CLIMATE RESPONSE AND RESILIENCE

CLIMATE EMERGENCY MOBILIZATION WORK GROUP

FREDERICK COUNTY AND THE CITY OF FREDERICK, MARYLAND

AUGUST 2021

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VOLUME 1

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> "Unless someone like you cares a whole awful lot, nothing is going to get better. It's not."
>
> Dr. Suess

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LETTER FROM THE CO-CHAIRS

Dear Frederick County Council, County Executive Jan Gardner, City of Frederick Mayor Michael O'Connor, and Board of Alderpersons,

It is our honor and privilege to submit the following report from the Climate Emergency Mobilization Workgroup, culminating a year of serious study, dialogue, and debate by nearly 50 committed citizen volunteers. More than anything else, this document is optimistic — hopeful that as a community, we have the will to change within a timeframe that will provide a decent future for our children and grandchildren.

If our research taught us anything, it is that overcoming the climate emergency is possible — and that as a community, we will emerge stronger than before by acting, depending on the decisions we make.

Our research also taught us that meaningful action on the climate crisis is an economic imperative. Major threats are coming our way. Severe weather is happening across the country with much more frequency than expected at this point in time. Severe weather events are costing the nation billions — 22 major natural disasters in 2020 that resulted in $95 billion in cumulative damages, shattering previous records. Local leaders grapple with these threats — one mayor told us "Every time it rains, we grit our teeth." These indicators and many more examples across the nation and in nearby cities underscore the need to act now to both curb the damage, and at the same time, invest in adaptations that will help protect us and future generations from devastating loss.

A final major lesson of our year together is that our local governments have been responsible. Both the City and County, and many of the County's municipalities, have established positions as leaders in the state on climate responsiveness by reducing greenhouse gas (GHG) emissions in government operations. We feel fortunate and at the same time recognize we MUST do more, faster. Households and businesses account for the lion's share of GHG emissions. We rely on the government to set the tone, develop the pathways and provide the incentives for the entire community to transition with haste to the clean energy economy that will keep us safe, healthy and thriving into the future.

We are sincerely grateful for the honor of serving our community. We are especially grateful for the 50+ volunteers who stuck with this effort for a solid year in very difficult circumstances. Some of us caught COVID–19. A few of us had other serious health diagnoses. Many of us were dealing with all the pandemic-related challenges of life this past year — juggling demands of work and young children or grandchildren while dedicating hours of time each week to this volunteer effort. Most of us didn't know each other before

this year, and none of us have met in person throughout the course of our work together. It is undeniably difficult to be a productive team in these conditions. But these volunteers stuck it out because they are sure we can help construct a better future, if only we work together.

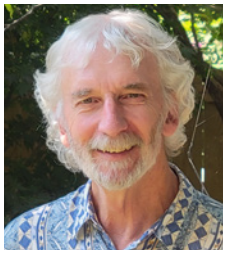
> “Every time it rains, we grit our teeth.”
>
> Nathan Brown
> Mayor, City of Brunswick

To honor the commitment of these volunteers, we are counting on you to take their work seriously. Although there are some limitations of what we have presented by virtue of our all-volunteer, no-budget committee, this is our sincere effort to recommend the best ideas for our shared home community. This is our answer to the question asked by author Andreas Karelas in his 2020 book, *Climate Courage*: “As the costs of clean energy technology continue to drop and the fossil fuel industry approaches obsolescence, the question is no longer ‘How do we create a carbon-free economy?’ Rather it is ‘How can we do so in a way that’s seamless, equitable, and fast enough?’”

Seamless. Equitable. Fast. These are our shared challenges in the months and years ahead.

Sincere thanks for this opportunity.

Barb Trader and Kevin Sellner
Co-Chairs, Climate Emergency Mobilization Workgroup



PREFACE

It is commonly known that the City of Frederick and Frederick County are experiencing hotter and longer summers, more moderate winters, more frequent extreme rain events with accompanying flooding, and extended dry periods. That these events are driven by distant and local accumulation of greenhouse gases (GHGs) in the atmosphere is also generally accepted. In acknowledging these facts, the City and County adopted Climate Emergency Resolutions to reduce GHG emissions and build resilience across our community and requested formation of a Climate Emergency Mobilization Workgroup (CEMWG) to provide recommendations on how emissions reductions and adaptations for building resilience might be identified and implemented. Over the past year, the Workgroup of approximately 70 volunteers across multiple disciplines, experiences, and ethnicities explored climate-related information from all sources to prioritize the most important steps the City and County should take to minimize impacts of the changing climate. CEMWG is pleased to submit its final report to the Frederick County Council and the City of Frederick Board of Aldermen regarding the steps that City and County leaders should take to lead residents responsibly as the climate continues to change. After a full year together, there is no lingering doubt that the local area — people, businesses, properties, and nature — is in the midst of an emergency and time is of the essence to keep the community safe, economically sound, and able to withstand increasingly extreme conditions.

Guidance for use of the document

This report has been developed in two main sections:

Volume 1:

- **Introductory materials**, explaining what CEMWG is and how the recommendations and report were completed;
- **Brief recommendation summaries** by sector
- **Appendices A–E**, which include a glossary and explanation of outreach more completely

Volume 2:

- **Appendix F, containing technical details for each of the brief recommendations that are summarized in Volume 1**, including science-based justification, implementation strategies, costs, benefits, examples from other jurisdictions, funding mechanisms, and equity considerations. The detailed recommendations of Appendix F explain the reasons for and details of implementing specific activities to reduce GHGs and/or adapt properties, businesses, and behaviors to ensure minimal climate damage and protect public health.

To use this report, it is suggested that the brief recommendations are reviewed in summary form first, and when more information is needed, carefully read the detailed recommendations in Volume 2, Appendix F. Many of the recommendations are interrelated and these are explained and cross-referenced in the detailed versions in Volume 2, Appendix F.

EXECUTIVE SUMMARY

The impacts of climate change are being experienced regularly in the City of Frederick and Frederick County. These impacts were documented in detail in a series of articles published in the Frederick News Post between December 2020 and July 2021. Recent surveys of Frederick area stakeholders have revealed concerns about climate impacts and the threats they pose to human health, economically fragile neighbors and friends, business profitability, personal property and lifestyle preferences. Predictions from climate models have consistently underestimated the consequences of climate change, and yet these models currently predict that impacts will be increasingly destructive unless decisive action is taken very soon.

Following submission of a citizen-generated request for immediate local responses to the current and future threats of climate change, Climate Emergency Resolutions were adopted by The City of Frederick on March 11, 2020 and by the Frederick County Council on July 23, 2020. The goals of the resolutions are:

1. implement policy and legislative actions through the lens of climate change;
2. reduce County– and City–wide greenhouse gas (GHG) emissions to 50% of 2010 levels by 2030 and by 100% of 2010 levels by 2050;
3. employ efforts to safely draw down carbon from the atmosphere; and
4. develop climate adaptation measures.

The two governments requested that a joint workgroup (Climate Emergency Mobilization Work Group, CEMWG) be formed. Out of more than 70 applicants from the area, 17 members were originally selected with 14 of those still serving. These members have broad professional expertise and represent multiple industrial or commercial sectors of the community as well as the ethnic diversity from the City's and County's population. Four sub-groups, totalling 50 people, were also formed: Agriculture, Forestry, and Land Management (AFL); Energy, Transportation, and Buildings (ETB); Health, Extreme Weather Events, and Resilience (HWR); and Public Awareness and Outreach (PAO).

The CEMWG met twice each month from August 27, 2020 through May 27th (with the exception of once in December) on the second and fourth Thursday of each month. Two additional meetings were held in July and August. CEMWG attendance has averaged 82%. These bimonthly meetings featured subject matter experts and included progress reports from subgroups as well as consensus-driven problem-solving discussions about processes to employ, such as priority setting. A full list of speakers and topics are listed on the County Council's website, and include videos and powerpoint slides.

Main take-aways from the year together resulted in these major lessons:

- **Action on climate change is an economic imperative.** The total cost of climate-related disasters in the U.S. last year was more than $95 billion, and that disaster-related damage is expected to grow

KAI HAGEN

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as storms continue to intensify, droughts become more severe, and natural systems are disrupted. Insurance companies and investors alike are pushing local governments to take action on climate and mitigate risk. Each recommendation includes cost-benefit information for this reason.

- **Governments that are setting and meeting climate action goals are innovative in their funding approaches.** Authors of recommendations included options for funding — more are likely available. Teeing up ideas now will position the City and County for increased funding competitiveness.

- **People do not experience climate change equally.** Some will lose their jobs as the economy shifts away from fossil fuels, and people who find themselves financially or medically insecure are already at high risk from the changing climate around us. We must make decisions that first do no harm, and intentionally help the most vulnerable people thrive by considering their needs first. As County Health Department officials stated, *preventing* exposures and threats to health is the most important means to *protect* residents, and any and all actions to ensure minimal encounters with illness-generating living conditions should be undertaken.

- **Making climate-responsible decisions that are within local governments' authority has rarely been so consequential — locally, nationally, and globally.** Our local governments must find ways to protect citizens, and have the power to develop land use policies and to determine how buildings are built. Local governments have extraordinary purchasing power and own property, buildings and vehicles, and can marshall communities together to incentivize major transformation. Our shared history as a nation is riddled with transformative changes brought about by small communities.

There is no time to waste. The chaos we are experiencing from weather events heretofore unheard of are happening faster than models suggest and will only get worse. Slashing GHG emissions and adapting to the changing climate are essential tasks right now.

CEMWG's recommendations fit into these main ideas:

- **Conserve as much as possible**
- **Electrify everything**
- **Restore and protect nature**
- **Build now for the future extremes ahead**

More details can be found at CEMWG's Mobilize Frederick **website**, as well as the CEMWG Mobilize Frederick Twitter Account, and the CEMWG Mobilize Frederick Facebook Account.

Methods and Approaches

The CEMWG subgroups used approaches that are most relevant to their topical areas. AFL and ETB members focused their deliberations and activities on GHG emission reductions while HWR addressed potential remedies or adaptations to reduce climate impacts on public health, residents' properties and businesses, and the environment. PAO used media, surveys, and interviews to assess how residents and businesses were recognizing and adjusting to climate impacts.

CEMWG members recognized early in the process that many recommendations could be developed, but it was decided in the earliest stages of the work to submit high priority actions that address key criteria: expected impact on GHG emission reduction and/or resilience, equity, cost savings over time, and co-benefits, such as improved health, economic stability, and restoration of natural resources. Given the data available, actions that are suited to Frederick City and County have been deliberately chosen.

Next Steps

One concept CEMWG has discussed is "external" costs or "externalities," which are a feature of the fossil fuel-driven economy. These costs are not borne by the industries responsible for them — rather, they are passed on to society at large, and typically borne by people who can least afford them. For example, the air pollution of an incinerator is not a legal responsibility the incinerator company is expected to address beyond a certain amount, but the health and medical bills of the surrounding residents are seriously affected. This dynamic explains why Baltimore has some of the highest childhood asthma rates in the country, and why those rates are most significant in poor, Black families who live near incinerators.

Likewise, fossil fuels release GHGs when they burn and cause illness in people who live near refineries, natural gas extraction facilities, and high traffic areas with minimal green infrastructure. These costs are passed on to all of us, but especially hurt people who are already vulnerable. To address these costs, the Social Cost of Carbon (SCC) is a concept used by the federal government and an increasing number of states to place a price tag on the damages caused to people and to the natural resources we all depend on. SCC is a powerful tool that guides policy makers to arrive at better decisions for the good of the community. For example, say new solar carports on school parking lots cost $8 million, and are projected to pay for themselves through energy savings within seven years, presenting a strong case for investment. The decision for this investment becomes even clearer when SCC is applied at $51 per metric

ton (the current federal rate) of carbon emitted by current energy use. Although using the federal rate to calculate costs and benefits in decision making does not appear in these recommendations, the Maryland legislature considered a bill (Climate Solutions Now Act), which would implement its use, further supported by analysis from the University of Maryland Department of Economics. Going forward, the County and City governments are urged to apply SCC at $51 per metric ton for evaluating all significant decisions.

Stakeholder feedback has been a critically important part of this exploration. Some stakeholder groups accepted the invitation to appoint representatives to serve as part of the CEMWG or a subgroup. Others made time available to meet with CEMWG representatives and share perspectives and provide specific feedback. In total, CEMWG members held more than 70 stakeholder meetings, and issued 6 surveys through stakeholder groups. More details on stakeholder engagement are provided in Appendix C and D. CEMWG members have made every effort to craft recommendations that are responsive to stakeholder preferences and concerns. To ensure optimal results, it's strongly recommended that these stakeholder outreach efforts continue as recommendations are implemented .

A final point: The formation of a County-City jointly supported Climate Response and Resilience Office (CRRO) is key to ensure future consideration, discussion, and adoption of the report's recommendations. There is an intensity of work required that current over-committed, hard-working City and County staff members will not be able to assume. The CRRO will work across both governments to identify the most urgent climate-related policies to pursue, provide needed technical insight and opinion for the governments' deliberations, educate and engage the public, track adoption and implementation, seek additional external financial support, and create and distribute progress/results to the public in simple-to-understand web-based dashboard graphics. The CRRO will provide the expertise needed to ensure future policies will be climate responsive by helping staff and elected officials evaluate decisions through the lens of climate change.

There's a difficult environment ahead but there are multiple options to ameliorate the changing climate impacts through rapid actions and working together. Shared commitment throughout the community relies on public servants leading the way.

CEMWG BY THE NUMBERS

21
Number of CEMWG meetings held

70+
Stakeholder meetings held

146
Number of CEMWG subgroup meetings held

21
Expert presentations

60+
Meetings with subject matter experts

5
Fact sheets

6
Surveys conducted

18,500+
Estimated total hours dedicated by CEMWG members

17
Frederick News Post articles

2,750
People ages 18-65 reached on Facebook

IMAGINE 2047

Imagine it is 2047 and Frederick County has reached its climate goals and a zero-carbon economy three years ahead of our target. Our collective vision doesn't include flying cars and other high-tech possibilities, but is grounded in appreciating the quality of our lives achieved by responsibly addressing climate change.

Except for a few collectors' historic cars in this scenario, our vehicles are electric. No more getting stuck behind a car spewing out noxious fumes. We are healthier and the air is cleaner. We also spend a lot less on transportation and have multiple options for getting from here to there. Some people don't need or want to own a car. They live and work in the County and transit options serve most of their travel needs. When they do want to travel elsewhere, or go on the classic American road trip, they rent a vehicle and save tremendously versus the yearly cost of owning their own vehicle.

In 2047 residents of Frederick still admire and enjoy the agricultural areas of our County. Local farmers are experiencing normal, more predictable weather patterns and we have avoided the blistering heat and severe drought that could have devastated ag in the County. With more precision farming practices aided by technology, better soil health, and less costly inputs, our farmers are also doing better financially. More farmers have direct control over the price of their products and find satisfaction in providing food and fiber for their local community.

Local natural resources we all cherish feature clean, clear water. Fishing and swimming in local streams and lakes is routine. There is plenty of shade for hikers through the Frederick Watershed; the local, state and national parks throughout our County; and on most City streets. Local ecosystems are thriving and healthy, and songbirds once thought lost to this area have returned.

By considering equity and impacts on lower-income populations, adoption of climate solutions has greatly improved life for these families. They no longer spend an outsized portion of their income on energy, transportation, and medical treatments. Financial security has increased through good, local jobs that lead toward careers in a clean economy. Fewer families worry about where the next meal is coming from because they have more options for affordable, locally produced, nutritious food.

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PAUL WALKER

Imagine that Maryland, the United States, and the world have joined Frederick in reaching this goal. Some cities, counties, and countries may even get there as early as the 2030's. Those who got there faster enjoyed the local benefits sooner. However, the big prize of less greenhouse gas emissions warming the atmosphere has been achieved, as more and more cities, counties, and countries have reached necessary climate goals and milestones. Yes, we still experience droughts, wildfires, hurricanes, and other "weather" events. However, they occur less often and their impact is much less dangerous. Human mental health is much better as stress from loss, worry, and hardship has eased and a feeling of abundance and possibility has returned. Heat dome events, such as the one that caused hundreds of deaths in the Pacific Northwest and British Columbia in 2021, no longer occur. Explosive "tornado" fires and other weird and unexpected disasters don't happen. And, due to more resilient infrastructure, when extreme weather events do occur, we are better prepared to avoid many of the impacts and recover faster.

The 2047 story above is possible. The alternative future resulting from the business-as-usual approach is not hard to imagine, but it is scary: we are already seeing alarming impacts that are accelerating in scope, severity, and frequency. Addressing climate change is no longer about expensive solutions and sacrificing our standard of living. It never was. Climate solutions are better for our health and economy by cutting pollutants and adding stability. Plus, by acting with urgency, we can save trillions of dollars worldwide and millions locally in avoided costs from reduction of climate impacts. **It's time to work together and get this done!**

APPROACHES TO ACTION PLANNING

After extensive fact-finding, case study review, presentation, and discussion, the Climate Emergency Mobilization Workgroup (Workgroup) has identified the primary drivers of rapidly improved climate and environmental performance in Frederick City and County as:

- Considering climate change impact when making all significant decisions.
- Accelerating transition to clean electricity.
- Expediting transition to the latest edition of the relevant codes for buildings and land use.
- Protecting and improving soil health on public, private, and agricultural lands.
- Changing structures between the City and County to coordinate and align policies and programs to accelerate adoption of these recommendations.

In this section, the Workgroup presents a broad overview of the recommendations and their implications to provide options for local officials on approaches to action planning. The pathways to action for the City and County are legislative, budgetary, and administrative. To the extent possible, the recommended actions are organized under those pathways. The primary proposed actions have been generally categorized under — plan, policy, pilot, program, promote, study, and implement — for sorting and content analysis (see Sector and Recommendation Table on page 24).

From those delineations, several trends can be discerned that point to possible approaches toward investment and implementation. For example, many recommendations have several steps identified over a specified period of time. Those that suggest immediate specific action as a first step have been assigned "Quick Start." Other recommendations require investments in studies or extensive planning before a course of action can be fully articulated. Those recommendations have been assigned "Investigate."

Overall, the Workgroup has organized the recommendations by sectors or cross-cutting initiatives. In total, the Workgroup identified 40 recommendations, of which 24 were sector-specific and 16 cross-cutting (see Summary of Quick Start and Investigate Recommendations, Appendix E). The 24 sector-specific recommendations fell within 6 sectors:

Buildings	Agriculture and Land Management
Energy	Food System
Transportation	Forestry

Cross-cutting recommendations are defined as initiatives and actions that impact one or more sectors. Those cross-cutting areas are as follows:

- Leadership
- Resilient Systems
- Clean Energy Economy
- Education
- Community Action

The sectors with the highest number of recommendations are energy, transportation, and agriculture/land management. They also align with some of the most GHG-emitting sectors in the County and should be given a higher priority by local officials. Furthermore, agriculture is the largest commercial industry in Maryland, and Frederick County has more farms than any other county in the State, making land and soil management a priority for mitigating climate impacts. In those sectors, 9 recommendations are viewed as having Quick Start components, including:

- Facilitate the transformation of utility customers to clean electricity
- Reinvest savings from energy efficiency projects toward more energy reduction
- Reduce greenhouse gas emissions associated with the electricity grid
- Reduce solar soft costs
- Support and promote telework
- Facilitate the availability of biofuels for all vehicle types and home heating
- Facilitate the regeneration of natural systems on agricultural lands
- Provide outreach and coordination to expand conservation practices on agricultural lands
- Facilitate the regeneration of natural systems on private and public lands.

Buildings are another high impact sector and its Quick Start recommendations include:

- Adopt building codes that emphasize energy efficiency and climate resilience
- Incentivize the transition to environmentally sustainable (“green”) homes

Altogether, the sector-specific recommendations that are Quick Starts are 14. All Quick Start recommendations should be given immediate review to determine the possibility of beginning proposed actions.

Ten recommendations were assigned to Investigate. The Investigate recommendations in the high-priority sectors are as follows:

- Accelerate solar deployment
- Expand the installation and use of microgrids
- Transition all bus fleets to electric and enhance ridership experience
- Transition light and medium duty vehicles to all electric
- Study the feasibility of electric rapid transit bus service
- Protect and expand the preservation of productive agricultural land
- Pilot flexibility in site planning for enhanced resilience

KAI HAGEN

Although Investigate recommendations have preliminary steps to determine their course of action, that does not mean they should be shelved for later review. It may indicate a slower scale-up until data are acquired or additional analysis to determine best approaches is completed. Therefore, they should be examined along with the Quick Starts to develop possible portfolios of investments that can be staggered or phased-in over time as funds, data, and organizational opportunities arise such as partnerships with State and Federal governments and NGOs.

Among the 16 cross-cutting recommendations, nine are Quick Starts, four Investigate, and three are Community actions. The area with the highest number of recommendations by far is Resilience with 8. Half of the Resilient Systems recommendations are Quick Start and the other half, Investigate. In fact, the only Investigate recommendations that are cross-cutting fall within this category. **The Resilience Quick Start recommendations are as follows:**

- Enhance community public health resilience to extreme heat events
- Improve public health resilience to extreme precipitation
- Minimize the impact of extended droughts
- Reduce threats from pathogens, parasites, and pests.

The Investigate Recommendations are as follows:

- Upgrade stormwater and wastewater conveyance and storage management
- Build new and retrofit existing infrastructure to withstand anticipated threats
- Prepare for climate migration
- Install advanced treatment capacities for removal of natural toxins from drinking water.

Leadership and the Clean Energy Economy are critical cross-cutting areas because they point to the overarching structural changes needed within the County and City Governments to oversee these recommendations. Two important organizational actions are the creation of the County–City Climate Response and Resilience Office (CRRO) and the Clean Energy Advisory Council.

The joint County–City Climate Response and Resilience Office would provide coordinated technical expertise to monitor and report gains, conduct public engagement, and facilitate innovative financing approaches. The Clean Energy Advisory Council would assess climate economic impacts, propose approaches to socio-economic solutions such as workforce training, and identify sources and methods for greater capital access in Frederick for small-to-mid-sized projects that typically fall below conventional lending thresholds.

It is important to underscore that the advantages of the cross-cutting recommendations are their benefit to multiple sectors and, in some cases, when coupled with sector-specific actions, their accelerated or amplified effect on outcomes. They should not be assessed in isolation, but in combination with a suite of actions.

Ultimately, as stated earlier, the primary drivers of rapidly improved climate and environmental performance in Frederick are:

- Making all significant decisions considering the impact of climate change
- Accelerating transition to clean electricity
- Expediting transition to current codes for buildings and land use
- Protecting and improving soil health on public, private, and agricultural lands
- Changing structures between the City and County to coordinate and align policies and programs to accelerate adoption of these recommendations.

The Workgroup understands that certain aspects of these changes are not expressly in the City or County's purview in their totality, such as clean electricity availability through the grid. While the County and City can promote community solar and incentivize private solar purchases, it does not control how the State relies on the regional transmission grid (which is still primarily fossil fuel-dependent). Still, there are ways for Frederick City and County Governments to voice concerns for PJM's fuel mix and continued reliance on fossil fuels and identify and implement strategies to accelerate needed changes.

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In summation, the Workgroup recognizes that these recommendations are not likely to be implemented altogether. The Workgroup, however, does believe that these efforts are critical to the path for the future sustainability of Frederick's legacy — its farming community, its historical significance, its natural beauty, and the contributions of the many individuals who live, work and visit Frederick! Parameters for determining how to proceed have been outlined here as a starting point for a process of assuring that the quality of life in Frederick is not denigrated by extreme natural events, overuse of resources, and insufficient means to protect life and property. The Workgroup examined ways to begin to address equity issues and recommended a means by which more extensive examination could help improve the future outlook for many more people. It is the hope of this Workgroup that the policies, programs, and other actions proposed here can change the trajectory of outcomes for Frederick so that we may all — including future generations — enjoy, thrive, and take pride in where we call home!

SECTOR & RECOMMENDATION TABLE

REC. NO.	SECTOR	RECOMMENDATION	PAGE	PATHWAY	PRIMARY PROPOSED ACTION
				Legislative/ Budgetary/ Administrative	Plan, Policy, Pilot, Program, Promote, Study, Implement Quick Start/Investigate
1	Leadership	Provide the organizational structure necessary to make meaningful, community-wide progress on mitigating and adapting to the climate emergency	28	L,B,A	Pl, Po, Pr/QS
2		Lead by example	31	L,A	Po/QS
3	Buildings	Institute a building performance standard	34	L,A	Pl, Po, Pr/In
4		Adopt building codes that emphasize energy efficiency and climate adaptation	36	L,A	Po/QS
5		Incentivize the transition to environmentally sustainable ("green") homes	41	L,A	Pl, Pi, Pr/QS
6	Energy	Accelerate solar deployment	46	L,A	Pl, Pr/In
7		Facilitate the transformation of utility customers to clean electricity	48	L,B,A	Pl, Pm/QS
8		Reinvest savings from energy efficiency projects toward more energy reduction	49	L,B,A	Po/QS
9		Reduce greenhouse gas emissions associated with the electricity grid	51	L,A	Pm/QS
10		Expand the installation and use of microgrids	52	L,B,A	St, Pm/In
11		Reduce solar soft costs	53	L,A	Pl, Po, Pm/QS
12	Transportation	Transition all bus fleets to electric and enhance ridership experience	56	L,B,A	Pl, Im/In
13		Transition light and medium duty vehicles to all electric	59	L,B,A	Pl, Pm/In
14		Support and promote telework	61	L,A	Pl, Pm/QS
15		Study the feasibility of electric rapid transit bus service	62	L,B,A	St/In
16		Facilitate the availability of renewable fuels for all vehicle types and home heating	63	L,B,A	Pl, Im/QS
17	Agriculture and Land Managemt	Protect farmland and encourage local food production in developed areas	67	L,B,A	Pl, Im, Pm/In

REC. NO.	SECTOR	RECOMMENDATION	PAGE	PATHWAY	PRIMARY PROPOSED ACTION
18		Provide outreach and coordination to expand conservation practices on agricultural lands	70	L,B,A	Im, Pm/QS
19		Support and encourage the regeneration of natural systems on agricultural lands	72	L,B,A	Po, Pr, Pm/QS
20		Restore and sustain natural systems on private and public land	74	L,B,A	Po, Pr, Pm/QS
21		Pilot an alternative for stormwater mitigation for better results	76	L,A	Po/Pi/In
22	Food System	Facilitate the expansion of a robust local food system	80	L,B,A	Pl, Po, Pm, Im/QS
23		Encourage adoption of plant-rich diets	83	L,B,A	Pm/QS
24		Prevent disposal of organic material	85	L,B,A	Pl, Pr, Pi, Im/QS
25	Forestry	Increase the county forest canopy by 10% over current levels	90	L,B,A	Pl, Po, Pm, Pr/In
26		Facilitate the enhancement and protection of regional biodiversity	92	L,B,A	Pl, St, Pm/In
27	Resilience	Improve community public health resilience to extreme heat events	98	L,B,A	Pr, Im/QS
28		Prepare for public health in extreme precipitation events	99	L,B,A	Pl, Im, St/QS
29		Minimize the impact of extended droughts	101	L,B,A	St, Im/QS
30		Reduce threats from pathogens, parasites, and pests	103	L,B,A	Pl, Im/ QS
31		Upgrade stormwater and wastewater conveyance and storage management	105	L,B,A	Pl, Po, Im/In
32		Build new and retrofit existing infrastructure to withstand anticipated threats	108	L,B,A	Pl, Im/In
33		Prepare for climate migration to Frederick	109	L,B,A	Pl/St/In
34		Install advanced treatment capacities for removal of natural toxins from drinking water	110	L,B,A	Pl, Pr, Im/In
35	Clean Energy Economy	Lead the community toward a clean energy economy	114	L,B,A	Pl, Im, Pm/QS
36		Create and deploy workforce transition plans	116	L,B,A	Im/QS
37	Education	Build climate-resilient school communities	120	L,B,A	Pl, Im/QS
38	Community	Climate actions for Frederick area residents, households and homeowners associations	125		QS
39		Climate actions for Frederick area businesses and institutions	129		Pm/QS
40		Charter a community–wide implementation team to support adoption of the recommended climate actions	132		QS

LEADERSHIP

Over the past several years, Frederick County and Frederick City governments have been recognized for their leadership on climate change among their peers, deservedly so. These governments have led by example, administering climate actions which have led to reduced GHGs and increased energy conservation, focused primarily on government operations, in collaboration with the Metropolitan Washington Council of Governments and other partners. At the same time, area residents are experiencing increased impacts of the changing climate, including longer, hotter summers, more dramatic weather events, frequent flooding, longer droughts, and associated health impacts.

Multiple stakeholders have shared that the climate emergency is increasingly experienced throughout all sectors of our community, most dramatically by individuals and families who face financial instability, consistent with patterns around the world. These members of our community are harmed when the price of food increases, when floods damage property, when utility bills increase, when their need for public transportation is not addressed; and their health suffers more when summer heat increases. For roughly 37% of the Frederick County population, climate-related impacts are making life harder, a dynamic expected to worsen with time unless planning and policymaking are intentional about bridging gaps in access to solutions. The climate emergency calls for a more intense, equitable and focused response, with local governments establishing the pathways in partnership with the entire community.

The World Resources Institute recommends governments pursue climate planning with actionable policy, political leadership, responsibility allocation, oversight, technical leadership and a whole government–whole society approach. These interrelated facets of climate leadership recognize that governments play a vital role, but cannot achieve the necessary GHG emissions reductions alone, nor completely prepare citizens for adaptation without comprehensive community–wide collaborative planning and engagement.

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1

LEADERSHIP RECOMMENDATION

Provide the organizational structure necessary to make meaningful, community-wide progress on mitigating and adapting to the climate emergency

- **Establish a joint County-City Climate Response and Resilience Office** to publicly report progress on goals, educate and involve the public, develop innovative financing support, and provide accountability.
- **Place equity and the needs of people as the driver** in climate planning and action.
- **Make all significant decisions through the lens of Climate Change.**

A combined Climate Response and Resilience Office (CRRO) is proposed to serve both County and City governments with three shared staff members, as a complement to the existing sustainability offices and other participating jurisdictions to: 1) regularly provide coordination, oversight, and accountability of climate program implementation; 2) provide technical assistance to County, school district, and City government departments, as well as other municipalities in Frederick County that choose to participate, in identifying the best technical solutions and expand thinking toward more sustainable practices and purchases; 3) launch and implement a robust public education and engagement campaign; 4) publicly report progress on achieving climate-related actions and metrics semi-annually; 5) review all public policies, regulations, and services to ensure that appropriate officials, staffs, and contractors have addressed impacts on emissions and/or resiliency; 6) seek funds from a variety of traditional and innovative funding sources to achieve goals; 7) administer the Benchmarking Program as described in Recommendation 3; and 8) coordinate with Frederick County Public Schools to create an interactive educational website for all residents, complementary to the K-12 climate education curriculum in Recommendation 37.

In a study of local leaders, researchers found that climate planning, action and resilience was hampered by the lack of dedicated staff and budget. This office is designed to combat these issues by collaborating across governments, seeking funds from a variety of public and private sources and recommending innovative funding models used by other jurisdictions so climate solutions are not stalled by funding barriers. A CRRO should be jointly funded and staffed with three qualified professionals within the first year, and reporting metrics should be finalized as a dashboard on a public website with educational and programming content included.

The success of climate mitigation and adaptation efforts will be highly dependent on how effectively the residents, businesses and schools are being actively engaged and encouraged to participate. In order to educate every sector of the public, the CRRO should strive to create and maintain partnerships with key stakeholders, provide increased opportunities for educating the community about climate change, and empower the community to take action, reducing the risks and stress associated with climate-related impacts. The County Public Health Officer has stated that it is much less expensive to educate people to prevent

climate-related health impacts than it is to ameliorate the impacts after the fact.

The CRRO should establish metrics for recommendation progress to be tracked within the first six months of office operations. The CRRO website should be the venue for publicly reporting selected metrics through a dashboard format, easily understandable and accessible for citizen engagement.

Although rebates and subsidies have incentivized a market shift to clean energy, they have not done enough to move clean energy technologies and other climate-related strategies into the marketplace at a rate that can match the need for GHG reductions. As a result, alternative financing approaches both backed by government agencies and those funded strictly by private capital providers are becoming more prevalent. An increasingly interesting delivery mechanism that often packages one or more of these alternative financing solutions in one institution is a Green Bank and Loan program, which seeks to expand market opportunities through focused, private investment. Green Banks fund projects by addressing barriers that exist currently, including: climate projects too small to attract conventional lending; the intended customer base appears to be credit risky for the high, upfront cost of the technologies; and small, geographically dispersed projects cannot, on their own, be cost-effective for lending.

Placing equity and the needs of people as the driver in climate planning and action: Making equity, racial justice, and a just economy core goals of resilience and climate action plans is a recommended best practice. With this mandate, communities are finding ways to innovate, such as creating community land trusts to protect land from speculation and ensure affordable housing in perpetuity; by providing solar energy for low-income households; or by budgeting specific

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funds for equitable access to clean energy options in car purchases or energy retrofits. Inclusionary zoning is another example of a policy choice that creates equity in housing *and* provides opportunities for climate-responsible land use planning.

All residents of Frederick County will experience impacts to their health and economic wellbeing due to climate change, but those already under-resourced will find it more difficult to adapt and recover quickly from an extreme weather event. Existing health threats will be amplified for everyone, but for those already disproportionately impacted by adverse health outcomes, the effects will be multiplied. Likewise, those on insecure economic footing are likely to experience still greater precarity. An equitable society is one where each individual has what they need to care for their family's health and general wellbeing.

Colleagues in Philadelphia have developed a vulnerability (equity) index for areas of the City most in need of public and private placement of sustainable infrastructure practices that if implemented, could substantially reduce persistent, disproportionate spatial disparities in public health and infrastructure established over past decades. Using compiled Frederick statistics on demography, income, receipt of public assistance, access to transportation, air quality, food access, education, amount of green infrastructure, etc., maps have been generated (in Appendix F, Recommendation 1, Figure 1) indicating likely County and City areas for targeted implementation of sustainable practices that will reduce climate impacts. Maps like these, with parameter weighting chosen to reflect identified variations in vulnerability or threat, could inform public and private decisions for modifying local land use, construction, public health access, and other important social services to best protect residents and their properties.

Make all significant decisions through the lens of climate change, centering the needs of people in climate planning.

City and County officials and staff have enormous responsibilities to protect quality of life for area residents and businesses and have done so effectively over the past decades, stimulating local growth. However, the rising income inequality in this area, coupled with disparate impacts of increased extreme heat, flooding, drought and other extreme weather events, calls for a decision-making process that takes these impacts into account with more analysis and intentional review. It is recommended that review boards for each jurisdiction be established, with technically skilled residents to assist in evaluation of services, codes, regulations, ordinances, or policies. Oversight of this review could be ensured through the proposed staff of the CRRO or the County Sustainability Commission and City Sustainability Committee through a change in bylaws and recruitment strategies. Several jurisdictions have adopted new procedures into governance of their communities for this reason. Assessment of government-sponsored legislation, policies, purchases, or infrastructure commitments through the 'lens of climate change' not only saves substantial public funds through time but offers multiple protections beyond the expected direct benefit of the decision, ensuring the high quality of life for the area that has been established through the City and County over the past decades. Implementing policies and practices that respond to the realities of the changing climate must become standard operating procedure so that future generations can continue to thrive in the society, culture, and natural beauty we value.

2

LEADERSHIP RECOMMENDATION

Lead by example

The City of Frederick and Frederick County have made great progress in the past decade to reduce GHGs and pollutants in government operations. This leadership matters. On average, local governments own 20% of the community's building floorspace and provide 15.6% of the purchasing power. In addition, local governments own and/or lease sizable vehicle fleets, and Frederick City and County own substantial parcels of public parkland. By changing practices in these four main areas — buildings, transportation, land management and consumption, governments can provide a model of energy efficiency and clean energy use, and have the power to change markets to cleaner, more sustainable practices. Leading by example can change the trajectory of the entire community to a healthier and thriving future — visions promoted in both the Livable Frederick Master Plan and CommUNITY 2030.

Purchasing products and services has great potential impact, two to three times more than other areas of operations. Both governments can use the power of the purse to favor the selection of sustainable, low-carbon products and services to move to a more restorative economy. Products used by the City and County should be "remade"— through recycling, repurposing and restoring.

Public parks can expand their missions to be demonstrations of ecological practices that restore natural systems, more easily appreciated through direct experience. Waterford Park in the City of Frederick is an example of a park developed by the City, with the help of passionate and visionary volunteers, to be an ecological teaching laboratory, much like **Highline Park in NYC**.

To lead by example, the City and County should adopt sustainable purchasing policies, integrate educational demonstrations of ecologically sound practices on parklands, continue to conserve energy, and electrify buildings and fleets.

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POINT OF ROCKS

BUILDINGS

While estimates vary, most U.S. residents spend approximately 90% of our time indoors. This makes residential and commercial buildings important not only from a climate change perspective, but also from a health and quality of life point of view. A recurring theme in addressing climate change is that the actions to reach critical climate goals will have added benefits in other areas, especially true with actions related to buildings. Reaching climate goals requires us to design, build and retrofit buildings that use less energy and rely on clean energy, making buildings healthier and more comfortable, and ultimately, improving quality of life.

> "Passive House is quickly becoming recognized as the most rigorous standard of sustainable building from a global perspective. The standard is purely metrics-based; that is, to meet the requirements, the building must satisfy specific measurable criteria that directly indicate how much (or how little) energy is consumed. But even more than that, Passive Houses have a reputation for providing healthy, well-ventilated, and extremely comfortable dwelling spaces."
>
> Bruce H. Zavos, AIA

Focusing climate action on buildings is a wise investment because most buildings last many decades. Improving buildings, and building them better from the start is an investment that pays off for a very long time through lower operating costs.

Getting value from building improvements requires good data and systematic measurement. Such a data-driven analysis will improve buildings, making them healthier and cost effective while reaching emission reduction goals.

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3

BUILDING RECOMMENDATION

Institute a Building Performance Standard

The Metropolitan Washington Council of Governments (MWCOG) estimates that 51% of the total greenhouse gas (GHG) emissions for Frederick County are from buildings. Implementing Building Performance Standards (BPS) across the County and City will improve performance, conserve energy, reduce operating costs in buildings, and mitigate the release of GHGs that drive climate extremes and cause deterioration of air and water quality for the entire community.

Implementing a BPS is a multi-step process over a 15–30 year period, starting with the development of benchmarks of energy consumption by building type across the County and City; then, creation of a set of recommendations that will evolve to an ordinance, with flexibility for amendments to include emerging technologies. The ordinance should permit establishment of interim standards for energy, water and waste. Ultimately, the ordinance will achieve the optimum performance standard for each building over a period of 15–30 years with decarbonization/electrification, providing grid flexibility and reliability.

A jurisdiction's Benchmarking and Building Performance Standard is an ordinance with four principals:

1. Equity must be central in designing a BPS ordinance, especially since building owners of and tenants in low income housing will be impacted. Planning for equity involves stakeholder input, the inclusion of tenant protections, and prioritization of funding for affordable housing and small business owners who lack the resources to achieve compliance.

2. A BPS platform provides Frederick County and City the option to develop multiple standards, such as performance metrics for water and energy consumption, peak electricity demand, and GHG emissions produced on site or from district energy systems.

3. The inclusion of short- and long-term requirements that encourage owners to take early action while providing them with certainty that allows planning for long-term comprehensive capital improvements. This strategy also provides the County and City time to adjust requirements, resource needs and funding options.

4. Compliance pathways should be flexible. This will allow building owners with unusual circumstances to propose alternative compliance plans with performance levels and timing which may differ from the ordinance requirement.

Frederick County's Top 20 ("Top 20") employers are important partners in the development and implementation of the BPS because they: 1) have existing sustainability efforts underway; 2) employ 10% of the Frederick County population; and 3) have resources (people) who can assist in future implementation of CEMWG recommendations that reduce GHGs and protect public health, businesses and property. This group of employers includes Frederick County Public Schools, Frederick Community College and Hood College, the latter with a curriculum framed around the water–energy–food (WEF) nexus.

A growing number of jurisdictions, including neighboring Montgomery County, have now implemented "beyond benchmarking" policies

that compel building owners to take action to improve their buildings' energy performance in addition to reporting data. Building owners will experience lower energy and water costs, with the possibility of passing on cost savings to tenants, freeing up funds for other expenses. Many of the anticipated actions have been shown to drastically improve indoor air quality and reduce respiratory and cardiovascular diseases and allergies.

Federal tax credits for builders of energy efficient homes and deductions for energy efficient commercial buildings are available. The Maryland Energy Administration has a number of programs that can support energy efficient upgrades or construction as well. The County and City should explore these funding sources to ensure inclusion of BPS in the construction and operations of all future public buildings.

This staged approach has been used by other jurisdictions in the implementation of a BPS:

- **Determine direct energy costs** for each building type through a Building Performance Study to inform reduction targets and compliance reporting milestones.

- **Establish a Building Energy Improvement Board** to evaluate and inform rulemaking decisions and compliance pathways, set and update performance standards, and advise and/or oversee implementation of the policy. This board should be composed of representatives from the building industry, utilities and building owners.

- **Adopt a benchmark ordinance** with phased compliance and specific actions to improve building performance after initial upgrades.

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4

BUILDING RECOMMENDATION

Adopt building codes that emphasize energy efficiency and climate adaptation

Efforts to increase energy efficiency in buildings and install climate resiliency measures, whether in new construction or retrofits, will reduce energy consumption, reduce GHG emissions, increase climate resiliency in local infrastructure, and result in healthier and more comfortable homes and work environments. Adoption of new codes should be the highest priority for both governments.

Most existing buildings are 'leaky' and allow heat to enter in the summer and escape in the winter, while current construction codes only loosely require protections for new owners or renters from temperature extremes or flooding damage. Technologies developed in the last three decades can stabilize air temperature, maximize air quality, and minimize flood threats in all buildings. In order to minimize these threats to health and property, particularly for the most economically constrained members of this community, it is imperative to require energy efficient and resilient buildings.

There are a number of construction options that can accomplish these goals. Passive building construction is a rapidly expanding industry that reduces energy demand *and* improves indoor air quality and heating/cooling to protect residents. In low lying areas or areas where there is a history of flooding, elevating buildings and adopting appropriate foundation designs should be considered, particularly in light of the much more frequent 100 year storms that are impacting this region. In areas with inadequate public stormwater, sewage conveyance systems, or insufficient storm storage capacities at public facilities, City or County funds should be appropriated to install greater conveyance and storage capacities for stormwater systems and sewerage utilities. If this option is impractical or not cost-effective for the number of homes and buildings impacted, the City and County should set aside funds to help homeowners who experience flooding damages because of insufficient public protections for their property. As the City and County grow in population, long-term plans for larger capacity stormwater and sewerage conveyance and storage should be a priority. Many other jurisdictions have adopted such measures and provide models for implementation.

Low income families are more likely to experience higher utility costs per square foot because of lower efficiencies of older homes and poor maintenance of affordable rental properties. There is one program available through the Department of Housing targeting these families; unfortunately, the program is only able to help 20% of the applicants who apply. The Empower Maryland Limited Income Energy Efficiency Program is another option helping households with installation of materials and equipment at no charge. To properly provide support for our community, grant programs for weatherization of homes should be created using ALICE income guidelines and staggered within the fiscal year. The improved income guidelines would provide more opportunity to families in Frederick to take part in this program.

Many of these building requirements could be initiated by limiting fiscal impacts on low income community members through adopting incentives, public-private partnerships, and creative financing like Green Banks to transition existing properties or build new construction. Rental owners should be engaged and required to transition existing buildings to the new designs, perhaps benefiting

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from private-public partnering possible in Green Banks or public incentive programs. The Power Saver Retrofit Program should be advertised and cued to households with limited income (ALICE, disabled, or senior residents) and people living below the federal poverty level. As indicated by the New Buildings Institute, “Some states have taken notice of the impact energy efficient housing plays in low-income communities and they encourage high-performance building by placing funding conditions on funding sources like grants and tax credits.” An excellent example is the Pennsylvania Housing Finance Agency (PHFA), which has provided tax credits to support the development of over 900 Passive House units, and is becoming a national leader in energy efficient housing for low income renters.

A common misconception is that energy efficient buildings may not be financially justified. Green buildings are a higher value, lower risk asset than those built to current building code standards. Green buildings typically have had a higher upfront cost compared to conventional construction, but they provide benefits lacking in buildings constructed to current code. Obvious benefits include reduced energy and water use, less waste production, and lower operations and maintenance costs. Often overlooked are the enhanced occupant health and productivity returns. The overall net benefit of investing in resilient infrastructure is $4 for every $1 invested in one study and $5.79/sq ft in another location. There are many options available for financing passive housing, and new incentives and funding sources are expected. Many states are expanding incentives because of the demonstrated benefits and cost savings described.

Recommended actions:

■ **The City and County should adopt the 2021 International Green Construction Code.** Various stretch codes, standards, and certifications will offer increased energy efficient buildings and can be added as amendments.

■ **Add a "Solar Ready" option to building codes and provide incentives for such an option.** This would encourage builders to construct buildings in such a way as to make later solar installations easier and less expensive (e.g., roof orientation, roof pitch, and rooftop protrusions located together).

■ **Add an "EV (Electric Vehicle) Ready" option to building codes and provide incentives for such an option**, encouraging builders to pre-wire for EV charging and offering them an EV Ready designation that could be used in their marketing efforts.

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■ **By executive order, require the County and City to lead by example** and take all necessary steps to integrate the U.S. Green Building Council's Leadership in Energy and Environmental Design ("LEED") Silver standards as a minimum for construction of all new County and City facilities and all major renovations to existing County and City buildings. Any development projects that are receiving financial assistance or special approvals from the County or City should be required to do the same.

■ **Begin discussions on adopting/ incentivizing passive building principles** and technologies as standard construction practices beyond 2030.

■ **Expand home inspections with trained personnel** that accompany construction permits for repairs, retrofits, and new buildings to ensure replaced or new materials are consistent with maximum use of cool roofs, building ventilation, and below ground flood protection.

■ **To increase participation in the Power Saver Retrofit Program among the lowest income members of our community, expand the outreach effort** to this segment of the local population. Establish and expand existing public incentive and energy assistance programs (e.g., LIHEAP) for low income, ALICE, disabled, or senior populations.

■ **Establish an active collaboration of the Office of Economic Development, Frederick Community College, and the Frederick County Business Industry Association** to develop ongoing training modules for new

RANI RUSNOCK

technology installation and maintenance in new construction and retrofits.

- **Build expanded stormwater and sewage conveyance and storage systems** for flood-prone areas or establish public funding mechanisms to reimburse or insure homeowners against flooding and sewage damage.

- **Develop long-term infrastructure plans for stormwater and sewage conveyance and storage systems** for the City and primary and secondary growth areas identified in the Livable Frederick Master Plan.

- **Local delegations should seek state adoption of a Maryland passive house incentives program**, as described for 12 states in the U.S., and permanent State/Federal funding for routine installation of climate resilient technologies.

Historic preservation and energy efficiency can work together

My wife and I bought a fixer-upper historic row home in Frederick, Maryland in December 2014. Many renovations over the years meant the house had been converted to apartments with wall surface mounted electric and individual wire and ceramic insulators. There was no air conditioning and the heat was provided by a gas hot-water boiler and radiators. We ended up gutting the house, and now have a mostly-electric home with high efficiency heat pumps and appliances. If we were making product choices now, an electric hot water heat pump is the smart decision. All hot water pipes were insulated to slow down cooling of the water, and additionally, we save energy by insulating all water pipes and the location of the water heater closer to the three plumbing stacks. We used a mix of state and federal tax incentives to help defray the costs of these expenses.

COURTESY THE ROBEYS

Pam and Bob Robey in front of their home

With the walls open during renovation to allow for running new electric and plumbing within the walls, we made a determination to improve the sealing of the envelope of the home. There was little we could do about the solid brick walls of the house but all exterior frame walls were padded out on the inside so that we could install 6 inches of spray foam insulation. We also sealed the perimeters of all exterior doors and windows. Historic windows were left as is but all new windows were double glazed and approved by the historic preservation staff of the City. We even insulated the common wall between our home and our neighbor to improve sound attenuation. After replacing the roof, all attic spaces were spray foamed to create an 'R' value in excess of R-60. We worked with the contractor to assure that all openings in exterior walls for plumbing, electrical and venting were sealed to reduce airflow. We are extremely pleased with the level of tightness we have been able to achieve, given that the historic home is located in the Historic District. The latest improvement was installing a 240v line from the house to the garage for an installed EV charging station.

5

BUILDING RECOMMENDATION

Incentivize the transition to environmentally sustainable ("green") homes

The Department of Energy (DOE) has developed a Home Energy Score (HES) system designed to make homes more energy efficient by:

1. incentivizing homeowners to become aware of various technical options to improve the energy efficiency of their homes in addition to the financial incentives available to offset capital investments for installing green technologies; and
2. encouraging homeowners to invest in improving home energy efficiency.

It is a proven system that has been in operation for more than eight years and has been adopted by a number of states and organizations. The HES system provides a means to quantify estimated reductions of energy use per home and a calculated CO_2emt (metric tons of CO_2 equivalents) per year, critical to showing energy demand declines, associated lower GHG release, and cost savings for homeowners.

Mentoring organizations exist for the purpose of helping programs develop. Important partners include the real estate industry, i.e. its leaders, appraisers, and assessors, to properly value the true worth of a home. These relationships help change local markets as the existing and projected housing stock changes to become safer and more resilient in the changing climate. Based on the experience of other communities that have adopted the HES system, a County-wide program could be ready for roll out within five years of initiating a pilot program.

The HES system, which rates the energy efficiency of a home and allows for comparison with other homes of similar characteristics, is built on several models and relies on experience.

BARB TRADER

Homes with rooftop solar panels in the North Pointe development, downtown Frederick

There are a number of sophisticated scoring systems (LEEDS, EPA Green Star Homes, and DOE's Home Energy Rating System) but all of these systems require testing, verification, and documentation that could be both costly and time consuming. HES is a system that is quick and straightforward, easily understandable, reasonably inexpensive, has a high level of confidence by industry stakeholders, and is easily understood by homeowners who may not have a technical background.

Moreover, the HES system is effective. Based on the results of HES for 128,000 homes, DOE determined the average initial HES score

to be 4.6/10 and the average final score after improvements to be 7.1/10. This resulted in an average reduction in CO_2 emt of 1.9 tons/year/home, an average reduction of $575/year/home in energy bills, and a 22% drop in energy demand. These outcomes provide substantial benefits to the community of improved air quality and reduced stress on the energy grid.

By requiring all homes for sale, resale, or major rehabilitation to obtain a nationally recognized Home Energy Score, there will be a standardized basis by which individuals can:

- Better determine the value of the home to the seller and buyer.
- Document the status of a home's energy efficiency.
- Accurately compare a home's energy related operating cost to other homes.

Recommended actions:

- **Develop an HES Assessor training program** with a national or industrial partner.
- **Create a resource pool for use by elderly and economically disadvantaged to have access for funding green upgrades to homes**, and a resource center to help all homeowners and real estate industry professionals.
- **Initiate a pilot program (for example, 1,000 homes).** Seek grant funds (investor, state, federal, etc.) to run the program and perhaps subsidize upgrades to demonstrate the validity of the program's benefits.
- **Establish a tax credit** for full/partial funding for securing an HES for the home.
- **Require HES to be included on the Multiple Listing Service (MLS)** for all homes being sold.
- **Create legislation similar to the Mathieu Cast Act in Michigan which does not allow municipalities to tax energy efficiency and solar assessments** — increasing property taxes for improvement to a home's energy efficiency is a disincentive.

Some Power Saver households are using 40% less energy than they used to.

FREDERICK COUNTY OFFICE OF SUSTAINABILITY AND ENVIRONMENTAL RESOURCES

Green Homes Challenge

Frederick County's Green Homes Challenge guides, rewards, and recognizes households for saving energy, adopting environmentally-friendly lifestyle practices, and using renewable energy. Anyone can participate at FrederickGreenChallenge.org, one centralized place where participants can find all the resources and actions needed to make a difference. Nearly 2,400 households have engaged in the Challenge. Participants can track their actions and certification progress online, create and join teams to work together, and view estimates of the impact of their actions on expenses, electricity and water use, and more. Based on their collective energy saving actions, together Challenge participants are avoiding approximately $1,537,400 in annual household expenses.

Three corresponding challenges make up the overall Green Homes Challenge and downloadable handbooks are available for each. The Power Saver Challenge aims to reduce your household's utility bills and improve the comfort of your home. Some Power Saver households are using 40% less energy than previously, and utility bill savings can mount up to thousands of dollars over just a few years. The Green Leader Challenge helps participants conserve valuable resources, reduce environmental impact, and create a healthy home. The Renewable Star Challenge is all about using clean renewable energy such as wind, solar, geothermal, or sustainable biomass. The Renewable Star Challenge can help any household use renewable energy for power, heating, cooling, or generating hot water. This Challenge's handbook also includes detailed chapters about how renewable energy options and systems work.

FREDERICK COUNTY OSER

Orr family at Green Homes Challenge Recognition Event

ENERGY

Energy is something easily taken for granted. While energy is not 'seen', its benefits are everywhere from multiple inexpensive and abundant energy sources. The harnessing of energy from fossil fuels has created a high quality of life, reduced the burdens of work, increased our comfort, and expanded our economy and economic output. However, these benefits have come at great cost in the form of greenhouse gas emissions and pollution. In addition to the climate change impacts from these emissions, the pollution from the use of fossil fuels has severely damaged human health and harmed the natural resources relied on to live, leading to much higher healthcare costs, premature death, and economic hardship.

> "Change is hard. The job of politicians is to make it easier for those affected, so that what must happen can happen... But that hard job is infinitely easier now that renewable energy is suddenly so cheap... It's the greatest gift we could have been given as a civilization, and we dare not waste it."
>
> Bill McKibben
> The New Yorker, April 28, 2021

The cost of the fossil fuel energy system has not been evenly distributed. Much of the 'dirty' energy system is located near low-income and minority communities. This places an outsized burden on these groups and a higher health impact.

While much needs to be done to revamp the energy system, the good news is that cost is not a barrier to this process. The cost declines for wind and solar energy have been dramatic. In increasing instances, the cost to build new wind and solar energy production facilities is less than the operational cost of existing, fully depreciated coal and natural gas power plants.

The energy-related actions to meet our climate goals have the potential to provide tremendous additional benefits related to improvements in health, lower healthcare costs, and less impact on wildlife and ecosystems. These have already been seen and can change the future; reversing these threats depends on the scale and pace of adoption of zero-carbon energy systems.

6

ENERGY RECOMMENDATION

Accelerate solar deployment

Increasing on-site generation of electricity at government and privately owned commercial and residential buildings in Frederick City and County will reduce greenhouse gas (GHG) emissions as well as the cost of this energy. Expansion can occur without significant impacts on the City and County budgets, leaving funds available for other purposes.

The cost of installing solar photo voltaic (PV) systems has been steadily dropping and multiple vendors are competing aggressively for installation contracts for large arrays. Many cities, counties, and non- government entities are opting for electricity bill savings by arranging with a tax-paying third party to own a solar array and simply paying for the electricity taken from the system. In this way, all capital costs and maintenance costs are avoided until the third party recovers the contracted sum fixed at the start of the project. This approach is especially advantageous for entities that do not pay income taxes, such as city and state governments, churches, and other nonprofit entities since the federal tax incentive of 26% of costs has been extended through at least 2023, with state and utility incentives added. When these savings are combined with the other financial income opportunities that the third party owners are experienced in maximizing, the amount that governments and nonprofits can save without incurring any costs can be substantial, assuming the contract with the third party is well designed.

Solar panels on the roof of Oakdale High School

THE SUSTAINABILITY AND ENERGY DEPARTMENT, FREDERICK COUNTY PUBLIC SCHOOLS

Two specific sites for solar PV systems — **schools** and **row homes** (also known as attached townhomes) illustrate the range of solar siting possibilities. Schools are an ideal site for solar PV systems because they often have large areas of unshaded parking spaces on level ground, over which carports can be installed to host solar panels, also providing shade for parked cars. School buildings use little electricity during the summer months, allowing the transfer of higher percentages of their generated power to the electric grid in the time when peak demand across other buildings is highest, adding a measure of resilience to the grid.

A second example is row homes in downtown Frederick and other Frederick County historic

communities. These contiguous roofs are typically flat and black from a waterproofing tar coating, and many are unobstructed. These features offer the possibility for a pilot program to install solar collectors and measure the estimated costs and benefits if this initiative were undertaken on a larger scale. Economies-of-scale should produce considerable cost savings. The Maryland Energy Agency may provide funding for such a pilot program. To comply with City Historic Preservation Guidelines, solar panels would not be visible from streets, sidewalks, or the windows of other homes.

Frederick County's Livable Frederick Master Plan and the City's draft Climate Action Plan both express the intention to expand solar generation locally — the two options mentioned demonstrate possible ways to proceed.

Maryland, like many other states, has passed three laws related to solar PV systems that provide special financial benefits to their owners or "renters" who are also customers of their local electric utility, further incentivizing expansion of solar energy. These laws can be leveraged effectively to expand solar generation capacity. They include the **Renewable Energy Portfolio Standard (RPS)** law, which requires all electric utilities to purchase sufficient Renewable Energy Credits or pay an Alternative Compliance Payment which provides funds for loans and grants to spur new renewable energy resources in the state. The **Net-Metering law** requires electric utilities to credit customers for excess electricity generated by their systems. This is especially beneficial since much of the excess generation occurs in summer months just when peak grid demand occurs. The **Community Solar Program** allows an entity to build a large solar PV array and sell or lease portions of it to utility customers who choose not to or are not able to install an on-site solar PV system. Residential customers whose annual income is below a certain level can receive a state grant to cover a significant portion of the participation costs for the program.

> "This year, when we looked at the pricing for purchase starting Jan. 1, 2020, we could buy from 100% renewable sources for less than the cost of renewing under current [conditions]."
>
> Michael O'Connor, Mayor, City of Frederick announcing the purchase of 100% renewable energy to power City operations

Recommended actions:

- **The County should develop a plan with Frederick County Public Schools (FCPS) officials** to install solar carports within the next few years to save money and reduce GHG emissions.

- **An ad hoc City-County technical group should be formed** with representatives from the two governments, builders, developers, solar companies, and utilities to lay out future solar array/panel building options for new construction and retrofits of existing structures.

- **An outreach/education program should be established and maintained**, distributing funding opportunities, incentives, tax breaks, and siting options to residents and businesses
The City should specifically identify location possibilities for solar panel arrays for buildings in the Historic District Overlay and seek funds for a pilot demonstration.

7

ENERGY RECOMMENDATION

Facilitate the transformation of utility customers to clean electricity

Using a combination of available strategies, Frederick City and County can meet or exceed a mitigation goal of 50% of electricity customers using totally zero carbon energy by 2030. The proportion of renewable energy currently offered on the grid in Maryland is about 11% of electricity generation as of 2018, and about 8% of peak capacity as of 2019. Promotion of clean energy supply and aggregation will help increase renewable energy utilization in our region.

Any resident or business can switch to clean, renewable energy easily by selecting a renewable energy retail supplier like ClearView Energy, Energy Harbor, Clean Choice Energy, or Common Energy. Some of these suppliers offer energy for less cost than the customer's previous average bills, providing an equity advantage. The Maryland Public Service Commission supports consumer choice of electricity suppliers. Sponsorship of existing programs, like the Green Homes Challenge, can accelerate progress toward 50% renewable energy utilization. Every additional household, business, or government location that chooses clean energy drives up utilization and demand for renewable energy while helping to decrease our dependence on fossil fuels. These efforts can work alongside other initiatives sponsored by the state of Maryland, including net metering, tax incentives, and the community solar pilot program.

Other localities, including neighboring Montgomery County, are actively encouraging citizens to switch to clean power. Prince George's County offers property tax incentives for residential solar PV installations, and as a result, has the most market penetration of solar power in the state. The proposed actions can also help reduce energy costs as solar electric generation is now the least expensive electricity in history. Adopting renewable energy can therefore benefit an organization's bottom line, as well as help support a sustainable future for Frederick.

Overall, the shift to renewable sources means a reduction of the Frederick carbon footprint is achieved while City and County governments also save money; better air quality and lower heat extremes result, reducing health risks in the community.

Recommended actions:

- **Set the example** by pioneering new, local, renewable energy generation on City and County properties (e.g., solar schools). Where on-premises generation does not make sense, purchase 100% renewable energy-sourced electricity for City and County properties from clean energy providers.
- **Partner with power companies** and promote/incentivize the switch to clean energy through existing providers.
- **Monitor the Community Choice Energy Aggregation Pilot in Montgomery County** for potential future implementation in Frederick, and promote adoption statewide through frequent dialog with state officials.
- **Promote existing programs** such as the Green Homes Challenge and commercial PACE (Property Assessed Clean Energy). Pursue and publicize federal and state tax incentives to homeowners for energy conservation and clean energy sourcing for new construction and retrofits.
- **Offer property tax incentives** for residential solar PV or other renewable energy installations.

8

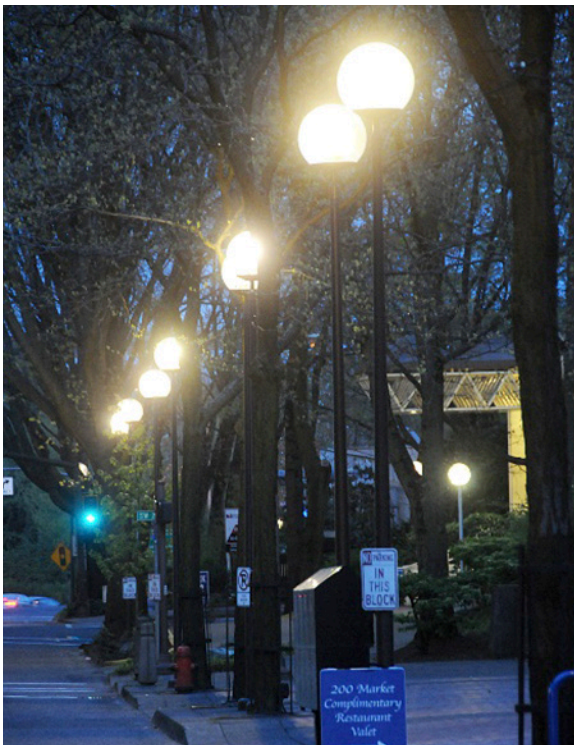
ENERGY RECOMMENDATION

Reinvest savings from energy efficiency projects toward more energy reduction

The cleanest, lowest climate impact energy is the energy that doesn't need to be used. This savings is often referred to as a Negawatt, a megawatt of power saved by increasing efficiency or reducing consumption. According to the American Council for an Energy-Efficient Economy, energy efficiency alone can achieve half of the 2050 climate and greenhouse gas emission goals.

Frederick County and Frederick City have been very active in improving the energy efficiency of government infrastructure and buildings. Building energy audits, various kinds of lighting retrofits, and other activities have reaped results, reducing energy use by the County and the City. These efforts should be organized as an ongoing, all-government project that continuously considers new opportunities. Savings from these efforts should be redirected toward additional energy reduction because of the scale and threats of the climate crisis.

LED streetlights in Portland, Oregon



MUNICIPAL STREET LIGHTING CONSORTIUM, PORTLAND CASE STUDY

Recommended actions:

- **Adopt a policy that cost savings from energy efficiency projects which exceed the cost of the project will be reinvested in other energy saving projects, much like a Green Revolving Fund.** These additional funds can be used to jump start projects with higher upfront costs and those where the savings are not sufficient to offset the implementation cost.
- **Create an inventory of the types of energy consuming products used in municipal operations.** This includes buildings, appliances, streetlights, mowers, etc. Determine the status of the energy efficiency of each product type as they are used (i.e., from manufacturer specifications, user experience, etc.), and as part of a routine replacement schedule, increase efficiencies as improved solutions become available.
- **Frederick County should collaborate with all municipalities in the County to learn from each other on these efforts and negotiate group purchasing arrangements when possible.** Public education about these efforts will also help businesses, institutions and organizations learn about new technologies and replacements, and provide a model for ensuring future energy efficiency in all operations.

C-PACE

The Commercial Property Assessed Clean Energy Loan (C-PACE) program provides commercial loans for Frederick County businesses and nonprofits that want to invest in energy efficiency, renewables, and water conservation projects. The loans are paid back through a surcharge on the property tax bill; this can provide favorable loan terms due to the strong position of a tax lien should the property go to tax sale. C-PACE allows commercial property owners to produce a new line of capital, create loans with up to 100% financing, and achieve a 20-year payback that can be cash flow positive from day one. Even more so, clean energy projects will add to the value of the commercial asset and can improve tenant retention. Eligible projects and costs include:

JOE RICHARDSON, JR.

Drone photo of Bar-T Mountainside campus

- Alternative energy systems (e.g., solar, geothermal, wind),
- Water conservation devices not required by law,
- Any construction, renovation, or retrofit to reduce energy consumption, including high efficiency lighting and building systems, HVAC upgrades, high efficiency boilers, furnaces, and hot water heating systems, and
- Qualifying improvements, such as energy audits, feasibility studies, design, installation, insurance, and loan closing costs.

Businesses with an interest in the program can email info@md-pace.com. The PACE website also includes program guidelines that specify program costs and other key elements. Additional information about the program can be found on the Frederick County Office of Economic Development website and on the Frederick County, Maryland Business Toolbox fact sheet.

The Bar-T Mountainside campus in Urbana is a showcase for energy efficiency, renewable energy, green building, and more. Bar-T was the first business to be approved for Frederick County's C-PACE program. This financing program allowed Bar-T to expeditiously implement a number of cutting edge renewable energy systems. Bar-T is a net-zero operation: it produces as much energy as it uses. Their C-PACE project was one of the first in the country to combine efficiency, generation, grid resiliency, and energy management technologies at a single location without out-of-pocket expenses and with savings from day one.

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ENERGY RECOMMENDATION

Reduce greenhouse gas emissions associated with the electricity grid

The electricity flowing through electric meters in Frederick County comes from the Potomac Edison **distribution grid** and has two components. The *smaller portion* is derived from the total amount of renewable energy that Potomac Edison purchased from customers and others, which is fairly "clean." The *larger portion* is derived from electricity supplied via the regional transmission organization, PJM Interconnection **transmission grid**, which is not as "clean" but has been getting "cleaner" every year as the fraction produced from power plants fueled by coal and oil has declined. The more self-generation by solar photo voltaic (PV) systems within the County by households, businesses, or government-owned systems, the larger the renewable, clean portion becomes thereby reducing the second, mostly fossil-fuel, powered energy production. The second portion also becomes cleaner as a result of:

- Decreases in the amount of electricity purchased each month by buildings and homes due to energy efficiency measures, and

- Increases in the MWh generated by eligible renewable energy installations producing Renewable Energy Credits that are sold to Potomac Energy and other distribution utilities to help them satisfy their Renewable Energy Portfolio Standard obligations.

As clean energy sources supplying the electricity grid increase, dependency on GHG-emitting sources decreases and energy becomes more dependable, paving the way for a clean energy future. Air quality and human health also improves, an important benefit for many low income community members living in poorly maintained residences.

Recommended actions:

- Expand actions to implement energy-efficiency measures and install renewable on-site electricity-generation systems at City and County facilities.

- Educate the public about the benefits and incentives associated with solar PV systems and energy conservation measures and promote their installation and adoption, respectively.

- Join with other Counties and municipalities to advocate for state and federal government actions that will accelerate the reduction in GHG emissions associated with both the electricity transmission and distribution grids.

Solar carports provide clean energy and keep vehicle interiors cooler.

IPS (INDEPENDENT POWER SYSTEMS) PHOTO

10

ENERGY RECOMMENDATION

Expand the installation and use of microgrids

Microgrids offer many positive features — they improve the resiliency of the facility(ies) they serve, they reduce monthly energy bills, and they reduce GHG emissions. It is the unfortunate expectation that severe storms in all seasons — and possibly tornadoes and hurricanes during hot weather — are more likely occurrences as a result of climate change. These weather events increase the likelihood of outages in the distribution grid and if an outage is widespread, it could last several days. The nearly state-wide power outage in February, 2021 in Texas served as a "wake-up call" for the nation regarding the fragile nature of large grids.

Power outages can be life-threatening for people whose lives depend on a continuous supply of energy because of medical conditions. People in nursing homes or hospitals are especially vulnerable. Fossil-fuel powered generators are often used to provide temporary power but microgrids can produce continuous power even when power from the grid is lost, while simultaneously producing energy savings every day.

Back-up generators have three disadvantages that microgrids do not have: 1) they provide no economic value except when events occur that require them to operate, 2) they are significant contributors to GHG emissions, and 3) they may fail to run at some point before power from the grid has been restored. In contrast, microgrids are ultra-reliable and operate every day of the year, reducing GHG emissions and saving money for the facility owner. They typically consist of a solar PV system, a battery, one or more back-up generators (including all existing units), and a control system that ensures the host facility's energy needs are met. They also provide the facility with power for heating, cooling, and other electric needs. As with stand-alone solar PV systems, facility owners can choose to contract with third party owners of microgrids to meet their ongoing daily energy and back-up needs without the responsibilities of maintenance.

Local energy costs are comparatively lower in Frederick County than in other parts of the state, so a feasibility study is warranted to understand costs and benefits. However, the dependability of energy sourcing, reduced GHG emissions, and protection for elderly, disabled, or families in poorly maintained homes during emergency events remain powerful reasons for expanding microgrids throughout the City and County.

Recommended actions:

- **Identify locations in Frederick County** where microgrids would serve the community with improved safety and reliability, such as medical facilities, community/cooling centers, elderly housing, and emergency response locations such as fire and police stations.
- **Request funds from the Maryland Energy Administration** for feasibility studies for these projects.
- **Develop a plan to facilitate the development of microgrids** in the County as a result of the study(ies).
- **Provide educational opportunities** for business owners and residents to encourage microgrids to improve resiliency.

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ENERGY RECOMMENDATION

Reduce solar soft costs

Solar module hardware costs have been decreasing dramatically for over a decade. Reduction of the non-hardware portion of solar installation costs will help to further reduce the cost of solar energy, thus making this type of renewable energy even more attractive from a budgetary standpoint. This will help promote further growth in the use of solar power and help reduce greenhouse gas (GHG) emissions. Already highly competitive, and now considered the "cheapest electricity in history," the price of solar power can be reduced further by shrinking non-hardware "soft costs" associated with labor hours, permitting and licensing, inspection and interconnection, installation processes, and solar developer company costs including customer relations and marketing.

Some of these cost reductions have been adopted in countries where solar energy deployment is more widespread. In Australia and Germany, for example, solar soft costs average 25% and 15% of total system cost, respectively, compared with the 65% of total system costs in the U.S. The U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy has supported teams in New York, California, Florida, and the Mid-Atlantic region to successfully develop cost-cutting solutions in three major areas — standardizing permitting and interconnection processes, facilitating bulk purchasing, and supporting online applications.

About 50% of identified soft costs in the U.S. are outside the sphere of direct government influence. But City and County governments do have some leverage over permit fees (2%) and labor required for interconnection, permitting, and inspection (2%). Local governments could also exert some influence regarding sales tax (5%) and transaction costs (6%). In addition, reducing permitting delays can indirectly reduce labor and overall costs for additional impact.

Recommended actions:

- **Reduce City and County permit and inspection fees** for solar installations.
- **Initiate application, permitting, inspection and interconnection process-simplification efforts.**
- **Explore funding opportunities** with the U.S. Department of Energy Solar Energy Technologies Office. Foster solar developer installation process improvement efforts.
- **Expand OED training modules** for technologies associated with solar panel installation and maintenance.

Frederick County solar panels have powered County operations with clean energy, reducing emissions and saving money.

FREDERICK COUNTY GOVERNMENT COMMUNICATIONS DEPARTMENT


TESLA
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TESLA

TRANSPORTATION

Transportation is the largest contributor to GHG emissions nationally and in Frederick County. It is also essential for getting to work, school, play, and household shopping. The impact of transportation goes beyond climate change. Air pollution from fossil fuel use has major negative impacts on public health and results in higher healthcare costs. This pollution also harms wildlife and ecosystems. The emissions and pollution from transportation are known as externalities, a side effect that is not reflected in the costs associated with transportation. The good news is that the benefits of transportation changes can occur very quickly. The 1996 Summer Olympics in Atlanta provides a good example. During this event there were large restrictions on vehicle traffic in downtown Atlanta. The reduction in vehicle traffic resulted in documented reductions in asthma acute care events at various hospitals. Cases returned to normal levels after vehicle traffic returned to regular patterns.

The path to a zero-carbon ground transportation system will require the electrification of vehicles, which are more efficient than gasoline and diesel vehicles with operational costs that are already lower for some vehicle types. Lower operational costs will be especially welcome to many lower-income households. According to an analysis by the American Council for an Energy-Efficient Economy, some households spend almost 20% of their income on gasoline. The electrification of vehicles will reduce noise and offer zero tailpipe emissions, improving health outcomes and reducing threats to wildlife and ecosystems. The transition to electric vehicles is not a sacrifice and provides a better travel experience.

The COVID–19 pandemic has shown that transportation patterns can change. Remote tools and the Internet allowed for new ways for people to work, learn, and connect, resulting in reduced transportation needs. Using the Internet for remote connections allows people to explore and connect faster than cars, trains, and even the fastest airplane. High speed internet access has become an essential utility in the U.S. and one of the tools for improving equity for all citizens.

The journey to a better transportation future has already begun. However, to meet climate response goals necessary to address the climate crisis and create a healthier and more equitable society, the City and County need to accelerate efforts to achieve a carbon zero future more rapidly.

JERRY RUSNOCK

12

TRANSPORTATION RECOMMENDATION

Transition all bus fleets to electric and enhance ridership experience

Frederick County will achieve significant GHG reductions by shifting from diesel to electric buses for both school and transit buses. This transition should be accomplished with the requirement for 100% carbon–free electricity, adding to the benefit. In addition, formally creating and announcing a transition plan would add to the signals already being sent to the market as bus electrification has been proven and primarily needs scaled adoption to drive down capital costs.

According to an estimate from Frederick County Public Schools (FCPS) staff, during the school year pre-COVID–19, the FCPS fleet of 446 buses were driven approximately 8 million miles with an average miles per gallon (MPG) of 7.5. According to the Environmental Protection Agency, using a gallon of diesel fuel results in 22.44 lbs of CO_2, meaning over 1 million gallons of diesel fuel was used and almost 12,000 tons of CO_2 emitted annually by FCPS's fleet.

Transportation is the largest contributor to GHG emissions in Frederick County. Significant reductions in greenhouse gas emissions from County bus fleets is not possible without electrification. Electric propulsion is much more efficient than combustion propulsion, with three times better MPGe (Miles per Gallon Equivalent) than a diesel bus. Additionally, over time the electric bus performs better as the grid gets cleaner, or as 100% clean electricity is adopted.

Eliminating the use of diesel engines will also improve human health and reduce the incidence of childhood asthma. Emissions from diesel engines result in higher air pollution emissions than other transportation fuels, and is a key source of one type of particulate matter, which is increasingly found to be more harmful than previously understood; it is especially dangerous to children, seniors, people with health conditions, and lower income communities.

There are also long term financial and resiliency benefits to electrifying buses. The operational costs (OPEX) of electric buses are lower than diesel buses. Frederick County has already experienced operational savings with the electric buses it has deployed. A variety of grants are available to address the higher initial upfront costs of the buses including the state of Maryland, federal funds, and VW DieselGate settlement funds. While electric buses purchased today are more expensive from a capital expenditure perspective, they have lower OPEX costs over the life of the vehicle in addition to the climate and health benefits.

School buses have some unique possibilities for financing or added revenue generation. Most of a school bus fleet sits idle during the summer months just when power demands increase due to air conditioning use. Using the batteries in a group of school buses as a virtual power plant (V2G, Vehicle-to-Grid technology), charging them at night at times of low demand, and discharging them to the grid during the day at times of high demand, can have several advantages. For the power system, this can flatten the demand curve for electricity, reducing stress on the grid system

and increasing resilience. For a school system, the arbitrage between the low cost night-time electricity rates and the high daytime peak demand rates can result in significant financial benefit. Pilots for V2G systems with school buses are occurring, providing models to draw on.

Recommended actions:

- **Complete plans by the end of 2022 for both the transit and school bus fleets to transition to electric buses.** These plans should include a date when replacement buses will all be electric, a timeline for the complete transition, and an analysis of the financial implications. With nine electric buses in its transit bus fleet, Frederick County is making good progress.

- With two electric school buses on order, FCPS has taken the first step in electrifying the FCPS school bus fleet. **The County should provide additional funding** to FCPS for creating an FCPS School Bus Electrification plan within one year of receiving funding.

- **Facility upgrades should be planned and implemented** to support these changes: all new/updated bus facilities should be built with future charging needs in mind; plan for the addition of as much on-site solar as possible at bus fleet depots; and explore the feasibility of sharing bus fleet facilities between TransIT and FCPS to reduce costs and improve impact.

> "If you provide good alternatives for public transport, you won't have traffic problems."
>
> Jaime Lerner

MARIO SESSIONS ON UNSPLASH

Winning drivers over to electric school buses

In late July the Electric Vehicle Association of Greater Washington DC (EVADC) participated in our first large event in over a year. It was an environmental expo at a park in Virginia near Mt. Vernon. In addition to a dozen cars from EVADC members, the local Fairfax County school district had one of their new electric school buses on display. I was especially interested in seeing this bus up close since I was fairly certain it was a similar model to the ones that Frederick County Public Schools has on order.

One of those showing the bus was a bus driver who uses it on his route every school day. He had great things to say about the driving experience: Less tiring to drive, easier to talk with kids without the diesel engine noise, and the lack of fumes. I asked him how they selected bus drivers for the new buses. He told me that they asked for volunteers and many drivers just weren't interested in "some new-fangled bus" and wanted to stay with what they knew. Once drivers are selected, they are permanently assigned one of the new electric buses. Over the last few months training for all the system's drivers has been taking place in anticipation of more electric buses in the future. With this training, most of those drivers who weren't originally interested have changed their minds, and are asking to be assigned an electric bus. This shows that while many aren't comfortable with change, once they have the chance to try it out, they are eager for it to occur.

PEGGY FOX / DOMINION ENERGY

One of the Fairfax County Public School system's first electric buses

— Ron Kaltenbaugh, President, EVADC

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TRANSPORTATION RECOMMENDATION

Transition light and medium duty vehicles (LDV and MDV) to all electric

The transportation sector has the largest share of greenhouse gas emissions (GHGs) in the United States, with 29% in 2019. In Frederick County, transportation is also a major contributor, accounting for 42% of overall emissions. Significant reductions in GHG emissions from transportation is not possible without electrification. A key benefit of electric vehicles is that over time their GHG reduction improves as the grid gets cleaner, or as 100% clean electricity is adopted.

As part of this initiative, the County and City can implement initiatives that encourage residents to replace their private vehicles with electric models.

The County and City can both achieve 100% transition to all-electric fleets by planning to replace aging vehicle inventory with electric models. This objective will be further enhanced by requiring contractors, such as mowing crews, to do the same. For every 1 million fossil fuel driven miles that change to zero emission electricity, over 500 tons of local CO_2 would be saved annually. This does not include the upstream emissions saved from not needing to produce, refine, and transport the gasoline or diesel fuel that was not used. Formally creating and announcing a transition plan would add to the beneficial signals already being sent to the market. Many vehicles in these classes are available today, and more models and better options have been announced and will be available soon.

Since fleet replacement plans exist, both governments can complete plans for transition to electric fleets by the end of 2022 for all relevant vehicle classes. These plans should include a date, and/or criteria, for when replacements will all be electric, a timeline for the complete transition, and an analysis of the financial implications. There may be some special-use vehicles for which a detailed path is unknown at this time. This should not derail this effort and these cases can be handled by including criteria based on availability and feasibility of suitable models.

Electric vehicles bring unique capabilities and options that will only increase as people become more familiar with them and as vehicle designers recognize the reduction in design constraints in electric compared to combustion engines. Some examples of these benefits include:

- More interior space
- Front trunks
- On-board power — An emerging feature is providing power outlets so that an electric vehicle can power equipment and homes during power outages.

Lower operational cost savings over the span of the vehicle's lifetime, coupled with greater longevity, leads to cost savings over the lifespan of most vehicles, even with typically higher purchase prices. There are a variety of financing options available. Grants and related incentives are one option, and leasing allows governments access to the value of federal tax credits that normally would not be available.

Both Frederick County and Frederick City have started with some electrified vehicles and are working on some elements of these recommendations. This recommendation is focused on accelerating these efforts and setting goals for 100% electrification of light and medium

FORD PROMOTIONAL PHOTO

The new Ford 150 Lightning EV is a game changer.

duty vehicles. This is another opportunity for Frederick County and Frederick City to work together and reach out to other County municipalities to partner in these transitions. Next steps include:

- **Creating a plan**, by the end of 2022, for 100% LDV/MDV electrification as soon as possible.
  - This plan should strive for no new purchases of non-electrified vehicles within the first year. With exceptions based on availability and feasibility criteria, a goal of the purchase of electrified vehicles (i.e., hybrids) in 2023 and only fully electric vehicles purchased starting in 2025 is recommended. In some use cases, even earlier deadlines may be feasible.
  - Plans for charging each municipality's fleet should be part of the plan and part of any upgrades to places where vehicles are parked/stored.
- **An education campaign for residents and businesses** in the City and County is important so they can learn by the example established.
- **Electrification of heavy-duty vehicles** (HDV), class 7 and 8, should also be explored. Since the nature of the work of this vehicle class generally involves heavy loads and not high speeds, the torque of an electric drivetrain can be beneficial.
- **Early examples of vehicles such as garbage trucks and fire trucks** are appearing on the market and starting to be adopted.
- **Rapidly add community-wide electric vehicle charging capacity.**

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TRANSPORTATION RECOMMENDATION

Support and promote telework

Telework reduces Vehicle Miles Traveled (VMT) and therefore reduces greenhouse gas emissions from commuting to work, and reduces road congestion which can also result in less traffic and idling of cars. The COVID-19 pandemic brought telework into the mainstream of employment practices for all companies. The advent of teleconferencing software also allowed isolated employees to communicate virtually and continue to operate. As the 2020–2021 pandemic is brought to an end, telework will still be a resource that businesses can use to attract employees and address climate change in a positive fashion.

Telework strategies have an immediate benefit by substantially reducing auto commuting trips. The drop in VMT was experienced throughout the County during the pandemic, and impacted climate change by reducing auto-related pollution. Richard Griffin, Director of the Frederick Office of Economic Development, reported in the March 25, 2021 CEMWG meeting that at least one member of 54% of the City's households telecommuted throughout the pandemic period, highlighting the potential impact telework has on emissions. In addition to reductions in VMT, telework aids families through increased flexibility, improves work/life balance via a reduction in time spent commuting, and saves costs associated with travel.

As the effects of the pandemic subside there will be a return to "business as usual" to some extent but telework options should be part of normal operating procedures going forward. There is no ideal model concerning time spent with telework vs. in the office. Schedules will vary based on job requirements, employee needs, and other factors.

> "At least one member of 54% of the City's working households telecommuted throughout the pandemic period."
>
> Richard Griffin, City of Frederick Office of Economic Development
> Presentation using data from the Stephen Fuller Institute, George Mason University

Plans should strive for flexibility and as much telework as feasible.

Recommended actions:

- **Update County/City plans to increase telework** options where it is feasible for each job type.
- **Adopt lessons learned from the pandemic** and continue good practices that support remote access to government services, remote inspections, etc.
- **The County's and City's offices of economic development should encourage area businesses** to offer telework and create a Telework Directory of Businesses that feature telework opportunities.
- **Utilize the expertise and resources available** through the state's newly created Office of Telework Assistance. The bill that created this office also requires "each governing body of a county or municipality to establish telework programs."

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TRANSPORTATION RECOMMENDATION

Study the feasibility of electric rapid transit bus service

Implementation of Bus Rapid Transit (BRT) routes has the potential to remove many vehicles from the roads targeted for this public transportation system. The scope of the impact is not available without further study, which should begin by evaluating a route from Frederick to Shady Grove Metro Station. Depending on the size and scope of the BRT system, the impact could be substantial. With transportation as the top sector for greenhouse gas emissions nationally and locally, reducing Vehicle Miles Traveled (VMT) and making those miles less polluting is key to addressing climate change. Additionally, road congestion makes the climate effect of VMT even more damaging through long idling and increases greenhouse gas emission. Congestion mitigation, traffic smoothing, and other techniques can reduce this impact.

Providing BRT using electric buses would eliminate the air pollution from the vehicles they replace, with the associated health benefits, and the reduction in traffic volume and road congestion would improve resident's quality of life. Many low-income populations rely on public transit or have vehicles that are unreliable and costly to operate. Other transportation-dependent individuals, including people with disabilities, would have a transportation option for routes with no current access: Adults with disabilities are twice as likely as those without disabilities to have inadequate transportation (31% vs. 13%). A lack of transportation is the primary reason for high unemployment in transportation-dependent populations, and a BRT system that connected County residents to the D.C. metro system could open job opportunities for people without adequate transportation resources. Subsidized fees for low-income riders should be considered.

ISTOCKPHOTO

The costs for such a system would need to be determined as part of a feasibility study. As an option to reduce congestion on roads such as I-270, a BRT system would almost assuredly be less expensive and faster to implement than other alternatives. The Maryland Department of Transportation offers Transit Innovation Grants to municipalities and transit systems in the state. These grants are for a variety of uses including corridor studies, feasibility studies, and BRT corridors. There are also funding opportunities at the federal government level. These multiple opportunities for grant funding could move the study forward quickly; however, these opportunities can have short lead times for applying, so the County and City should initiate collaboration immediately to allow rapid response to these funding possibilities.

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TRANSPORTATION RECOMMENDATION

Facilitate the availability of renewable fuels for all vehicle types and home heating

From delivery trucks to construction and farm equipment to long haul trucks to boat and locomotive engines, diesel (compression ignition) engines are likely to remain as active parts of our vehicle fleets for a long time. This is not only because they are so useful for efficient freight transportation and heavy duty work, but also because they last for many years. Until technology advances and provides a future where all engines are powered by electricity, providing a bridge fuel that lowers CO_2 emissions through the use of alternative and renewable fuels is a worthy goal, and a means by which many jurisdictions throughout the country are lowering emissions. Use of renewable fuels is a near-term option while plans for fleet transition to electric-only vehicles are developed and implemented.

Renewable alternative fuel options for compression ignition engines include biodiesel, renewable diesel, co-processed diesel, straight vegetable oil (SVO), renewable dimethyl ether (rDME), ethanol, and lignin ethanol oil (LEO). Each of these options emit lower levels of carbon on combustion than fossil fuels, with varied environmental impacts.

Most ethanol in gasoline for spark ignition engines is made from corn, which has a GHG emissions profile 39–43% lower than petroleum gasoline. Light duty vehicles commonly use E10 gasoline (10% ethanol), the main fuel sold in the U.S. Some fueling stations in the region offer E15 (15% ethanol) that, consistent with U.S. Environmental Protection Agency guidance, can be used in vehicles built in 2001 and later, although some automakers dispute the finding.

Beyond emissions reductions, research has found that community availability of alternative, renewable fuels substantially reduces air pollution, preventing premature death, decreasing lost work days and avoiding health care costs. There is only one fueling station in Frederick City or County that offers E15. Increasing the availability of E15 could lower the carbon footprint of the vast majority of vehicles in the City and County. Only two retail stations offer 85% ethanol. Increasing the availability of renewable fuel alternatives would increase availability for compatible long haul freight and light duty vehicles passing through on major highways and stopping to refuel.

The National Energy and Fuels Institute, which represents the nation's retail distributors of liquid heating fuels, ratified a pledge to reduce emissions by 40% by 2030 and deliver a net-zero liquid heating fuel to consumers by 2050. The availability of these alternatives presents possible energy sources for lower GHG emissions for homes heated by oil and gas as retrofits to electric are being anticipated.

Recommended actions:

- **Begin using renewable fuels** in municipal and County fleets and equipment as soon as possible.
- **Encourage local fuel supply businesses** (heating oil, aviation and retail/wholesale gasoline and diesel suppliers) to increase the renewable fuel options available to private consumers, businesses for fleets and equipment, and for agricultural purposes.
- **Provide consumer education, encouragement, and facilitation** of renewable fuel use in collaboration with the business and agricultural communities.
- **Frederick Municipal Airport** should provide sustainable aviation fuel as soon as possible.

AGRICULTURE & LAND MANAGEMENT

Agriculture is the largest commercial industry in Maryland, employing about 350,000 people, on almost 13,000 farms covering two million acres. Frederick County has more farms than any other county in Maryland, and is a lead producer of dairy, turkey, cattle, pigs, hay, commodity crops such as wheat, soy and corn and produces a wide variety of specialty agricultural products such as wine and cider. Because of its high agricultural production, rapid urbanization, proximity to two large urban centers, high exposure to riverine flooding and moderate to severe drought outlook, Frederick County is an important region to focus efforts to improve agricultural resilience to climate change.

> "Essentially, all life depends upon the soil... There can be no life without soil and no soil without life; they have evolved together."
>
> Dr. Charles E. Kellogg
> Soil Scientist and Chief of the USDA's Bureau for Chemistry and Soils

Changes in temperature and precipitation have a direct effect on agriculture, and Frederick farmers are already facing challenges brought on by warmer winters and summers, wetter autumns and springs, and dryer summers. Wet springs delay planting, and heavy precipitation and extreme heat events can damage crops, kill livestock, and endanger farm workers. Warm weather and mild winters will increase pressure from weeds and pests, and shifting habitats may introduce pests and diseases to the region. Droughts and flooding can adversely affect ecosystem function, farm economic viability, and land use. More intense precipitation events have already increased the risk of some types of inland floods, particularly in valleys, where people, infrastructure, and agriculture tend to be concentrated.

Our ability to cope with such adverse events after they happen is limited; therefore it is important to do everything we can to safeguard our existing agricultural resources by investing in practices that will improve resilience in agricultural communities. One of the most important ways to protect agriculture in Frederick County is by focusing efforts on building soil and protecting the existing soil we have. Soil is the foundation of any lasting farm economy, and many local farms are already moving in the direction of regenerative agricultural management.

KAI HAGEN

Regenerative agriculture is a holistic framework and set of principles that focuses on regenerating the soil. These practices focus on improving the resources we use, rather than depleting them. It rebuilds and enhances the health of the soil by restoring carbon content and biodiversity, which increases productivity and improves resilience in the face of increasingly extreme weather events.

Along with managing farmland soils with regenerative principles in mind, all lands — private and public — are best managed in this way. Using regenerative land management principles takes carbon from the atmosphere and increases the health of soils to retain water, increasing drought tolerance and preventing and reducing the risk of flooding, erosion and stormwater runoff during rain events. With a modest amount of up-front investment, Frederick County has the potential to lead Maryland's agricultural sector in reversing climate change and building resilience against flooding and drought for future generations.

DAVID WALENSKI

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AGRICULTURE & LAND MANAGEMENT RECOMMENDATION

Protect farmland and encourage local food production in developed areas

There are multiple compelling reasons for preserving farmland for agricultural production, and for increasing the County's agricultural preservation goal. Farmland has the capacity to sequester 0.68 metric tons of CO_2e per acre per year based on an assumption of 3% soil organic matter (SOM). Increasing SOM increases carbon sequestering capacity. Land-based carbon sequestration is the most practical and effective strategy to remove carbon from the atmosphere, according to the University of Maryland. The goal of preserving 100,000 acres of farmland in the Livable Frederick Master Plan would result in sequestration of 68,000 metric tons of CO_2e per year. Increasing that goal to 160,000 acres has the potential to sequester 40,800 more metric tons of CO_2e each year. This acreage is also estimated to be needed to feed at least 50% of the County's population as it grows, a goal encouraged for climate resiliency.

Preserving agricultural land has the added benefit of potentially providing significant flood mitigation by absorbing and holding stormwater in the soil, reducing flooding, erosion, and damage to infrastructure. Farmland has the capacity to hold 81,000 gallons per acre, assuming 3% SOM. For every 1% SOM is increased, land holds at least 27,000 more gallons of water per acre.

An equally critical argument for increasing the preservation of agricultural land is food security for residents of this area. Although Frederick County boasts more farms than any other county in the state, the City of Frederick and Frederick County currently produce a small fraction of the food consumed in the county. Preserving farmland and encouraging local food production

ZOE SCHAEFFER ON UNSPLASH

improves the reliability of the county's food supply, mitigating the impacts of food shortages or supply chain disruptions resulting from climate change and other major events. The strength of the local economy is also benefited, not just through the products produced and sold, but through support for local business supplying farmers and their families.

Preserving Frederick County farmland is largely dependent on an economy that supports local farms to the extent that they are economically viable. Many farmers prefer to keep their land in agricultural production, but economic necessity often drives the decision to sell land for new

> “In order to feed the world’s growing population, farmers have adapted to produce more food, fuel and fiber on less land, while reducing soil erosion, water use, and greenhouse gas (GHG) emissions. The data we utilize on our farms is far more advanced than just 10 years ago. We are leaders in climate smart technologies, which have the potential to reduce GHG emissions by more than half by 2025 — from 9.9% to 3.8% — and ultimately be a carbon sink (0.4%) by 2035.”
>
> Belinda Burrier, Burrier Farm, Union Bridge
> Frederick News Post op-ed, April 3, 2021

residential or commercial development. Frederick County should adopt multiple strategies that improve farm profitability, including encouraging the growth of a robust local food system that provides reliable markets for county farmers, promoting healthy soils (regenerative agricultural) practices, and adopting strategies such as Carbon Banking or payment for ecosystem services as they become available.

Recommended actions:

- **Increase farmland preservation goal** from 100,000 acres to 160,000 acres.
- **Adopt policies and practices** to encourage County residents, business, and public institutions to purchase as much food locally as possible (as per Recommendation 22).
- **Allocate funding** to perform an assessment of the financial impact of land-use changes to include food resilience, water quality, and climate change, and restrict changes in land-use from agricultural to non-agricultural uses until assessment is completed.
- **Conduct analysis to identify highest-priority farmlands for preservation.** Include contiguous smaller parcels in order to meet acreage thresholds for some preservation programs.
- **Establish partnerships with non-profit land preservation groups** such as the Catoctin Land Trust, The Nature Conservancy, etc., and work in partnership toward the 160,000 acre goal.
- **Evaluate feasibility of carbon banking programs** to provide income to farmers following healthy soils practices.
- **Increase awareness** of LandLink and other programs, in partnership with the Frederick Office of Economic Development and MD agriculture extension service, to link beginning farmers with available land.
- **Meet regularly with farmers** to understand additional support needed to maintain viability of their farms (investment, marketing, business planning, labor, etc.).
- **Establish an ongoing sustainable agriculture working group** composed of farmers, conservation groups, agricultural extension, and county sustainability and economics staff to monitor health of the county agricultural economy, adoption of sustainable farming solutions, and progress toward climate mitigation and resilience goals.
- **Implement an urban agriculture tax credit.**

House in the Woods Farm

We grow a wide variety of vegetables, herbs and flowers for our Community Supported Agriculture (CSA) farm-share customers. We also sell our organic produce to the Common Market, best known for our heirloom tomato seedlings, heirloom tomatoes, garlic and sweet potatoes.

Phil and I started the farm when we were newlyweds and right as I received my masters degree in Environmental Psychology. We started our CSA program to give people access to local organic produce and the experience of learning how it grows. We started small, apprenticing with ourselves, learning, and expanding as we learned, raising our two sons as we raised our crops, all in plenty of soil and sunshine.

We grow produce by sustainable, organic methods because it is healthy for the land, the people who work the land, and the people who eat the food grown here. We want to be part of the solution to climate change.

— Ilene Freedman, Co-Owner, House in the Woods Farm, Adamstown, MD

BOTH PHOTOS: HOUSE IN THE WOODS FARM FACEBOOK PAGE

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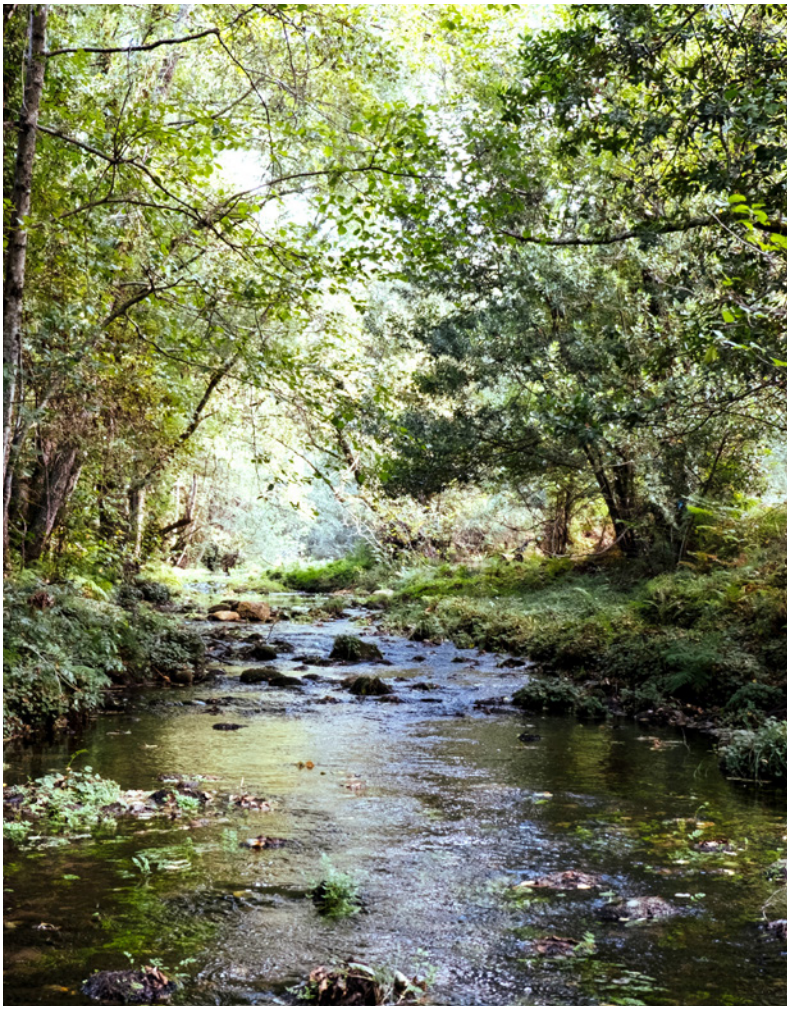
AGRICULTURE & LAND MANAGEMENT RECOMMENDATION

Provide outreach and coordination to expand conservation practices on agricultural lands

Frederick County farmers are state and national leaders in implementing conservation practices improving water quality and soil health, which build resilience in a changing climate. Maryland has more acres in cover crops and no-till as a percentage of farmland than any state, and Frederick County farmers are implementing as many conservation programs as the rest of the state, combined.

Conservation practices, frequently called best management practices, or BMPs, are tools that farmers can use to reduce soil and fertilizer runoff, properly manage animal waste, and protect water and air quality. These practices also can help improve a farm's profitability by reducing operational costs. BMPs are relevant to climate goals, particularly those that reduce soil erosion and build soil organic matter, sequestering carbon, increasing nutrient availability, and elevating below-ground water storage capacity, minimizing runoff and poor water quality in local waterways. According to the Chesapeake Bay Foundation, the five most cost-effective conservation practices are: streamside buffers, streamside fencing, nutrient management plans (NMPs), continuous No-Till, and cover crops. Several federal and state agencies and nonprofit organizations implement conservation practices on agricultural land in Frederick County. The most commonly tapped are the Natural Resources Conservation Service (NRCS) and the Catoctin and Frederick Soil Conservation Districts. Others include the Chesapeake Bay Foundation, Streamlink Education, and the County's Creek ReLeaf program. The Maryland Department of Transportation funds contractors to implement stream restoration projects to offset erosion caused by highway construction.

These programs are effective, but have limitations. First, farmers have to know about them to tap these resources. An estimated 20% of farms in Frederick County do not have internet services and may not be aware of the programs. Some programs only fund projects for farms over a certain acreage, which could be a barrier since 54% of Frederick County's farms, a total of 734, are 49 acres or less, with 16%, or 214, under 9 acres. These farmers could either be ineligible, or too stretched for time, to seek out cost share programs which would benefit their operations.



KARIM SAKHIBGAREEV ON UNSPLASH

Another limitation may be a lack of coordination and follow-through. The NRCS conservationist reported a three year back-log of projects in the fall of 2020, simply due to lack of staff time to process and implement requests.

Finally, there is no coordination of these multiple programs within the County. From time to time, these agencies work together informally, leveraging their resources for more impact, but there is not an expectation within the State or the County that they coordinate efforts. For example, a stream mitigation project was implemented on a farm that resulted in the removal of a riparian buffer made up of 20 acres of 30 foot trees, a wasteful and unnecessary project. Another common issue is that farmers are often in the position of working on a project with one agency and learning later that other, more long-term options were available to them.

The solution proposed for coordination is based on a model implemented years ago. In such a scenario, all agencies listed above would meet once a quarter, describe upcoming project plans not yet underway, and identify opportunities for combining resources and coordinating efforts. Quarterly planning and coordination of projects at a watershed level would enable the involved agencies to achieve greater conservation impact over time and more effective use of public funds.

The potential for conservation practices to accelerate climate goals is very high. The five cost-effective BMPs listed above provide more resilience for the County in terms of soil's water retention capacity and cleaner water. Yet, according to USDA's 2017 Ag Census, No Till is only used by 28% of the County's farms and cover crops by 20% of the farms in Frederick County.

The County has responsibilities for meeting WIP III goals and MS4 requirements. Public data show that the nitrogen concentration in the Monocacy River doubles as it passes through Frederick County posing a significant threat to the long-term health of the watershed, the Potomac, and the Chesapeake Bay. Coordinating public funds to meet those goals will be time well spent and result in more efficient and effective projects, reaping long-term conservation and climate adaptation benefits.

Recommended actions:

A skilled **Conservation Project Coordinator** should be hired to serve out of the County's Office of Sustainability and Environmental Services to:

- **Coordinate with all agencies** in the county and leverage resources as described above.
- **Target farms without internet services, as well as other underserved farms**, to update them on an annual basis of funding, practice, mentoring opportunities and assess interest.
- **Maintain a database of conservation projects** within the county to track implementation and necessity for follow-up. Coordinate with agencies to identify and respond to follow-up needs.
- **Identify interested farms/farmers that may not meet eligibility requirements.**
- **Administer the fund created by Recommendation 21.**
- **Work with agencies to identify and work through a "waiting list"** using a variety of sources, and including funds created by Recommendation 21 to fill in gaps.
- **Provide help and share resources** with collaborating agencies to improve outreach, follow-through, and education to farmers.

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AGRICULTURE & LAND MANAGEMENT RECOMMENDATION

Support and encourage the regeneration of natural systems on agricultural land

Maryland farmers, including those in Frederick County, have used the Maryland Agricultural Water Quality Cost-Share (MACS) Program, which funds the planting of cover crops and a host of other conservation measures, for the purposes of limiting/preventing soil erosion and controlling nutrients (manure, fertilizers, etc.). Maryland has also advanced "no till" agriculture to mitigate erosion resulting in healthier soils. Local farmers have used these programs and their own resources to be good stewards of the land. To continue improving the soils with natural cycles, a farmer-centered stakeholder group encourages increased promotion and outreach of the existing conservation programs and the MDA Healthy Soils Initiative program so more farmers implement healthy soils practices consistent with regenerative agriculture principles.

The purpose of regenerative land management (or regenerative agriculture) is to build soil health to the point it can "regenerate" itself without external inputs. The principles of regenerative agriculture have been promoted by the Natural Resources Conservation Service (NRCS) for decades, and consistent with the current MDA Healthy Soils initiative program are as follows: reduce soil disturbance and compaction; cover soil year-round, preferably by maintaining plants with deep-penetrating roots; reduce inputs that harm beneficial soil biology; increase biodiversity above ground and below through crop rotations or a mix of crops and grazing animals; and consistent with the latter, integrate livestock onto the land.

Regenerative agriculture improves soil health and increases soil organic matter. Healthy soils require far less chemical fertilizer, made with nitrous oxide, a greenhouse gas 300 times more potent than carbon dioxide. Soil organic matter is critical in sequestering carbon from the atmosphere, and increases soil's natural water storage capacity. Stormwater resiliency is increased because of improved water infiltration and water holding capacity of healthy, biologically diverse soils, reducing stormwater management costs while decreasing flood frequencies and severities and associated infrastructure damage and public health threats. Soil fertility, nutrient availability, and soil structure are improved, reducing input requirements and costs and increased farm productivity and profit.

Moist, shaded, biologically active soil, covered in vegetation year-round, cools the local atmosphere as well as adjacent waterways, reducing heat stress for humans and supporting native species, such as brook trout. Healthy soil can support the local production of healthier, nutrient-rich food for human consumption..

Many farm managers adopt regenerative practices gradually as they receive additional support and test out new practices, with net increases in profit because of the need for fewer external inputs. Making the transition from more traditional methods of farming to regenerative practices can seem risky and requires an investment of time and problem solving. Interested farmers need support to make these changes.

Recommended actions:

- **Hire a full time county regenerative specialist** to advise and coordinate regenerative land management options and opportunities across all County agencies, residents, businesses, and institutions. Establish collaborative

MARKUS SPISKE ON UNSPLASH

relationships and ongoing discussions with the University of Maryland Agricultural Extension Agent, the Soil Conservation District, the Natural Resources Conservation Service, the Maryland Department of Agriculture Healthy Soils Program, and the Million Acre Challenge on regenerative land management and options to increase its adoption in Frederick County.

- **Consider establishing a farmer-to-farmer mentoring program** to support adoption and problem-solving.
- **Incorporate regenerative management scoring/metrics into land preservation programs.**
- **Stay attuned to the evolution of carbon markets** and payment strategies for ecosystem services for farmers, and be ready to leverage these programs when they become available for local implementation.
- **Consider the establishment of an equipment rental program**, or provide start-up resources for an equipment rental co-op, for farm equipment needed to implement regenerative agriculture, such as roller-crimpers, etc.
- **Commission a study to produce a cost/benefit analysis** of a broad-scale shift to regenerative management; and if substantial long term cost savings are projected by the study, use part of the anticipated savings to establish a voluntary program that rewards landowners who achieve measured improvements in soil health, water infiltration, biodiversity, and water quality.
- **Prioritize all or a portion of agricultural innovation grants** for farmers who request financial support for adopting regenerative practices. Consider a special grant program for farmers ineligible for federal conservation grants (due to farm size, etc.)
- **Direct funds generated through implementation of Recommendation 21 to fund regenerative land management projects.**

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AGRICULTURE & LAND MANAGEMENT RECOMMENDATION

Restore and sustain natural systems on private and public lands

The implementation of simple strategies that maintain public and private lands can substantially reduce GHG release through deeper rooted plants and the accompanying accumulation of soil organic matter (SOM), which stores more water to reduce drought effects for surface vegetation as well as runoff and flooding. These efforts will increase carbon sequestration, which has great potential for climate change mitigation and is currently underutilized. The average rate of carbon sequestration for home lawns in the US is 2.8 Mg C/ha/year vs. a potential sink capacity of 45.8 Mg C/ha/year. These numbers do not account for public lands, like parks and public schools. In addition, the estimated carbon emissions due to home lawn turfgrass maintenance (i.e., fertilizer application and mowing fuel combustion) is estimated to be 444 kg CO_2e/ha/year.

Standard lawn maintenance equipment creates significant amounts of air pollution, 11 times the air pollution of a new car for each hour of operation, accounting for as much as 5.7 million tons of the United State's annual CO_2 emissions. These emissions contribute to the formation of ground level ozone, toxins and other particulates, impairing lung function and inhibiting plant growth.

Likewise, pesticides, which by definition include herbicides, fungicides, insecticides, and rodenticides that are used on turf areas and gardens, present multiple harmful impacts. Some of these chemicals can remain in the soil for years, effectively keeping necessary micro-organisms from working the soil and supporting plant health. Because of this detrimental effect on soil biology, the abilities of plants and soils to sequester carbon decreases. Pesticides also have detrimental effects on pollinators, water quality, biodiversity, etc. and are detrimental to human health. Even low levels of pesticide exposure can affect young children's neurological and behavioral development.

Native regenerative landscaping is not only beautiful, it can significantly reduce the need for fossil fueled lawn and garden equipment, reducing the associated air pollution and health risks. Native plants themselves can help to improve air quality by reducing particulates and gaseous air pollutants. It is cheaper to use plants to mitigate air pollution than it is to add technological interventions, meaning the "typical" ways of managing landscapes are not only destructive, but

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replace important beneficial climate mitigation and health enhancing features of the area.

Native regenerative landscaping also reduces the environmentally detrimental effects of pesticides and fertilizers. It virtually eliminates the need to use water for irrigation, as is required for turf grass lawns. While not maintenance free, native regenerative landscaping requires less time and money for ongoing maintenance than conventional landscapes. It reduces the stress that a "weed-free" lawn places on clean air, clean water, soil stability, and other environmental qualities of life. It also attracts wildlife, such as butterflies and birds, thus increasing biodiversity and pollinator populations for valuable crops. Similarly, eliminating randomly timed boom mowing along rural roads would protect those roadside pollinators.

Many practical, simple, less expensive steps could be implemented to reverse these damaging practices. Low Traffic Turf Areas (LTTAs) should receive less intensive management than high-traffic turf areas. This less intensive management should include the elimination of herbicide and pesticide use, reduced annual mowing, and the elimination of grass clipping collection.

Prioritizing natural turf grass over artificial turf will increase carbon sequestration and other ecosystem services on public lands in the County, reduce the risk of environmental pollutants leached from artificial turf infill products, and protect the health of all individuals using publicly managed turf fields. Artificial turf infill products (predominantly recycled tires) have been shown to contain a number of heavy metals and carcinogenic chemicals that can volatilize or leach out in rain water. Removal of rubber infill would also significantly lower the temperature on the playing field, reducing the risk of heat exhaustion.

Home lawns make up 70% of the turf grass in the Chesapeake Bay Watershed. In Frederick County, 96,309 acres, nearly 23% of our land mass, are in turf grass. Restoring natural systems on these lands will improve Frederick City and County public health, reduce GHG emissions, and sequester carbon.

Recommended actions:

- **Adopt and implement a Turf Management Policy** for all non-sportsfield public and park lands, including public school acres, that defines and identifies LTTAs on public lands. The Policy should include the significant reduction and eventual elimination of herbicide and pesticide use, adoption of Integrated Pest Management procedures, reduced annual mowing, and other practices to increase soil organic matter and its associated benefits.

- **Adopt legislation that bans the installation of artificial turf fields** (new or replacements) in parks and public schools.

- **Adopt a Frederick County Pesticides Law** modeled after the Montgomery County Pesticide Law that restricts the use of certain pesticides and identifies approved products for use on public and private lawns and includes a public outreach campaign.

- **Create a Regenerative Landscapes Campaign** organized collaboratively with City and County personnel, community organizations (such as Master Gardeners), and nonprofit organizations (such as the Chesapeake Conservation Landscaping Council), to educate and support a transition to native regenerative landscapes, native edible food "forests," and community gardens. This campaign would also include a gas-powered lawn equipment buy-back program to incentivize electrification of lawn equipment.

- **Promote and incentivize certification of landscaping contractors and professionals** through the Chesapeake Bay Landscape Professional Certification program and prioritize certified vendors in County and City bids.

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AGRICULTURE & LAND MANAGEMENT RECOMMENDATION

Pilot an alternative for stormwater mitigation for better results

Current standards and methods of Stormwater Mitigation (SWM) and Environmental Site Design (ESD) at spot-lot and small cluster residential development sites often require 100%, or near 100%, re-introduction of rain water into the ground. Calculations for impervious areas are made, volumes calculated, and various structures built such as drywells, infiltration trenches, calming berms, and bioretention swales. The design and construction of these structures often cost approximately $10,000 per lot. Residential properties once completed are immediately covered in vegetative materials and then tended by an owner-occupant. SWM and ESD devices that prevent minimal soil moving on site until the ground is covered in plant material are extremely expensive with low benefit. This is an argument for proportionality. Ten thousand dollars to prevent loss of a few 'shovels of dirt' may not be the most effective use of funds. On proper residential lots, simple grading and bioswales may be almost as effective and cost 80% less to construct.

Rather than requiring these expected mitigation strategies in defined circumstances, a pilot project could be established to use fee-in-lieu funds, paid by the builder and earmarked for projects with much more impact., i.e., those protecting

A tree planting by Stream-Link Education volunteers

STREAM-LINK EDUCATION WEBSITE

against large soil losses common throughout the County. Targeting funds for best management practice implementation at identified hot spots has been highly successful in the Chesapeake Bay watershed. Focusing a newly-established reserve fund on buffering these areas could, for example, reduce delivery of phosphorus-rich sediment to impaired Monocacy tributaries or Lake Linganore, thereby improving water quality, reducing future algal blooms, maintaining high quality drinking source waters that require less advanced water treatment, and reduce sediment accumulation in local lakes to delay future costly dredging projects.

If such an approach is adopted, using this newly established fund for more strategic and targeted purposes could expand load reductions from the largest contributing sectors of the community, i.e., County and City areas built prior to required SWM implementation and the agricultural community. Reducing sediment inputs improves water clarity and oxygenation of local waters as well as minimizes the addition of phosphorus, a nutrient critical to algal blooms in fresh and brackish waters. Additionally, vegetated areas of spot-lots and small development clusters would not be needlessly removed as often occurs during construction to meet SWM requirements, thereby maintaining valued habitat as well as carbon sequestering capacity that reduce GHGs in the area. Reserve funds could also be tapped to support tree plantings and stream restoration projects by staff, contractors, and environmental groups. New home purchasers would also know that they are paying into an environmental fund that will make meaningful differences locally.

Frederick County has more than 6,000 lots remaining that fall into spot-lot, minor subdivision, or ag-cluster concepts. Estimating that an 80% reduction in on-site SWM/ESD mitigation is a reasonable expectation, this concept plan would, at the rate those lots are developed, create an environmental revenue stream of $48,000,000 over time (an average of $8,000 per lot), with no new cost to taxpayers or home buyers. There are also additional economic and environmental benefits of leaving lot vegetation, particularly trees, in place.

Recommended actions:

- **Request that the Frederick County delegation to Annapolis seek 'local deference'** in permitting the County to pilot a program to assess shifting of SWM fees as outlined above.

- **The Frederick County Building Industry Association (FCBIA), Soil Conservation District (SCD), and County and City staff should work together to create guidelines for this program.**

- **Select several local builders** to undertake the pilot program over 12 months.

- **Site design and post-construction site conditions should be evaluated** by an independent authority (such as field staff followed by use of the Chesapeake Bay Program modeling suite or other models) to determine if 80% reduction in dislocated soils are mitigated by a 20% investment.

- **County staff, in cooperation with the Soil Conservation District, the Natural Resources Conservation Service, and non-profit staff working in the area should develop a competitive, fair, and transparent mechanism** to select projects for the new fund to finance. Selection criteria could include projects that 1) provide the largest reductions in sediment loads, 2) have been selected in past reviews but could not be supported due to inadequate funds or technical staff processing, or 3) address other strategies that identify high priority conservation needs.

FOOD SYSTEM

The City of Frederick and Frederick County have a long tradition of agricultural production, processing, distilling, brewing and, more recently, have become a destination for fine dining that often utilizes local produce. Despite this, the vast majority of the food consumed in the County is not produced locally and residents must rely on food grown hundreds or thousands of miles away and shipped here. In addition, much of the food that is purchased goes to waste — ending up in landfills where it contributes to climate change through the release of methane. Globally, food waste is considered one of the primary contributors to climate change.

> "We need more community gardens."
>
> Derek Shackleford
> Frederick Board of Aldermen

The development of a robust local food system based on regenerative agriculture and encouraging consumption of plant-rich diets is integral to the development of a sustainable future for Frederick County residents. Support for local agriculture provides a significant contribution to the economy through the development of farm- and food-related businesses as well as supporting more local farmers. The preservation of farmland with healthy soils not only provides a carbon sink to help capture and sequester carbon, it also helps to mitigate the more frequent flooding associated with the warming climate.

An efficient food system that treats food as a valuable resource reduces food waste by finding uses for all the food that is produced. Even as excess food is produced, there are food-insecure families who do not have access to fresh, nutrient-rich foods. Some surplus foods can be upcycled to create value-added products that further contribute to the local economy. Food that can no longer be used for human consumption can be used as animal feed or composted. Composting creates a new product that contributes to soil health and again supports the local economy by creating business opportunities.

Honoring local long-standing traditions as an agricultural area reduces County and City dependency on a centralized food system that is at risk of disruption due to the impacts of climate change that are already present. Focusing on the health of the local food system provides an opportunity to reduce GHG emissions, improve the local economy, support food-insecure families, and preserve valuable productive farmland.

SHELLEY PAULSON UNSPLASH

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FOOD SYSTEM RECOMMENDATION

Facilitate the expansion of a robust local food system

Thirty-four percent of all man-made greenhouse gas emissions are generated by food systems. A robust local food system can reduce greenhouse gas emissions and provide better food security by limiting risks of disruptions in centralized food distribution caused by increased extreme weather and natural disasters in areas where most of the U.S. food supply is produced. It can also improve the financial sustainability of the local agricultural economy by providing an ongoing, dependable market for local farmers. Most regions, including Frederick County and the surrounding areas, consume only about 5 to 15% of their food from local sources. This leaves Frederick County vulnerable to food distribution disruptions as a result of climate change and natural or other disasters, as seen in recent COVID–19 supply chain disruptions.

Frederick County farmers producing food for human consumption are challenged by a lack of capacity to aggregate produce with other farms to meet the volume requirements of institutional buyers. They also lack the infrastructure to support aggregation, storage, and processing. Beginning farmers have a difficult time finding and purchasing affordable productive land. Many other limitations exist, such as a lack of capacity-building for marketing and institutional customer relations; lack of access to equipment, loans, relief aid, and agricultural support programs for farmers of color; and an insufficient workforce. Farmers with less than 25 acres of land, which describes many vegetable farmers, do not qualify for most publicly funded grants. Returning to a more local system that addresses these barriers has the potential to strengthen the local agricultural economy;

KENAN KITCHEN ON UNSPLASH

address historic disenfranchisement of farmers of color; preserve more farmland, which can act as a carbon sink and provide flood mitigation; reduce emissions associated with transportation and processing; improve resilience during natural disasters; attract younger and diverse farmers during a time when the average age of farmers is increasing; eliminate food deserts; supply healthier nutrient-dense local foods, leading to better health outcomes; and reduce food prices if volume sales increase as expected. These benefits address goals of the Livable Frederick Master Plan and the City of Frederick Comprehensive Plan.

Many communities are experiencing the benefits of a localized food system throughout the country. These localized systems helped farmers and families through the COVID–19 crisis, demonstrating their role in community resilience.

Producing more food locally has great potential for the local economy. The Johns Hopkins Center for a Livable Future estimated that if Maryland institutions (hospitals, universities, and K-12 schools) purchased just 10% of food served locally (vs. the current rate of 1%), $28,821,666 would be returned to the local economy; if it increased to 25%, $72,054,166 would be put back. These estimates do not include the substantial impact other institutions, such as senior living facilities, nursing homes, and adult detention centers, could have on local profits. Buying local food allows farmers to keep more of the retail food dollar and creates benefits through the multiplier effect estimated to be 1.4% to 2.6% per dollar spent.

Recommended actions:

- **Enact the Good Food Purchasing Policy**, encourage participation by local institutions, and set a goal of purchasing at least 20% of food from local suppliers by 2025.
- **Integrate food systems planning** into the Frederick County comprehensive planning process to create a coherent system that focuses on protecting local agricultural lands, making farms economically profitable, and producing, buying, and selling as much local food as possible.
- **Provide resources, business incubator support, and financial incentives for younger farmers and farmers of color** to establish farming operations in Frederick County.
- **Provide incentives for established farmers** to convert land in production from commodity crops to grazing lands for meat production and vegetable, fruit, and grain crops for local sale and human consumption.
- **Develop a plan to support the scaling up of necessary local infrastructure** such as slaughterhouses, cold storage, processing facilities, mills, distribution, etc.
- **Strengthen the Frederick County Food Council and the Frederick Food Security Network** by providing County and City funding to provide operational support and project grants.
- **Replicate Montgomery County's Farm to Food Bank Capacity Building Grant Program** to assist Frederick County-based food producing farms with the purchase of equipment, and/or to build food production capacity and infrastructure in order to sell and contribute to a Frederick County Farm to Food Bank program.
- **Develop creative initiatives and incentives within the City and County Offices of Economic Development** to drive customers to farmers markets and other sources of local food. Designate unused or abandoned plots of land for community farming and gardens and educational resources to support local community farming.

How the Islamic Society of Frederick's garden grew

The Organic Garden at the Islamic Society of Frederick (ISF) was started humbly — by mothers trying to engage their children in some healthy activity during long summer months. It was just 4 raised beds, wood and construction donated by a member contractor. The kids filled the beds with soil, raised seedlings at home and transplanted them to the garden. It did really well the first year! Then groundhogs arrived, and from then on it was a battle for the harvest. Against such odds, the young gardeners grew disheartened, and slowly the gardening project crumbled.

COURTESY ISLAMIC SOCIETY OF FREDERICK

But, help came unexpectedly. During the spring of the Muslim travel ban, Frederick community members reached out in solidarity and offered support. One offer came from Hood College student volunteers, and along with ISF volunteers, they revamped the sputtering organic garden. The next year, Hood College asked ISF to become part of the Frederick Food Security Network, which provides organic vegetables to community members without access to healthier food options. ISF was delighted to offer our grounds and provide organic produce, grown lovingly by volunteers for the benefit of our neighbors. The garden grew from 4 to 11 beds, with 3 beds that capture rainwater and a pollinator garden through this partnership.

Soon after, MACS (Multi Faith Alliance of Climate Stewards of Frederick County) brought more than a dozen burr oak trees to be planted in a grove on an otherwise vacant grassy knoll. Next, as the COVID–19 pandemic raged and things closed down one by one, SilvoCulture, Inc. offered to build a food forest for ISF as an excellent complement to the increasingly verdant landscape. They incorporated nuts like chestnuts and black walnuts, and fruits including pawpaws, mulberry, serviceberry, nanking cherry, and currant. The ISF garden offers children and teens volunteering opportunities, while teaching them the interdependence of plants, insects, humans and food.

Like a sizzling platter of colorful fall vegetables, it aims to bring together people of different faiths and backgrounds for a common goal of building a habitat that not only provides for humans but is a sanctuary for native species of insects, birds and animals. It is a place that truly represents community. These elements explain the garden's name 'Seeds of Sadaqah' — an ongoing deed that benefits in multiple ways, extending long into the future.

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FOOD SYSTEM RECOMMENDATION

Encourage adoption of plant-rich diets

The average American diet is carbon intensive (equaling 1.8 metric tons of CO_2eq/person/year), largely due to heavy reliance on meat as a protein source. Americans eat 40% more meat than they did in 1961, about half of a pound each day, while nutritionists advise no more than 3 ounces per meal and only a few times a week. Heavy in meat and processed meats and low in fresh fruits, vegetables and whole grains, the typical diet also threatens human health. With the exception of carbon-sequestering managed grazing practices (grazing used in regenerative agriculture), the production of meat and dairy contributes significantly more emissions and uses more water than growing plants as food sources.

Reducing consumption of animal products to what nutritionists advise for human health is one of the most impactful carbon emission reduction strategies an individual and family can make. To illustrate the potential impact, the food-based emissions of an individual could be reduced to 1.2 metric tons CO_2eq/person/year by cutting meat consumption in half. If 10% of the County's population, roughly 26,000 people, made this change, it would be the equivalent of removing 3393 cars from the road each year.

Produce at the Urbana farmers' market at Urbana Library

RANI RUSNOCK

The health benefits of a diet based on less meat and more plant-based protein are well known, including reduction of risk of diabetes, cardiovascular disease, and cancer. Transitioning toward more plant-based diets will significantly reduce mortality. The Healthy Choices section of the Livable Frederick Master Plan calls for making diet choice information routine throughout the community, including an emphasis on healthy choices and incorporation of local foods. An added economic benefit is that decreased consumption of animal protein can shift food-related resources and consumers to local farmers as illustrated by a recent Washington Post editorial by a regenerative farmer who noted "If Americans eat less meat, but better meat, we can help keep smaller, local farms in business… ."

A plant-rich diet is less expensive for families, substituting plant-based protein-rich foods, such as legumes, for meat. The potential for savings in community health care costs is significant, with a decrease in direct health care costs such as medical visits, hospitalizations, and prescription costs related to diet-related diseases, in addition to indirect costs such as lost days of work. Chronic illnesses, all linked to dietary choice, comprise 90% of the nation's annual healthcare expenditures, and lifestyle medicine programs that emphasize diets rich in fruits and vegetables report up to $3.92 saved on each dollar spent. For these reasons, the City of Frederick adopted a Healthy Eating Active Living Policy in order to combat obesity in 2015.

Recommended actions:

- **Lead by example** — Amend County and City purchasing processes to prioritize purchase of sustainably and when possible, locally produced plant-rich food at all County and City facilities and events. "Meat of the Matter: A Municipal Guide to Climate-Friendly Food Purchasing" provides tools and examples. Encourage all grantee agencies and Frederick County Public Schools (FCPS) to adopt these policies. Examples of similar programs can be found at DC Central Kitchen and Green Bronx Machine.

- **Encourage and support curriculum at FCPS schools** that increases the knowledge of food production and its relation to human and environmental health.

- **Mount an extensive and highly visible County-wide campaign on benefits of a plant-rich diet.**

- **Encourage and incentivize restaurants** to add more vegan/vegetarian and regeneratively farmed meat entrees, and to indicate on their menus which items have a lower carbon footprint.

- **Encourage local institutions to work with Cool Food** to decrease their food-related emissions by 25% by 2030.

- **Institute community-wide diet challenges** to encourage dietary change and purchase of locally and sustainably produced products.

- **Explore options to improve food choices** in areas that currently do not have grocery stores or healthy food options, such as mobile food trucks offering locally grown fresh vegetables or a year-round farmer's market in the City.

- **Promote and support community gardens.**

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FOOD SYSTEM RECOMMENDATION

Prevent disposal of organic material

According to the U.S. Department of Agriculture, 40% of food is never eaten and up to 38 million tons of food — worth $168 billion — are thrown out each year. Almost 30% of the municipal solid waste (MSW) stream generated in the US is organic waste, nearly all disposed of in landfills or incinerators. Organic materials decomposing in landfills currently account for 16% of global methane (CH_4) produced and attributable to human activity. This GHG is 84 to 86 times more potent than carbon dioxide in the first two decades after it's released, and while methane does not remain in the atmosphere as long as carbon dioxide, methane traps radiation more efficiently than CO_2, contributing to the extreme heat and storms now commonly experienced. Diversion from landfills and incinerators provides a beneficial use for food waste by diverting first to people (as food), then to animals (as feed), and then to composting for soil amendment.

Composting or otherwise diverting this food will save disposal costs and prevent generation of methane. Frederick County would experience an

EDWARD HOWELL ON UNSPLASH

annual net GHG emissions reduction of 15,703 $MTCO_2e$ if the 31,958 tons of food waste currently going to the landfill was successfully diverted. The Social Cost of Carbon (external costs estimate) associated with this waste is $1,629,858 each year (@$51 per metric ton).

Food waste diversion programs in other communities have increased availability of new jobs and job training in associated businesses; increased food donations to organizations that serve hungry people; improved community-wide understanding of how food systems work; emphasized the importance of resource stewardship and community sustainability; increased composting; and reduced the need for new disposal methods, which are often placed in or near economically disadvantaged communities. The Livable Frederick Master Plan and the City of Frederick Strategic Plan both describe food diversion and/or composting as a goal.

Evidence is mounting that food waste diversion programs are an economic imperative. Potential household savings from reducing food waste are significant. The average U.S. adult spends over one fourth of their food budget on food that is wasted. Consumer education could save a household of four between $919 and $1,576 per year. Frederick County and the City of Frederick could realize reduced overhead costs of approximately $1.7M by removing 31,958 tons of waste, currently costing $53 per ton. Food-related businesses can save as well; estimates average $7 saved for every $1 spent on food diversion.

Recommended actions:

- **Comply with a 2021 state law** passed to ban institutional food waste.
- **Pass a County-wide resolution and municipal ordinances** requiring use of compost in highway and stormwater projects in the City of Frederick and Frederick County to mitigate flooding and stormwater runoff.
- **Include funding for grants** for private sector compost facility expansion as outlined in the 2017 Solid Waste Options Study (What's Next).
- **Create a Frederick County Organics & Compost Manager position**, to be either a County or City employee, or as a contracted private/non-profit effort, to coordinate these recommendations, guided by a local version of U.S. EPA's program,"Food Too Good to Waste."
- **Test, improve and ramp up programs to support diversion** of food wastes from households and the commercial sector.
- **Incentivize food waste reduction/ diversion programs at all levels** by encouraging municipalities to explore Full Cost Accounting and/or revisions in billing so that trash disposal costs are transparent.
- **Establish a joint** Food Recovery Network among the three colleges in Frederick County to serve the community, working in tandem with Hood College's Frederick Food Security Network to leverage partnerships and fill gaps in food supply.
- **Coordinate efforts across food banks** to increase diversion and decrease food insecurity.
- **Institute training for Frederick County Public Schools Food & Nutrition Services staff** to decrease food waste by students and faculty and institute a system of share tables in all public schools.
- **Initiate a restaurant recognition program** for food waste reduction, recovery and composting, in concert with the Frederick County Chamber of Commerce.

The past and future at Key City Compost

The vision for Key City Compost began in 2016 during the Frederick County process to review the state of solid waste in the county. The County Executive put together a team to study methods by which our community could decrease volumes sent to far away landfills, increase sustainability, and increase local solutions to waste and recycling.

This process exposed the fact that Frederick County had no stakeholders when it came to food waste collection, and food waste disposal (industrial composting). Key City Compost came about as a response to that lack of infrastructure. The first step was picking up 5 gallon buckets for friends and family using the trunk of our car. Now we have several trucks, and a growing dedicated team that diverts several tons per week — sometimes per day — of food waste from landfill.

KEY CITY PHOTO

In the next few years, Key City Compost's mission is to increase our residential services. This includes updated pricing for target areas of impact and a number of public drop-off locations that provide free or subsidized collection for those community members. We intend to expand our manufacturing capacity here at home in Frederick County. This includes a 5 acre, "large scale" composting facility. This site will process, in its first stage, up to 1,000 tons per year and expand to over 4,000 tons per year, as we prove success and the need for expansion. We hope to dramatically increase municipal and community support over the next few years. This includes public-private partnerships with our local Cities and Counties, as well as private relationships with HOAs and multifamily dwelling units. These are target areas for our team due to the potential impact. These types of projects have a huge capability to capture tons of food waste with minimal fuel and labor costs — a bonus for both your wallet and our planet.

— Phil Westcott, Key City Composting

FORESTRY

Forests are one of the best-known solutions to address climate change. They act as a carbon sink providing long-term storage of carbon and offsetting greenhouse gas emissions. In addition, they help to store and filter water, which mitigates the flooding associated with the stronger, more frequent rainfall events caused by climate change as well as providing a water buffer for crops during sustained droughts. Through reforestation, afforestation (the planting of trees on land that has not had forest cover for 50 years or more), and active forest management, it is possible to draw down the amount of carbon in the atmosphere.

> "I'll breathe easier knowing trees are part of our future."
>
> Mike Kay, DNR Forest Service

In addition to direct carbon sequestration, forests and trees support entire ecosystems of plants, animals, fungi, and nutrient-cycling bacteria. When large contiguous sections of forest are preserved, they provide wildlife corridors that allow for the movement of plants and animals as they adapt to the changing climate and development pressures. Forested stream banks filter rainwater and cool streams and rivers, supporting fish populations. Forests and tree canopy also provide economic and health benefits for the people who live near them. They support wood products industries, improve air and water quality, provide cooling, reduce the effects of heat islands and increase employment in urban areas, and provide many recreational opportunities.

The City of Frederick and Frederick County are fortunate to have large areas of existing forest in the Catoctin and South Mountain corridors. The Frederick Municipal forest provides significant economic and environmental benefits for the City of Frederick and protects 20% of local water supply. According to the Livable Frederick Master Plan, the County currently has 33% total forest cover and 43% total tree canopy (tree canopy includes tree cover in developed areas as well as forests). The County has been losing approximately 420 acres of forested land per year. However, there are many opportunities to both protect existing forest and expand forested land that can reverse this trend and would be integral to addressing climate change and improving the health and well-being of all economic sectors of our communities.

KAI HAGEN

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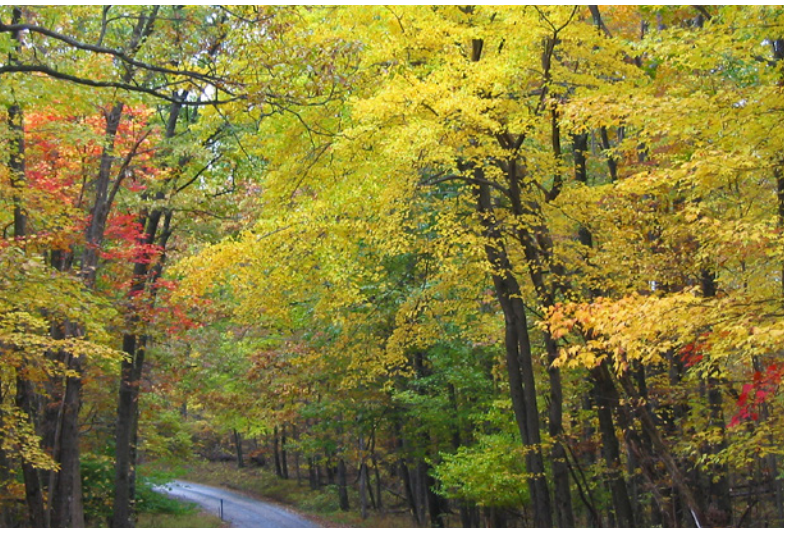
FORESTRY RECOMMENDATION

Increase the County forest canopy by 10% over current levels

Forests are a critical tool in climate mitigation and resilience and are considered to be the best natural land use for carbon sequestration. By increasing forest acres in Frederick County 10% from current levels, up to 720,000 MT of CO_2 emissions can be sequestered annually by 2050. This exceeds the current sequestration capacity of 540,000 $MTCO_2$ each year from the existing 180,000 forest acres, an increase from 15% of total annual County emissions to 20%.

The proposed increase in County forest canopy requires planting approximately 640 acres (a square mile) annually. Healthy, managed forests sequester more carbon than aged, unmanaged forests due to faster growth rates and CO_2 capture in photosynthesis than slower growing old and unmanaged forests. However, old growth forests still capture considerable carbon. Forests lead to substantial increases in soil organic carbon, the largest terrestrial carbon reservoir, which absorbs water to prevent surface runoff of nutrients and particulates, thereby protecting local water quality and pathogen distribution. The increase in soil organic matter, in turn, through the associated increase in water storage capacity, protects crops against drought while reducing the amounts of synthetic fertilizer applications.



DAVID WALENSKI

Forest trees are also huge carbon reservoirs and can provide not only a carbon sink, but also benefits to GHG emission reductions through their use in construction instead of cement and steel, justifying a local, managed wood products industry as an important strategy. Tree canopy is also important in reducing urban heat island impacts and improving local public health benefits. Forests maintain habitat, biodiversity and wildlife corridors, and in riparian areas along streams, provide particulate organic matter as leaves, twigs, etc. for needed nutrients that support food webs and recreational fisheries.

Deliberately increasing tree canopy and its beneficial shading is an important equity consideration in traditionally underserved communities. The Equity Index (see Recommendation 1) demonstrates a powerful example of intentionally increasing canopies in these neighborhoods, especially for their cooling and air quality enhancing benefits. Planting trees where underserved people live, work and play is a strategy used in other jurisdictions, such as Philadelphia, to mitigate climate impacts of heat islands, flooding and stormwater run-off, while at the same time, improving quality of life.

Applying the Social Cost of Carbon of $51 per MT/acre helps define the benefit of carbon stored and sequestered by Frederick County forests. Planting cost per tree referenced in the Tree Solutions Now Act (for planting on agricultural, public or private land) is $9.50 x 303 trees per

acre = $2878.50 per acre. Annual carbon capture benefit based on 3 MT/acre x $51 = $153/acre/year, or over 100 years to forest maturity = $15,300 per acre. Additionally, the planting costs go back into the local economy.

Many existing and new forestry programs (Healthy Forests Healthy Waters, TreeFrederick, Conservation Reserve Enhancement Program (CREP), Creek ReLeaf, and the recently enacted Tree Solutions Now Act (HB991, 2021) can be leveraged, along with community interest, to increase forest planting or enhancements of existing forests. This act increases funding for both urban and rural tree planting, with a goal of planting 5 million additional trees in the state through 2030.

Recommended actions:

- **Resolve to reach a net increase in County Forest Canopy** of 10% by 2050. Build a community-wide campaign, public education, and events calendar around this goal.
- **Evaluate the success of County forest banking offset programs** (such as Forest Resource Ordinance) and make adjustments that support goal achievement.
- **Adopt the assistance of science-based data evaluation techniques** such as the Geographic Information System (GIS) tool developed through the CEMWG effort or the Equity Index tool to assist in optimizing forest plantings that do not impinge on other priority land use activities such as cropland.
- **Consider a property tax credit per acre** for landowners owning forest acreage below the current minimum to allow entry into a stewardship program with tax credits (often 10 acres or more). This small forest management credit will help maintain the 180,000 acres currently in the County, while creating more.

> "The goal of these initiatives is to not only prevent the loss of forest cover in Frederick County but to be forward thinking to preserve our forests, our environmentally sensitive areas, and our cultural and historic amenities. These proposals will go a long way to ensure that we protect the beauty, rich history and the environment of our County for future generations."
>
> Jan Gardner, Frederick County Executive, on the 2020 Forest Resource Ordinance amendments

- **Adopt protective policies for forest corridors** to maintain wildlife migrations and in a broader effort, a Green Infrastructure Plan for natural areas recommended in the Livable Frederick Master Plan.
- **In addition to plantings, consider reducing mowing of County roadway edges** beyond 50 feet (or wider in select cases) to allow "re-wilding" and create an easement plan or other program to encourage rewilding of open land, adjacent to existing forests.
- **Assess the current status of and need for support for the forest products industry** in Frederick County, with stakeholder input and goals included.
- **Leverage successful programs such as TreeFrederick, Creek ReLeaf, and agriculture preservation to expand forests.**
- **Update and increase goals for expanded urban tree canopy** to reduce urban heat island impacts, focusing on underserved communities.

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FORESTRY RECOMMENDATION

Facilitate the enhancement and protection of regional biodiversity

Intact ecosystems with healthy forests, meadows, wetlands, and biologically active soils support and are supported by the species that live within them. These ecosystems are a crucial component of climate mitigation as they sequester carbon that otherwise remains in the atmosphere. The amount of carbon that can be sequestered in these environments varies by ecosystem. To adequately protect these natural systems, the City and County should develop and implement a Green Infrastructure plan to identify and establish contiguous wildlife corridors that protect nature, connect fragmented populations of plants and animals, and enable species movement and migration to adapt to the changing climate.

Increased temperatures from climate change coupled with development pressure-induced fragmented habitat has led to biodiversity loss and water pollution indicative of lost resilience in the area. Plants and animals that cannot adapt to the changes will be forced to migrate north or to higher elevations. If this migration is prevented, species will face extinction.

RANI RUSNOCK

The natural world is our life-support system. Biodiversity in nature enables the functioning of ecosystems — the functions of the natural world that enable life to exist. About three-quarters of the more than 240,000 species of the world's flowering plants rely on pollinators — insects, birds, bats, and other animals — to carry pollen from flowers for pollination. Some species require specialized habitats in order to survive. Brook trout, the only native trout in the area, are currently at the limit of suitable habitat in Frederick County. Brook trout require cold, clean freshwater as well as gravels on the bottom for fall spawning. The Livable Frederick Master Plan calls for an initiative to protect and re-stabilize populations of this fish species for conservation, recreation and financial reasons, since tourists drawn to the area to fish bring an estimated $2.5 million in annual revenue. Without an intentional intervention, assisted migrations may be required and this once plentiful native fish could be lost to Frederick County.

Other species need the insulating effect of a large forest interior free from human disturbance to breed successfully and maintain viable populations, including birds such as owls, the Allegheny woodrat (commonly called the pack rat), the wood thrush, scarlet tanagers, the eastern box turtle, bats, frogs and salamanders. Still other species thrive in warm-season grassland

RANI RUSNOCK

habitat which has steadily declined throughout the state. Wild turkeys and songbirds (such as field sparrows, indigo buntings, prairie warblers, eastern meadowlarks, loggerhead shrikes and grasshopper sparrows) use warm season grasses for cover while raptors like American kestrels and northern harriers use the areas as hunting grounds.

Climate-related threats to native species include increased air temperature, increased water temperature, and polluted waterways. Development pressure also plays a role in threatening local wildlife. The landscape is fragmented by roads, dams, development, and other barriers to movement, making survival and migration difficult.

Maintaining a connected landscape is a widely cited strategy in the scientific literature for building climate change resilience. Protection of nature and its biodiversity must occur at the local level, where land use decisions are made. Protecting and connecting habitat that allows for migration along the Appalachians will ensure continued biodiversity for our remaining flora and fauna. Vegetated corridors and hubs are found throughout the County but are declining due to development and other human activity. It is important to maintain and possibly expand vegetated corridors to ensure persistence of the current animal populations under the increasing threat of fragmentation and the extremes of temperature now in the region.

Other cities and counties have adopted several strategies to provide migration corridors. Volunteers in Montgomery County are working to create community supported wildlife corridors through neighborhoods and County parks that

BARB TRADER

A beautiful backyard pollinator garden in downtown Frederick.

allow travel to the C&O Canal National Park. Along the C&O Canal National Park, wildlife can travel through Frederick County toward the Appalachians. Greenways have grown in popularity in cities across North America. Baltimore is developing a 35-mile Greenway Trails Network that weaves nature into pedestrian and bike-friendly infrastructure. Trails connect neighborhoods to anchor institutions, such as universities, hospitals, museums, parks, schools and business districts.

The natural environment is fundamental to the ecosystem services that support human life and health. Greenspace that conserves natural ecosystem values and functions provides protection against floods and hurricanes and a place for outdoor recreation, relaxation, and exercise to improve health, and access to these spaces lowers the likelihood of obesity and reduces stress. Locating natural areas within walking distance of traditionally disadvantaged populations provides convenient access to low cost recreational and human health benefits.

Multiple federal, state and local financing options exist to protect land for conservation purposes. Sometimes, simply notifying landowners of the value of green space features and explaining the purpose of a green infrastructure network are sufficient. People value what they understand and protect what they value. Some landowners have already donated or willed property to the County or to an entity such as the Audubon Society for conservation. Privately-funded land trusts are also active in the County and are valuable potential partners.

Recommended actions:

- **Review existing County policies, ordinances and regulations for consistency** on protection of contiguous natural green infrastructure; recommend legislative and administrative changes, as necessary.
- **Examine zoning** for areas of contiguous forest and explore ways to protect these lands
- **Work with private landowners** to protect Tier 1-3 conservation and sensitive species areas.
- **Establish and promote incentives** to protect forest tracts and corridors.
- **Educate the community** on the value of natural green infrastructure and involve stakeholders in its protection.
- **Work with the Federal Delegation** to advocate for the C&O Canal National Park to be a designated wildlife corridor, press for passage of the Federal Wildlife Corridor Act, and pursue national wild and scenic status for the Monocacy River.

Creek ReLeaf

Frederick County's Creek ReLeaf Program is a multi-year reforestation program designed to increase the total amount of forested area within Frederick County, including privately owned lands and public properties. Forested lands provide stormwater control, reduce temperature impacts on County streams, and increase wildlife habitat. The program provides private landowners with native trees and shrubs planted on their property, 5 years of maintenance to establish the forest stand, and payment for a permanent conservation easement that will be placed on the planted parcel to protect the conservation values. After the initial 5 years, the property maintenance reverts to the land owner with County inspections every three years. Since its inception, Creek ReLeaf has planted approximately 400 acres, with 350 native tree seedlings per acre. The plantings include 14 private properties and 11 County owned properties.

FREDERICK COUNTY OFFICE OF SUSTAINABILITY AND ENVIRONMENTAL RESOURCES

Because forested lands provide stormwater control, Creek ReLeaf helps Frederick County meet its Municipal Separate Storm Sewer System (MS4) permit requirements required by the Maryland Department of the Environment. Such municipal permits help carry out the National Pollutant Discharge Elimination System (NPDES) program implemented by the Federal Clean Water Act. Check the Creek ReLeaf website for the next application period.

RESILIENCE

The impacts of extreme heat, precipitation events and flooding, and extended drought are readily apparent throughout Frederick County and the City of Frederick. 90°F+ days are more frequent inducing heat stress and need for caution for all outdoor workers and residents with pre-existing conditions. Rain events frequently flood City streets causing substantial property damage, repair costs, and exposure to pathogens in sewage back-ups. Rain events have also delayed spring plantings and fall harvests, and long dry periods threaten crop and animal productivity and routine maintenance of public and private vegetation.

> "Do unto those downstream as you would have those upstream do unto you."
>
> Wendell Berry

Coping with these impacts of the changing climate is critical and is referred to as adaptation. The more effectively the community adapts the more resilient it becomes. The goal is achieving resiliency in local infrastructure, public health, industries, and natural environment. There are multiple ways to minimize climate impacts, short- and long-term, often with initial capital costs recovered through loss prevention.

Protecting the public from pathogens, flooding, and heat exposure is central to the core mission of the Frederick County Health Department. By ensuring protection from these impacts through proactive public or public/private funding partnerships, human suffering is prevented and medical attention and funds are preserved for other health crises.

The health and wellbeing of residents, including those with limited means, and the economic vibrancy of the community will be indicators of adaptation success. Responding now will prevent these climate change impacts from overwhelming our community in the future. Climate change impacts can be minimized, softening local losses and allowing continued expansion of Frederick as THE place to live, work, and recreate.

COLIN LLOYD ON UNSPLASH

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RESILIENCE RECOMMENDATION

Improve community public health resilience to extreme heat events

Heat events are the top cause of climate-related death in the United States. As summer extreme heat events continue to increase, the local health department can be a valuable partner to Frederick County and City to prepare for and respond to related health impacts. Preventing conditions that create illness is the most important role that public and private organizations can take to combat climate health impacts. Immediate health impacts of extreme heat include heat stress, heat stroke, and death, along with increased risk of heart attacks, renal failure, and negative impacts on fetal health. Extreme heat will likely increase concentrations of secondary pollutants such as ozone in the coming decades, increasing respiratory threats.

There are many models for effective resilience measures throughout the country. In addition to cooling centers, Baltimore City accommodates senior citizens through the CARE's Taxi Card voucher program to make cooling centers more accessible. Some jurisdictions also implement heat health alert systems to disseminate timely messages about safety and resources. For example, North Carolina's Department of Health and Human Services communicates heat-health alerts through farm worker health trainings, information campaigns with local housing authorities, nutritional assistance site staff trainings, and parks and recreation staff trainings to reach vulnerable populations. The Rhode Island Department of Health also has a system where emails are sent to health care providers statewide. Maryland's Office of Human Services also has private home energy assistance and weatherization programs. Improving tree canopy, especially in locations where older and financially-insecure people live, and improved building codes that increase energy efficiency, are also important.

Tracking increases in heat-related deaths and illnesses is an important feature of preparedness and resilience. With enhanced surveillance for heat-related illness during heat waves, data can be shared with public health practitioners, community partners, and in technical reports to benefit future planning. Any spikes in emergency room visits during, or immediately following, days with extreme heat can be identified to enhance preparedness for hospitals and families, a practice in the Oregon Climate and Health Program.

These infrastructure improvements will keep the community healthier and prevent heat stroke-related deaths and reduction of hospitalizations due to heat stress. Weatherization and energy efficiency retrofit programs benefit human health, and have the added benefit of cost savings on utility bills.

Recommended actions:

- **Establish an early warning Heat Health Alert system**
- **Assess the need for and increase access to cooling centers**
- **Increase home energy and weatherization assistance**
- **Implement a heat illness surveillance program**
- **Increase education and outreach programs (Buddy program, etc.)**
- **Improve building codes to add resiliency features (Recommendation 4)**

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RESILIENCE RECOMMENDATION

Prepare for public health in extreme precipitation events

Extreme precipitation can increase risk of flooding related deaths, food and waterborne illness, and road accidents, and increase burden of respiratory illnesses from exposure to molds. Rather than reactive responses after the disasters, proactive measures geared towards enhancing community resilience to extreme precipitation need to be implemented, including expanded green infrastructure; development of early warning systems with longer lead time; waterproofing basements in high flood risk area to avoid mold exposure; and enhanced surveillance of food/waterborne illness and data coordination with the State Health Departments.

Extreme precipitation can impact human health, both directly and indirectly. In Maryland, there was a 23% increase in the risk of motor vehicle accidents during extreme precipitation events, with a considerably higher risk (46%) observed on roads with defects or obstructions. Exposure to extreme precipitation also led to a significantly increased risk of *Salmonella* infections in Maryland, and development of and exposure to mold following flooding of basements is frequent in the humid, warm areas of the region, leading to respiratory distress, allergic reactions, and in very young children, life-long asthma.

There are multiple ways to prepare for extreme weather to prevent impact on human health.

Flooding, Monocacy River, Dickerson, MD

USEPA PHOTO BY ERIC VANCE

Baltimore City zoning policies were upgraded to incorporate climate risks and protect existing buildings. Frederick County has adopted wider buffer zones in local watersheds while floodplain building restrictions are already in place. The City and County have also agreed that there would be no building in a floodplain, exemplified in the 2020–2021 discussions in the South Frederick Corridor planning process. For the City, officials are now considering updating its floodplain ordinance to require higher building standards and is working with the U.S. Army Corps of Engineers to identify flood-prone areas and stormwater management options to prevent future City flooding.

More can be done. Construction practices should be changed for buildings to prevent flooding basements from pathogen-laden stormwater and sewage, such as requiring foundation sealants, vapor barriers, and backflow valves. Public funds should also be established to assist owners in building repairs from flooding damage due to inadequate stormwater or sewage conveyance/ storage capacities. Wastewater treatment plant infrastructure improvement will prevent production losses and possible human health impacts from overflows. Green infrastructure practices are also effective in slowing runoff, retaining bacteria-associated particles, and infiltrating water, thereby reducing down-gradient flooding potential for some storms. Increasing soil organic matter on public and private lands is also an effective measure, as it improves soil's water storage capacity by 27,000 gallons per acre (see Recommendation 20).

The Livable Frederick Master Plan, the draft City Climate Action Plan, the 2020 City Comprehensive Plan and the City's strategic plan all reference the need to improve stormwater management and minimize flooding. Besides the documented benefits to public health, residents and businesses would benefit greatly from these improvements that minimize disruption and preventable expense. Since low income communities are most at risk from these hazards, the County and City should employ an Equity Index (per Recommendation 1) to identify most impacted and deserving areas for more targeted retrofits, flood prevention, and green infrastructure implementation, thereby funding areas with most need for protection.

Recommended actions:

- **Include County Public Health officials** in proactively identifying needed City and County policies to prevent future exposure of residents, particularly at-risk communities, to extreme precipitation events and the illnesses that follow.

- **Develop a County-wide easily accessible public health database** on extreme precipitation-related illnesses.

- **Develop an early warning system** for extreme precipitation related threats and illnesses that can be used to warn residents living in high risk areas to prevent the illness before it occurs.

- **Increase green infrastructure**, such as expanding riparian buffers, urban tree canopy, and stormwater management structures, to reduce impervious cover in flood-prone areas.

- **Explore use of an Equity Index** for green infrastructure placement and the U.S. Army Corps of Engineer model to best protect specific City and County areas from future flooding.

- **Assess whether recently adopted floodplain zoning policies are adequate** for protecting mass floods and runoff that would threaten existing residents and infrastructure (downstream developments or municipalities) as well as placement of future developments.

- **Assess and plan for future retrofit** and new construction of conveyance and storage systems for wastewater and stormwater service.

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RESILIENCE RECOMMENDATION

Minimize the impact of extended droughts

Public and private partnership programs will be needed to enhance storage and efficient use of drinking water, while building capacity for safe reuse of reclaimed water for agricultural purposes to maintain local food availability. The focus should be on building these partnerships now as an iterative process so that droughts can be anticipated, and responses implemented in a timely manner.

Frederick County has experienced a few severe droughts in the past, some requiring mandatory water restrictions, and will now face extended dry periods much more frequently. Residents with shallow wells have greater susceptibility to droughts than those with deeper wells. Adaptation measures for extended drought seek to expand the overall supply and availability of water by increasing the water retention capacity of soils through increases in soil organic matter. Minimizing water use and consumption through more efficient practices is also necessary, allowing for a limited water supply to be distributed effectively for drinking water and other needs. This efficient use also reduces the risk of food insecurity and infectious diseases related to water quality. Increases in population and frequency of drought will increase demands for municipal water in direct competition with agricultural water needs. It is prudent to build capacity that enables safe use of reclaimed/greywater for agricultural purposes, thereby enabling most freshwater for drinking water supplies.

Homeowners can conserve water with water-saving devices and behavioral changes, and by harvesting rainwater. Businesses have also been taking on corporate responsibility to conserve water, especially industries with large water footprints, e.g., food and IT companies. Use of reclaimed or greywater is also feasible for homes and businesses.

Agriculture can protect limited freshwater resources through the efficient use of water within the agricultural supply chain, water and fertilizer management practices, and water stewardship policies. For wastewater, treatment technologies can allow utilities to supply recycled water to agriculture in the growing season and recharge groundwater in the offseason. The Livable Frederick Master Plan calls for measures to protect the County from droughts in the future and the City encourages drought-tolerant trees as it aims to increase the tree canopy. These measures also improve flood control, could provide water for the completion of projects that reduce reservoir sedimentation, and support forest management projects to enhance carbon sequestration. Water conservation and grey water use in agriculture adds the additional benefit of preventing expensive facility upgrades downstream for nutrient-removal processes and lessens the threats to food security.

Recommended actions:

- **Assess water volume need, then build capacity** to increase use of reclaimed water sources for irrigation to address agricultural water shortages.
- **Increase water storage capacity** by increasing soil organic matter on public and private lands; practicing aquifer storage and recovery; removing accumulated sediment in reservoirs or lowering water intake elevation; distributing rain barrels locally; and enhancing alternative drinking water systems, including deep wells and rainwater cisterns (RWCS) that directly collect rainwater runoff from roofs and other surfaces into storage systems for later use.
- **Support local community food banks**, a food hub, and community gardens to provide food during drought-induced high food price periods.

Vision and volunteerism form an oasis in the City

The Friends of Waterford Park have applied vision, volunteerism, and elbow grease to 16 years of ecosystem restoration within the City limits of Frederick. With the support of grants from various environmental agencies and donors, the group has taken an empty strip of undeveloped land and turned it into an oasis. They've planted thousands of native trees and shrubs and fields of wildflowers, and added a butterfly garden and various bird houses, including a purple martin house. These enhancements are based on a site plan approved in concept by the City's Department of Parks and Recreation.

BARB TRADER

The success of Waterford Park stems from a robust private-public partnership. Local neighbors started with a vision and worked with several City departments, which have provided hardscape and lighting, and have facilitated a major stream restoration project. The shared use path provides the only major connection between the eastern and western sections of the City independent of vehicle traffic. From a litter-filled tangle of invasive species along an eroded streambed, Waterford Park is now a contemplative place, filled with songbirds, wildflowers, and year-round natural beauty, and at the same time, serves as an important floodplain, connector, and shady respite.

BARB TRADER

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RESILIENCE RECOMMENDATION

Reduce threats from pathogens, parasites, and pests

An increase in activity from climate resilient pests and pathogens is expected in this area due to global climate change. While preventing new pathogens and parasites from entering the region is difficult, it is possible to limit the exposure to and severity of infection from these threats. Limiting exposure can be done through establishing a robust monitoring system followed by a tracking system for illnesses and agricultural pest infestations and controls. Currently, there is no active pest monitoring program in the County or City.

Mosquitoes are the most common vector insect in our region, and carry West Nile (WNV), Zika and other viruses. Common symptoms of WNV include, but are not limited to flu-like symptoms, fever, headache, and body aches and more severe symptoms can cause meningitis, encephalitis, other neurologic diseases, and even death. While Zika virus is rare in the United States, cases are increasing as the climate warms. Although symptoms of initial Zika virus are mild, flu-like symptoms, Zika can cause severe harm to an unborn child, leading to significant neurologic problems and birth defects.

Over a span of 12 years from 2004 to 2016, the number of tick-borne diseases has doubled and climate change will accelerate the development cycle of ticks leading to increased egg production, which in turn will increase the population. The most common tick in the Mid-Atlantic region is the blacklegged tick, the common vector for Lyme disease; the tick can be active year-round with above freezing temperatures. Lyme disease is serious and common symptoms include fatigue, rashes, numerous neurologic symptoms such as numbness and inability to control facial muscles, and tachycardia. Even after treatment, symptoms may persist a lifetime and infected individuals have a higher likelihood of developing an auto-immune disorder. Ehrlichiosis is another severe tick-borne disease common in the Mid-Atlantic region.

> "Preventing exposures and threats to health is the most important means to protect residents."
>
> Barbara Brookmyer, County Health Department director

People who are immunocompromised are most at risk for infection with severe symptoms from any of these diseases. While no one is immune from getting bitten by a mosquito or tick, people who are overweight, pregnant, or sweating are more likely to experience an increase of pest activity surrounding them. With the increased likelihood of pests in the area, especially new pests, additional training on and use of Integrated Pest Management (IPM) for farmers, gardeners, landscape companies and other land managers is needed. IPM is a management system that utilizes a variety of techniques to limit the impact of pests and reduce the use of pesticides that are needed to control these pests in agriculture.

The Livable Frederick Master Plan and the County Health Department repeatedly stress the importance of public health in defining the high quality of life in the County. A surveillance system

provides protection against infection, reducing the likelihood of illness and long-term medical care. Should infections progress, the resulting illnesses lead to lost employment, fiscal hardship, and expensive treatments and medications, threats to individuals and their employers. Preventing infection through avoidance of identified pest 'hot-spots' also reduces medical service, thereby freeing staff and medication/treatments for other community illnesses. For agriculture pests, monitoring and identification of infected crops allows more immediate intervention to protect crops, and longer term benefits such as pest identification, planning for the next crop's natural defenses against the pest, protecting future production, and limiting the use and runoff of environmentally-threatening pesticides.

Skeletonized leaves of oakleaf hydrangea caused by feeding of Japanese beetles

MISSOURI BOTANICAL GARDEN

People most vulnerable to serious illness from pest-related infections are also likely to be overrepresented in asset limited, disabled, or senior populations. These groups also would face a disproportionate risk for lost work, costly medical care and other stressors should they become ill. Monitoring for human pests could assist members of these communities to avoid pest-rich locations to avoid infections.

Recommended actions:

- **At least once a year, City and County staff and Health Department staff officials should meet to discuss vector-borne illnesses** and ascertain whether a monitoring program is needed.
- **Communicate quarterly with local agriculture agents and local producers** to discuss observations of crop- or animal-specific pests in order to monitor and identify appropriate IPM approaches to reduce infestations and crop or animal production declines.
- **Should human or agricultural pests increase, examine and amend the health department budget** for establishing rapid response monitoring/surveillance programs.
- **Seek extramural funding for implementing a monitoring/surveillance program.**
- **Seek and provide County Health Department funding for human disease responses**, should vector-delivered human illness increase, such as outreach, education, awareness, home visits and care, and medical center/clinic treatment.
- **Add staff or consultants to increase monitoring** or draft grant proposals.

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RESILIENCE RECOMMENDATION

Upgrade stormwater and wastewater conveyance and storage management

Growth plans must be developed with larger stormwater and wastewater conveyance and storage capacities for current flood-prone areas as well as future primary and secondary growth areas, possible annex areas, and developments. The long-term growth strategies of the City and County should include an inter-connected and comprehensive stormwater (SW) and wastewater (WW) permitting and planning effort with the impacts of climate change adaptation embedded throughout, specifically designed to accommodate the 100 year storms now common to and increasing in the area. Recommendations for permit issuance and community planning efforts resulting from this new study should be swiftly incorporated into regulations. Tracking of the flooding locales, new infrastructure, and subsequent flooding reductions should be put in place by the Climate Response and Resilience Office (described in Recommendation 1).

AARON VOLKENING FLICKR.COM

Bioretention / bioswale in road median

Flooding as a result of inadequate SW planning and mitigation efforts to meet the demands of the increases in more frequent and intense storms has resulted in a large number of costly and damaging impacts to infrastructure, homes and businesses. Flash flooding can damage pavement or wash out bridges and culverts; clog drainage systems with roadway debris; roadway debris breaks or disrupts underground gas lines and electrical transmission lines; and jeopardizes emergency vehicle traffic access. Extreme runoff can also exceed wastewater treatment plant (WWTP) storage capacities, leading to release of untreated pollutant- and pathogen-laden water into local receiving waters and back-up into basements of homes and businesses. These damages can result in high-dollar capital project costs for the City and County, undefinable costs in human health impacts, and costly state fines for release of untreated sewage.

A flood resiliency study by the U.S. Army Corps of Engineers was conducted for the City of Frederick in 2019, but climate change impacts were not considered. As indicated in the City of Frederick's Draft Climate Action Plan, flood risk is increasing in the City and County due to climate change. It is expected that in the City of Frederick alone, the number of properties currently exposed to a 5% annual chance flood is expected to increase by 11% by 2050. SW and WW management needs to be large-scale and interconnected with municipalities within the County as well as those of neighboring counties for them to be effective. An effective plan must consider where downstream

BARB TRADER

Culverts of Frederick's Carroll Creek flood control project

increases in SW outflow could impact the next municipality. Similarly, sewer conveyance (including pumping stations) and treatment capacities need to be adjusted for projected City and County population density increases through 2050.

One way to address increased SW flooding probabilities is to prioritize the preservation of green space within new development and redevelopment parcels, as well as expanding green space in existing developments. Prioritizing green designs and emphasizing regenerative land management will improve soil water retention and reduce runoff. Water from storm events is released over time, rather than all at once in unmanageable surges to the existing SW runoff systems of the City and County. When SW and WW management is expanded to effectively inhibit, prevent, and respond to flooding events, other important benefits are realized, including water quality protection (particularly meeting Total Maximum Daily Loads, or legally permitted discharges of nutrients and sediments), green canopy is increased, community health is protected, and heat islands are reduced.

The human impact is particularly concerning. Many City and County residents who are considered part of the ALICE population live in flood-prone areas and may not have a vehicle nor flood or renter's insurance. This population would be disproportionately affected by a large or severe flooding event as compared to a median income resident who could escape the flooding event and recoup losses. Similarly, sewage back-ups into homes in areas with inadequate conveyance systems unfairly jeopardizes those same portions of our populations with limited funds for clean-up or repairs.

Costs for increasing storage and conveyance capacities in flood-prone areas to protect homes that are regularly flooded would likely be exorbitant. Providing tax breaks, incentives, or free public services for clean-up and repairs should be considered, including costs for purchase, installation, and maintenance of backflow valves. For new growth areas, however, projections of population and business increases as well as the increased impacts of climate change should drive decisions about conveyance and storage capacities of these water streams. Past aperiodic peak flows should be compiled and storage capacities estimated to ensure future buildings will not experience exposure to sewage through back-up of City or County WWTP capacities. A number of financing opportunities for Maryland MS4 programs are outlined in the Maryland Department of the Environment 2020 Annual Report on financial assurance plans.

Recommended actions:

- **Create a comprehensive and coordinated Stormwater and Wastewater Management Plan** that incorporates the predicted impacts from climate change for future primary and secondary growth areas, possible annex areas, as well as for new and existing developments.
- **Evaluate the sequencing of agency approvals for new building development projects** to determine the best point at which to incorporate stormwater and wastewater practices review.
- **Increase the percentage of Municipal Separate Storm Sewer System permitting costs** (including re-examination of the SW Remediation Fee) that can be offset from the general overhead fund and passed onto new permitting, planning, and development in the County and City as well as other applicable State and Federal Sources.
- **Work with homeowners, businesses, and the building and services sectors** to identify and require flood protection technologies in retrofits to existing homes and buildings to minimize flooding damage/threats during major renovation, improvement, and expansion efforts.
- **Amend post-permitting policies** and City and County building codes and enforcement to ensure all runoff controls, including conservation plantings in place of structural controls, are maintained and effective.
- **Estimate future housing unit additions and sewer production,** and assess current and future storage capacity, to prevent conveyance system backups into homes and businesses, and the discharge of untreated sewage into local receiving waters.
- **Establish a public fund** to retrofit existing buildings in flood-prone areas and reimburse property owners for SW or WW flood damages incurred through inadequate public conveyance systems or storage capacities.
- **Require that new private developments employ a variety of climate-hazard mitigation techniques**, such as SW retention, sewage storage, sequestration tactics, etc. before approval by the planning commissions.
- **Adopt aggressive County codes** to limit impervious concrete surfaces and require the use of pervious pavements, especially in publicly-funded projects. For example, sidewalks, driveways and parking lots should use pervious pavements to reduce runoff and flooding that overwhelms the storm sewer system.
- **For new and existing buildings, aggressively promote and incentivize** use of green roofs, regenerative land management, native plantings, rain gardens, runoff retention, and other nature-based technologies to reduce runoff and to minimize heat island effects.
- **Identify grants and other financial incentives** within federal and state programs that the County/City could pursue to provide funding for climate change adaptation.

> "We're stuck between two streams that flood regularly, more over the past 4–5 years. Big Hunting Creek runs through Thurmont, so downtown gets a lot of water to begin with. And when the state opens dams, it rips away yards and stream embankments."
>
> John Kinnaird, Mayor, Thurmont

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RESILIENCE RECOMMENDATION

Build new and retrofit existing infrastructure to withstand anticipated threats

The Maryland Commission on Climate Change Act requires the Maryland Department of Transportation (MDOT) to maintain a comprehensive action plan with five year benchmarks to mitigate climate change impacts. The MDOT has identified the top weather-related hazards as extreme weather, winter storms, extreme temperature, high winds, and flooding. Extreme heat causes concrete and asphalt roads to expand and buckle after multiple days of exposure. That damage can then allow water seepage and eroding of the underlying subsurface layers leading to road damage and collapse. Use of reflective coatings or lighter pigmentation to reduce heat absorption has proven effective in reducing damage. Train tracks can also buckle, a concern for the local MARC commuter trains and freight trains. Heat can be reduced by shade from increased tree canopies in the areas of roadways or railways, lowering the surface temperature of sidewalks, rails, and roads.

The Maryland Department of the Environment (MDE) notes in their Climate Action Plan (CAP) that large quantities of runoff from extreme precipitation events overwhelm stormwater drainage systems of the Northeast, and a business-as-usual scenario will cost an estimated $1 to $2 billion in damages by 2100. MDOT guidelines plan for an increase in 100 year storms predicted by climate models. For storms of this magnitude, several recommended procedures for road culverts include using the largest diameter pipes possible exceeding the highest water levels observed; placing the bottom of the culvert pipe below the lowest level of the water entering the pipe; protecting the culvert inlet soil with stone to depths and widths that exceed the highest expected water levels; and vegetating the area to allow roots to help secure the soil.

The City and County have experienced multiple road and culvert washouts in recent years; reducing likely repeat damage is a priority. Several other strategies to reduce damage include stream restoration projects to reduce flood velocities, or installing pond levelers to divert rising water levels. Maintaining resilient highways, bridges, and culverts ensures public safety and reliable transportation, critical to commerce and routine travel within the County and City as well as access for emergency responders. The City and County should initiate explorations of transportation infrastructure resilience within a year followed by funding discussions and a plan for new/retrofitted transportation infrastructure over 5–10 years, partially supported by stormwater utility and water quality protection fees.

Recommended actions:

- **Identify at-risk transportation infrastructure.**
- **Build and repair for 100 year storms**, exploring new pavement technologies/mixtures.
- **Plan and fund retrofitted transportation infrastructure** over 5–10 years.
- **Investigate the feasibility and implications of a stormwater utility or water quality protection fee** to fund stormwater retrofits as well as inspection and enforcement operations.
- **Implement green infrastructure capacities** along roadways and across floodplains and explore stream restoration projects to address increased precipitation and protect infrastructure from new storm flows, building resiliency to the increased severity of weather events.
- **Seek State and Federal funding** for highway and transportation infrastructure improvements.

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RESILIENCE RECOMMENDATION

Prepare for climate migration to Frederick

As sea level rise floods coastal areas of Maryland and threatens freshwater drinking water sources and productive farmland, and wildfires, hurricanes and other extreme weather events threaten other states and countries, displaced people will be seeking safe places to relocate.

The City and County should collaborate on an area plan to increase affordable housing for resettlement, job training, food, mental health services, and medical access for climate migrants. Extreme events associated with climate change are now identified as a world-wide crisis, causing millions of people to flee areas experiencing catastrophic flooding or sea level rise around the globe. In 2018, the World Bank estimated that three regions alone (Latin America, sub-Saharan Africa, and Southeast Asia) will generate 143 million climate migrants by 2050.

In the United States, 13 million Americans could be displaced by sea-level rise and natural disasters by 2100 with about one-half from Florida, principally Miami. The Chesapeake region faces a similar plight as major portions of the bay's coastal area of the lower Eastern Shore will face regular flooding and salt intrusion in groundwater and soils, rendering them unsuitable for agriculture or consumption. Storm-induced property damage is also likely to increase in this region.

The migrants are likely to be of modest income as wealthier individuals often have means to protect or ameliorate these impacts. Migrants will often arrive after surviving a catastrophic natural disaster, losing their homes, communities, and perhaps members of the immediate family. This region is an attractive area with industry, jobs, and a high quality of life, and should anticipate and plan for an influx of U.S. and global citizens and identify options to encourage resettlement, jobs, food, mental health and medical access.

Montgomery County has identified services to assist climate migrants. The City of Frederick and Frederick County should prepare accordingly.

The arrival of climate migrants increases potential workforce candidates for the new businesses of the area. Although initial costs for the basic services noted above might appear high, the advantages are considerable. First, there is potential that the plan could provide a competitive advantage to Frederick City and County for affordable housing grants and additional funding. Second, setting up training opportunities, as outlined in Recommendation 36, could increase the needed skilled labor force to construct passive housing, LEED buildings, green infrastructure, and emerging agricultural technology critical to a cleaner, healthier economy.

Recommended actions:

- **Establish a working group** of public staff and officials, social service organizations, County Public Health staff, and others to begin assessment of the magnitude of potential climate migrant influx and their service needs.
- **Work with the City and County delegations** to secure existing state or federal funds for housing infrastructure, social services and additional training capacity for anticipated workforce growth areas.

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RESILIENCE RECOMMENDATION

Install advanced treatment capacities for removal of natural toxins from drinking water

Local drinking water for Frederick City is supplied from two sources: 24% from the Potomac River, and 64% from Lake Linganore and Linganore Creek. Both of these sources are warming, with summer water temperatures often exceeding 88°F. As local water temperatures rise, algae common to our waters shift from multiple populations of free-floating and attached species considered 'healthy,' to a group that prefers high-temperatures, the cyanobacteria. The 'healthy' populations die back leaving multiple strains of cyanobacteria that can produce compounds which threaten human and wildlife health, including cancer-forming compounds and materials that curtail normal nerve transmission, alter cell integrity, and in mildest impacts, inflame the skin. Immediate health impacts include upset stomach, vomiting and diarrhea; longer term problems include liver and kidney damage.

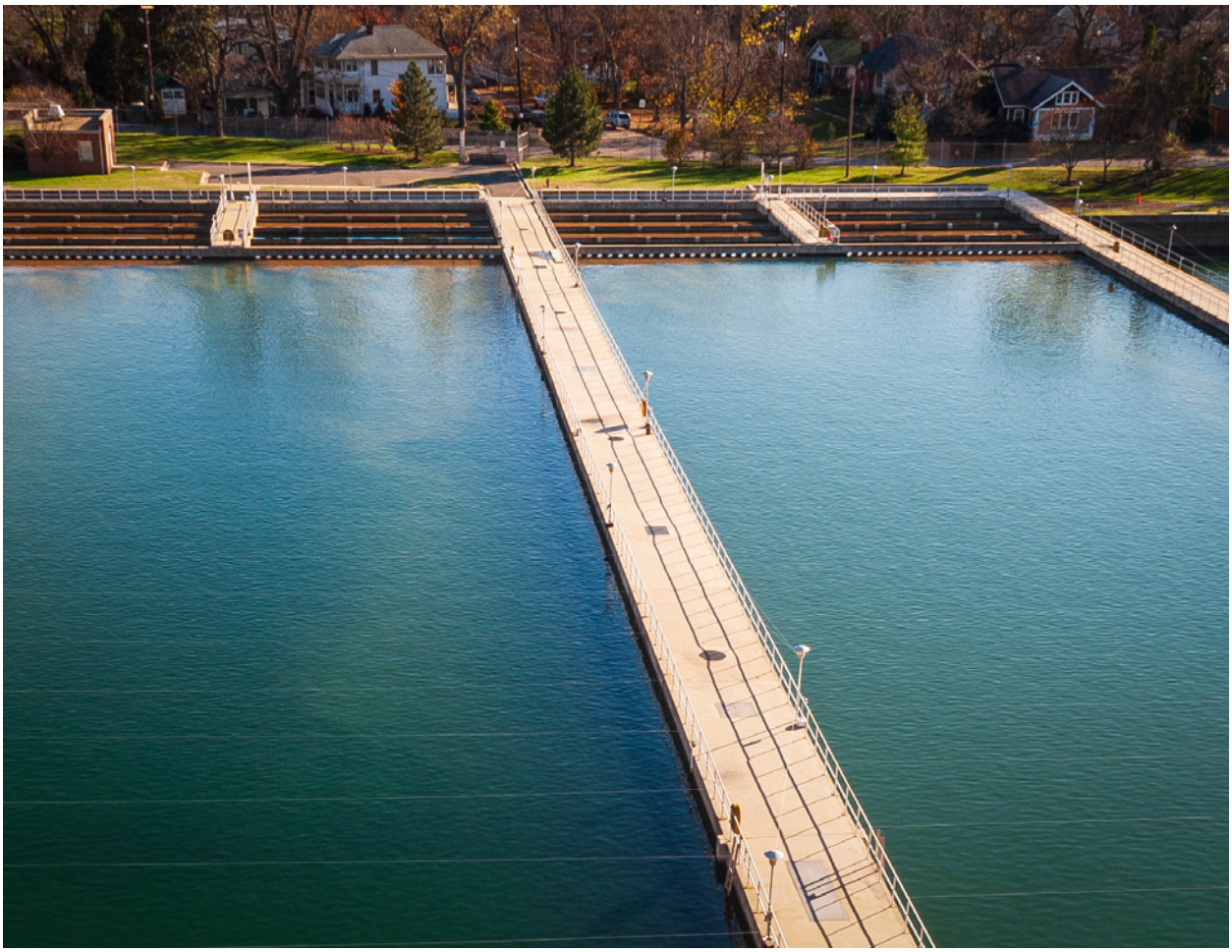
Currently City and County drinking water utilities use chlorination to reduce concentrations of these problematic organic compounds. Unfortunately, when toxins are abundant, chlorination may only be partially effective in toxin removal, with some portions of these unsafe molecules impacting the safety of the drinking water supply.

Examples of the source water threat are evident in several water supplies in the County. Lake Linganore is now dominated by free-floating cyanobacteria from June into October, with many species identified in the scientific literature having toxin-producing variants, strains, or subspecies. Another group of cyanobacteria, bottom-dwelling species, can dominate low flow conditions of the Potomac River during summer, producing micocystin (a liver toxin) as well as dermal irritants. These have become occasional concerns for the drinking water facilities along the Potomac River.

The Livable Frederick Master Plan and CommUNITY2030 (the City strategic plan) express commitments for a safe water supply. A 2014 catastrophe in Toledo, OH indicates the potential severity of this problem because Lake Erie, the city's water supply, became overwhelmed by a free-floating cyanobacterium, and toxins were distributed in drinking water. The National Guard distributed bottled water for the population of 400,000 in the city.

Ohio Air National Guard distributing bottled water in Toledo, OH after the city's water supply became overwhelmed by a free-floating cyanobacterium

MASTER SGT. BETH HOLLIKER



USEPA PHOTO

Prevention of toxins and their derivatives in drinking water supplied to City and County residents through public utilities prevents illness. It also reduces potential economic burdens on financially insecure households if City water becomes unsafe, necessitating purchase of bottled water or other alternative water supplies free of contaminants.

There are several treatment options which require retrofits, and are safe and effective. Federal and state funds are available through several sources to address these needs.

Recommended actions:

- **Monitoring programs for multiple toxins** should be established in drinking water source areas and the intakes and distribution ports of local utilities.
- **Possible alternative water supplies** should be identified.
- **Government and utility staff** should consult with drinking water facility construction teams regarding selection of appropriate toxin removal infrastructure for local facilities.
- **Funding mechanisms should be explored** for installation of appropriate utility infrastructure improvements and extended and ongoing maintenance/replacement.
- **Delegations should seek State/Federal funding** for drinking water facility upgrades.

CLEAN ENERGY ECONOMY

A rapid shift is underway in the economy nationally and locally, away from a fossil-fueled economy to one powered by clean energy. It is to our collective advantage to accelerate progress in this shift to reap the multiple benefits of a more resilient future, while also anticipating and planning for climate impacts that may cause instability in the local economy.

Workers will be impacted, new skills will be needed, improved technologies will be introduced and new businesses started in order to take advantage of these opportunities. Investing in the future through innovative funding arrangements is necessary to catalyze these changes. As the community learns more about climate-related impacts on daily life, consumer demand for "climate-forward" products and services will grow.

> "The nation that leads the clean energy economy will be the nation that leads the global economy."
>
> Barack Obama

Many jobs in the clean energy sector require a high school degree and technical training in the industry and are already providing more diverse opportunities for career building locally. The residents of this area will be well served by an economic leadership attentive to these shifts, poised to seize opportunities that advance climate goals.

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CLEAN ENERGY ECONOMY RECOMMENDATION

Lead the community toward a clean energy economy

A transition to a Clean Energy Economy is underway and is impacting industries in Frederick County and around the region. Important features of a successful transition are a workforce trained on new technologies; workforce transition plans for workers displaced by the transition from fossil fuels or climate impacts elsewhere; businesses that are "climate-forward" and responsive to consumer demands; and adequate secondary and post-secondary training. The more rapidly the local business community and workforce can meet the needs of consumers demanding clean energy solutions, the more likely ambitious climate goals can be achieved. The more self-sustaining the local community is, the more vibrant the local economy becomes, while climate goals are advanced.

A Clean Energy Advisory Council should be established to advance climate goals of the City and County by: assessing climate-related economic impacts, needs and recommendations on technical, economic and social solutions; working toward a more self-sustaining local economy; ensuring a trained and skilled workforce; and providing leadership for innovative funding arrangements. Beginning in 2022, the Council should be composed of representatives from a variety of stakeholder groups, including small and large employers, industry representatives, secondary and post-secondary education staff, technical experts, and members of the public.

Climate-related economic impacts are already being experienced. Helped by federal tax incentives and state grants, homeowners are installing clean energy features, but installers report high turnover of a skilled workforce, frequently losing trained staff to other jurisdictions where pay is higher. According to the Columbia Climate School, the industry most vulnerable to climate change is agriculture, Frederick County's largest industry. The rapid shift to telework as a result of the COVID–19 crisis will have lasting impact, with associated ripples throughout the local economy. Tourism and outdoor recreation are already impacted by climate change. Considering the fate of native brook trout and its vulnerability to warming stream temperatures, these changes will very likely strain the local economy, since fishing alone draws $2.5 million in local annual revenue. Identifying these trends early will be an important task of the Clean Energy Advisory Council to inform its strategic direction.

Another area the Clean Energy Advisory Council should consider is the evaluation of current market-based barriers that make climate solutions difficult. Discontinuing investment in what will soon become stranded assets is also essential. These examples highlight the need for economic development efforts to be viewed through the lens of climate change. Communities around the country are finding it necessary to ask a series of questions. Which businesses are "climate-forward," investing in projects that reduce GHG emissions in order to mitigate forecasted GHG emissions from "business as usual" operations? Is it worth attracting new businesses that leave polluting infrastructure, such as new gas stations? What will happen to members of the local workforce who are displaced by the departure from fossil fuels? Will there be a just transition to new employment? How will the community respond to an expected

influx of "climate migrants", forced to move from Maryland's Eastern Shore, the coastal areas of the country, or the drought-stricken western states (see Recommendation 33)? Which businesses are essential to a thriving, clean, local economy and what is their presence locally?

Another important area for consideration is the role local economic development efforts can play to catalyze a circular economy, which by definition, designs waste and pollution out; keeps products and materials in use; and regenerates natural systems, conserving natural resources and restoring natural systems. Incentivizing start-up businesses committed to these principles is an important strategy for the future health of the community. An ongoing inquiry into the skills needs and gaps present in the City and County as they relate to achievement of climate goals is needed to maintain a thriving local economy, and is an important function of the proposed advisory council.

The Clean Energy Advisory Council will also provide leadership and support for innovative funding mechanisms to drive transition to a clean energy economy and to build capacity of private sector funding through innovation grants, support for the establishment of a local green bank, and development of public-private partnerships. These investments will accelerate market changes that will position the local economy for greater resiliency through an uncertain time. The Clean Energy Advisory Council approach provides a mechanism by which Frederick City and County can "go the extra mile", anticipating employee dislocation before it occurs, seeing opportunity on the horizon and preparing to benefit from it, and structuring financing arrangements, such as sliding scale subsidies, that allow all people to benefit from improvements in efficiency and resulting cost savings. The core purpose of such an approach, equity, should be a driving motivator.

> "We simply must do everything we can in our power to slow down global warming before it is too late. We can save our planet and also boost our economy at the same time."
>
> Arnold Schwarzenegger
> Former governor of California

Recommended actions

- **Develop a strategic plan for attracting climate-forward, carbon-neutral, plastics-neutral businesses to this area.**
- **Review economic development goals** through the lens of climate change and provide direction to align with climate goals.
- **Recommend updated trades training** and climate-forward business training to all workforce training options in the Offices of Economic Development and Frederick County Public Schools career center programs.
- **Continually provide updates to vendor lists** for City and County departments, and community-focused programs such as the Green Homes Challenge, to list businesses that are climate-forward, carbon-neutral and plastics-neutral.
- **Develop an Agriculture Transformation Strategic Plan** (the most recent plan is from 2007) as the industry is the most at risk from climate change impacts.
- **Establish a leadership position** for the development of funding mechanisms to accelerate action on climate goals.
- **Seek stakeholder engagement** on a continuous basis to identify market barriers to the acceleration of climate goals and develop public-private solutions to solve them.

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CLEAN ENERGY ECONOMY RECOMMENDATION

Create and deploy workforce transition plans

Technology is changing rapidly and has the potential to have a great impact on transition to a clean energy economy. The pace by which the local workforce is able to learn and absorb the skills needed to integrate new technology into their working lives will matter in industries like agriculture, building construction and landscaping. This is not an inclusive list. Reductions in GHG emissions and building resilience will be most impacted by the availability of training, modernized to include new technologies that address energy efficiency, soil health improvements, and more.

In addition to training the local workforce, a new Climate Corps to implement climate-related training and infrastructure projects can bring new skills training that increase employment and career opportunities for young adults, especially those not interested in higher education.

There is an increasing interest in energy efficient new and rehab construction with accompanying new skills required. Local builders in these construction sectors have identified the lack of skilled tradespeople (plumbers, electricians, heating and air conditioning technicians, carpenters, etc.) as the greatest barrier to selecting and installing clean energy technologies. They report finding tradespeople who are skilled, but not aware of, or without the skills needed to select and install clean energy technologies; that inexperience leads to requests for higher fees for new technology installation, perpetuating

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the erroneous notion that energy efficient technologies cost the builder and eventual buyer substantially more. With proper training and skill development, up-front costs could be only slightly higher for these clean energy options, making them much more attractive to consumers who can expect to recover those costs through lower energy bills.

To further the development of skills in the current workforce, expansion of educational programming like Skill Up Frederick, a program offered by the County's Office of Economic Development Workforce Training Program, could speed the delivery of the skilled tradespeople needed in the expanding energy efficient construction industry. A proposed Green Bank Grant and Loan program (Recommendation 1) could be tapped to fund innovative pilot projects, internship opportunities, retrofits for low income community members, and to optimize a well-trained, technologically adept workforce. A training approach is also needed to advance agriculture and land management transformations. The case for these needs is made in Recommendation 19 and Recommendation 20. To recap, "precision" agriculture is viewed as the "future of agriculture" and includes expanded uses of drones, collection and interpretation of data, robotics and many other technologies to increase productivity while measuring, protecting and building soil and ecosystem health. Regenerative (or conservation) land management is benefited by using existing and emerging technologies which guide decision making by land managers. Implementation of these and other green infrastructure projects could be accelerated through development and support of Climate Corps or Ameri-Corps-like programs within the City and County. Climate Corps members, screened for aptitude and preference, could be placed in projects listed throughout these recommendations, such as skilled trades internships, conservation landscaping crews, and projects in parks, regenerative agriculture, and ecosystem restoration.

Transitioning our local economy to a clean energy economy has multiple benefits for residents, businesses, and City and County revenues. First, routinely building highly energy efficient, clean energy housing in the area not only provides new skills, jobs, and potential career paths for current and future tradespeople, it also reduces costs for heating and cooling for all portions of our community. A Clean Economy with the components noted expands job opportunities to individuals with few professional skills, providing them with skills training, income, and financial security.

Suggested funding includes the American Rescue Plan, Maryland SB 636 Neighborhood Revitalization — Passive House Pilot Program enacted May 30, 2021, and Maryland SB 764 Workgroup on Adaptive Reuse of Vacant Commercial Spaces enacted May 30, 2021. Local funding sources for non–IT training or apprenticeships are available as well.

Recommended actions:

- **Through executive action**, request that the City and County Offices of Economic Development establish new training modules and apprenticeships for the application, installation, and maintenance of new technologies important for high energy efficiency standards.
- **Implement a Frederick City and County Civilian Climate Corps** to undertake implementation of multiple climate-specific recommendations to reduce local GHG emissions or increase resiliency in the infrastructure of the area.


AMERICAN
EAGLE
Compost Starts Here
Compost Starts Here

EDUCATION

An informed citizenry is a powerful force for climate mitigation and adaptation. More than 80% of all public school parents want climate change added to school curricula, and governments are witnessing accelerated reductions in GHG emissions that can be attributable to behavioral change as a result of education. The natural world is all around us and for the educated eye, climate impacts are clear and increasingly alarming for adults and children alike. Climate education can provide the motivation, empowerment and direction for change.

> "Children must be taught how to think, not what to think."
>
> Margaret Mead

As schools have embraced sustainability practices, students' views of their futures improves, a testament to the idea that "knowledge is power." Frederick County has witnessed this impact through the Lunch Out of Landfills program and students have beamed with pride, rightly so, reporting the amount of food waste they kept from entering the landfill. Realizing THEY were the ones who kept methane from escaping into the atmosphere and understanding the environmental damage prevented as a result was the ultimate teaching moment about the importance of being responsible stewards.

Maryland schools with student Green Teams save on utility and water bills, decrease waste and restore ecosystems. An additional argument for Green Schools is the immediate difference to student health. Transformation of buildings through green retrofits at one Wisconsin school resulted in: $85,000 in annual energy savings; 75% decrease in allergies and asthma; 15% reduction in absenteeism; 425% lower incidence of communicable diseases; and increasing test scores, teacher retention, and enrollment.

Expanding climate education to K–12 school students and to the general population is a key part of a climate action plan. This sector includes a K–12 component (explained in Recommendation 37) and a public education component, which is explained more fully as part of Recommendation 1.

LISA ORR

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EDUCATION RECOMMENDATION

Build climate-resilient school communities

Based on data collected from Maryland public schools, expanded environmental education has been shown to reduce emissions, improve habitat conservation and restoration, and support environmentally responsible consumerism and a more equitable society regarding climate justice issues. To have all Frederick County Public Schools (FCPS) schools certified by 2035 to achieve these potential benefits, FCPS should begin formulating curriculum and creating Green Teams in Fall of 2022.

There are 46 new Green Schools, 86 recertified Green Schools, and 18 Sustainable Schools in Maryland public schools, but just seven Green High Schools in Frederick County. In Green School classrooms, students complete projects pertaining to water conservation, energy conservation, solid waste reduction, habitat restoration, structures for learning, transportation, and healthy schools. Through project-based learning, Maryland Green Schools saved their schools money and engaged students and staff in responsible behaviors that reduce climate change impacts by: conserving water and energy; composting food waste; and recycling. Green Schools and accompanying curricula also are important to enticing resident participation in climate-specific actions.

The Climate Response and Resilience Office (Recommendation 1) and FCPS could collaborate to develop simple climate-specific webpages for students and adults, providing easily understood aspects of the climate and what might be done to reduce emissions and build community infrastructure to minimize impacts.

Incorporating environmental literacy and action into the public school system empowers students with conceptual tools to imagine a more positive future, significantly improving future expectations and supporting the mental health and emotional needs of students. It can also promote inclusivity and empathy by addressing social justice issues created by disparate impacts of the changing climate on low income and minority communities, and foster partnerships with local higher education. Climate education increases overall academic and life skill achievement, including feelings of civic responsibility and empowerment and ability to take action. When education has been combined with targeted behavior change efforts (e.g., drivers education and auto safety, and education about tobacco use and lung cancer), investments in education prove beneficial for residents' and communities' health and quality of life.

The Livable Frederick Master Plan and CommUnity 2030 both include several references to the need to increase environmental education. Several state, federal, foundation, and government grant programs are available for funding Green Schools and curriculum development efforts from sources listed below.

We recommend that Frederick County Public Schools integrate the Maryland Environmental Literacy Standards into the K–12 Frederick County curriculum in all subjects and grade levels, and require all FCPS schools to become certified MD Green Schools by 2035.

Lunch Out of Landfills: A program that teaches kids how to divert organics (and recyclables) from the landfill

In 2018, Beth McCook, an environmental science teacher at Urbana High School in Frederick, wanted to teach her students about the benefits of diverting organic waste away from landfills and composting. She asked Joe Richardson, Sr., a local business owner, Rotarian and composting proponent, for help implementing a food waste diversion program at her school. With volunteers from the Frederick Compost Work Group, the Southern Frederick Rotary Club, and teachers and parents at the high school, Joe launched an effort that eventually resulted in students taking action in 13 Frederick County schools, sorting food waste, liquids, and recyclables; weighing them to measure impact; and separating food waste to be picked up and composted off site.

LISA ORR

Joe Richardson teaches elementary school students about diverting waste from landfills.

Lunch Out of Landfills (LOOL) was born. For LOOL, Joe organizes pilot programs in Frederick County Public Schools that begin with a "waste sort," during which students don gloves and pick through their lunchtime trash, sorting out food for composting; perfectly good unopened food that could be shared or brought back home; recyclables; liquids; and trash. All of these components are weighed, so everyone can understand what comprises the lunchtime "trash" on a typical school day.

During the first two days of the program at Urbana Sugarloaf Elementary School, 87% of the "trash" that would have gone to the landfill was diverted! Liquids made up 24% of the weight — these were poured down the drain. Recyclables comprised 10% of the weight. A whopping 53% was food waste that was picked up and composted, leaving just 13% of total weight of the collected materials to be taken to the landfill.

The program was suspended during 2020 due to COVID–19 school closures, but will resume during the 2021–2022 school year.


OCEAN CITY

COMMUNITY

What role can the community play in responding to the climate emergency?

If just the last few years are considered, it is clear climate change is not just someone else's problem, it is also ours, made obvious by changes that are increasingly evident in our daily lives. We are experiencing extreme heat, increasingly intense weather events and major flooding, as well as the health impacts of each. These risks will increase over the next several years and create challenges for area residents, businesses and institutions. For example, roofers are not allowed to work when temperatures are over 90°F. Other members of the local workforce, such as construction workers, farmers, summer camp staff and landscapers will experience increased likelihood of heat stress, dehydration, dizziness, and lost work days. Extreme heat is the number one weather-related cause of death in humans, and threatens agricultural production, reducing plant growth and productivity and increasing disease in farm animals. The changing climate is hurting the bottom line: from late June to early September, business cooling is now nearly nonstop, and total flood damage from just one 2018 storm was estimated at nearly $24M.

> "Now that we've learned to fly in the air like birds and dive in the sea like fish, only one thing remains — to learn to live on earth like humans."
>
> George Bernard Shaw

Residents of this area are fortunate that local governments have been responsible. Both the City and County, and many of the County's municipalities, have established positions as leaders in the state on climate responsiveness by reducing GHG emissions in government operations. This is fortunate but at the same time important to recognize that more MUST be done and faster. Households and businesses account for the largest portion of GHG emissions. However, the government has the platform to set the tone, develop the pathways, and provide the incentives for the entire community to transition with haste to the clean energy economy that will keep everyone safe, healthy, and thriving into the future. More must be done, faster, together. As author Andres Karelas has stated, "Climate change is a collective problem, caused by collective behavior."

COURTESY ISLAMIC SOCIETY OF FREDERICK

Households in the United States emit an average of 21.5 metric tons of carbon per year — almost 5 times the global average. A sustainable level of emissions is more like 3 metric tons per person. Contrary to a common belief that cutting back on GHG emissions is somehow a sacrifice, most people report substantial benefits. Along with the good feelings that come from making a contribution to the greater good, decreasing one's "carbon footprint" is almost always a catalyst for financial savings, improved health, additional convenience, and a greater quality of life. For example, switching from natural gas to electric heat improves home air quality and lessens the possibility of respiratory distress, an important change since more than 25% of childhood asthma can be linked directly to natural gas use in homes. Switching to an electric vehicle saves substantial fuel and maintenance costs. Imagine what it's like to never have to go to the gas station! Converting turfgrass lawns to native shrubs and perennials reduces yard maintenance time and costs. Once people get in the habit of "going green," the benefits and cost savings substantially increase.

As awareness of climate change and its impacts on everyday life are experienced with increasing intensity each year, the natural and common question is "What can I do?"
Climate change is a monumental problem with devastating impacts and given this reality, individual acts seem so small. But, individual acts to improve energy efficiency add up quickly, resulting in big differences in GHG emissions.

This is why it's critical that everyone comes together as a community to do more. Homeowners Associations (HOAs), churches, and community groups can determine how to facilitate these changes through hosting educational events, developing group purchasing agreements, and changing group operations and practices. Community groups are often most effective when they "adopt" an initiative, as the Rotary Club has done by supporting the Lunch Out of Landfills initiative. Other groups can follow their lead or create their own path.

The bottom line is that government cannot hit these important GHG emission targets alone — but it can "lead by example," paving the way for the entire community to transform to a healthier, more abundant future for our children.

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COMMUNITY RECOMMENDATION

Climate actions for Frederick area residents, households and homeowners associations

If every household reduced its "carbon footprint" (GHGs emitted per year) to a sustainable level (GHGs emitted being equal to or less than carbon sink capacity), estimated to be 3 metric tons per person, about 40% of the emissions reductions necessary to achieve net zero emissions will be achieved, leaving the rest up to business, industry, and government. This all adds up to individual action as a powerful force in motivating societal shifts — in fact, it is essential.

There are multiple individual household changes that climate experts recommend. HomeOwners Associations can be effective facilitators of change by arranging group purchasing agreements for solar installation and composting services — or adopting conservation landscaping practices and installing LED lighting, for example. Individuals and households can get started by learning what their carbon footprint is by using tools such as the calculator from the CoolClimate Network. Once that baseline is understood, then decide on actions that fit lifestyle and budget. Many of these options are surprisingly affordable because of tax credits, product rebates, or other incentives, which are expected to increase over the next several years. **Here are some of the possible areas of action to focus on:**

Talk about it!

According to climate scientist Dr. Katharine Hayhoe, the most important thing to do is to talk about why the climate crisis matters. Encourage civic clubs, church groups, neighborhood associations, and other groups to have these conversations. She explains: "When I speak to people, it's not a case of needing new values ... It is a very rare human being who does not already have a key value or part of their identity that connects directly to concern over changing climate." Dr. Hayhoe's GlobalWeirdingSeries.com is a great resource for learning more and assisting conversations across individual networks.

Save energy and shift to clean power.

Conserving energy use at home provides examples of small actions leading to big societal changes as well as the added benefit of cost savings for homeowners. For instance, LED lighting uses 80% less energy than regular lighting and lasts much longer. In less than a decade, LED bulbs have become the main source of lighting in U.S. households and during that 10 year period, emissions from households overall decreased in the U.S. for the first time in more than a century. That's a powerful example of individual actions adding up.

Frederick County's Green Homes Challenge leads visitors through a variety of actions a household can take and provides local resources for incentives and guidance. It's possible to support wind energy through household energy bills by calling the electric company, or choosing a supplier that offers 100% green-e certified wind credits, such as Groundswell. Another clean energy option is to subscribe to a community solar project. Two companies with projects in the Potomac Edison territory are Common Energy and Neighborhood Sun. Groups of homeowners across Frederick, Hagerstown, and Morgantown, WV have come together to form a solar purchasing group to reduce costs through Solar United Neighbors (SUN), an option that is likely to expand in the future.

Change food habits.

Changing household food practices may be the most economically effective way to make substantial contributions to GHG emission reductions. First, make sure to use all food that's been purchased. As much as 40% of the food bought in the United States ends up in landfills, which then emits methane, a GHG 28 times more potent than carbon dioxide. Eating a plant-rich diet makes a big difference in GHG reduction and in water conservation. Limiting meat consumption to a few servings a week and buying meat from local farmers who graze their livestock are sustainable strategies. Area producers are listed in the Amazing Grazing Network Directory. Composting food scraps and waste in backyard compost bins or piles keeps waste out of landfills. Or, arrange for home, church, and business pick-up from Key City Compost.

Limit fossil-fueled driving and reduce or eliminate airline travel.

Think twice about how to travel from one place to the other. In some cases, biking or walking might be a better, even faster, option than a car. When local car travel is necessary, doing so during non-peak hours, or using navigational software and traffic alerts to avoid back-ups, can reduce emissions by as much as 50%. Adopting a personal "no-idle" policy has multiple benefits of improving air quality, eliminating wasteful emissions and saving vehicle engines from needless wear and tear. Consider an electric vehicle (EV) for the next car purchased. Used, good quality EVs are now on the market. EVs are more affordable than ever and are also fun to drive! Tax credits are available at the state and federal level. EVs offer a better driving experience than combustion engine counterparts and fuel savings combined with little to no maintenance expense makes transitioning to electric cars a great financial decision as well as a responsible choice.

Since air travel contributes to climate change in multiple ways, consider train travel — which reduces GHG impact by about seven-fold. When that's just not possible, choosing non-stop flights reduces emissions. Purchasing carbon offsets for miles traveled is also a good idea. There are several options — Terrapass and Native Energy are just a few of the sources recommended.

Manage your land to draw down carbon.

Healthy soil and trees draw carbon from the atmosphere and substantially reduce stormwater run-off, whereas turf grass, the lawns of most homes, provides very little benefit. Therefore, many homeowners are limiting the size of lawns or eliminating mowed grass completely! Even the smallest landscapes can invite nature back in by avoiding chemical fertilizers, fungicides, pesticides or herbicides, which destroy soil health, weaken plants, and harm people, pets, and ecosystems. Planting native trees and deep-rooted perennials, especially those that attract pollinators, contributes to the beauty of the landscape while facilitating crop production and building the natural systems necessary to make chemicals obsolete. Native shrubs and trees can be purchased from the Maryland State Nursery for $1.00 each.

Put your money where your heart is.

If you have investments, steer clear of fossil fuel and chemical companies. Purchasing from local producers, resale shops, retailers, and businesses for most household needs is a win-win for strengthening the local economy while cutting GHGs.

The acts of individuals to reduce GHGs and increase carbon sequestration are not unimportant. Rather, they add up and have the potential to become a social movement, a tipping point, when actions of a few can change the world.

VIRGINIA BORDA

Work with others.

Beyond one's household, many residents are hoping to support and/or join efforts to make a bigger impact on climate change, locally, statewide, and nationally. Some local groups actively working on climate change solutions are:

Mobilize Frederick — https://www.mobilizefrederick.org/

Multifaith Alliance of Climate Stewards (MACS) — https://www.macsfrederick.org/

Envision Frederick County — https://envisionfrederickcounty.org/

Streamlink Education — https://www.streamlinkeducation.org/

Community Fare — https://www.communityfare.org/

Fox Haven Farm — https://foxhavenfarm.org/

Mountainside Education and Enrichment — http://www.meegreen.org/

Climate Change Working Group — https://envisionfrederickcounty.org/climate-change-working-group/

Sierra Club Catoctin Group — https://www.sierraclub.org/maryland/catoctin-group

Smarter Growth Alliance for Frederick County — https://smartergrowthfrederick.com/

Suggested Sources

Common Energy: https://www.commonenergy.us/

Green Homes Challenge: https://frederickgreenchallenge.org/

Groundswell: https://groundswell.org/about/

Maryland State Nursery: https://nursery.dnr.maryland.gov/default.asp

Native Energy: https://native.eco/product/carbon-offsets/

Neighborhood Sun: https://neighborhoodsun.solar/

Solar United Neighbors: https://www.solarunitedneighbors.org/

Terrapass: https://terrapass.com/buy-carbon-offsets-2021

The ERUCC Green Team journey

I joined the MACS (Multifaith Alliance of Climate Stewards of Frederick County) Steering Committee and was inspired to start a Green Team at my church, the Evangelical Reformed United Church of Christ (ERUCC).

Since then, the ERUCC Green Team has become an "all church" effort, earning designation as a Creation Justice UCC church, committed to examining the impact of our collective actions on the environment and our fellow humans. Some of our early Green Team efforts centered on changing individual habits by encouraging our congregants to stop using single use water bottles and grocery bags. We transformed the way we did fellowship and food by switching to using real dishes and utensils, contracting with Key City Compost to collect all of our food waste, and drastically reduced the amount of trash going to the landfill. We then expanded our community and partnered with MACS to plant trees and to host a Climate Change conference. We increased our knowledge, contacts and friendships.

COURTESY LINDA COYLE

Linda Coyle speaks to a group on a Spiritual Hike at the Ford Loop Trail of the Monocacy Battlefield

Through MACS, we learned that individual actions, while important, are not enough to effect change as quickly as the earth needs so we collaborated on advocacy work to pass two Forest Ordinance bills and the Climate Emergency Resolution in Frederick County. Then this year, with guidance from Interfaith Power and Light, we enrolled several congregants in a solar co-op, and wrote letters of support for climate-related legislation at the state level.

The COVID–19 pandemic opened up our eyes to the importance of viewing the natural world with awe and humility. We in faith-based organizations are summoning our courage to speak up for the earth and seeking wisdom to lead with grace and humility, leaning on the bonds of community and our faith to stay strong and not despair or give up.

—Linda Coyle, ERUCC Green Team Leader, MACS Co-Facilitator, Libertytown

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COMMUNITY RECOMMENDATION

Climate actions for Frederick area businesses and institutions

A recent Deloitte Insights article encouraged businesses to change the way they approach business planning as it relates to climate change by viewing actions through a lens of long-term, sustainable profitability and value creation. From a cost perspective, sustainable solutions, which often combine mitigation and adaptation, are increasingly the least expensive option when both upfront and monthly operating costs are considered. Following initial investments, substantial cost savings are often experienced over the lifespan.

Beyond considering mitigation and adaptation impacts on the bottom line, an emerging trend is for businesses to recognize the value in climate stewardship at the community as well as global levels. **Responsibly addressing climate change will lead to a better future** — a resilient future with healthier children and adults, fewer lost school and work days caused by asthma and other climate-related diseases, and fewer extreme weather events than by continuing the status quo. A resilient and sustainable future seeks to address the staggering costs and equity issues for poor and minority communities and integrate sustainable solutions that lift up all communities, ensuring that future generations will have access to healthy food, clean water, and clean air. Without action, underserved communities are too often sacrificed: left with little fiscal flexibility, and often choosing between paying for rising utility bills, putting food on the table, or skipping needed medication.

Green roofs at Arlington's Walter Reed Community Center

ARLINGTON COUNTY, VIRGINIA

What can businesses and institutions do? Even small actions can make a difference, so no business is too small to take steps to change the trajectory of the shared future for the better. And small steps add up to big results — just consider the lowly lightbulb. In 2017 alone, "the use of LEDs to illuminate buildings and outdoor spaces reduced the total carbon dioxide emissions of lighting by an estimated 570 million tons" according to LightED Magazine. LEDs compared to incandescent bulbs use about 80% less energy.

The Metropolitan Washington Council of Governments (MWCOG) estimates that 51% of the total greenhouse gas (GHG) emissions for Frederick County are from buildings and 42% from transportation. Reducing emissions from these two sectors is a priority. **Businesses can tackle this from two angles — by conserving energy and by purchasing from clean energy sources.**

Buildings

Businesses have taken steps to conserve energy by using LED lighting, decreasing lighting at night, using smart thermostats, adding insulation to buildings, replacing or enhancing old windows, adopting cool roof technologies, and other "tighten the envelope" strategies. **Three online resources are useful for considering options:**

- Seek help from the **Institute for Market Transformation**. This Washington, D.C.-based non-profit helps businesses assess their energy uses and identifies ways to become more efficient.

- Participate in the **Maryland Green Registry**. This registry is free and provides tools and tips to increase energy efficiency and promotes a values-driven focus to customers. Participating businesses have reported $76 million in savings from adopting conservation and sustainability practices.

- A good way to understand opportunities for savings is by assessing a business's carbon footprint. This business carbon footprint calculator is designed for small business: **https://coolcalifornia.arb.ca.gov/small-business**.

Businesses (as well as individuals) can choose to purchase their energy from renewable sources. The City of Frederick just recently announced their decision to make this switch and many churches in the area also have used this option by calling 800-932-1569, or going to **mycleanchoiceenergy.com/sun**.

A few businesses in Frederick County have used the **Commercial Property Assessed Clean Energy Loan** (C-PACE) program, which provides commercial loans for businesses and nonprofits that want to invest in energy efficiency, renewables, and water conservation projects. As Joe Richardson, Commercial Property Owner of Bar-T Mountainside explains, "I see such benefit for other businesses to invest in green technology, green infrastructure, and *PACE really makes it possible*." Businesses are also making use of innovative financing options, such as Energy Service Agreements (ESAs), which can save utility costs from the beginning as long as the terms of the contract are well designed.

Transportation

There is no doubt that changing the way of getting from one place to another, or whether travelling at all, will greatly impact the future climate. During the COVID-19 crisis, Frederick City's Office of Economic Development reports that 54% of all Frederick County households had at least one adult resident who telecommuted, improving air quality and reducing GHG emissions substantially. The strategies from this difficult year provide opportunities for the future. Experts are encouraging continued telecommuting and hosting meetings virtually whenever possible. When business needs mandate local travel, doing so during non-peak hours, or using navigational software and traffic alerts to avoid back-ups can reduce emissions by as much as 50%.

And adopting a "no-idle" policy company-wide has multiple benefits of improving air quality, eliminating wasteful emissions, and saving vehicle engines from needless wear and tear.

Greening fleets is also a great strategy. Electric vehicles (EVs) are more affordable than ever and tax credits are still available at the state and federal level. EVs offer a better driving experience than combustion engine counterparts and fuel savings combined with little to no maintenance expense makes transitioning to an all-electric fleet a great business decision as well as a responsible choice.

Air travel contributes to climate change in multiple ways, including GHG emissions. When business needs call for air travel, think twice and consider train travel, which reduces GHG impact by about seven-fold. Or think about virtual meeting options. When that's just not possible, choose non-stop flights and consider purchasing a carbon offset. There are several options - Terrapass and Native Energy are just a few of the sources recommended.

Other areas for consideration

Other GHG contributors are food waste and landscaping practices. According to **Project Drawdown**, about 40% of all food produced in the U.S. is wasted, contributing about 11% of U.S. greenhouse gas emissions. By focusing on reducing food waste and increasing composting on the consumer side, Frederick City and County can maximize reductions in GHGs from landfills and food production. One example where we are already seeing how this is possible is in a program called Lunch Out of Landfill (LOOL). LOOL has been launched in 13 Frederick County Schools and reducedfood waste by 70–80% during the 2019–20 school year, in the months before the COVID-19 pandemic lockdown (**https://www.facebook.com/lunchoutoflandfills**).

A growing number of local businesses are offering more plant-based food options. Not only are plant-based foods (veggies, fruits, grains, legumes, and nuts) healthy for humans, they are easier on the planet's resources than typically raised animal products by taking less land and water to grow *and* emitting far fewer GHGs to produce. Encouraging plant-rich diets by offering vegan and vegetarian entrees on restaurant menus and at events helps encourage residents and visitors to make better choices. And, for meat-based menu options, sourcing from local producers that use sustainable grazing practices eliminates transportation impacts and significantly reduces the carbon footprint of these products.

Altering local landscaping can also help. Businesses that own land can consider limiting or eliminating turf grass and non-native plants, improving soil's natural ability to draw carbon out of the atmosphere by as much as 75% and improving the landscape's ability to soak up stormwater. Businesses that make the transition from lawn to natural landscapes report as much as a 25% reduction in landscaping costs. The **Chesapeake Conservation Landscaping Council** offers resources for landowners.

The best news about climate change is that the tools, technology, and knowledge to slow down and reverse the warming trajectory currently experienced are here and readily available. Multiple examples of tested and successful models are all around us. Collective action CAN reverse climate change, and making all business decisions by evaluating their impacts on climate change is a necessary part of the solution.

Suggested Sources

Deloitte Insights. **https://www2.deloitte.com/us/en/insights/topics/strategy/economic-impact-climate-change.html**

Native Energy. **https://native.eco/product/carbon-offsets/**

Terrapass. **https://terrapass.com/buy-carbon-offsets-2021**

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COMMUNITY RECOMMENDATION

Charter a community-wide implementation team to support adoption of the recommended climate actions

The City and County governments will be tasked with implementing most of the recommendations described in this report. They will need support and cooperation from the community to act and be successful.

A volunteer, community-based Climate Mobilization Implementation Team, known as Mobilize Frederick, should be developed for the following functions:

- **Maintain a record** of the 37 climate actions recommended to City and County governments, as well as the Community Sector recommendations, **and track actions** and stated intentions for each, including budget allocations for action.
- **Meet quarterly to track and report** on progress related to each recommendation.
- **Communicate with stakeholders** when issues arise and help educate and problem solve to remove any questions or barriers to implementation.
- **Encourage stakeholder groups to "adopt" recommendations** in order to leverage existing expertise in the community to drive adoption and implementation.
- **Continually assist with outreach, communication, and expert advice** to members of the community and to both governments to promote adoption of recommendations.

To make their task easier, all records and reports from the CEMWG's year-long effort will be made available to them, and they will benefit from the CEMWG's website, FaceBook page, Instagram, and Twitter accounts, and their established presence and audience. As a community, we are in this together. Mobilize Frederick will consistently promote that message while helping to lead Frederick toward a climate resilient future.

RANI RUSNOCK

DAVID WALENSKI


Pollinator Habitat
This area has been planted with pollinator-friendly flowers and is protected from pesticides to provide valuable habitat for bees and other pollinators.
To learn how you can help to bring back the pollinators, please visit www.xerces.org.
Bring Back the Pollinators

APPENDICES A–E

APPENDIX A | ACRONYMS AND GLOSSARY

ACRONYM	DEFINITION
AARP	American Association of Retired Persons
AASHE	Association for the Advancement of Sustainability in Higher Education
ACEEE	American Council for an Energy-Efficient Economy
ACEP	Agricultural Conservation Easement Program
AEDG	Advanced Energy Design Guide
ALICE	Asset Limited, Income Constrained, Employed
APHIS	Animal and Plant Health Inspection Service (USDA)
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
BEPS	Building Energy Performance Standards
BMP	Best Management Practice
BPS	Building Performance Standards
BRT	Bus Rapid Transit
BTU	British Thermal Unit
CAPEX	Capital Expense
CARB	California Air Resources Board
CBF	Chesapeake Bay Foundation
CBP	Chesapeake Bay Program
CCE	Community Choice Energy
CDC	Centers for Disease Control and Prevention
CEMWG	Climate Emergency Mobilization Work Group
CHP	Combined Heat and Power
CNCA	Carbon Neutral Cities Alliance
CO2, CO2	Carbon Dioxide
CREP	Conservation Reserve Enhancement Program
CREST	Center for Research, Education, Science, and Technology
CRRO	Climate Response and Resilience Office
DNR	Department of Natural Resources (MD)
DOE	Department of Energy (US)
DOI	Department of the Interior (US)
EERE	Office of Energy Efficiency and Renewable Energy (Department of Energy)
EPA	Environmental Protection Agency (US)
EQIP	Environmental Quality Incentives Program
EUSP	Electric Universal Service Program
EV	Electric Vehicle
FACA	Food and Agriculture Climate Alliance
FCAR	Frederick County Association of Realtors
FCBIA	Frederick County Building Industry Association

FCPS	Frederick County Public Schools
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FFA	Future Farmers of America
FFSN	Frederick Food Security Network
GGRA	Greenhouse Gas Emissions Reduction Act 2030 (MD)
GHC	Green Homes Challenge (Frederick County)
GHG	Greenhouse Gas
GIS	Geographic Information System
GREET	Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation
HDV	Heavy Duty Vehicle
HES	Home Energy Score
HVAC	Heating, Ventilation, and Cooling
ICE	Internal Combustion Engine
IEA	International Energy Agency
IMT	Institute for Market Transformation
IPM	Integrated Pest Management
JAMA	Journal of the American Medical Association
LDV	Light Duty Vehicle
LEED	Leadership in Energy and Environmental Design
LFMP	Livable Frederick Management Plan
LIHEAP	Low Income Home Energy Assistance Program
LOOL	Lunches out of Landfill
LTTA	Low Traffic Turf Areas
MAEOE	Maryland Association for Environmental and Outdoor Education
MAFRAC	Mid-Atlantic Food Resilience and Access Coalition
MALPF	Maryland Agricultural Land Preservation Foundation
MARC	Maryland Area Regional Commuter
MCCC	Maryland Commission on Climate Change
MDE	Maryland Department of the Environment
MDOT	Maryland Department of Transportation
MDV	Medium Duty Vehicle
MEA	Maryland Energy Administration
MEAP	Maryland Energy Assistance Program
MPG	Miles per Gallon
MPGe	Miles per Gallon Equivalent
MS4	Municipal Separate Storm Sewer System
MTCO2e	Megatons of CO2 equivalent
MWCOG	Metropolitan Washington Council of Governments
NAAQS	National Ambient Air Quality Standards
NAHB	National Association of Home Builders
NASA	National Aeronautics and Space Administration
NASEO	National Association of State Energy Officials
NASPO	National Association of State Procurement Officers

NBI	New Buildings Institute
NCSL	National Conference of State Legislatures
n.d.	Indicates no date provided for the publication or web material
NFIP	National Flood Insurance Program
NGO	Non Governmental Organization
NIFA	National Institute of Food and Agriculture (USDA)
NIH	National Institute of Health (US)
NISIC	National Invasive Species Information Center (USDA)
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
NRDC	Natural Resources Defense Council
NREL	National Renewable Energy Laboratory
NSSP	National Syndromic Surveillance Program
NYC	New York City
OED	Office of Economic Development (Frederick County & City)
OPEX	Operating Expense
OSER	Office of Sustainability and Environmental Resources (Frederick County)
PHEV	Plug-In Hybrid Electric Vehicle
PJM	PJM Interconnection, a Regional Transmission Organization
PLOS	Public Library of Science
PPA	Power Purchase Agreement
PSC	Public Service Commission
PURPA	Public Utilities Regulatory Policies Act
PV	Photovoltaic
RCPP	Regional Conservation Partnership Program
REC	Renewable Energy Credit
RFSP	Regional Food Systems Partnership (USDA)
RMI	Rocky Mountain Institute
RPS	Renewable Portfolio Standard
SARE	Sustainable Agriculture Research and Education
SEIA	Solar Energy Industries Association
SEPA	Smart Electric Power Alliance
SETO	Solar Energy Technologies Office (DOE)
SOM	Soil Organic Matter
SW	Stormwater
SWM	Solid Waste Management
TMDL	Total Maximum Daily Load
UCS	Union of Concerned Scientists
USDA	United States Department of Agriculture
USGS	United States Geological Survey
USPP	Utility Service Protection Program
V2G	Vehicle to Grid
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compound
WW	Wastewater

APPENDIX B | CEMWG MEDIA

The Public Outreach and Awareness Subgroup of CEMWG developed a media presence through the following strategies:

WEBSITE — mobilizefrederick.org — about 60 views per month.

FACEBOOK — followers are 18-65, reaching about 2,570 people living within 15 miles of Frederick.

FREDERICK NEWS POST — published 17 articles and letters to the editor, posted on mobilizefrederick.org.

EMAIL — CEMWG has an 85% open rate on emails sent to the distribution list.

RADIO/LOCAL TELEVISION — CEMWG was featured twice on WFMD and once on Local DVM.

APPENDIX C | SURVEY SUMMARY

CEWMG subgroups used a variety of strategies to understand the experiences of Frederick City and County residents and businesses as we developed recommendations. Surveys were one way to discover answers related to specific areas of interest. Surveys were sent to the following groups and a summary of questions and findings follows.

Frontline communities

CEMWG members identified organizations and leaders that primarily serve frontline communities in Frederick City and County that are likely to experience the effects of climate change "first and worst." They then drafted a survey tailored to those community leaders to get their perspective of the specific social and economic issues at top of mind for the community members they serve, including how the likely effects of climate change are affecting and will continue to affect the community members they serve. Community sectors served by the organizations identified include those requiring assistance in housing, human services or mental health, veterans, immigrants, people of color, and individuals with disabilities or special needs , including seniors.

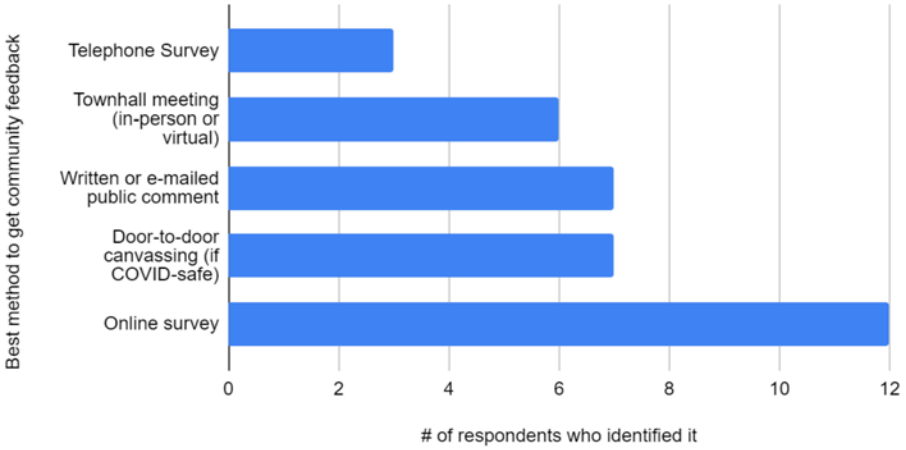
Surveys were sent to 81 individuals from 39 organizations. A group of volunteers called survey recipients multiple times over a number of days to help encourage a response. We received 19 responses from 15 organizations.

Lessons learned

Getting substantive feedback is not easy and takes significant effort. It seems likely that previous efforts have been limited to scheduling public forums and publicizing or emailing invites to participate. It takes multiple attempts to make contact and receive a response. The stronger the relationship with members of the public the more numerous and substantive the input will be. For purposes of ongoing public engagement, outreach is likely to be more effective when done through organizations and community leaders who are integrated into decision-making and oversight of the climate efforts in a formal or ongoing manner.

Suggested followup methods:

BEST METHOD TO GET COMMUNITY FEEDBACK VS. NUMBER OF RESPONDENTS WHO IDENTIFIED IT



Other suggestions:

- Education regarding changing climate issues.
- Contact in person and follow up over the phone.
- Open discussion at a meeting/event hosted by the organization.

Education:

The Education survey was sent to teachers and students throughout Frederick County, through Facebook, primarily, as distribution lists were not available. Twenty seven responses were submitted. The question which generated the most robust answers was: ***Do you wish things were different (related to the climate education you received or provided)?*** Answers were:

- Yes — only in a few select classes was environmental curriculum present.
- I wish there were more clubs or classes.
- Yes! Environmentally-based classes are not a requirement, they're just an elective.
- Nope, they're great
- I think the amount of environmental education people got was very dependent on the teachers and not the curriculum.
- Yes, I wish at least basic environmental care was required to be taught at the middle and high school.
- I wish things were different. It's important to learn about our climate and environment in order to preserve our earth longer and keep it healthier.
- I think it should be more integrated into the curriculum rather than offered as an elective.
- There was an ecology club at Urbana Middle but few opportunities at Urbana High.
- We need to know more about the climate and how we are impacting it.
- Yes! Climate change is mentioned in AP environmental science but it is never mentioned in the beginning level science classes.
- Yes, there should definitely be more of a focus in this area considering the urgency with which our society should be working.
- Yes, I think more opportunities should be present. I took one class with a climate based curriculum and other than that, none of my classes focused on this topic.

Developers/ builders:

The Frederick County Business Industry Association (FCBIA) distributed a CEWMG survey, constructed for the purpose of discerning how climate change was impacting their operations and how they were responding to changes in the industry. Although some of the respondents mentioned excessive summer heat as a barrier to regular operations, this issue wasn't the greatest concern. However, the lack of tradesmen with updated skills was viewed as a major barrier for the industry for responding to a need to build more energy efficient homes and commercial buildings. The overwhelming response to this question was no: "Are there sufficient numbers of skilled tradesmen to easily install and maintain new technologies?" In many follow-up conversations with FCBIA members, training skilled tradesmen on new energy efficient technologies was the most urgent need.

Restaurants:

The Frederick City Office of Economic Development distributed surveys to restaurants on CEMWG's behalf to ascertain current practices in food waste handling and interest in learning more. Seven responded and the low

response was, in part, attributed to the demands of responding to the COVID-19 crisis. Of these seven, about half compost, three are interested in learning more about food diversion options, and two reported very little food waste. Although the results are very limited, the interest in food diversion is present.

Business (general): This survey was informative with a purpose of building a contact list. No findings to report.

Faith communities:

The faith community outreach was managed through the cooperation of two ministerial groups, the Thurmont Ministerium and Frederick Area Ministerial Association. Surveys were circulated to ministerial members (pastors of churches) and congregational members. Survey responses were only invited once — no reminders were sent. Eleven congregant responses were received. Of this group, five reported mold in their homes as a result of recent rains and flooding, and six reported a desire for solar panels if the cost was not a factor. Of the seven pastors responding, all seven were concerned with excessive summer heat and its impact on congregants and the low income communities their ministeriums supported; four reported a desire for solar on church rooftops if cost was not a factor; and all seven reported a need for answers to the question, “what can we as individuals and congregations do?”

APPENDIX D | STAKEHOLDER ENGAGEMENT SUMMARY

CEMWG developed an intentional outreach strategy with stakeholders as part of the research for each subgroup. Stakeholders were identified as groups or communities that would be directly impacted by a recommendation, and/or would be involved in implementing the recommendation. The CEMWG Co–Chairs and relevant subgroup chairs met with groups whose interests crossed over multiple sectors. Meetings were held to discover concerns about climate change, efforts already underway to mitigate and/or adapt to climate change, and perspectives on potential actions — both positive and negative. These conversations were influential in the formation of final recommendations and they are more informed and stronger as a result. Most stakeholders hope to be continuously engaged as climate actions advance in the City and County.

Meetings were held with these stakeholder groups and/or individuals:

Frederick Sustainability Manager — Jenny Willoughby

Frederick County Sustainability Manager — Shannon Moore

Frederick Sustainability Committee

Frederick County Sustainability Commission

Frederick County Farm Bureau — Sam Roop

Frederick County Farmers — John Sewel, Eric Spates, David Burrier, Robert Black

Frederick County Building Industry Association — Jason Wiley and Danielle Adams

Thurmont Ministerium — Rev. Bob Kells and 12 members

Frederick Area Ministerial Association — Rev. Carl Gregg and 10 members

Frederick City Office of Economic Development — Richard Griffin

Frederick County Office of Economic Development — Helen Propheter, Katie Stevens, Michelle Day, and Kayla Umbel

Downtown Frederick Partnership — Kara Norman

Frederick County Health Department — Barbara Brookmeyer, Barry Glotfelty, and Rissah Watkins

Frederick County Chamber of Commerce — Rick Weldon

Frederick Health Hospital — Michael McLane

Chesapeake Bay Foundation — Rob Schnable

Waterkeepers Chesapeake — Bernard Devlin

Potomac Conservancy — Emmalee Aman

Future Harvest CASE — Caroline Selle

Frederick and Catoctin Soil Conservation Districts — Denny Remsburg

Natural Resources Conservation District — Brent Cammauf

United States Geological Service — Nathaniel Hitt

United Way of Frederick — Ken Oldham

Patuxent Environmental and Aquatic Research Laboratory — Scott Knocke

Potomac Valley Fly Fishers — Andy Mekelburg

Frederick County Planners — Tim Goodfellow, John Dimitriou

Livable Frederick Planning and Design — Kimberly Brandt, John Dimitriou, Dana French

Department of Natural Resources — John Mullican, Gwenda Brewer, Dana Limpert, Lynn Davidson, Kerry Wixted, Mike Kay, Anne Hairston–Strang

The Nature Conservancy — Deborah Landau

Rewild Montgomery County — Galen Tromble and Luke Chesek

Sustainable Energy Systems — Ryan Nicholson

Catoctin Land Trust — David Lillard

Frederick County Association of Realtors — Hugh Gordon and Lisa May

Frederick County Public Schools — Paul Lebo, Bob Wilkinson, and Travis Tracey

Frederick County Municipality Mayors Focus Group — John Kinnaird, Nathan Brown, and Bob Rittlemeyer

Frederick County Green Teams Focus Group — Cindy Poole, Pam McDonald, Carey Murphy, Chris Weatherly, Mark Carney, Jake Romanell, Katie Cesposito

Frederick County Department of Public Works — Phil Harris

Frederick County Parks and Recreation — Jeremy Kortright

Frederick County Interagency Information Technologies — Mary McCullough and Austin Williams

WMDA Service Station and Automotive Repair Association — Kirk McCaulty

APPENDIX E | SUMMARY OF QUICK START AND INVESTIGATE RECOMMENDATIONS

Technical Sectors	Number of Recommendations per Sector	Quick Start Recommendations	Recommendations to Investigate Further
Buildings	3	2	1
Energy	6	4	2
Transportation	5	2	3
Agriculture & Land Management	5	3	2
Food System	3	3	0
Forestry	2	0	2
Total	**24**	**14**	**10**

Cross-cutting Sectors	Number of Recommendations per Sector	Quick Start Recommendations	Recommendations to Investigate Further
Leadership	2	2	0
Resilience	8	4	4
Clean Energy Economy	2	2	0
Education	1	1	0
Community Action	3	3	0
Total	**16**	**12**	**4**

FOR MORE INFORMATION OR TO DOWNLOAD MORE COPIES OF THIS REPORT:

Frederick County, Maryland County Council web page:

frederickcountymd.gov/8113/Climate-Change-Workgroup-Information

Mobilize Frederick website:

mobilizefrederick.org

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