

# **Report of the Montgomery County Climate Mobilization Workgroup**

**June 5<sup>th</sup>, 2018**

## **Accelerating County Greenhouse Gas Goals**

The Montgomery County Council adopted Resolution 18-974, Emergency Climate Mobilization, on December 5, 2017. This resolution accelerates the County's greenhouse gas (GHG) reduction goal to 80 percent by 2027 and 100 percent by 2035 and calls upon the County Executive, Montgomery County Public Schools (MCPS) and the Maryland-National Capital Park and Planning Commission (M-NCPPC) to advise the County Council on "specific methods for accelerating the County's greenhouse gas emissions reduction goal."

## **Envisioning a Decarbonized Future**

Achieving 100% GHG emissions reduction by 2035 will require a massive cultural shift, essentially reversing the adverse climate impacts associated with the industrial revolution while maintaining a high standard of living and economic opportunity for the County's residents. This would require aligning all levels of government, including utility regulators, residents and businesses, at a scale not comparable to anything previously undertaken by the County or any other large community.

Such a future would require dramatic changes in our buildings, vehicles, infrastructure, behavioral patterns, lifestyles and purchasing decisions. It would entail an extraordinarily ambitious reduction in energy use and conversion to renewable energy.

Since it is unrealistic to assume that all County residents and businesses will achieve carbon neutrality, it will be necessary to compensate by implementing an extremely aggressive set of restorative actions, such as tree planting and other efforts to sequester carbon.

To appreciate the magnitude of a decarbonized future, it is helpful to envision what it would entail. At the least, it would be characterized by the following:

- Nearly 100% of all vehicles – cars, buses and trucks – would be zero-emission vehicles (ZEVs) powered by clean energy;
- Nearly all residents, businesses and government entities would utilize 100% clean energy as a result of state-mandated renewable portfolio standard, voluntary purchases or on-site generation, with nearly all buildings being net-zero;
- Significant percentages of buildings in the County would have solar and/or geothermal systems;

- Public transit use, biking and walking would become common modes of transportation on par with personal vehicle use;
- Virtually all products would be reused or recycled, and zero waste would be disposed;
- Massive tree-planting would be embraced by virtually all property owners, resulting in far greater than no-net loss of tree canopy;
- Local farmers would restore carbon in the soil through multiple agricultural techniques, including no use of pesticides or synthetic fertilizers.

Forging such a dramatically different future will require difficult policy decisions, significant resources, efforts to redirect investment towards GHG neutral or restorative activities, community buy-in, transformational behavioral change and a willingness to consider and discuss measures currently regarded as politically charged. In terms of resources, this change will require billions of dollars of investment, the scale of which has not been quantified by this workgroup. However, these investments may provide a variety of other community benefits (e.g., healthier communities, opportunities for new industries). It also will require visionary and creative thinking and a willingness to take risks and cut new paths.

### **Climate Mobilization Workgroup**

In response to the Emergency Climate Mobilization resolution, the County Executive formed a workgroup comprised of 10 representatives (identified in Appendix E) 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 Workgroup had two primary goals:

- 1) Identify solutions and specific methods that could advance the County's progress towards its GHG reduction goals;
- 2) Inventory existing efforts and measures to reduce GHG reductions across the County Government and County Agencies;

The Workgroup also met with representatives from organizations who are advocating for the Resolution and similar efforts. These include representatives from the Montgomery County Chapter of the Climate Mobilization, MOCO 350, Indivisible, MC Faith Alliance for Climate Solutions and others who expressed interest in meeting with the group.

Members of the Workgroup acknowledge that while their respective Departments and Agencies have important insights and play a key role in reducing emissions through numerous initiatives, there are many other government and community stakeholders who must be engaged and who are essential to realizing the County's goals.

## Framework for Identifying GHG Reduction Measures

As a starting point, the Workgroup reviewed Paul Hawken's *Project Drawdown*. This comprehensive plan draws on a broad coalition of experts who have identified and modeled 80 of the most impactful technological, ecological and behavioral climate change solutions on a global basis.

A number of the *Drawdown* solutions are not applicable to County Government either because they are geographically irrelevant (e.g., tropical staple trees, peatlands), premised on development of a sophisticated technology or outside the County's control (e.g., truck design, alternative cement, smart glass). Therefore, the workgroup prioritized its focus on the high impact *Drawdown* solutions that are in the County's purview or that it can influence (See Table 1).

The Workgroup also reviewed the Metropolitan Washington Council of Government's (MWCOG) *Multi-Sector Approach to Reducing Greenhouse Gas Emissions in the Metropolitan Washington Region – Final Technical Report*, which identified 22 GHG reduction strategies, including policies, programs and incentives, as well as order-of-magnitude estimates related to costs and benefits.

The workgroup used *Drawdown's* applicable solutions, the strategies identified by MWCOG and each member's familiarity with current County policies, programs and activities that reduce GHG emissions to identify nine areas for consideration.

The list of GHG reduction measures that follow should not be considered recommendations as they have not been rigorously evaluated to determine their feasibility or cost effectiveness. Nor is the list comprehensive since broader engagement will undoubtedly lead to the identification of additional measures that should be pursued. Rather, they provide general direction on the types of policies that the County and Agencies can directly pursue or indirectly influence through advocacy and/or collaboration with State and regional partners.

The list includes over 100 high-level measures covering 1) Policy Changes, 2) Programs and 3) Financial Incentives. Some measures are simple while others are extremely complex and would involve a combination of resources and collaborative arrangements or changes to laws and regulations. While all measures contribute to GHG reduction, it is impossible to quantify the impact of each measure without additional resources and access to technical expertise.

**Table 1 – Priority Areas for County Consideration**

<b>Priority Areas for County Consideration</b>	<b>Corresponding Drawdown Technological, Ecological and Behavioral Solutions</b>	<b>MWCOG Identified Strategies</b>
Distributed Renewable Energy	Rooftop Solar, Micro Wind	√
Electric Vehicles	Electric Vehicles	√
Energy Efficient Buildings	Insulation, Heat Pumps, Green Roofs, District Heating, Smart Thermostats, Building Automation, Retrofitting	√
LED Lighting	LED Lighting (Commercial), LED Lighting (Household)	√
Mass Transit and Transportation Demand Management	Mass Transit	√
Walkable and Bikeable Communities	Walkable Cities, Ridesharing, Bike Infrastructure, Telepresence	√
Waste Reduction, Reuse & Recycling	Recycled Paper, Residential Recycling, Industrial Recycling	√
Food and Farming Strategies	Reduced Food Waste, Plant-Rich Diet, Conservation Agriculture, Regenerative Agriculture, Nutrient Management, Composting	
Tree Strategies	Afforestation, Forest Protection	

**Challenges**

There are enormous challenges to achieving a decarbonized future, including fiscal constraints, opposition to government regulation, jurisdictional limitations and cultural/behavioral resistance, to name just a few.

Fiscal and other constraints present a clear challenge. For example, the capital cost of building out the County’s proposed 81-mile Bus Rapid Transit System network is estimated to be \$2.9 billion, or \$36 million per mile; the Purple Line is estimated to cost \$5.9 billion; and offsetting the community’s carbon emissions from electricity consumption through the use of solar would require more than \$20 billion of

investment and more than 25,000 acres of rooftops or grounds, an area representing nearly eight percent of the total land area in the County.

Updates to existing government regulations and possible new regulations will likely engender significant resistance among both businesses and residents. For example, measures that disincentivize driving by taxing parking spaces or improve building energy efficiency by requiring commercial property owners to install building automation systems could inconvenience some and lead to criticism that County Government is overreaching.

Perhaps the greatest challenge centers on creating widespread awareness and a culture of sustainability. Many communities including Montgomery County are taking action to reduce their impacts on the climate. However, we are not alone in perceiving the challenges as daunting and requiring more than just local efforts. Mobilizing Montgomery County will require an outreach effort on an unprecedented scale. Moreover, such outreach cannot occur through a one-way flow of information like some conventional campaigns. Obtaining broad community support and participation will require an extensive visioning process and dialogue, and the path forward will be shaped by a series of trade-offs and compromises.

Regional collaboration with the State and neighboring jurisdictions will also be necessary to facilitate the implementation of numerous initiatives requiring harmonization and coordination. This is likely to involve extensive negotiations and the establishment of mutual agreements to effectively respond to the threat of climate change in a cooperative manner.

Finally, there are significant policy developments that are beyond the County's control and can either hinder or accelerate its GHG emissions reduction efforts. For example, the Federal Government is considering changes that would weaken Corporate Average Fuel Economy standards which, in turn, could increase local transportation emissions.

### **Opportunities and Co-Benefits**

Addressing the climate crisis by focusing exclusively on GHG reductions is likely to be overwhelming and draining. Instead, the County could and should view the climate crisis as an opportunity to enhance its overall quality of life including its economy and social well-being. In doing so, the County will also distinguish itself as a leader.

Indeed, co-benefits abound. Significant GHG reductions improve public health because of better air quality; businesses become more profitable when they employ energy conservation measures that lead to savings on energy costs; community resiliency is strengthened through greater energy and food independence; expanded transit options reduce congestion and enhance mobility; our economic base is broadened and made more competitive as sustainability-oriented entrepreneurs cater to environmentally conscious residents and businesses locally and beyond.

It is also important to note that nearly all the *Drawdown* solutions achieve savings over a period of 30 years. Moreover, in some cases, the County, State and private companies have access to financing

mechanisms to address financial barriers, particularly as it relates to commercial and residential buildings.

For example, the County has established the Commercial PACE program, as well as the Green Bank, to finance energy efficiency and renewable energy improvements for commercial and multifamily buildings. Electric and gas utilities, through the EmPOWER Maryland program, offer significant incentives and discounts on lighting, heating and cooling, appliances and other energy efficiency measures for both residents and businesses. Private solar companies also offer lease and power purchase agreements allowing customers to finance solar installations.

### **County Government and Agency GHG Reduction Methods to Date**

Stemming from the County’s original climate protection goal and other policy efforts, the County Government and County Agencies have implemented or contributed to a significant number of policies, programs and activities to reduce greenhouse gas emissions and improve the resiliency of the Community. This includes programs that either reduce GHG emissions or address other community needs with GHG reductions as a co-benefit. Table 2 provides some examples of these. A comprehensive list of over 150 GHG reduction efforts underway by the County Government and County Agencies can be found in Appendix B. Links to the Agency sustainability reports and other informational resources are included in Appendix D.

The County also has been a constant advocate before the Maryland Public Service Commission (PSC) and legislature on efforts to reduce GHG emissions. These entities, as well as other state and federal bodies, can influence key initiatives and policies with wide ranging potential. Examples include the County’s engagement before the PSC to support the installation of approximately 20,000 EV charging stations across Maryland and the development of microgrids to reduce emissions and bolster resiliency. Other examples include advancing and supporting legislative proposals before the Maryland State Legislature to foster additional clean energy development.

**Table 2 – Example Activities by County Government, MCPS or M-NCPPC**

<b>GHG Emissions Reduction Methods</b>	<b>Examples of Current County Government and County Agency GHG Reduction-Related Policies, Programs and Activities</b>
Distributed Renewable Energy	<ul style="list-style-type: none"> <li>• As of the end of 2018, government buildings, schools and parks will host 14.2 megawatts of solar.</li> <li>• County Government and M-NCPPC purchase 100% of annual electricity consumption from wind turbines. MCPS purchases 33% of annual electricity use from wind turbines.</li> </ul>
Electric Vehicles	<ul style="list-style-type: none"> <li>• Combined, the County Government and Agency fleets include 38 all-electric and 10 plug-in hybrid vehicles, as well as 18 EV charging stations for public use.</li> </ul>

Energy Efficient Buildings	<ul style="list-style-type: none"> <li>• Combined, the County Government and Agencies have nine LEED Silver and 37 LEED Gold facilities.</li> <li>• The Commercial PACE program and Montgomery County Green Bank finance energy efficiency and renewable improvements for commercial and institutional buildings.</li> <li>• County Government, MCPS and private non-residential buildings participate in the Building Energy Benchmarking program.</li> </ul>
LED Lighting	<ul style="list-style-type: none"> <li>• County Government and Agencies have completed numerous LED lighting retrofits in buildings, parking lots and outdoor spaces.</li> </ul>
Mass Transit and Transportation Demand Management	<ul style="list-style-type: none"> <li>• MCPS reduced miles driven per student since 2013.</li> <li>• County Government and Agencies offer a variety of programs to encourage sustainable transit by employees, including providing free or reduced cost transit options and options for telework and compressed work week.</li> <li>• Commuter Services works with businesses to increase employee transit use and other alternative commuting options by providing a wide range of financial incentives.</li> </ul>
Walkable and Bikeable Communities	<ul style="list-style-type: none"> <li>• The County has more than 72 bikeshare stations and is piloting dockless bikeshare.</li> <li>• The County has approximately 436 miles of hard and natural surface bike trails and lanes for commuting and recreation.</li> <li>• Bike/Pedestrian Safety Initiative, Vision Zero and Safe Routes to Schools program enhance bicycle and pedestrian safety.</li> </ul>
Waste Reduction, Reuse & Recycling	<ul style="list-style-type: none"> <li>• The County's current community-wide waste diversion/recycling rate is 61 percent.</li> </ul>
Food and Farming Strategies	<ul style="list-style-type: none"> <li>• More than 600 gardeners grow produce, herbs and flowers on 11 community gardens on Parks property.</li> <li>• Pre-consumer food scrap composting pilot at three County facilities.</li> <li>• Recognition of sustainable farms through the Green Business Certification Program.</li> </ul>
Tree Strategies	<ul style="list-style-type: none"> <li>• Combined, the County Government and the M-NCPPC own more than 30,000 acres of forested and wetland areas.</li> <li>• Tree Montgomery, Shades of Green and Leaves for Neighborhoods programs provide free and reduced-price trees in the County.</li> </ul>

**Countywide GHG Inventory**

Between 2005 and 2015, Montgomery County community-wide GHG emissions decreased by 14 percent, even as the population grew by 11 percent. Residential and commercial energy consumption accounted for 51 percent of emissions and transportation and mobile sources accounted for 41 percent. (See MWCOG GHG Inventory and Summary Factsheet in Appendix C). Moreover, although emissions between 2005 and 2015 decreased overall, emissions between 2012 and 2015 increased by nearly three percent, largely resulting from increased residential and commercial energy use. The factors causing

this increase and what policies could mitigate them require additional investigation, however the trend is concerning.

It is important to note that the inventory does not account for voluntary purchases of Renewable Energy Credits (RECs) on the part of businesses and residents which would lower overall emissions. However, the inventory also omits emissions from all the processes associated with the products and services consumed (e.g., mining, manufacturing, transportation). Were consumption-based emissions included in the GHG inventory, total emissions would increase significantly (although the changes that have occurred in this category of emissions between 2005 – 2015 are unknown).

### **Complementary Initiatives**

The County and Agencies are pursuing numerous initiatives that will result in a more expansive approach to reducing GHG emissions.

The County recently submitted its application for STAR Community certification. STAR is a comprehensive, data driven framework for benchmarking local economic, environmental and social performance measures. As such, it will reveal opportunities for new strategic plans, initiatives and policies. The STAR Community certification is designed to promote collaborative efforts that cut across sectors. In addition, it encourages shared responsibility and improves accountability for sustainability, including decarbonization.

The Department of General Services is finalizing a clean energy and resiliency plan, required by Council Bill 8-14, highlighting opportunities to incorporate advanced energy technologies in existing and future County buildings. This plan will enable the County to continue its efforts to incorporate renewable energy into County facilities while improving the ability of key County services to remain uninterrupted due to the impacts of major storms and other weather events that are expected to increase in frequency due to a changing climate.

In addition, the M-NCPPC will be updating its General Plan, which will include, among other things, a focus on climate change and sustainability.

Finally, the County Council recently passed Resolution 18-1095 requiring the development of an equity policy framework in County Government for budgeting and policy decisions. The Workgroup recommends that any new policies, programs or financial incentives adopted to reduce GHG emissions reductions be developed through an equity lens. The Workgroup encourages the Office of Legislative Oversight to include environmental factors in their baseline report that will advise the County Council's efforts to develop an equity policy framework to inform the delivery of all County services.

These initiatives dovetail with one another as well as with the goals in the Emergency Climate Mobilization Resolution and, importantly, will inform one another and present opportunities for continued collaboration.



## **Next Steps and Process Moving Forward**

The County is in the process of securing a consultant to provide additional analysis. It is expected that a contract, with initial funding, will be in place by the end of July 2018. Significant additional resources will be necessary to refine and prioritize the measures, determine relative costs and benefits, analyze trade-offs and identify additional actions. Moreover, the County Council and County Executive will need to establish a mechanism for broad community engagement and input, as well as a plan for implementation.

Appendix A. Potential Solutions or Actions

Appendix B: Inventory of GHG Reduction Actions to Date

Appendix C: MWCOG Montgomery County GHG Inventory and Summary Factsheet

Appendix D. Resources

Appendix E. Workgroup Members

## Appendix A: Potential Solutions or Actions

### Distributed Renewable Energy

*(Rooftop Solar, Micro Wind, Distributed Solar, Other Renewables)*

Renewable energy sources, such as solar and wind, are crucial to eliminating GHG emissions. Distributed renewable energy also improves resiliency by reducing reliance on large, centralized power plants. The most common and practical forms of distributed renewable energy in Montgomery County are rooftop, canopy and ground-mount solar.

#### **Current Status/Activity:**

- Solar installations on many County, MCPS and other public-sector buildings/properties.
- County efforts to install microgrids, including solar, via microgrid-as-a-service.
- Montgomery County C-PACE and Montgomery County Green Bank programs provide financing for solar and energy-efficiency.
- Recent changes to County zoning to permit free standing solar projects, such as community solar, up to 2 MW in many zones.
- Residential solar installations benefit from a fast-tracked permitting application process.
- State and County law prevent community restrictions on residential solar.
- Statewide Community Solar pilot.
- Valuation of solar study and grid modernization strategy under discussion at Maryland Public Service Commission under Grid-of-the-Future initiative.
- Montgomery County solar and energy storage co-ops.
- Utility streamlined interconnection efforts and upcoming solar ready “circuits” maps.
- Online utility tools for evaluating solar potential and cost benefits.
- Include renewable energy and energy-efficiency assets in property valuation.
- Maryland Energy Administration anemometer loan program.
- Small wind installations at Montgomery College; Montgomery County is evaluating the Correctional Facility site in Clarksburg for wind.

#### **Potential Next Steps:**

##### Policy Changes

- Advocate for expansion of Renewable Portfolio Standards (RPS).
- Expand recent changes to Zoning Code to allow additional solar (including Community Solar) and wind power in the agricultural reserve.
- Require solar on new or extensively modified buildings.
- Require residents to be offered solar for new home construction.
- Require buildings to be solar ready or require solar for new construction.
- Incorporate solar orientation into Master Planning and site design.
- Support solar friendly electricity tariffs, including tariffs that benefit larger systems.
- Identify real value of solar to the environment and utility ratepayers (e.g., environmental, utility load reduction) to support solar friendly electricity tariffs.

- Encourage solar as a resiliency option for public facilities.
- Fast-track commercial building permits for buildings with solar panel installations.
- Encourage micro wind generation where wind sources are more constant, such as atop taller buildings.
- Monitor improvements in micro wind generation to expand use of micro wind as technology improves.

#### Programs

- Develop/promote education programs to help consumers and businesses understand solar and storage options and how to evaluate offers from vendors.
- Educate businesses and building operators on financial models for installing solar (e.g., Power Purchase Agreements and Microgrids as a Service).
- Maximize use of solar on public buildings.
- Incorporate expanded solar uses in the Agricultural Reserve consistent with agricultural objectives.

#### Financial Incentives

- Provide tax credits, rebates, or other financial incentives for solar installations and battery storage systems.
- Support/expand Commercial PACE and Green Bank programs that leverage private sector funding for solar.

## **Electric Vehicles**

Electric vehicles (EVs) use battery-powered electric motors instead of fossil-fuel driven engines as the source of propulsion. The GHG potential of EVs is dependent upon the source of power used to charge the vehicle's batteries. Recent improvements in battery technology have enhanced the range and power of EVs.

#### **Current Status/Activity:**

- Federal income tax credit to buyers of new EVs up to \$7,500.
- Maryland excise tax credit available to buyers and lessees of EVs up to \$3,000.
- MEA Alternative Fuel Infrastructure Program (AFIP), for up to \$50,000 for businesses, state and local government agencies and non-profits to install DC Fast Charger.
- MEA Parking Lot Solar PV Canopy with Electric Vehicle Charger Grant Program for businesses, state and local government agencies and non-profits; from up to \$400/kW of installed solar PV capacity with a cap of \$200,000 per project.
- MEA rebates for residential and commercial charging stations (\$700 for residential, \$4,000 for commercial and \$5,000 for service stations).
- Proposal before the MD-PSC to allow the utilities to install over 20,000 EV charging stations throughout the state, including a significant number in Montgomery County.
- Use of High Occupancy Vehicle (HOV) Lanes for EV drivers.

- Fleets for the Future partnership through COG and the National Association of Regional Councils to develop cooperative procurement contract opportunities for jurisdictions interested in purchasing alternative fuel vehicles and infrastructure for use in their fleets.
- Over 100 government and business charging stations are publicly available; over 50 residential charging stations are publicly available through PlugShare network/app.
- County Government and M-NCPPC Montgomery County fleet combined have a total of 285 electric and gasoline/electric hybrid vehicles including 16 new Chevrolet Bolt electric vehicles; received grant for four electric buses and charging stations.
- In FY16, approximately 1,040 out of a total more than 25,440 newly registered vehicles were all electric.
- Development projects of certain types and sizes (based on numbers of parking spaces) required by Zoning Ordinance to provide certain number of EV charging-ready parking spaces.
- County is supporting the Public Services Commission’s proposal to implement a Statewide electric vehicle portfolio that would significantly expand electric vehicle infrastructure.
- City of Poolesville organizes annual electric vehicle parade, the largest gathering of electric vehicles on the East Coast.

### **Potential Next Steps:**

#### Policy Changes

- Expand the number of EV charging stations available at County garages and facilities.
- Require all new multi-family and commercial buildings to include EV charging stations.
- Implement a parking tax on non EV vehicles.
- Pursue economic development initiatives to support job growth in the transportation electrification sector to accelerate EV growth and support services.
- Accelerate phase in of electric Ride On buses as other jurisdictions are doing (Los Angeles, Vienna, London, Cape Town, New York).
- Increase the number of EV charging stations on public facilities to enable charging options for employees and visitors to County facilities in addition to fleet vehicles. This will encourage County employees to purchase EVs and reduce “range anxiety”.
- Expand use of High Occupancy Vehicle (HOV) Lanes to include shared autonomous vehicles.
- Develop policies for incentivizing shared autonomous vehicles either through dedicated lanes shared with transit, or through congestion pricing.
- Support policies that recycle or repurpose used electric vehicle batteries.

#### Programs

- Create program that allows private entities and utilities to deploy publicly available charging stations in the right of way. The City of Berkeley is piloting a residential curbside program.
- Work with regional jurisdictions and the State to develop a strategic plan prioritizing charging station infrastructure based on travel patterns to ensure comprehensive coverage.
- Work with carshare companies to provide affordable access to EVs.
- Establish a brand-neutral electric vehicle educational center where consumers can learn about a range of different electric vehicles, and test drive and loan them.
- Fund the replacement of hybrid buses with full electric buses and associated infrastructure including providing a specific budget for future replacements.

## Financial Incentives

- Promote state and federal EV tax incentives for residents and businesses.
- Provide free and/or preferred parking at government garages for EV users.
- Work with utilities to provide lower electricity rates for EV charging.
- Provide government subsidy to EV Lyft and Uber drivers.
- Wave or reduce vehicle registration fee for EVs.

## **Energy Efficient Buildings**

*(Residential and Commercial Sustainability Building Upgrades and Monitoring including Insulation, Heat Pumps, Green Roofs, District Heating, Geothermal Heating and Cooling, Retrofitting, Smart Thermostats and Building Automation)*

Building energy use constitutes the largest source of GHG emissions. Energy efficiency upgrades to buildings not only lower GHG emissions, but also reduce building operating costs.

### **Current Status/Activity:**

- Utilities offer building upgrade project incentives through the EmPOWER Maryland program.
- Multiple County programs currently or will soon support low/moderate income energy efficiency efforts (e.g., DCHA, future Energy Coach network).
- Green roof projects reduce building heating/mechanical loads and are eligible for Water Quality Protection Charge (WQPC) rebates.
- Building upgrade projects are eligible measures for C-PACE and Green Bank financing.
- Large private commercial buildings are already using Building Automation Systems (BAS); less common in small commercial and older multifamily properties.
- Demand-Side Management data sources are evolving (i.e. WeatherBug, smart meters, BAS and smart thermostats).
- Smart thermostats are becoming more mainstream as a residential energy management tool.
- Utilities are offering discounted smart thermostats through EmPOWER Maryland.
- Some County, MCPS and other public-sector buildings have building automation systems.
- Some County, MCPS and other public-sector buildings have geothermal heating and cooling systems.

### **Potential Next Steps:**

#### Policy Changes

- Fast-track building permits for buildings with green roofs.
- Require all building retrofits meet highest efficiency standards.
- Expand Commercial PACE to include new building construction.
- Require private building new construction/major renovations to include BAS installation.
- Require that all public buildings upgrade to a BAS where feasible.

- Provide a central clearinghouse/technical support organization to assist consumers in using smart meter data.
- Advocate for State-level regulations on refrigerant emissions, similar to California, which require facilities with large refrigeration systems to conduct and report periodic leak inspections, promptly repair leaks, and keep service records on site. The program also prohibits the sale and use of high-global warming potential refrigerants.
- Update codes and regulations as needed to minimize barriers to geothermal energy installations.

### Programs

- Education campaign on specific building upgrade technology benefits/energy savings as well as programs that are available to support upgrades (both residential and commercial).
- Education campaign about the low-impact energy savings of BAS/smart thermostats.
- Encourage utilities to offer a smart thermostat purchase during a Quick Home Energy Check-up.
- Education campaign about how to save energy using WeatherBug, smart meter, BAS and smart thermostat data.
- Recognize County food retailers that reduce their refrigerant emissions to meet EPA's GreenChill Store Certification.
- Awards program for net zero buildings and green homes to create awareness and competition for energy efficient green buildings.

### Financial Incentives

- Increase the County's current residential EE property tax credit.
- Expand the County's commercial/multifamily incentives for energy conservation devices/systems.
- Explore an innovative performance-based incentive, similar to the City of Takoma Park Neighborhood Energy Challenge.
- Expand Commercial PACE and Green Bank programs that leverage private sector funding.
- Provide performance-based energy efficiency upgrades.
- Utilities subsidize cost of smart thermostats through EmPOWER MD; County could provide incentive for the remaining cost (\$100).
- Offer a property tax credit for commercial BAS as an energy conservation device.
- Offer property owners tax credits if utilizing a green lease.
- Provide financial incentives and technical support to businesses that participate in refrigerant management practices above and beyond existing requirements.
- Expand home energy efficiency rebates to Montgomery County residents to reduce home energy usage.

## LED Lighting

*(LED Lighting - Household, LED Lighting - Commercial)*

Replacing CFL (compact fluorescent lamps), incandescent lamps and other less efficient lighting systems with high efficiency LED (light emitting diode) lighting can dramatically reduce energy use in buildings and outdoor spaces.

### **Current Status/Activity:**

- The cost of LEDs has dropped in recent years, but still have a higher cost than incandescent/CFLs.
- Many County, MCPS and other public-sector buildings/properties/parking lots and garages have installed LEDs.
- The County, other jurisdictions and HOAs are converting to LED streetlights and traffic signals.
- Utilities offer incentives for LED lighting upgrades through the EmPOWER Maryland program.
- Financing is available for LED lighting upgrades (e.g., Commercial PACE, Green Bank).

### **Potential Next Steps:**

#### Policy Changes

- Convert public building lighting systems to LEDs where appropriate.

#### Programs

- Create a CFL/incandescent bulb trade-in program to give out LED bulbs/coupons.
- Encourage utility customers who received CFLs through Quick Home Energy Check-ups to call their utility for LED upgrades.
- Educational campaign about benefits of LED technology and strategies for successful implementation (e.g., people may find they need fewer lights).
- Develop program to convert state and municipally owned streetlights to LED.
- Create outdoor lighting standards/regulations, similar to “dark skies” standards to save energy and reduce light pollution.

#### Financial Incentives

- Provide incentives for facility managers who upgrade their lighting to LEDs.  
Create an incentive for HOAs to replace external lighting/streetlights with LEDs.

## **Mass Transit and Transportation Demand Management**

*(Metro, Bus, Microtransit, Reduced Work Week and Telepresence)*

Mass transit and transportation demand management solutions are focused on reducing single occupancy vehicle travel. Solutions include financial and other incentives to encourage residents and those employed in the County to use alternative modes of transportation and telework, as well as improvements to or development of a range of mass transit options.

### **Current Status/Activity:**

- MCDOT serves 26 million passengers a year with a fleet of 370 buses, 100 percent of which are hybrid electric, compressed natural gas or clean diesel.
- Suite of Commuter Services “Better Ways to Work” programs and incentives including: Fare Share transit/vanpool subsidies; rideshare matching; Guaranteed Ride Home; and outreach programs.
- State tax credit of 50 percent up to \$100/month/employee for employers offering transit/vanpool subsidies.
- Transportation Management Districts (TMDs) require businesses of 25 or more employees to submit a Traffic Mitigation Plan and annually report on activities.
- New development projects in TMDs required to include TDM-supportive components.
- Green Business Certification Program includes elements related to adoption of TDM strategies by businesses.
- \$35 monthly transit subsidy to County government employees; pre-tax payroll deduction for remaining costs to maximum under Federal tax law; free Ride On using C-pass on employee badge.
- Free rides on weekdays between 2pm and 8pm on Ride On buses and certain Metrobus routes within Montgomery County to kids ages 18 and under (older if still in high school) who are Montgomery County residents.
- Free rides for seniors and people with disabilities on Ride On and Metrobus from 9:30am-3pm, Monday-Saturday and half fare rides at all other times.
- 2015 Transit Task Force Report and recommendations.
- Provision and promotion of car/vanpool parking spaces at reduced rates in County garages; installation of parking availability signs at County parking garages to reduce time spent circling for parking.
- Parking below minimum requirements is allowed under the Commercial Residential Town (CRT), Commercial Residential (CR), Life Sciences Center Floating (LSC) and Employment Office Floating (EOF) zones, and in the Commercial Residential Neighborhood (CRN), Non Residential (NR) and General Rural (GR) zones for properties located within one mile of a transit station.

### **Potential Next Steps:**

#### Policy Changes

- Adopt parking policies that disincentivize driving and parking, particularly in urban centers (e.g., expand the elimination of parking minimums in commercial developments, eliminate Parking Convenience Stickers in Parking Lot Districts and reduce or eliminate availability of other monthly payment arrangements).
- Limit freeway speed limit to 55 mph, enforce speeding using advanced technology and collaborate with local jurisdictions to harmonize policies regionally.
- Expand TDM program countywide; include multi-unit residential as well as commercial projects.
- Ensure rights-of-way provide for shared uses, including transit and separated bikeways.
- Incentivize teleworking and alternative work schedules at least two days a week for all employers.



## Programs

- Build out majority of Rapid Transit System (RTS) network, including Bus Rapid Transit (BRT) and Corridor Cities Transitway (CCT).
- Implement dedicated HOV lanes on major County roads (some of which could be HOT lanes, particularly during off-peak). Add frequent bus service in designated HOV/HOT lanes. Consider shared autonomous vehicle usage in HOV/HOT lanes.
- Lobby to maximize Metrorail capacity by using eight-car trains and having 24 trains per hour.
- Maximize MARC capacity, advocating for increased frequency and two-way service.
- Increase use of demand-responsive/micro-transit strategies to facilitate service between residential neighborhoods and transit hubs.
- Conduct intensive outreach to residents, businesses and schools regarding transit use and commuting alternatives, e.g., work with schools to incorporate components into curriculum to create healthy, green commuters of the future – and to promote changes in culture for both children and their parents (similar to non-smoking and seat-belt use campaigns).

## Financial Incentives

- Increase transit subsidy to County government and Agency employees; charge employees for parking.
- Impose a tax on parking transactions at non-residential parking places, similar to the City of Pittsburgh.
- For Ride On fare, reduce cost; offer corporate sponsorships of certain routes to offset increased costs. Subsidize Metro fares for trips within Montgomery County.
- Implement taxation and insurance programs tied to vehicle miles traveled.
- Expand network of Park & Ride lots at key interchanges and intersections in outer portions of the County and coordinate with surrounding jurisdictions; implement dynamic pooling opportunities for commuters involving buses, Transportation Network Companies (e.g., Uber, Lyft).
- Provide tax incentives for carpool participants.  
Employers subsidize first mile-last mile (or two – three miles) to connect with transit/other transportation options through shuttles, bikeshare or Transportation Network Companies.

## **Walkable and Bikeable Communities**

*(Walkable Cities, Bikesharing and Bike Infrastructure)*

Mass transit offers one alternative to single occupancy vehicles. Biking and walking provide other alternatives that not only reduce GHG emissions but provide health benefits to the participant. Solutions in this area focus on creating communities and infrastructure that support safe and efficient biking and walking opportunities.

### **Current Status/Activity:**

- Capital Bikeshare network of docked bikes across Montgomery County and piloting dockless bike-share program in Silver Spring and Takoma Park.
- The County has approximately 436 miles of hard and natural surface bike trails and lanes for commuting and recreation.
- New Bicycle Master Plan has been sent to the County Council for review. The Bicycle Master Plan includes a Bicycle Stress Map to help public make decisions about where to bicycle and to help planners understand the impediments to bicycling during development of the Bicycle Master Plan.
- Bicycle Pedestrian Priority Areas (BiPPA) enhance safety and facilitates bike/ped connections in 29 targeted areas.
- Expansion of bicycle infrastructure, including separated bike lanes, bike boxes and protected intersection. Outreach and educational recently developed to expand understanding of new cycling infrastructure.
- Adding more bike parking racks in high-demand areas.
- Chapter 49 of the Montgomery County Code (“Streets and Roads”) requires sidewalks on both sides of most streets; target speed for urban streets, business district streets and secondary and tertiary residential streets is 20 – 25 MPH.
- County land use plans emphasize a “constrained parking policy” to minimize parking in urban areas.
- Plans for new development and redevelopment focus on creating pedestrian connections to destinations.
- New development projects in Transportation Management Districts required to include biking- and walking-supportive components, and to participate in programs to encourage biking and walking among employees and residents.
- Bike/Pedestrian Safety Initiative, Vision Zero and Safe Routes to Schools program enhance bicycle and pedestrian safety.
- Bicycle and pedestrian safety are enhanced continuously through intersection improvements, sidewalk maintenance and repairs and the Bus Stop Improvement Program.
- Neighborhood traffic calming, speed cameras and red light cameras reduce vehicle speeds and enhance safety.
- Redevelopment of County-owned surface parking lots into mixed use developments in urban cores.

### **Potential Next Steps:**

#### Policy Changes

- Ensure adequate lighting along all rights-of-way and particularly at intersections and other crossing points, to make cycling and walking after dark safer and more pleasant.
- Ensure full funding for maintenance of walking and cycling paths and road crossings.
- Expand use of technology to improve bike and pedestrian safety.
- Ensure rights-of-way incorporate opportunity for optimum bike and pedestrian infrastructure.
- Extend requirements for pedestrian- and bicycle-friendly development components to all areas of the County and all types of development projects.

- Incorporate electric bikes, scooters, other new and future two- or three-wheeled options into transportation network.
- Expand bike rack capacity and admissibility on bus and rail systems.

### Programs

- Approve and fully implement the Bicycle Master Plan.
- Expand dockless bikeshare throughout the County, including non-urban areas such as UpCounty.
- Expand bike parking in urban centers, areas where personal and bikeshare bikes are in greater use.
- Expand Safe Routes to School and implement Safe Routes to Parks programs.
- Increase funding for training and education programs related to bike safety and city cycling classes; incorporate instruction for school children into curriculum to promote safe bicycling and walking and build the green commuters of the future.

### Financial Incentives

- Establish a Live Near Your Work program like Baltimore City.
- Provide tax incentives to employers that incentivize employee walking and biking.
- Incentivize employers to subsidize first mile-last mile (or two – three miles) to connect employees with transportation options through bikeshare or personal bike programs.
- Encourage development of health insurance incentives/benefits for both employers and employees for promoting and achieving significant percentages of healthy commuting by their workforce via cycling or walking.
- Require new or extensively renovated buildings to provide bike friendly accommodations and infrastructure (e.g., secure storage, shower facilities).

## **Waste Reduction, Reuse and Recycling**

*(Recycled Paper, Residential Recycling and Industrial Recycling)*

The end-of-life management of products and materials creates significant opportunities to reduce GHG emissions. Reducing the amount of waste generated should be the highest priority. Products that have reached the end of their “original” life can be reused and recycled into a variety of new products.

### **Current Status/Activity:**

- The County’s current waste diversion/recycling rate is 61%. This is the combined rate for residential, commercial and government across the entire County.
- The County requires recycling of mixed paper, commingled containers, yard trim, Christmas trees and scrap metal items at all properties.

- Generators of other recyclable materials for which markets are developing or exist are encouraged to separate these materials for voluntary recycling.
- Additional recycling, reuse and/or waste management opportunities are provided at the Transfer Station for materials including: reusable building materials, bulky rigid plastics, textiles (including clothing and shoes), electronics and computers, household hazardous waste, automotive fluids, tires, appliances/scrap metal items and more.
- The County’s procurement law requires procurement of goods containing recycled materials by County departments and allows a price differential of up to 10% for recycled materials.
- Administrative Procedure 5-23 provides guidance to County departments on methods to reduce the amount of paper purchased and used, reduce overall printing and reduce mailing costs.
- Many County agencies require electronic reviews of applications and permits saving costs on paper and waste as well as increasing efficiency of reviews.
- A long-term planning effort has begun that includes the future vision of the County’s solid waste and recycling programs and operations with the goal to maximize waste reduction, reuse/repair, recycling and sustainable materials management. Actionable strategies, new investments, initiatives, changes in methods of operations and retiring or replacement of existing facilities will be included in this planning effort.

**Potential Next Steps:**

Policy Changes

- Implement development standards to ensure adequate recycling infrastructure exists in all new development, including multi-family and commercial buildings.
- Support extended producer responsibility laws at the state and federal level related to packaging, the recyclability of packaging and the responsibility to take back hard-to-recycle packaging and products.
- Require bids for County services and products to be submitted electronically.
- Require all development applications and permits to be submitted electronically.
- Create green purchasing ordinance like the City of San Francisco’s SF Approved program which would require County staff to buy designated green products.
- Expand curbside pickup of solid waste and recyclables to all parts of the county and do not rely on individuals contracting with separate firms.

Programs

- Increase education about the County’s solid waste management and recycling programs.
- Expand list of recyclable materials taken by the County.

Financial Incentives

- Incorporate “pay-as-you-throw” charging systems for waste disposal.

## Food and Farming Strategies

*(Reduced Food Waste, Plant-Rich Diet, Conservation and Regenerative Agriculture, Nutrient Management and Composting)*

The growth, consumption and management of excess food encompasses a variety of activities that involve the County's agricultural sector, restaurants and other food service establishments, and residents.

### **Current Status/Activity:**

#### *Conservation and Regenerative Agriculture, Nutrient Management*

- Maryland Cover Crop Program and Maryland Agricultural Water Quality Cost Share grants.
- Technical and financial assistance through the USDA Natural Resources Conservation Service (NRCS).
- Technical assistance for developing conservation plans through Montgomery County Soil Conservation District (MSCD).
- MSCD equipment rental program (e.g., No Till Drill).
- University of Maryland Extension Nutrient Management Program provides farmers with technical assistance for nutrient management plan development.
- Sustainable farms included in the Green Business Certification Program.

#### *Reducing Food Waste and Encouraging Plant Rich Diets*

- MCPS' Division of Food and Nutrition Services (DFNS) features daily meatless items; working with manufacturers to develop plant-based protein offerings that meet the required meat/meat alternative equivalent.
- The Strategic Plan to Advance Composting, Compost Use and Food Scraps Diversion in Montgomery County (April 2018) provides direction, framework and recommended strategies to reduce wasted food, channel excess food to others with unmet needs and increase the amount of food scraps recycled through composting and/or other technologies, such as anaerobic digestion.
- County supports Community Food Rescue, a Manna Food program that receives food donations from local businesses that would have been thrown away and delivers it to agencies serving those in need.
- The Montgomery County Food Council is creating a comprehensive list of all current hunger relief resources and emergency food providers in the County to highlight existing efforts and gaps; the Council also created a Food Security Plan which addresses who is at risk, where they are and what their barriers are to food security.
- Food waste composting taking place at cafeterias in three County buildings – Executive Office Building, Council Office Building and Public Safety Headquarters.
- Live Well initiative incorporates messaging and campaigns for plant based diets.

## **Potential Next Steps:**

### Policy Changes

- Provide farmers with subsidized compost to help sequester carbon in soil.
- Require all restaurants and caterers to compost food scraps and disposable food service ware.
- Explore local options to reduce packaging and single-use items (bags, utensils, condiments, napkins) in restaurants and food service operations.
- At MCPS cafeteria lines, display fruit/vegetables at the beginning and make them default side dishes.
- Provide expedited permitting for rooftop vegetable gardening.
- Support amendments to Maryland's Lawn Fertilizer Law to ease restrictions on the application of compost to turf.

### Programs

- Develop incentives to encourage increased separation of commercially-generated food scraps for recycling.
- Establish a Regenerative Agriculture staff position to train farmers and assist them in becoming certified through the Rodale Institute's new Regenerative Organic Certification program (in pilot stage).
- Secure processing capacity for commercially-generated food scraps to facilitate and increase the amount of food scraps separated for recycling, delivered to processing facilities for composting and/or anaerobic digestion and recycled.
- Refine and implement recommendations of the Strategic Plan to Advance Composting, Compost Use and Food Scraps Diversion in Montgomery County.
- Establish training program around no/low till, cover cropping, crop rotation, etc.
- Launch Meatless in March campaign, similar to the City of Santa Monica.
- At MCPS, increase the variety of plant-based entrees to include home style dishes using beans, lentils and dried peas; develop marketing strategies to educate students on plant-based protein entrées and how they can be part of a healthy school meal; continue student based focus groups at all levels to assess acceptability of new plant-based protein sources as part of the reimbursable meal.
- Expand the number of edible gardens at MCPS and other County government facilities.

### Financial Incentives

- Incentivize farmers to use cover crops and practice crop rotation and no/low till.
- Provide property tax credits to farmers who achieve Regenerative Organic Certification.
- Provide financial incentives to restaurants with all-vegetarian or vegan menus.
- Provide farmers with subsidized compost to help sequester carbon in soil.

## Tree Strategies

*(Afforestation, Forest Protection, Individual Tree Planting on Lots)*

Tree strategies are key for carbon sequestration. Afforestation refers to the creation of new forests where there were none before. Reforestation is the establishment of forest/tree cover in areas that had recent tree cover.

### **Current Status/Activity:**

- A number of laws are in place to protect trees and forested areas and require tree planting or payment into a fund through in-lieu fees, when development occurs, resulting in a variety of tree planting activities on public and private land.
- Efforts to avert damage to homes, buildings and utility lines during inclement weather includes removal of damaged or overhanging street trees in the right-of-way.
- Priority planting areas County-wide are increasingly being identified through GIS technology.
- The Montgomery County Planning Department has a tree canopy analysis on their web page.
- DGS is expanding efforts to increase tree canopy on public facilities.

### **Potential Next Steps:**

#### Policy Changes

- Require a no net loss of trees on a developed site (accounting for tree size and maturity, not just number of trees) and establish incentive program for tree gain on a site.
- Establish greater incentives for stormwater management installed beneath infrastructure like parking lots and other structures to provide greater available land area for tree planting and habitat preservation.
- Support establishment of policy on State level to provide stormwater credit for protection of existing trees on a site.
- Support establishment of policy on State level to ensure that use of trees in stormwater management facilities receive stormwater credit.
- Increase funds available for tree-planting activities by issuing G.O. Bonds to finance program.
- Update the County's tree canopy analysis and use to focus efforts at increasing canopy.
- Underground all utilities in already developed areas to allow for fully sized canopy trees to develop.

#### Programs

- Improved educational campaigns in support of tree planting incentives on private land.
- Improved educational campaigns supporting best management practices for tree protection and care including mandatory deer caging and non-native invasive plant removal.

### Financial Incentives

- Expand available funding for tree planting incentives on private land.
- Fully fund the street tree planting program.
- Incentivize tree gain on sites undergoing development with focus on species diversity.
- Increase funding for after-care of planted trees on public and private lands to increase tree survival rates.
- Incentivize preservation of existing habitat, trees and forest cover in areas slated for development.



## **Appendix B: Inventory of GHG Reduction Actions to Date**

The following is a selected list of GHG reduction actions taken to date by Montgomery County Government, Montgomery County Public Schools and Maryland-National Capital Park and Planning Commission. Additional information can be found in the sustainability reports and plans listed in Appendix D.

### **Distributed Renewable Energy**

#### **County Government Operations**

- Installed 5.3 megawatts of solar on 15 County facilities as of December 2017. These panels have the ability to generate more than 6.6 million kilowatt hours of electricity each year, lowering greenhouse gas emissions as much as taking 980 cars off the road. Installation of an additional 5.7 megawatts of solar is underway.
- Montgomery County is installing microgrids at Public Safety Headquarters and Montgomery County Correctional Facility. When completed in 2018, the microgrid at Public Safety Headquarters is expected to generate 11.4 million kilowatt hours of clean and low emissions energy and will reduce greenhouse gas emissions as much as taking 680 cars off the road. The project design will include two megawatts (MW) of solar photovoltaic canopies mounted over the existing parking lot.
- The County is working with Pepco to develop a public service microgrid in Rockville that will ensure key facilities, including City and County buildings, grocery stores, gas stations, pharmacies and other important services remain open and available to the public even during major power outages.
- The County is currently reviewing options for installing microgrids at additional County facilities.
- Montgomery County government purchases 100 percent of its annual electricity consumption from clean sources, specifically energy generated by wind turbines.

#### **County Government Policies and Programs**

- Expedited Solar Permitting: Legislation passed in 2014 to fast track and reduce costs associated with solar installations on single detached residences. Local solar installations are also exempt from the County's Fuel Energy Tax, which applies to fossil-fuel generated electricity and other building fuels.

#### **Montgomery County Public Schools**

- Currently MCPS is hosting rooftop photovoltaic systems at 12 school sites with three megawatts of installed capacity.
- In 2018, MCPS will add five rooftop photovoltaic systems that will generate an additional capacity of 1.4 megawatts. Upon completion, MCPS will be hosting solar photovoltaic systems at 17 school sites with the ability to generate 4.4 megawatts of electricity.

- The hosted solar arrays provide an annual savings of around 14 percent for each school with the rooftop units.
- MCPS purchases 33 percent of its annual electricity consumption from clean energy sources through purchases of renewable energy certificates.

### **Maryland-National Capital Park and Planning Commission**

- Installed a combined 2.5 megawatts of ground-mounted solar at South Germantown Recreational Park and Rock Creek Regional Park as of March 2018. Combined, the arrays produce about 3,500,000 KWH of solar electricity annually – offsetting 2,877 tons of greenhouse gases. This is equivalent to the carbon sequestered by over 3,000 acres of US forest or the amount of CO2 generated in the production of the grid-supplied electricity used by nearly 400 average American homes in a typical year.
- M-NCPPC – Montgomery County is currently working on piloting small-scale solar panel installations on park shelters and bathroom facilities.
- As an agency, M-NCPPC purchases 100 percent of its annual electricity consumption from clean sources, specifically energy generated by wind turbines.
- Master Plans include provisions to increase use of renewable energy.

## **Electric Vehicles**

### **County Government Operations**

- Montgomery County’s government fleet includes 37 all electric vehicles and 6 plug-in hybrid vehicles.
- There are 16 electric vehicle charging stations for fleet use and 13 EV stations for public use at County facilities.
- Montgomery County was just awarded a grant from the Federal Transportation Administration to purchase four electric buses and charging stations.
- In FY17, the County replaced 25 fleet sedans with hybrid sedans, converted 6 gasoline vans to hybrid and installed idle reduction technology on 35 vehicles.

### **Maryland-National Capital Park and Planning Commission**

- M-NCPPC – Montgomery County’s fleet includes 37 hybrid vehicles, four plug-in hybrid electric vehicles and one all-electric vehicle.
- There are five electric vehicle charging stations for fleet use and the agency is currently working on a contract for the first public electric vehicle charging station on parkland.

## Energy Efficient Buildings

### County Government Operations

- Montgomery County is implementing a multi-year plan to invest more than \$100 million in facilities through energy performance contracting. These energy use reduction projects are expected to reduce GHG emissions by more than 25,000 metric tons per year.
- 11 County government facilities have green roofs, totaling 523,713 square feet or 12 acres.
- Several County buildings, including White Oak Community Recreation Center, employ geothermal heating and cooling.
- Montgomery County is employing cogeneration, or combined heat and power (CHP), technology at facilities that have a high level of hot water use and that operate long hours. CHP is installed at the Pre-Release Center. The County also is installing CHP as part of its microgrid projects at the Montgomery County Correctional Facility and Public Safety Headquarters.
- Approximately 80 buildings in the County's portfolio have building automation controls and Facilities Management staff are using the controls to better manage and balance energy use and occupant comfort.
- New buildings and energy saving retrofits to existing buildings incorporate addition of building automation controls.
- Through its Continuous Energy Improvement Program, the County continually evaluates the energy performance of its portfolio of facilities, identifies deficiencies, formulates action plans, implements low and no cost solutions and mobilizes resources to resolve more complex issues.

### County Government Policies and Programs

- Commercial Building Energy Benchmarking: First county in the nation to pass a building energy benchmarking law which became effective in February 2016. It requires commercial building owners with 50,000 gross square footage or more to report their building energy use annually for public disclosure.
- Commercial PACE Financing: Adopted in 2015 to help commercial property owners finance energy-saving upgrades through a property tax surcharge repaid over the life of the upgrade, potentially financing up to 100% of the cost and for up to 20 years.
- Green Bank: Created through legislation in 2015, the Montgomery County Green Bank's sole purpose is to increase investment and implementation of energy improvements across all sectors in the County. The Bank, still in its developmental stage, will use its seed capital to spur private capital investment, provide unique programs to target and open new markets to energy-saving investments, and contribute to a growing regional market of energy financing.
- Energy Efficiency and Environmental Design Requirements: Enacted in March 2007, the law requires that all new public and private buildings greater than 10,000 square feet be LEED Silver (public) and LEED Certified (private). Private building owners are eligible for property and special service tax credits based on a building achieving one of 10 qualified ratings for energy efficient buildings, most of which are tied to a Gold or Platinum LEED rating.

- Energy Summit: The County and the U.S. Green Building Council-National Capital Region co-host an annual, all-day Energy Summit annually focusing on commercial energy efficiency and clean energy in the County.
- Energy News: DEP disseminates a number of monthly energy-related newsletters, including Energy News, which is sent to over 2,000 residents, and Commercial Energy News, which is sent to 1,400 business representatives.
- Adoption of the 2015 International Energy Conservation Code and the 2012 IgCC: The County adopted and enforces the International Energy Conservation Code (currently the 2015 IECC) without modification or amendment. The County has also adopted the 2012 International Green Construction Code with amendments.
- Energy Exploration: DEP holds "Energy Express" workshops tailored to elementary students who love science. Students learn the basics of renewable energy (solar + wind) and then build their own renewable energy powered devices, including a SunZoon Lite Solar Car or a Wind Generator II.
- Energy Coach Network: Currently in development, the program will support in depth public outreach to single family and multi-family residents of all incomes with a focus on low and moderate-income residents. The ECN will accomplish this by providing trained personnel to provide support through the sometimes confusing and complex process of accessing resources to help residents save on their energy bills, choose affordable clean energy and access assistance for paying high bills.
- Montgomery County Energy Efficiency Program: The program is aimed at reducing home energy usage for PEPCO customers and includes services such as insulation, A/C upgrades, LED light bulbs, appliance upgrades and more for households meeting certain income requirements.
- Newly launched Homeowner Energy Efficiency Program provides free energy-efficiency upgrades to modest income homeowners. Upgrades may include attic insulation, upgraded furnace and air conditioning units, water heater replacement, LED light bulbs, solar-powered attic fan, programmable thermostat and new energy efficient appliances.

### **Montgomery County Public Schools**

- As of FY 2017, green roofs have been installed at 34 school sites, totaling 946,047 sq. ft. Two other projects are currently under construction that will add approximately 120,000 sq. ft.
- In FY 2017, MCPS launched an effort to research and implement energy-saving improvements for its data center. Initial actions included increased server virtualization and consolidation of storage area networks (SANs).
- 23 LEED Gold certified schools and 2 LEED Silver certified schools.
- Geothermal heating and cooling system is installed in 31 schools.
- Energy management systems (EMS) are installed in most of the MCPS buildings. These systems maximize energy savings by controlling when and how the heating, ventilation and air cooling (HVAC) systems operate.
- MCPS continues to upgrade its systems due to changes in technology, software and hardware. Between FY 2014 and FY 2017, 92 schools have received EMS upgrades.
- The HVAC replacement program implements the systematic replacement of the HVAC equipment to maximize indoor environmental quality (IEQ) and energy performance.

- Between FY 2014 and FY 2017, 59 HVAC replacement projects have been completed and MCPS is on target to complete 17 replacement projects in FY 2018.
- New construction projects include low flow water fixtures for faucets and showerheads, waterless urinals and dual flush valves that use 1.1 gal of water for liquid waste and 1.6 gal water for solid waste.
- Between FY 2013 and FY 2017, 93 restroom renovation projects have been completed that include many of the water conservation features listed above.

### **Maryland-National Capital Park and Planning Commission**

- M-NCPPC – Montgomery County Parks operates its Shady Grove maintenance facility out of a County facility that has a green roof. In March of 2017, Montgomery County Parks relocated 170 employees to this new LEED Silver facility. Among many sustainable improvements, the parks campus has over 85,000 square feet of vegetative roof and a complete building automation system.
- The recently opened Rock Creek Maintenance Facility, located in Rock Creek Regional Park was designed to achieve LEED Gold. This facility was designed with geothermal HVAC, solar tubes for hot water heating and solar panels.
- In M-NCPPC – Montgomery County facilities, high efficiency heating, ventilation and air conditioning (HVAC) systems that meet ENERGY STAR or equivalent standards are installed in all new and retrofit construction projects. Additionally, exposed piping and ventilation ducts are insulated to LEED Silver or equivalent standards. LEED Silver or equivalent standard insulation material is installed at new facilities and major renovations.
- M-NCPPC – Montgomery County is working on the implementation of a small-scale net-zero facility that will serve as the Maydale Nature Center. This facility will utilize rainwater harvesting, and will include solar panels, among other sustainable building/design elements.
- M-NCPPC – Montgomery County has installed 116 Ecobee Smart thermostats in Park facilities across the County. The M-NCPPC – Montgomery County HVAC Supervisor and team have much greater management control to troubleshoot system issues remotely and balance energy use and occupant comfort.
- M-NCPPC – Montgomery County continually evaluates utility consumption across facilities, identifies deficiencies and devises strategies for planned upgrades to address the specific needs of the site.
- Master Plans include provisions to increase use of passive solar through building and site orientation.
- Master Plans include provisions to encourage water conservation and to move toward net zero energy use buildings.

## LED Lighting

### County Government Operations

- LED lighting projects on County facilities completed in FY17 are expected to save the County \$191,354 in electric bills and to reduce greenhouse gas emissions as much as 1,177 metric tons each year. LED lighting projects completed between FY13 and FY16 reduced GHG more than 4,300 metric tons each year.
- The County plans to retrofit its 26,000 streetlights to highly energy efficient lighting over the next two years, with anticipated energy savings of more than \$1 million each year. The project also is expected to reduce greenhouse gas emissions as much as 6,395 metric tons annually.

### Montgomery County Public Schools

- All retrofit lighting projects at MCPS are installed with LED lamps/fixtures.
- A LED lighting retrofit program for high school auditoriums began in 2013; 40 percent of the auditoriums are completed as of FY 2017.
- Since 2015, all new construction projects are designed with LED lighting throughout the school.

### Maryland-National Capital Park and Planning Commission

- At M-NCPPC – Montgomery County facilities, light-emitting diodes (LEDs), daylight fixtures or other efficient low-energy lighting solutions are used in place of incandescent, halogen or fluorescent lights.
- In FY16 and FY17, parking lot lights in 48 M-NCPPC parks were retrofit with LED technology.
- M-NCPPC – Montgomery County intends to continue implementation of parking lot lighting retrofits to LED.

## Mass Transit and Transportation Demand Management

### County Government Operations

- Montgomery County employees have access to free Ride On bus service.
- Free rides on weekdays between 2pm and 8pm on Ride On buses and certain Metrobus routes within Montgomery County to kids ages 18 and under (older if still in high school) who are Montgomery County residents.
- Free rides for seniors and people with disabilities on Ride On and Metrobus from 9:30am-3pm, Monday-Saturday and half fare rides at all other times.
- Get-In Program reimburses County Employees for regular public transit use.
- Commuter Transit Flexible Spending Account benefit offered to County employees starting in 2018.

- Provision and promotion of car/vanpool parking spaces at reduced rates in County garages; installation of parking availability signs at County parking garages to reduce time spent circling for parking.
- Montgomery County Government Telework Pilot. Montgomery County piloted a formal employee telework program from March 2016 – February 2017. Following the successful pilot, telework began being implemented more widely across the County with the official telework policy going into effect July 25, 2017. As of November 2017, there are 322 employees participating in the telework program, typically one day per week or on an as needed basis.

### **County Government Policies and Programs**

- MCDOT serves 26 million passengers a year with a fleet of 370 buses, 100 percent of which are hybrid electric, compressed natural gas or clean diesel.
- Suite of Better Ways to Work programs and incentives including: transit/vanpool subsidies; rideshare matching; Guaranteed Ride Home; and outreach programs.
- Transportation Management Districts (TMDs) require businesses of 25 or more employees to submit a Traffic Mitigation Plan and annually report on activities.
- New development projects in TMDs required to include TDM-supportive components.
- Green Business Certification Program includes elements related to adoption of TDM strategies by businesses.

### **Montgomery County Public Schools**

- Diesel particulate filters are installed in 88 percent of the buses. The goal is to install diesel particulate filters in all buses by 2019.
- Annual number of miles driven for each student is 189 miles in FY 2017 compared to 192 miles in FY 2013 despite the increase in student enrollment and transportation needs.

### **Maryland-National Capital Park and Planning Commission**

- M-NCPPC – Montgomery County operates a van-pool for staff that is utilized by 40-45 staff traveling between 50-90 miles per day, round trip.
- The agency maintains an Administrative Procedure for Alternative Commuting Resources (03-02) for commuting staff to utilize free of charge during qualifying emergency situations.
- The agency maintains Administrative Procedure for Telework Agreements (03-01) and Compressed Work Schedules (95-02) for staff to utilize that reduces impacts from transportation and costs/needs associated with workspace operations.
- Master Plans include provisions for transit-served communities.
- Purple Line Master Plan and multi-agency BRT Alternatives plans address key mass transit elements for the region.
- M-NCPPC can provide Commercial Residential (CR) Zone Public Benefit Points for transit proximity, connectivity and mobility, and diversity of uses and activities during regulatory review.
- M-NCPPC's Mobility Assessment Report identifies mobility trends and priority areas for public transit improvements.

## **Walkable and Bikeable Communities**

### **County Government Operations**

- Discounted membership in Capital Bikeshare for County Employees.
- As of December 2017, the County has installed 72 bikeshare stations.
- The County is piloting dockless bikeshare options in Silver Spring and Takoma Park.
- The County is currently improving bicycle access in the Pike District and elsewhere across the County by constructing protected bike lanes and improving bicycle access to public transit stations.
- Redevelopment of County-owned surface parking lots into mixed use developments in urban cores.
- Bicycle and pedestrian safety are enhanced continuously through intersection improvements, sidewalk maintenance and repairs and the Bus Stop Improvement Program.
- Neighborhood traffic calming, speed cameras and red light cameras reduce vehicle speeds and enhance safety.

### **County Government Policies and Programs**

- Bicycle Pedestrian Priority Areas (BiPPA) enhance safety and facilitates bike/ped connections in 29 targeted areas.
- Expansion of bicycle infrastructure, including separated bike lanes, bike boxes, protected intersections; outreach and educational materials in development to expand understanding of new cycling infrastructure.
- New development projects in Transportation Management Districts required to include biking- and walking-supportive components and to participate in programs to encourage biking and walking among employees and residents.
- Bike/Pedestrian Safety Initiative, Vision Zero and Safe Routes to Schools program enhance bicycle and pedestrian safety.

### **Maryland-National Capital Park and Planning Commission**

- The agency maintains more than 250 miles of hard surface and natural surface trails County-wide. All hard surface trails have recently been opened after-dark to transient biking in support alternative commuting opportunities.
- Master Plans include provisions for compact communities, walkable and bikeable communities, bicycle and trail connections and mixed-use communities.
- New Bicycle Master Plan has been sent to the County Council for review. The Bicycle Master Plan includes a Bicycle Stress Map to help public make decisions about where to bicycle and to help planners understand the impediments to bicycling during development of the Bicycle Master Plan.
- Trail design guidelines completed for the proposed Life Science Center (LSC) Loop Trail, a 3.5-mile cycling and walking path that would knit together five districts within the Life Sciences



center area near Gaithersburg and connect to the Corridor Cities Transitway, a proposed bus rapid transit route. If approved, the LSC Loop Trail would help achieve the increased non-auto driver mode share requirements established in Master Plans.

## **Waste Reduction, Reuse & Recycling**

### **County Government Operations**

- The County's Police Department recycled 3,700 tons of metal from abandoned, unregistered and junk vehicles in FY2017.
- On average, County facilities are achieving a required recyclable materials recycling rate of 41.5 percent.
- The County government recycles 100 percent of end of life computer equipment and communication devices.
- Montgomery County recovers as much of the construction waste material as possible for reuse and recycling during renovations, demolitions and construction of County government facilities.
- Montgomery County Government saved 6.7 million sheets of paper in FY2017 through its state-of-the-art print management system and through the conversion of paper to electronic processes (such as the Department of Permitting Services implementation of ePlans).
- Copier and printer paper purchased through the County is 100 percent recycled, with 30 percent post-consumer content.
- 62 percent of all paper products the County purchased in FY2017 contained more than 25 percent recycled content.
- Montgomery County Government purchased six million dollars of products containing recycling materials in FY2017, an increase of 40 percent over FY2016.
- On average, Montgomery County Government diverted 84 percent of construction waste from landfills in its 19 LEED Certified buildings completed through the end of 2017.

### **Montgomery County Public Schools**

- FY 2017 required recyclable material recycling rate is 44 percent. A total of 8,900 tons of required material were recycled.
- FY 2017 recycling rate of required and voluntary recyclable material is 81 percent. A total of 24,700 tons of voluntary recyclable material were recycled.
- During FY 2016 and FY 2017, MCPS purchased 44 million sheets of 8.5" x 11" paper, made of 30 percent recycled paper stock.
- In FY 2017, the amount of solid waste was reduced by 29 percent, despite an increase of more than 20,000 in student enrollment since FY 2005.
- Total solid waste generated in FY 2017 was nearly 3,900 tons lower than in FY 2005.
- Digitization of curriculum and instructional materials to increase the flexibility of teaching and learning using cloud-based platform; reduces paper usage and the need for printed material.

- In 2016, MCPS launched Employee Self Service (ESS), an online platform that provides employees and retirees access to benefits enrollment and information. This technology solution reduces a number of manual, paper-dependent processes.

### **Maryland-National Capital Park and Planning Commission**

- Since late 2017, M-NCPPC - Montgomery County has operated hauling of recyclable materials by dedicated in-house staff. Consistent service to more than 50 recycling dumpsters is now provided across more than 25 sites. As a result, there is increased flexibility in how/when we service specific sites – we can reduce hauling trips as needed and seek greater efficiency overall. In addition, all mixed paper/cardboard and commingled materials are now being transported to the Montgomery County Transfer Station rather than being transported to a facility outside of the County.
- In 2017, the M-NCPPC - Montgomery County achieved a 68 percent combined recycling rate (mandatory and voluntary).
- M-NCPPC – Montgomery County participates in a number of voluntary recycling programs to further reduce the waste stream. This includes motor fuel, tires, electronic waste, light bulbs, batteries, construction debris, concrete and asphalt.
- The M-NCPPC – Montgomery County Green Waste Management composted 2,619 tons of green waste material and provided compost, wood chips and mulch to park projects across the County.
- Copier and printer paper purchased through the County is 100 percent post-consumer recycled paper. Purchased printer paper is limited to those that are Forest Stewardship Council (FSC) Certified. Commission standards mandate double sided printing for most documents.
- M-NCPPC – Montgomery County utilizes ePlans for project submittal and review as a strategy to reduce paper waste.
- M-NCPPC can provide Commercial Residential (CR) Zone Public Benefit Points for building reuse during regulatory review.

## **Food and Farming Strategies**

### **County Government Operations**

- Montgomery County operates a pre-consumer food scrap recycling collection demonstration project at three facilities: Executive Office Building, Council Office Building and Public Safety Headquarters. In FY17, 25 tons of food scraps were diverted from the waste stream. The program has diverted 112 tons since the project's inception.

### **County Government Policies and Programs**

- Strategic Plan to Advance Composting, Compost Use and Food Scraps Diversion: The Plan focuses on reducing food waste, diverting excess food to those with unmet needs, advancing food composting and encouraging the use of compost.

### **Montgomery County Public Schools**

- MCPS' Division of Food and Nutrition Services (DFNS) features daily meatless items; working with manufacturers to develop plant-based protein offerings that meet the required meat/meat alternative equivalent.

### **Maryland-National Capital Park and Planning Commission**

- M-NCPPC – Montgomery County operates 11 Community Gardens on parkland. Over 600 gardeners utilize this program annually to grow fresh local produce, herbs and flowers.

## **Tree Strategies**

### **County Government Policies and Programs**

- Tree Canopy Law: Legislation passed in 2014 which requires property owners to plant or pay into a fund to support the planting of new shade trees during development. Funds generated from the law are used to plant 500 to 600 trees annually at single family homes around parking lots and in multi-family communities.

### **Montgomery County Public Schools**

- As of FY 2017, MCPS maintains nearly 111 acres of forest-conservation easements on Board of Education property.
- MCPS has invested in 30.62 acres of off-site forest conservation credits.

### **Maryland-National Capital Park and Planning Commission**

- The M-NCPPC – Montgomery County Department of Parks manages a nearly 37,000 acre park system where close to 30,000 acres of that land is dedicated to environmental preservation. The vast majority of this land is comprised of forested and wetland areas – both of which provide carbon sequestration as an ecosystem service.

- The M-NCPPC – Montgomery County continues managing fee-in-lieu, mitigation and other development-related afforestation and reforestation planting projects on parkland to enhance the natural tree canopy, promote species diversity and manage non-native invasive plants.
- To increase the urban tree canopy, the M-NCPPC – Montgomery County Department of Planning implements a program called Shades of Green. This program provides free trees and planting in Geographic Information Systems (GIS)-identified canopy-deficient urban areas. Promotion of the program is gaining cooperation and acceptance with property owners and the business community.
- The Department of Planning, through the Leaves for Neighborhoods program, and in coordination with the Montgomery County Forest Conservation Fund, encourages residential property owners to help increase the tree canopy county-wide by providing \$40 coupons for the purchase and installation of shade trees on private residential property. Minimum eligible tree cost is \$75.
- The M-NCPPC – Montgomery County Department of Parks has implemented a new mobile app called Open Tree Map (accessible via the Google Play Store or Apple App Store) for M-NCPPC parkland in Montgomery County where individual trees are surveyed and mapped, and the data is input into the app. Useful information about the ecological/community benefits of individual trees including gallons of stormwater filtered, pounds of carbon dioxide and air pollutants removed, as well as energy conserved, are calculated using formulas developed by the U.S. Forest Service. App users can learn about different tree species, ecological/community benefits of individual trees, mark favorite trees in the app, take photos and communicate with Montgomery Parks staff and others via social media.
- The M-NCPPC – Montgomery County Department of Parks Continues to conduct active inventory of individual urban trees in developed parks, tracked by park, using mobile GIS applications. Assessments conducted include size, species and tree health with the goal of improved identification and tracking of tree pest issues, tree maintenance needs and assessment of species diversity and size class.
- Since 2012, the M-NCPPC – Montgomery County Pope Farm Nursery has maintained a native perennial plant program supported by staff and volunteer assistance. The native perennials are utilized at Brookside Gardens, in vegetated stormwater management facilities (for Environmental Site Design), volunteer planting events following Weed Warrior volunteer non-native invasive plant removals, meadow habitat restoration, nature center gardens, native plant sales and special projects.
- Master Plans include provisions to increase tree canopy.
- M-NCPPC has opportunities to influence afforestation and forest conservation through the Forest Conservation Plan review.
- M-NCPPC can provide Commercial Residential (CR) Zone Public Benefit Points for protection and enhancement of the natural environment during regulatory review.

## **Cross-Cutting Environmental Education and Outreach**

### **Montgomery County Government**

- GreenFest: Annually, the County and 13 community and government partners host GreenFest, a free, all-day environmental festival helping residents green their lifestyles by connecting them with neighbors, local and national environmental leaders and green businesses and products.
- Green Business Certification Program: A voluntary recognition program for businesses that exhibit a high level of sustainability. Approximately 80 businesses are listed in the Green Business Directory.
- My Green Montgomery: An award-winning website that serves as a one-stop-shop for sustainable living.

### **Montgomery County Public Schools**

- Each school has a school based SERT team comprised of students and staff with the mission to support energy efficiency, recycling and sustainable operations of the school.
- These SERT teams are supported with outreach, resources, monthly recycling reports and quarterly energy reports that compare their energy performance against a baseline, incentives and recognition and technical support.
- MCPS has incorporated sustainability into the instructional program through the Outdoor Environmental Educational Programs (OEEP) that conduct several sustainability programs to educate both students and teachers.
- OEEP and the SERT program engages with several partners and external programs to supplement its mission including the US Department of Education which has recognized eight schools with the Green Ribbon Award and the Maryland Green Schools certification program, which has certified 95 MCPS schools.
- The US Department of Education recognized MCPS with the 2013 District Sustainability Award for being in the top one percent of school districts in the nation for implementing comprehensive sustainability programs.

### **Maryland-National Capital Park and Planning Commission**

- Evans Parkway Neighborhood Park in Silver Spring was one of the first pilot projects in the nation to be certified under the Sustainable Sites Initiative (SITES) rating system for sustainable design, construction and maintenance.
- M-NCPPC – Montgomery County invests time in providing high-quality training opportunities on a number of sustainability-related topics to staff in support of encouraging best environmental practices in the workplace.

- M-NCPPC – Montgomery County operates four nature-based educational centers across the County and provides volunteer opportunities in environmental stewardship for citizens and visitors to parkland.
- M-NCPPC – Montgomery County also engages the community at events like the Green Matters Symposium, Trees Matter Symposium, Earth Day Festival and through participating on the planning committee for the annual Montgomery County GreenFest.

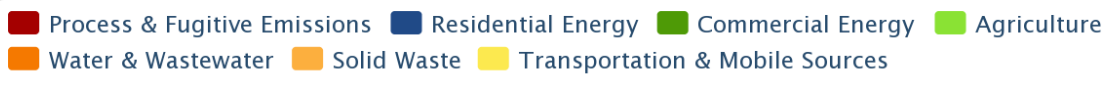
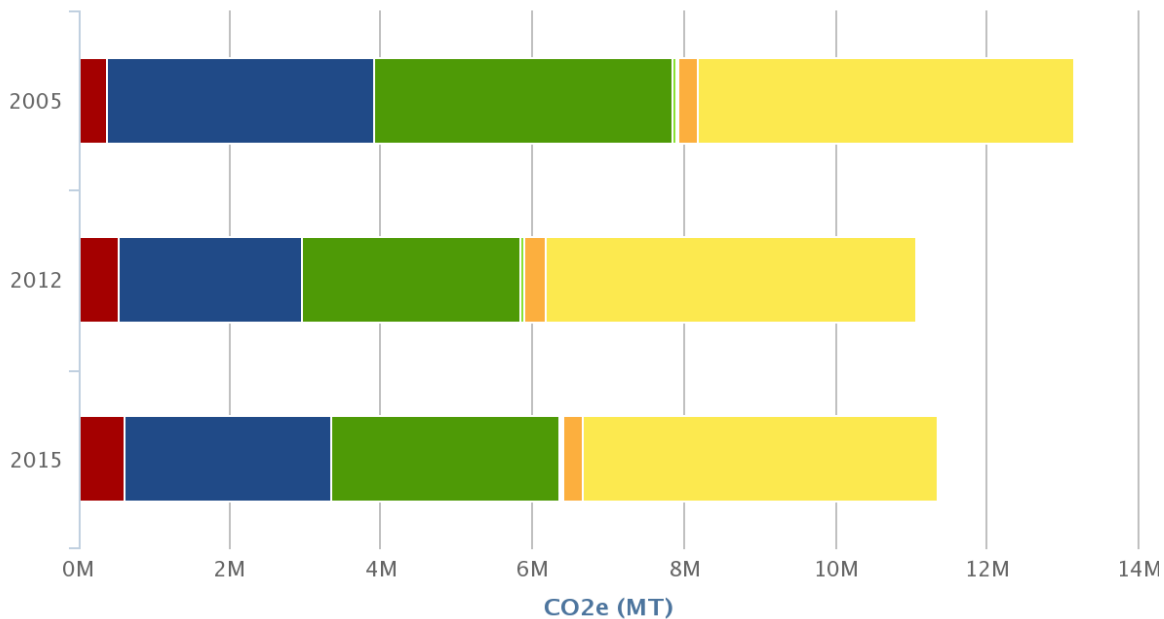
## Appendix C: MWCOG Montgomery County, Maryland

### Community-Wide Greenhouse Gas Inventory and Summary Factsheet

#### Emissions Summary

Montgomery County community-wide greenhouse gas (GHG) emissions decreased by 14% between 2005 and 2015.

- Despite an 11% growth in population, GHG emissions reduced from 13.14 MMTCO<sub>2</sub>e (million metric tons of carbon dioxide equivalent) in 2005 to 11.34 MMTCO<sub>2</sub>e in 2015.
- Per capita emissions decreased 22% between 2005 and 2015; from 14.3 MTCO<sub>2</sub>e (metric tons of carbon dioxide equivalent) in 2005 to 11.1 MTCO<sub>2</sub>e in 2015.
- In 2015, energy consumption (residential and commercial) accounted for 51% of GHG emissions and transportation and mobile sources accounted for 41%. Efficiency and switching to cleaner fuel sources contribute to GHG reductions.



Source: ICLEI ClearPath

Highcharts.com

#### Inventory Background

In 2008, the Metropolitan Washington Council of Governments (COG) and local governments across metropolitan Washington collaboratively established the regional GHG emission reduction goals of: 10% below business as usual projections by 2012 (back down to 2005 levels); 20% below 2005 levels by 2020; and 80% below 2005 levels by 2050. COG and its member jurisdictions are working toward these goals. Montgomery County surpassed the 2012 goal, demonstrating that GHG reductions are possible even as the population and economy grows.

## Emissions Activities

The inventories measured GHG-emitting activities undertaken by residents, businesses, industry and government located in Montgomery County, as well as emissions from visitors. Emissions sources accounted for include:

- Electricity consumption from all sectors within the county;
- Combustion of natural gas and other fuels;
- Mobile transportation, including on-road vehicular travel, air travel and commuter rail travel undertaken by residents, business and visitors in the county and off-road activities such as use of construction and landscaping equipment;
- Collection and treatment of solid waste produced by residents and activities within county boundaries;
- Pumping and treatment of water and wastewater used or produced by residents and activities;
- Agricultural emissions from enteric fermentation, manure management and soils (including fertilizer application);
- Fugitive emissions from ozone depleting chemicals and natural gas.
- All emissions are reported in million metric tons of carbon dioxide equivalent (MMTCO<sub>2</sub>e) or metric tons of carbon dioxide equivalent (MTCO<sub>2</sub>e).

## Methodology

- The methodology for the Montgomery County GHG inventories are consistent with the metropolitan Washington regional GHG inventories. Both the regional and jurisdictional inventories use the ICLEI US Community Protocol and ClearPath tool to measure emissions.
- Utility data was collected from regional electric and natural gas utilities. Emissions factors for electricity were based on EPA's Emissions & Generation Resource Integrated Database (eGRID) versions for 2005, 2012 and 2014.
- On-road and off-road transportation emissions were calculated using the EPA's Motor Vehicle Emission Simulator (MOVES v2010a and 2014) and based on VMT data provided by COG's Transportation Planning Board. Air travel emissions were calculated using national emissions from the EPA GHG Inventory scaled locally using population and air travel data from the Washington-Baltimore Regional Air Passenger Survey. Commuter rail emissions were calculated using MARC and VRE diesel consumption data scaled to the region.
- Emissions from landfills were calculated based on local and regional solid waste data. Wastewater treatment emissions were determined by data collected from local water utilities.
- Agricultural emissions were calculated using EPA's State GHG Inventory Tool and data from EPA's Chesapeake Assessment Scenario Tool and USDA's Census of Agriculture.
- Ozone depleting chemicals were calculated using national emissions scaled locally by population.

## Links

- Metropolitan Washington Climate Energy and Environment Policy Committee: <https://www.mwcog.org/committees/climate-energy-and-environment-policy-committee/>
- Montgomery County Department of Environmental Protection: <http://www.montgomerycountymd.gov/dep/>
- Montgomery County Department of General Services Office of Energy and Sustainability: <https://www.montgomerycountymd.gov/DGS-OES/>



## Community GHG Inventory Detailed Emissions Results Table - Montgomery County Totals

Emissions Type (Main ClearPath Tab)	Emissions Activity or Source (ClearPath Calculator)	Inventory Records (Entered in ClearPath)	Emissions (MTCO <sub>2</sub> e)				Emissions (MMTCO <sub>2</sub> e)			
			2005	2012	2015	% Change, 2005-2015	2005	2012	2015	% Change, 2005-2015
<b>BUILT ENVIRONMENT</b>										
<b>Residential Energy</b>	Emissions from Grid Electricity	Residential Electricity	2,284,893	1,466,233	1,550,879	-32%	2.285	1.466	1.551	-32%
	Emissions from Stationary Fuel	Residential Natural Gas	1,068,063	870,142	1,070,540	0%	1.068	0.870	1.071	0%
		Residential Fuel Oil	140,409	62,584	88,373	-37%	0.140	0.063	0.088	-37%
		Residential LPG	27,827	25,225	29,655	7%	0.028	0.025	0.030	7%
<b>Commercial Energy</b>	Emissions from Grid Electricity	Commercial Electricity	3,227,989	2,155,655	2,196,794	-32%	3.228	2.156	2.197	-32%
	Emissions from Stationary Fuel Combustion	Commercial Natural Gas	712,313	717,452	793,298	11%	0.712	0.717	0.793	11%
		Commercial Fuel Oil	5,003	7,489	7,660	53%	0.005	0.007	0.008	53%
		Commercial LPG	4,076	3,737	3,642	-11%	0.004	0.004	0.004	-11%
<b>TRANSPORTATION AND MOBILE EMISSIONS</b>										
<b>Transportation and Mobile Emissions</b>	On Road Transportation	On Road Mobile Emissions	4,105,322	4,191,084	4,024,881	-2%	4.105	4.191	4.025	-2%
	Aviation Travel	Passenger Air Travel	504,344	280,457	243,567	-52%	0.504	0.280	0.244	-52%
	Rail Transportation	Rail Transportation	0	8,525	9,794	N/A	0.000	0.009	0.010	N/A
	Emissions from Off Road Vehicles	Off Road Mobile Emissions	362,442	410,597	409,740	13%	0.362	0.411	0.410	13%
<b>WASTEWATER TREATMENT</b>										
<b>Water and Wastewater</b>	Fugitive Emissions from Septic	Septic System Emissions	7,522	7,491	7,491	0%	0.008	0.007	0.007	0%
	Nitrification/Denitrification Process N2O Emissions from Wastewater	Sewer System Emissions	2,242	2,430	2,480	11%	0.002	0.002	0.002	11%
		Process N2O from Effluent Discharge to Rivers and Estuaries	N2O Effluent Discharge Emissions	2,229	1,454	1,008	-55%	0.002	0.001	0.001
<b>AGRICULTURE</b>										
<b>Agriculture</b>	Emissions from Agricultural Activities	Enteric Fermentation	20,178	15,848	11,511	-43%	0.020	0.016	0.012	-43%
		Manure Management	4,365	3,341	2,060	-53%	0.004	0.003	0.002	-53%
		Ag Soils	27,647	29,251	28,344	3%	0.028	0.029	0.028	3%
<b>SOLID WASTE TREATMENT</b>										
<b>Solid Waste</b>	Waste Generation	Landfill Waste Generation	68,012	73,601	54,973	-19%	0.068	0.074	0.055	-19%
	Combustion of Solid Waste Generated by the Community	Combustion of Solid Waste	200,521	190,404	211,644	6%	0.201	0.190	0.212	6%
<b>OTHER</b>										
<b>Process and Fugitive Emissions</b>	Hydrofluorocarbon & Refrigerant Emissions	HFCs	317,393	473,634	541,868	71%	0.317	0.474	0.542	71%
	Fugitive Emissions from Natural Gas Distribution	Natural Gas Fugitive Emissions	51,867	46,251	54,299	5%	0.052	0.046	0.054	5%
<b>TOTAL GREENHOUSE GAS EMISSIONS</b>			<b>13,144,657</b>	<b>11,042,886</b>	<b>11,344,499</b>	<b>-14%</b>	<b>13.14</b>	<b>11.04</b>	<b>11.34</b>	<b>-14%</b>

Column Header	Description
Emissions Type	This column lists the main tabs in the online ClearPath tool's GHG inventory entry pages in the same order listed in ClearPath.
Emissions Activity/Source	This column lists the ClearPath calculators used in for the development of these inventories. These calculators are found under each of the main tabs in the same order listed in ClearPath.
Inventory Records	This column lists COG's inventory record entries according to which calculator was used to create that entry.
Emissions	Metric Tons of CO <sub>2</sub> Equivalent (MTCO <sub>2</sub> e) and Million Metric Tons of CO <sub>2</sub> Equivalent (MMTCO <sub>2</sub> e) by emissions activity or source for 2005, 2012, 2015 and percent change between 2005 and 2015.

## Community Greenhouse Gas Inventory Inputs – Montgomery County Totals

Emissions Type (Main ClearPath Tab)	Emissions Activity or Source (ClearPath Calculator)	Inventory Records (Entered in ClearPath)	Local Data Inputs				
			Metric	2005	2012	2015	% Change, 2005 - 2015
<b>BUILT ENVIRONMENT</b>							
<b>Residential Energy</b>	Emissions from Grid Electricity	Residential Electricity	# of Accounts <sup>1</sup>	N/A	317,739	392,755	N/A
			Consumption (kWh) <sup>1</sup>	4,397,861,073	3,747,179,864	4,096,506,601	-7%
	Emissions from Stationary Fuel	Residential Natural Gas	# of Accounts <sup>1</sup>	N/A	209,779	217,136	N/A
			Consumption (Therms) <sup>1</sup>	200,858,928	163,637,950	201,324,692	0%
		Residential Fuel Oil	# of Households Using Fuel Oil <sup>2</sup>	19,572	14,823	12,787	-35%
			Consumption (Gallons) <sup>3</sup>	13,666,762	6,091,612	8,601,824	-37%
Residential LPG	# of Households Using LPG <sup>2</sup>	5,105	4,691	4,513	-12%		
		Consumption (Gallons) <sup>3</sup>	4,757,592	4,312,663	5,070,071	7%	
<b>Commercial Energy</b>	Emissions from Grid Electricity	Commercial Electricity	# of Accounts <sup>1</sup>	N/A	30,341	50,746	N/A
			Consumption (kWh) <sup>1</sup>	6,213,091,899	5,509,103,693	5,802,633,829	-7%
	Emissions from Stationary Fuel Combustion	Commercial Natural Gas	# of Accounts <sup>1</sup>	N/A	10,729	11,430	N/A
			Consumption (Therms) <sup>1</sup>	133,956,909	134,923,370	149,186,859	11%
		Commercial Fuel Oil	# of Commercial Buildings <sup>4</sup>	4,332	4,504	4,570	5%
			Total Commercial Sq Footage <sup>4</sup>	138,733,539	148,296,020	151,698,706	9%
			Sq Feet of Commercial Space Using Fuel Oil <sup>5</sup>	24,345,849	36,445,143	37,281,385	53%
			Consumption (Gallons) <sup>5</sup>	486,917	728,903	745,628	53%
Commercial LPG	Sq Feet of Commercial Space Using LPG	13,938,914	12,777,109	12,452,438	-11%		
	Consumption (Gallons) <sup>5</sup>	696,946	638,855	622,622	-11%		
<b>TRANSPORTATION AND MOBILE EMISSIONS</b>							
<b>Transportation and Mobile Emissions</b>	On Road Transportation	On Road Mobile Emissions	N/A <sup>6</sup>	N/A	N/A	N/A	N/A
	Aviation Travel	Passenger Air Travel	Air Passengers Leaving BWI <sup>7</sup>	974,250	892,125	790,230	-19%
			Air Passengers Leaving DCA <sup>7</sup>	859,000	875,939	965,672	12%
			Air Passengers Leaving IAD <sup>7</sup>	814,250	749,120	623,789	-23%
	Rail Transportation	Rail Transportation	N/A <sup>8</sup>	N/A	N/A	N/A	N/A
Emissions from Off Road Vehicles	Off Road Mobile Emissions	N/A <sup>6</sup>	N/A	N/A	N/A	N/A	
<b>WASTEWATER TREATMENT</b>							
<b>Water and Wastewater</b>	Fugitive Emissions from Septic Systems	Septic System Emissions	Population Served by Septic <sup>9</sup>	69,339	69,055	69,055	0%
	Nitrification/Denitrification Process N2O Emissions from Wastewater Treatment	Sewer System Emissions	Population Served by Sewer <sup>9</sup>	859,761	932,045	950,981	11%
	Process N2O from Effluent Discharge to Rivers and Estuaries	N2O Effluent Discharge Emissions	Daily Nitrogen Load (kg N / day) <sup>9</sup>	2,609	1,702	1,180	-55%

Emissions Type (Main ClearPath Tab)	Emissions Activity or Source (ClearPath Calculator)	Inventory Records (Entered in ClearPath)	Local Data Inputs				
			Metric	2005	2012	2015	% Change, 2005 - 2015
<b>AGRICULTURE</b>							
<b>Agriculture</b>	Emissions from Agricultural Activities	Enteric Fermentation	Dairy Cows ('000 head) <sup>10</sup>	2.1	1.5	0.6	-71%
			Beef Cattle ('000 head) <sup>10</sup>	3.8	2.7	2.2	-42%
			Sheep ('000 head) <sup>10</sup>	0.8	0.7	0.5	-38%
			Goats ('000 head) <sup>10</sup>	0.5	0.2	0.3	-40%
			Swine ('000 head) <sup>10</sup>	0.4	0.2	0.1	-75%
			Horses ('000 head) <sup>10</sup>	9.2	9.1	9.1	-1%
		Manure Management (all enteric fermentation metrics + chickens)	Poultry, Layers ('000 head) <sup>10</sup>	1.4	2.6	2.2	57%
			Poultry, Broilers ('000 head) <sup>10</sup>	4.9	2.1	2.2	-55%
			Poultry, Turkeys ('000 head) <sup>10</sup>	15.2	1.0	5.8	-62%
		Ag Soils (all enteric fermentation and manure management metrics + crop production and fertilizer use)	Crop Production-Corn ('000 bushels) <sup>10</sup>	409	474	450	10%
			Crop Production-Wheat ('000 bushels) <sup>10</sup>	602	572	523	-13%
			Crop Production-Soybeans ('000 bushels) <sup>10</sup>	266	522	576	117%
			Fertilier Applied, Synthetic (kg N) <sup>10</sup>	170,124	1,730,114	1,668,658	881%
Fertilier Applied, Manure (kg N) <sup>10</sup>	297,141		233,489	189,943	-36%		
Fertilier Applied, Biosolids (kg N) <sup>10</sup>	23,737	61,799	0	-100%			
<b>SOLID WASTE TREATMENT</b>							
<b>Solid Waste</b>	Waste Generation	Landfill Waste Generation	MSW Landfilled (tons) <sup>11</sup>	183,425	154,718	126,188	-31%
			Methane Collection at Receiving Landfill? <sup>12</sup>	YES (mostly)	YES (mostly)	YES (mostly)	N/A
	Combustion of Solid Waste Generated by the Community	Combustion of Solid Waste	Mass of MSW Combusted (tons) <sup>11</sup>	577,811	548,659	609,862	6%
<b>OTHER EMISSION TYPES</b>							
<b>Process and Fugitive Emissions</b>	Hydrofluorocarbon & Refrigerant Emissions	HFCs	Population <sup>13</sup>	918,046	974,824	1,017,859	11%
	Fugitive Emissions from Natural Gas Distribution	Natural Gas Fugitive Emissions	Total Natural Gas Consumption (Therms) <sup>1</sup>	334,815,837	298,561,320	350,511,551	5%
<b>DEMOGRAPHICS</b>							
<b>US Census American Community Survey</b>	Main source of demographic data. Used for greenhouse gas emission calculations and benchmarking for the Built Environment, Solid Waste, and HFCs.		Population <sup>14</sup>	918,046	974,824	1,017,859	11%
			Housing Units <sup>14</sup>	356,603	375,973	382,913	7%
			Households (Occupied Housing Units) <sup>14</sup>	344,038	357,579	365,235	6%
			Employment <sup>14</sup>	479,266	522,564	540,333	13%
<b>MWCOG Cooperative Forecasts</b>	Regional models for Transportation and Mobile Emissions use COG Cooperative Forecast data. For the purposes of this inventory work, these models provide greenhouse gas emission outputs.		Population <sup>15</sup>	929,100	1,001,100	1,020,036	10%
			Housing Units <sup>15</sup>	347,500	N/A	377,524	9%
			Employment <sup>15</sup>	500,000	N/A	532,004	6%

Column Header	Description
Emissions Type	This column lists the main tabs in the online ClearPath tool's GHG inventory entry pages in the same order listed in ClearPath.
Emissions Activity/Source	This column lists the ClearPath calculators used in for the development of these inventories. These calculators are found under each of the main tabs in the same order listed in ClearPath.
Inventory Records	This column lists COG's inventory record entries according to which calculator was used to create that entry.
Local Data Inputs	This column lists the main local input data that impacts the greenhouse gas emission outputs (Metric Tons of CO <sub>2</sub> Equivalent -MTCO <sub>2e</sub> ) and the percent change in those inputs between 2005 and 2015.

## Sources and Notes:

MWCOG conducts community inventories for the region and all its member local jurisdictions. In order to have comparable inventories that are consistent from the top down and bottom up, the same data sources and methodologies are used across all the inventories. Data comes from sources that are regularly available over the years to compare inventories across 2005, 2012 and any future inventories. MWCOG follows the U.S. Communities Protocol as the methodology for these inventories. The data presented above includes the leading local data inputs called for by the USCP. The local data inputs and emission factors influence the resulting greenhouse gas emissions (see Results Table).

1 MWCOG. (2017). Metropolitan Washington Energy Utility Data Survey Analysis for 2005, 2012 and 2015

2 U.S. Census Bureau. American Community Survey

1, 3 and 5 year estimates, 2005, 2005-2007, 2005-2009, and 2011-2015

General Housing Characteristics (ACS, DP04)

Subheader: Home Heating Fuel; Rows: "Fuel oil, kerosene, etc." and "Bottled, tank or LP gas"

<https://factfinder.census.gov>

Webpage last accessed: September 2017

3 Energy Information Administration (EIA) State Energy Data System (SEDS)

Table CT4. Residential Sector Energy Consumption Estimates, 1960-2015

<https://www.eia.gov/state/seds/>

Webpage last accessed: August 2017

*Notes:* Residential consumption is derived by downscaling EIA statewide consumption totals:

*Per Household Consumption = Total gallons of statewide residential consumption / Statewide # of households using fuel oil*

*Residential Consumption in Gallons = # of households using fuel oil in community \* Per household consumption*

Number of households using fuel oil and LPG was not available for cities in 2005 (exceptions: District of Columbia and Alexandria). The city to county ratio of households in 2015 was applied to 2005 to downscale from county households. Household data was interpolated for 2012.

4 CoStar. (2015). Commercial Property Records.

[www.costar.com](http://www.costar.com)

*Note:* MWCOG has a license for the CoStar database. MWCOG's main use of the CoStar database is in the development of the annual regional commercial construction reports.

5 Energy Information Administration (EIA). (2007, 2012). Commercial Buildings Energy Consumption Survey (CBECS)

Table B23. Energy Sources, Floorspace, 2003 South and 2012 South Atlantic

<https://www.eia.gov/consumption/commercial/data/2012/>

Webpage last accessed: September 2017

Energy Information Administration (EIA). (2007, 2016). Commercial Buildings Energy Consumption Survey (CBECS)

Table C35. Fuel oil consumption and conditional energy intensity by Census region, 2003 and 2012

Row: Energy Sources, Fuel Oil; Column: Fuel Oil Energy Intensity, South

<https://www.eia.gov/consumption/commercial/data/2012/c&e/cfm/c35.php>

Webpage last accessed: September 2017

Note: Based on EIA data, it is estimated that 18-25% of the commercial square footage in the region uses fuel oil and 8-10% use LPG (varies by year). CoStar and EIA data are used to calculate the commercial consumption of non-utility fuel:

*Commercial Buildings Using Fuel Oil or LPG = Total number of commercial buildings \* % of commercial buildings using fuel oil or LPG*

*Square Footage of Commercial Buildings Using Fuel Oil or LPG = Total square footage of commercial buildings \* % of commercial buildings using fuel oil or LPG*

*Total Fuel Oil or LPG Consumption = Square footage of commercial buildings using fuel oil \* Fuel oil energy intensity*

6 Metropolitan Washington Council of Governments. (2014). Transportation Planning Board Constrained Long Range Plan (CLRP), Version 2.3.57 travel demand model, MOVES2010a mobile emissions model, and Round 8.3 Cooperative Forecasts

Metropolitan Washington Council of Governments. (2015). Transportation Planning Board Constrained Long Range Plan (CLRP), Version 2.3.57a travel demand model, MOVES2014 mobile emissions model, and Round 8.4 Cooperative Forecasts

U.S. Environmental Protection Agency. NONROAD2008 Model

<https://www.epa.gov/moves/nonroad-model-nonroad-engines-equipment-and-vehicles>

7 MWCOG. (2016). Washington-Baltimore Regional Air Passenger Survey Geographic Findings Report 2015

Section II. Findings. Page 8. Table 1: Annual Trip Originations by Airport

Appendix H. Page 65. Table 16: Originating Passengers by Jurisdiction

[www.mwco.org/documents/2016/11/16/washington-baltimore-regional-air-passenger-survey-geographic-findings-report-airport-access/](http://www.mwco.org/documents/2016/11/16/washington-baltimore-regional-air-passenger-survey-geographic-findings-report-airport-access/)

*Webpage last accessed: July 2017*

MWCOG. (2013). Washington-Baltimore Regional Air Passenger Survey Geographic Findings Report 2011

Section II. Findings. Page 6. Table 1: Annual Trip Originations by Airport

Appendix G. Page 68. Table G-1: Originating Passengers by Jurisdiction

MWCOG. (2008). Washington-Baltimore Regional Air Passenger Survey Geographic Findings Report

Page 10. Table 3: Originating Passengers by Jurisdiction, 2007 data

MWCOG. (2005). Washington-Baltimore Regional Air Passenger Survey Geographic Findings Report

Section II. Findings. Page 6. Table 1: Annual Trip Originations by Airport

Bureau of Transportation Statistics. Airline Information: Revenue Passenger Miles.

All Carriers, Domestic and International by Origin Airport for All Airports, BWI, Dulles, and Reagan

<https://www.transtats.bts.gov/DataElements.aspx?Data=3>

*Webpage last accessed: July 2017*

U.S. Environmental Protection Agency. (2017). Inventory of U.S. GHG Emissions and Sinks - 1990-2015

Chapter 3. Energy. Page 3-24. Table 3-12: CO2 Emissions from Fossil Fuel Combustion in Transportation End-Use Sector (MMT CO2 Eq.), Commercial Aircraft row, 2011 and 2015 columns

[www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2015](http://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2015)

*Webpage last accessed: July 2017*

Note: EPA's greenhouse gas inventory for the U.S. provides an estimate OF total emissions from the commercial aircraft sector. This is downscaled to the local level using data from local passenger travel surveys, local enplanements, and passenger miles. 2005 local passenger travel statistics are an interpolation of 2000 and 2007 data.

## 8 Federal Transit Administration. National Transit Database

2005, 2012, 2015 Annual Energy Consumption

<https://www.transit.dot.gov/ntd/data-product/2005-annual-database-energy-consumption>

<https://www.transit.dot.gov/ntd/data-product/2012-annual-databases-energy-consumption>

<https://www.transit.dot.gov/ntd/data-product/2015-annual-database-energy-consumption>

*Website Last Accessed: March 2018*

*Note:* FTA provides passenger rail diesel consumption data for transit authorities. Emissions are calculated using diesel consumption in gallons and a percent attributable to metropolitan Washington. 59% of MARC stations are located in the COG region in MD. 75% of VRE stations are located in Northern VA. Emissions are then downscaled to local jurisdictions by population.

## 9 MWCOG Wastewater Models

### MWCOG Cooperative Forecasts

Round 8.0 Cooperative Forecasting Summary Tables - Adopted November 10, 2010 (Excel Spreadsheet)

Round 8.3 Cooperative Forecasting Summary Tables - Adopted October 8, 2014 (Excel Spreadsheet)

Round 8.4 Cooperative Forecasting Summary Tables - Adopted October 14, 2015 (Excel Spreadsheet)

<https://www.mwcog.org/documents/2016/11/16/cooperative-forecasts-employment-population-and-household-forecasts-by-transportation-analysis-zone-cooperative-forecast-demographics-housing-population/>

*Webpage last accessed: July 2017*

### U.S. Census Bureau. 2005 American Community Survey Population Estimates

Demographic and Housing Estimates (2005 ACS, Table DP05)

<https://factfinder.census.gov>

*Webpage last accessed: July 2017*

### MWCOG. (2016). Original 2005 Greenhouse Gas Inventory

*Note:* ACS population data used where MWCOG Cooperative Forecast data unavailable.

## 10 U.S. EPA. (2018). Chesapeake Assessment Scenario Tool (CAST).

<https://cast.chesapeakebay.net>

### U.S. EPA. (2017). EPA State GHG Inventory and Projection Tool.

AG Module

[www.epa.gov/statelocalenergy/download-state-inventory-and-projection-tool](http://www.epa.gov/statelocalenergy/download-state-inventory-and-projection-tool)

*Webpage last accessed: December 2017*

*Note:* CAST model outputs are entered into the EPA AG Module, which calculates the GHG emissions based on state-level agricultural and emission factors. CAST model provides an urban fertilizer application output for the District of Columbia and Virginia independent cities. Urban fertilizer for Maryland cities and Town of Purcellville are downscaled from county data.

## 11 Northern Virginia Regional Commission (NVRC). (2007). 9th Annual Survey of Public Solid Waste Services in the Washington Metropolitan Region

Table 8: Refuse Fee, Disposal, Refuse and Recycling Facilities Fiscal Year 2005, Column: Refuse 2005 Tonnage page 10

<https://www.novaregion.org/DocumentCenter/Home/View/100>

*Website Last Accessed: February 2018*



Northern Virginia Regional Commission (NVRC). (2016). Public Solid Waste Services in the Washington Metropolitan Region (14th ed)

Table 14: Refuse/Garbage Tonnage, Tip Fees 2008-2014, column: Refuse Tonnage 2012, page 49

<http://www.novaregion.org/DocumentCenter/View/11026>

*Website Last Accessed: September 2017*

Northern Virginia Regional Commission (NVRC). (2017). DRAFT Master Table Waste Report

Table: Refuse/Garbage Tonnage, Tip Fees, Column: 2015

MWCOG. (2016). Original 2005 Regional Greenhouse Gas Inventory Spreadsheets

*Note:* A combination of local, regional and state solid waste reports were used in the development of the solid waste data for this inventory. Local and state reports helped determine waste disposed to landfill versus waste-to-energy.

**12** US Environmental Protection Agency. (data year 2015). Facility Level Greenhouse Gas Tool (FLIGHT)

Sector: Waste. Search by state, county, and or facility name for all facilities jurisdictions send municipal solid waste (MSW). Click on facility and data year 2015. Under Facility Information and the question "Does the landfill have an active gas collection system?" there will be a Y/N answer.

<https://ghgdata.epa.gov/>

*Website Last Accessed: September 2017*

**13** U.S. Census Bureau. American Community Survey 1 and 5-Year Population Estimates

1 and 5 year estimates, 2005, 2008-2012 and 2011-2015

Demographic and Housing Estimates (2005, 2012 and 2015 ACS, Table DP05)

<https://factfinder.census.gov>

*Webpage last accessed: July 2017*

U.S. Environmental Protection Agency. (2017). Inventory of U.S. GHG Emissions and Sinks - 1990-2015

Executive Summary, Page ES-7, Table ES-2: Recent Trends in U.S. Greenhouse Gas Emissions and Sinks (MMT CO<sub>2</sub> Eq.), row titled "Substitution of Ozone Depleting Substances" under HFCs subheader, 2012 and 2015 columns

[www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2015](http://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2015)

*Webpage last accessed: July 2017*

*Note:* EPA's US greenhouse gas emissions inventory provides a national emissions estimate of substitutions for Ozone depleting substances, which primary result in HFC emissions as well as small amounts of perfluorocarbons (PFC) emissions. Data is not available at the local level for ozone depleting substances. The national total has been downscaled to the local level by population. Population estimates in 2005 for cities (except DC and Alexandria) are downscaled from the ratios found in the U.S. Census Bureau 2008-2012 American Community Survey 5-Year Population Estimates.

*Local Jurisdiction HFCs = (US HFC total in MMTCO<sub>2</sub>e \* 1,000,000) \* (local population/US population)*

**14** U.S. Census Bureau. American Community Survey 1 and 5-Year Population Estimates

1 and 5 year estimates, 2005, 2008-2012 and 2011-2015

Demographic and Housing Estimates (2005, 2012 and 2015 ACS, Table DP05)

General Housing Characteristics (2005, 2012 and 2015 ACS, DP04)

General Economic Characteristics (2005, 2012 and 2015 ACS, DP03)

<https://factfinder.census.gov>

*Webpage last accessed: July 2017*

Note: 2005 estimates for cities (except DC and Alexandria) are downscaled from the ratios found in the U.S. Census Bureau 2008-2012 American Community Survey 5-Year Population Estimates.

**15 MWCOG Cooperative Forecasts**

Round 8.0 Cooperative Forecasting Summary Tables - Adopted November 10, 2010 (Excel Spreadsheet)

Round 8.3 Cooperative Forecasting Summary Tables - Adopted October 8, 2014 (Excel Spreadsheet)

Round 8.4 Cooperative Forecasting Summary Tables - Adopted October 14, 2015 (Excel Spreadsheet)

<https://www.mwcog.org/documents/2016/11/16/cooperative-forecasts-employment-population-and-household-forecasts-by-transportation-analysis-zone-cooperative-forecast-demographics-housing-population/>

*Webpage last accessed: July 2017*

## Appendix D: Resources

### County Government and Agency Sustainability Reports and Plans

- Montgomery County FY 2017 Green Government Report:  
<http://www.montgomerycountymd.gov/DGS-OES/Resources/Files/2017GreenGovernmentReport.pdf>
- Montgomery County Office of Sustainability 2017 Annual Report:  
<https://www.montgomerycountymd.gov/DEP/Resources/Files/ReportsandPublications/Sustainability/Amended-Office-of-Sustainability-Report-June-2017.pdf>
- Montgomery County Department of Transportation Sustainability Policy:  
<https://www.montgomerycountymd.gov/dot-dir/Resources/Files/SustainabilityFinal4-2016.pdf>
- Montgomery County Public Schools FY 2016 Environmental Sustainability Management Plan:  
[http://www.montgomeryschoolsmd.org/uploadedFiles/departments/facilities/greenschoolsfocus/0730%2016\\_2016EnvironSustainManagementPlan\\_BOOKLET\\_web.pdf](http://www.montgomeryschoolsmd.org/uploadedFiles/departments/facilities/greenschoolsfocus/0730%2016_2016EnvironSustainManagementPlan_BOOKLET_web.pdf)
- Maryland-National Capital Park and Planning Commission, Montgomery County Parks, Montgomery County Department of Planning Sustainability Plan July 2017 – June 2019:  
[https://www.montgomeryparks.org/uploads/2018/01/MNCPPC-MontgomeryCounty\\_Sustainability-Plan-FY18\\_19\\_FINAL.pdf](https://www.montgomeryparks.org/uploads/2018/01/MNCPPC-MontgomeryCounty_Sustainability-Plan-FY18_19_FINAL.pdf)

### Project Drawdown

- Project Drawdown: <http://www.drawdown.org/>

### Distributed Renewable Energy

- Solar ready buildings: [https://energy.gov/sites/prod/files/2014/11/f19/pv\\_solar\\_ready.pdf](https://energy.gov/sites/prod/files/2014/11/f19/pv_solar_ready.pdf)
- Solar friendly electricity tariffs: <https://www.eia.gov/todayinenergy/detail.php?id=11471>
- Maryland Public Service Commission Transforming Maryland's Electric Grid (PC44) (aka Grid of the Future) initiative: <http://www.psc.state.md.us/transforming-marylands-electric-grid-pc44/>
- Solar zoning streamlining: <http://solarcommunities.org/>
- Montgomery County Green Bank: <https://mcgreenbank.org/>
- Montgomery County C-PACE: <http://www.MC-PACE.com>
- Maryland Energy Administration Anemometer Loan:  
<http://energy.maryland.gov/Residential/Pages/incentives/anemometerPhotos.aspx>
- Maryland Energy Administration Clean Energy Grants Program:  
<http://energy.maryland.gov/residential/Pages/incentives/CleanEnergyGrants.aspx>
- DOE Small Wind Electric Systems <https://www.energy.gov/energysaver/buying-and-making-electricity/small-wind-electric-systems>

## Electric Vehicles

- Portland Electric Vehicle Strategy: <https://www.portlandoregon.gov/shared/cfm/image.cfm?id=309915>
- Electrifying Transportation Reduces Greenhouse Gases and Improves Air Quality: <http://www.ourenergypolicy.org/wp-content/uploads/2015/09/000000003002006881.pdf>
- City of Berkeley Residential Curbside Electric Vehicle Charging Pilot: <https://www.cityofberkeley.info/evcurbside/>
- Electric Vehicle Experience Centre, a non-brand specific EV Education Showroom in England: <https://www.facebook.com/fullychargedshowofficial/videos/770416683347424/>
- In the City of Oslo, over 30% of all new cars sold in 2015 and 2016 were EVs, due to a series of local and national incentives: <https://www.oslo.kommune.no/english/politics-and-administration/green-oslo/best-practices/the-electric-vehicle-capital-of-the-world/#gref>
- Maryland Public Service Commission Transforming the Electric Grid (PC44) initiative. This includes a subcommittee evaluating significant direct utility investment in EV charging infrastructure: <http://www.psc.state.md.us/transforming-marylands-electric-grid-pc44/>
- Electric Vehicle Association of Greater Washington, DC <http://evadc.org/>

## Energy Efficient Buildings

- Green Roofs for Healthy Cities: <https://greenroofs.org/about-green-roofs/>
- DOE Insulation info: <https://www.energy.gov/energysaver/weatherize/insulation>
- Pepco C&I incentives (Custom program): <https://cienergyefficiency.pepco.com/Custom.aspx>
- BGE Smart Energy Savers programs: <https://bgesmartenergy.com/>
- Potomac Edison incentive programs: [https://www.firstenergycorp.com/save\\_energy/save\\_energy\\_maryland.html](https://www.firstenergycorp.com/save_energy/save_energy_maryland.html)
- Washington Gas energy saving programs: <https://www.washingtongas.com/campaign/washington-gas-rebates>
- Quick Home Energy Checkup (QHEC): <https://mygreenmontgomery.org/2017/qhec/>
- City of Takoma Park Neighborhood Energy Challenge: <https://takomaparkmd.gov/government/sustainability/neighborhood-energy-challenge/>
- California's Refrigerant Management Program: <https://www.arb.ca.gov/cc/rmp/rmp.htm>
- GreenChill Partnership, an EPA partnership with food retailers to reduce refrigerant emissions: <https://www.epa.gov/greenchill>

## LED Lighting

- Department of Energy's LED Lighting Information: <https://www.energy.gov/energysaver/save-electricity-and-fuel/lighting-choices-save-you-money/led-lighting>
- Pepco C&I Lighting and Controls Incentives: <https://cienergyefficiency.pepco.com/Lighting.aspx>

## Mass Transit and Transportation Demand Management

- Montgomery County Telework Program: <https://www.montgomerycountymd.gov/HR/Telework/TeleworkProgram.html>

- Montgomery County Department of Transportation Commuter Services: <http://www.montgomerycountymd.gov/dot-dir/commuter/index.html/index.html>
- Commuter Connections: <https://www.commuterconnections.org/>
- County Executive's Transit Task Force Report (2015): [http://www.montgomerycountymd.gov/transit-task-force-2015/Resources/Files/FINAL\\_MC\\_Transit\\_Task%20Force\\_Report\\_10222015.pdf](http://www.montgomerycountymd.gov/transit-task-force-2015/Resources/Files/FINAL_MC_Transit_Task%20Force_Report_10222015.pdf)
- Pittsburgh Parking Tax Regulation: [http://apps.pittsburghpa.gov/redtail/images/332\\_Parking\\_Tax\\_Regulations\\_FINAL\\_version\\_\(1\).pdf](http://apps.pittsburghpa.gov/redtail/images/332_Parking_Tax_Regulations_FINAL_version_(1).pdf)

### **Walkable and Bikeable Communities**

- Live Near Your Work program, Baltimore City: <https://livebaltimore.com/live-near-your-work/>
- Bicycle Master Plan: <http://montgomeryplanning.org/planning/functional-planning/bicycle-master-plan/>
- Bicycle Stress Map: <http://www.mcatlas.org/bikestress/>
- Vision Zero: <https://www.montgomerycountymd.gov/visionzero/>
- Bike/Pedestrian Safety Initiative: <https://www.transportation.gov/safer-people-safer-streets>
- Safe Routes to Schools: <https://www.montgomerycountymd.gov/dot-pedsafety/srts/home.html>

### **Waste Reduction, Reuse and Recycling**

- The Strategic Plan to Advance Composting, Compost Use and Food Scraps Diversion in Montgomery County (April 2018): <https://www.montgomerycountymd.gov/sws/foodwaste/index.html>
- Montgomery County Office of Procurement, Procurement of Recycled Paper and other Recycled Materials FY 2017 Report: <http://www.montgomerycountymd.gov/PRO/Resources/Files/Reports/FY17RecycleRpt.pdf>
- City of San Francisco's SF Approved Green Purchasing Guide for City Staff: <https://www.sfapproved.org/guide-city-staff>

### **Food and Farming Strategies**

- USDA Nutrition Standards for School Meals: <https://www.fns.usda.gov/school-meals/nutrition-standards-school-meals>
- Montgomery County Food Security Plan: [http://www.montgomerycountymd.gov/exec/Resources/Files/pdf/MoCo\\_Food-Security-Plan\\_2017.pdf](http://www.montgomerycountymd.gov/exec/Resources/Files/pdf/MoCo_Food-Security-Plan_2017.pdf)
- The Strategic Plan to Advance Composting, Compost Use and Food Scraps Diversion in Montgomery County (April 2018): <https://www.montgomerycountymd.gov/sws/foodwaste/index.html>
- *Managing cover crops profitably*, Beltsville, MD: Sustainable Agriculture Network: <http://www.sare.org/Learning-Center/Books/Managing-Cover-Crops-Profitably-3rdEdition>
- *Regenerative Organic Agriculture and Climate Change: A Down-to-Earth Solution to Global Warming*, Rodale Institute (2014): <http://rodaleinstitute.org/assets/WhitePaper.pdf>

- *The benefits of using compost for mitigating climate change*, New South Wales Government: <http://www.epa.nsw.gov.au/resources/waste/110171-compost-climate-change.pdf>
- Rodale Institute's Regenerative Organic Certification program: <https://rodaleinstitute.org/assets/ROC-One-Page-9.12.17.pdf>
- Meatless in March campaign, City of Santa Monica: <https://www.smgov.net/Portals/mim/>
- Food Security Plan, Montgomery County Food Council: [http://www.montgomerycountymd.gov/exec/Resources/Files/pdf/MoCo\\_Food-Security-Plan\\_2017.pdf](http://www.montgomerycountymd.gov/exec/Resources/Files/pdf/MoCo_Food-Security-Plan_2017.pdf)

### **Tree Strategies**

- Montgomery County Forest Conservation Law, Tree Canopy Law, Montgomery County Roadside Tree Law and Maryland Roadside Tree Law: <https://www.montgomerycountymd.gov/green/trees/laws-and-programs.html>
- Tree Montgomery: <https://treemontgomery.org/>
- Shades of Green: <http://montgomeryplanning.org/planning/environment/forest-conservation-and-trees/shades-of-green/>
- Leaves for Neighborhoods: <http://montgomeryplanning.org/planning/environment/forest-conservation-and-trees/leaves-for-neighborhoods/>
- Backyard Buffers: <http://dnr.maryland.gov/forests/Pages/programs/Backyard-Buffer-Program.aspx>
- Montgomery County Tree Canopy Report: [http://www.montgomeryplanning.org/environment/documents/TreeCanopy\\_Report\\_MontgomeryCountyFinal.pdf](http://www.montgomeryplanning.org/environment/documents/TreeCanopy_Report_MontgomeryCountyFinal.pdf)

## **Appendix E. Climate Mobilization Workgroup Members**

### **Montgomery County Government**

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Lindsey Robinett Shaw, Commercial Energy Program Manager, Division of Environmental Policy & Compliance, Department of Environmental Protection

Douglas Weisburger, Sustainability Program Manager, Division of Environmental Policy & Compliance, Department of Environmental Protection

### **Maryland National Capital Park and Planning Commission**

Amanda Aparicio, Sustainability Coordinator, Facilities Management Division, Montgomery Parks

Steve Findley, Planner Coordinator, Area 2 Planning Division

### **Montgomery County Public Schools**

Richard Benjamin, SERT Program Manager, Department of Facilities Management

Sean Gallagher, Assistant Director, Department of Facilities Management