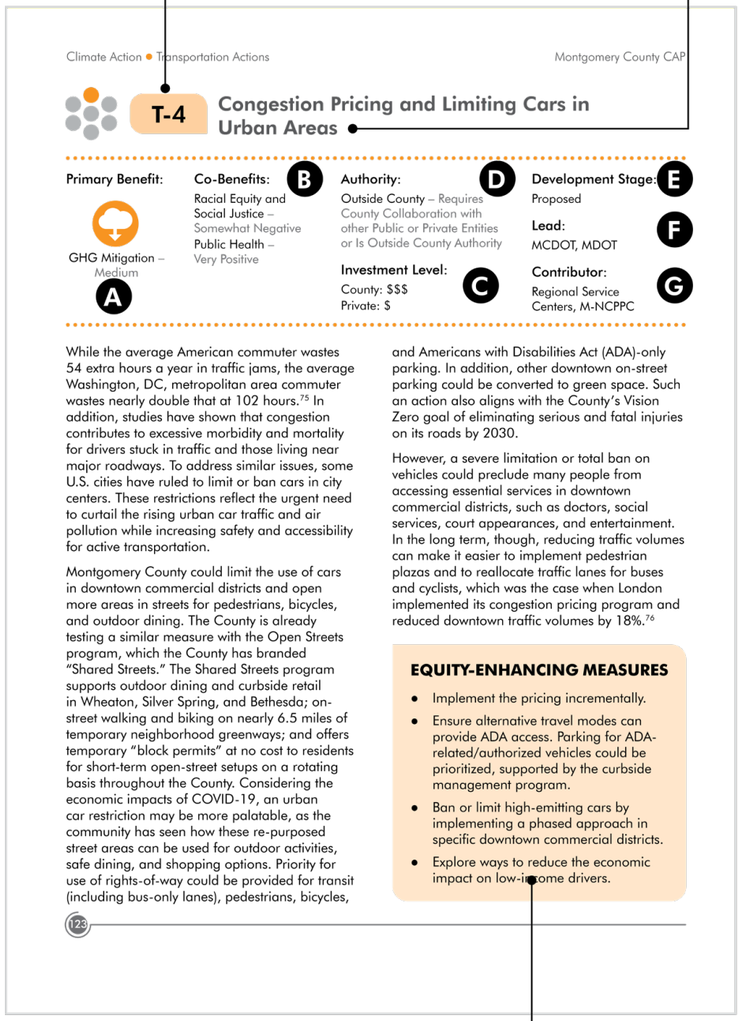
- **A** E-1: Community Choice Energy Program
- **B** E-4: Public Facility Solar Photovoltaic Installations and Groundwork
- **C** E-3: Promote Private Solar Photovoltaic Systems
- **D** E-2: Private Building Solar Photovoltaic Code Requirements
- **E** E-5: Advocate for a 100% Renewable Portfolio Standard by 2030
- **F** B-3: Energy Performance Standard for Existing Commercial & Multifamily Buildings
- **G** B-2: Electrification Code Requirements for Existing Residential Buildings
- **H** B-1: Electrification Code Requirements for Existing Commercial and Public Buildings
- **I** B-4: Electrification Incentives for Existing Buildings
- **J** B-5: All-Electric Building Code for New Construction
- **K** B-6: Ban Natural Gas in New Construction
- **L** B-7: Net Zero Energy Building Code for New Construction
- **M** T-1: Expand Public Transit
- **N** T-2: Expand Active Transportation and Shared Micromobility Network
- **O** T-12: Advocate for Vehicle Carbon Gas Tax
- **P** T-8: Transportation Demand Management and Telework Strategies
- **Q** T-4: Congestion Pricing and Limiting Cars in Urban Areas
- **R** T-3: Private Vehicle Electrification Incentives and Disincentives
- **S** T-10: Electric Vehicle Car Share Program for Low Income Communities
- **T** T-5: Electrify Public Buses and School Buses
- **U** T-6: Electrify County and Public Agencies Fleet
- **V** T-7: Expand the Electric Vehicle Charging Network
- **W** T-9: Traffic Management Systems
- **X** T-11: Off-Road Vehicle 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 Streetscape
- **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: Culvert Repairs
- **KA** A-20: Study Potential for Buildings in the County to Flood and Possible Remedies
- **LA** A-11: Climate Adapted Building Code
- **MA** A-9: Mold Protection and Remediation
- **NA** A-16: Flood Rescue Resources
- **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 Forests
- **UA** S-2: Increase Tree Canopy
- **VA** S-3: Restore Forests, Meadows, and Wetlands
- **WA** S-4: Regenerative Agriculture
- **XA** S-5: Restore Soil Fertility, Microbial Activity, and Moisture-Holding

Figure 28: CAP actions plotted for cumulative co-benefits and cumulative primary benefits

How to Read the CAP Action Descriptions

ACTION NUMBER

ACTION NAME



EQUITY-ENHANCING MEASURES

ACTION DETAILS

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 CO_2e
- Medium: 500,000-1,000,000 MT CO_2e
- Low: <500,000 MT CO_2e
- 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)

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

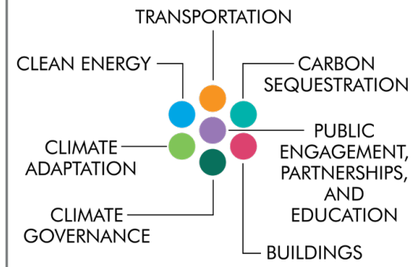
E Development Stage Current development stage for the action.

- 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 should the enabling actions be 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 CO_2e
- Medium: 500,000-1,000,000 MT CO_2e
- Low: <500,000 MT CO_2e
- 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 & 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 County Council. Independent public agencies, such as MCPS and M-NCPPC, are defined as "other Public entities" for the purposes of this section.

- County – County can implement the action under existing policy
- County with Change – 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

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

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Clean Energy Actions

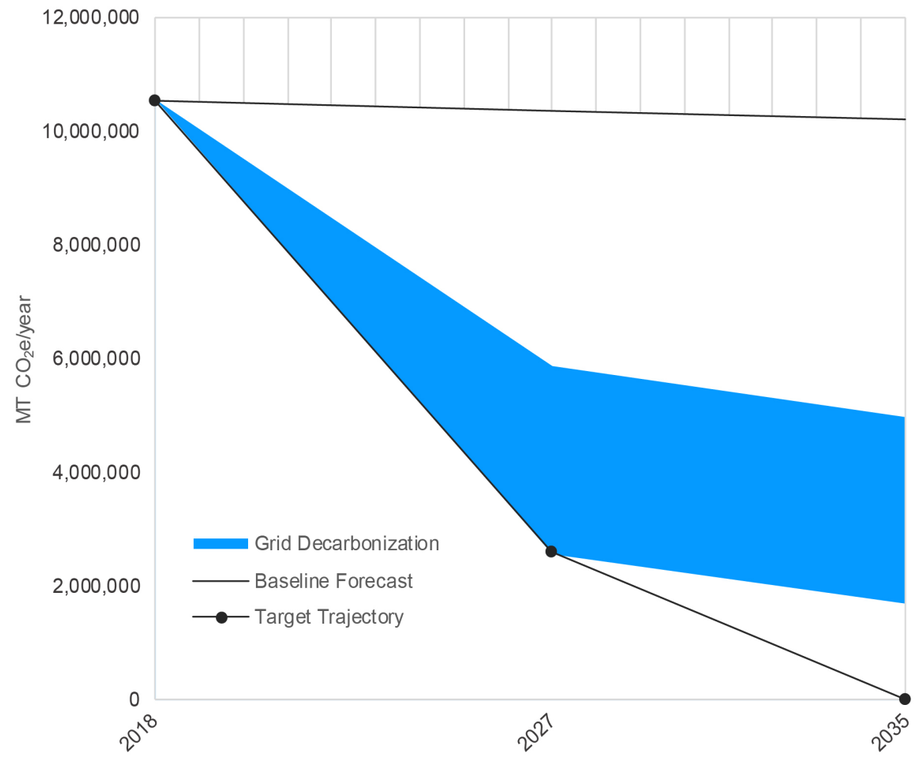
Montgomery County uses and invests in carbon-free, reliable, affordable electricity.

- Ensure broad access to affordable zero-carbon electricity.
- Create 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



Clean Energy

The electricity sector accounted for 30% of 2018 GHG emissions in Montgomery County. By 2030, 100% of the electricity used in the County must be generated from renewable 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% renewable, then building and transportation electrification will help the County reach its zero-emissions goal.

Achieving the County's energy target will involve leveraging both energy efficiency and distributed renewable energy resources to reduce the amount of electricity the County consumes from the electric grid while ensuring that 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 100% renewable energy supply by providing 100% renewable 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% renewable energy to the grid, a potential option for the County, assuming change in state law to allow it, would be to establish an opt-out Community Choice Energy (CCE) program and purchase renewable energy for its residents.

To reach its holistic energy vision, the County will need to use the transition to renewable energy consumption 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 renewable sources can be achieved by a mix of energy efficiency 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. For example, as this plan is being developed, there is an ongoing discussion about the use of land in the County's Agricultural Reserve (AR) for solar PV installations. Proponents of solar in the AR maintain that to achieve aggressive carbon reduction goals, solar must be installed throughout the County, including in the AR. Opponents of solar in the AR feel that there are sufficient rooftops, parking lots, and other locations for solar 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. Additionally, the issue involves balancing the rural character and aesthetic appeal of the AR with the County's sustainability values. This debate is not unique to Montgomery County; it is occurring in other parts of Maryland and around the country. While a rigorous technical analysis beyond the scope of this plan might provide useful information on the carbon benefits of one approach over another, there are many value judgments that policy makers and the community must wrestle with in order to establish the County's policy related to solar in the AR. Similarly, should the County adopt a CCE program, difficult judgments, supported by additional technical and financial analyses, will have to be made regarding the structure of such a program so that the potential GHG reduction benefits do not come at a cost that drives customers to opt out of the program. Clean energy actions are outlined in **Table 13**.

Table 13: CAP clean energy actions

Action	GHG Reduction	Racial Equity & Social Justice	Public Health	Environmental Stewardship	Economic Prosperity	Authority	County Investment	Private Investment	Lead	Contributor
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, Office of Agriculture, Revenue Authority, DEP
E-5: Advocate for a 100% Renewable Portfolio Standard by 2030	N/A	Neutral	Neutral	Neutral	Neutral	County	$	$	OIR, CEX	DEP

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% renewable 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 GHG emissions.

To achieve a 100% renewable electricity goal, the County could develop an "opt-out" Community Choice Energy (CCE) program 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 would enable the County to choose an electricity supply that is significantly 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. Under state law, Montgomery County can participate in an opt-in CCE program (in which consumers could voluntarily choose to join) but would need to advocate at the state level for enabling legislation that would permit the development of an opt-out program.

Through a CCE, 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 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 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 Maryland Public Service Commission (MD-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 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 among Maryland, Virginia, and North Carolina, may result in the opportunity to directly contract with an off-shore 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. 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.[67] 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*

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.

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 County-wide 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 are needed. The County could amend the building code 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 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 technology 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 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

Contributor:

DPS, MCGB

Electricity consumption from private buildings generates approximately 30% of County-wide 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 of the magnitude 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 photovoltaic (PV) panels.

Approximately 74% of the buildings in Montgomery County are solar-viable according to Project Sunroof.[68] 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 is how to pay for a solar PV system (not to mention a battery storage system to support 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. Incentives should also support solar installations on the rooftops of small commercial businesses, non-profit properties, and residential homes, with greater assistance provided to low- and medium-income households. As solar technologies advance, consideration could be given for more innovative solar PV systems, such as solar PV glass for windows. The continuation

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 PV systems to traditionally underserved communities.

and expansion of federal and state-level tax credits for solar installations would support the achievement of this action. A good discussion of various payments options (as well as a variety of other information on solar) can be found in the Maryland Energy Administration's publication entitled ***A Maryland Consumer's Guide to Solar.*** Additionally, 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 Montgomery County to promote clean energy and reduce the cost of energy efficiency and renewable energy projects, provides 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. The Bank'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 detached residences. This practice should be expanded to other building types, such as multifamily and commercial properties. The County could also consider reinstituting its property tax credit for both residential solar and geothermal systems.

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 demonstrates how the system is performing, which is one of the most effective sales tools a solar advocate can easily share with neighbors. Montgomery County recently partnered with Solar United Neighbors (SUN) on the fourth 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 that 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 related to the financial aspects of solar systems.

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

Community solar systems provide the opportunity for those who cannot install solar on their own property due to site constraints, or those that 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 that can receive subsidized electricity.

As noted above, the County is currently deliberating over the issue of ground-mounted community solar installations in the Agricultural Reserve. As part of these discussions, the County is researching demonstration "agrivoltaic" projects around the U.S. and world in which PV solar projects are co-located with agricultural production (such as grapes), pollinator habitat, beekeeping, and even animal grazing. At a minimum, the County should collaborate with the agricultural community and research institutions to establish demonstration agrivoltaic projects that explore the viability of co-location and examine other related issues such as equity and the economic impact on farmers currently leasing land.

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, County-wide analysis would be useful to identify 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 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 program volume cap of 1,500 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 to 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

Contributor:

MCDOT, DPS, Office of Agriculture, 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 purchases. The County purchases renewable energy credits to offset greenhouse gas 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 renewable energy credits. 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. The systems already in place have reduced County facility energy consumption by 1,865,009 kilowatt hours and saved the County roughly $200,000 in electricity costs in 2017. 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, such as what is being done at the closed Oaks landfill community solar installation.

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

Investment Level:

County: $
Private: $

Development Stage:

Proposed

Lead:

OIR, CEX

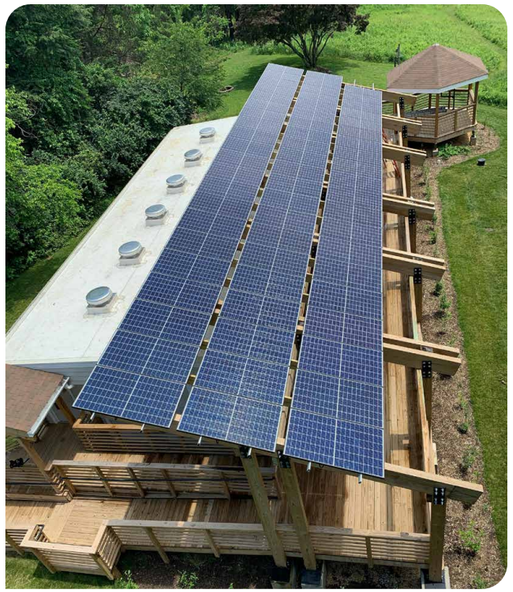
Contributor:

DEP

The path to zero GHG emissions is completely reliant on the use of 100% renewable energy sources for electricity production. The electrification of buildings and vehicles will not produce the intended emission reductions 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 using this power from renewable sources. However, the current Maryland Renewable Portfolio Standard (RPS) requirement is 50% renewable by 2030, while the County's zero emissions pathway requires a 100% renewable grid by 2030. If the state implemented a 100% RPS, this would enable the County to more easily meet its carbon neutrality goal. Absent changes to the RPS, the County must advocate for and develop a robust opt-out CCE 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

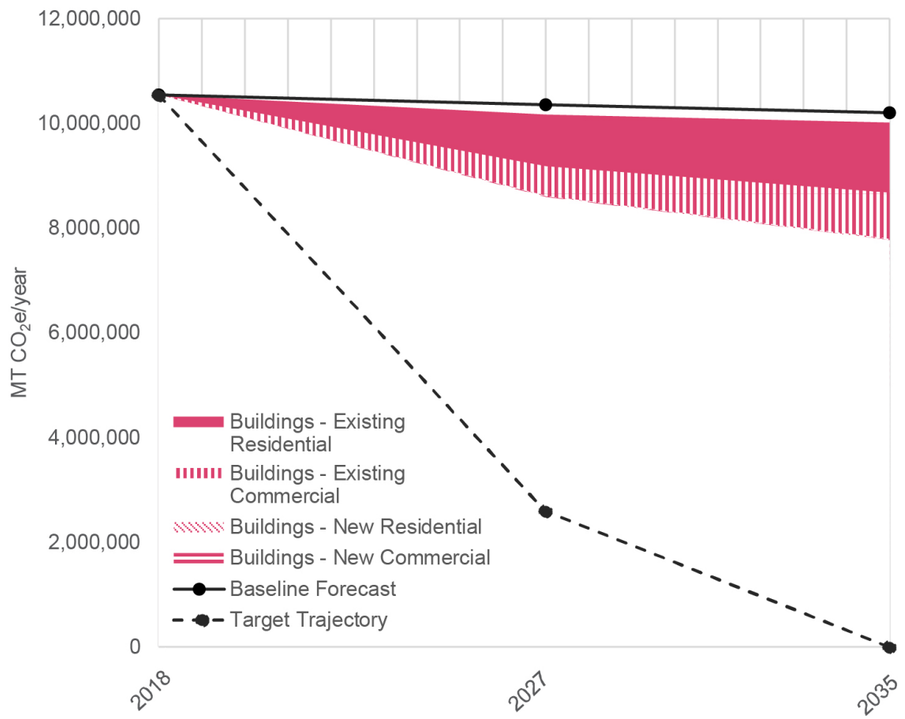
Montgomery County is home to resilient and efficient buildings.

- Increase energy efficiency in all buildings, with the County leading by example with its own building portfolio.
- Support sustainable, carbon neutral building design and improvements.
- Expand access to financing and programs to construct or upgrade resilient, efficient buildings.
- Create jobs and grow the workforce by transitioning to resource-efficient, low-carbon, resilient buildings.

Buildings

Target: All-electric new construction starting in 2022.
100% electrification of existing buildings by 2035.

Buildings Emissions Reduction Pathway



Buildings

50% of the County's GHG emissions in 2018 came 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 cooling, lighting, and appliances and by the use of natural gas for space heating, water heating, and cooking. To reach zero GHG emissions in buildings by 2035, all existing buildings will need to be electrified by 2035, and all new building construction must be 100% electric by 2022. Achieving the County's goal of supplying 100% renewable energy by 2030 is essential to ensure that building electricity does not create emissions. In addition, all existing buildings must have efficient insulation, windows, and water fixtures by 2035, and all new construction after 2022 must be designed with these measures. New jobs will be created, and job training will need to be provided to support the transition to resource-efficient, low-carbon, resilient buildings.

The County will need to establish and implement programs, policies, and building codes to successfully pursue its buildings target. Energy efficiency programs and initiatives, as well as passive building design features including building orientation, are key to reducing demand and increasing the feasibility of providing all electricity through renewable resources. The County will also need to help building owners overcome the financial barriers associated with retrofitting existing buildings for electrification efforts.

The building-related actions included in this plan are a mix of prescriptive requirements and performance standards. Requirements are needed because some activities—like 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 14**.

Buildings Emissions Reduction Pathway (Percent Reduction by Strategy)

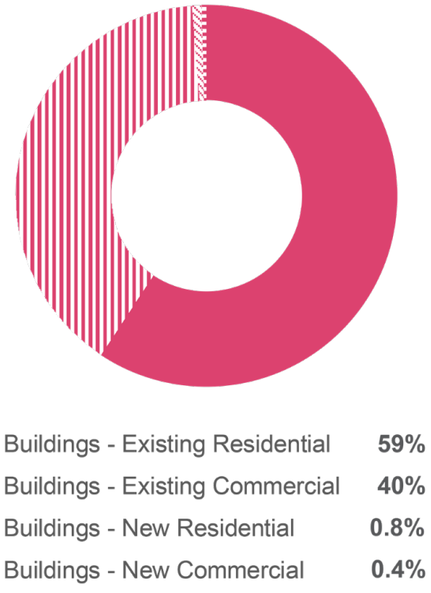


Table 14: CAP building actions

Action	GHG Reduction	Climate Risk Reduction	Racial Equity & Social Justice	Public Health	Environmental Stewardship	Economic Prosperity	Authority	County Investment	Private Investment	Lead	Contributor
B-1: Electrification Code Requirements for Existing Commercial and Public Buildings	High	N/A	- -	+	Neutral	+	Outside County	$$	$$$	DPS, DGS, DHCA, MCPS	DGS, DEP, DPS
B-2: Electrification Code Requirements for Existing Residential Buildings	High	N/A	- -	+	Neutral	+	Outside County	$$	$$$	DPS	DEP
B-3: Energy Performance Standard for Existing Commercial & Multifamily Buildings	High	Drought	-	+	Neutral	+	Outside County	$$$	$$$	DEP	DGS, DPS, DHCA, DOF, MCGB
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	DEP, DGS
B-6: Ban Natural Gas in New Construction	High	N/A	-	+	Neutral	Neutral	Outside County	$$	$$	DPS	DEP, DGS
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 Code 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:

DGS, DEP, DPS

Commercial buildings generate 26% of total County-wide GHG emissions, primarily from the use of electricity and natural gas. Although commercial emissions can be targeted through a building energy performance standard policy (see Action B-3), there are specific code mechanisms that can promote rapid electrification. 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 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 three mechanisms can be powerful tools in reducing commercial building emissions.

Even though County facilities generate only 1% of total community-wide emissions, it is crucial that the County lead by example on the path to zero GHG emissions. By electrifying all public buildings, the County can demonstrate the feasibility of and its commitment to a carbon-free future. Montgomery County has already established a continuous energy improvement program, participates in energy performance contracting, and has implemented green construction codes. These programs should be expanded to include widespread electrification targets.

Electrifying commercial and public buildings while using a 100% renewable grid would completely reduce emissions from these buildings. Electrification also reduces on-site fossil fuel combustion (from natural gas, propane, or oil), which decreases local pollution and improves public health. In addition, electrification codes will increase local jobs in the building, electrical, and mechanical sectors. However, these 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 the ordinance, 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 financial support (for example, partial or full subsidies) to small and minority-owned businesses to replace fossil fuel appliances with electric options.

B-2 Electrification Code 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 total County-wide 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. Though the County cannot require residents to immediately electrify their homes, there are specific building code mechanisms that can help residents transition to an all-electric future over time. The County needs to implement a point-of-sale or lease ordinance that would require building owners to replace fossil fuel 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. In addition, the County could stipulate that residents undertaking major renovations or 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 three mechanisms can be powerful tools in reducing residential emissions over time.

Electrification leads to reduced on-site fossil fuel combustion (from natural gas, propane, or oil), which in turn decreases local pollutants and improves public health. In addition, electrification codes will increase 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 County-wide rent control policy (although the City of Takoma Park does have rent control), electrification costs in rental units are likely to be passed on to renters.

EQUITY-ENHANCING MEASURES

- Provide financial support (such as partial or full subsidies) to low-income households to replace fossil fuel appliances and equipment with electric options.
- Develop an awareness campaign related to the ordinance, including what it means, how to access financial incentives (such as subsidies or affordable financing), and what the benefits are of transitioning to electric appliances and equipment. Ensure the awareness campaign is developed in multiple languages.

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:

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

Investment Level:

County: $$$

Private: $$$

Development Stage:

In Development

Lead:

DEP

Contributor:

DGS, DPS, DHCA, DOF, MCGB

Currently, Montgomery County's Building Energy Benchmarking Law requires owners of nonresidential buildings over 50,000 square feet to annually benchmark their building energy use and report it to the County for public disclosure. Benchmarked buildings in the County receive an energy reduction of 2% each year. However, relying on transparency requirements alone is not be enough to generate the drastic emissions reductions needed in the commercial sector.

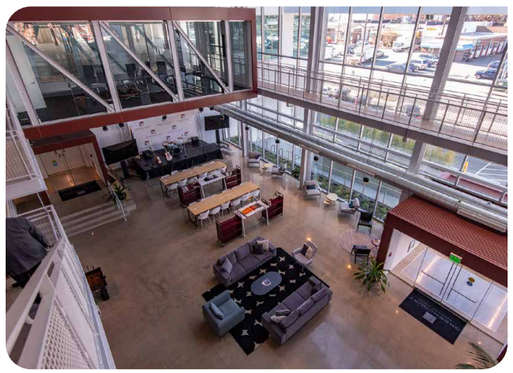
Montgomery County will need to expand upon its Building Energy Benchmarking Law to adopt a building energy and water performance standard that includes large multifamily buildings. A performance requirement would encourage building owners to make energy efficiency improvements while also giving them the flexibility to determine how to achieve these upgrades. Energy and water performance standard compliance could be measured in energy usage intensity (for example, change to British thermal units BTUs per square foot, kilowatt-hour kWh per square foot) or GHG reductions (MT CO_2e). These standards should continually increase in stringency to ensure that existing buildings are set on a path toward decarbonization. In addition, the Benchmarking Law's 50,000-square-foot minimum requirement will need to be gradually reduced to cover more commercial and multifamily buildings in the future. As multifamily buildings contain approximately 30% of Montgomery County's total housing units, requiring an energy performance standard for these buildings would not only reduce emissions, but improve quality of life for thousands of residents.

The Building Energy Benchmarking Law could also be amended to require energy and water performance ratings to be displayed on buildings or in real estate databases, much like restaurant 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.

To meet these increasing energy and water requirements, many existing buildings will need to undertake deep energy retrofits. The County will need to promote existing state or utility retrofit incentives while providing its own options (for example, grants, tax rebates, fee reductions). The Montgomery County Green Bank provides several options for commercial property owners seeking affordable options for financing energy improvements necessary to meet a performance standard. The Green Bank recently completed pilot programs providing technical assistance to multifamily rental properties and common

ownership properties to help them identify energy efficiency opportunities, as well as options for implementing the identified improvements. Additionally, the Commercial Loan for Energy Efficiency and Renewables and Commercial Property Assessed Clean Energy programs can be used to finance a wide variety of energy efficiency measure on 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, especially beneficial for small and minority-owned businesses in the County.

Energy performance requirements can lead to reduced on-site fossil fuel combustion (for example, natural gas, propane, or oil), which in turn decreases local pollutants and improves public health. However, because there is no County-wide rent control, electrification costs are likely to be passed on to residential or commercial renters. In addition, even if the County provides incentives such as grants or tax rebates to low-income homeowners, the capacity and ability to access these financial incentives will vary.



LEED Gold certified Greencourt Innovation Center, which includes energy efficiency measures such as LED light fixtures, high efficiency mechanical systems, and a vegetative roof

EQUITY-ENHANCING MEASURES

- Ensure that the costs of implementing building energy and water performance standards are not passed onto vulnerable groups, such as small and minority-owned business tenants. For small and minority-owned businesses that own commercial buildings, the County can help provide more flexible 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 the 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 energy audits and retrofits in buildings of organizations that need financial assistance to meet the standards.

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

Contributor:

MCGB, DOF

The upfront costs for existing building electrification can be daunting, and the County's goal of electrifying all existing buildings cannot be accomplished without financial incentives and assistance programs. The County should offer a suite of technical assistance and incentives, such as grants, tax rebates, or fee reductions, to help pay for upfront costs and defray the marginal costs associated with fossil fuel equipment replacement. 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 retrofit accelerator program could provide individual guidance to facilitate electrification retrofits for existing buildings and provide design assistance for any major renovations. Electrification incentive programs typically see great success when supported by ordinances 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 efficiency programs sponsored and incentivized by the federal, state, and County Government; utilities; non-profit organizations; and others have been in effect for years. However, these programs have not penetrated all building sectors, and opportunities for significant improvements in building energy efficiency still exist, particularly in medium to small businesses, multifamily properties, and the residential sector. The most direct efficiency improvements include improvements to a building's envelope, increased insulation, and more efficient HVAC systems, lighting, and appliances. 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.

Electrification leads to reduced on-site fossil fuel combustion (from natural gas, propane, or oil), which in turn decreases local pollutants and improves public health. In addition, building energy efficiency and electrification will increase local jobs in the building, electrical, and mechanical sectors.

Montgomery County Energy Summit participant learning about energy-saving upgrade planning

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

Contributor:

DEP, DGS

Allowing new buildings to utilize fossil fuel-based systems (such as natural gas) 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 the County is to meet its emissions reduction targets. This would be extremely costly to building owners, as they would be replacing systems well before their end of life and may need to integrate large structural and mechanical modifications for electric HVAC systems.

To avoid emissions lock-in and reduce the need for future retrofits, the County needs to update its building code to require all-electric new construction by 2022. 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. Electrification would also lead to reduced on-site fossil fuel combustion (for example, natural gas, propane, or oil), which in turn would decrease local pollutants and improve public health. If grid electricity is generated by 100% renewable 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 increased initial costs associated with building under an all-electric code when applied to certain building types.

B-6 Ban 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

Contributor:

DEP, DGS

Natural gas consumption produces 19% of County-wide GHG emissions. These emissions will increase if the County continues to allow new developments to be built with natural gas infrastructure. Other jurisdictions have recently undertaken a new approach to reduce natural gas use and promote electrification: banning natural gas in new developments. By banning natural gas in new construction projects, jurisdictions can help avoid future emissions lock-in (in other words, being locked into continued emissions from a fossil fuel-based technology with a long useful life) as well as costs for new natural gas infrastructure.

The County could consider banning natural gas in new buildings starting in 2022, with exemptions for specific types of commercial buildings that could phase out over time as new technologies emerge. Banning natural gas would reduce on-site gas combustion, which would in turn decrease local pollution and improve indoor environmental quality and thus public health. A natural gas ban can replace or complement an all-electric building code because both the ban and the code promote the complete electrification of new developments. However, a natural gas ban does not ensure new buildings will not install oil or propane gas heating systems, and electric heating may be more expensive than natural gas heating, which could disproportionately impact low-income communities.

EQUITY-ENHANCING MEASURES

Provide financial support to help pay for the cost differential between natural gas heating and electric heating (for example, a tax credit or other financial subsidy) for low-income households that may experience high energy burdens and energy poverty as a result of switching to electric heating and other electric equipment.

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

Contributor:

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. 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 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. Net zero energy buildings are gaining momentum across the U.S., and some jurisdictions have begun to incorporate net zero ready, zero energy, and zero carbon goals in their new construction codes.

Montgomery County will need to amend the building code to require all newly constructed buildings in the County to be net zero energy, starting in 2030. As the industry evolves to meet electric building needs, a net zero building code can replace the County's all-electric building 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.

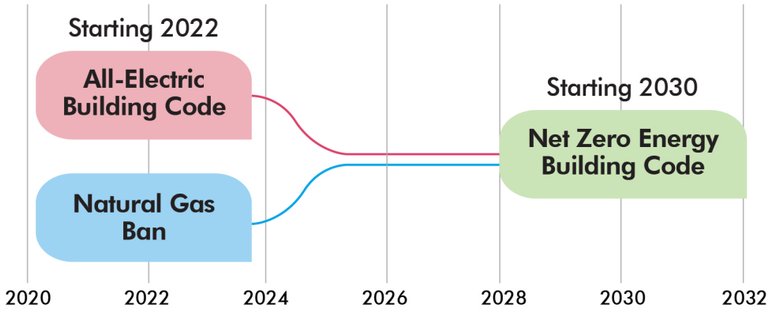
In order to lead by example and to provide case studies for different building types, the County could require that all new public buildings be designed to net zero standards starting prior to 2030. In addition to changing the County's current design practices, this may require the County to revise its 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 beginning in 2022 would demonstrate the feasibility of local net zero construction and promote the immediate development of renewable resources.

EQUITY-ENHANCING MEASURES

Evaluate the need for financial incentives or financing to help overcome increased initial costs associated with building under a net zero code when applied to certain building types.

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. 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. However, a net zero code could increase the initial cost of construction for some building types given the current state of building practices. These costs may be a burden to small business owners who rent properties or buyers with limited incomes.

Net zero building codes encourage solar installation and job creation



Potential timeline for new construction actions

Wheaton revitalization project will achieve LEED platinum certification and include an efficient mechanical system, solar panels, EV charging station sites, and more

Transportation Actions

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

- Introduce new technologies and approaches to greening the transportation system.
- Electrify vehicles and expand supporting infrastructure.
- Provide clean, efficient, frequent and reliable public transit.
- Increase active transportation options like biking, walking, and micromobility services with safe, supportive infrastructure.

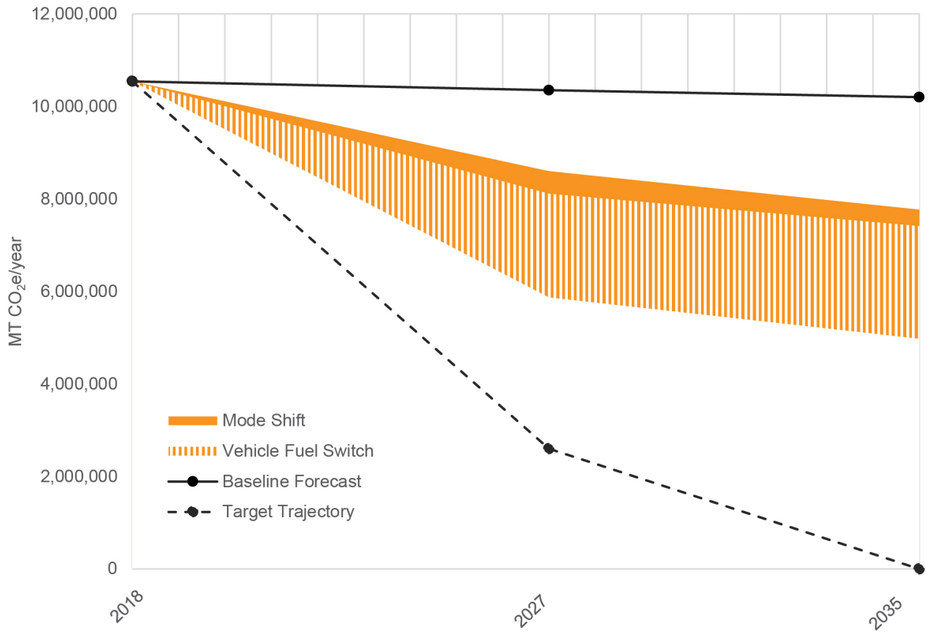
Transportation

Target: 100% electrification of 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 over the 2018 base levels of total trips by 2035.

Transportation Emissions Reduction Pathway

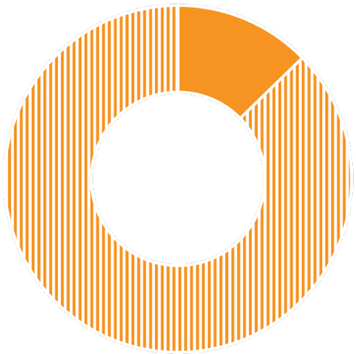


Transportation

In 2018, 42% of the County's GHG emissions came from the transportation sector, which includes on-road transportation, aviation, rail, and off-road vehicles. On-road transportation, such as from cars and buses, accounted for 36% of 2018 emissions and offers the greatest opportunity for emissions reduction through electrification. Of the total trips taken in the County, private cars accounted for approximately 75%, buses 10%, rail 5%, walking 2%, taxis/rideshares 1%, and biking less than 1%.[69] 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 electrified or use other zero emissions technologies by 2035. The County's electric supply must be 100% renewable by 2030 to ensure that transportation options powered by electricity produce zero emissions. 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.[70] The proportion of bus, rail, and bicycle trips taken will need to double to fill the transportation needs created by the reduction in private vehicle ridership. Mode shifting is also necessary, as it will reduce the number of private vehicles that will need to be electrified to meet the GHG reduction targets.

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 transportation electrification efforts. The County

Transportation Emissions Reduction Pathway (Percent Reduction by Strategy)



will need to support programs and resources, such as educational campaigns and financing tools, to support EV adoption. An expansive, accessible public EV charging infrastructure network will be needed to support widespread EV adoption. The implications for electricity 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 target. Transportation actions are outlined in **Table 15**.

Table 15: CAP transportation actions

Action	GHG Reduction	Racial Equity & Social Justice	Public Health	Environmental Stewardship	Economic Prosperity	Authority	County Investment	Private Investment	Lead	Contributor
T-1: Expand Public Transit	Medium	++	++	Neutral	++	Outside County	$$$	$	MCDOT, WMATA, MDOT	MTA, M-NCPPC
T-2: Expand Active Transportation and Shared Micromobility Network	Medium	++	++	Neutral	++	County	$$$	$	MCDOT	MDOT, M-NCPPC
T-3: Private Vehicle Electrification Incentives and Disincentives	Medium	-	++	Neutral	++	Outside County	$$$	$$$	DOT, MCDOT, DEP	MCGB, DOF
T-4: Congestion Pricing and Limiting Cars in Urban Areas	Medium	-	++	Neutral	Neutral	Outside County	$$$	$	MCDOT, MDOT	Regional service centers, M-NCPPC
T-5: Electrify Public Buses and School Buses	Medium	++	+	Neutral	+	County	$$$	$	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
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	$$$	$	MCDOT	DEP; car share companies
T-11: Off-Road Vehicle Electrification	Low	-	+	Neutral	Neutral	County with Change	$$$	$$$	DEP	DOT, construction industry, MVA
T-12: Advocate for a Vehicle Carbon Gas Tax	N/A	Neutral	Neutral	Neutral	Neutral	Outside County	$	$	MCDOT	OIR, DEP
T-13: Advocate for Rail Alternative Fuels	N/A	Neutral	Neutral	Neutral	Neutral	County	$	$	MCDOT, MDOT/ MDTA	OIR

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

Contributor:

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.[71] 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.[72] 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, 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 for the County. When combined with 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 by expanding network service so that nearly 100% of residents are within a half mile of a high-frequency transit stop. To accomplish this, several actions will need to be taken, including the following:

- Implement all components of the Bus Rapid Transit (BRT) program to include MD 355, Veirs Mill Road, and the Great Seneca Science Corridor Cities Transitway, which will require up to 100 buses for the BRT system.
- Restructure the local route network to support the BRT corridors, which will require an additional 50 local Ride On buses.
- 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.

Adding BRT stops and connecting them to pedestrian and bicycle networks throughout the County could help greatly increase transit access. However, ridership may not increase if service is slow or unreliable. Two important factors in increasing ridership include travel time and frequency. Total travel time can be reduced by creating dedicated high-occupancy vehicle (HOV) or high-occupancy toll (HOT) lanes for bus use on County roads, including those within the state road system. High-frequency service, typically defined as service every 15 minutes or less during peak periods throughout the week, can be achieved by adding more peak-hour buses.

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 ridership, the County will need to provide free Ride On and Metrobus fare programs for these groups to use every day of the week.

Rail and other transit incentive programs are underutilized, and the County could increase both their value and their promotion. 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.

ADDITIONAL 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 the County so that more mixed-used housing and commercial projects have convenient access to nearby bus routes and transit stations.
- Create dedicated bus lanes on major roads to support other transit modes and a future 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.

The 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 improve its function as a regional rail system. Providing more reliable, off-peak, and reverse services will enable the Commuter Rail to attract more trips. The federal government would need to be involved in the process of expanding MARC service, as the tracks are CSX-owned.

Improving the public transit system can also increase access to jobs for all residents but especially benefits low-income communities, which rely more heavily on transit services. However, improved access to jobs requires much more than solely increasing frequency. Service coverage at both ends of the trip, travel reliability, on-time performance, and service spanning throughout the day and evening are also key factors that must be addressed if ridership is to be increased to levels required to achieve the goals.

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 expanding public transit. This action also relates strongly to land use policy in the County and will require coordination with the newly adopted County Growth Policy/Subdivision Staging Plan as well as the Thrive Montgomery 2050 General Plan that is currently in development.

> *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.*
>
> *Better, more direct access to public transit, such as connections from bus stops to Metro would reduce my need to commute.*
>
> *~ Resilience Ambassador Survey*

T-2 Expand Active Transportation and Shared 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:

Can Be Implemented Under Existing Policy

Investment Level:

County: $$$
Private: $

Development Stage:

In Progress

Lead:

MCDOT

Contributor:

MDOT, M-NCPPC

Active transportation, such as walking or biking, is a zero-emissions method of transport that produces large public health benefits. It is also a less expensive transit mode that many low-income households prefer and/or depend on. Further, trail-oriented development provides economic benefits as well, better connecting residents 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 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 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.[73] This would incorporate all forms of bike facilities, including on-street and separated bike lanes, side paths, trails, and neighborhood greenways. Assuming that adding bike lanes results in a proportional increase in ridership, the bicycle mode share could increase to 6% of total trips.[74] Increasing 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, including implementation of the Pedestrian Master Plan that is currently in development, and ensuring 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 5½ miles) of additional sidewalks per year. This rate of construction has sometimes been as high as 40,000 linear feet (7½ miles) per year. However, the effort has now reached a point where many of the remaining projects are more complex and difficult to complete, requiring detailed engineering studies and other more costly components. 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.

ADDITIONAL EQUITY-ENHANCING MEASURES

- There are currently 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. These programs should be enhanced and widely promoted to ensure eligible users are aware of them and understand how they can be used.
- Provide more targeted education on the County bike and trail systems and how they connect to other modes of transportation.
- Inspect existing bike and pedestrian lanes across the County; restore damaged lanes and construct new lanes to safely connect more areas of the County.

Capital Bikeshare provides active transit options throughout Montgomery County

Improving and integrating micromobility services and infrastructure, such as for shared and/or electric bikes and scooters, can increase the safety and accessibility of 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. 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 to enable creative approaches to fund the Capital Bikeshare system, such as through sponsorships.

To achieve its goals, the County would need to rapidly implement its Bicycle and Pedestrian Master Plans as well as Vision Zero transportation safety initiatives. 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. In other portions of the CIP, the County could prioritize bicycle infrastructure and trail projects to complete gaps and connect existing networks. The active transportation network can also be improved through expansion of the existing program for "road diets," which include the removal and repurposing of road lanes for other modes of transportation.

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. Care must be exercised to accommodate the disability community in planning, design, and operations of these bicycle/pedestrian and micromobility projects.

> *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*

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:

DOT, MCDOT, DEP

Contributor:

MCGB, DOF

Electrifying private vehicles in Montgomery County is a crucial step in reaching the zero GHG emissions goal. 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. As vehicle choice is personal and cannot be regulated by the County, electrification will be difficult unless its promotion is coupled with both large incentives and disincentives. Providing a variety of incentives, such as grants, tax credits, priority or free parking, or HOV and BRT lane access, is critical to increasing the appeal of EVs. 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 "Cash for Clunkers" program would allow residents to trade in older gas vehicles for zero emissions vehicles or transit and car/bike sharing vouchers.

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 (MCDOT) 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 a certain percentage of drivers use EVs or pay a penalty. This percent 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.

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 percent of EVs in their fleet, their property taxes would be decreased. If they do not, their taxes would be increased.

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.
- Incentives should be progressive (in other words, the incentive should be greater for those with lower levels of income).
- Consider subsidies for households whose income depends on driving, such as taxi drivers.
- 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, higher-emissions vehicles.

Private electric vehicle being charged at a County parking garage

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.

T-4 Congestion Pricing and Limiting Cars in Urban Areas

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

Contributor:

Regional Service Centers, M-NCPPC

While the average American commuter wastes 54 extra hours a year in traffic jams, the average Washington, DC, metropolitan area commuter wastes nearly double that at 102 hours.[75] 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 have ruled 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 limit 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; on-street walking and biking on nearly 6.5 miles of temporary neighborhood greenways; and 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 re-purposed street areas can be used for outdoor activities, safe dining, and shopping options. 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. Such an action also aligns 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, though, 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%.[76]

EQUITY-ENHANCING MEASURES

- Implement the pricing incrementally.
- Ensure alternative travel modes can provide 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.
- Explore ways to reduce the economic impact on low-income drivers.

Maintenance of deliveries of goods and services would need to be addressed, as well as other economic and social impacts. 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 TNCs, and ADA-related vehicles, and perhaps commercial vehicles essential for maintaining commerce—while restricting or charging fees to most private autos, could help transition those areas to less congestion and reduced emissions. 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 may be an additional tool that could be used to achieve similar objectives.

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 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). 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.

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

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.

> *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*

T-5 Electrify 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:

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 the 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. Alternative technologies such as fuel cells may also become available to similarly reduce vehicle emissions.

Currently, MCDOT serves 26 million passengers a year with a fleet of approximately 370 buses, 100% of which are electric or hybrid electric, compressed natural gas, or clean diesel. 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. Additionally, as the County increases transit routes and frequency, prioritizing the use of electric buses will ensure bus emissions do not increase proportionately.

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 with the assistance of a consultant in order to achieve the County's 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 also being explored and may offer a path to more expedited electrification. The County is also exploring a variety of zero emission vehicle technologies. For example, fuel cell vehicles may be a viable option as that technology matures and may enable the County to achieve the same climate objectives.

As pollution from school buses primarily affects children, electrifying school buses is crucial to protecting the County's youth. A school bus fleet transition plan is being developed by MCPS. A turn-key, budget-neutral electrification program is being sought. If budget neutrality is possible, electrification will take place rapidly over the next full school bus replacement cycle. 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. Electrifying public buses would increase local jobs in EV infrastructure integration while improving public health through reduced bus pollution.

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

> *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*

T-6 Electrify County and Public Agencies Fleet

Primary Benefit:

GHG Mitigation – Medium

Co-Benefits:

Public Health – Somewhat Positive

Economic Prosperity – Somewhat Positive

Authority:

Can Be Implemented Under Existing Policy

Investment Level:

County: $$$

Private: $

Development Stage:

In Progress + Plan Being Developed

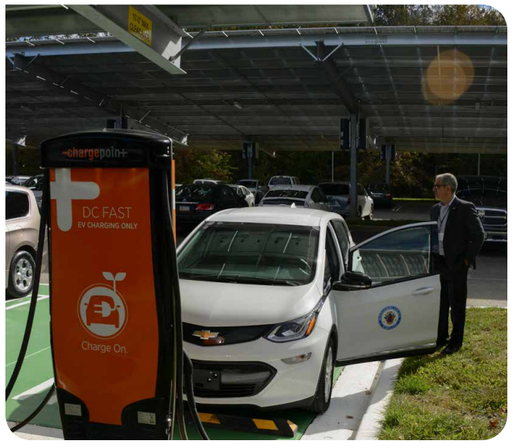
Lead:

DGS, M-NCPPC, MCPS

Contributor:

FRS, POL, OMB, MCDOT, OP, DEP

Montgomery County currently has 39 electric vehicles (EVs) and 224 hybrid vehicles in its 2,437-vehicle fleet, or roughly 1% and 9% of the total fleet, respectively. The County will need to reach 100% fleet electrification by 2027 in order to meet its zero GHG emissions target. The County is currently in the process of developing a fleet transition plan with the assistance of a consultant, 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. Additionally, 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. 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. Electrifying the County fleet 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

Contributor:

DEP, WMATA, Utilities

Drastically increasing electric vehicle (EV) use in the 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 for incoming trips. County facilities currently house 36 EV charging stations for fleet use and 13 stations for public use. Including the County charging stations, there are approximately 153 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.[77] 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.

Meeting this goal would require developing 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.

The County is currently coordinating with Pepco to expand EV charging infrastructure. Building on existing electrical infrastructure, such as by converting streetlights into chargers, is a cost-effective method to expand the network. There may be an opportunity to implement this in 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 collaborate with the Washington Metropolitan Area Transit Authority (WMATA) to encourage travel and transit by EV by installing banks of outlets and chargers 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.

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

EQUITY-ENHANCING MEASURES

- Ensure EV charging is distributed throughout the County in an equitable manner.
- Incentives should be progressive (in other words, there should be a greater incentive for those with lower levels of income).
- Focus on vulnerable groups that may need full or partial subsidies, especially households whose income depends on driving (for example, taxi drivers).
- Low-income families that buy EVs could receive a reduced or eliminated County energy tax on the electricity used for 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.

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 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 currently 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.

> *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

Contributor:
Businesses with 25 or more employees, Developers of projects in TMDs, DPS

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

The County has created Transportation Management Districts (TMDs) and adopted Code revisions that require businesses of 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 or utilizing shared and priced parking. These strategies help to reduce local vehicle pollution, expand access to jobs, enhance employers' recruiting efforts, and reduce costs for many households.

However, TMD fees only apply to commercial developments and do not require multi-unit housing developments to contribute support for these programs. Additionally, 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.

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

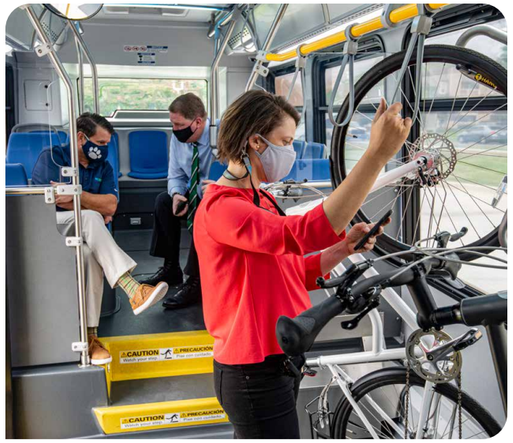
EQUITY-ENHANCING MEASURES

- Provide more active transportation amenities (bicycle storage, showers, connectivity).
- Prioritize communities where multimodal connectivity 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 lower-income residents/ households and areas of the County where broadband internet is not easily accessible.

needs to 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/car conflicts and thus support the County's Vision Zero goal to eliminate serious injuries and fatalities on the County's roads by 2030.

Telework 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 telework for many years, both independently and in conjunction with programs through Metropolitan Washington Council of Governments (MWCOG). MCDOT has conducted many training sessions and webinars on a regular basis to inform employers and employees about the benefits of telework and to help them establish effective telework policies and programs. Adoption of telework has increased exponentially during the COVID-19 pandemic. Both employers and employees found that telework can work 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 telework programs on a permanent basis.

As 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).



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

> *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 the flexibility and work/life balance.*
>
> *~ Resilience Ambassador Survey*

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

Contributor:

SHA, Municipalities

Adaptive traffic control systems are traffic management strategies in which traffic signal timing changes or adapts based on actual traffic demand rather than adherence to a fixed cycle. This is accomplished through hardware, such as vehicle loops and cameras, that recognizes traffic demand as well as software that analyzes the data and intelligently manages traffic. These systems can reduce idling, travel time, and emissions while increasing travel reliability and safety. The County could install fully adaptive traffic management systems on County roads and partner with the Maryland Department of Transportation (MDOT) to install management systems on state roads.

Adding detection equipment and systems that prioritize safety as well as throughput would increase intersection safety. Equipping all intersections with passive bike and pedestrian detection so there is no need to press buttons would facilitate walking and biking and make them more viable modes of travel over time. These various traffic management systems would reduce local vehicle pollution and benefit public health.

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

EQUITY-ENHANCING MEASURES

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

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:

MCDOT

Contributor:

DEP; 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.

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 that have limited parking and that would have to be addressed to accommodate an EV car share program. To address concerns of communicable diseases in shared vehicles, heightened sanitization procedures would need to be implemented.

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

ADDITIONAL EQUITY-ENHANCING MEASURES

Develop a campaign to raise awareness related to 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.

> *I think electric vehicles should be affordable to low-income residents in order to decrease pollution in the County.*
>
> *~ Resilience Ambassador Survey*

T-11 Off-Road Vehicle 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

Contributor:

DOT, Construction Industry, MVA

Off-road vehicles, such as construction and landscaping equipment, generate 3% of the total transportation emissions in Montgomery County. These 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 the electrification of these vehicles by 2035. To achieve this, 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.

Though using cleaner off-road vehicles would reduce local air pollution and improve public health, it could also increase operating costs, which would be particularly burdensome for small businesses.

EQUITY-ENHANCING MEASURES

- Provide subsidies for small to medium businesses that fall under specific revenue thresholds to phase in these vehicles over time.
- Incentives should be progressive (in other words, there should be a greater incentive for those with lower levels of income).

T-12 Advocate for a Vehicle Carbon Gas Tax

Primary Benefit:
Enabling Action

Co-Benefits:
N/A – Enabling Action

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

Contributor:
OIR, DEP

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, and other transportation programs. By using enabling state legislation, some U.S. cities have looked to 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. Currently, state law prohibits Montgomery County from imposing its own gas tax. Therefore, lobbying at the state level is needed to create enabling legislation for a local tax. The tax would be used to disincentive inefficient gas- and diesel-powered vehicles while providing funds for transit and electrification projects.

A local vehicle 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 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. 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 to implement the Transportation and Climate Initiative cap-and-trade efforts. The initiative calls for vehicle fuel wholesalers to pay the state for emissions allowances. The states would then direct the revenues to mass transit and electrification projects. However, a local carbon tax would give the County more authority to use the revenue generated to implement targeted transport electrification actions.

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.

T-13 Advocate for Rail Alternative Fuels

Primary Benefit:
Enabling Action

Co-Benefits:
N/A – Advocacy

Authority:
County – Can Be Implemented Under Existing Policy

Investment Level:
County: $
Private: $

Development Stage:
Proposed

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, the 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, the frequency, fuel consumption, and emissions of commuter rail travel will increase over time.

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. This would not only decrease rail GHG emissions but also produce regional benefits by improving air quality across communities served by rail.

County residents ride the electric-powered Metro

EQUITY-ENHANCING MEASURES

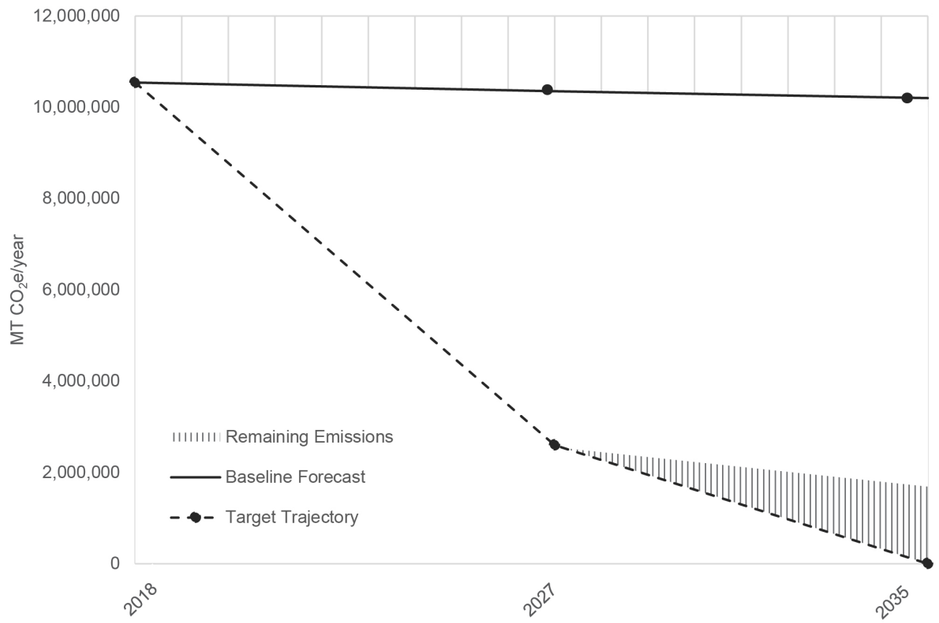
Make rail electrification a requirement to provide definite benefits to vulnerable communities living near rail.

Carbon Sequestration Actions

Montgomery County has preserved and enhanced its nature-based solutions, including forest and wetland ecosystems, greenspaces, and trees while reversing carbon dioxide emissions.

- 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, wetlands, green spaces, and urban trees.

Remaining Emissions Reduction Pathway



Carbon Sequestration

Achieving the County's climate change goals cannot be accomplished through GHG emissions reduction alone. In addition to reducing emissions, carbon sequestration can offset emissions by capturing and storing 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 grasslands, as well as individual trees and small groups of trees that comprise the urban forest. Carbon sequestration can be further enhanced by increasing carbon in soils and improving agricultural practices. These efforts to increase carbon sequestration and storage are collectively known as nature-based solutions.

In addition to sequestering and storing carbon, increases in forests and trees improve a community's climate resilience in many ways. For example, well-distributed tree canopy in urban areas reduces summertime temperatures and provides winter windbreaks, thereby reducing energy consumption. Conserving ecosystems also benefits air and water quality, increases biodiversity of flora and fauna, improves stormwater management, and supports flood hazard management. Additionally, nature-based solutions can improve human health by reducing air pollution, filtering out particulate matter, encouraging active lifestyles, lowering the urban heat-island effect, reducing crime, and enhancing moods and emotional health. Carbon sequestration actions are outlined in **Table 16**.

Table 16: 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	Contributor
S-1: Retain Forests	Level TBD	Extreme Precipitation	+	++	++	+	County with Change	$$$	$	M-NCPPC	DEP, DPS
S-2: Increase Tree Canopy	Level TBD	Extreme Heat	+	++	++	+	County with Change	$$$	$	DEP, M-NCPPC	MCDOT
S-3: Restore Forests, Meadows, and Wetlands	Level TBD	Extreme Precipitation	+	++	++	++	County with Change	$$$	$	M-NCPPC	DEP
S-4: Regenerative Agriculture	Level TBD	High Winds	Neutral	+	+	Neutral	County with Change	$$$	$	Office of Agriculture, 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
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 GHG emissions, the level of emissions reduction is to be determined (TBD) and cannot be estimated without further study.

S-1 Retain 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

Contributor:

DEP, DPS

As forests act as sinks for carbon dioxide emissions, the County should further prioritize the protection of existing forests to retain the amount of carbon currently being sequestered annually and prevent the loss of captured carbon. The County must protect existing forests to ensure that they are not 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. Increasing tree canopy cover in concentrated areas may require 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 on developed areas. Forests also need to be sustainably managed to ensure their long-term viability and increase their resiliency to non-infrastructure 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 they impact both forests and the urban canopy. Supplemental plantings, including maintenance to establish the new plantings, may be needed to maintain sufficient densities of trees within forests following disturbance by pests. For example, the over-abundance of deer and invasive species, combined with 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 trees. Therefore, management including supplemental plantings is necessary to ensure the land remains as forest.

EQUITY-ENHANCING MEASURES

- Prioritize the retention of forests in urban areas where there is typically less access to green space and a higher concentration of vulnerable communities.
- Provide resources to maintain forest lands, including resources for sustainable management, invasive species management, and supplemental planting and establishment.
- Provide resources for safety measures and infrastructure, such as lights, in green spaces.
- Enhance the wood products industry in the County to increase opportunities to retain and manage forests.

These actions promote environmental stewardship and maintain, or even increase, carbon sequestration, and should be applied to forests on County-owned properties, in parks, and on privately owned land. Outreach and education programs to raise awareness of the importance of forests, as well as stewardship, should be developed. The County will likely need to amend its land use laws and policies to implement this action.

Retaining well-managed forests has multiple co-benefits beyond carbon sequestration including improved air and water quality, increased 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 management including invasive species, 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 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

The County must retain and increase tree canopy and trees outside of forests (see **Figure 98** for the County's existing tree coverage). This action will involve efforts to plant trees on residential, commercial, and public properties. Tree canopy cover is the area of land covered by the branches, twigs, and leaves of trees. Generally, tree canopy refers to trees outside of forests. The collection of trees outside of forests, small groups of trees, and small remnant patches of forests in developed communities comprises the urban forest.

The benefits of trees outside of forests, particularly those covering built surfaces, are as broad and important as the co-benefits of forests. Large shade trees provide exponentially more co-benefits than smaller ornamental trees, including carbon sequestration. Like retaining forests, retaining tree canopy allows for continued sequestration of carbon by trees and reduces emissions of carbon associated with the removal of trees. Greenspaces and local parks should be planted to the extent possible and also be maximized in master plans. Similarly, County-owned properties and public rights-of-way should be used to expand 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 (the conversion of land use), redevelopment (often referred to as tear-down

EQUITY-ENHANCING MEASURES

- Develop and implement an awareness campaign on the County's various tree programs, including how to access it and what the associated benefits are.
- Develop educational materials in multiple languages.
- Prioritize green corridors in more urban areas, where there is typically less tree cover and a higher concentration of vulnerable communities which are more susceptible to the effects of urban heat island.
- Engage with residents of Montgomery County to understand different cultural practices for native pollinator-friendly practices and ways in which they could be used within the County.

and rebuild), or more natural causes like storms, drought, or urban pollution.

Similar to retaining forests, retaining trees and canopy goes beyond limiting the loss of stems. To increase the resiliency of individual trees, long-term care is needed for routine maintenance, integrated pest management, watering during establishment and droughts, prevention and repair of storm damage, and replacement of trees removed. Additionally, assistance with removal of trees when they become hazardous could encourage retention of trees. Traffic safety issues such as sharp curves and significant sightline issues should be considered, as they may limit efforts in certain areas.

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, and higher property values. This action promotes economic prosperity by creating job opportunities through development planning and review activities, landscape 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 Forests, 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

To increase the amount of carbon sequestered, the County should establish a long-term plan to restore forests, wetlands, and meadows by 2035 in all County parks and lands not required for other uses (for example, sports fields and visitor centers). To increase the amount of carbon sequestered by forests and trees, the existing programs to reforest and plant individual trees should be expanded, and additional programs are needed.

Forested riparian and stream buffers should be established where needed and enlarged where insufficient. Supplemental planting to increase density in forests impacted by storms, disease, pests, and invasive species are also needed. Enhancing and creating forested wetlands should be included in this action. Long-term maintenance is needed for reforestation projects to help ensure that newly planted forests become established in the face of the over-abundance of deer and invasive species.

Meadow restoration is essential and a natural carbon sink. Not only do meadows sequester carbon, but they 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.

Increasing tree canopy by planting trees, particularly large shade trees, should focus on areas where canopy cover is lacking, the amount of impervious surface is high, stream quality is poor, trees are being lost to development activity, and stormwater management is insufficient. Additionally, greenspaces, developed areas of parks, and green infrastructure corridors should be planted to the extent possible. Programs for long-term maintenance should also be developed.

EQUITY-ENHANCING MEASURES

- Prioritize urban areas that have more impervious surfaces and are more prone to flooding.
- Prioritize individual shade tree planting in areas lacking canopy cover, particularly in low-income, underserved communities.
- Provide resources and training for urban forestry jobs such as foresters, arborists, pruners, and wood waste recovery and product development.

Balla Machree crop field with no-till wheat planted as a crop cover, a regenerative agriculture strategy

All planting projects should rely heavily on native tree species that will likely be able to adapt to the County's changing climate. All reforestation programs should implement planting plans with high numbers of stems per acre to increase likelihood of producing durable wood products that will store carbon into the future. Allowable plant management strategies across various habitat types and legislation around pesticides and other strategies will need to be reviewed as part of this action.

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.

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:

Office of Agriculture, M-NCPPC

Contributor:

DEP, MCGB

The County should work with local farmers to increase regenerative agriculture practices in the County. Regenerative agriculture practices such as herbaceous field borders, reforestation, healthy soil practices (including use of compost on degraded soils), succession planting, or silvopasture systems (farms with trees that allow domesticated animals to graze and forage among them) increase carbon sequestration on farmland while improving biodiversity, the water cycle, and natural ecosystems. To support this action, the County should work with the Montgomery County Green Bank to develop incentive financing and revolving loan funds.

Developing a farmer-to-farmer information sharing community, as well as investing in an equipment sharing program and other programs to help farmers access resources will improve farming practices and reduce dependency on chemicals. Existing programs, such as the Re-Leaf the Reserve Program, should be expanded, and work with existing organizations such as the Good Food Purchasing Campaign should be increased to augment regenerative agriculture. The County should help create opportunities for farmers to sustainably harvest and sell products within the regional community and/or to create teaching farm days. The County will particularly need to incentivize the rebuilding of healthy soils in the County's Agricultural Reserve, using transferable development rights, and in the Conservation and Stream Valley Parks.

The well-established farm community in the County is currently tracking regenerative practices already in place that sequester carbon, most notably through herbaceous field borders. For this action to be successful in sequestering carbon as well as in 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, create habitat for deer, and require regular maintenance. Likewise, livestock can damage trees and growing conditions in forests.

EQUITY-ENHANCING MEASURES

- Launch this action through a pilot project partnership with local farmers to facilitate the shift from traditional agriculture practices that farmers rely on for their livelihoods.
- Incentives should be prioritized for lower-income farmers (for example, through progressive incentives).

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

Contributor:

M-NCPPC

The County should boost soil fertility, microbial activity, and moisture-holding capacity on all properties throughout the County in order to restore the earth's carbon, water, and energy cycles. By doing so, the County will maximize carbon sequestration of its soils. The County should consider implementing programs, policies, incentives, and investment of resources to support efforts to improve 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. The County will also need to establish legislation in support of a County-wide healthy soils program and review the Maryland Fertilizer 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. The County should start an additional campaign to convert existing lawns into landscapes that better sequester carbon (through biodiversity, composting, etc.) and that provide added co-benefits to the community and the environment. 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.

Improving soil health boosts carbon sequestration

EQUITY-ENHANCING MEASURES

- Prioritize land that could be converted to community gardens, particularly in low-income and underserved communities.
- 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 understand the benefits of healthy soils and ensure engagement efforts are undertaken in multiple languages.
- Develop educational material for farmers on using winter cover crops, no-till practices, and reduced or no chemical use to support and build healthy living soils that sequester more carbon than plowed and tilled soil.

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

Contributor:

OMB (CountyStat), DOF, WorkSource Montgomery

The County should identify or develop a management and planning tool to strategically pursue whole-system, nature-based solutions that comprehensively measures societal and economic benefits along with carbon sequestration and biodiversity benefits. Through this tool, 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, the tool 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 creation of this 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. In addition, the 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.

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.

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.

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 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 CAP is an integrated plan designed to reduce 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 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 17**.

Table 17: CAP climate adaptation actions

Action	Climate Risk Reduction	Racial Equity & Social Justice	Public Health	Environmental Stewardship	Economic Prosperity	Authority	County Investment	Private Investment	Lead	Contributor
A-1: Water Infrastructure Resilience	Extreme Precipitation	+	++	+	Neutral	Outside County	$	$	WSSC Water	DEP, municipalities, DC Water
A-2: Culvert Repairs	Extreme Precipitation	+	+	+	Neutral	County	$$$	$	DOT	DPS, M-NCPPC
A-3: Temperature Monitoring and Alerts	Extreme Heat	++	+	Neutral	Neutral	County with Change	$$	$	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	$$$	$	DHCA, DEP	MCGB, DPS
A-6: Green/ Cool/PV Roof and Pavement Code	Extreme Heat	- -	++	+	++	County with Change	$$	$$$	DPS	DHCA, MCGB
A-7: Green Streetscape	Extreme Precipitation	Neutral	+	++	Neutral	County with Change	$$$	$	DEP, MCDOT	DPS, M-NCPPC

Action	Climate Risk Reduction	Racial Equity & Social Justice	Public Health	Environmental Stewardship	Economic Prosperity	Authority	County Investment	Private Investment	Lead	Contributor
A-8: Harden Emergency Shelters and Install Resilience Hubs	Extreme Heat	++	++	Neutral	Neutral	Outside County	$$$	$	HHS	DGS, OEMHS, MCPS, FRS, DPS
A-9: Mold Protection and Remediation	Extreme Precipitation	++	++	Neutral	+	County with Change	$$$	$$	DHCA, DPS	DEP, MCGB
A-10: Green Infrastructure	Extreme Precipitation	Neutral	+	++	Neutral	County with Change	$$$	$$	DPS, DEP	MCDOT, M-NCPPC
A-11: Climate Adapted Building Code	Extreme Precipitation	+	+	Neutral	Neutral	County with Change	$$$	$$$	DPS	DGS, DEP
A-12: Stormwater Retention Credit Trading	Extreme Precipitation	Neutral	+	+	Neutral	County with Change	$$	$	DEP	M-NCPPC, DPS
A-13: Ban Stormwater Management Requirement Waivers	Extreme Precipitation	Neutral	+	+	-	County with Change	$	$$	DPS	M-NCPPC
A-14: Update Floodplain Maps	Extreme Precipitation	Neutral	Neutral	Neutral	Neutral	County with Change	$$	$	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, POL, DOT	DGS, OEMHS, PIO
A-17: On-Site Water Reuse	Drought	+	Neutral	+	Neutral	Outside County	$$	$	DPS, WSSC Water	Municipalities
A-18: Expanded Community Gardens	Drought	+	++	+	+	County with Change	$	$	M-NCPPC	MCPS, OA, HHS
A-19: Advocacy for Off-River Water Storage	N/A	Neutral	Neutral	Neutral	Neutral	Outside County	$	$$$	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

Contributor:

DEP, Municipalities, DC Water

Water and wastewater supply and treatment depend on reliable distribution pumps to move water where gravity flow is not possible. The 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 and risk exposure of the pumping infrastructure. Implementation of this action will require close coordination with the Washington Suburban Sanitary Commission (WSSC) and other municipal water and wastewater utilities. 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 Culvert Repairs

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:

DOT

Contributor:

DPS, M-NCPPC

The 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.[78] Continued identification and repair of damaged or failing culverts 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. Additionally, the County should consider upsizing drainage, infrastructure in flood-prone areas to accommodate increased volume, intensity, duration and frequency associated with climate change. Broader stormwater management design and inspection of bike and pedestrian lanes could also be incorporated as part of this culvert repair and management program.

Properly maintained culverts promote 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.

EQUITY-ENHANCING MEASURES

Earmark culvert funding for areas most in need (for example, areas that lack appropriate infrastructure), especially if they are in or near vulnerable communities.

> *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*

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

The 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, shelters, etc. to ensure that systems are operational or address challenges prior to an extreme temperature event; however, temperature alerts and communications should be incorporated into public emergency plans.[79] 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 on this effort.

The County could also collaborate with the Centers for Disease Control and Prevention 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

Contributor:

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

Contributor:

MCGB, DPS

To support installation or retrofits of buildings with climate adaptive technologies, the 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 PV 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 weather hazards. The action would increase economic prosperity by kickstarting 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 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

Contributor:

DHCA, MCGB

The County should update its residential and commercial building code to require all existing and new roofs to (1) be 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) be cool/albedo roofs. The building code should prioritize green roofs or rooftop solar PV panels over cool roofs. 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 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 reflectance (for example, 0.70 for low-sloped roofs, and 0.40 for steep-sloped roofs)[80] and a minimum thermal emittance (for example, 0.85), and owners who build green roofs or permeable pavement should be required to submit a plan and schedule for regular maintenance.

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 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

> *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).

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 urban heat island effect and increase urban greening

A-7 Green Streetscape

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

Contributor:

DPS, M-NCPPC

The County should update 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 to planting in stormwater management facilities, planter boxes, rain gardens, grass swales, and wide, vegetated rights-of-way that retain and filter stormwater. 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.[81]

Green streetscapes provide multiple public health benefits, including reduced heat island effects, improved air quality from increased urban greening, improved pedestrian and biker safety, 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.

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

Contributor:

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. The 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, or community centers 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 and cooling. At the hubs, residents can access essential resources (for example, electricity for charging cell phones or clean water for those with distribution pipes that are broken) while they continue to use their home infrastructure.

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 MCPS 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.

ADDITIONAL 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 to be 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 additional shelters to strengthen services in vulnerable areas. **Figure 29** shows the location of existing shelters in the County in communities with social vulnerability concerns (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 SVI > 0.5.

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*

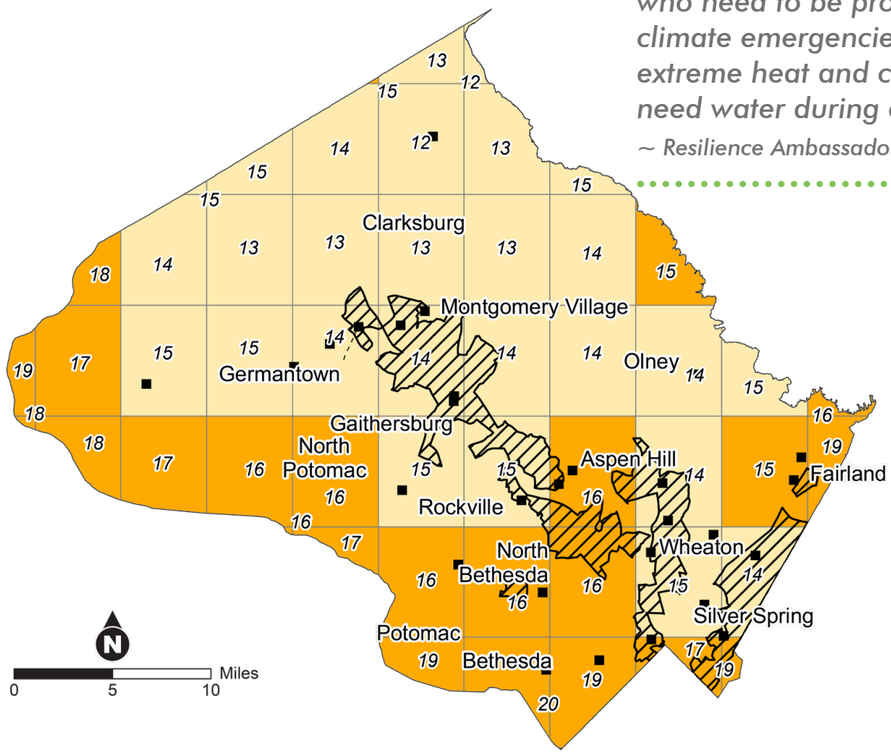


Figure 29: Projected increase in days per year >95°F for 2050 and climate scenario RCP 8.5 outlining areas ranked in the top 50% most vulnerable by the CDC SVI, showing existing County emergency shelters

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

Contributor:

DEP, MCGB

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 County residents' health and safety. Mold growth is also a persistent health issue in buildings without humidity control. 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 FEMA-approved flood-damage-resistant materials,[82] requiring dehumidification to maintain building humidity below 70%, stipulating regular HVAC system duct and filtration cleaning and maintenance, or requiring door and window sealants to protect against stormwater intrusion. Montgomery 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 for procuring and installing stormwater drainage systems and building floodproofing to landlords who may have difficulty financing these measures.

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.

ADDITIONAL 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 to 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

Contributor:

MCDOT, M-NCPPC

The 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. The County should also adopt codes to limit impervious concrete surfaces and require the use of pervious pavements, especially in County-funded projects. For example, sidewalks, driveways, and parking lots should be constructed using pervious pavements 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.[83] 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.

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. 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 need to continue including green infrastructure and identifying opportunities to expand the use of green infrastructure to support this action.

> *It's important that our water's going down to the earth and not on surfaces like the parking lot or concrete because once the water starts running off on those type of surfaces, what happens is it collects pollution, like oil, that's on that pavement or concrete and it goes straight to the Bay.*
>
> *~ Resilience Ambassador Survey*

A-11 Climate-Adapted Building Code

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

Contributor:

DGS, DEP

Most building codes in the U.S.—including that of Montgomery County, 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 flood maps. As sea level rises and precipitation events increase with climate change (see **Figure 30**), the 100-year flood (the flood event with a 1% chance of occurring annually) is becoming more common. What is more, National Flood Insurance Program flood maps are not updated on a regular, chronological basis. To counter this, municipalities such as Austin, Texas, and Washington, DC, which are in areas prone to increasing flooding and extreme precipitation, are re-designating 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, 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.

The County should update building codes to require 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.

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.

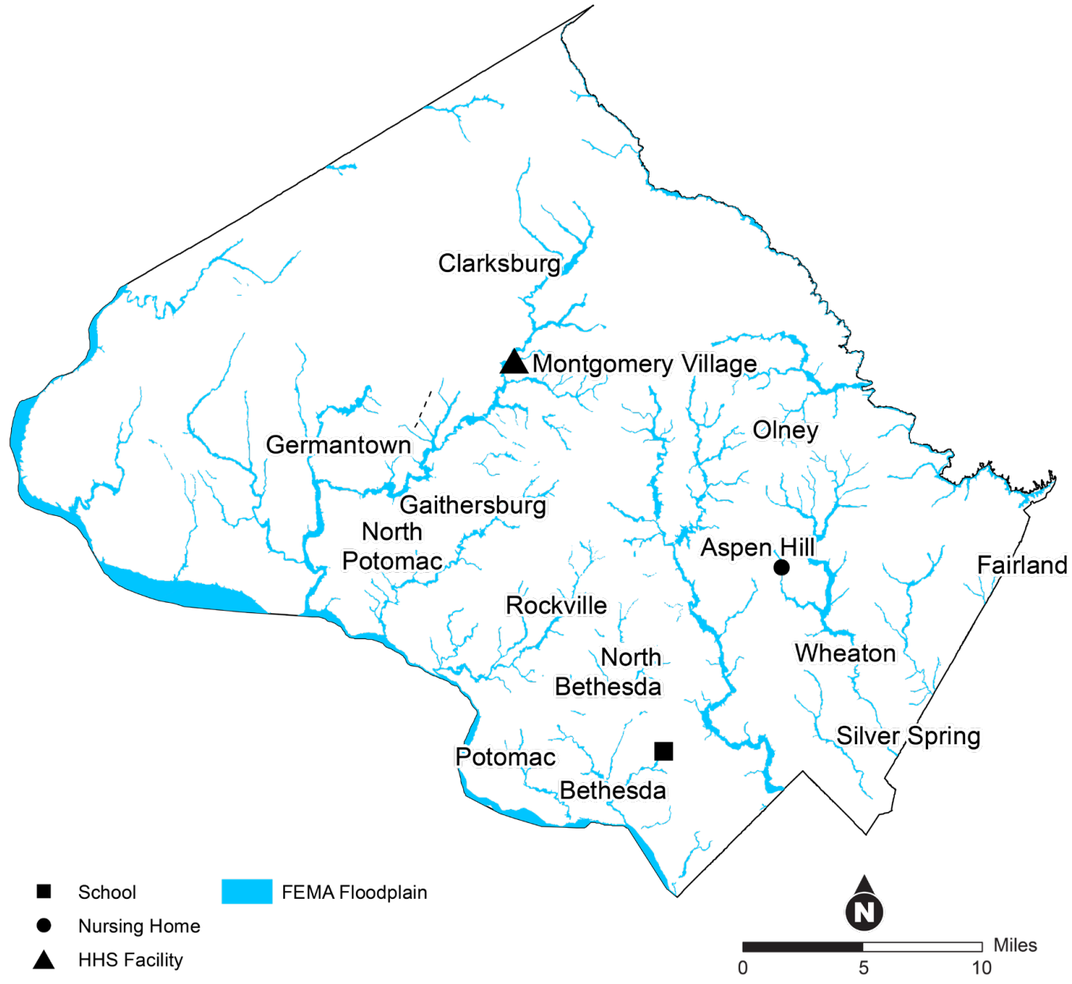


Figure 30: Montgomery County critical and County facilities within the floodplain (3 total)

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

Contributor:

M-NCPPC, DPS

In 2014, Washington, DC launched a Stormwater Retention Credit Trading Program, which allows development projects to meet a portion of the city's stringent stormwater management requirements by purchasing credits for stormwater retained on other property that exceeds its own requirements.[84] The trading program incentivizes voluntary installations of green infrastructure, such as rain gardens or bioswales, which slows stormwater runoff and naturally filters 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.

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 Positive

Authority:

County – May Require Policy Amendment or New Policy

Investment Level:

County: $

Private: $$

Development Stage:

Proposed

Lead:

DPS

Contributor:

M-NCPPC

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).[85] 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. As part of the code update, the County included a grandfathering provision allowing sites with construction plans approved prior to January 2013 to apply for stormwater management waivers.[86] The County also does not require stormwater management for minor land-disturbing activities.[87] 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 revise 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

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 FEMA floodplain maps, but not all areas in Montgomery 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, areas impacted will increase in size, impacting 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:

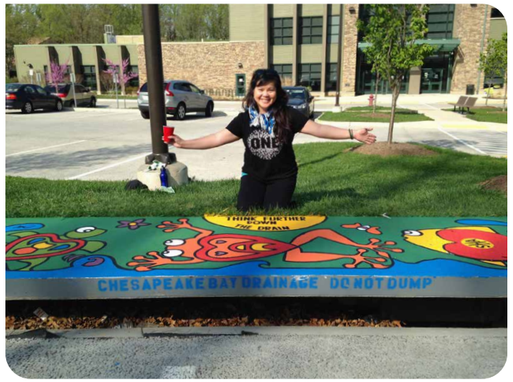
DEP, WSSC Water, M-NCPPC

Contributor:

Municipalities

The 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.[88] 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 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.[89]

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

Investment Level:

County: $$$
Private: $

Development Stage:

Proposed

Lead:

FRS, POL, DOT

Contributor:

DGS, OEMHS, PIO

The County should assess and increase flood first-response resources, including swift-water rescue, vehicles that can navigate high water, and the 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 31** 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.

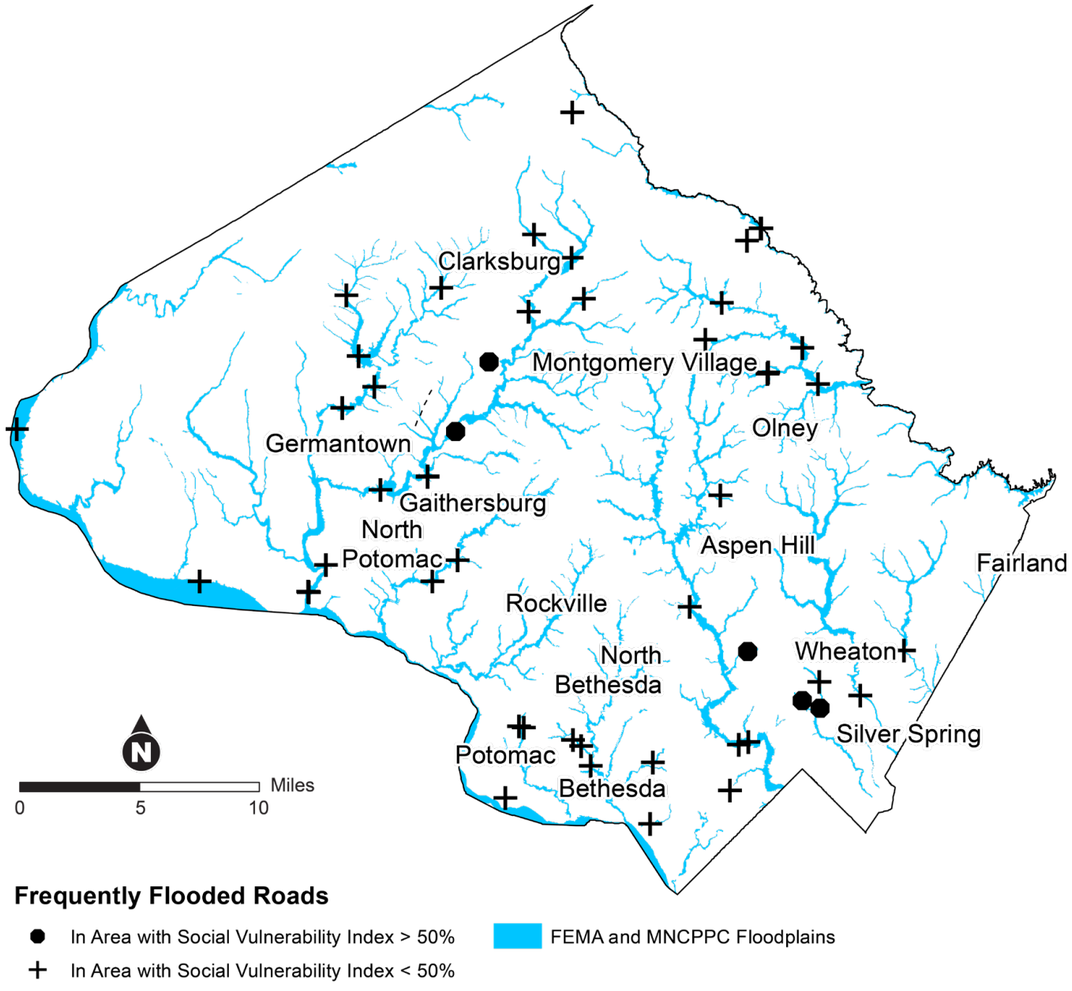


Figure 31: Location of roads in the County that experience frequent flooding, showing social vulnerability

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

Contributor:

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, the 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. 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. In tandem 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). 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 the Department of Permitting Services to 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 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

Contributor:

MCPS, OA, 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 11 gardens across the County and more than 600 local gardeners who grow vegetables and flowers in rented individual plots as well as maintain the gardens through community workdays. The County should create and promote more community gardens in urban and suburban areas to reduce farm-to-table distance and to promote food security. By expanding the number and location of community gardens, more County residents would be able to take advantage of increased connection to nature, connectivity with a community of gardeners, fresh and local food, increased food security and affordability, and a potential source of income.

Students plant rain garden at Olney Elementary School

EQUITY-ENHANCING MEASURES

- Create and promote more community gardens in areas that are food deserts and/or where residents face food insecurity because of affordability. 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.

> *I want to see a community garden for my community to grow closer together.*
>
> *~ Resilience Ambassador Survey*

A-19 Advocacy for Off-River Water Storage

Primary Benefit:
Enabling Action

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, WSSC Water

Contributor:
OIR

Community water resilience is largely reliant on the availability and quality of the potable water supply. Most of the County's potable water comes directly from the Potomac and Patuxent rivers.[90] 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.

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

Authority:
County – Can Be Implemented Under Existing Policy

Investment Level:
County: $$
Private: $

Development Stage:
Proposed

Lead:
DEP, OEMHS

Contributor:
DPS

While building code and permitting climate adaptation measures can protect new or retrofitted buildings, existing buildings remain susceptible to extreme precipitation events. The 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.

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 32** shows areas of social vulnerability concerns (SVI greater than 50%) within the FEMA floodplain that may contain houses eligible for buyouts. **Table 18** shows the percentage of buildings in Montgomery 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.

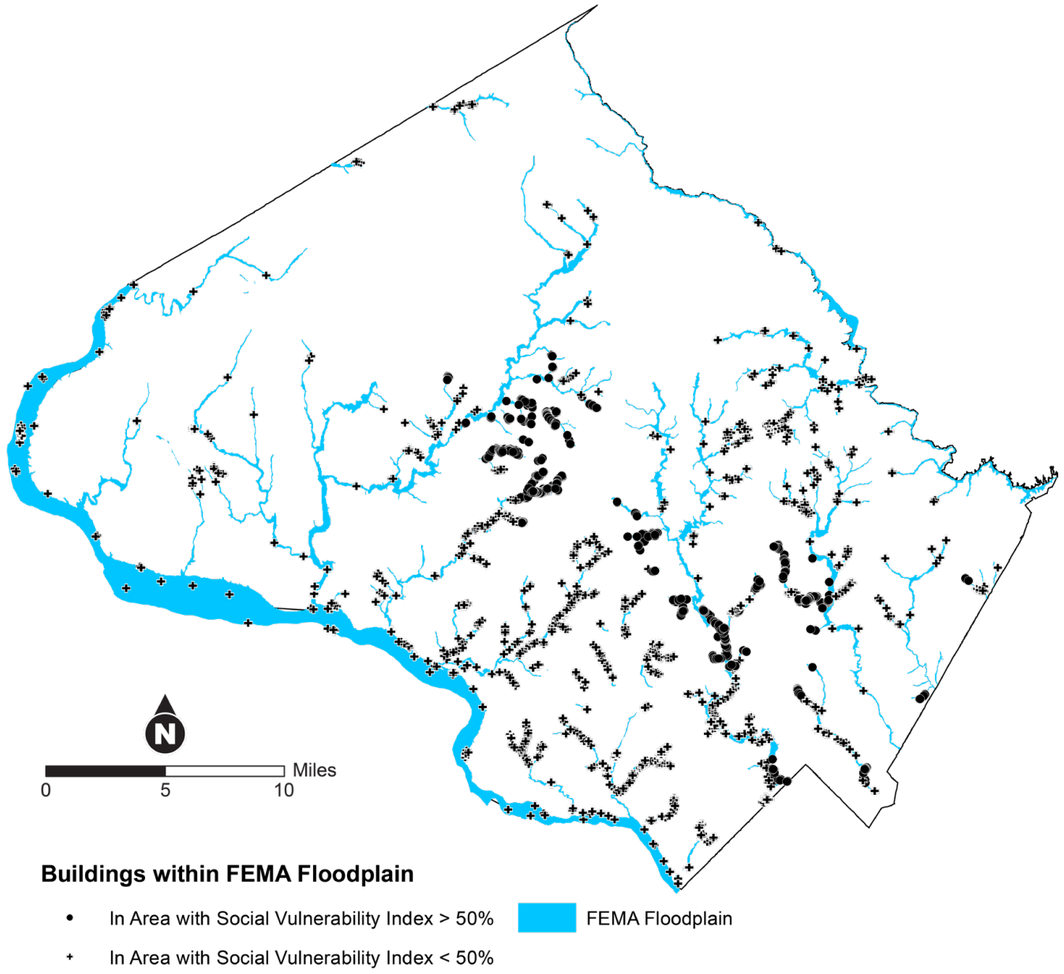


Figure 32: Buildings in the County within the floodplain and in areas of SVI > 50%

Table 18: Buildings in the County within the floodplain and in areas of SVI > 50%

	Count	Percent of Total Buildings in County within Floodplain (Total: 3,726)	Percent of Total Buildings in Montgomery County (Total: 404,057)
Buildings in Floodplain and Area with SVI > 50%	(Total: 3,726)	Percent of Total Buildings in Montgomery County	0.32%
Buildings in Floodplain and Area with SVI < 50%	(Total: 404,057)	65%	0.60%

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Climate Governance Actions

Montgomery County has institutionalized 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 on-going work.
- Utilize 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 chapter 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 19**.

Table 19: Climate governance actions

Action	Authority	Lead	Contributor
G-1: Build Awareness among All Montgomery County Government Staff about Climate Change	County	DEP	CEX, OHR, DGS, M-NCPPC, MCPS
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	DEP, OLR, unions
G-4: Identify 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, and Operations Activities to Account for the Risks of Climate Change Impacts and Prioritize the Needs of Vulnerable Residents	County	CEX, OEMHS	HHS, DOT, FRS, POL, M-NCPPC
G-8: Evaluate and Update County Planning, Policy, and Operations Activities to Reduce Greenhouse Gases	County	OP, CEX, DEP	All departments
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, DTS, OMB (CountyStat)	HHS (African American Health Program, Latino Health Initiative, Asian American Health Initiative)
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, DTS, 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	DTS, OMB (CountyStat)	DEP, OEMHS, DOT, DPS, M-NCPPC
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

Contributor: CEX, OHR, DGS, M-NCPPC, MCPS

In 2020, the County engaged the Association of Climate Change Officers to gather feedback from County staff about their awareness and literacy 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.

G-2 Establish a Climate Change Academy to Integrate Climate Change Training into the Professional Development of Montgomery County Government Staff

Lead: OHR, DEP

Contributor: CEX, Office of Racial Equity and Social Justice, DGS, Montgomery College, DNR, M-NCPPC, MCPS

In the summer of 2020, approximately 170 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 Montgomery 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 can enable all staff to have a foundational understanding of the risks and opportunities that climate change poses for Montgomery County operations, residents, and businesses. 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 throughout the County. The Climate Change Academy 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 utilize 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: OHR

Contributor: DEP, OLR, 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 the County prepares for and responds to climate hazards or make decisions that may impact the County's GHG footprint. A comprehensive review of Montgomery County Government 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 in order to attain climate competency. In addition, performance plans for climate-relevant positions should include objectives related to the climate change aspects of the job.

G-4 Identify 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

Contributor: All departments

In order for the County Government to effectively combat climate change, new climate-relevant positions should be established. 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 GIS data for better understanding and articulating the County's changing flood risk. These are just a few examples of the climate-relevant positions needed across County Government, and they should be inventoried and prioritized in the 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)

Contributor: DEP

In 2019, 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.

G-6 Designate Climate Ambassadors within Each County Department

Lead: CEX, DGS, DEP

Contributor: 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, and work as a team with other department ambassadors to facilitate deep emissions reductions across all departments. 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.

G-7 Evaluate and Update County Planning, Policy, and Operations Activities to Account for the Risks of Climate Change Impacts and Prioritize the Needs of Vulnerable Residents

Lead: CEX, OEMHS

Contributor: HHS, DOT, FRS, POL, M-NCPPC

County departments' essential services, plans, codes, and processes must account for the risks of climate change. These include but are not limited to County standards, codes, policies, and plans related to hazard mitigation, emergency response, public health, transportation, residential services, parks and landscaping, and buildings. For example, as historical references to rainfall and water flow become outdated, updates will need to continue 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 the Racial Equity and Climate Advisory Committee, and engage with community members to reach the best solutions.

G-8 Evaluate and Update County Planning, Policy, and Operations Activities to Reduce Greenhouse Gases

Lead: CEX, OEMHS

Contributor: HHS, DOT, FRS, POL, M-NCPPC

Choices made throughout the County Government have the potential to negatively or positively impact our GHG emissions. Departments should establish approaches to ensure they are factoring emissions potential and equity into their decision-making and procurement processes. These approaches include 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. 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. This action also includes establishment of a climate impact statement to evaluate all pending bills, budgets, plans, and land use decisions. To report progress on these and other efforts to reduce GHG emissions, departments should include continuous improvement plans within 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: OMB, CEX, DEP

Contributor: All departments

In 2020, the 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. 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 20 and beyond. These short-term actions form a foundation for more in-depth, longer-term approaches.

G-10 Develop Financing Strategies for Implementing Climate Actions and Incorporate Climate Considerations into County Finance Practices

Lead: DOF

Contributor: OMB, MCGB, DEP, CEX, Board of Investment Trustees

Fully implementing the actions in the CAP will require leveraging resources from both the public and private sectors through traditional and innovative funding streams. The 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 that have worked in other communities for this purpose, and philanthropic sources that can be approached for funding support. 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, DTS, OMB (CountyStat)

Contributor: HHS (African American Health Program, Latino Health Initiative, Asian American Health Initiative)

The County will regularly measure and report on its progress in implementing the actions outlined in this CAP. The County will define metrics of success in consultation with the Climate Energy and Air Quality Advisory Committee and the Racial Equity and Climate Change Committee. Metrics should include those related to GHG reductions, to resilience to the impacts from 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). The County should proactively engage underrepresented communities to share data and findings in multiple languages and facilitate accessible and 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 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. 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. On an annual basis, the County will develop and release a climate work plan of the initiatives planned for the upcoming year. The County will also develop a robust web page 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 will provide people with tools they can use, climate change presentations, and other related resources.

G-12 Formalize the Climate Leadership Team to Guide the Implementation of Climate Plan Actions

Lead: CEX

Contributor: All departments, independent agencies, and municipalities

The Climate Leadership Team consists of leadership and key staff from various 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 and monitoring the progress of implementation. The County's COVID recovery framework can serve as a model for the coordination of climate efforts.

G-13 Update the County's Teleworking and Transit Benefit Policies to Encourage MCG Staff to Reduce Vehicle Miles Traveled

Lead: OHR, DOT

Contributor: DEP, DTS, OLR, OCA, CEX (Office of Innovation), DGS, unions

The global pandemic has accelerated the shift to teleworking. Up to 35% of MCG employees are currently teleworking at some point each week, a major increase from pre-pandemic levels. Teleworking contributes to a reduction in 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 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 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

Contributor: DEP

The global pandemic has accelerated the shift to virtual meetings and virtual conferences. To the extent that MCG staff must use air travel for work-related purposes, the 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.

G-15 Consolidate County Climate Data

Lead: DTS, OMB (CountyStat)

Contributor: DEP, OEMHS, DOT, DPS, M-NCPPC

The CAP was developed in collaboration with many different County departments and agencies to gather the necessary climate data, from 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 or 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 to enable community members to view and download.

G-16 Conduct Climate Vulnerability Detailed Assessments

Lead: DEP

Contributor: OEMHS, 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 resilience assessments of key assets located within areas of high climate hazard and/or social vulnerability, in order to develop climate resilience projects to harden or relocate those assets.

Public Engagement, Partnerships, and Education Actions

Montgomery County's community members are empowered, actively engaged, and activated to take action on climate change.

- Create authentic and inclusive community engagement, particularly with Black, Indigenous, and People of Color and communities most vulnerable to the impacts of climate change.
- Build strategic partnerships among Maryland counties to result in ambitious state climate policies.
- Empower youth to take action at home and in their community.
- Build community trust and partnerships with residents, and provide them with relevant tools and resources.

Public Engagement, Partnerships, and Education Actions

The success of the County's Climate Action Plan is based largely on the degree to which community members are actively engaged and participating. 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 to 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).

This is just the beginning of a more ambitious effort to engage a diverse network of partners across a broad swath of sectors. Such an effort will deepen community trust, understanding, and partnership, and help open avenues to enhanced participation for implementing climate action. Public engagement, partnership, and education actions are outlined in **Table 20**.

Table 20: Public engagement, partnerships, and education actions

Action	Authority	Lead	Contributor
P-1: Undertake Vigorous Public Outreach Campaign Aimed at Empowering the Public With Information on How to Reduce Emissions and Adapt to the Impacts from Climate Change	County	DEP, OEMHS, PIO	Community Engagement Cluster, Regional Service Directors, HHS, MCPS, M-NCPPS, 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, M-NCPPC, civic and business community
P-4: Enhance County Websites to Focus More Sharply on Climate Change	County	PIO	All departments
P-5: Expand and Evolve the Resilience Ambassador Program to Advance Racial Equity and Climate Action	County	DEP	REC, HHS, DOT, Office of Racial Equity and Social Justice

Action	Authority	Lead	Contributor
P-6: Establish a Racial Equity and Climate Change Task Force to Advance Racial Equity and Climate Action	County	DEP	Office of Racial Equity and Social Justice, HHS, DOT, Climate Leadership Team
P-7: 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-8: 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-9: Support the Efforts of Community Organizations, Businesses, and Associations that Promote and Operationalize Equitable Climate Action	County	DEP	Montgomery College, public libraries, civic and business community, Racial Equity and Climate Change Task Force, M-NCPPC
P-10: 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-11: Establish a Statewide Coalition of Local Governments Focused on Advancing Ambitious State Climate Policy by Collectively Advocating their Positions before the State Legislature, Public Services Commission, and the Utility Companies	County	CEX	OIR, DEP
P-12: Establish Partnerships with Federal Agencies Located within the County's Boundaries on GHG Mitigation and Climate Resiliency Efforts	County	CEX	MCEDC, DEP
P-13: Advocate for the Continued Integration of Climate Change Education into the Existing School Curriculum	County	MSDE, MCPS	DEP
P-14: Develop a Standardized Climate Change Curriculum Across Public Schools and Recommend the Same for Private Schools and Home Schools	County	MSDE, MCPS	DEP
P-15: Provide Professional Development for Educators on Climate Change Topics	County	MCPS	Montgomery College, DEP
P-16: 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-17: 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-18: Develop Sustainability Goals for Schools to Reach and Provide Incentives to Do So	County	MCPS	DEP
P-19: Encourage Climate Change Action at Home	County	MCPS	DEP, MCCPTA
P-20: Establish Cross-Departmental Partnership to Facilitate Implementation of Climate Goals at County Schools	County	MCPS	DEP, M-NCPPC,CUPF, DPS

P-1 Undertake Vigorous Public Outreach Campaign Aimed at Empowering the Public with Information on How to Reduce Emissions and Adapt to the Impacts from Climate Change

Lead:
DEP, OEMHS, PIO

Contributor:
Community Engagement Cluster, regional service directors, HHS, MCPS, M-NCPPS, civic and business community

While 84% of Montgomery County residents surveyed in 2020[91] 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,[92] 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. 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. 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

Contributor:
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 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. The health frame 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. 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

Contributor:
All departments, MCPS, M-NCPPC, civic and business community

All 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. This entity would be responsible for developing, coordinating, and disseminating information on climate change so that all sectors of our society 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.

P-4 Enhance County Websites to Focus More Sharply on Climate Change

Lead:
PIO

Contributor:
All departments

The County has extensive climate and energy resources, tools, and incentive programs that are insufficiently disseminated. Working in coordination with the Climate Change Communication Coalition, all departments and agencies should enhance their websites so that climate change information and resources are available on all County Government websites, which will facilitate wider audience reach.

P-5 Expand and Evolve the Resilience Ambassador Program to Advance Racial Equity and Climate Action

Lead: DEP

Contributor: REC, HHS, DOT, Office of Racial Equity and Social Justice

During the summer of 2020, the County launched a pilot program with a team of five youth Resilience Ambassadors hired as part of the "COVID Corps" through the Department of Recreation. The program was designed to better engage with underrepresented communities, predominantly people of color, disproportionately impacted by COVID-19, transportation injuries/fatalities, the energy cost burden, and other systemic inequities. The experiences and insights gleaned from Resilience Ambassador conversations have been used to help make racial equity and health outcomes central to this plan. Given its early successes, the County should expand the Resilience Ambassador Program in partnership with other community-based organizations (including those focused on environmental, health, and social justice issues) so that Ambassadors are scattered throughout the County to sustain community outreach and engagement. Resilience Ambassadors should ultimately serve as information and advocacy bridges between communities and the County, and help build resiliency, advance racial equity, encourage carbon-reducing behavior, and identify solutions that broaden participation.

> *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.*
>
> *~ Resilience Ambassador Survey*

P-6 Establish a Racial Equity and Climate Change Task Force to Advance Racial Equity and Climate Action

Lead: DEP

Contributor: Office of Racial Equity and Social Justice, HHS, DOT, Climate Leadership Team

While the County has organized an informal group of staff members from HHS, DEP, DOT, and CEX to begin examining the intersecting issues of climate change and racial equity, there is a need for a more formal and expansive entity that also includes members from the community. The County should establish a Racial Equity and Climate Change Task Force affiliated with the Racial Equity and Social Justice Committee and the Climate Energy and Air Quality Advisory Committee to help guide the evolution and implementation of the Climate Action Plan, and that will advise the County Council, County Executive, and County departments about racial equity and climate change, and recommend policies, programs, legislation, and regulations necessary to promote racial equity through climate-related initiatives. This group should also serve as a community liaison by engaging and building partnerships with the County's most vulnerable populations to advance and accelerate their climate and equity priorities.

P-7 Use the Climate Energy and Air Quality Advisory Committee as a Resource to Advise the County on Performance Metrics and Plan Implementation

Lead: DEP

Contributor: Climate Leadership Team

The Energy and Air Quality Advisory Group was amended by legislation in 2020 to also include "Climate" in its name and mission. The County should use the Climate Energy and Air Quality Advisory Committee (CEAQAC) for advice and guidance on policy and program development, to identify areas and methods to encourage 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 the Racial Equity and Climate Change Task Force to help guide the CAP's evolution and implementation.

> *To make sure climate change resources are available to 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-8 Facilitate Ongoing Input from Community Members on the CAP's Implementation

Lead: CEX, DEP

Contributor: DOT, OEMHS, PIO, Community Engagement Cluster, regional service directors, MCPS, M-NCPPC

The County has put in place monthly "virtual office hours" to foster ongoing dialogue with members of the community on climate issues. As the CAP 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 U.S. 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-9 Support the Efforts of Community Organizations, Businesses, and Associations that Promote and Operationalize Equitable Climate Action

Lead:
DEP

Contributor:
Montgomery College, public libraries, civic and business community, Racial Equity and Climate Change Task Force, M-NCPPC

MCG 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 establish and deliver open enrollment climate change courses for residents, businesses, and particularly relevant professionals (for example, health professionals would benefit from enhanced understanding of the health effects from climate change on the elderly, those with underlying health conditions, and economically disadvantaged populations) and to organize book club discussions and host lectures. Supporting a network of partners across a broad swath of sectors 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 Engage County Artists through Public Art Installations to Raise Awareness, Discussion and Action on Climate Change

Lead:
DEP

Contributor:
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 the 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 through the Sustainable Environmental Public Art Project Initiative to build a broad partnership of arts organizations committed to sponsoring local artists to install 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.

P-11 Establish a Statewide Coalition of Local Governments Focused on Advancing Ambitious State Climate Policy by Collectively Advocating their Positions before the State Legislature, Public Services Commission, and the Utility Companies

Lead:
CEX

Contributor:
OIR, DEP

State authority over energy sources and transmission is very significant, as many key decisions are made in the General Assembly and Public Service Commission. It is therefore essential to influence the adoption of ambitious state goals and policies for the 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 Commission and legislative meetings, are required, but neither 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 (such as, 100% renewable portfolio standard and community choice energy). 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. 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, amend building and zoning codes, etc.

P-12 Establish Partnerships with Federal Agencies Located within the County's Boundaries on GHG Mitigation and Climate Resiliency Efforts

Lead: CEX

Contributor: MCEDC, DEP

Federal agencies occupy a large footprint in Montgomery County. Over 15 federal agencies have a physical presence in the County, from the National Oceanic and Atmospheric Administration headquartered in Silver Spring to the US Nuclear Regulatory Commission in Rockville. Several federal agencies are situated on expansive campuses, including the National Institute of Health (NIH) and Naval Support Activity (home of Water Reed National Military Medical Center) in Bethesda, the National Institute of Standards and Technology (NIST) campus in Gaithersburg, and the U.S. Food and Drug Administration's (FDA's) White Oak Campus. Point-source combustion generated at the NIH facility alone generated approximately 2% of the County's GHG emissions in 2018.[93]

There are opportunities for Montgomery County to partner with federal agencies located within the County's boundaries on GHG mitigation and climate resiliency. One County-federal partnership is already underway. In 2020, the County received a climate resiliency grant award from the Department of Defense totaling $372,000. During the one-year grant term, Montgomery County's Departments of Transportation and Environmental Protection conducted a Naval Support Activity Bethesda Military Installation Resiliency Review to assess approaches to minimize impacts from flooding caused by extreme storm events, evaluate opportunities for stormwater management to improve water quality, develop approaches to prevent or address adverse impacts to transportation logistics and the power grid, and ensure that this plan addresses climate resiliency challenges. In addition to partnering with individual agencies, the County and federal agencies can establish a multi-party working group to jointly discuss strategies for addressing GHG mitigation and climate resiliency on federal installations in the County.

> *"I want to see us push for needed change."*
> *~ Resilience Ambassador Survey*

P-13 Advocate for the Continued Integration of Climate Change Education into the Existing School Curriculum

Lead: MSDE, MCPS

Contributor: DEP

Whereas science and social studies include climate change curriculum at various grade levels in MCPS, 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. Due to Maryland State Department of Education (MSDE) requirements and time constraints, a stand-alone course focused on climate change may not be practical. Instead, educators should identify opportunities to integrate climate change education into a variety of other subjects in order to increase student exposure to the varied issues within the topic of climate change. For example, students should already 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. The MSDE dictates curriculum content and standards for public school systems and needs to be involved in this work.

P-14 Develop a Standardized Climate Change Curriculum Across Public Schools and Recommend the Same for Private Schools and Home Schools

Lead: MSDE, MCPS

Contributor: DEP

With knowledge that the Maryland State Department of Education (MSDE) dictates curriculum content and standards for public school systems, climate change education should be an expectation of all schools across Montgomery County. Tailoring climate change curriculum to the grade level of students is essential. Using established content standards, teachers have the freedom to differentiate instruction to the needs of their specific classes. With equity and access fundamental to the curriculum, factors like home ownership, access to green space, and monetary investment need to be considered. As discussed in P-11, climate change curriculum should reach beyond science, and embrace other content areas. The social and historical context of climate change needs to be taught, including discussions of environmental justice and the disproportionate effects of climate change on vulnerable members of the community. MSDE needs to be involved in the decision-making process.

P-15 Provide Professional Development for Educators on Climate Change Topics

Lead: MCPS

Contributor: Montgomery College, DEP

Teachers need to be prepared with an understanding of the concepts of climate change and how to teach it. Professional development targeted to teachers about the climate change content they will teach to their students needs to be provided. For example, a Grade 2 teacher may be introducing weather, but needs to know what climate is and be able to answer students who ask why the climate is changing, and they need to do that in a grade level appropriate way. These topics can be uncomfortable and disheartening if not addressed through a hopeful lens and 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 their students to think about their own role in combatting climate change. Within MCPS, professional development related to environmental justice has already begun, and includes how to manage difficult discussions and tough questions. Professional development opportunities should also be made available to educators from private schools and home schools in the County.

P-16 Use School Gardens or Other Outdoor Learning Facilities as a Jumping Off Point to Address a Multitude of Climate-Related Topics

Lead: MCPS

Contributor: DEP, M-NCPPC

School gardens can 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 can also be a way to teach students about where their food comes from and goes to 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. ***MCPS provides guidance*** and processes for creating and using perennial and container gardens in the classroom. While many MCPS schools have school gardens, many do not have because they do not have a person, a champion, who can take on the extra work and hours of creating and managing a garden. A solution to this problem is to find funding for regional school garden coordinators who could oversee the construction and mechanics of these small school gardens. There are other school systems that have been successful with this model, and our neighbor, ***Washington, DC,*** is an example. 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, considerations for partnering with an off-site facility should be considered in order to provide all students access to a hands-on learning experience.

P-17 Develop Increased Opportunities for Students to Participate in Climate Change Learning Experiences Outside of the Classroom

Lead: MCPS

Contributor: Local universities, non-profits, public libraries, Maryland Association for Environmental & Outdoor Education, (MAEOE), M-NCPPC, municipalities

The community at-large can serve as a resource for students to learn about climate change. Local universities, non-profits, and libraries can partner with schools to host lectures and roundtables with climate professionals, and offer hands-on climate learning opportunities, such as environmental film competitions. School functions and field trips are also opportunities to facilitate climate change conversations for students and families. In Grade 4, students in MCPS are engaged in a learning unit called, "Our Neighborhood, Our World," in which they are outdoors mapping water flow on their school yard, looking for erosion and pooling of water, and devising mitigation strategies. Montgomery County's ***Outdoor Environmental Education Programs*** also uses the outdoors as a classroom to connect Grade 6 students to their local environment though the, Our Watershed, Our World unit. In culmination of this unit, students complete an environmental-focused Student Service Learning (SSL) project as part of their Maryland State Department of Education SSL requirement needed for graduation. 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 which MCPS should continue to expand. Additionally, schools can also build on existing STEM nights, the County STEM festival, and the ***Maryland Green School Program*** to increase awareness, and help inform and empower students about climate change. Additional resources include the City of Rockville's nature center and M-NCPPC's four nature centers and nature classroom located across the County, where these types of educational experiences take place and can be expanded upon.

> *"It's so great to see how we students are creating positive change."*
> *~ Resilience Ambassador Survey*

P-18 Develop Sustainability Goals for Schools to Reach and Provide Incentives to Do So

Lead: MCPS

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 MCPS 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. MCPS is already deeply involved in moving students toward an understanding of sustainability through the ***Maryland Green School Program***. MCPS has a target of 50% of its schools reaching certification as Maryland Green Schools within the next three years. 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. Additional, school-specific motivators and incentives 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-19 Encourage Climate Change Action at Home

Lead: MCPS

Contributor: DEP, MCCPTA

Given the reach of the 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 extracurricular activities, as well as through school environmental awareness efforts, should tie to concrete actions that households can take to reduce their emissions and prepare for the impacts of climate change. For example, MCPS 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 organize fundraisers that are eco-friendly to reinforce an environmental ethic, and school administrators can use existing touchpoints, like back to school night, to help prepare families for high heat days, storm events, etc. Additionally, involving student organizations that focus on climate change and environmental justice in school sustainability initiatives can be a way to keep students more motivated and engaged in the sustainability of their schools. 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 they can take to live more sustainably. An equity lens must be applied in that 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. Thus, incorporating strategies that work for a variety of living situations is necessary to include all students participating in sustainability goals outside of school.

P-20 Establish Cross-Departmental Partnership to Facilitate Implementation of Climate Goals at County Schools

Lead: MCPS

Contributor: 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. Linking the installation of stormwater retention sustainability features on school sites to that of the MCPS outdoor environmental education program would create connections between the physical environment and the academic experience for educators, staff, and students. 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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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 justice and social equity 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 33**.

STEPS

1. **Visit the EPA Carbon Footprint Website**
2. **Calculate Your Carbon Footprint**
   - Energy
   - Transportation
   - Waste
3. **Take Action**

Figure 33: Identify your carbon footprint

Step 1: Visit the EPA Carbon Footprint Website

Carbon footprint calculators such as the Environmental Protection Agency's (EPA's) Carbon Footprint 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.[94]

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 action 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 reduction, 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, the calculator will generate your overall carbon footprint and break down your emissions in pounds of carbon dioxide per year into three categories: energy, transportation, and waste. The calculator will also show you how your impact compares to similar households in the U.S. 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. Below is a sample of actions that you, your household, or your business can take to reduce personal emissions.

Actions to Lower Your Transportation Footprint

1. **Walk and bike more**: Not only is walking 10,000 steps a day better for your health but it is better for the environment. If you are interested in biking, Montgomery County offers both docked and dockless bikeshare opportunities.[95]
2. **Use public transportation as much as possible**: 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.
3. **Vacation closer to home**: Air travel is a big contributor to GHG emissions, so see what sites are within driving or rail distance and take a vacation there.
4. **If you drive, switch to an electric or hybrid vehicle**: Replace 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.
5. **If you drive, drive less**: Save errands for one car trip, combine trips with friends, schedule trips to avoid rush hour traffic, and patronize one-stop shopping centers.

Actions to Lower Your Carbon Footprint in Your Home or Business

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.

Planting trees at a multifamily home in the County

Actions for Renters

1. **Schedule a quick home energy checkup**: This program is at no additional cost to homeowners or tenants, and the appointment takes about 45 to 60 minutes to complete. A contractor will provide you with energy-efficient products such as LED light bulbs, high-efficiency showerheads, and advanced power strips.
2. **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 eight hours can reduce your heating bill by 5 to 15%.
3. **Use your appliances at the right time**: During the day, many people use their computers, electronics, and lights, creating peak demand.[96] 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.
4. **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.
5. **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.

Actions for Homeowners

1. **Schedule a home energy audit**.
2. **Purchase 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.[97]
3. **Switch to clean energy**: Maryland is a choice state, meaning that you can buy your electricity from many different sources, including renewable energy sources like wind and solar.
4. **Install solar panels**: 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."
5. **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! Also, participate in Tree Montgomery for free shade trees.[98]

Actions for Business Owners

1. **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. High performers can also earn recognition with the ENERGY STAR building label.
2. **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.
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. **Buy ENERGY STAR appliances**: Before you buy or lease appliances, check to see if they are ENERGYSTAR-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.
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.
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, Business Continuity Plans, creating "go-kits" for your businesses, and 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.***

Actions That Everyone Can Take

1. **Transition to a low-carbon diet**: Depending on your comfort level, adjust your diet to consume less meat and dairy and more vegetables, fruits, beans, and grains.
2. **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.
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 stuff that have never been used to other working hands, through gifting and sharing between group members.[99]
4. **Start composting**: Composting enriches soil, helping retain moisture and suppress plant diseases and pests. It 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.
5. **Increase climate resilience**: Purchase flood insurance, flood-proof your home (make sure windows and doors are watertight), and have an emergency preparedness kit on hand (including water, dry food, first aid materials, backup of critical files on a thumb drive or other media, etc.).
6. **Spread the word**: 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.

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Zero Waste Task Force Planning and Initiatives

Zero Waste Task Force Planning and Initiatives

While solid waste accounted for only 2% of Montgomery County's GHG emissions in 2018, it is an important area for continued improvement in both emissions reduction and environmental stewardship.[100] In May 2018, 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.[101] The task force worked closely with DEP and provided several recommendations to reduce waste in the County. The County is preparing an updated solid waste plan to make continued progress on reducing waste and increasing recycling. These initiatives are summarized below.[102]

Reduce waste sources: The most effective place to reduce waste is at the source. The Task Force recommends that the County continue its source reduction planning and implementation efforts, as well as increase programs to reduce food waste. Specific recommendations include mandating residential and commercial collection and diversion of organics, as they represent 43% of the waste generated in the County. The Task Force recommended adoption of a "Pay as You Throw" funding mechanism to encourage waste reduction. The primary goal of these recommendations is to reduce waste sources and increase awareness of how and why we should create less waste.

Address physical infrastructure needs: The Task Force noted that upgrading recycling processing capacity is foundational to making any significant progress in achieving improvements to the County's collection, recycling, and diversion goals. Therefore, the group strongly advised that the County staff and Council should upgrade capacity for recycling by upgrading the existing Materials Recycling Facility, siting a new facility, or increasing contracts for capacity outside the County.

Improve recycling for more materials: The Task Force recommended that collection and recycling of cardboard boxes, which constitute 29% of the paper generated in the County, be improved. The report also recommended that recycling of construction and demolition debris be increased through promotion of salvage and reuse markets as well as enhanced enforcement associated with recycling of these materials.

Advance "People" infrastructure: Education, participation, and behavioral changes are essential for successful waste reduction. The Task Force recommends that the County enhance the education and enforcement campaigns already underway to facilitate increased waste reduction.

Montgomery County CAP
Zero Waste Task Force Planning and Initiatives

Participants at an open house for zero waste initiative

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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 five percent (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 impact global temperatures much more quickly and powerfully than carbon dioxide,[103] making their reduction a key strategy to mitigate climate change.[104] Both private and commercial refrigerators, 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° Celsius. Although the U.S. is not currently a party to the Paris Agreement, the EPA has been regulating "ozone-depleting substances" under the amended Clean Air Act of 1990, section 612.[105] A complete list of federal rules and updates concerning HFCs can be found on the Significant New Alternatives Policy (SNAP) page at EPA.gov.[106] Over the past several years, laws have outlined acceptable substitutes for HFCs and revised conditions for their use but have not outright banned most HFCs. A 2016 effort to regulate HFC use was challenged in court, and now SNAP rules 20 and 21 are no longer being enforced.[107] In the absence of federal leadership, individual states must advance more aggressive policies. Maryland did just that in October 2020, adopting prohibition dates for HFCs deemed to have "high global warming potential and [which] pose a higher overall risk to human health and the environment." Essentially, Maryland is proceeding according the SNAP rules as they are written. The Maryland regulation does not apply to residential air conditioning units or air conditioning in most automobiles but does phase out many HFCs, with a goal of reducing HFC emissions 25% by 2030.[108]

Other states have adopted refrigerant emissions laws, including California, a national leader on this issue.[109] Several others, primarily along the East Coast, have also passed legislation limiting HFCs.[110] However, a majority of U.S. jurisdictions do not have rules in place that go beyond EPA regulations. As long as these regulations remain unenforced, HFCs remain a major threat to achieving climate stability in the near future.

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.[111] Methane is the predominant GHG emitted from natural gas pipeline leaks, but nitrous oxide 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.[112] Best practices for avoiding fugitive emissions include replacing cast iron and unprotected steel pipes with plastic or protected steel, the use of flexible insert liners, and conducting assessments of leak volume.[113]

The Trump Administration has relaxed the federal standards that address fugitive methane emissions from the oil and gas industry. In response to the relaxation of federal regulations, the MDE has recently adopted standards to control methane emissions from natural gas facilities in the state.[114] Actions proposed include requirements to mitigate methane emissions through fugitive emissions detection and repair. If Montgomery County completely electrifies all systems utilizing natural gas, this would also eliminate any natural gas fugitive emissions attributed to the County.

Agriculture Emissions

GHG emissions from the agriculture sector comprise approximately a third of a percent (0.35%) of the County's 2018 GHG inventory. The majority of GHG emissions from the agriculture sector originates from soil fertilization. Most of these emissions are of nitrous oxide, a potent greenhouse gas. There are a variety of strategies available to reduce nitrous oxide emissions from agriculture, some of which have already been mandated by the State of Maryland, including regulating amounts of nitrogen used on agricultural fields, limiting the months in which fertilizer usage is allowed, and subsidizing cover crops.[115]

Specific recommendations to reduce GHG from the agriculture sector include implementing nitrification inhibitors,[116] 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."[117] 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.[118]

Wastewater Emissions

GHG 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 Montgomery 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 is 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 nitrous oxide (N_2O) into the atmosphere, the third biggest contributor to climate change after carbon dioxide and methane. A recent study has shown that the prime source of nitrous oxide from anthropogenic sources originates from wastewater treatment plants, contributing to both climate change and air pollution.[119]

Limiting emissions of nitrous oxide 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 nitrous oxide emissions, studies are still inconsistent on concrete ways to actively decrease these pollutants. Laboratory level studies have indicated that applying longer solid retention time decreases nitrous oxide production but this will need to be experimented with on a larger scale before this strategy becomes available for implementation.[120] Future research will focus on "both the quantification and reduction of N_2O emissions from various full-scale wastewater treatment plants. Additionally, future studies will reveal the fundamental processes involved in N_2O production by both nitrification and denitrification."[121]

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 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 innovation of technologies to use carbon dioxide as a valuable feedstock in products. Enhanced oil recovery is the most mature carbon capture technology that 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 represents the most venture capital-backed sector. 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 and other smart agriculture practices, Montgomery County can contribute positively in reducing its GHG emissions. As carbon capture, use, and storage technologies grow and transform in the next decade,[122] the County can then participate in innovative practices to decarbonize. On the policy side, the County can advocate for policies that incentivize corporations[123] to adopt carbon negative products by pricing the externalities of carbon emissions.[124]

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 found to be cost-effective. First, 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.[125] One example of this technology is New Jersey's PSE&G solar installations, a two hundred-million-dollar project that mounted 175,000 solar panels on utility poles and produces 40 megawatts for approximately 6,000 homes annually. There were no capital costs for PSE&G, as the company already owned the poles.[126]

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 the state department of transportation, and rights-of-way are efficient locations for solar as they are usually close to electrical loads and free from development.[127] 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.[128] The Massachusetts Department of Transportation has been siting solar panels in the rights-of-way since 2012, made possible through public-private partnerships. It has eight solar array facilities producing 5.5 million megawatts of power annually.[129]

Another solar siting possibility is within highway noise barriers (also known as photovoltaic noise barriers). First deployed in Switzerland in 1989, photovoltaic noise barriers are found in several countries,[130] and this technology does not require additional dedicated land.[131] 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 photovoltaic pavers applied directly over existing pavement. Georgia's Department of Transportation installed 50 square meters of solar roadway to power a visitor information center.[132] 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.[133] A less aesthetically pleasing but more efficient method for solar bikeways would be solar hanging above the bikeway, as in South Korea, in which a solar bike path runs through a highway and shields bikers from the sun.[134] 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 shield riders on bike paths. It is also aesthetically pleasing.[135]

Solar windows can be easily incorporated into a traditional building design. Although the older type of solar windows using quantum dots was too expensive for cost-effective installation, it set the precedent for perovskite solar cells, which are almost as efficient as silicon solar panels.[136] The U.S. National Renewable Energy Laboratory 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.[137] 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.[138] 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.[139]

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. Montgomery County can join other leading communities like San Francisco; Portland, Oregon; and King County, Washington, by conducting a consumption-based emissions inventory. The results of this study can be used to promote the importance of conscious consumption and educate members of the public on which products have an outsized effect on GHG emissions. Additionally, results can be used to develop an embodied carbon policy framework and implement programs that target the most pressing consumption-based emission sources.

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Looking Forward

Montgomery County CAP
Looking Forward

Paying for Climate Action Implementation

Montgomery County's climate goals are among the most ambitious anywhere in the country—and the world. As outlined in the Climate Action Plan, 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.

The sheer scale of the work that must be done means that Montgomery County will not be able to fully implement the Climate Action Plan 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 CAP calls for commitment from both the public and private sectors, while leveraging state and federal government resources.

Due to resource constraints, the County will need to creatively pursue actions that provide multiple benefits. Expanding community gardens is a great win-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 be innovative with regard to financing. To support initiatives in the CAP, the County will need to utilize a variety of tools such as the Montgomery County Green Bank products; tax-related platforms such as Property Assessed Clean Energy (PACE) financing, credits, assessments, and sales tax rates; and partnering with organizations to target financing opportunities to our most vulnerable residents. As a next step, CAP 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.

While the costs of implementing the CAP are high, the cost of inaction on climate change will be even higher. Furthermore, many of the CAP actions create economic opportunities related to reducing GHG emissions and increasing the County's resilience to the effects of climate change.

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

Looking Forward

Next Steps:

- **Public Review of the Draft Plan**. There are multiple ways to participate and provide feedback on the draft Climate Action Plan:
  - » Please let us know what you think of the draft Climate Action Plan by completing a brief survey: ***https://montgomerycountymd.gov/climate.***
  - » The County will host virtual community sessions about the draft plan and will be available to answer questions. For upcoming sessions, see the listing of ***Upcoming Climate Events***.
  - » Have questions or comments on the draft plan? You can email them to ***climate@montgomerycountymd.gov***.
  - » Participate in the Climate Action Plan Art Contest. Submissions can be in the form of original photos, drawings, poems, videos, and memes that invoke the need to protect our community from climate change. Winners will receive $100, and entries may be featured in the final climate plan! The deadline for the art contest is January 31, 2021. ***More details can be found at the Climate Action Plan art contest website***.

We anticipate that the final Climate Action Plan will be issued in spring 2021.

- **Sustainable Economic Development Report**. The County originally intended to include a section within the CAP focused on sustainable economic development strategies, as there were several compelling recommendations made by a number of the workgroups. However, given time constraints and the need for a deeper analysis, it was determined that a more comprehensive document, one that builds on the County's existing economic development and community engagement efforts, would be more valuable. Beginning in 2021, the County will work with community-based organizations, the Montgomery County Economic Development Corporation, and business associations to produce a companion to the Climate Action Plan outlining strategies for building a carbon-free, resilient, and equitable local economy.
- **Fiscal Year 2022 Budget Proposals**. The draft Climate Action Plan is being released during the County's Fiscal Year 2022 (FY22) budget development cycle. Due to the global pandemic, the County's fiscal outlook and revenues for FY22 are uncertain. Because additional staffing and resources will be critical to implement the actions listed in this Plan, departments are drafting budget proposals that identify positions and funding needed to take the Plan forward in FY22 and beyond.
- **Near-Term Climate Initiatives**. The climate planning process has not been a substitute for immediate, ongoing, impactful action on climate change. While the climate plan is being finalized, the County is making progress on things that make sense to pursue immediately. These include:
  - » adoption of green building codes
  - » development of energy performance standards for existing commercial buildings
  - » purchasing the County's first electric Ride On buses
  - » launching the FLASH bus service on US 29
  - » providing climate change training to our most senior leaders
  - » installing solar arrays on additional County facilities

A full listing of the near-term climate initiatives can be found ***in this document of Montgomery County Climate Change Planning and Climate Actions***.

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 its past and present of racial inequities. 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 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 guide us in tackling the climate emergency head on. It has provided clarity on the actions that are 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

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