MCCC

MARYLAND COMMISSION ON CLIMATE CHANGE

2024 ANNUAL REPORT

CONTENTS

MESSAGE FROM THE COMMISSION LEADERSHIP

On behalf of the members of the Maryland Commission on Climate Change ("the Commission"), we are honored to present our 2024 Annual Report to Governor Wes Moore and the Maryland General Assembly. Over the past year since the release of the Maryland Climate Pollution Reduction Plan, this Commission and its working groups have had collaborative and productive discussions focused on the innovative strategies needed to meet our goals. This report outlines dozens of actionable solutions — what we do next matters.

Marylanders care about safety, accessibility, sustainability, and affordability. The recommendations put forth in this report appeal to these concerns. Since the Commission was created, Maryland has experienced an accelerated clean energy transition benefitting both public health and the economy — creating local jobs, increasing access to transportation options, and building communities that are resilient.

The next phase of climate action will require bold leadership, accountability, and acceptance of new, pragmatic ideas. We must work shoulder-to-shoulder with legislators, the public, the private sector, and industry to prioritize practical climate action, ensuring that no Marylander is left behind. We must restore and protect a thriving environment, while continuing to expand workforce opportunities, deliver public health and environmental benefits, and lead with justice in the implementation of practical solutions. It is imperative we do this for Maryland's children, grandchildren, and future generations.

The cost of inaction is too great and is growing every day. We cannot slow down. We must quicken the pace of and broaden the reach of progress.

As an independent, nonpartisan body, the Commission will continue leveraging our collective expertise in 2025 and beyond. We thank the dedicated commissioners, working group members, and supporting staff for their efforts. We also thank engaged Marylanders for voicing their concerns and ideas with our members.

Serena McIlwain
Chair

Kim Coble
Co-Chair

INTRODUCTION

This is the Maryland Commission on Climate Change's ("the Commission") 2024 Annual Report. Final recommendations from the Commission provided by the working groups are detailed below for the General Assembly and Governor to consider.

For context, this report also highlights the Commission membership, the Climate Solutions Now Act of 2022, 2023 Climate Pollution Reduction Plan, the Executive Order signed June 4, 2024, titled "Leadership by State Government: Implementing Maryland's Climate Pollution Reduction Plan," high-level information about the federal landscape of climate work, and updates on climate science for 2024.

Thank you for your time and consideration.

WHO WE ARE

MEMBERS

LEADERSHIP

MDE Secretary Serena McIlwain
Commission Chair

Kim Coble
Commission Co-Chair

STANDING MEMBERS

Kevin Atticks
Department of Agriculture Secretary

Atif Chaudhry
Department of General Services Secretary

Erik Fisher
Chair, Critical Area Commission

Rebecca Flora
Department of Planning Secretary

Frederick Hoover
Chair, Maryland Public Service Commission

Josh Kurtz
Department of Natural Resources Secretary

David Lapp
Office of People's Counsel

Brooke Lierman
Comptroller

Fernando Miralles-Wilhelm
President, UMCES

Paul Pinsky
Maryland Energy Administration Director

James (Jamie) Raley
Maryland Farm Bureau

Russell Strickland
Maryland Emergency Management

Paul Wiedefeld
Department of Transportation Secretary

Carey Wright
Interim Superintendent of Maryland Schools

GOVERNOR APPOINTED MEMBERS

Russell Dickerson
Climate Change Expert

Robyn Gilden
Public Health Expert

SENATE PRESIDENT APPOINTED MEMBERS

Brian Feldman
Senator

Jesse Iliff
Environmental NGO Representative

Jennifer Laszlo Mizrahi
Philanthropic Representative

Michael Powell
Business Community Representative

Jim Strong
Organized Labor Representative

HOUSE SPEAKER APPOINTED MEMBERS

Beth Harber
Philanthropic Representative

Gerald Jackson
Organized Labor Representative

Brian Megali
Business Community Representative

David Smedick
Environmental NGO Representative

Dana Stein
Delegate

LOCAL GOVERNMENT APPOINTED MEMBERS

Mark Belton
Charles County Administrator,
Maryland Association of Counties

Michael Bibb
Town of St. Michael's Commissioner,
Maryland Association of Counties

WELCOME NEW MEMBERS

It is a pleasure to welcome several new members of the Maryland Commission on Climate Change this year. The Commission recognizes the following new members for their commitment to serve the State:

- Frederick Hoover, Maryland Public Service Commission Chair;
- James (Jamie) Raley, Maryland Farm Bureau President;
- Brian Megali, Constellation Energy;
- Fernando Miralles-Wilhelm, University of Maryland Center for Environmental Science President;
- Brooke Lierman, Comptroller; and
- Russell Strickland, Maryland Emergency Management Agency Secretary.

Leveraging their unique expertise, new Commissioners will inform policy discussions to address climate change and ensure a just transition to a clean economy. Their service on the Commission will make a positive, lasting difference for all Marylanders for generations to come.

THANK YOU TO DEPARTING MEMBERS

It is with immense gratitude that the Commission wishes a fond farewell to Charmaine Brown, Dereck Davis, Anne Lindner, and Wayne Stafford.

The Commission plays a vital position in not only advancing equitable climate solutions, but also in expanding Maryland's leadership in reducing greenhouse gas emissions, growing the economy sustainably, and protecting communities. During their tenure, they expertly modeled collaboration and commitment to this shared vision.

On behalf of all Marylanders, thank you for moving the vision of the Commission forward.

HISTORY OF THE COMMISSION

The Maryland Commission on Climate Change ("the Commission") is an independent, statutory body established under Executive Order in 2007 (01.01.2007.07). The Commission was charged with developing an action plan and firm timetable for mitigating and adapting to the impacts of climate change in Maryland. The Commission first produced a climate action plan that was the catalyst for the Greenhouse Gas Emissions Reduction Act of 2009 (GGRA of 2009).

In 2014, a second Executive Order (01.01.2014.14) expanded the scope of the Commission and its membership to include non-state government participants. In 2015, the General Assembly codified the Commission into law.

The Commission advises the Governor and General Assembly "on ways to mitigate the causes of, prepare for, and adapt to the consequences of climate change." Fulfilling this role, the Commission's focus is to:

- Recommend short and longer-term strategies and initiatives to better mitigate the causes and address the consequences of climate change;
- Review the most up-to-date climate change science to consider how it might inform State efforts on greenhouse gase (GHG) mitigation, adaptation, resiliency, economics, and policy;
- Publicly engage with a wide range of organizations and individuals to share evidence and analysis;
- Convene regular working group and full Commission meetings to ensure that sufficient progress is being made across all sectors and communities in Maryland.

The Commission delivers an annual report for the Governor and the Maryland General Assembly that includes recommendations from the Commission's working groups on the necessary steps to mitigate and adapt to climate change and meet the state's climate goals. The recommendations provide important support to policymakers at the Maryland Department of Environment (MDE), which develops the plan to mitigate and adapt to the impacts of climate change, as mandated by the Climate Solutions Now Act (CSNA) of 2022.

CLIMATE SOLUTIONS NOW ACT

Maryland has reduced climate pollution faster than almost any other state, achieving a 30% reduction in statewide GHG emissions from 2006 levels in 2020.[1]

In 2022, the CSNA passed into law in Maryland, which established the most ambitious greenhouse gas reduction goals of any state in the country. Maryland is legally required to reduce statewide GHG emissions 60% from 2006 levels by 2031 and to achieve net-zero GHG emissions by 2045. MDE's Climate Pollution Reduction Plan provides a roadmap for achieving Maryland's 2031 and 2045 GHG reduction goals.

[1] Maryland's 2020 Greenhouse Gas Emissions Inventory, https://mde.maryland.gov/programs/air/climatechange/pages/greenhousegasinventory.aspx

NEW WORKING GROUPS IN 2024

Prior to the CSNA, the Commission consisted of a main body and four working groups: the Scientific and Technical Working Group, the Greenhouse Gas Mitigation Working Group, the Adaptation and Resilience Working Group, and the Education, Communication, and Outreach Working Group.

The CSNA required four new Commission working groups to be established in addition to the four pre-existing working groups: the Just Transition Employment & Retraining Working Group, the Energy Resilience and Efficiency Working Group, the Energy Industry Revitalization Working Group, and the Solar Photovoltaic Systems Recovery, Reuse, and Recycling Working Group. Membership, scope, and required deliverables for all Commission working groups are set by statute.

JUST TRANSITION EMPLOYMENT & RETRAINING WORKING GROUP

The Just Transition Employment & Retraining Working Group focuses on supporting clean and renewable technologies and strategies while considering equitable economic development opportunities at community levels, including workforce development and training.

ENERGY RESILIENCE AND EFFICIENCY WORKING GROUP

The Energy Resilience and Efficiency Working Group focuses on energy infrastructure improvements, transmission efficiency, and battery backups.

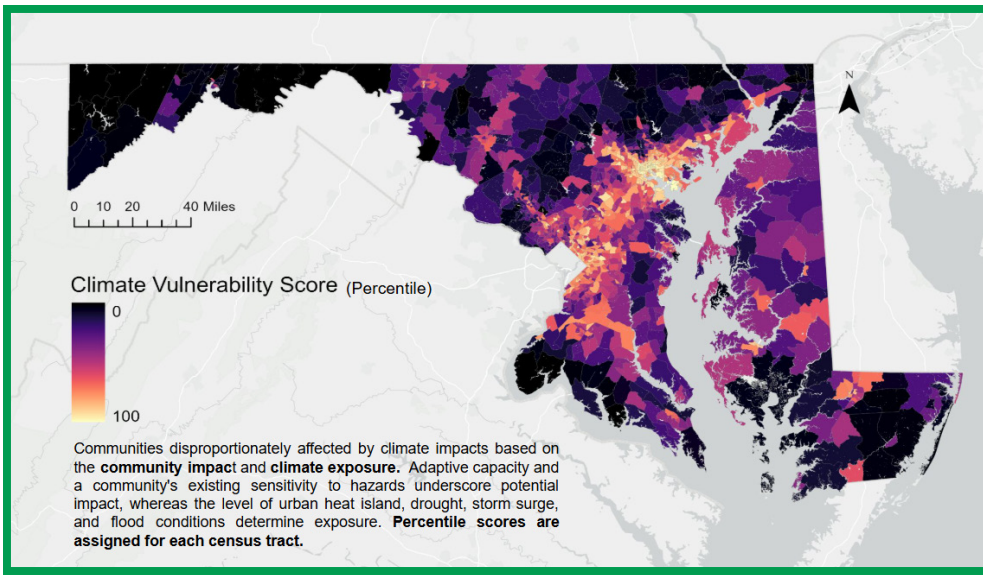
ENERGY INDUSTRY REVITALIZATION WORKING GROUP

The Energy Industry Revitalization Working Group focuses on the possible impacts to small businesses and potential facility closures as the result of climate change policies.

SOLAR PHOTOVOLTAIC SYSTEMS RECOVERY, REUSE, AND RECYCLING WORKING GROUP

The Solar Photovoltaic Systems Recovery, Reuse, and Recycling Working Group focuses on options for recycling or reusing solar panels.

The CSNA required each of the four new working groups to submit studies to the Commission and the Maryland General Assembly by December 31, 2023. Due to staffing and budget constraints, the four new working groups and their associated studies were delayed until 2024; all new working groups are on track to officially submit the required studies in 2024 or early 2025.



CLIMATE ACTION IN MARYLAND AND BEYOND

CLIMATE POLLUTION REDUCTION PLAN

Published in December 2023, Maryland's Climate Pollution Reduction Plan provides a detailed roadmap on how to achieve Maryland's climate goals of reducing greenhouse gas emissions 60% from 2006 levels by 2031 and ultimately to achieve net-zero emissions by 2045.

If fully implemented, the Plan will create:

27,400
additional jobs

$2.5B
in increased personal income

$5.3B
of net gain in Maryland's gross domestic product (by 2031)[2]

New policies recommended by the CPRP will transition Maryland from the fossil fuel era of the past to a clean energy future. Citizens will benefit from cleaner air, improved public health, lower energy costs, and more jobs with higher wages. Average households will save up to $4,000 annually on energy costs. Air quality and public health outcomes will improve for everyone, especially people living in historically underserved and overburdened communities.

To ensure that no one is left behind, Governor Wes Moore signed an Executive Order on June 4, 2024, requiring the Executive Branch to produce Climate Implementation Plans that will demonstrate how each agency will incorporate climate action into their work.

[2] Maryland's Climate Pollution Reduction Plan, Chapter 3: Economic and Public Health Impacts, and Chapter 4: Lower Energy Costs and More Jobs, include additional detail on the specific benefits of implementing the plan and transitioning the state to clean energy for all.

EXECUTIVE ORDER 01.01.2024.19 – "LEADERSHIP BY STATE GOVERNMENT: IMPLEMENTING MARYLAND'S CLIMATE POLLUTION REDUCTION PLAN"

"It is bold, it is ambitious; In Maryland we're going to get it done, because that's what we do."

-**Governor Wes Moore**
at the Executive Order signing at Henderson-Hopkins School in East Baltimore, June 4, 2024.

On June 4, 2024, Governor Wes Moore signed an Executive Order (EO) – "Leadership by State Government: Implementing Maryland's Climate Pollution Reduction Plan".

The EO establishes a Governor's Subcabinet on Climate and directs the Secretary of the Department of the Environment to chair the new Subcabinet. It calls for a whole-of-government approach to addressing climate change and requires 25 departments and agencies within the Executive Branch to submit a Climate Implementation Plan (CIP) to the Governor by November 1, 2024.

This unparalleled state action brings agencies to the table to discuss how they can collectively address climate change and safeguard a just transition to a clean economy and asks agencies to identify actions and resources necessary to implement Maryland's Climate Pollution Reduction Plan, including their top priorities for the upcoming year, funding needs, and potential outcomes of investment in future years.

Each agency created and submitted a Climate Implementation Plan to the Governor's office this year. These plans guarantee that each agency has a blueprint to work with MDE to advance climate action with clear and integrated approach. Moving forward, MDE will support agencies throughout the year to track progress on their CIPs and submit annual progress reports to the Governor.

MARYLAND'S SUSTAINABLE GROWTH POLICY

The MCCC recommendations are guided by Maryland's Sustainable Growth Policy to ensure achievement of climate change mitigation, sustainable growth, resilience, and other land-based community goals in Maryland for the 1 million more Marylanders arriving between 2020 and 2050. Under Section 9-1401 of the State Government Article, the "Sustainable Growth Policy" means the State Economic Growth, Resource Protection, and Planning Policy set forth in Section 5–7A–01 of the State Finance and Procurement Article. As Chair of the Maryland Sustainable Growth Subcabinet, MDP will continue to work with other state agency Secretaries in the near-term to update Maryland's Sustainable Growth Policy, which focuses on guiding land use-related and growth-related policies, all of which are critical to our success with climate change mitigation and adaptation.

FEDERAL LANDSCAPE

The Bipartisan Infrastructure Law (BIL) and the Inflation Reduction Act (IRA) reflect the largest federal investment in infrastructure, clean energy, and climate action in U.S. history. As of November 2024, over $5 billion in BIL and IRA funding has been apportioned for Maryland with over 100 projects identified for funding.

Two multi-state coalitions that were formed to apply for the EPA's Climate Pollution Reduction Grant funding opportunity – the Clean Corridor Coalition (C3) and the Atlantic Conservation Coalition (ACC) – secured a total of $130 million for Maryland: C3 brought in $80 million for Maryland for electric vehicle (EV) charging station development along the I-95 corridor; the ACC brought in $50 million to Maryland for agroforestry, afforestation, urban trees, and coastal restoration projects. An additional $40 million is going to Nature Conservancy Maryland.

The first three years of these historic federal investments have spurred the clean energy transition nationwide. Maryland is in a lead position to leverage these once-in-a-generation federal investments to further accelerate its response to the climate crisis. These funds will transition the State to a clean energy economy in a way that is robust, equitable, and inclusive.

RECOMMENDATIONS

ADAPTATION AND RESILIENCY

The following actions should be guided by a **Justice40** approach so that environmental justice and climate change adaptation goals are achieved simultaneously within Maryland's dynamic Environment:

1. **The state of Maryland should seek to increase the level of community-led participatory engagement in adaptation and resilience projects by:**
   - Working with Department of Budget Management (DBM) to provide guidance on existing state mechanisms of compensatory (e.g. transportation stipend, child care, direct payment) community engagement, and community liaison recruitment options.
   - Removing barriers to community participation in projects (e.g. technology requirements, childcare, paperwork).

2. **State agencies should increase the utilization of the adaptation and resilience resources they offer to support local governments by:**
   - Making progress on the priorities identified in the local government and state service delivery focus group of the Next Generation Adaptation Plan.
   - Allowing for more flexible state processes in low-resourced communities (e.g. technical assistance, longer grant terms, lowered match amounts).
   - Making tools and information more accessible (e.g. using plain language, translation services, offering trainings, providing guidance documents).

3. **State agencies involved in land use decisions should prioritize the conservation of natural and working lands in accordance with the Next Generation Adaptation Plan.**
   Funding in these areas should focus on best development and management practices as well as equity.

4. **Incorporate Justice, Equity, Diversity, Accessibility, and Inclusion into State Agency Annual Reports.**
   State agencies should incorporate Next Generation Adaptation Plan Justice, Equity, Diversity, Accessibility, and Inclusion priorities and milestones into their 2025 annual state status reports on GHG reduction and impacts of climate change. This will assist the state in identifying gaps in service to vulnerable communities to ensure no Marylander is left behind.

EDUCATION, COMMUNICATION, OUTREACH

1 Outreach to Mobilize All Marylanders to Proactively Address Climate Change

Recognizing the critical importance of informing, engaging, and encouraging Marylanders to take action to achieve the state's ambitious climate goals, the Maryland Commission on Climate Change–upon the recommendation from the Education, Communication and Outreach Working Group (ECO)-- proposes that the Governor and State Legislature approve legislation to allocate funding for the purchase, development, or placement of multimedia advertising to support and expand the reach of the campaign. The goal is to develop the resources and outreach branding for use by state agencies and to create a fund for the media buys needed to reach and capture the attention of Marylanders and garner their active participation in climate solutions. The initial funding would also be used as a seed fund to attract other private funds.

2 Develop Maryland's Future Generation of Environmental and Climate Change Leaders

Recognizing the power of education to create a fundamental understanding of the challenges our state faces with respect to climate change, ECO strongly recommends that the Governor and State Legislature commit to fostering our next generation of environmental leaders, advocates, and responsible citizens.

ECO recommends a three-pronged approach by engaging administrators, educators, and students to facilitate the link between climate preparedness, climate literacy, and job potential. Student involvement, voice, and passion are critical to the fundamental culture change needed to meet the goals outlined in the Climate Solutions Now Act. Adequate resources should be allocated to:

- **Advancing Climate Literacy**—Direct Maryland's State Department of Education and new Outdoor Learning Partnership to review the state's new environmental literacy standards framework for opportunities to incorporate climate change. Designate funding for awareness activities and training for Maryland educators on these standards and the resources available for incorporation into classroom activities. This initiative can be integrated into the existing Maryland State Department of Education's 'Blueprint for Success,' especially as it pertains to opportunities for high school graduates.
- **Developing Climate Action Plans**—Request each school system to create a specific, measurable, and actionable climate action plan to promote environmental awareness and guide individual schools in sustainability efforts. Plans should be prepared to support and follow the framework set in the State Department of Education's Climate Implementation Plan, as required by Executive Order dated January 19, 2024. Helpful resources should be provided with ECO's assistance.
- **Expanding Maryland Green Schools Program**—Allocate funding to expand the statewide Maryland Green Schools Program, which encourages participation from preschool through high school in urban and rural Maryland, demonstrating integration of local environmental issues into each grade's lesson plans. Funds should be used to support communications outreach, offer professional development opportunities, and expand the existing grant program for individual schools seeking to become a Maryland Green School. These schools implement sustainable practices and fosters cultural change through student immersion and experiential learning.

Our future generation of environmentally literate graduates will vote, advocate, and make both civic and personal decisions that advance climate action.

3 The Legislature Should Pass "Climate Education Week" Bill

Building on the success of the Climate Change Teach-In, including the Governor's proclamation of Climate Education Week in 2024, ECO recommends that the Maryland General Assembly reintroduce and pass former FY 2024 House Bill 993 with bi-partisan support. This bill would proclaim one week in April, coinciding with Earth Month, as "Climate Education Week". This declaration would provide a unique opportunity for state agencies, county and municipal governments, and private organizations to come together to celebrate climate and expand education on ways to mitigate climate change and improve resilience in our regional and global environment.

ENERGY INDUSTRY REVITALIZATION

1 The State should establish a dedicated liaison/clearinghouse to help small businesses navigate available resources, funding and financing opportunities for the clean energy transition.

An example approach is in the form of a Large Language Model (LLM) that serves as a help desk to make access and navigation as easy as possible for small business owners.

2 The State should expand existing electric vehicle (EV) infrastructure programs within the Maryland energy administration (MEA) with a designated focus on small businesses. The program would draw in existing funding and incentives for small businesses to install EV charging infrastructure.

With the influx of investment from the Bipartisan Infrastructure Law, Maryland's National Electric Vehicle Infrastructure (NEVI) Program is changing the State's landscape of EV charging infrastructure. The new investments present an opportunity for small businesses to share in the benefits of EV charging infrastructure. **Studies** have shown that charging stations can boost annual spending at nearby businesses, bringing in more revenue to those businesses.

The EV infrastructure programs run by MEA are currently oversubscribed, meaning there is more demand than funding available. Expansion would allow more small business to access these resources, supporting both the environment and the economy of Maryland.

3 Identify permanent dedicated funding to the Maryland Clean Energy Center Maryland Energy Innovation Accelerator program to enable increased growth of small businesses bringing advanced energy, climate mitigation, and adaptation solutions for market adoption more expeditiously.

The Climate Pollution Reduction Plan calls for expansion of clean energy infrastructure to support Maryland residents, small businesses, and large commercial businesses. This transition will help the state in achieving its ambitious emission reduction goals as set forth in the Climate Solutions Now Act of 2022, which include a 60% reduction in emissions by 2031 from 2006 levels and net-zero emissions by 2045. The target of this proposal is to facilitate small businesses from an economic standpoint in the transition from fossil fuel emitting energy production to clean energy production.

The MCEC's Maryland Energy Innovation Accelerator (MEIA) program, which started in 2019, facilitates growth for small businesses to be drivers of the energy industry. The program helps expedite the transfer of clean energy and climate technologies from lab to market and create new and investible advanced energy businesses. It was created to unify the intersection of energy innovation, energy entrepreneurs and researchers, and business executives to create new and investment-ready clean energy businesses. MEIA also supports early-stage technology commercialization in a myriad of clean energy technologies including solar, wind, and battery technologies. Currently, the MEIA program has baseline funding through 2027 (fiscal year 2028) with funds from the Climate Tech Founders Fund.

With increased funding, the MCEC's MEIA program can be expanded to support more small businesses in the energy transition. The MEIA program currently serves small businesses across industries, and this expansion seeks to capitalize from the potential Maryland has to generate wealth and facilitate rapid decarbonization efforts to achieve climate goals. Because it is estimated that small businesses will bear a level of financial impact through the energy transition, it is important that there are funding, grants, loans, and incentive opportunities in order to mitigate those impacts. Further, the provision of business and industry experts will help numerous small businesses make the best financial decisions for each of their individual and unique businesses.

Maryland will foster sustainability and benefit from outcomes of these investments, in terms of the economic, environmental, and community impacts. The proposal seeks to overall facilitate small businesses in the transition from fossil fuel emitting energy consumption to adoption of clean energy, electrification, energy storage and efficient management solutions to reduce demand.

ENERGY RESILIENCE AND EFFICIENCY

1 Maryland must take short term actions to address energy capacity constraints

The Public Service Commission should issue a policy statement for the prioritization of battery storage and other demand response systems on the distribution grid, provided that they are cost effective in adding reliability to the grid and avoiding or delaying other capacity cost increases and/or transmission upgrades.

2 In support of the state energy planning framework, Maryland must invest in a user- friendly, transparent model for state-wide planning to inform policy and administrative decisions.

The model should enable cost benefit analysis of power prices by resources, be detailed enough to enable location value planning and support the transition to a clean energy workforce. The model should also consider time horizons for commercialization of energy technologies and when those technologies may appear in the market.

3 The State should conduct the following immediate studies, in parallel to the extent possible, and building upon prior studies and existing information, in order to support a long-term integrated approach to energy system assessments and energy planning and to meet the State's climate change goals:

- The Public Service Commission should, in consultation with the Maryland Energy Administration, study on transmission line reconductoring opportunities in the State;
- The Maryland Energy Administration should study the expansion and extension of our nuclear energy capabilities – particularly including, but not limited to, small modular reactors. A report on options should be made available to the state and public within the next 18 months. The report should include feasibility evaluations for the economic viability and deployment of new nuclear generation in the state, considering scenarios that include and exclude both ratepayer and taxpayer subsidies and guarantees. Specifically, in assessing feasibility, the study should analyze the experience over the past 25 years of conventional nuclear and SMRs, as well as any new progress, including timing, costs, and affordability. These studies should include and evaluate site adequacy (including at former fossil fuel plants and current nuclear plants), availability of transmission assets, and environmental justice impacts. Furthermore, the evaluation of impacts should include the overall employment and other benefits of new plant construction and operations. The study should incorporate public input and coordination with the Public Service Commission
- The Public Service Commission should perform an analysis to determine if Maryland's Offshore Wind (OSW) projects that do not have a current interconnection agreement could be interconnected with Salisbury substations and the feasibility of building in-state transmission from the OSW interconnects to Maryland load centers;
- The Public Service Commission should study the viability of energy storage-as-a-transmission-asset within its 3,000MW storage procurement program;
- The Power Plant Research Program should perform an analysis of land in the State to identify land suitable for solar energy and storage development.

JUST TRANSITION EMPLOYMENT AND RETRAINING

1 Just Transition Principles

The MCCC should support Just Transition Principles in its ongoing work of supporting climate change action:

- Quality clean job creation
- Occupational training and education, including accessible transportation
- Promoting investment in clean jobs and impacted communities
- Identifying and eliminating structural barriers to employment
- Hiring and retaining underrepresented workers
- Collaborating with stakeholders, especially emphasizing workers
- Ensuring fossil fuel workers are supported in transitioning into green energy sectors

2 Labor Agreements

To successfully support Just Transition Principles in Maryland's new clean energy economy, new infrastructure projects should consider following best practices regarding labor, including but not limited to prevailing wages. This can be done through project labor agreements like the provisions under HB 397 of 2024, which supports Title 17, Subtitle 2 of the Maryland Finance and Procurement Article. This would provide job security and support for new and existing decarbonization construction projects of varying sizes.

3 Green Jobs Campaign

The JTWG proposes a Green Jobs outreach campaign in 2025 to encourage applications and participation in clean energy-related apprenticeships (including energy audits, LEED certifications, and other relevant training programs) alongside the adoption of clean energy technologies. This two-pronged approach will support job growth in the clean energy sector as well as public adoption of clean energy technologies that job growth is contingent upon. This could include expanded Electrification Pilots across Maryland jurisdictions and other programs that educate consumers about greenhouse gas reduction strategies, which may include residential electrification and decarbonization, as well as provide financial and technical resources to implement decarbonization upgrades. The campaign would partner with pre-apprenticeship, apprenticeship, institutions of education, and other programs that specialize in clean energy workforce development and training to recruit segments of the population who may be underrepresented, including but not limited to person from economically marginalized communities and previously incarcerated persons, in the clean energy workforce.

4 Investments in Registered Apprenticeship Programs

The JTWG proposes additional strategic investments into expanding current registered apprenticeship programs that support transferrable skills, such as proven workforce models programs like the Maryland Department of Labor's Employment Advancement Right Now (EARN) Maryland, Registered Apprenticeship, and Maryland Works for Wind (MWW) to address existing and emerging workforce needs in solar, wind, geothermal, electrification, and other clean energy sectors.

Investments in Registered Apprenticeship will be needed to create a robust clean energy workforce, but additional support for programs and certifications based around specific clean and sustainable occupations will also be needed. An infusion of additional funds in the EARN model will allow the Maryland Department of Labor to support new sector-based efforts to address occupational specific needs. Additionally, investments in workforce ecosystems, like the MWW framework, will allow partners, like unions, to develop curriculum, purchase new equipment, and provide specific training to ensure workers have the right skills to safely work on new clean energy projects, ensuring programming is responsive to emerging clean energy technologies and bolstering the availability of a highly skilled workforce to support these critical projects.

MITIGATION

1 Cap and Invest

Maryland is currently not on track to meet the goal of reducing greenhouse gas emissions by 60% by 2031. The Climate Pollution Reduction Plan released by the Maryland Department of the Environment at the end of last year outlines a needed investment of $1 billion annually in new spending to meet this and other climate goals in Maryland. Understanding the state has pervasive budget challenges, it is still important to identify sustainable funding for climate initiatives that will enable the state to meet its goals. Therefore, the state should study options to design and move to implement an equitable strategy to raise revenue for climate programs and investments that decrease emissions, reduce energy costs for businesses and families, and promote equity while taking into account the state's larger budget context.

One option for climate funding is to pursue the path of California, New York, and Washington states and develop an economy-wide cap-and-invest program to build on Maryland's existing successful cap-and-invest program for fossil fuel power plants. As described in **Maryland's Climate Pathway Report** and **Maryland's Climate Pollution Reduction Plan**, a cap-and-invest or a similar policy that puts a regulatory cap on emissions from major polluters and invests approximately $1 billion annually in priority decarbonization projects can put the state on a pathway to achieve its climate goals. Maryland's Climate Pollution Reduction Plan shows that without additional policies, the state will fall short of its emissions reduction requirements by approximately 3.5 million tons of carbon dioxide equivalent (MMTCO2e) in 2031 and 15.6 MMTCO2e in 2045. The Plan further shows that Maryland can eliminate this shortfall and keep pace with other climate-leading states by adopting a cap-and-invest policy.

For over a decade, fossil fuel power plants in Maryland and other states participating in the Regional Greenhouse Gas Initiative (RGGI) have performed under a declining emissions cap and sold emissions allowances at auctions. To date, Maryland has received approximately $1.3 billion in proceeds from the sale of allowances, including $214 million in FY24 alone, while power plant emissions plummeted more than 60% due to the program's success.

The General Assembly should authorize a study to evaluate the design of a cap-and-invest program that would put the state on a pathway to achieve its climate goals, verify progress for both climate mitigation and public health with direct ambient air measurements and numerical simulations, and provide a sustainable funding source for climate initiatives. The study should consider the impact of a cap and invest program on energy affordability, the state's economy, and the competitiveness of the state, as well as potential remedial measures. The study should also consider the impact of likely changes to relevant Federal funding and regulatory programs. The study should be due by the end of 2025. Upon receipt of the study:

- MDE should adopt a reporting rule requiring major polluters to begin reporting data in 2027. Data would be used to establish the baseline performance of major polluters, as described in **Regulatory Options for an Enforceable Emissions Cap-and-Invest Program in Maryland** and **Cap-and-Invest for Maryland: A Primer**; and
- The General Assembly should consider whether to direct MDE to adopt a cap-and-invest program.

2 RENEW

The Commission believes that Maryland taxpayers should not have to pay the full cost of constantly escalating climate change impacts in the state from sea-level rise, severe storms, and health impacts. To protect taxpayers, the Maryland Commission on Climate Change recommends that the Maryland General Assembly commission a study of the current and projected costs of anthropogenic climate change to the State of Maryland for the purpose of joining other states in assessing a fee on major carbon polluters, one that cannot be transferred to consumers, to compensate the State of Maryland.

3 Transition from One-Way Air Conditioners to Two-Way Heat Pumps

3A. Require HVAC Contractors to Provide Heat Pump Estimates for AC Replacement

The federal Inflation Reduction Act provides incentives for Marylanders to replace on-way air conditioners with heat pumps. Other state policies under consideration – such as an economy-wide cap-and-invest program – would expand funding for such incentives. The General Assembly should accelerate the transition from one-way air conditioners (ACs) to two-way heat pumps (HPs) by ensuring that heating and cooling contractors have adequate education and training concerning HPs – and that they provide accurate information about HPs to their customers. This is an important emissions reduction and consumer production measure.

Emissions Reductions - HPs are more efficient at cooling than ACs and more efficient at heating than fuel-burning systems, resulting in emissions reductions throughout the year. Getting more HPs installed at the point of AC replacement would help the state accelerate emissions reductions.

Consumer Protection - HPs replace ACs, so when consumers install new ACs and then install HPs when their boilers or furnaces fail, the new ACs are replaced and the residual value is lost. MDE's forthcoming Zero-Emission Heating Equipment Standards (ZEHES) will require the installation of zero-emission equipment like HPs when fuel-burning heating equipment like boilers and furnaces need to be replaced. In the absence of measures to promote or require HPs as replacements for AC, consumers who have recently paid to install new ACs could find themselves needing to pay to replace their new ACs with HPs as soon as their heating systems fail. Legislation could prevent many consumers from double paying for systems that provide cooling.

The General Assembly should require heating and cooling contractors to provide their customers with cost estimates for heat pump installation and information about State and federal heat pump incentives when customers request cost estimates for air conditioner installation. The cost estimate should include information comparing the installation and projected lifetime operating cost of a heat pump with the same installation and projected lifetime operating costs of an air conditioner and replacement heating equipment. The General Assembly should require the Department of Labor, in consultation with the Maryland Energy Administration, to evaluate the efficacy of this requirement. The evaluation can then be used to determine whether the State should adjust its incentive programs or take other steps to accelerate heat pump adoption.

3B. Focus Incentives on Heat Pumps rather than AC and Fuel-Burning Heating Systems

The General Assembly should direct the Public Service Commission to focus publicly funded incentives on driving customer adoption of efficient heat pump equipment rather than and as a replacement to traditional air conditioning and space heating equipment. Heat pumps can offer cost savings in situations involving the replacement of both air conditioning and furnace equipment. More significant incentives may be necessary to catalyze heat pump adoption at a time when customers are only considering replacement of one traditional piece of equipment. Incentives for traditional air conditioning and furnace equipment should be phased out of the EmPOWER Maryland program and other publicly funded incentive programs. This will allow heat pump incentives to expand without necessarily increasing overall program costs or ratepayer impact. Incrementally higher incentives should be offered for heat pumps meeting certain efficiency criteria that will better support peak electrical demand reduction.

4 Add Electrification as an Allowed Use for RGGI Funding to Allow Funding for Limited-Income Electrification Programs

Maryland's RGGI proceeds have increased in recent years, rising from $140 million in FY23 to $214 million in FY24, a $74 million increase in one year. Meanwhile, the funding provided to the Department of Housing and Community Development (DHCD) is not sufficient to satisfy the demand for new heating and cooling systems from limited-income families. As a result, many families struggle to maintain safe living conditions in the cold of the winter and heat of the summer. Maryland has the opportunity to help more limited-income families replace old AC and heating systems with new heat pumps, which would reduce emissions, lower energy costs, and improve the quality of life for some of the most vulnerable members of our community.

The General Assembly should add electrification as an explicitly allowed use of RGGI proceeds and direct MEA to collaborate with DHCD to replace old heating and cooling systems with heat pumps and replace old water heaters with heat pump water heaters as soon as possible.

5 The State Should Take Action to Increase the Pace of Solar Power Development

- The General Assembly should help to accelerate the development of large solar projects through reducing barriers, standardizing conditions, and improving permitting processes to aid the solar market. Standardizing conditions for setbacks, decommissioning, visual buffers, and streamlining permitting processes will provide more market certainty for solar project developers. Projects near existing transmission infrastructure should benefit from consistent and efficient approval processes.
- Maryland DNR in consultation with MDE, MDP, MEA and MDA, and counties, should develop plans, maps and a statewide online mapping platform displaying areas preferential for utility-scale solar development, considering factors such as existing natural resources, conserved lands, agriculturally important areas and prime agricultural soils, historic resources, brown/gray fields, military assets, and transmission lines location. These plans may be useful in the design of future incentive programs and efficient approvals.
- The legislature should act to support the added cost of developing low- and moderate-income community solar projects, especially those in preferred locations (brownfields, rooftops, parking lots, etc.) through improved financing incentives.

- The General Assembly should provide additional incentives for solar development on "preferred sites" including residential and commercial rooftops, parking lots, abandoned sites, grayfields, and brownfields.
    - » Substantial (e.g., 25% of project cost) refundable state tax credit for new solar arrays on these sites.
    - » Increasing the cost of Solar Alternate Capacity Payments beyond the low and declining levels set by 2021 SB65, to increase SREC value. There are many examples of "upfront" incentives from other states that could be drawn on.
- MEA should work toward developing a program/policy in coordination with the PSC and PJM to link interconnection service agreement timelines and incentives to ensure that developers can access funding in a timely manner.
- The State should incorporate project "readiness" or maturity into solar project siting, and permitting (similar to what PJM is doing with "first-ready, first-serve").
- The Building Codes Administration should adopt solar-related provisions in the 2024 International Energy Conservation Code.
- The General Assembly should consider revisions to the RPS to encourage more solar through SRECs and more ambitious carveouts. These measures should seek to stabilize SREC prices relative to other PJM states. SRECs should incentivize projects on developed and brownfield sites and limit use for projects on sensitive lands.
- New construction – both residential and commercial – codes should be updated to require electrical wiring and panels that are both solar- and EV-ready.
- Any changes to the process for developing solar energy projects should result in faster and more efficient issuance of permits.

6 Pass G.R.E.E.N.

The General Assembly should pass Green and Renewable Energy Efficiency for Nonprofits (G.R.E.E.N.), introduced for the third time in 2024 as SB169. G.R.E.E.N. would allow Maryland's nonprofit sector to participate in addressing our Climate Crisis by providing no-interest loans to nonprofits for the purchase and installation of qualifying energy systems in the State. This past session, the bill once again passed the Senate unanimously.

SCIENTIFIC AND TECHNICAL

The STWG recognizes that these recommendations should be assigned to an appropriate State agency, general assembly, or other governmental entity. However, the MCCC Staff are best equipped to make those additions to these recommendations as we are well versed in current government authority(ies). Implementation of these recommendations, including site selection, should be done in a just and equitable manner, and through consultation with overburdened and underserved communities.

1. **Woody Biomass:**

   Woody biomass burning for thermal energy is a suboptimal choice (e.g., low energy yield per ton of carbon dioxide emitted), but strategic use of wood from thinning for forest fire protection or various waste streams can be considered. Burning biomass can generate substantial amounts of pollutants that have adverse health effects. Harvesting live forests for woody biomass burning is NOT recommended as a tier one energy source under Maryland's Renewable Portfolio Standard.

2. **Hydrogen:**

   Pilot large-scale carbon-negative (fully inclusive of the supply chain) technology that involves natural gas/methane decomposition to hydrogen and carbon-based commodity chemicals or sequestered carbon and reduces greenhouse gas emissions and short-lived pollutants. Consider creating tax, labor and/or financial incentives.

3. **Methane:**

   Reduce nutrient inputs to Chesapeake Bay to avoid methane production and investigate wetland restoration methods that do not lead to increased methane production.

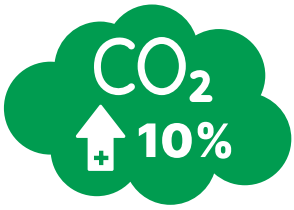
4. **Health:**

   Update the climate and health profile report to identify specific Maryland communities that are bearing disproportionate health burden tied to climate change. Develop location specific public health early warnings to help communities adapt to the health threats of climate change.

UPDATE ON THE SCIENCE

GLOBAL AND NATIONAL OUTLOOK

Globally, July 2024 was characterized as: (i) being the hottest month on record and the 14th-consecutive month of record-high temperatures; (ii) having the second lowest sea ice on record, and the global ocean surface temperature hitting its second warmest on record; and (iii) having been estimated as being approximately 1.21°C warmer than the pre-industrial average for 1850-1900, according to the National Oceanic and Atmospheric Association. The UN World Meteorological Organization announced that there is an 80 percent chance that average global temperatures will exceed the 1.5°C threshold above the pre-industrial value within next five years but this is likely a "temporary" change. According to the World Meteorological Organization, greenhouse gas (GHG) levels reached a new record in 2023 while carbon dioxide atmospheric accumulations have risen more than 10% in only two decades.



carbon dioxide atmospheric accumulations have risen more than 10% in only two decades

The world experienced a series of climate-related disasters in 2024. Wildfires, extreme heat waves, flash floods, and windstorms devastated communities around the world and in the U.S. These events have destroyed built environments and killed or displaced millions of people. In September, Hurricane Helene created intense rainfall and wind that led to deadly and devastating flooding in western North Carolina, demonstrating that not only coastal communities are vulnerable to hurricanes. Hurricane Helene led to 98 confirmed fatalities and estimated damages of $53 billion dollars. Hurricane Helene was followed shortly after by Hurricane Milton in October, which rapidly intensified into the second-most intense **hurricane** on record in the **Gulf of Mexico**.

ATMOSPHERIC LEVELS OF GHG ARE CONTINUING TO RISE DESPITE LOWERING EMISSIONS

Between 2005 and 2019, annual US GHG emissions decreased 12%. This was mainly due to decreased coal use and increased use of natural gas and renewable technology. More generation of wind, solar, and battery storage technologies will continue to lower costs for these types of energy, which will also decrease greenhouse gas emissions.

Recently, the U.S. Environmental Protection Agency (EPA) announced that GHG emissions from large facilities decreased by 22%, mainly due to a decrease in power plant emissions. However, this number does not reflect the impact of several rules issued by the EPA in 2024 aimed at reducing methane emissions from the oil and gas sector and enhancing data quality. With methane more at the forefront, there has been increasing research on its effects as a GHG and an increasing emphasis on strategies that reduce methane as well as carbon.

Methane is much more potent than carbon dioxide when it comes to trapping heat in the atmosphere, even though it doesn't last as long. This means that every bit of methane contributes to global warming, and the impacts of and solutions for the agricultural and energy sectors must receive increasing focus as part of a holistic climate action strategy.

In the Baltimore-Washington area, methane comes from a variety of sources. Of concern is the acceleration of atmospheric methane over the past twenty years, coincident with the development of shale gas extraction (Hydraulic Fracturing or Fracking). While Maryland has banned fracking, export of liquid natural gas (LNG) through the Cove Point facility is occurring. Some of the methane over Maryland comes from cities and natural gas operations, but a surprising amount is blown in from large swine farms down south, especially in North Carolina. Weather patterns, like winds from the west and southwest, deliver methane to Maryland from both urban areas and farms.

Methane production is enhanced with eutrophication, as measured by Dr. Laura Lapham, University of Maryland Center for Environmental Science. Nutrient enrichments generate organic matter that is decomposed in sediments and this eutrophication leads to methane production. Methane is released from Chesapeake Bay sediments, particularly during storm events. These storm events fluxes are not currently considered in the Maryland Greenhouse Gas inventory.

Methane emissions from restored wetlands are being assessed by Dr. Stephanie Yarwood at the University of Maryland. Dr. Yarwood has measured significant methane emissions from restored marshes on Maryland's Eastern Shore. While the hydrology and vegetation can be restored rather quickly, methane emissions persist for decades after the restoration occurs. Dr. Yarwood also found that various amendments to enhance revegetation, like biosolids, hay, manure, and wood chips, can serve to accentuate methane emission rates. Further research into wetland restoration methods is critically needed to ensure those efforts do not compromise emissions reduction progress.

While it is difficult to address methane coming from other states, Maryland can reduce methane emissions from its own agricultural sources and landfills. For example, Dr. Eric Wachsman (University of Maryland) and Dr. Jonah Erlebacher (Johns Hopkins University) are developing technologies that can turn methane into hydrogen for transportation applications while sequestering the carbon into more valuable chemicals rather than it being emitted into the atmosphere as carbon dioxide.

New opportunities have arisen recently to abate methane emissions from the livestock sector. A new feed additive (Bovaer) was approved this year by the Food and Drug Administration that can reduce methane emissions from ruminants by about 30%. However, incentives are needed for dairy farmers to adopt the usage of this feed additive for their cows, which merits consideration for Maryland's dairy industry.

Due to its relatively short atmospheric lifetime (10-12 years), abatement of methane emissions would have a rapid impact on slowing the rate of global warming and is urgently needed. Failure to address methane as well as carbon will affect Maryland's ability to achieve its goals as well as global efforts to stay within necessary limits.

Despite lowering GHG emissions, GHG concentrations in the atmosphere continued to increase, reaching record levels. The three most abundant greenhouse gases are carbon dioxide, methane and nitrous oxide. A comparison of these gases is summarized in the following table.

Greenhouse Gas	Percent of total greenhouse gas emissions	Lifetime in atmosphere	Major sources	Current Atmospheric Concentrations (2023 average)	Percent Increase from Pre-Industrial Levels	Increase from 2022
Carbon Dioxide	76%	Can be greater than 1,000w years	Burning of fossil fuels, solid waste, and trees; deforestation and soil degradation	419 ppm	+51%	+2.8 ppm
Methane	16%	11.8 years	Production & transport of oil, natural gas, and coal; livestock & agricultural practices; decay of organic waste in municipal solid waste landfills	1,923 ppb	+165%	+10.9 ppb
Nitrous Oxide	6%	109 years	Agricultural & industrial activities; combustion of biofuels; biomass burning and wastewater treatment	337 ppb	+25%	+1 ppb

Black carbon (BC) and brown carbon (BrC) aerosols, although not gases, contribute to global warming and can pose a substantial health hazard. Major sources include diesel exhaust, biomass burning such as forest fires, and fugitive coal dust. These relatively short-lived species demonstrate strong spatial gradients and contribute to environmental injustice. Emissions can be mitigated by improving traffic flow, electrification of heavy-duty vehicle fleets, and enclosures on coal facilities [*Aubourg et al., 2024; Dickerson et al., 2024*].

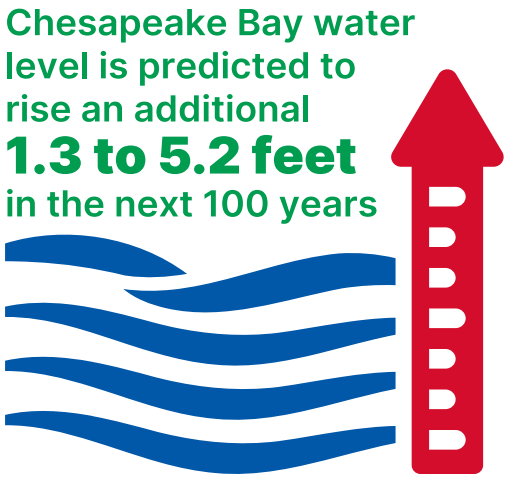
WARMING OCEANS ARE INCREASING SEA LEVELS AND AFFECTING MARINE LIFE

Ninety percent of the emissions driving global warming are stored within our oceans. The last decade accounted for the warmest ocean temperatures since at least the 1800s, with 2023 being the warmest year. The heat held in the oceans causes the water to expand, which contributes to sea level rise. Warming waters have also caused glacier melting, which further contributes to rising sea levels.

Warming oceans have significantly impacted the health of marine ecosystems, causing significant changes over the past three decades. As oceans are warming at an alarming rate, some species can adapt and thrive, while others, like coral reefs, marine mammals, and polar species, are struggling to survive.

The more sensitive species, which are often crucial to their ecosystems, are the ones impacted the most. Coral reefs are bleaching, fish are moving to new areas, and marine mammals are losing their habitats. The results have ultimately caused imbalances that disrupt both marine and land ecosystems.

Sea level rise is particularly troublesome in the mid-Atlantic, including the Chesapeake region, due to long-term background land subsidence (sinking) of about one foot per century. Adding sea level rise due to global warming, the Chesapeake Bay water level is predicted to rise an additional 1.3 to 5.2 feet in the next 100 years. Water level rise is contributing to coastal flooding and erosion causing land loss. The water rise is also affecting marshes, wetlands, forests, and agricultural fields due to saltwater contamination. The loss of habitat that also catches pollution is detrimental to the wellbeing of the Chesapeake Bay watershed and the vitality of communities that inhabit the region and rely on ecosystem resources for their livelihood.



Focusing on global and local efforts to mitigate ocean warming is more important than ever. We risk continued sea level rise that will contribute to flooding in the Chesapeake Bay region and losing vital marine biodiversity, which could have cascading effects on everything from food security to coastal protection.

THE WARMING CHESAPEAKE BAY AND ITS WATER LEVEL RISE IS AFFECTING NATIVE SPECIES AND THE GENERAL LANDSCAPE

Water temperatures in the streams and rivers of the Chesapeake Bay watershed have been rising over the past few decades, often faster than air temperatures. This increase is driven by changes in land use, with urban development playing a significant role. In areas with lots of concrete and other hard surfaces, rainfall runs off quickly and heats up before flowing into nearby streams, raising water temperatures. In contrast, forests and areas with natural vegetation help keep streams cooler by providing shade and allowing water to soak into the ground.

This warming is causing serious problems for aquatic life, such as brook trout, which need cooler water to survive, or eelgrass, which becomes stressed in waters warmer than 30°C. Warmer waters also contribute to other issues, like harmful algal blooms and lower oxygen levels, making life harder for many species. Warmer waters also increase the acidity levels, which hinders the growth of the eastern oyster. While some management practices, like planting trees along waterways, help reduce these impacts, other common practices, like stormwater ponds, can unintentionally make the problem worse by heating up the water even more.

To combat rising water temperatures, we need to focus on protecting natural areas and strategically managing urban and agricultural lands. By increasing tree cover and using land management practices that help cool the water, we can protect vulnerable species and improve the overall health of the watershed. It's a reminder that how we use the land directly affects the health of our water systems.

UMD and the Marine-Estuarine Environmental Sciences program have initiated a **water-level network** to monitor sea-level and flooding in the Bay and other water bodies. This project, part of the Climate Resilience Network, makes data freely available.

MARYLAND SCIENCE & TECHNOLOGY DEVELOPMENTS

Technologies are being developed at Maryland universities to reduce greenhouse gas emissions, with the methane to hydrogen mentioned above being only one of many examples. While these are still in development and it will be sometime before they have commercial impact, the Maryland Clean Energy Center (MCEC) is actively deploying existing clean energy technologies to assist Maryland with meeting its climate goals. For example, in fiscal years 24 and 25, MCEC was awarded federal grants to implement clean energy and decarbonization measures. These include $62.4M from U.S. EPA Greenhouse Gas Reduction Fund's Solar for All grant for deployment of solar on low income single and multi-family households as well as community serving solar projects with potential to impact approximately 10,000 households with reduced energy costs; and a $48M grant from the U.S. Department of Transportation Federal Highway Administration for the installation of approximately 87 electric vehicle charging stations across Maryland transportation corridors and in community settings.

During 2024, the **Maryland Mesonet** project, a partnership of the University of Maryland and the Maryland Department of Emergency Management, has moved forward to improve disaster preparedness, response and recovery, as well as regional forecasting related to precipitation, temperature, sea level rise, flooding and other climate-related risks. Progress is being made in expanding the Mesonet network to agricultural centers across the state to assess climate impacts on agro-ecosystems.

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ATTACHMENT

MDE commissioned an analysis conducted by the UMD School of Public Policy to determine the total amount of State money spent on measures to reduce GHGs during the preceding fiscal year and the percentage of that funding that benefited disproportionately affected communities.

The report is available here:
https://mde.maryland.gov/programs/Air/ClimateChange/MCCC/Pages/index.aspx