STATE OF MARYLAND

COMPREHENSIVE CLIMATE ACTION PLAN

JULY 2025

Maryland
Department of
the Environment

Maryland
Department of
the Environment

State of Maryland Comprehensive Climate Action Plan (CCAP)

Prepared by the Maryland Department of the Environment (MDE) for the United States Environmental Protection Agency's Climate Pollution Reduction Grants Program (CPRG).

July 2025

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ii. Acknowledgements

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- Environmental Protection Agency (EPA)
- EPA Region 3
- Maryland Department of General Services (DGS)
- Maryland Department of Housing and Community Development (DHCD)
- Maryland Department of Natural Resources (DNR)
- Maryland Department of Agriculture (MDA)
- Maryland Department of Transportation (MDOT)
- Maryland Department of Planning (MDP)
- Maryland Energy Administration (MEA)
- Public Service Commission (PSC)
- University of Maryland Center for Environmental Science (UMCES)
- University of Maryland Environmental Finance Center (EFC)
- Maryland Association of Counties (MACo)
- Maryland Municipal League (MML)
- Maryland Commission on Climate Change (MCCC) (and its working groups)
- Building Energy Transition Implementation Task Force
- Green and Blue Infrastructure Policy Advisory Commission
- Commission on Environmental Justice and Sustainable Communities (CEJSC)

- Philadelphia - Camden - Wilmington, PA-NJ-DE-MD: Delaware Valley Regional Planning Commission (DVRPC) and Wilmington Area Planning Council (WILMAPCO)
- Baltimore - Columbia - Towson, MD: Baltimore Metropolitan Council (BMC)
- Washington-Arlington-Alexandria, DC-VA-MD-WV: Washington, DC and Metropolitan Washington Council of Governments (MWCOG)

MDE acknowledges and thanks the many technical assistance partners who continue to support Maryland in its efforts to tackle and reduce climate pollution. The State of Maryland CCAP builds on the work of the following technical assistance partners: University of Maryland - Center for Global Sustainability, Towson University - Regional Economic Studies Institute, Energetics, Vermont Energy Investment Corporation (VEIC), U.S. Department of Energy (DOE), U.S. Environmental Protection Agency (EPA), Lawrence Berkeley National Laboratory, Pacific Northwest National Laboratory, Institute for Market Transformation, Northeast Energy Efficiency Partnerships, Regulatory Assistance Project, University of Maryland - Department of Geographical Sciences, and Sierra View Solutions.

Additionally, MDE thanks the U.S. Climate Alliance and the Convener's Network for coordination efforts and resources developed to assist states in meeting the objectives of the CPRG program.

Most importantly, MDE thanks all individual contributors, stakeholders, and Marylanders that have shared their time, expertise, and input in the development of this CCAP and who will be instrumental in taking the multitude of actions needed to meet the State's nation-leading greenhouse gas reduction goals. Meeting the climate crisis requires the combined and coordinated effort of all Marylanders, companies, nonprofits, communities, and state and local governments.

iii. Executive Summary

This report is the State of Maryland's Comprehensive Climate Action Plan (CCAP) under the U.S. EPA's Climate Pollution Reduction Grant (CPRG). Developed by the Maryland Department of the Environment (MDE), this CCAP meets the requirements of the State of Maryland CPRG Planning Grant.

This CCAP builds directly on the Priority Climate Action Plan (PCAP) delivered to the EPA on March 01, 2024 and *Maryland's Climate Pollution Reduction Plan*[1] released December 28, 2023. Although Maryland has been doing formal climate planning for over fifteen years, the bedrock for Maryland's latest climate plans is the Climate Solutions Now Act (CSNA) of 2022. It is from the CSNA that MDE is given the science-based directive to develop measures that meet Maryland's climate targets to reduce greenhouse gas (GHG) emissions by 60% from 2006 levels by 2031 and produce net-zero emissions by 2045.

MDE partnered with a multitude of stakeholders groups, other governing authorities, national science laboratories, and subject matter experts to analyze the lowest-cost, greatest-benefits pathway to achieve the State's GHG reduction requirements.

The results from these analyses found that:

Fully implementing existing (as of 2023) State and Federal policies could reduce emissions by 51% by 2031. Existing State policies include Advanced Clean Cars II, Advanced Clean Trucks, Building Energy Performance Standards, EmPOWER, Renewable Portfolio Standard (RPS), hydrofluorocarbon rules, landfill methane rules, natural gas industry rules, and zero-emission transit and school bus conversion; and Federal policies such as clean energy tax credits and other investments made possible by the Inflation Reduction Act (IRA).

Fully implementing existing State and Federal policies *plus* expeditiously implementing new sectoral and economywide policies could reduce emissions by 60% by 2031. New State policies to reduce sector-specific emissions include Advanced Clean Fleets, Clean Power Standard (CPS) (100% clean power by 2035), Clean Heat Standard (CHS), Zero-Emissions Heating Equipment Standard (ZEHES), an updated Regional Greenhouse Gas Initiative (RGGI) program, Maryland Department of Transportation (MDOT) investments to reduce vehicle miles traveled (VMT); and incentives for clean energy deployment, electric vehicle purchasing, and emissions reduction/sequestration projects at agricultural, forestry, industrial, and waste management sites. Maryland currently

[1] See *Maryland's Climate Pollution Reduction Plan* here: https://mde.maryland.gov/programs/air/ClimateChange/Pages/Maryland%27s-Climate-Pollution-Reduction-Plan.aspx

participates in a cap-and-invest program, RGGI , covering fossil fuel power plants, which has allowed the State to invest more than a billion dollars in electricity bill assistance and clean energy projects.

Economic analysis found that fully implementing *Maryland's Climate Pollution Reduction Plan* would create significant economic benefits between 2024 and 2031 including:

- $1.2 billion in public health benefits
- $2.5 billion in increased personal income
- $5.3 billion in additional gross domestic product (GDP) in Maryland
- 27,400 additional jobs
- $2,600 to $4,000 reduction in annual energy costs for most households

These significant public health and economic benefits would occur statewide. Air quality would improve everywhere with the greatest improvements occurring in Baltimore City and Prince George's County. New policies would help more Marylanders transition to efficient electric vehicles and heating equipment, saving a family thousands of dollars per year.

This CCAP includes 21 measures (containing 42 existing and new policies) that, if fully implemented, would achieve the State's GHG reduction requirements, reduce household energy costs, improve health outcomes, and grow the economy. It's important to note that some of Maryland's policies achieve their full effect when combined with the other policies. For example, the policies that bring about the transition to electric vehicles become more effective by Maryland's clean and renewable energy policies like the RPS and the CPS.

This CCAP also identifies executive and legislative actions needed to accomplish the State's goals. Legislative actions focus on mechanisms for increasing the State's investments in equitable climate solutions. Executive actions focus on regulatory and program development by the State's executive branch agencies.

Maryland has been a leader in addressing the climate crisis, adopting and pioneering many new measures. Preliminary analysis from the forthcoming triennial State of Maryland GHG Inventory shows statewide GHG emissions have been reduced approximately 29% from 2006 - 2023. In order to reach the State's 2031 target, Maryland will need to increase momentum to achieve an additional 31% reduction over the next six years.

[1] Introduction

Climate change poses an existential threat to every Marylander. The changes in climate from human-caused pollution and human activities – primarily the emissions of GHGs – adversely affects public health, ecological stability, and economic prosperity.

Maryland aims to reduce GHGs emissions by 60% from 2006 levels by 2031 and achieve net-zero emissions by 2045. In addition to the 2031 and 2045 targets, there are many important milestones along the timeline of the state's plan, including 2035 when Maryland aims for its use of electricity to come from 100% clean sources and all new sales of cars, light-duty trucks, and sport-utility vehicles to be zero-emission vehicles.

Both short-term and long-term investments coupled with immediate and persistent action are needed to implement this plan and adequately address the climate crises. While this CCAP can serve as the script, and the work of governments will set the stage and direct, a net-zero emissions goal means that all Marylanders must play a role.

Maryland Context

The influences and consequences of climate change can vary place-to-place based on the characteristics of elevation, soil, vegetation, population, land use, industries, and ecologies, both natural and artificial. This section highlights some characteristics of Maryland that are helpful to understanding climate change across the state as well as the climate action measures selected. Maryland is a Mid-Atlantic state located at the center of the East Coast. Maryland shares borders with Pennsylvania, Delaware, Washington DC, Virginia, and West Virginia. Maryland is home to many waterways, including the Chesapeake Bay, the largest estuary in the United States, and the 405 mile-long Potomac River that runs from the mountains of West Virginia through the highlands of Maryland and Virginia, and the lowlands of DC, Maryland, and Virginia.

Maryland's intricate sideways "F" shape traces over 3,100 miles of coastline and encompasses a wide variety of land types including cityscapes, agricultural lands, countrysides, highlands, mountains, beaches, and islands. The elevation in Maryland ranges from 3,360 feet high at the summit of Hoye-Crest in Garrett County to sea level in the coastal areas. Maryland is approximately 250 miles at its widest, and approximately 100 miles at its longest.

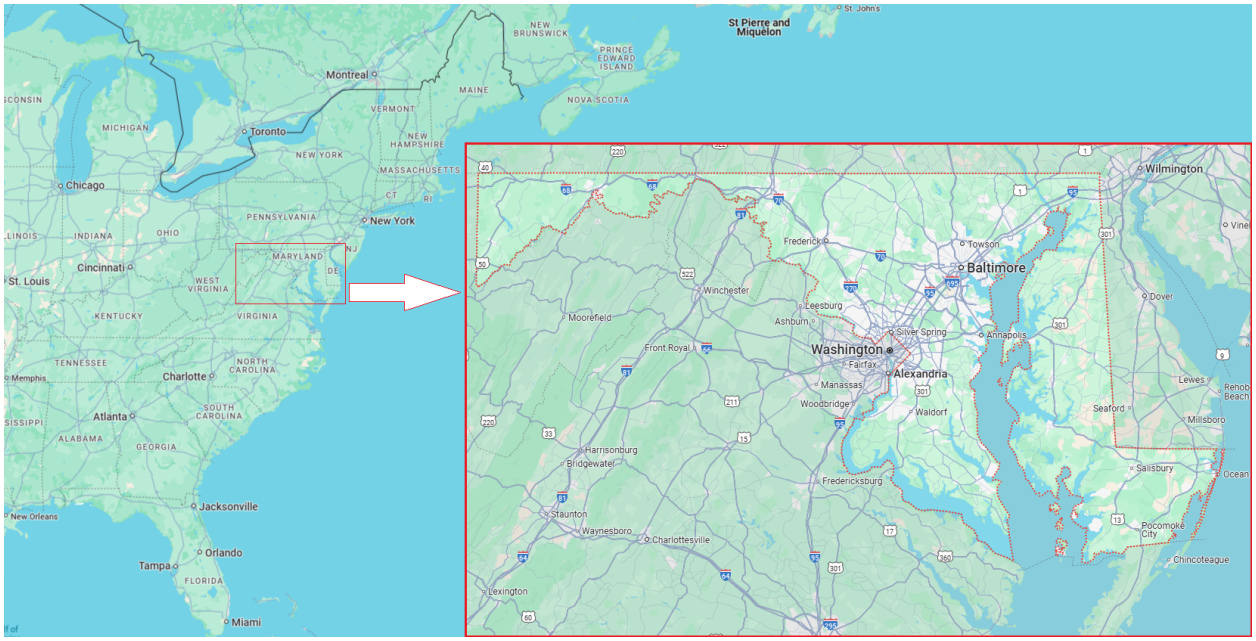

Figure 1. Map of American East Coast, zoomed-in on Maryland using Google Maps.

Maryland's unique geography contributes to a range of climates. The state lies within a temperate, continental zone. There is generally snow in winter, rain in spring, heat and humidity during summer, and a mild crispness in fall.

Geographic, demographic and economic quick facts about Maryland[2]:

- Maryland Population - 6,177,224 (up 7% from 2010)
  U.S. Rank - 18th largest
- Maryland Population Density - 632 persons per square mile
  U.S. Rank - 5th highest
- Maryland Land Area - 12,407 square miles
  U.S. Rank - 42nd largest
- Maryland has 23 counties and one independent city jurisdiction (Baltimore City).
    - 12 Rural Counties, 12 Urban Counties (Including Baltimore City)
- Maryland Median Household Income - $98,700
  U.S. Rank - 3rd highest
- Maryland Net Annual GHG Emissions Per Capita - 12.42 metric tons CO2e[3]

[2] U.S. Census Bureau. "Maryland's Population Grew 7% to 6,177,224 Last Decade." Census.gov, 12 Mar. 2025, www.census.gov/library/stories/state-by-state/maryland.html
[3] Maryland's net 2020 GHG Emissions using 20 year GWP (76.714MMTCO2e) / Population (6,177,224)

Broader context:

- United States Population - 331,449,281 (2020 U.S. Census)
- United States Total Net Emissions - 5,489 MMTCO2e (2022 U.S. EPA[4])
- United States Emissions per Capita - 16.56 metric tons CO2e

The Influences and Consequences of Climate Change on Maryland

Figure 2. Allegany County flash flood, May 2025. (Source: Allegany County Government)

In the near term, Maryland's climate will continue to get warmer, wetter, and wilder. Greater extremes in temperature and precipitation will lead to intensified heat waves, droughts, storms, and floods. Maryland's low-lying farms will be increasingly affected by saltwater intrusion resulting from global sea-level rise, compounded by regional land

[4] US EPA Inventory of U.S. Greenhouse Gas Emissions and Sinks. Accessed June 4, 2025 https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks

sinking. Islands throughout the Chesapeake Bay and much of Dorchester County could be completely lost to the sea by the end of this century. Maryland's climate in 50 years could resemble Mississippi's climate today.

This CCAP contains the state-level policies that can shape our economy and highlights how making the necessary changes to address climate will be much less of giving things up and more of upgrading. For example, heat pump appliances, zero-emission vehicles, and climate-smart buildings come with high-benefits for the environment and health, and typically have a lower total cost of ownership compared to their fossil fuel counterparts. The policies in this plan result in an annual energy cost reduction range of $2,600-$4,000 for most Maryland households.

CPRG Program Overview

The U.S. EPA's CPRG Program, authorized under §60114 of the IRA, is a two-phase program that provides technical assistance, guidance, and grant funding to states, territories, local governments, and tribes to address climate change through climate planning and the implementation of high-priority, high-reduction GHG emission projects. Five billion dollars under the IRA was appropriated for the CPRG program.

Phase 1 of the CPRG Program provided $250 million for non-competitive Planning Grants. The climate action plans developed in Phase 1 incorporate measures to reduce GHG emissions across all sectors of the economy (electricity generation, industry, transportation, buildings, agriculture, natural and working lands, and waste management). Planning Grants, awarded in mid-2023, have a four-year grant performance period.

There are three main deliverables under the CPRG Planning Grant: a PCAP due in year one, a CCAP due at the halfway point, and a Status Report due at the conclusion of the grant period in July of 2027. MDE is leading the Planning Grant for the State of Maryland, focusing statewide with local and regional coordination.

The purpose of the PCAP was to identify high-priority, near-term, implementation-ready GHG reduction measures[5]. The PCAP was delivered March 1, 2024 and is hosted on MDE's CPRG webpage[6]. This CCAP builds on the PCAP, updating and expanding certain plan elements, and adds new elements such as a workforce planning analysis.

Phase 2 of the CPRG Program provided approximately $4.6 billion for competitive Implementation Grants to carry out the execution of high-priority GHG reduction

[5] A measure is a policy, program, action, or a grouping of two or more, containing a specific, tangible action(s) that will reduce emissions. Measures have clear responsible parties and quantifiable attributes.
[6] See Maryland's CPRG webpage here: https://mde.maryland.gov/programs/air/ClimateChange/Pages/CPRG.aspx

measures identified in the Phase 1 planning efforts. Implementation Grants were open to grantees that developed a PCAP under Phase 1 of the CPRG program. Local governments that did not directly receive a planning grant were also eligible to compete for funds to implement measures included in an applicable PCAP.

Maryland led or participated in four competitive Implementation Grant applications; two applications were awarded funding.

- Clean Corridor Coalition[7] (Measure 6)
  Awarded approximately $249,000,000
    - This New Jersey-led multi-state coalition application includes Maryland, Connecticut, and Delaware. This coalition is implementing electric vehicle charging infrastructure for commercial medium and heavy-duty zero-emission vehicles along the I-95 corridor and adjacent roadways from Connecticut to Maryland.
- Atlantic Conservation Coalition[8] (Measures 19, 20, & 21)
  Awarded approximately $421,000,000
    - This North Carolina-led multi-state coalition includes South Carolina, Virginia, and Maryland. This coalition is implementing natural carbon sequestration through the protection and restoration of highly threatened, high-carbon coastal habitats, and forests with the greatest carbon sequestration potential and/or heat island abatement co-benefit.
- Building Energy Performance Standards Clean Buildings Accelerator (Measure 9)
  Not Awarded
    - Partnering with the District of Columbia, MDE led the submission for the Clean Buildings Accelerator project. This coalition application aimed to enhance and accelerate Building Energy Performance Standards (BEPS) implementation, focusing on low-income and disadvantaged communities. $195,000,000 was requested to implement this project.
- States Supporting Resilient Local Energy Systems (Measure 2)
  Not Awarded
    - Led by Hawaii, Maryland joined 14 other states requesting funds to purchase and install solar panels and grid battery storage and other

[7] Learn more about the Clean Corridor Coalition here: https://dep.nj.gov/drivegreen/cprg-ccc/
[8] Learn more about the Atlantic Conservation Coalition here: https://www.epa.gov/inflation-reduction-act/states-north-carolina-maryland-and-south-carolina-and-commonwealth-virginia

zero-emission and resilient energy technologies. $500,000,000 was requested to implement this project.

The planning, coordination, and action supported by the CPRG program will help to ensure that Maryland's continued response to the climate crisis and transition to a clean energy economy is robust and equitable.

CCAP Purpose and Scope

This CCAP includes measures that address GHGs in all sectors of the economy. These measures represent the statewide policies that, if fully implemented, will enable the necessary actions for Maryland to achieve its climate targets of a 60% reduction in GHG emissions by 2031 and net-zero emissions by 2045.

The following elements are included in this CCAP:

- GHG Inventory
- GHG Reduction Targets
- GHG Emission Projections
- GHG Reduction Measures
- Benefits Analysis
- Low Income / Disadvantaged Communities (LIDAC) Benefits Analysis
- Review of Authority to Implement
- Workforce Planning Analysis
- Intersection with Other Funding Availability
- Interagency and Intergovernmental Coordination
- Public and Stakeholder Engagement

This CCAP includes 21 climate action measures that were synergistically designed to reduce GHG emissions and the associated co-pollutants while increasing GHG removals to promote public health, protect our environment, and ensure a strong green economy.

- MEASURE 1: Clean Economy Standard
- MEASURE 2: Increasing Renewable and Clean Energy

- MEASURE 3: Regional Greenhouse Gas Initiative (RGGI)
- MEASURE 4: Clean Power Standard (CPS)
- MEASURE 5: Advanced Clean Cars II (ACC II)
- MEASURE 6: Advanced Clean Trucks (ACT)
- MEASURE 7: Advanced Clean Fleets (ACF)
- MEASURE 8: Maryland Transportation Plan and Carbon Reduction Strategies
- MEASURE 9: Building Energy Performance Standards (BEPS)
- MEASURE 10: EmPOWER
- MEASURE 11: Zero-Emission Heating Equipment Standard (ZEHES)
- MEASURE 12: Clean Heat Standard (CHS)
- MEASURE 13: Hydrofluorocarbon Regulations
- MEASURE 14: Control of Methane Emissions from the Natural Gas Industry
- MEASURE 15: Buy Clean
- MEASURE 16: Landfill Methane Regulations
- MEASURE 17: Sustainable Materials Management
- MEASURE 18: State Incentives for Agricultural Decarbonization
- MEASURE 19: Agricultural Resource Conservation and Management
- MEASURE 20: Afforestation and Improved Forest Management
- MEASURE 21: Coastal Wetland Restoration and Management

Approach to the CCAP

The State of Maryland CCAP builds on MDE's fifteen years of GHG inventory and reduction planning experience and was developed based on the following foundational inputs:

- Existing statewide GHG inventories
- Prior statewide climate action plans

- Maryland's Climate Pathway Report[9] (June 2023)
- Stakeholder feedback on Maryland's Climate Pathway Report[10]
- *Maryland's Climate Pollution Reduction Plan* (December 2023) to achieve 60% GHG emissions reductions by 2031 and attain "net zero" by 2045 (goals set by legislation). The statewide and economy-wide plan provides the analytical and policy framework to structure Maryland's PCAP and CCAP.
- Stakeholder input, including over 300 GHG emission reduction measures/projects assembled by MDE from eligible agencies, jurisdictions, and stakeholders.
- State of Maryland PCAP[11]

The State of Maryland's CCAP covers the geographical scope of the entire state of Maryland, inclusive of the Maryland jurisdictions additionally covered by other CPRG Planning Grants. In addition to the CPRG Planning Grant for the State of Maryland, led by MDE, there are three metropolitan statistical area (MSA) regional planning groups that were awarded a CPRG Planning Grant. More information on these entities and efforts can be found in Section 9, under the "Regional and Local Coordination" sub-heading.

[9] See Maryland's Climate Pathway Report here: https://mde.maryland.gov/programs/air/ClimateChange/Documents/MARYLANDS%20PATHWAY%20REPORT%20AND%202031%20GHG%20PLAN/Maryland%27s%20Climate%20Pathway%20Report.pdf

[10] View stakeholder feedback on Maryland's Climate Pathway Report here: https://mde.maryland.gov/programs/air/ClimateChange/Pages/Outreach-Results-on-2031-GHG-Reduction-Planning.aspx

[11] See Maryland's PCAP here: https://mde.maryland.gov/programs/air/ClimateChange/CLIMATE%20POLLUTION%20GRANTS/State%20of%20Maryland%20CPRG%20Priority%20Climate%20Action%20Plan%20(PCAP).pdf

[2] GHG Inventory

Inventory Methodology

The Greenhouse Gas Emissions Reduction Act of 2009 (GGRA; Maryland Code, Environment Article §2-1203) requires MDE to prepare and publish an updated inventory of statewide GHG emissions and removals on a three-year cycle. Published Maryland State GHG inventories include the 2006 base year inventory, and the 2011, 2014, 2017 and 2020 triennial inventories.

The GHG inventory is typically published approximately 1.5 years after the close of the reporting year due to the cadence of publishing for federal input data sets. At the time of this writing, a preliminary 2023 inventory has been produced and will be finalized once the remaining federal government data sets on which it depends become available; the inventory is expected to be published in September of 2025. Discussed in the sub-sections below are some key takeaways from the 2023 inventory, along with results of the published inventories, with the caveat that the 2023 results are preliminary.

Maryland's GHG inventory tracks carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6) emissions and CO_2 sinks occurring in the state across all economic sectors — electricity, transportation, buildings, industry (including fossil fuel industry), waste, agriculture, and forestry and land use — and from out-of-state electricity generation consumed in the state. The methodology for emissions quantification is based on EPA's State Inventory Tool, augmented with state-specific emission factors and alternative estimation methods for some sectors. Examples of alternative methods include the use of reported facility-level emissions for power plants, landfills, incinerators, and cement plants, modeling for on-road transportation and non-road equipment using the EPA MOtor Vehicle Emission Simulator (MOVES) model, and the use of high-resolution remote sensing data together with an ecosystem model to estimate the CO_2 emissions or removals associated with changes in the amount of forest and tree biomass.

As required by the CSNA, Maryland's GHG inventory reports emissions in carbon dioxide equivalents (CO_2e) using a global warming potential (GWP) considered over a 20-year time horizon. Emissions are also presented using a GWP over a 100-yr time horizon, consistent with conventional national and international inventory protocols. The 20-yr GWP emissions are to be used in evaluating progress toward Maryland's GHG reduction goal.

Inventory Results, Trends, and Analysis

Interactive inventory results and complete spreadsheets are available on MDE's website[12].

For the Maryland economy as a whole, gross GHG emissions decreased steadily from 2006 to 2020 (Figure 3). Around three-fourths of the reductions came from the electricity sector, with transportation and industry also making sizable contributions of around one-tenth each. Emissions in 2020 were 30% below the baseline, which exceeds the 25% reduction by 2020 required by the GGRA. COVID-19 restrictions had some downward influence on those emissions, though MDE estimates that the emissions would have still been at least 25% below the baseline absent the pandemic impacts. According to the preliminary 2023 inventory, overall emissions were essentially unchanged in 2023 relative to 2020 (Figure 4). That lack of trend is due to a continuation of the long-term decline being offset by a rebound from the COVID-19 dip (mainly in the transportation sector).

CO_2 made up more than three-fourths of Maryland's GHG emissions in 2020, while methane contributed 15% and the other gases contributed lesser amounts (Figure 5).

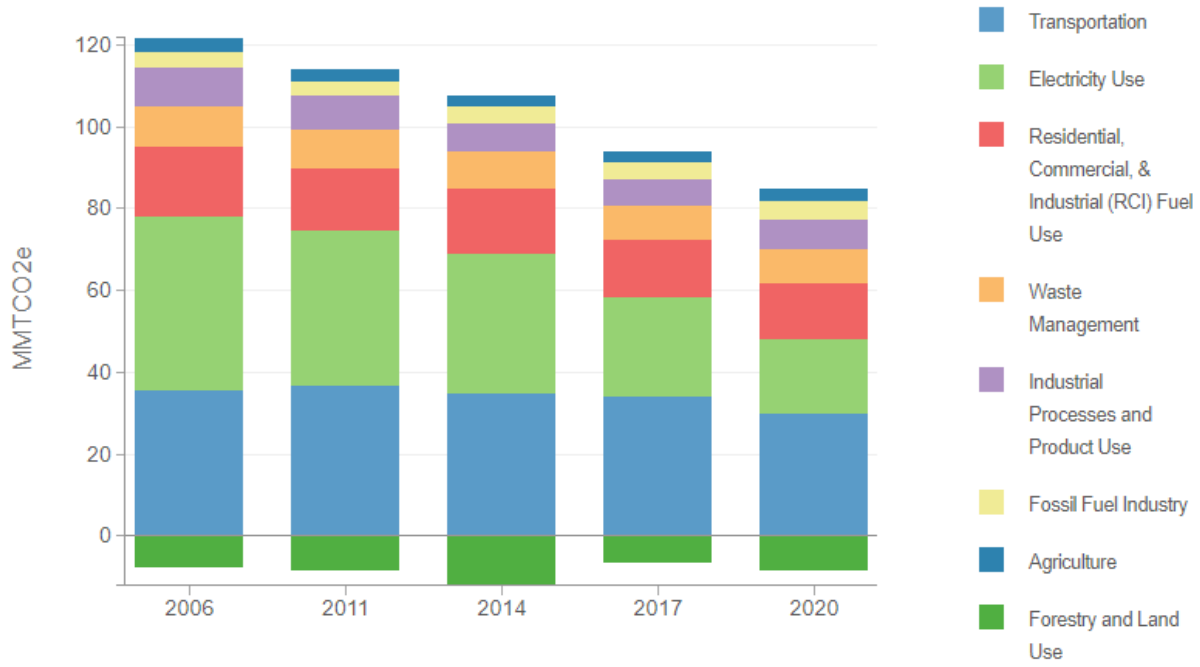

Figure 3. Maryland GHG Emissions and Sinks Trends by Sector

[12]"Greenhouse Gas Inventory." Maryland Department of the Environment, mde.maryland.gov/programs/air/ClimateChange/Pages/GreenhouseGasInventory.aspx.

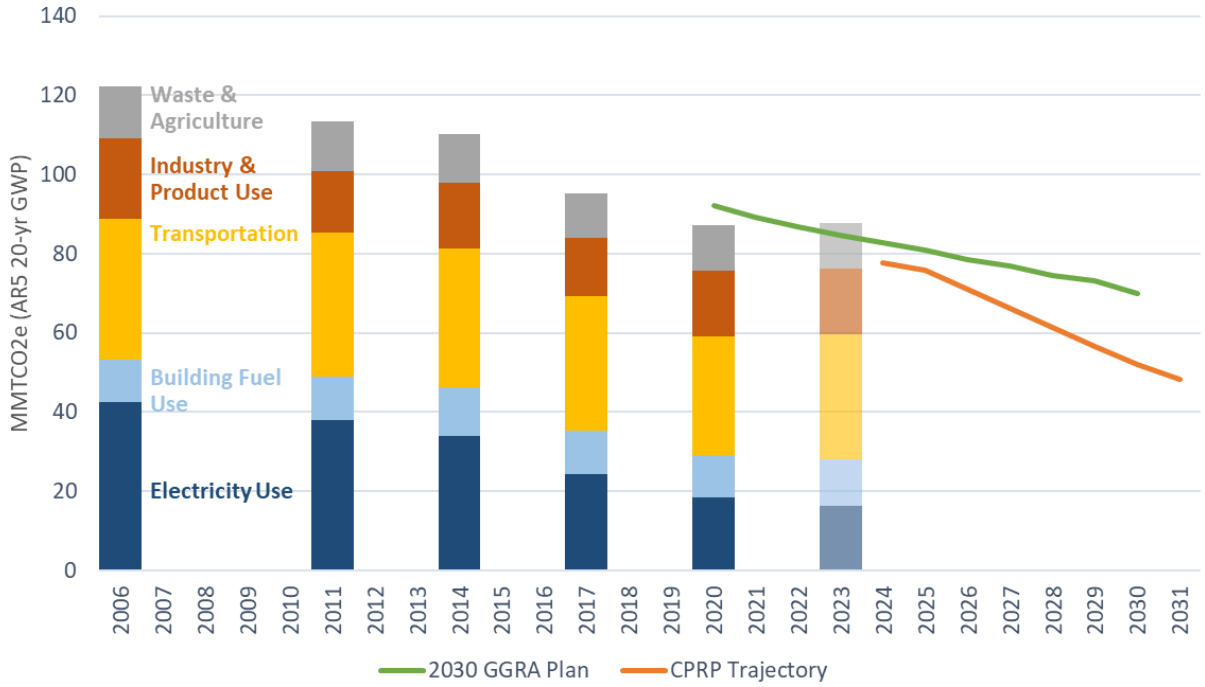

Figure 4. Maryland Gross GHG Emissions Trend Including Preliminary 2023 Estimates.

Note that the economy-wide emissions differ slightly between Figures 3 and 4 due to a revision in the HFC emissions estimate (in the industrial product use sub-sector) after publication of the 2020 inventory that affects the years 2014-2020. In Figure 4, the green line represents the target trajectory for total emissions under the older 2030 GGRA Plan, and the orange line is the trajectory (up to year 2031) under the newer *Maryland's Climate Pollution Reduction Plan*.

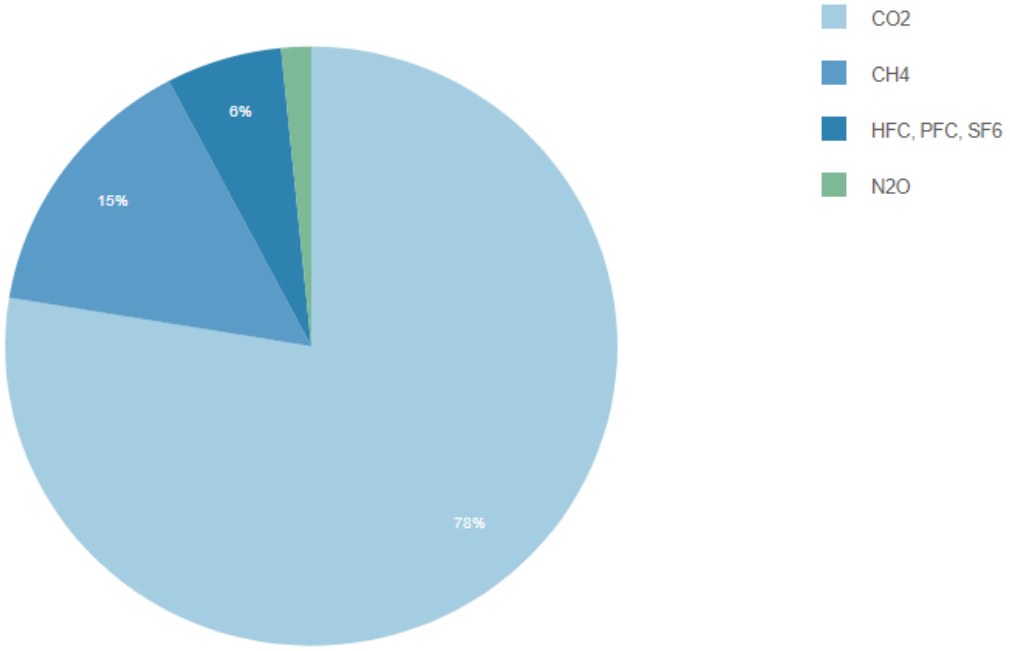

Figure 5. Gross GHG Emissions Breakout by Gas for 2020

Electricity

In 2020, electricity consumption accounted for 21% of Maryland's gross GHG emissions (Figure 3). While this may seem like a large amount, the electricity sector has made significant progress since 2006, when it accounted for 35% of emissions. The GHG reductions in this sector can be attributed to programs that reduce total electricity demand, programs aimed at reducing the carbon intensity of the electricity consumed, and wholesale electricity market trends, including the large-scale replacement of coal-fired power plants with cleaner sources of electricity.

In Maryland, reduced energy demand results from energy efficiency and conservation, which is driven by the EmPOWER Maryland program, building energy codes and standards, and other policies. To reduce the carbon intensity of the electricity generated, the state relies on the RPS and other clean energy initiatives to incentivize renewable energy generation. In addition, RGGI and other pollution control programs reduce CO_2 emissions from fossil fuel-fired energy generation, also impacting the carbon intensity of the electricity. The combination and interaction between these programs lowers the emissions intensity of both in-state electricity generation and imported electricity.

Reaching Maryland's clean energy goals is made easier with incentives funded through the IRA. The Renewable Energy Production Tax Credit is an IRA-funded program providing a per kilowatt-hour (kWh) tax credit for electricity generated by solar and other

qualifying technologies for the first 10 years of a system's operation. The current Investment Tax Credit reduces federal income tax liability for a percentage of the cost of an eligible renewable energy system that is installed during the tax year. Importantly, the IRA also expanded the eligibility for these tax credits, so they can now be utilized by tax-exempt entities and local governments through direct pay provisions, by homeowners installing rooftop solar or residential wind systems, and by more traditional commercial entities. Both tax credits also receive bonuses for domestic content and siting in an energy community.

Transportation

The transportation sector accounted for 35% of Maryland's GHG emissions in 2020 with most emissions (82%) in this sector coming from on-road vehicles powered by gasoline or diesel. Non-road and other emissions, which are relatively minor compared with on-road emissions, come from vehicles, including airplanes, trains, marine vessels, farming equipment, recreational vehicles, and other motorized vehicles that do not operate on public roads. On-road passenger vehicle miles traveled (VMT) and air travel in 2023 had rebounded from the 2020 COVID dip, though not fully back to pre-COVID levels.

On-road gasoline and diesel emissions have decreased steadily and will continue to decrease with the influx of vehicles meeting federal Corporate Average Fuel Economy (CAFE) standards and increased demand for EVs. Emissions from heavy-duty diesel vehicles have remained more or less unchanged since 2006.

Buildings

Direct fuel use in the building sector accounted for 16% of Maryland's GHG emissions in 2020. This includes emissions from burning fuel for space heating, water heating, cooking, and industrial heating processes. Buildings also use almost all the electricity consumed in the state; thus, improving energy efficiency to reduce electricity consumption and fuel use is a key strategy for addressing climate change and reducing energy costs for consumers.

Maryland's 2030 GGRA Plan called for the state to accelerate the transition of fossil fuel heating equipment in buildings to efficient electric equipment that can be powered by clean electricity. Using electric, zero-emission appliances for space heating, water heating, and cooking is common throughout Maryland and the rest of the nation. Several current policies, described in Section 5, already support reductions in fossil fuel combustion from these end-uses as well as the transition from fuel-burning to zero-emission equipment in buildings.

Industry

Industrial processes and product use (IPPU), industrial fuel use, and direct emissions from the fossil fuel industry, which are three different sectors in Maryland's GHG Inventory, comprised 18.3% of Maryland's GHG emissions in 2020. The five largest sources of industrial emissions are:

- Hydrofluorocarbon (HFC) and perfluorocarbon (PFC) emissions from their use primarily in cooling and refrigeration equipment (5.2 $MMTCO_2e$ in 2020)
- Methane (CH_4) emissions from leaks in natural gas infrastructure (3.1 $MMTCO_2e$ in 2020)
- CO_2 emissions from fossil fuel use in industrial facilities (2.7 $MMTCO_2e$ in 2020)
- CO_2 emissions from the calcination of limestone in the manufacturing of cement (1.8 $MMTCO_2e$ in 2020)
- CO_2 emissions from generators used to produce liquified natural gas (1 $MMTCO_2e$ in 2020)

Within the IPPU sector, approximately 96% of emissions come from two sources: cement manufacturing and the use of HFCs for cooling and refrigeration equipment. A small number of emissions comes from limestone use, soda ash use, non-fertilizer usage of urea, and sulfur hexafluoride (SF_6) use for electric power transmission and distribution systems.

Within the industrial fuel use sector, emissions were evenly split between coal, oil, and natural gas in 2020. Practically all the coal used in the industrial sector is used by two cement manufacturing plants, while almost all the oil and gas is consumed by non-cement industries.

Within the fossil fuel industry, most of the direct emissions are from the natural gas industry, which includes the in-state emissions from the production, transmission, and distribution of natural gas. A small portion of emissions is from coal mining, which includes underground and surface mines and abandoned mines.

Waste

The waste sector accounted for 10% of Maryland's GHG emissions in 2020. This sector includes emissions from landfills, wastewater management, waste combustion, and residential open burning. Emissions have decreased since 2006, though they were up in

2023 relative to 2020 due to an estimated 14% increase in landfill emissions. Note that the 2023 emissions may not yet reflect the strengthened state requirements and standards for landfill gas that went into effect in June of that year.

Agriculture

The agriculture sector represented 4% of the state's GHG emissions in 2020. This sector includes emissions from enteric fermentation (i.e., methane emissions from cattle), manure management, and nutrient application. Emissions from the combustion of fossil fuels in agricultural equipment are not included in this sector as they are already accounted for under building fuel use and non-road transportation. Reductions in atmospheric CO_2 from carbon sequestration in soils are included in the forestry and land use sector along with other emissions and sinks.

Forestry and Land Use

The forestry and land use sector includes a combination of GHG emissions sources and sinks, which makes it unique from other sectors. GHG emissions in this sector include CH_4 and N_2O emissions from wildfires and prescribed forest burns, N_2O from the application of synthetic fertilizers to settlement soils, and CH_4 from reservoirs and coastal wetlands. Potential net GHG sinks (carbon sequestration pathways) in this sector include the carbon flux in forested and treed landscapes; carbon stored in harvested wood products, wood in landfills, and landfilled yard trimmings and food scraps; carbon flux in agricultural soils; and carbon flux in coastal (tidal) wetlands and submerged aquatic vegetation. This sector is not included in Maryland's gross emissions accounting and is instead factored into Maryland's net emissions calculation for 2045.

In 2020, the forestry and land use sector counteracted 9% of Maryland's gross GHG emissions by removing 8.34 $MMTCO_2e$ from the atmosphere. While this number is variable year to year, due to differences in rates of forest growth largely influenced by weather and natural or human-induced disturbance, this value is very similar to the long-term average. The carbon sequestration potential of the agricultural sector can be maximized through the expansion of the Maryland Department of Agriculture's (MDA) resource conservation programs, which increase the rate of best management practice adoption across Maryland's croplands. Further GHG sink enhancements in this sector can be achieved through the expansion of forestry programs involving forest conservation, improved forest management, and reforestation facilitated by Maryland Department of Natural Resources (DNR) and other agency partners.

[3] Near & Long-term GHG Reduction Targets

GHG Targets – 2031 & 2045

Maryland has long been a leader in addressing the causes of climate change, beginning with the establishment of the Maryland Commission on Climate Change in 2007, and has reduced GHG emissions faster than most other states while cleaning the air, improving public health, and strengthening the economy. In 2022, the Maryland General Assembly passed the CSNA establishing the most ambitious GHG reduction goals of any U.S. state. Maryland is required to reduce statewide GHG emissions 60% from 2006 levels by 2031 and achieve net-zero emissions by 2045. Net-zero emissions means that the total GHG emissions from Maryland's economy will be equal to the GHGs removed from the atmosphere through natural and technological systems annually.

Sectoral Breakdown

Required emissions and percentage reductions in the target years are shown by sector in Table 1, based on the integrated assessment modeling conducted for *Maryland's Climate Pollution Reduction Plan*. Details on the modeling and the policy measures accounted for can be found in Sections 4 and 5 below.

Table 1. Sectoral Emissions for Achieving Reduction Targets

Sector	2006 Base Year Emissions ($MMTCO_2e$)	2031 Target Emissions ($MMTCO_2e$)	% Reduction 2006 to 2031	2045 Target Emissions ($MMTCO_2e$)	% Reduction 2006 to 2045
Electricity	43	4.9	89	0.9	98
Transportation	36	19	46	6.1	83
Residential Buildings	6.2	3.7	41	1.1	82
Commercial Buildings	4.5	3.2	29	0.4	92
Industrial Processes and Product Use	9.4	5.4	43	1.5	84
Industrial Fuel Use	6.4	1.1	83	1.0	84
Fossil Fuel Industry	3.9	2.6	34	1.2	69
Waste Management	10	5.7	43	5.4	45
Agriculture	3.2	2.9	12	2.8	12
Gross Emissions	**121.7**	**48.5**	**60**	**20.5**	**83**

[4] Business as Usual (BAU) GHG Emission Projections

BAU Projections Methodologies

The University of Maryland Center for Global Sustainability was contracted by MDE to evaluate options for achieving the state's requirements to reduce GHG emissions and, with supplemental analysis from the Regional Economic Studies Institute at Towson University , identify economic impacts from these actions. Those modeling analyses have been incorporated into the 2023 *Maryland's Climate Pathway Report*, the 2023 *Maryland's Climate Pollution Reduction Plan*, Maryland's PCAP, and now, the CCAP. The integrated assessment modeling of the energy and economic system and associated GHG and criteria pollutant emissions conducted by University of Maryland Center for Global Sustainability employed a U.S. focused version of the Global Change Analysis Model (GCAM)[13], GCAM-USA.

Given that Maryland has a history of planning and implementing climate pollution mitigation actions, the BAU projection accounts for policies that are already in effect or have been legislated, with the expectation that they will continue or will be fully implemented. The set of "Current Policies" include Advanced Clean Cars II, Advanced Clean Trucks, Building Energy Performance Standards, EmPOWER, RPS, hydrofluorocarbon rules, landfill methane rules, natural gas industry rules, and zero-emission transit and school bus conversion; and Federal policies such as clean energy tax credits and other investments made possible by the IRA.

BAU Projections Results

The overall trajectory for GHG emissions under the BAU projection is shown in Figure 6. Current policies will reduce emissions 51% by 2031.

[13] View the GCAM overview here: https://jgcri.github.io/gcam-doc/overview.html

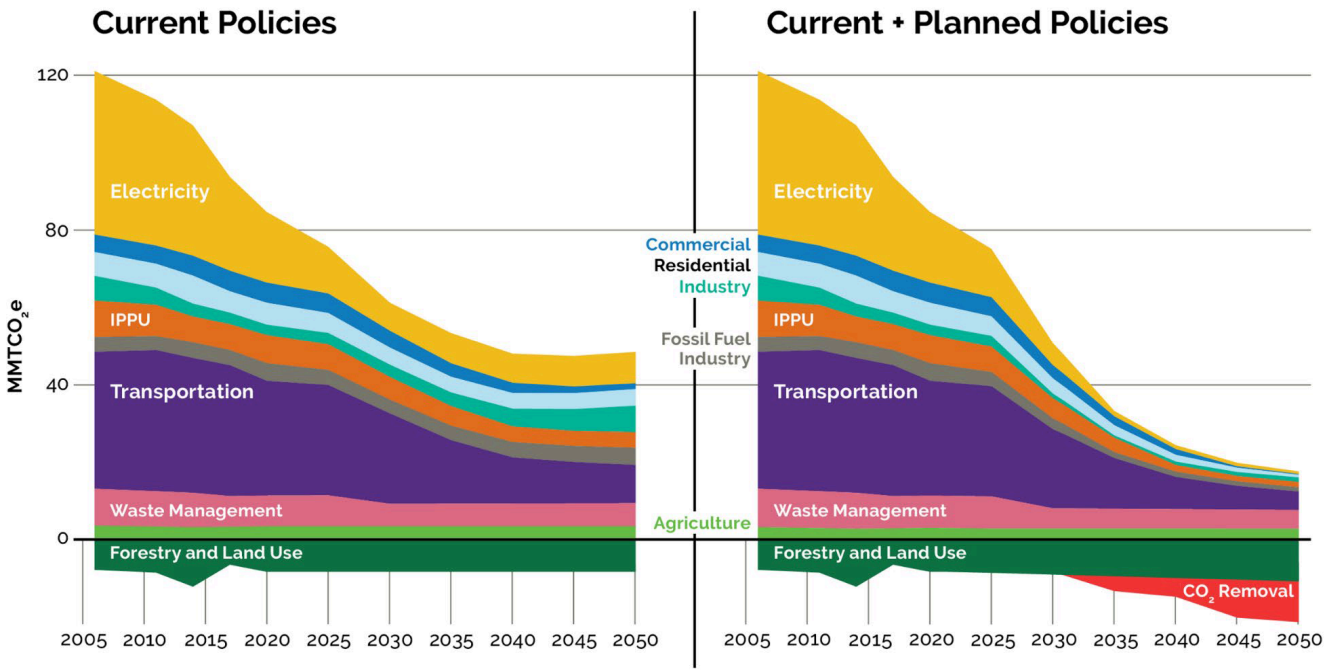

Figure 6. Maryland's statewide GHG emissions and sequestration trends, historical and projected, from 2006 to 2050 based on current and new policies.

[5] GHG Emission Reduction Measures and Implementation Scenario Projections

New policies will transition the state from the fossil fuel era of the past to a clean energy future. Marylanders will benefit from cleaner air, improved public health, lower energy costs, and more jobs with higher wages, as detailed in Sections 6 through 8. Core policies of the December 2023 *Maryland's Climate Pollution Reduction Plan* were aligned based on the GHG modeling for the State's Climate Plan to the 21 measures in this CCAP to meet the quantification requirements of the CPRG Program. The key measures and policies are summarized and described in this section. All measures and policies in this plan cover the geographic scope of the entire State of Maryland.

GHG Emission Reduction Measures Summary

Table 2. Summary of GHG Reduction Measures

Economy-wide	
CCAP MEASURE 1: Clean Economy Standard	**Clean Economy Standard** (new) - Directs the state to provide incentives, set sectoral standards, and set economy-wide standards to reduce GHG emissions. **Expanded Strategic Energy Investment Fund** (current, modified) - Distributes funding from Maryland's participation in RGGI(see Measure 3) and other programs to provide incentives for decarbonization projects across different sectors of Maryland's economy. **New Funding Sources** (potential) - Provides approximately $1 billion annually for new state investments in equitable climate action.
Electricity	
CCAP MEASURE 2: Increasing Renewable and Clean Energy	**RPS** (current, modified) - Requires approximately 50% of electricity consumed in Maryland to be generated by renewable resources by 2030 and modifies definitions of qualifying resources. **POWER Act** (current) - Sets a goal for the state to build 8,500 megawatts of offshore wind energy capacity by 2031. **Energy Storage Act** (current) - Sets a goal for Maryland to have 3,000 megawatts of energy storage capacity by 2033.

	Community Solar Act (current) - Requires community solar projects constructed under the program to dedicate 40% of energy output to LMI subscribers. Latest legislation removes the cap on the amount of community solar capacity that Maryland can deploy, constraining it only by the state's statutory net energy metering limit of 3,000 megawatts. **State Incentives for Renewable Energy** (current) - Provides robust incentives for a wide range of renewable energy projects.
CCAP MEASURE 3: RGGI	**RGGI** (current, modified) - Maryland's existing cap and invest program, which limits emissions from fossil fuel power plants and invests proceeds in Maryland communities, generated $151 million in 2022. Maryland is advocating for a stronger regional pollution cap aligned with Maryland's and partner states' 100% clean energy goals in ongoing multistate deliberations and planning to remove offsets and certain exemptions.
CCAP MEASURE 4: Clean Power Standard	**Clean Power Standard** (new) - 100% of the electricity consumed in Maryland to be generated by clean and renewable sources of energy by 2035.
Transportation	
CCAP MEASURE 5: Advanced Clean Cars II	**Advanced Clean Cars II** (current) - Requires 100% of new cars, light-duty trucks, and sport utility vehicles (SUVs) sold in Maryland to be ZEVs by 2035. **Zero-Emission Vehicle Infrastructure Plan** (current) - A comprehensive plan to further develop Maryland's charging infrastructure for zero-emission vehicles (ZEVs). **State Incentives for Purchasing EVs** (current) - Provides a point-of-sale rebate to lower the upfront cost of buying new and used EVs and provides bonus rebates to low and moderate income Marylanders.
CCAP MEASURE 6: Advanced Clean Trucks	**Advanced Clean Trucks** (current) - Requires certain types of medium and heavy-duty trucks sold in Maryland to be ZEVs in certain years. **ZEV School Buses** (current) - Requires school districts to purchase or contract for the use of ZEV school buses starting in 2024, provided that federal, state, or private funding is available to cover incremental costs, relative to non-ZEV buses.
CCAP MEASURE 7: Advanced Clean Fleets	**Advanced Clean Fleets** (potential) - Requires specific high-priority fleets of medium and heavy-duty vehicles to transition to ZEVs.
CCAP MEASURE 8: Maryland Transportation Plan	**Maryland Transportation Plan** (new) - Aims to reduce vehicle miles traveled (VMT) per capita by 20% through infrastructure and programmatic investments. Also aims to minimize fossil fuel

and Carbon Reduction Strategies	consumption, reduce GHG emissions, and improve air quality from the transportation sector. **ZEV Transit Buses** (current) - Requires state-owned transit buses to transition to ZEVs. **Off-Road Zero-Emission Vehicle Upgrades** (new) - Accelerating the widespread adoption of zero-emission off-road/non-road electric equipment at port facilities, aviation facilities, rail facilities and other non-road transportation modes.
Buildings	
CCAP MEASURE 9: Building Energy Performance Standards	**Building Energy Performance Standards** (current) - Requires certain buildings 35,000 square feet or larger to achieve specific energy efficiency and direct emissions standards, including achieving net-zero direct emissions by 2040. **State Government Lead by Example** (current) - Requires all-electric new construction and other emission reduction measures for state-owned buildings. **State Incentives for Building Decarbonization** (current, modified) - Provides substantial new funding for projects that improve energy efficiency and reduce emissions from residential, commercial, and institutional buildings statewide.
CCAP MEASURE 10: EmPOWER	**EmPOWER** (current, modified) - Requires utility companies and the state government to help customers improve energy efficiency and reduce GHG emissions, including through beneficial electrification.
CCAP MEASURE 11: Zero-Emission Heating Equipment Standard	**Zero-Emission Heating Equipment Standard** (new) - Requires new space and water heating systems to produce zero direct emissions starting later this decade. **Energy Codes and Standards** (current) - Requires the state to adopt the latest version of the International Energy Conservation Code, with possible amendment, within 18 months of issuance. **EV-Ready Standards for New Buildings** (current, modified) - Requires EV charging equipment to be installed during the construction of single-family detached houses, duplexes, and townhouses, and extends new requirements to multifamily buildings.
CCAP MEASURE 12: Clean Heat Standard	**Clean Heat Standard** (new) - Requires clean heat measures to be deployed in buildings at the pace required to achieve the state's GHG reduction requirements.

	Gas System Planning (new) - Requires natural gas utility companies to plan their gas system investments and operations for a net-zero emissions future.
Industry	
CCAP MEASURE 13: Hydrofluorocarbon Regulations	**Hydrofluorocarbon Regulations** (current) - Prohibits the use of certain products that contain particular chemicals with high global warming potential (GWP). **State Incentives for Industrial Decarbonization** (current, modified) - Supports decarbonization activities in Maryland's industrial sector.
CCAP MEASURE 14: Control of Methane Emissions from the Natural Gas Industry	**Control of Methane Emissions from the Natural Gas Industry** (current) - Requires methane emissions from natural gas transmission and storage facilities to be mitigated through fugitive emissions detection and repair.
CCAP MEASURE 15: Buy Clean	**Buy Clean** (current) - Requires producers of cement and concrete mixtures to submit environmental product declarations to the state and for the state to establish a maximum acceptable global warming potential (GWP) values for each category of eligible materials.
Waste	
CCAP MEASURE 16: Landfill Methane Regulations	**Landfill Methane Regulations** (current) - Requires landfills to detect and repair landfill gas leaks and operate emission control systems to reduce methane emissions.
CCAP MEASURE 17: Sustainable Materials Management	**Sustainable Materials Management** (current) - Sets goals for GHG emissions reductions, material-specific recycling rates, and overall statewide recycling and waste diversion rates. **Food Residuals Diversion Law** (current) - Requires businesses that generate at least one ton of food residuals per week to separate the food residuals from other solid waste and ensure that the food residuals are composted. **State Incentives for Waste Sector Decarbonization** (current, modified) - Provides substantial funding for waste sector decarbonization activities.
Agriculture	
CCAP MEASURE 18: State Incentives for Agricultural Decarbonization	**State Incentives for Agricultural Decarbonization** (current, modified) - Provides additional funding for decarbonization activities in Maryland's agricultural sector.
Forestry and Land Use	

CCAP MEASURE 19: Agricultural Resource Conservation and Management	**Agricultural Resource Conservation Programs** (current) - Supports farmers in adopting best management practices that improve soil health and increase carbon sequestration on agricultural lands.
CCAP MEASURE 20: Afforestation and Improved Forest Management	**Forest Management** (current) - Promotes tree planting activities and sustainable forestry management practices on public and private forest lands in Maryland. **Maryland 5 Million Trees Initiative** (current) - Requires the state to plant and maintain five million native trees in Maryland by 2031, with at least 10% of these trees located in urban underserved areas of the state. **Forest Preservation and Retention Act** (current) - Requires that when forested land is lost to development, it is either replaced through planting new trees or compensated for through conserving existing forest. **State Incentives for Forestry and Land Use** (current, modified) - Provides additional support for activities that promote enhanced carbon sequestration in Maryland's forestry and land use sector.
CCAP MEASURE 21: Coastal Wetland Restoration and Management	**Coastal Wetland Restoration and Management** (current) - Maximizes carbon sequestration and coastal resilience benefits by protecting and restoring coastal wetlands.

Implementation Scenario Projections

The overall trajectory for GHG emissions when all 21 measures are implemented is shown in Figure 6. More detailed breakdowns are shown sector-by-sector in Figures 7-15.

Adding new sectoral policies could reduce emissions 56% by 2031. New sectoral policies include Advanced Clean Fleets, Clean Power Standard, Zero-Emission Heating Equipment Standard, etc. Adding economy-wide policies on top of new sectoral policies could result in a reduction in emissions of 60% by 2031. New economy-wide policies, such as a cap and invest program, could be necessary for Maryland to achieve its emissions reduction goals.

To achieve Maryland's 2045 net-zero emissions goal, carbon sequestration must be increased to offset particular sectors that are difficult to decarbonize (Figure 6). This will be a challenge, given recent trends in land-use change and population growth, aging forests that tend to sequester less carbon annually, and climate change impacts like sea level rise and more frequent and intense drought, storms, and disease and pest attacks. Ongoing and increased investment in natural climate solutions today will help the state maximize its carbon sink by 2045. In addition, new investments in research on technological carbon dioxide removal approaches and possible deployment, not included in the 21 CCAP measures, may be needed to enable achievement of net zero.

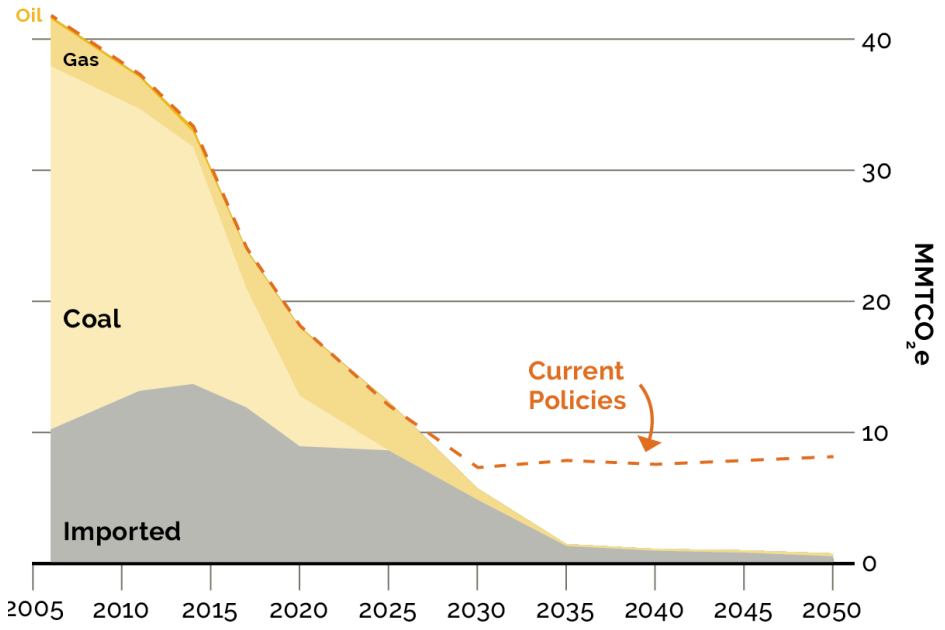

Figure 7. Maryland's electricity sector GHG emissions trends, historical and projected, from 2006 to 2050 based on current and new policies.

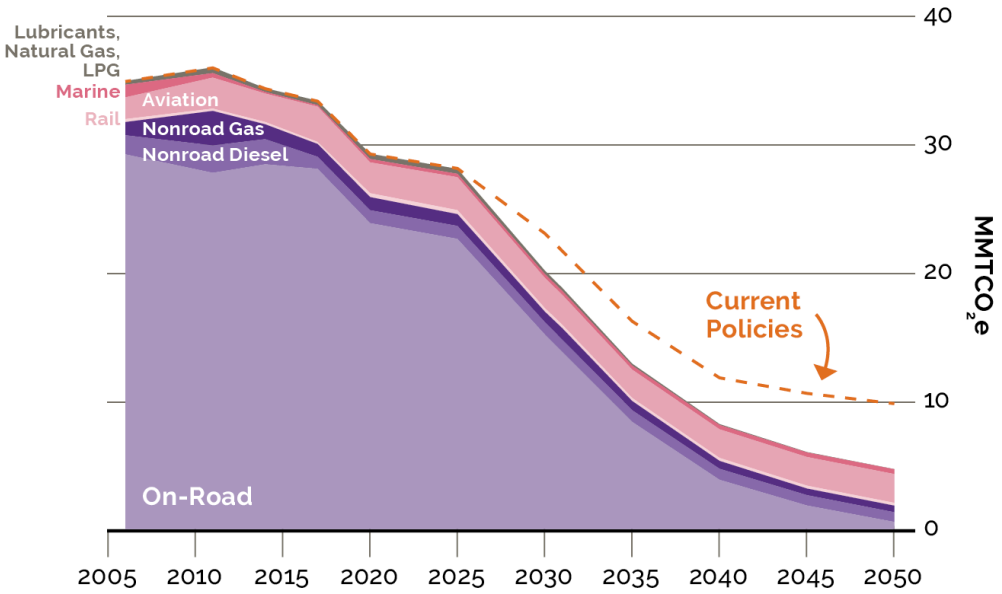

Figure 8. Maryland's transportation sector GHG emission trends, historical and projected, from 2006 to 2050 based on current and new policies.

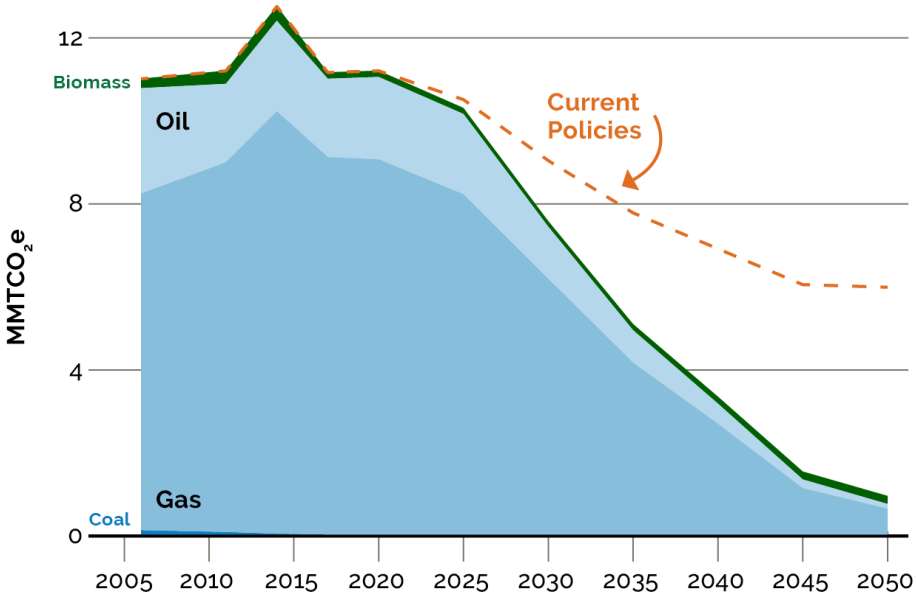

Figure 9. Direct GHG emissions from fuel use in Maryland's building sector (residential and commercial), historical and projected, from 2006 to 2050 based on current and new policies.

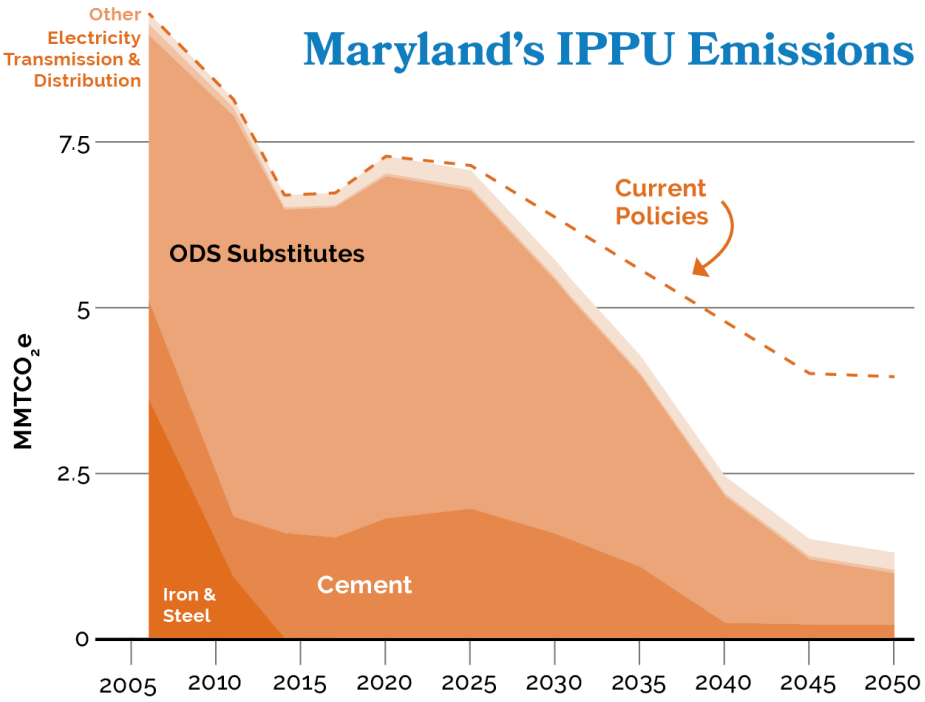

Figure 10. Maryland's industrial processes and product use GHG emissions trends, historical and projected, from 2006 to 2050 based on current and new policies.

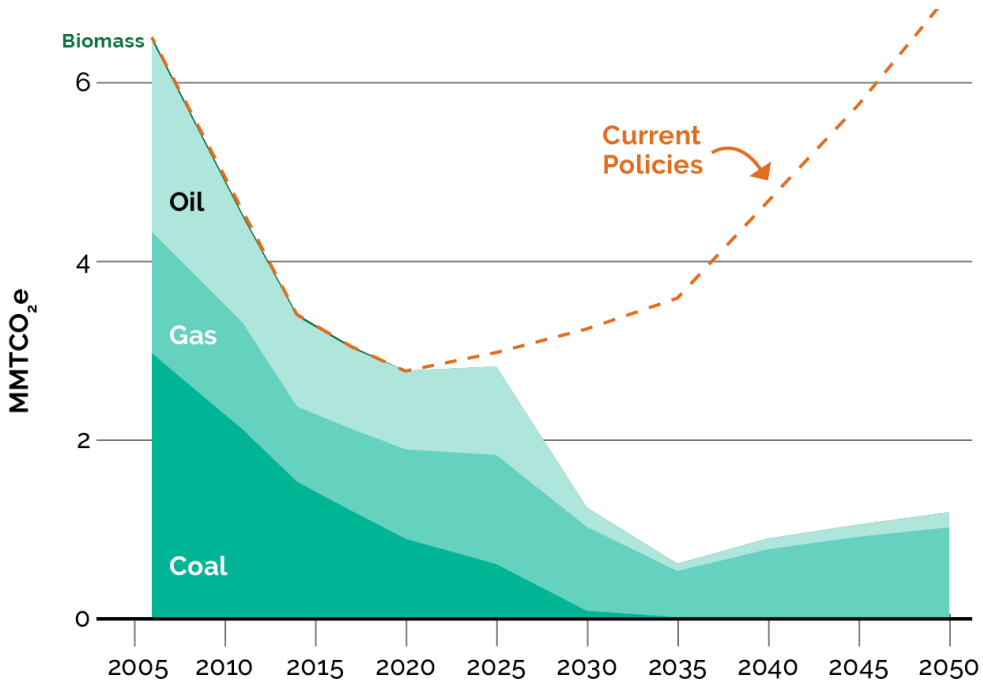

Figure 11. Maryland's industrial sector fuel use GHG emissions trends, historical and projected, from 2006 to 2050 based on current and new policies.

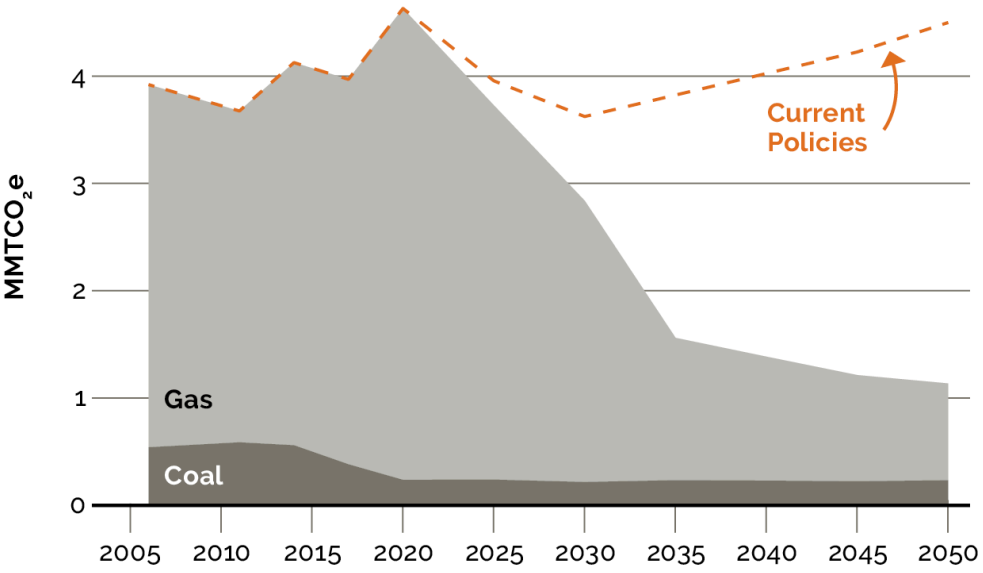

Figure 12. Maryland's fossil fuel industry GHG emissions trends, historical and projected, from 2006 to 2050 based on current and new policies.

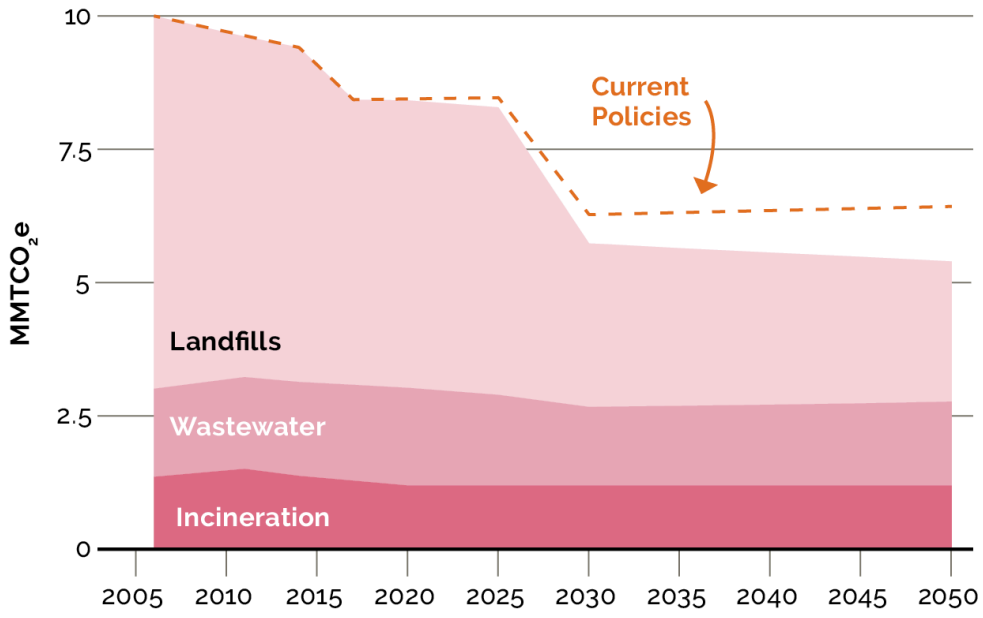

Figure 13. Maryland's waste sector GHG emissions trends, historical and projected, from 2006 to 2050 based on current and new policies.

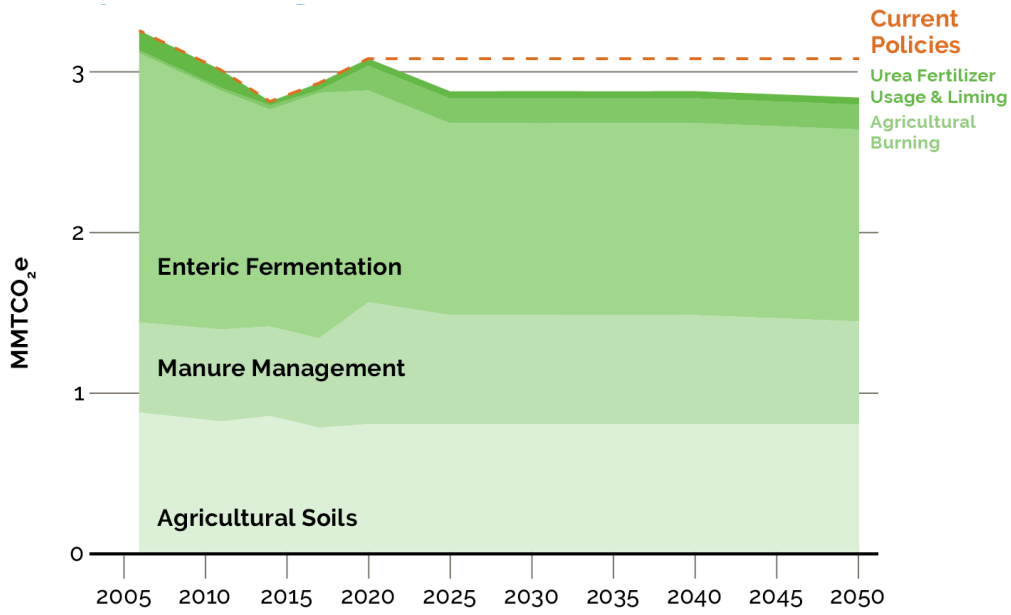

Figure 14. Maryland's agricultural sector GHG emissions trends, historical and projected, from 2006 to 2050 based on current and new policies.

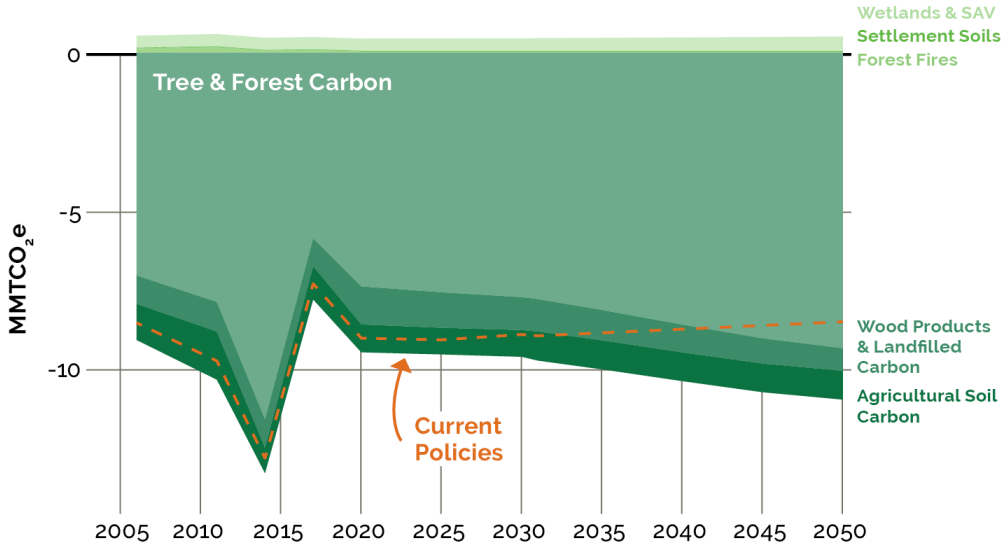

Figure 15. Maryland's forestry and land use sector GHG emissions and sinks, historical and projected, from 2006 to 2050 based on current policies and future potential.

GHG Emission Reduction Measures

In order to estimate the emissions impact of a measure, scenarios were run with and without a specific policy modeled to assess the relative impact of the 21 measures. As described, the implementation of all the measures in combination would achieve the 2031 and 2045 reduction targets. Given interactions between the measures, the GHG impacts estimated for individual measures are not additive and therefore not expected to sum to the overall reductions.

Economywide Measures

Table 3. Summary of Economywide Measures

Measure	GHG Emission Reductions* in 2031 (MMTCO2e)	GHG Emission Reductions* in 2045 (MMTCO2e)
1. Clean Economy Standard	3.476	15.558

**Emissions Reductions Attributable to Specific Policy for the Specified Target Year*

Measure 1. Clean Economy Standard

The economywide policies described below work with the sectoral policies (measures 2 - 21) to achieve Maryland's GHG reduction goals. In the aggregate, the economywide and new sectoral policies are projected to reduce statewide GHG emissions by 646 MMTCO2e between 2024 and 2050. The societal benefit of this level of emissions reduction is estimated to be $135 billion.

Description

The Clean Economy Standard directs the state to provide incentives, set sectoral standards, and set economy-wide standards to reduce GHG emissions.

Quantified GHG Emission Reduction

2031 Reduction: 3.476 MMTCO2e | 2045 Reduction: 15.558 MMTCO2e

Implementation Authority and Responsible Parties

MDE, MEA, Maryland General Assembly, The Office of the Governor

Implementation / Milestones

Provide Incentives

- Target investments in clean electricity, clean buildings, clean vehicles, and clean industry in communities throughout the state, especially overburdened and underserved communities.

Set Sectoral Standards

- Establish regulatory standards to ensure critical actions are taken in each sector of the economy.

Set Economy-wide Standards

- Consider expanding Maryland's current cap and invest program, RGGI (Measure 3), or developing new revenue-generating policies to complement targeted investments and sectoral standards, while providing a sustainable revenue source for state-funded community investments.

Expand the Strategic Energy Investment Fund (SEIF)

- SEIF distributes funding from Maryland's participation in the RGGI and other programs to provide incentives for decarbonization projects across different sectors of Maryland's economy. New investments from SEIF will stimulate Maryland's economy and help consumers, businesses, local governments, farmers, and foresters invest an estimated $1 billion annually into measures that reduce reliance on fossil fuels, deploy clean energy solutions, and sequester more carbon in Maryland's natural and working lands.

New investments will support:

- Home Energy Efficiency and Electrification Incentives
- Commercial, Multifamily, and Institutional Building Incentives
- EV and Charging Infrastructure Incentives
- Industry, Public Infrastructure, and Nature-Based Solutions Incentives

Metrics for Tracking Progress

To achieve the state's emissions goals, the new policy would need to reduce annual GHG emissions by 3.5 million metric tons of carbon dioxide equivalent (MMTCO2e) in 2031, and 15.6 MMTCO2e in 2045.

Measure Costs

Emissions and economic modeling conducted by the University of Maryland and Towson University show that a new economywide policy could be necessary for the state to achieve its goals. A cap and invest policy was used in the modeling to establish a regulatory cap on climate pollution from certain sources and use revenue from the sale of carbon allowances for investments in clean energy projects, consumer rebates, and other decarbonization programs. The state must further consider if cap and invest or another policy is best for Maryland. Modeling shows that a policy that would require polluters to pay for their pollution and provide at least $1 billion per year for clean economy investments could be critical for Maryland to achieve a 60% reduction in GHG emissions by 2031. To achieve the state's emissions goals, the new policy would need to reduce annual GHG emissions by 3.5 million metric tons of carbon dioxide equivalent (MMTCO2e) in 2031, and 15.6 MMTCO2e in 2045.

Electricity Sector Measures

Table 4. Summary of Electricity Sector Measures

Measure	GHG Emission Reductions* in 2031 (MMTCO2e)	GHG Emission Reductions* in 2045 (MMTCO2e)
2. Increasing Renewable and Clean Energy	0.647	-1.561
3. RGGI	0.271	0.729
4. Clean Power Standard	0.895	2.507

**Emissions Reductions Attributable to Specific Policy in the Specified Target Year*

Measure 2. Increasing Clean and Renewable Energy

Description

To effectively decarbonize Maryland's electricity supply, the state intends to increase the deployment of clean and renewable energy resources through the RPS and other clean energy initiatives.

- The RPS requires approximately 50% of electricity consumed in Maryland to be generated by renewable resources by 2030.
- The Promoting Offshore Wind Energy Resources (POWER) Act sets a goal for the state to build 8,500 megawatts of offshore wind energy capacity by 2031.
- The Energy Storage Act of 2023 established a goal for Maryland to have 3,000 megawatts of energy storage by 2033.
- The Community Solar Act Requires community solar installations to dedicate 40% of energy output to low and moderate income customers.

Quantified GHG Emission Reduction

2031 Reduction: 0.647 MMTCO2e | 2045 Reduction: -1.561 MMTCO2e

Implementation Authority and Responsible Parties

Maryland Public Service Commission (PSC), Maryland Energy Administration (MEA), Department of General Services (DGS), PJM Interconnection

Implementation / Milestones

RPS

- Maryland's RPS requires Maryland electric suppliers to provide increasingly large proportions of Maryland's electricity from renewable energy sources like solar, wind, hydropower, and qualifying biomass. The program is implemented through the creation, sale, and transfer of Renewable Energy Credits (RECs). The current RPS goal is for 52.5% for non-municipal utilities and 20.4% for municipal utilities of Maryland's electricity to come from renewable sources by 2030 through increases in solar power, deployment of new offshore wind energy off the Atlantic coast, and geothermal energy.
- Under the Clean Energy Jobs Act (CEJA) and through the SMART-Power partnership, Maryland aims to expand education and training programs to grow a new offshore wind workforce, expand local supply chains, support

the redevelopment of and improvements to critical port infrastructure, and advance research and innovation. In addition, Maryland will work with the U.S. Department of the Interior Bureau of Ocean Energy Management to explore the expansion of offshore wind lease areas in federal waters.

- The CPRP calls for the definitions of qualifying resources in the RPS program to align with definitions of clean power resources under the forthcoming CPS including the elimination of eligibility for municipal solid waste (MSW) incineration. Legislation passed in 2025 removing waste-to-energy and refuse-derived fuel from the state's RPS program.

Promoting Offshore Wind Energy Resources (POWER) Act

- The POWER Act intends to upgrade and expand the transmission system to accommodate the buildout of at least 8,500 MW of offshore wind energy from qualified projects and maximize the opportunities for obtaining and using federal funds for offshore wind and related transmission projects.

Energy Storage Act

- The law requires PSC to implement a Maryland Energy Storage Program to cost-effectively procure energy storage over the next decade. PSC issued Order No. 90823 on October 2, 2023, initiating a workgroup to develop a Maryland Energy Storage Program and docketed Case No. 9715 to develop this program.

State Incentives for Renewable Energy

- Over the years, Maryland has hosted a wide range of incentives to encourage the new development of renewable energy projects. The Maryland Clean Energy Center (MCEC) provides public-private and public-public partnerships, including through leading Commercial Property Assessed Clean Energy (C-PACE), the Maryland Clean Energy Capital Program (MCAP), and the Clean Energy Advantage (CEA) Loan Program. The state also administers the Maryland Energy Storage Income Tax Credit Program and the Maryland Solar System Sales Tax Exemption. Local governments have created Green Banks, Finance Authorities, and Energy Conservation Tax Credits.

Metrics for Tracking Progress

RPS will continue to require that approximately 50% of electricity consumed in Maryland will be generated by renewable sources by 2030. RPS will also link with a new Clean Power Standard to achieve the Administration's goal for 100% of the electricity consumed in-state to be clean by 2035.

Measure 3. RGGI

Description

RGGI is a cooperative, market-based effort among the11 states of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont to cap and reduce CO_2 emissions from the power sector. It represents the first cap-and-invest regional initiative implemented in the United States.

RGGI's cap and invest program is designed to reduce emissions from fossil fuel-fired electric power generators with a nameplate capacity of 25 megawatts or greater. The program sets a binding cap on CO2 emissions from power plants in the region that reduces every year. Maryland has participated in RGGI since the program's inception in 2007. Through RGGI, the participating states have cut power plant emissions in half while enjoying billions of dollars of economic benefit and creating thousands of jobs.

RGGI states reinvest the proceeds from the quarterly CO2 allowance auctions in consumer benefit programs to improve energy efficiency and accelerate the deployment of renewable energy technologies.

Maryland allocates proceeds from the sale of CO2 allowances into SEIF, a special, non-lapsing fund administered by MEA. MEA deploys SEIF funds to promote affordable, reliable, and clean energy across Maryland's diverse regions and communities while reducing energy bills, creating jobs in growing industries, helping to reduce GHG emissions, increasing resiliency, and promoting energy independence. RGGI generated $151 million in 2022.

Quantified GHG Emission Reduction

2031 Reduction: 0.271 MMTCO2e | 2045 Reduction: 0.729 MMTCO2e

Implementation Authority and Responsible Parties

MEA , MDE , PJM Interconnection

Implementation and Milestones

The 2030 GGRA Plan proposed to reduce the RGGI cap to zero by 2040, with cost controls. More recently, Maryland has been advocating for a stronger regional pollution cap aligned with Maryland's and partner states' 100% clean energy goals in ongoing

multistate deliberations and planning to remove offsets and certain exemptions. The participating states are expected to reach an agreement on a new program structure in 2025. If the outcome of the multistate agreement is not sufficiently stringent to meet the goals of the CSNA, MDE will consider additional complementary regulations.

MDE, which enforces Maryland's regulations for RGGI participation, will also eliminate underutilized components of the program including offsets and the Limited Industrial Exemption Set Aside when it updates its CO2 Budget Trading Program regulation in 2025.

Metrics for Tracking Progress

CO_2 emissions from power plants across the region need to continue to stay within the cap, which will decline towards zero emissions by 2035 according to Maryland's plan.

Measure 4. Clean Power Standard

Description

To achieve Governor Moore's commitment to achieve 100% clean power by 2035, strengthen Maryland's status as a climate leader, and support the goal of reducing statewide GHG emissions, the Administration and state agencies are developing a Clean Power Standard (CPS). CPS is a policy that will complement the RPS to ensure that all electricity consumed in the state is generated by clean and renewable sources of energy by 2035. Although the policy is still in development, it will likely allow for solar, wind, hydro, nuclear, energy storage, and other zero-emission technologies to qualify as clean energy sources, while eliminating existing eligibility and subsidies for municipal solid waste (MSW) incineration.

Quantified GHG Emission Reduction

2031 Reduction: 0.895 MMTCO2e | 2045 Reduction: 2.507 MMTCO2e

Implementation Authority and Responsible Parties

MDE, MEA, DNR, PSC, Maryland Office of People's Council (OPC)

Implementation and Milestones

The state agency partnership will design requisite components, timing, and milestones for outcomes of a potential regulation, including responsible agency; designing supportive and/or complementary policy; identifying the relevance of existing and proposed federal policy; and identifying key stakeholders for their perspectives on a potential rule framework. The partnership will address any economic and ratepayer impact. Ideally, a CPS would have minimal impact on electricity rates and promote public and private investment within the state. The goal is to design a program that mitigates potential ratepayer impacts, ensuring that existing inequities are remediated while stimulating

economic growth within the state. Challenges related to generation deployment within the RPS will likely apply to CPS implementation as well.

Metrics for Tracking Progress

The Clean Power Standard requires 100% of the electricity consumed in Maryland to be generated by clean and renewable sources of energy by 2035.

Transportation Sector Measures

Table 5. Summary of Transportation Sector Measures

Measure	GHG Emission Reductions* in 2031 (MMTCO2e)	GHG Emission Reductions* in 2045 (MMTCO2e)
5. Advanced Clean Cars II	0.902	5.814
6. Advanced Clean Trucks	0.496	0.821
7. Advanced Clean Fleets	-0.001	1.782
8. Maryland Transportation Plan and Carbon Reduction Strategies	0.684	1.089

**Emissions Reductions Attributable to Specific Policy in the Specified Target Year*

Measure 5. Advanced Clean Cars II

Description

The Maryland Clean Cars Act of 2007 required MDE to adopt regulations implementing the California Advanced Clean Cars I (ACC I) program in Maryland. The ACC I program is a dynamic, changing program in which many of the relevant California regulations are continuously updated to stay current with vehicular technology advancement and environmental science. To retain California's standards, Maryland must remain consistent with their regulations, hence when California updates its regulations, Maryland must reflect these changes by amending our regulations. The ACC I program included requirements for vehicles through model year 2025.

The Advanced Clean Cars II (ACC II) program requires that by 2035 all new passenger cars, trucks, and SUVs sold will be ZEVs. The ACC II program takes the state's already growing ZEV market and robust motor vehicle emission control rules and augments them to meet more aggressive tailpipe emissions standards and ramp up to 100% ZEV. The ACC II program adopts new requirements for model year 2026 and later vehicles.

To accomplish Maryland's goal for rapid growth in the number of ZEVs on Maryland's roads, building out a robust ZEV infrastructure network is critical. As such, theMDOT's National Electric Vehicle Infrastructure (NEVI) Plan, which was developed in partnership with MEA, serves as the foundational first step for this strategic network buildout. The NEVI Plan details the strategy for awarding $63M of NEVI funds to build out and certify Maryland's 23 EV Alternative Fuel Corridors (AFCs) before investing in public community charging infrastructure throughout the state. Maryland's initiatives supporting increasing zero-emission vehicles (ZEVs) include the following:

State Incentives

- The Maryland EV Tax Credit Program provides a one-time excise tax credit up to $3,000 for the purchase or lease of a new zero-emission plug-in electric or fuel cell electric vehicle. Businesses may also qualify for the tax credit for up to ten vehicles. Tax credits are issued on a first-come, first-served basis while funding is available.
- Maryland's EVSE Rebate Program offers a one-time rebate for 50% of the costs of acquiring and installing qualified EVSA up to $700 for residential installations and up to $5,000 for commercial installations. Rebates are also issued on a first-come, first-served basis while funding is available.

Quantified GHG Emission Reduction
2031 Reduction: 0.902 MMTCO2e | 2045 Reduction: 5.814 MMTCO2e

Implementation Authority and Responsible Parties
MDE, MEA, MDOT, Electric Utilities

Implementation and Milestones
Maryland's implementation of the ACC II program will begin with the 2027 model year. Although there are a substantial number of conforming revisions, the major revisions associated with the ACC II program consist of a requirement that vehicle manufacturers continue to offer more ZEVs for sale, culminating in a 100% sales requirement by model year 2035, and a requirement that internal combustion engine vehicles meet increasingly stringent pollutant standards during the period in which they continue to be sold.

Metrics for Tracking Progress
100% of new cars, light-duty trucks, and sport utility vehicles (SUVs) sold in Maryland to be ZEVs by 2035.

Measure 6. Advanced Clean Trucks

Description

Maryland's Clean Trucks Act of 2023 requires MDE to exercise authority and adopt regulations implementing the California ACT program in Maryland. Adopting ACT in Maryland will result in a significant reduction of harmful emissions associated with medium- and heavy-duty trucks and help Maryland attain its air quality goals. The ACT program will reduce NOx, PM2.5, and GHG emissions from the mobile source sector as cleaner, zero-emission trucks replace older internal combustion vehicles.

Robust ZEV infrastructure is critical to enable the transition to medium and heavy-duty ZEV in Maryland, regionally, and nationally. Therefore, Maryland's Zero-Emission Vehicle Infrastructure Plan (ZEVIP) and NEVI Plan must include investments in deploying charging infrastructure for commercial medium- and heavy-duty ZEV at sites along major highways and freight corridors, as well as support private fleet charging depots.

Zero-Emission School Buses: The CSNA includes school bus electrification as a goal for the state. Under the CSNA, beginning in fiscal year 2025, a county board of education may not enter into a new contract for the purchase or use of any school bus that is not a zero-emission vehicle. There are exemptions for lack of sufficient funding or availability of a vehicle that meets the performance requirements. The CSNA also permitted electric utilities to provide rebates for school buses subject to certain limitations.

Quantified GHG Emission Reduction

2031 Reduction: 0.496 MMTCO2e | 2045 Reduction: 0.821 MMTCO2e

Implementation Authority and Responsible Parties

MDE, MEA, MDOT, Electric Utilities, County/City School Districts (for school buses)

Implementation and Milestones

MDE adopted regulations in 2023 through incorporation by reference of the applicable California regulations.

Zero-Emission School Buses

- CSNA requires school districts to purchase or contract for the use of ZEV school buses starting in 2024, provided that federal, state, or private funding is available to cover incremental costs, relative to non-ZEV school buses. Switching over to electric fleets has become a goal for many cities and school districts. As of June 2023, there were 2,277 electric buses either on the streets or on order for school districts in the U.S., according to the World Resources Institute. More than double that number are committed, meaning that school districts plan to continue electrifying their fleets.
- Several school districts in Maryland have already deployed or are in the process of deploying ZEV school buses, often using federal or state

incentives to assist with the transition. For example, through Maryland's Clean Fuels Incentive Program (CFIP), five school districts received grant funding for more than 20 ZEV school buses from 2021-2023. More ZEV school buses are expected to be funded through the Medium- and Heavy-Duty Emission Vehicle Grant Program, discussed further in the following section, succeeding CFIP.

Zero-Emission Commercial MHDVs

- State funding for the purchase of new Class 3-8 electric vehicles will be offered through Maryland's Medium- and Heavy-Duty Zero-Emission Vehicle Grant Program, which is required by statute. These competitive grants will offset up to 75% of incremental costs associated with transitioning commercial on- and off-road fleets to battery electric or fuel cell vehicles that will be primarily domiciled and operated in the state.

Metrics for Tracking Progress

Requires certain percentages of different types of medium and heavy-duty trucks sold in Maryland to be ZEVs in certain years.

Measure 7. Advanced Clean Fleets

Description

Under the Advanced Clean Fleets (ACF) program, owners of covered truck and bus fleets are required to make an increasing amount of their new purchases zero-emission vehicles.

California's Advanced Clean Fleets (ACF) regulation applies to fleets performing drayage operations (freight from an ocean port to a destination), those owned by state, local, and federal government agencies, and high-priority fleets. High-priority fleets are entities that own, operate, or direct at least one vehicle in the state, and that have either $50 million or more in gross annual revenues, or that own, operate, or have common ownership or control of a total of 50 or more vehicles (excluding light-duty package delivery vehicles). The regulation affects medium- and heavy-duty on-road vehicles with a gross vehicle weight rating greater than 8,500 pounds, off-road yard tractors, and light-duty mail and package delivery vehicles.

The state will also provide technical assistance grants to owners of small fleets (with 10-199 vehicles) to help develop fleet electrification plans. Fleet vehicles are typically driven more miles annually than average vehicles, so they have an outsized impact on transportation sector emissions and an outsized opportunity to reduce emissions through

electrification. Additional details on these incentives can be found in the 2023 Annual Report of the Maryland Commission on Climate Change.

Quantified GHG Emission Reduction

2031 Reduction: -0.001 MMTCO2e | 2045 Reduction: 1.782 MMTCO2e

Implementation Authority and Responsible Parties

MDE

Implementation and Milestones

MDE would be responsible for developing, adopting, and implementing regulations to enact and enforce ACF in Maryland. MDE will continue to work with stakeholders to analyze and determine if adopting ACF would result in emissions reductions beyond those expected by Maryland's adoption of the ACT regulation.

Metrics for Tracking Progress

ACF would require specific high-priority fleets of medium and heavy-duty vehicles to transition to ZEVs.

Measure 8. Maryland Transportation Plan and Carbon Reduction Strategies

Description

MDOT recently published plans to advance the reduction of greenhouse gas emissions from the transportation sector. Specifically, MDOT's Carbon Reduction Strategy (CRS), required by the Bipartisan Infrastructure Law, documents existing strategies available to Maryland for transportation emissions reduction. MDOT also prepared a transportation-specific appendix to MDE's CPRP to help Maryland meet its goals of 60% reduction in GHG emissions statewide by 2031 from the CSNA of 2022. The updated long-range Maryland Transportation Plan (MTP) provides an overarching direction for MDOT actions, and includes a goal to reduce per capita VMT by 20%. Vehicle technology, vehicle fuel or energy use, and VMT are drivers of transportation sector GHG emissions. VMT has steadily increased in Maryland since 2014, with over 60 billion VMT in 2019. VMT dropped in 2020 due to the COVID-19 pandemic but has mostly rebounded to pre-pandemic levels. While MDOT anticipates that VMT will return to 2019 levels over the next five years, there is uncertainty regarding the exact timeline and pace of the recovery.

Reducing projected traffic on Maryland's roads is crucial to reducing GHG emissions from the transportation sector. Reduction of VMT will require implementation of numerous complementary strategies with a focus on trip reduction, trip consolidation, and mode shift. Examples include increased telework, broader deployment of transportation

demand management (TDM) programs such as increased car sharing incentives and services and Commuter Choice Maryland, accelerating bicycle and pedestrian projects, transit-oriented development (TOD), and ensuring reliable and efficient public transportation networks. Maryland is also investing in transitioning its public transit bus fleet to ZEVs. This requires state-owned transit buses to transition to ZEVs.

Off-Road Zero-Emission Vehicle Upgrades: This measure also includes accelerating the widespread adoption of zero-emission off-road/non-road electric equipment at port facilities, aviation facilities, rail facilities and other non-road transportation modes. These vehicles include marine vessels, locomotives, airplanes, drones, and on-site equipment such as shuttles, fueling vehicles, and other vehicles necessary to operate non-road transportation facilities and hubs. It also includes transitioning government owned and operated equipment to electric.

Maryland Aviation Administration (MAA) has robust sustainability practices to reduce food waste from airport operations, convert its shuttle bus fleet to electric, and support wetland and environmental restoration efforts. In FY 2022, both its BWI Thurgood Marshall Airport and Martin State Airport received Federal Aviation Administration Airport Improvement Program awards to develop decarbonization strategies at both facilities. MAA has also invested in solar power generation and has recently completed the Solar PV Array Siting and Feasibility Study. The Study evaluated more than 50 sites on the BWI Marshall campus, including existing terminal structures.

The Maryland Port Administration (MPA) owns several public marine terminals that are the core of the greater Port of Baltimore, the 11th largest port in the nation. MPA works closely with tenants and shipping companies to advance emission reduction programs for off-road cargo handling equipment, including the Cargo Handling Equipment Replacement and Repower Program. This program helps owners replace existing diesel cargo handling equipment with zero emission equipment. Continuing to invest in the replacement of these pieces of equipment will improve air quality in nearby communities and reduce GHG emissions while also promoting the efficiency of cargo movement at one of the busiest ports on the east coast.

Quantified GHG Emission Reduction
2031 Reduction: 0.684 MMTCO2e | 2045 Reduction: 1.089 MMTCO2e

Implementation Authority and Responsible Parties
MDOT

Implementation and Milestones
MDOT's 2050 Maryland Transportation Plan (MTP) includes an objective to reduce VMT per capita by 20%, which will guide transportation project selection and development. The

MTP also includes an objective to minimize fossil fuel consumption, reduce GHG emissions, and improve air quality. MAA is developing a Decarbonization Roadmap analyzing the feasibility of a variety of decarbonization measures including but not limited to increasing renewable energy onsite, building a microgrid, electrifying fleet vehicles, reducing VMT by the public as well as airport employees, and increasing energy efficiency. When finalized, MAA's Decarbonization Roadmap will provide metrics and specific project activities to track and measure progress.

New VMT reduction measures will include investments to deliver more transportation choices as well as incentives to encourage the use of such options. Specifically, MDOT initiatives include launching new public transportation infrastructure such as rail and clean bus lines, making transit safe, efficient, and easy to use, and actively catalyzing Transit-Oriented-Development (TOD) to help increase transit ridership and support housing and economic development. MDOT will ramp up investments and policies to accommodate bicyclists and pedestrians routinely and safely on our extensive road network by retrofitting streets with bike lanes, sidewalks, and traffic calming measures. MDOT will also increase our commitment to TDM measures. For example, Commuter Choice Maryland has helped expand IncenTrip statewide and is exploring options to implement a statewide vanpool incentive and support the Maryland Jobs Access Reverse Commute (MD-JARC) program.

Zero Emission Transit Buses

- The first seven electric buses were delivered to the Maryland Transit Administration (MTA) in the Fall of 2023, and MTA is contracting for up to 350 more over the next five years. In addition, MTA is working closely with its electric utility provider, electric charging and power distribution suppliers, transit labor unions, and employees to ensure a seamless transition to zero emissions that maintains reliable bus service. Technology advances that increase the range of electric transit buses and increase hydrogen fuel availability will be important components to successful transit fleet conversions in Maryland.

Off-Road Zero-Emission Vehicle Upgrades

- Actions to implement off-road zero-emission vehicle upgrades at port facilities, aviation facilities, rail facilities and other non-road transportation modes could include, but are not limited to:
    - Expand or create new incentive and technical assistance programs to promote and spread the use of electric equipment.

- Investigate innovative low- or zero-emission vehicles and technologies at the Port of Baltimore and BWI Thurgood Marshall International Airport.

Metrics for Tracking Progress

The Maryland Transportation Plan aims to reduce VMT per capita by 20% through infrastructure and programmatic investments. Implementation of zero-emission off-road/non-road electric equipment can be measured in the number of pieces of electric equipment or electric off-road vehicles procured by MDOT.

Buildings Sector Measures

Table 6. Summary of Buildings Sector Measures

Measure	GHG Emission Reductions* in 2031 (MMTCO2e)	GHG Emission Reductions* in 2045 (MMTCO2e)
9. Building Energy Performance Standards	0.083	0.621
10. EmPOWER	0.841	0.816
11. Zero Emission Heating Equipment Standard	0.765	3.433
12. Clean Heat Standard	0.769	0.757

**Emissions Reductions Attributable to Specific Policy in the Specified Target Year*

Measure 9. Building Energy Performance Standards

Description

Building Energy Performance Standards (BEPS) applies to buildings in Maryland that have a gross floor area of 35,000 square feet or more (excluding the parking garage area). Historic properties, public and nonpublic elementary and secondary schools, manufacturing buildings, agricultural buildings, and federal buildings are exempt. The goal is to reduce direct GHG emissions and improve overall energy efficiency from Maryland's BEPS covered buildings. Maryland BEPS requires covered building owners to measure and report data to MDE. Maryland BEPS further requires that covered building owners meet specific net direct GHG emissions and energy use intensity (EUI) standards. This dual- standard system promotes efficient electrification to enable Maryland's clean energy transition, minimize electricity grid impacts, and achieve Maryland's goal of net-zero GHG emissions by 2045.

State Government Lead by Example: Requires all-electric new construction and other emission reduction measures for state-owned buildings. The Department of General Services' (DGS) Energy Office partnered with University System of Maryland (USM) to purchase over $165 million of electricity in FY 2023. Included in the energy commodity purchases are three 20-year Power Purchase Agreements (PPAs) of renewable energy from two utility-scale wind installations and one solar installation. In FY 2023, the state government spent approximately $19 million on renewable electricity, which accounted for 11.5% of the electricity cost for state operations.

Quantified GHG Emission Reduction

2031 Reduction: 0.083 MMTCO2e | 2045 Reduction: 0.621 MMTCO2e

Implementation Authority and Responsible Parties

MDE

Implementation and Milestones

MDE is in the process of adopting Building Energy Performance Standards (BEPS) for covered buildings to achieve a 20% reduction in net direct GHG emissions on or before January 1, 2030, as compared with 2025 levels for average buildings of similar construction, net-zero direct GHG emissions on or before January 1, 2040, and improve overall energy efficiency. Covered buildings are subject to interim performance standards before 2040 and to a final performance standard that must be achieved on an annual basis in 2040 and beyond.

Between 2025 and 2040, covered building owners whose buildings do not already meet the BEPS standards will be required to implement energy efficiency measures and/or electrification measures or pay alternative compliance fees in order to comply with BEPS. As building owners implement these measures, they will begin to save money from reduced energy costs. Savings from reduced energy costs will accumulate and increase over time and beyond the initial implementation period for BEPS.

Results from a 2023 study by the U.S. Department of Energy's Lawrence Berkeley and Pacific Northwest National Laboratories demonstrate that during BEPS implementation (2025-2040), all covered buildings combined will spend more on efficiency measures ($8.8B) and electrification measures ($6.4B) than the energy cost savings accrued in this period ($8.96B). However, on a longer time horizon (2025-2050), energy cost savings increase to $22.3B, indicating a net savings for Maryland's covered buildings. On average, over the 2025-2050 time horizon, covered buildings save $4.47 per square foot in energy costs. However, there is significant variation with 25% of covered buildings modeled to save more than $9.29 per square foot and 25% of covered buildings modeled to lose more than $4.43 per square foot.

The CSNA established, among many other provisions, the creation of the Building Energy Transition Implementation Task Force ("Buildings Task Force"). The Buildings Task Force met throughout 2023 to fulfill its mandate of providing recommendations to support the policies and decarbonization goals for Maryland's buildings. The Buildings Task Force recommendations reflect the reality that the building energy transition will require significant financial, technical, and practical solutions to help raise money, get money out the door, help owners invest their money in their buildings for maximum benefit, guide projects to high quality standards, provide long-term social and environmental benefits, and equitably benefit Maryland residents.

A supporting initiative to BEPS is State Government Lead by Example. In 2022, DGS adopted an all-electric policy for planning and implementing new construction and major renovations. One of the first new all-electric buildings will be the Supreme Court of Maryland located in Annapolis. The building is approximately 215,000 square feet, will include electric vehicle charging infrastructure, and will attain Leadership in Energy and Environmental Design (LEED) Silver certification. Since 2020, DGS has also managed the replacement of nearly fifty thousand fluorescent light fixtures in state-owned buildings with high-efficiency LEDs and controls. Due to a strong focus on energy efficiency, overall energy use in state-owned buildings has declined nearly 12% since 2018.

Metrics for Tracking Progress

Certain buildings 35,000 square feet or larger must achieve specific energy efficiency and direct emissions standards, including achieving net-zero direct emissions by 2040.

Measure 10. EmPOWER

Description

In response to concerns relating to sufficient electricity supply and reliability, the Maryland General Assembly passed the Maryland Energy Efficiency Act of 2008, thereby establishing the EmPOWER Maryland Program. The EmPOWER energy efficiency programs are managed by the five largest electric utility companies and the Department of Housing and Community Development (DHCD). As reported in PSC's 2015 annual report to the General Assembly, the EmPOWER programs were successful at meeting initial goals relating to the reduction of per capita consumption and per capita demand. This first phase of EmPOWER was shown to have provided customer bill savings, lower wholesale energy prices due to the reduced need for infrastructure investments, and a reduction in GHG emissions.

Quantified GHG Emission Reduction

2031 Reduction: 0.841 MMTCO2e | 2045 Reduction: 0.816 MMTCO2e

Implementation Authority and Responsible Parties

MEA, PSC, Maryland Department of Housing and Community Development (DHCD)

Implementation and Milestones

In 2015, PSC established a new target for the five participating electric utilities: 2% annual incremental energy savings based on gross electricity sales by 2020. In 2017, this percentage goal was codified into law by the General Assembly. The percent target is based on a rolling baseline using the data from the year before the current three-year program cycle. Not only does the PSC consider aspects of its general authority to regulate utilities, such as public safety and climate change in approving programs, but over time the Public Utilities Article has also required that the PSC consider cost-effectiveness to encourage and promote the efficient use and conservation of energy. Through a rigorous evaluation process, the PSC reviews progress on EmPOWER on a semi-annual basis and may request program and budget changes.

The EmPOWER Program includes both electric and gas utility companies and DHCD. EmPOWER programs are managed by the following companies: Baltimore Gas and Electric Company (BGE), Potomac Edison Company (PE), Delmarva Power & Light (Delmarva), Potomac Electric Power Company (PEPCO), Southern Maryland Electric Cooperative, Inc. (SMECO), and Washington Gas Light Company (WGL). DHCD also provides EmPOWER programs and is aiming to increase annual energy savings across all limited-income households.

The PSC's Future Programming Work Group recommended that a GHG reduction goal be established as the central goal under EmPOWER. *Maryland's Climate Pollution Reduction Plan* calls for legislation to establish GHG reduction goals and require EmPOWER programs to include beneficial electrification. Beneficial electrification refers to the use of electricity to replace the direct use of fossil fuels in buildings in a manner that reduces overall lifetime GHG emissions or customers' energy costs. Legislation passed in 2024 to establish GHG reduction goals and beneficial electrification in the EmPOWER programs.

Metrics for Tracking Progress

The CSNA requires that the utility companies' EmPOWER programs meet increasingly higher energy savings goals: 2.25% annually in 2025 and 2026, and 2.5% annually in 2027 and thereafter. Additionally, in 2023, legislation was enacted that established energy savings goals for DHCD requiring energy savings of 0.53% in 2024, 0.72% in 2025, and 1% in 2026 for limited-income households.

Measure 11. Zero-Emissions Heating Equipment Standard

Description

The Zero-Emission Heating Equipment Standard (ZEHES) is a new state policy that will require new heating systems installed in Maryland buildings to produce zero on-site emissions beginning later this decade. Zero-emission heating equipment including electric water heaters and heat pumps for space heating and cooling are already widely used across Maryland. New technologies, falling prices, and robust federal, state, and utility-sponsored incentives for heat pump water heaters and space heating/cooling systems make heat pumps the preferred solution for energy-efficient, low-cost, zero-emission buildings. Marylanders can currently take advantage of a federal tax credit providing up to $2,000 off the cost of installing a heat pump.

Supporting initiatives also include:

- *Energy Codes and Standards*
  Requires the state to adopt the latest version of the International Energy Conservation Code, with possible amendment, within 18 months of issuance. The Maryland Building Performance Standards (MBPS) requires that Maryland jurisdictions implement the latest edition of building code requirements, including those pertaining to the International Building Code (IBC), the International Residential Code (IRC), and the International Energy Conservation Code (IECC). In Maryland, the Codes need to be considered for new construction as well as major renovations. According to Maryland law, the state may not adopt energy conservation requirements that are less stringent than the requirements in the IECC. Upon the MBPS being released, local jurisdictions are responsible for the modification and adoption of codes. The Building Codes Administration (BCA) within Maryland's Department of Labor is currently in the process of adopting the 2024 version of the IECC for new residential and commercial structures statewide. Federal Department of Energy analysis indicates that the increased energy efficiency will result in additional site energy savings of 7.8 percent, source energy savings of 6.8 percent, and energy cost savings of approximately 6.6 percent of residential building energy consumption over existing state-wide requirements. The BCA is currently finalizing analysis, outreach, and stakeholder engagement; the BCA's goal is to have the adopted changes published in the Maryland Register by November 14, 2025.

- *EV-Ready and Solar-Ready Standards for New Buildings*
  Requires EV charging equipment to be installed during the construction of single-family detached houses, duplexes, and townhouses, and extends new requirements to multifamily buildings.

MEA studied the cost, barriers, and impacts of requiring multifamily residential buildings to include EV-ready and EVSE-installed parking spaces. *Maryland's Climate Pollution Reduction Plan* calls for the Maryland General Assembly to introduce legislation requiring EV-ready and EVSE-installed parking spaces in new multifamily buildings. Legislation should also require solar-ready standards for new buildings.

Additional state funding will be necessary for rapid building decarbonization in Maryland. The IRA rebates are among MEA's residential energy efficiency and electrification programs that will be supercharged with new funding from the state. New programs will be established to support efficiency and electrification projects in commercial, institutional, and industrial buildings, including those covered by BEPS or other state requirements that require building improvements. Some of the funding will also support projects in Maryland's elementary and secondary schools to reduce energy costs for local school districts and improve the health and well-being of students statewide.

Quantified GHG Emission Reduction
2031 Reduction: 0.765 MMTCO2e | 2045 Reduction: 3.433 MMTCO2e

Implementation Authority and Responsible Parties
MDE, MEA

Implementation and Milestones
MDE is responsible for developing, adopting, and implementing regulations to enact and enforce ZEHES in Maryland. MDE initiated a rulemaking process in 2024 and has shared model regulatory language for stakeholder input and questions. Outreach and stakeholder meetings will continue as MDE works to propose ZEHES regulations for Maryland.

Maryland is among several states moving to adopt zero-emission appliance/heating equipment standards. In September 2023, Maryland joined with 24 other states in the U.S. Climate Alliance in committing to quadruple the number of heat pumps installed by 2030. With ZEHES, new buildings will be constructed with zero-emission heating equipment and the existing building stock will transition to having almost all space and water heating demand provided by zero-emission heating equipment by 2045. Cooking equipment is not covered by this policy but incentives will be provided to help Marylanders upgrade to electric cooking appliances, which can significantly improve indoor air quality compared to cooking with combustible fuels.

ZEHES will not require anyone to remove a working furnace, boiler, or other piece of heating equipment. Existing fuel-burning equipment can continue to be serviced and remain in place until the time the individual decides to replace their fuel-burning equipment. It is at this time of replacement that new equipment will need to meet the

zero-emission standard. The effect of this policy will be, over time, to replace one-way air conditioning (AC) units with two-way heat pumps, which function as efficient AC and can reverse cycle to provide efficient heating. Modern heat pumps are more than capable of meeting 100% of the heating demand of Maryland buildings, as evidenced by the fact that heat pumps are already commonly used in buildings statewide.

Energy Codes

- Each local jurisdiction must implement and enforce the most current version of MPBS and any local amendments to MPBS. In addition, any modification to MBPS adopted by the state must be implemented and enforced by a local jurisdiction no later than 12 months after the modifications are adopted by the state. The building energy codes apply to all building owners undergoing new construction or large renovations, and the MBPS applies to all buildings and structures within the state for which a building permit application is received by a local government. Maryland's 23 counties are responsible for the adoption of new building energy codes and related operational impacts. Impacted entities may include local governments, state governments, schools, residential property owners, and nonresidential property owners.

EV Ready and Solar-Ready Standards

- Beginning in October 2023, homebuilders in Maryland are required to include EV charging equipment during the construction of single-family detached houses, duplexes, and townhouses. Specifically, each new housing unit in Maryland must include one EVSE-installed or EV-ready parking space capable of providing level-2 charging in a garage, carport, or driveway. EVSE-installed means having an EV charging device that is fully installed and ready to use at a parking space. EV-ready means having electrical panel capacity and wiring in place to easily install a level-2 EV charger in the future.

As of July 1, 2023, Maryland House Bill (HB) 169 "Public Utilities - Energy Efficiency and Conservation Programs - Energy Performance Targets and Low-Income Housing" established the Green and Healthy Task Force to address the following: 1) to advance the alignment, branding, and coordination of resources to more effectively deliver green and healthy housing for low-income households in the State, 2) examine the public and private resources needed to address the housing needs of low-income communities, 3) develop policy and statutory recommendations to eliminate barriers to low-income households achieving healthy, energy-efficient, affordable, and low-emission housing and 4) engage with interested parties and collaborate with other entities that can help advance the goals of the task force, including experts in the field of healthy, energy-efficient, and low-emission housing. In order to achieve the ambitious goals of building electrification in

the state, a comprehensive, coordinated, and community-informed approach that will ensure equitable access to energy efficiency, electrification, and renewable energy technologies is needed.

Metrics for Tracking Progress

Transition to having almost all space and water heating demand provided by zero-emission heating equipment by 2045.

Energy Codes: The CSNA required the state to adopt the IECC (2018 Edition) by January 2023 and to adopt each subsequent version of the IECC within 18 months after it is issued.

EV-Ready and Solar-Ready Standards: The state is in its third year of transitioning its 4,000-vehicle fleet to EVs. In parallel with purchasing EVs, DGS installs EV charging infrastructure across the state at all agencies. The goal is to install at least 2,000 EV charging ports by 2030.

Measure 12. Clean Heat Standard

Description

A Clean Heat Standard (CHS) is a performance-based approach to reducing GHG emissions from the building sector. CHS is designed to broadly decarbonize covered sectors in a manner that is market-based and friendly to customer choice in coordination with other programs. It complements and supports the achievement of other policies including energy codes and standards, EmPOWER, BEPS, and ZEHES. As a sector-specific policy, it ensures that decarbonization proceeds at the pace needed to achieve the state's goals.

CHS requires natural gas utility companies and heating oil and propane providers to reduce the GHG emissions associated with their businesses following a schedule set by MDE. As a market-based performance standard, obligated parties can meet the requirements in several ways including but not limited to helping their customers save energy, helping their customers install heat pumps, and replacing fossil fuels with lower-impact fuels. Obligated parties can also work with third parties to deploy a range of clean heat measures that reduce emissions. Anything that reduces emissions from buildings helps the obligated parties meet the CHS requirements, so as customers take advantage of federal, state, and EmPOWER incentives for energy efficiency and electrification upgrades or take any other actions to reduce emissions from buildings, the customers' actions help the obligated parties achieve their requirements. As rulemaking proceeds in 2025, a comprehensive cost-benefit analysis will be conducted for CHS.

Other Supporting Initiatives include Gas System Planning. Gas System Planning requires natural gas utility companies to plan their gas system investments and operations for a net-zero emissions future. Respecting PSC's status as an independent state agency, MDE supports the call for PSC to oversee the development and implementation of gas system planning to achieve a structured transition to a net-zero emissions economy in Maryland.

Quantified GHG Emission Reduction

2031 Reduction: 0.769 MMTCO2e | 2045 Reduction: 0.757 MMTCO2e

Implementation Authority and Responsible Parties

MDE, PSC

Implementation and Milestones

MDE is responsible for developing, adopting, and implementing regulations to enact and enforce CHS in Maryland. MDE initiated a rulemaking process in 2024. Outreach and stakeholder meetings will continue through 2025 and beyond to gain feedback as the model policy is developed into a Maryland specific policy.

CHS and ZEHES can work together to deliver the lowest-cost pathway for decarbonizing buildings. While ZEHES, electrification incentives, and other policies will transition almost all of Maryland's fuel-burning buildings to be all-electric by 2045, CHS layers on top of these policies to increase the pace of building sector decarbonization while improving building shells and transitioning the last bit of fuel demand to lower-impact fuels, especially for high-heat applications.

Metrics for Tracking Progress

Requires clean heat measures to be deployed in buildings at the pace required to achieve the state's GHG reduction requirements.

Industry Sector Measures

Table 7. Summary of Industry Sector Measures

Measure	GHG Emission Reductions* in 2031 (MMTCO2e)	GHG Emission Reductions* in 2045 (MMTCO2e)
13. Hydrofluorocarbon Regulations	0.611	1.631
14. Control of Methane Emissions from the Natural Gas Industry	0.862	2.060
15. Buy Clean	0.299	0.464

**Emissions Reductions Attributable to Specific Policy in the Specified Target Year*

Measure 13. Hydrofluorocarbon Regulations

Description

In November 2020, MDE adopted regulations to prohibit certain hydrofluorocarbons (HFCs) and HFC blends that have a high global warming potential (GWP) and pose a higher overall risk to human health and the environment. The regulations adopted specific prohibitions for HFCs in air conditioning and refrigeration equipment, aerosol propellants, and foam end-uses. The phase-out of HFCs encourages the use of available alternatives with lower GHG emissions.

MEA currently provides grants for energy efficiency and decarbonization projects at industrial facilities and, under *Maryland's Climate Pollution Reduction Plan*, the state will provide additional support for decarbonization activities across Maryland's industrial sector. Priority investments could include HFC reduction. MDE, MEA, and the Maryland Clean Energy Center (MCEC) will increase staff capacity to partner with industry to streamline access to grants and financing for emissions reduction projects.

Quantified GHG Emission Reduction

2031 Reduction: 0.611 MMTCO2e | 2045 Reduction: 1.631 MMTCO2e

Implementation Authority and Responsible Parties

MDE, MEA, Maryland Clean Energy Center (Maryland's Green Bank)

Implementation and Milestones

MDE's HFC regulations apply to any person who sells, offers for sales, installs, or introduces into commerce in Maryland any substance in end-uses identified in the regulations. The requirements focus on end-use prohibitions for the following sectors/categories: Aerosol Propellants, Air Conditioning, Refrigeration, and Foams. The effective prohibition phase-in dates range from January 1, 2021, to January 1, 2024. The regulations include a sell-through provision for products and equipment manufactured before the prohibition date. The regulation also allows continued use of existing products and equipment that contain banned substances acquired before the prohibition dates.

In July 2023, EPA finalized the Phasedown of Hydrofluorocarbons: Allowance Allocation Methodology for 2024 and Later Years, which spins off of the regulation that was finalized by EPA in 2022 that created a framework to phasedown HFC production and consumption by 85% by the year 2036 through establishing the Allowance Allocation and Trading Program Under the American Innovation and Manufacturing (AIM) Act. On October 19, 2023, a Notice was published for the 2024 Allowance Allocation for Production and Consumption of Regulated Substances Under the AIM Act of 2020, and a Notice of Final Consequences. By October 1 of each calendar year, EPA must determine

the quantity of allowances for the production and consumption of regulated substances that may be used for the following calendar year.

In October 2023, EPA finalized the Technologies Transition rule which restricts the use of certain higher-GWP HFCs in aerosols, foams, refrigeration and air conditioning, heat pump products, and equipment. The restrictions are to transition to alternatives listed by sector and subsector and would prohibit the manufacture and import of products containing restricted HFCs by January 1, 2025, in most cases, and would prohibit the sale, distribution, and export of products containing restricted HFCs a year later, which in most cases would be January 1, 2026. To support compliance with the prohibitions on the use of HFCs in specific sectors and subsectors, EPA requires labeling, reporting, and recordkeeping requirements for companies that import, manufacture, sell, or offer for sale products using HFCs.

The EPA's AIM Act HFC Technologies Transition rule covers more end-use categories than Maryland's HFC regulations and lowers the GWP allowable limit significantly from Maryland's HFC regulations. Maryland's regulations help to reduce HFCs with compliance deadlines between 2021 and 2024. The EPA's new rules establish additional reductions from 2025 and beyond.

Additionally, the EPA has just proposed a rulemaking addressing existing sources, the Management of Regulated Substances, under subsection (h) of the AIM Act to maximize reclamation and reduce emissions of HFCs and their substitutes.

Maryland supports these national rules to achieve HFC reductions throughout the country. Maryland is exploring opportunities to develop a more robust workforce by offering training for technicians. Implementation would be supported by a CA F-gas Reduction Incentive Program (FRIP).

Metrics for Tracking Progress

Reduced HFC production and consumption

Measure 14. Control of Methane Emissions from the Natural Gas Industry

Description

Maryland's Control of Methane Emissions from the Natural Gas Industry regulations affect new and existing natural gas compressor stations, one liquefied natural gas facility, and one underground storage facility in the transmission and storage segment. The regulations set requirements to mitigate methane emissions through fugitive emissions leak detection and repair, and control measure requirements to limit emissions from compressors and pneumatic devices.

Quantified GHG Emission Reduction

2031 Reduction: 0.862 MMTCO2e | 2045 Reduction: 2.060 MMTCO2e

Implementation Authority and Responsible Parties

MDE, U.S. Environmental Protection Agency

Implementation and Milestones

Maryland began taking steps to restrict methane emissions from the value chain by establishing a law in 2017 to ban hydraulic fracturing in state operations that occur in the production segment. On October 23, 2020, Maryland finalized regulations to reduce vented and fugitive emissions of methane from both new and existing natural gas transmission and storage facilities. Beginning in 2021, EPA announced policies to strengthen the controls required for GHG emissions in the oil and gas industry. In November 2021, EPA proposed New Source Performance Standards Updates and Emissions Guidelines to Reduce Methane and Other Harmful Pollution from the Oil and Natural Gas Industry. The proposal would expand and strengthen emissions reduction requirements that are currently on the books for new, modified, and reconstructed oil and natural gas sources and would require States to reduce methane emissions from hundreds of thousands of existing sources nationwide.

In November of 2022, EPA proposed supplemental regulations to the 2021 action by adding requirements for abandoned and unplugged wells, improved performance to minimize malfunctions at flares, and improved tank truck loading operations. These proposals align with the current Maryland natural gas industry methane controls and add significant requirements beyond the Maryland rule for the extended gathering and processing of these fossil fuels that will achieve reductions in surrounding States.

Metrics for Tracking Progress

Requires methane emissions from natural gas transmission and storage facilities to be mitigated through fugitive emissions detection and repair. Facility-wide GHG emission data is required to be calculated and submitted to MDE annually. Additionally, owners and operators are required to notify MDE and the public during “blowdown events,” which are the release of pressurized natural gas from stations, equipment, or pipelines into the atmosphere so that maintenance, testing, or other activities can take place.

Measure 15. Buy Clean

Description

The Buy Clean Maryland Act was passed by the Maryland General Assembly in 2023. DGS will work in consultation with MDOT to analyze the environmental product declarations

and establish maximum acceptable GWP values for each category of eligible materials used in certain construction projects.

In establishing the GWP for each category, DGS is required by the Buy Clean Maryland Act to base the maximum acceptable GWP on the industry average of GWP emissions for that material and determine the industry average of GWP emissions, which may include transportation-related emissions, by consulting nationally or internationally recognized databases of environmental product declaration. Contractors must submit facility-specific environmental product declarations for each eligible material before any installation. DGS can waive certain requirements if it determines that requiring the relevant eligible materials would be technically infeasible, result in a significant increase in project cost, result in a significant delay in project completion, or result in only one source or manufacturer being able to provide the necessary materials.

The Buy Clean Maryland Act includes an Environmental Product Declaration Assistance Fund, administered by the Department of Commerce, that awards grants to producers of eligible materials. This fund supports the development, standardization, and transparency of environmental product declarations for construction materials and products, and consists of money appropriated in the state budget.

MEA currently provides grants for energy efficiency and decarbonization projects at industrial facilities and, under *Maryland's Climate Pollution Reduction Plan*, the state will provide additional support for decarbonization activities across Maryland's industrial sector. Priority investments could include cement manufacturing decarbonization. MDE, MEA, and the Maryland Clean Energy Center (MCEC) will increase staff capacity to partner with industry to streamline access to grants and financing for emissions reduction projects.

Quantified GHG Emission Reduction
2031 Reduction: 0.299 MMTCO2e | 2045 Reduction: 0.464 MMTCO2e

Implementation Authority and Responsible Parties
DGS, MDOT

Implementation and Milestones
The law requires producers of eligible materials to submit environmental product declarations to DGS by the end of 2024. Beginning in December 2025 and throughout each following year, DGS is required to submit an annual report to the Maryland General Assembly that includes what DGS has learned about how to identify and quantify embodied carbon in building materials, including life cycle costs. DGS must also report on any obstacles encountered by them, bidders, or offerors in identifying and quantifying embodied carbon in building materials. To ensure that the most appropriate calculations

are used in developing the maximum acceptable GWP for each category of eligible materials, DGS must include in its report a detailed description of its methodology.

Maryland also joined the Federal-State Buy Clean Partnership, initiated by the Biden Administration in 2023. Through this partnership, the State will work with federal and other state partners to enhance adoption, implementation, and harmonization of Buy Clean policies and maximize regional, cross-jurisdictional solutions whenever possible.

Metrics for Tracking Progress

Producers of cement and concrete mixtures must submit environmental product declarations to the state and for the state to establish a maximum acceptable GWP values for each category of eligible materials.

Waste Sector Measures

Table 8. Summary of Waste Sector Measures

Measure	GHG Emission Reductions* in 2031 (MMTCO2e)	GHG Emission Reductions* in 2045 (MMTCO2e)
16. Landfill Methane Regulations	2.280	2.280
17. Sustainable Materials Management	0.129	0.426

**Emissions Reductions Attributable to Specific Policy in the Specified Target Year*

Measure 16. Landfill Methane Regulations

Description

MDE has concurred with recent research findings which show that municipal solid waste (MSW) landfills in Maryland are the single largest source of the state's methane emissions and these emissions are approximately four times higher than previously thought. These regulations require landfills to detect and repair landfill gas leaks and operate emission control systems to reduce methane emissions.

Quantified GHG Emission Reduction

2031 Reduction: 2.280 MMTCO2e | 2045 Reduction: 2.280 MMTCO2e

Implementation Authority and Responsible Parties

MDE

Implementation and Milestones

In 2021, MDE proposed to implement regulatory requirements for owners and operators of new and existing MSW landfills, which include surface emission monitoring, detecting,

and repairing landfill gas leaks, recordkeeping and reporting requirements, and installing and operating emission control systems based upon regulatory applicability.

Additional climate change abatement strategies include MDE forming partnerships with state agencies, local jurisdictions, environmental advocacy groups, and the private and public sectors to limit the amount of methane-generating waste that enters landfills through waste diversion. Waste diversion combines both recycling and source reduction activities. These strategies have been effective in reducing methane emissions from landfills and helping to meet Maryland's climate goals.

Metrics for Tracking Progress

Emissions from MSW landfills are characterized and calculated using accepted industry standards along with some measured and reported figures. The methane and CO2 generation rates are modeled using EPA's Landfill Gas Emissions Model tool "Land GEM". Additional figures come from the landfill facility reporting to EPA Part 98 GHG reporting and from annual MDE emission certification Reports.

MDE used the 2020 GHG Inventory to calculate a range of anticipated emission reductions that will come from minimizing surface leaks and capturing and converting methane to CO2. By applying a range of emission reduction factors to the list of affected sources, MDE estimates a 25-50% reduction in CO2 (CO2 and CO2 equivalent – using a GWP of 28) emissions from the affected landfills subject to MDE's latest landfill regulations when fully implemented. The new requirements and standards for MSW landfills are either equivalent or more stringent than current federal requirements for MSW landfills, such as component leak testing, surface emission monitoring, gas collection and control systems (GCCS), and recordkeeping and reporting schedules. Furthermore, the new requirements and standards for MSW landfills are more stringent than those under Title 26, Subtitle 11, Chapter 19.20 of the Code of Maryland Regulations (COMAR 26.11.19.20) - Control of Landfill Gas Emissions from MSW landfills.

Measure 17. Sustainable Materials Management

Description

Sustainable materials management (SMM) includes using and managing materials as efficiently and sustainably as possible throughout their entire life cycles. Through source reduction, reuse, and recycling, Maryland can extend existing disposal capacity, reduce the need to construct new or expanded solid waste disposal facilities, conserve natural resources including water and energy, increase the innovative reuse and beneficial use of dredged material, and support a productive economy through the recovery of valuable resources.

Maryland has undertaken key initiatives to strengthen recycling programs, including the establishment of clearer permitting pathways for composting facilities; adoption of more aggressive county and state government recycling rates; coordination of a statewide waste sort study; enhancement of electronics recycling education and outreach; and provision of recycling opportunities at apartments, condominiums, and special events. MDE recognizes the value of partnerships in achieving statewide recycling and source reduction goals, including cooperative efforts of waste generators, state agencies, local governments, the waste industry, the recycling industry, environmental groups, boards of education, and other interested parties.

A supporting policy is the Food Residuals Diversion Law, which requires businesses that generate at least one ton of food residuals per week to separate the food residuals from other solid waste and ensure that the food residuals are composted. The law and regulations follow the traditional food recovery hierarchy: prevent waste before it occurs, provide food for people, animal feed, and/or recycle. The focus is to reduce the amount of GHG emitted from landfills, provide edible food to people at a free or low cost, and improve Maryland's soil and water quality.

Supporting local initiatives include:

- The creation and expansion of local, decentralized organics collection and composting programs through distributed infrastructure in partnership with local operators
- The establishment of a distributed network of food rescue systems, such as cold storage infrastructure, to reduce food loss, increase waste diversion, and fill hunger gaps
- On-farm composting and compost utilization with technical assistance, financial support, and reduced barriers to operating which will support urban and rural farmers, build healthy soils, and enhance local food security
- Public outreach and education programs to promote compost as a resource, reduce food loss and waste, and connect waste and food systems to climate change

The state supports waste diversion programs in several ways. One example includes the School Waste Reduction and Composting Program, which awards grants to schools to reduce food waste and establish composting programs. Additionally, the Maryland Water Infrastructure Financing Administration (MWIFA) provides low-interest rate loans under the two Revolving Loan Fund Programs and grants under the State Bay Restoration Fund Program for water quality point source projects and non-point source pollution control projects, drinking water system upgrade projects, and septic system upgrade projects

using best available technology to achieve nitrogen removal on onsite sewage disposal systems. Between FY21 and FY23, the Bay Restoration Fund provided $45 million in revenues for 2,567 Best Available Technology (BAT) installations and 497 connections to public sewer.

The Energy-Water Infrastructure Program (EWIP) was established during the 2016 legislative session through MCCBL 2016, funded through a PSC order that provided $40 million in funding for programs that reduce GHG emissions and conserve energy. Between FY17 and FY20, MDE budgeted and awarded $40 million in grants to water and wastewater systems throughout the state of Maryland for alternative energy generation and upgrading to more energy-efficient equipment. EWIP provided funds for the planning, design, and construction of projects that benefited both the environmental and economic interests of the state.

This dual-pronged program provided reliable and resilient infrastructure for communities throughout Maryland by implementing energy efficiencies, and reducing emissions and operating costs at water and wastewater treatment facilities. While EWIP was discontinued due to the lack of ongoing funding, it helped in planting the seeds and jump-starting the concept of energy-water infrastructure throughout the state of Maryland. The projects under this concept are eligible for and continue to be funded under MDE's Revolving Loan Fund Programs, which provide low-interest loans and principal forgiveness (grant). One such project is the WSSC Piscataway Bio-Energy Project, for which MDE has provided $168M in Revolving Loan Funds to date.

With new funding, the state will support additional decarbonization activities in Maryland's waste sector. Priority investments include landfill and wastewater treatment plant methane capture projects.

Quantified GHG Emission Reduction

2031 Reduction: 0.129 MMTCO2e | 2045 Reduction: 0.426 MMTCO2e

Implementation Authority and Responsible Parties

MDE, MEA, MDA, Maryland Department of Commerce (MDC), Maryland Department of Planning (MDP), Maryland counties

Implementation and Milestones

In 2021, Maryland's recycling activities reduced the amount of CO2 equivalent by over 8.3 million tons, on a lifecycle accounting basis. While MDE is responsible for implementing the requirements of Executive Order 01.01.2017.13, Maryland Counties perform all recommended recycling and source reduction activities. The Executive Order defines the SMM policy for the state. MDE provided Waste Reduction and Resource Recovery Plan Goals and Metrics Recommendations in April of 2019. The voluntary

statewide metrics and goal recommendations support the Maryland Recycling Act by defining specific material recycling goals for each county.

MDE continues to consult with relevant stakeholders to assess and improve the state's methodology for tracking waste generation, recycling, and source reduction in Maryland. MDE has pursued numerous partnerships to work towards the recycling and source reduction goals established in the SMM Executive Order 01.01.2017.13 and the recommendations made in April 2019.

The Food Residuals Diversion Law: In 2021, the Maryland General Assembly passed House Bill 264/Senate Bill 483 titled Solid Waste Management – Organics Recycling and Waste Diversion – Food Residuals, which requires "persons"that generate at least two tons of food residuals per week as of November 1, 2023, and one ton of food residuals per week as of November 1, 2024 to separate the food residuals from other solid waste and ensure that the food residuals are diverted from final disposal at landfill or incineration. MDE issued supporting regulations under COMAR 26.04.13 Food Residuals - Organics Recycling and Waste Diversion.

Metrics for Tracking Progress

As MDE works to develop markets for recyclables in Maryland, key partnerships with other Maryland agencies include:

- MDE and the Maryland Department of Commerce (MDC) work in cooperation with local and economic development agencies to identify local markets for recycled materials and provide siting, permitting, and technical assistance for innovative recycling and resource recovery businesses.
- MDE and MDA work to support research and demonstration of innovative technologies for recovering nutrient resources in a manner protective of water quality.
- MDE and MEA work to research and promote methods of recovering energy from waste, including anaerobic digestion. These digesters would drastically reduce odors, increase renewable energy production, increase rural economic development, reduce air pollution from fossil fuel-based energy production, increase the grid stability of renewable energy production, and the digester biogas can be stored, with additional generators used to offset times of high power load.
- MDE and the MPA work to develop technical screening criteria and guidance to support innovative reuse and beneficial uses of dredged material removed from the Port of Baltimore's shipping channels and other state-funded dredging projects. State agencies shall consider innovative reuse and beneficial uses of dredged

material when economically feasible and in conformance with all appropriate environmental standards.

Agriculture Sector Measures

Table 9. Summary of Agriculture Sector Measures

Measure	GHG Emission Reductions* in 2031 (MMTCO2e)	GHG Emission Reductions* in 2045 (MMTCO2e)
18. State Incentives for Agricultural Decarbonization	0.204	0.223

**Emissions Reductions Attributable to Specific Policy in the Specified Target Year*

Measure 18. State Incentives for Agricultural Decarbonization

Description

Provides additional funding for decarbonization activities in Maryland's agricultural sector. The state currently supports farmers implementing emission reduction measures in manure and nutrient management. The state would expect to increase the adoption of climate-smart agricultural practices with new focused funding to complement federal funds available to farmers from the U.S. Department of Agriculture.

Quantified GHG Emission Reduction

2031 Reduction: 0.204 MMTCO2e | 2045 Reduction: 0.223 MMTCO2e

Implementation Authority and Responsible Parties

MDA

Implementation and Milestones

Priority investments include manure management and feeding techniques that reduce enteric fermentation (leading to methane production) from livestock.

Metrics for Tracking Progress

Increased adoption of farming best practices to manage manure and nutrients in environmentally preferable ways

Forestry and Land Use Sector Measures

Table 10. Summary of Forestry and Land Use Measures

Measure	GHG Emission Reductions* in 2031 (MMTCO2e)	GHG Emission Reductions* in 2045 (MMTCO2e)
19. Agricultural Resource Conservation and Management	0.096	0.163
20. Afforestation and Improved Forest Management	0.225	1.469
21. Coastal Wetland Restoration and Management	0.005	0.009

**Emissions Reductions Attributable to Specific Policy in the Specified Target Year*

Measure 19. Agricultural Resource Conservation and Management

Description

MDA manages a range of agricultural resource conservation programs, which support farmers in adopting practices that improve soil health and increase carbon sequestration on agricultural lands. Maryland farmers lead the nation in their adoption of soil conservation practices. Building on existing Departmental programs, the 2017 Healthy Soils Act charged MDA with the development of a Healthy Soils Program to improve the health, yield, and profitability of Maryland's soils and promote the further adoption of conservation practices that foster soil health while increasing carbon sequestration capacity.

Quantified GHG Emission Reduction

2031 Reduction: 0.096 MMTCO2e | 2045 Reduction: 0.163 MMTCO2e

Implementation Authority and Responsible Parties

MDA

Implementation and Milestones

In 2022, MDA rolled out the Cover Crop Plus program, to leverage the success of cover cropping in the state and encourage earlier planting, later termination, and multi-year planning for soil health. A second program, the Healthy Soils Competitive Fund, was launched in 2023 to encourage innovative soil health management. This new Fund encourages continued learning in the farming community as Maryland agencies work to bolster agriculture's role as a climate solution. Both new programs capitalize on

co-benefits for air and water quality, and carbon sequestration that build upon Maryland's nationally recognized progressive farming practices and programs.

Metrics for Tracking Progress

Adoption of best management practices is tracked by the State for both water quality and carbon mitigation purposes. MDE will continue to work with MDA to ensure all current and additional program outcomes are quantified and verified.

Measure 20. Afforestation and Improved Forest Management

Description

The Maryland 5 Million Trees Initiative is the state's premier afforestation program. This initiative requires the state to plant and maintain five million native trees in Maryland by 2031, with at least 10% of these trees located in urban underserved areas of the state. In collaboration with state agencies and non-profit organizations, the 5 Million Trees Initiative leverages existing programs to increase, manage, and support tree planting projects statewide. This program provides one of the largest opportunities to grow the state's forest carbon sink and offset carbon sequestration declines over time due to aging forests.

Current state policy also promotes sustainable forestry management practices on Maryland's public and private forest lands. Enrolling unmanaged forests into forest management plans and implementing sustainable forest best management practices can enhance forest productivity by increasing the rate of carbon sequestration in forest biomass, maximizing carbon storage within harvested durable wood products, and minimizing the risk of forest pest and/or disease outbreak. This can translate to economic benefits for landowners and Maryland's forest products industry, demonstrating an annual economic impact of over $3.3 billion in 2019. Over 90% of state forests are dual certified for sustainable forest management and regularly implement sustainable practices on other state-owned lands like Wildlife Management Areas and State Parks. Only 40% of privately owned forests in Maryland are enrolled in forest management plans, presenting an opportunity to increase engagement with remaining landowners towards sustainable forest management.

Maryland also leads the nation in forest conservation and protection from development. The Forest Preservation and Retention Act, which requires replacement of forested lands lost to development through afforestation or compensatory conservation of existing forest. In 2023, the state's Forest Conservation Act of 2013 was updated with a new statewide goal of achieving net forest and tree canopy gain by requiring each county to achieve no net forest loss, measuring progress every 4 years. This policy can be achieved

through mechanisms that strengthen tree loss mitigation requirements for developers, ensuring that cleared forested land for new construction is adequately replaced. This law also requires DNR to review local forest conservation plans more frequently to ensure alignment with state forest protection goals.

Complementing the state's forest goals is support for sustainable growth and land use/location efficiency to minimize GHG emissions from future land development; fosters transit use, walking, and biking; and reduces travel distances for daily mobility needs. The Maryland Department of Planning (MDP) is the lead agency for reducing emissions through sustainable growth and land use/location efficiency, which involves the private sector and various agencies and commissions at all levels of government within Maryland. This policy, coupled with the state's afforestation and forest management programs and ongoing coalition participation is critical for maintaining a healthy forest carbon sink through 2045. With new funding in place, the state will provide additional support for activities that promote enhanced carbon sequestration in Maryland's forestry and land use sector. Priority investments include tree plantings and forest management.

Quantified GHG Emission Reduction
2031 Reduction: 0.225 MMTCO2e | 2045 Reduction: 1.469 MMTCO2e

Implementation Authority and Responsible Parties
MDE, DNR, MDP, MDA, MDOT, Chesapeake Bay Trust

Implementation and Milestones
The Tree Solutions Now Act of 2021 includes a historic directive to plant and maintain 5 million native trees on public and private land by 2031 (also known as the Maryland 5 Million Trees Initiative (5MT)). To advance equity and environmental justice, 5MT directs that at least 10% (500,000) of these trees be planted in underserved urban areas, improving air and water quality and reducing urban heat island effects. Foundational to this Initiative is support for long-term maintenance and management to ensure trees and forests are healthy and resilient for decades to come.

Many local governments in Maryland are already implementing more sustainable land use and transportation policies and programs that are:

- promoting green building and compact, transit-oriented development;
- improving walkability;
- reducing aggregate VMT and auto dependency;
- preserving vegetated/forested lands, which sequester carbon; and
- protecting agriculture

In support of these programs, the Smart Growth Subcabinet, led by MDP, makes recommendations to the Governor regarding changes in state law, regulations, and procedures needed to create, enhance, support, and revitalize sustainable communities across Maryland; and facilitates interagency coordination to ensure successful statewide community reinvestment and compact development initiatives are integrated and balanced to achieve multiple benefits that advance equity, economic growth and environmental regeneration.

Metrics for Tracking Progress

MDE coordinates the tracking and implementation of the Maryland 5MT Initiative in partnership with DNR, MDA, MDOT, and the Chesapeake Bay Trust. MDP works with other state agencies to advance smart growth planning.

Eligible plantings and forest management activity is tracked across all state-funded programs and through the participation of many private planting partners. All carbon outcomes related to 5MT and ongoing forest conservation and management activities are quantified and integrated within the state's GHG inventory using advanced science capabilities supported by the University of Maryland.

Measure 21. Coastal Wetland Restoration and Management

Description

Blue carbon in Maryland refers to the carbon captured by the ocean and coastal ecosystems, including coastal salt marshes and seagrasses. State policy maximizes blue carbon sequestration and coastal resilience benefits by protecting and restoring coastal wetlands. For the Maryland GHG inventory, blue carbon stocks and fluxes comprise the state's estuarine wetlands and seagrasses, otherwise referred to as submerged aquatic vegetation (SAV). Ongoing restoration of SAV in the Chesapeake Bay is primarily advanced through the shared goals of the Chesapeake Bay Program.

Restoration of coastal wetlands has not been widely implemented in Maryland, apart from island restoration projects where dredge material is used to build up islands that are partially composed of wetlands. While coastal wetlands are vital ecosystems that provide important ecosystem services like erosion prevention and wildlife habitat, restoration of these systems is quite expensive, frequently exceeding $50,000 per acre restored.

The gap in current State efforts towards coastal wetland restoration presents a unique opportunity for the State to maximize avoided emissions and enhance sequestration in the blue carbon sector. Maryland is equipped to scale adoption of blue carbon restoration and preservation projects through targeted project implementation at the State and

regional-level. Prioritizing high carbon coastal regions and areas at risk of sea level rise also enable the State to capitalize on multiple long-term co-benefits such as improved water quality, climate resiliency, and enhanced biodiversity.

Quantified GHG Emission Reduction
2031 Reduction: 0.005 MMTCO2e | 2045 Reduction: 0.009 MMTCO2e

Implementation Authority and Responsible Parties
DNR

Implementation and Milestones
DNR has partnered with The Nature Conservancy and ESA, Inc. to conduct a blue carbon feasibility study of several existing or potential wetland restoration projects in Maryland. The study is ongoing but preliminary results indicate that the sale of blue carbon credits would not be able to support the costs associated with project implementation, even if the price of carbon were to rise dramatically. Under certain price points, the sale of credits can fund a portion of the cost of maintaining the project. Given project costs, it is likely that projects will be done for reasons other than blue carbon, like enhancing coastal resiliency or ensuring habitat for endangered species, but blue carbon will remain an important co-benefit of this work.

Metrics for Tracking Progress
Acres of wetlands created or restored in the mesohaline or polyhaline regions of the Maryland portions of the Chesapeake Bay and the Atlantic Coastal Bays. Acres of wetlands impacted by a tidal reconnection project in those salinity zones. Acres of submerged aquatic vegetation restored anywhere within the Maryland portions of the Chesapeake Bay or Atlantic Coastal Bays.

Intersection with Other Funding Availability

Maryland Federal Investment Team (FIT)

In April of 2023, the Governor's Federal Investment Team (FIT) was established. The FIT, comprised of representatives from Maryland's state agencies, has worked in close coordination with the Governor's Office to ensure the state is not leaving any available federal money on the table. The FIT holds bi-weekly meetings to track and discuss the most recent funding opportunities available and provide updates on the status of existing applications.

FIT meetings also serve as an opportunity for the Governor's Office to emphasize the Administration's priorities and highlight specific funding opportunities towards those

ends. FIT further emphasizes Maryland's whole-of-government approach to address climate goals. FIT has helped streamline the federal grant application process and allowed staff across the Administration to collaborate with their counterparts in other agencies, leading to billions of dollars in captured federal funds.

As of November of 2024, the State of Maryland secured more than $13 billion through the Inflation Reduction Act (IRA) and the Infrastructure Investment and Jobs Act (IIJA).

These investments include the following grants:

- $62 million from the IRA's Solar for All Program, which will help advance solar development in low income communities in Maryland;
- $133 million from the IRA's CPRGs Program, which will augment climate planning, help advance medium and heavy-duty electric vehicle charging infrastructure along the I-95 corridor, and enhance climate resilience projects along Maryland's forests and coastal areas;
- $147 million through the IRA's Clean Ports Program for the deployment of zero-emission port equipment and infrastructure, and climate and air quality planning;
- $137 million in home energy rebates from the Department of Energy. These rebates are primarily for low and moderate income households to perform home energy upgrades, including the transition to efficient electric appliances that keep energy bills low and indoor air quality high.

Elective Pay

Additionally, in partnership with FIT, the Department of Budget and Management (DBM) has created a centralized system to ensure that Maryland is taking advantage of the Elective Pay provision of the IRA. The Elective Pay provision–also known as Direct Pay–allows non-tax paying entities, including state governments, to receive a payment equal to the full value of tax credits for qualifying energy projects. Maryland submitted its first direct pay application in November 2024.

[6] Benefits Analysis

The State of Maryland government prioritizes assessing the societal costs and benefits of its climate goals. These benefits encompass more than just reduced GHG emissions, extending to decreased co-pollutants, better public health, stronger economic growth, and greater resilience and efficiency in utility and electricity systems. State government also understands that climate policy is closely linked to economic justice, public well-being, and infrastructure development. As with the earlier sections, this section largely relies on modeling from the 2023 *Maryland's Climate Pollution Reduction Plan* to provide a general picture of the level of benefits that can be expected.

This section discusses the overall benefits of Maryland's proposed suite of climate policies, while also identifying and addressing potential disbenefits. A comprehensive understanding of both the positive and negative impacts is essential to ensure that the transition to a clean energy economy is equitable, cost-effective, and sustainable. Maryland is committed to maximizing climate benefits while minimizing unintended consequences through inclusive planning, careful implementation, and coordinated investment.

Co-Pollutant Reduction Estimate By Year

Previously, Maryland's *Climate Pollution Reduction Plan* published an analysis of the health benefits from Maryland's proposed climate policies for the year 2031. Although health benefits are anticipated between 2024 and 2030, the analysis here concentrates on health benefits projected over the subsequent twenty years, specifically from 2030 to 2050. Health impacts were evaluated for 2030, 2035, 2040, 2045, and 2050 using the same methodology as in the earlier report.

Emissions data based on output from the GCAM integrated assessment model for a current policies scenario and a current and planned policies scenario were compiled into a single input file for each year. These files were created to run in the EPA's CO–Benefits Risk Assessment (COBRA) model. The files captured emissions of key co-pollutants—nitrogen oxides (NO_x), sulfur oxides (SO_x), ammonia (NH_3), fine particulate matter ($PM_{2.5}$), and volatile organic compounds (VOCs), while the output captured differences in ozone (O_3).

The method compared pollution reductions within each file resulting from the policy. Following analysis of specific years, a multi-year tool in the COBRA package estimated the 20-year cumulative benefits in terms of chosen metrics. The following table outlines the

annual co-pollutant emission differences from the baseline, derived from GCAM data utilized in the COBRA analysis.

Table 11. Annual co-pollutant reductions in Maryland resulting from planned policies based on GCAM modeling

Co-Pollutant Emissions: Current Policies vs. Current + Planned Policies Scenarios (metric tons)						
		2030	2035	2040	2045	2050
NO_x	Current Policies	54,910	47,271	46,948	47,988	49,614
	Current + Planned Policies	43,450	32,883	30,338	27,573	27,002
	Emissions Avoided	**11,460**	**14,388**	**16,610**	**20,415**	**22,612**
SO_x	Current Policies	12,537	12,117	11,938	11,738	11,393
	Current + Planned Policies	5,173	3,894	3,188	2,706	2,529
	Emissions Avoided	**7,364**	**8,223**	**8,750**	**9,032**	**8,864**
NH_3	Current Policies	14,407	14,448	14,853	15,357	15,818
	Current + Planned Policies	13,891	13,311	13,069	12,730	12,593
	Emissions Avoided	**516**	**1,137**	**1,784**	**2,627**	**3,225**
$PM_{2.5}$	Current Policies	27,315	27,750	28,763	29,603	30,085
	Current + Planned Policies	21,717	20,822	21,228	21,969	22,639
	Emissions Avoided	**5,598**	**6,928**	**7,535**	**7,634**	**7,446**
VOCs	Current Policies	213,374	209,057	208,421	208,172	209,422
	Current + Planned Policies	197,430	189,946	189,116	186,303	186,836
	Emissions Avoided	**15,944**	**19,111**	**19,305**	**21,869**	**22,586**

The full implementation of Maryland's climate policies is projected to result in substantial annual reductions in NO_x. Notable decreases are also expected in NH_3, $PM_{2.5}$, and VOCs.

Incremental reductions in SOx emissions beyond 2020 from planned policies are expected to be minimal given the historic reductions already achieved to date and those anticipated from current and planned policies through 2030.

Mitigation of Disbenefits

Maryland is engaging with stakeholders during the rollout of electrification and energy efficiency policies in the buildings, transportation, and energy sectors to assess and address issues such as energy burden and affordability. As an example, certain EV rebates mentioned in Measure 5 are designed specifically for affordability for LMI customers.

To address grid limitations that could hinder renewable energy integration, Maryland needs focused investments in grid expansion and modernization. The state is currently investigating collaborative strategies with counties and local governments, including community choice aggregation (CCA) and distributed solar initiatives, to leverage renewable energy benefits. Simultaneously, Maryland will monitor long-term progress in crucial grid modernization efforts like transmission and infrastructure enhancements through continued collaboration with utilities and PJM, its regional transmission organization (RTO).

Further efforts are needed including providing technical assistance and financial support to help businesses adopt cleaner technologies and improve waste management practices. However, compliance expenses and technological demands in the industrial and waste sectors may present operational challenges. To mitigate these challenges, Maryland continues to work with local authorities to strengthen both landfill methane management and community involvement in recycling and composting through outreach and accessible resources.

Prioritizing equity is key to ensure that climate action measures support all Maryland communities and leave no one behind. Policies must be intentionally designed with inclusive access for all Marylanders. As further discussed in Section 9, Maryland State Government is working together under the formation of the Governor's newly formed Subcabinet on Climate to develop solutions to meet the needs of the state's most vulnerable populations that will be disproportionately affected by the negative impacts of climate change.

Mitigating disbenefits from the implementation of this plan will require targeted investments, robust public engagement, strong governance, and complementary policies to ensure an equitable, efficient, and sustainable transition.

Health Benefits

COBRA 5.1 was used to assess the health and economic benefits of improved air quality resulting from clean energy policies (energy efficiency and renewable energy) across various regions. This tool quantifies the benefits of reductions in pollutants such as NO_x, SO_x, $PM_{2.5}$, NH_3, and VOCs, and this version incorporates the health impacts of ozone formation. In alignment with EPA guidance, a three percent discount rate was used to calculate benefits.

Input files for COBRA were developed by the University of Maryland's Center for Global Sustainability . Custom population files for each year were generated using COBRA's 2023 baseline data and EPA Integrated Climate and Land-Use Scenario (ICLUS) growth rates from the Shared Socioeconomic Pathways (SSP2) analysis. COBRA settings for health valuation, incidence, and population functions were determined using corresponding COBRA Future Year Input files (e.g., 2030 data was based on the 2030 input files). This analysis supported broader economic benefits modeling in the Regional Economic Models, Inc (REMI) PI+ model. Cumulative health benefits between 2030 and 2050 were estimated using linear interpolation of annual COBRA outputs. While this method introduces some uncertainty, it is considered conservative.

Total Health Benefits (2030-2050)

Between 2030 and 2050, the state of Maryland is projected to experience significant health benefits as a result of avoided incidences of select health indicators. Table 12 below quantifies both the total number of avoided cases and the corresponding monetary value of these health improvements across the state. This comprehensive assessment provides a clear understanding of the positive public health impacts anticipated over this twenty-year period. The specific health indicators included in this analysis represent key areas where preventative measures and interventions are expected to yield substantial reductions in illness and associated healthcare costs for the Maryland population.

Table 12. Estimated total health benefits and select indicators in Maryland, 2030-2050

Health Impact		Total Avoided (2030-2050)	Monetary Value ($ million)
Total Health Benefits	*low estimate*	-	$122,413
	high estimate	-	$217,050
Total Mortality (2030-2050)	*low estimate*	9,014.63	$117,055
	high estimate	16,290.20	$211,692
Total Incidence, Asthma		434,951.75	$154.38
Total ER Visits, Respiratory		70,137.47	$76.59
All Respiratory Hospital Admits		4,360.51	$6.38
PM Incidence Lung Cancer		812,977.28	$243.40
PM Minor Restricted Activity Days		4,549.38	$362.88
PM Work Loss Days		4,788,072.23	$555.24

Based on two key studies integrated into COBRA, MDE derived low and high estimates for overall health benefits and mortality reductions. The low estimates for these outcomes are modeled on Wu et al. (2020)[14], while the high estimates are based on Pope et al. (2019)[15].

[14] Wu, X., D, Braun, J. Schwartz, M.A. Kioumourtzoglou, and F. Dominici. 2020. Evaluating the impact of long-term exposure to fine particulate matter on mortality among the elderly. Science Advances 6: eaba5692

[15] Pope, C.A., J.S. Lefler, M. Ezzati, J.D. Higbee, J.D. Marshall, S. Kim, M. Bechele, K.D. Gilliat, S.E. Vernon, A.L. Robinson, and R.T. Burnett. 2019. Mortality Risk and Fine Particulate Air Pollution in a Large, Representative Cohort of U.S. Adults. Environmental Health Perspectives 127(7): 077077.

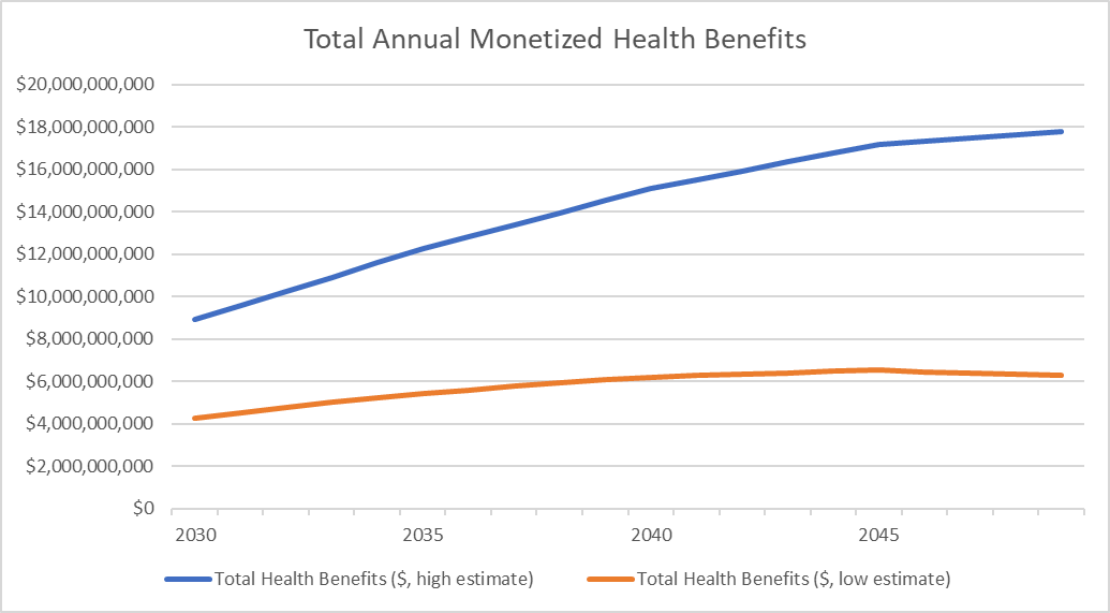

Figure 16. Total annual monetized health benefits in Maryland, low and high estimates, 2030-2050

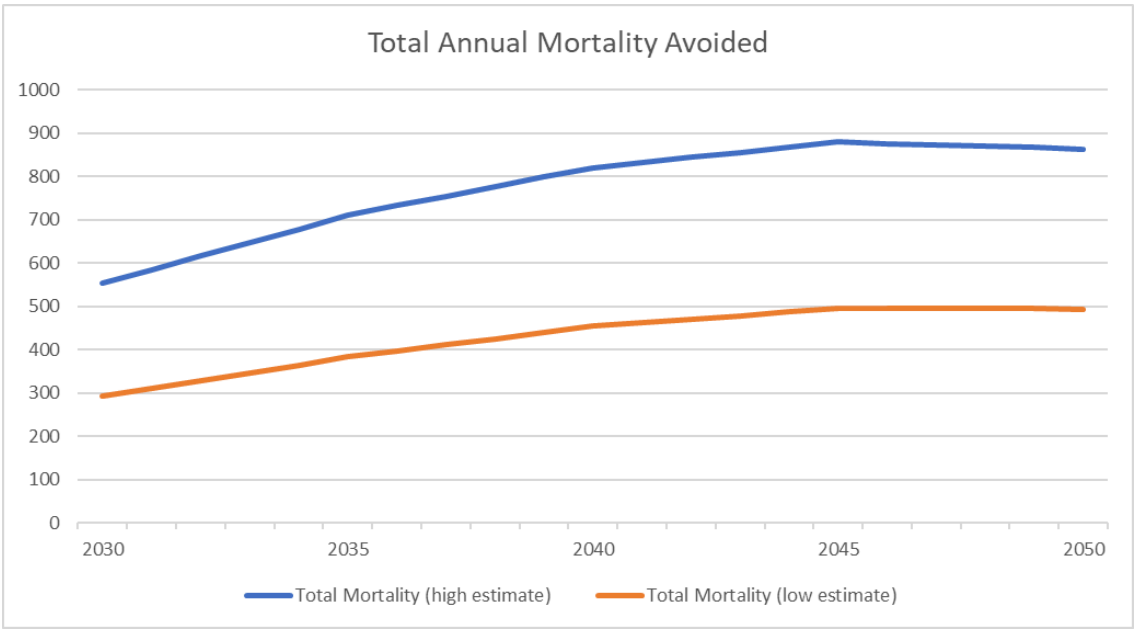

Figure 17. Total annual mortality avoided in Maryland, low and high estimates, 2030-2050

Health Benefits By County

Maryland's climate policies will generate health benefits statewide between 2030 and 2050. While more measurable benefits are anticipated in densely populated areas or near emission sources, the still considerable advantages for less affected regions reinforces the

importance of complete implementation of the GHG emission reduction measures detailed earlier.

Total Benefits

Maryland anticipates significant health benefits from decreased emissions and pollution, although these benefits will vary across the state, with more densely polluted areas seeing greater gains (Figure 18). Nevertheless, all Maryland regions are projected to experience considerable improvements in health and quality of life. For example, over a 20-year period, Garrett County, while projected to have the second-lowest total health benefits, is still expected to see $264-407 million in benefits. Likewise, Somerset County, with the lowest projected benefits, is anticipated to save $158-268 million through lower healthcare expenses and reduced mortality. This suggests that even counties located far from Maryland's main emission sources will experience significant health benefits.

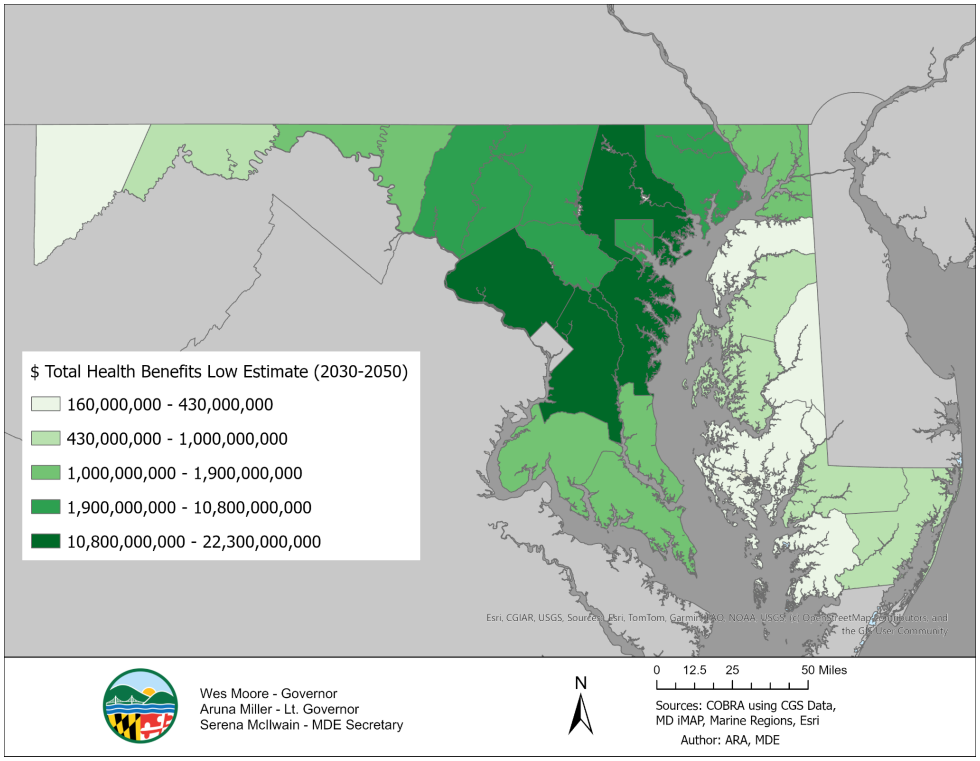

Figure 18. Low estimate of total health benefits by county ($), 2030-2050

Average Annual Reduction in PM2.5 and O3

Significant reductions in $PM_{2.5}$ ($\mu g/m^3$) and O_3 (ppb) concentrations at ground level are predicted in densely populated regions with numerous emission sources. Specifically,

communities within the Baltimore City area, many of which have a history of disadvantage, realize particularly notable improvements. This pronounced pattern of health benefits in the Baltimore area remains consistent even when controlling for population density. Projections indicate that through 2050, Baltimore County, Prince George's, Anne Arundel, and Harford counties will experience the most substantial savings in both $PM_{2.5}$ and O_3 levels (Appendices A and B).

Asthma Incidence

Projections indicate that the decline in $PM_{2.5}$ and O_3 levels will lead to a reduction in newly reported asthma cases relative to baseline. The most significant improvements are predicted to occur within the Central Maryland region, with substantial decreases also expected in Frederick, Washington, Charles, and Cecil Counties (Figure 19).

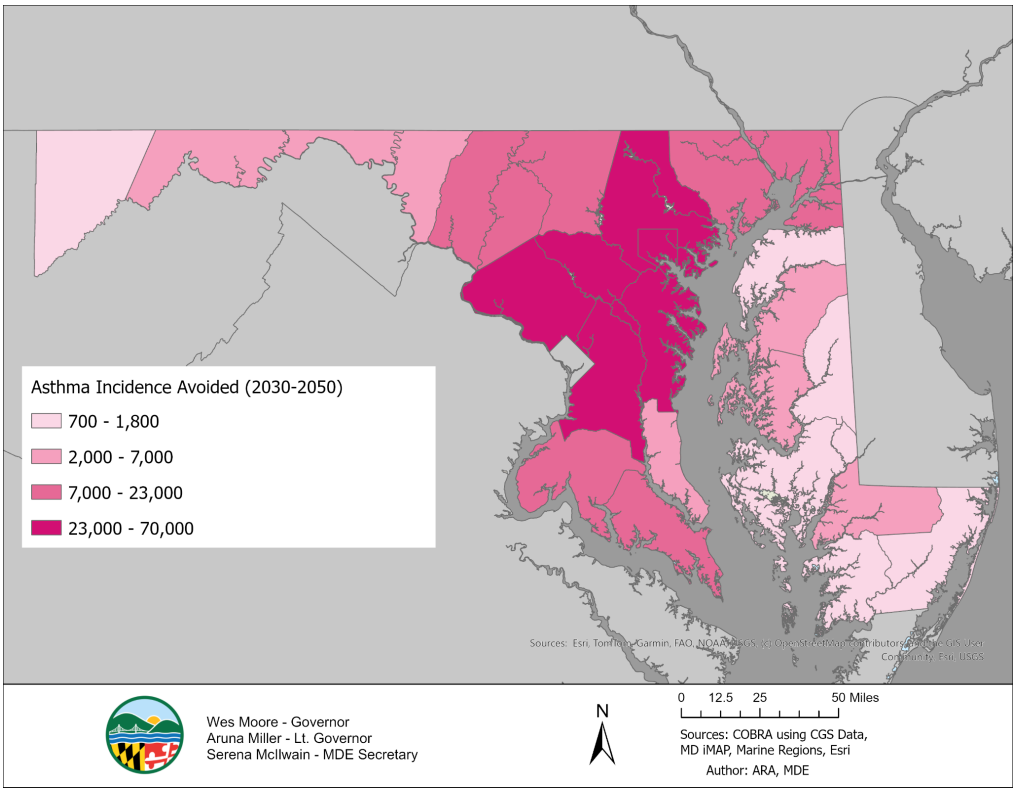

Figure 19. Total $PM_{2.5}$ and O_3-linked asthma incidence avoided by county, 2030-2050

ER Visits, Respiratory

Projected decreases in respiratory emergency room visits relative to baseline, attributed to declining co-pollutants, are anticipated to be most significant in Baltimore City (Figure 20). The greater Baltimore and Washington metropolitan regions are also forecasted to experience improvements. Furthermore, Baltimore, Prince George's, Montgomery, and

Anne Arundel counties are projected to witness substantial reductions. It is noteworthy that these benefits are expected to be geographically concentrated in the most densely populated areas of the state.

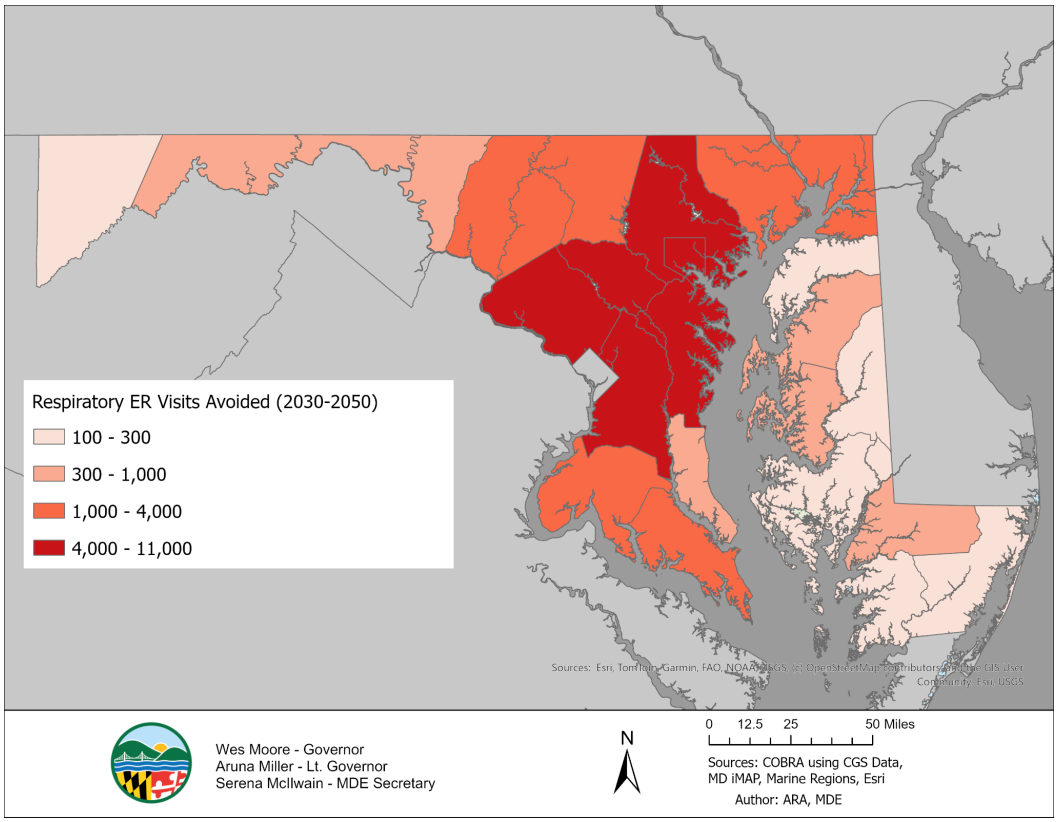

Figure 20. Total respiratory ER visits avoided by county, 2030-2050

Lung Cancer

Improving air quality, particularly by reducing $PM_{2.5}$, would significantly lower lung cancer incidence across Maryland relative to the baseline scenario. Montgomery, Prince George's, Baltimore, and Anne Arundel counties are projected to see the largest absolute reductions in cases (Figure 21). Baltimore City and its metropolitan area would also experience a substantial decrease. Adjusting for population, several Eastern Shore (Wicomico, Queen Anne's) and Southern Maryland (Calvert, St. Mary's) counties are also expected to benefit significantly from reduced lung cancer rates.

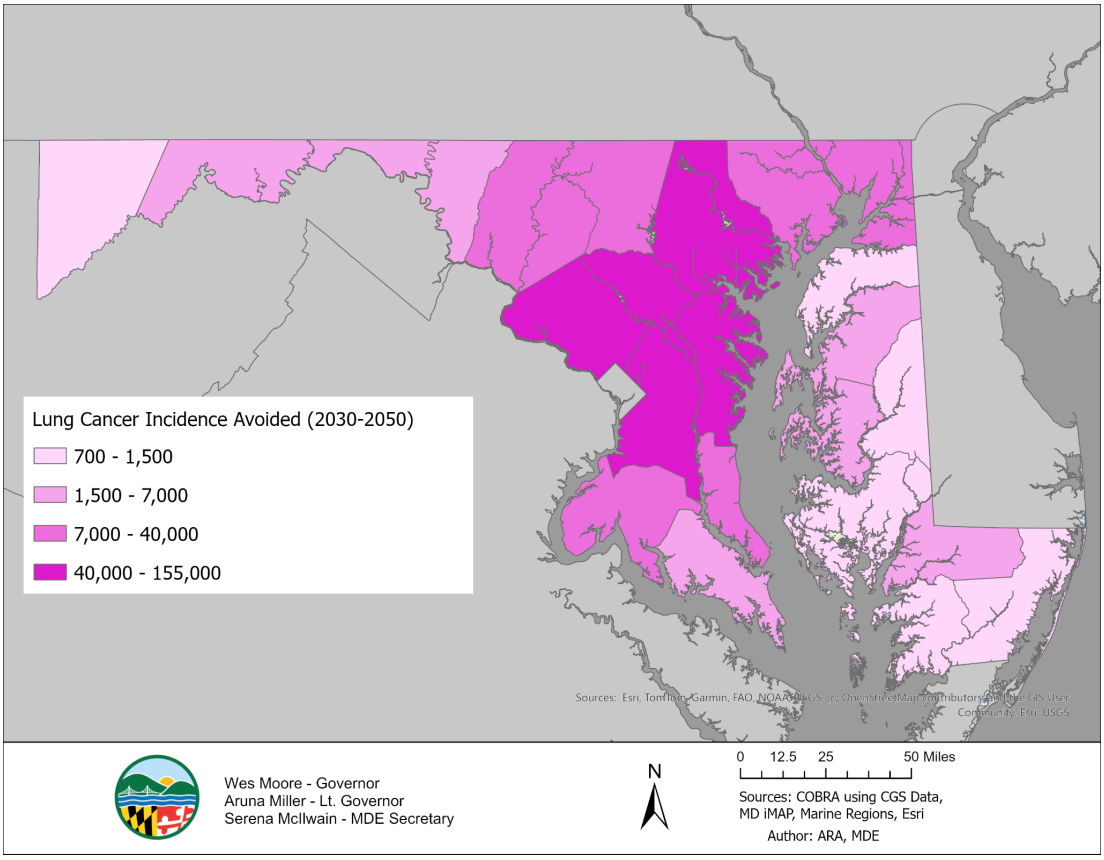

Figure 21. Total lung cancer incidence avoided by county, 2030-2050

Economic Benefits

The results from COBRA modeling were translated into inputs for the Regional Economic Models, Inc (REMI) PI+ model. This modeling was performed by the Regional Economic Studies Institute at Towson University to provide an estimate of broader economic benefits of Maryland's suite of climate policies through 2050. If implemented, Maryland's climate policies will contribute to several economic indicators, including GDP growth, employment, and personal incomes. Maryland's proposed climate policies are projected to grow the state's GDP through clean energy investments and new climate resilience industries. This transition is expected to result in a net increase in jobs across sectors such as renewable energy, energy efficiency, sustainable transportation, and climate adaptation, leading to higher employment and increased personal incomes for Maryland residents.

Table 13. Projected economic benefits of Maryland's climate policies, 2024-2050

Metric	Unit	Impacts of Current + Planned Policies Relative to Reference Scenario Summed Over 2024-2050
Total Employment	Individuals (Jobs[16])	271,305
Private Non-Farm Employment	Individuals (Jobs)	249,675
Residence Adjusted Employment	Individuals (Jobs)	207,821
Gross Domestic Product	Millions of Fixed (2023) Dollars	50,101
Personal Income	Millions of Fixed (2023) Dollars	34,521
Disposable Personal Income	Millions of Fixed (2023) Dollars	22,157
Real Disposable Personal Income	Millions of Fixed (2012) Dollars	18,560

Utility Rate Impacts

The annual energy cost for a typical all-electric household with EVs is around $2,600 lower than the annual energy cost for a typical gas-heated household with gasoline-powered vehicles. The majority of these savings are due to the lower fueling costs of an EV as compared to a gasoline-powered vehicle. Savings for the all-electric household increase to around $4,000 annually compared to homes that are heated with oil or propane. Consumers should keep these energy cost savings in mind when they consider the cost of purchasing vehicles and heating equipment. Marylanders who have already moved away from fossil fuels and gone all-electric not only enjoy lower energy costs but are also shielded from fossil fuel price fluctuations, which are variable and often influenced by geopolitical situations.

Electricity prices have historically been much less volatile and more predictable than natural gas, heating oil, and propane prices and that trend is expected to continue. Energy and Environmental Economics, an energy consulting firm, published a report in 2021 titled *Maryland Building Decarbonization Study*.[17] The study projected that a high-electrification policy scenario that resembles the policies presented in *Maryland's Climate Pollution*

[16] The unit here is technically "job years" (where one job year is defined as one job for one year), as the job-related numbers in this table represent differences in employment between the two scenarios summed over multiple years and not necessarily numbers of distinct jobs (e.g., *x* construction workers, *y* HVAC technicians, and *z* business owners) created (net the numbers lost) due to planned policies.
[17] "Maryland Building Decarbonization Study." by Tory Clark et al., Oct. 2021, mde.maryland.gov/programs/Air/ClimateChange/MCCC/Documents/MWG_Buildings%20Ad%20Hoc%20Group/E3%20Maryland%20Building%20Decarbonization%20Study%20-%20Final%20Report.pdf.

Reduction Plan would have a minimal impact on electricity prices through 2050, increasing retail rates by just $0.01 per kilowatt-hour (kWh) per decade, relative to business-as-usual. Federal clean energy investments through the Bipartisan Infrastructure Law (BIL) and IRA, which were authorized after the E3 study concluded, could further reduce electricity rates by increasing energy efficiency and efficient electrification. On the other hand, ongoing developments in PJM's wholesale electricity markets and transmission planning operations could raise electricity prices in the near term. A revised electricity rate impact analysis will be run once the state's new Clean Power Standard is developed. Ultimately, electric rates will be driven by utility investments to meet the needs of the state and are subject to Public Service Commission's (PSC) jurisdiction.

The cost of natural gas utility service has risen dramatically over the past few years for two reasons. First, gas utilities have significantly increased spending on their distribution infrastructure. Second, after a decline during the early years of widespread hydraulic fracturing, gas commodity costs have also risen while becoming more volatile. Gas utility rates are expected to continue to increase significantly over the coming decades. In every scenario that E3 modeled for the *Maryland Building Decarbonization Study*, gas rates doubled or more by 2035.

Maryland's Climate Pollution Reduction Plan will help all Marylanders enjoy the benefits of living without dependence on fossil fuels. Policies such as a Clean Heat Standard could put additional upward pressure on natural gas rates if fossil fuel companies pass their cost of compliance on to their customers. However, the rate impacts of the new policies in *Maryland's CPRP* are expected to be less than the savings that gas customers will see if natural gas utility companies are directed to scale back plans to rebuild their gas distribution systems. One study shows that if gas utility companies decreased gas system capital investments by 75% relative to projected spending - a reduction that is consistent with a transition away from fossil fuels in the building sector - then gas customers would save approximately $22 billion between 2025 and 2045. That level of savings could more than offset the rate impacts of new policies. These possible impacts highlight the need for comprehensive gas planning, which is currently being considered by the PSC.

Electricity System Impacts

One often-discussed factor that can influence electricity rates is the buildout of the electricity grid to handle periods of system peak demand, when overall consumer demand on the grid is the highest. The electricity grid is constructed to handle peak demand and, to the extent that peak demand increases, then additional investments may be needed to increase grid capacity.

Studies show that electrification paired with energy efficiency and load flexibility can lessen growth in peak demand. E3's *Maryland Building Decarbonization Study* found that Maryland's grid will shift from summer to winter peaking around the end of this decade and peak demand will grow very gradually through 2045 with efficient electrification.

A study by the Lawrence Berkeley National Laboratory (LBNL) found similar results when looking at the impact of electrification policy on large buildings in Maryland. LBNL found that MDE's Building Energy Performance Standards (BEPS) regulation, due to its combination of energy efficiency and emissions standards, is modeled to decrease peak electricity demand for covered buildings by 6% by 2040, whereas a hypothetical BEPS policy that excludes energy efficiency standards would increase peak demand by 24% by 2040. LBNL's findings are especially relevant in the context of E3's study, which found that commercial building electrification has a larger impact on peak demand growth than residential building electrification. In other words, because BEPS is modeled to decrease, not increase, peak demand, there is even more confidence that peak demand impacts from residential electrification can be similarly managed through the state's new policies.

The CSNA directed PSC to conduct a study "assessing the capacity of each company's gas and electric distribution systems to successfully serve customers under a managed transition to a highly electrified building sector" including the following requirements for this study:

- Use a projection of average growth in system peak demand between 2021 and 2031 to assess the overall impact on each gas and electric distribution system;
- Compare future electric distribution system peak and energy demand load growth to historic rates;
- Consider the impacts of energy efficiency and conservation and electric load flexibility;
- Consider the capacity of the existing distribution systems and projected electric distribution system improvements and expansions to serve existing electric loads and projected electric load growth; and
- Assess the effects of shifts in seasonal system gas and electric loads.

The report was completed in January 2024. The following is a summary of the results:

- In aggregate, Maryland's electric systems would see a load growth in the range of 0.6-2.1% per year through 2031 under a high electrification scenario assuming utility energy efficiency plans consistent with the CSNA and existing demand response plans.

- The Maryland electric system, which is currently summer peaking, would switch to winter peaking around 2026-2027.
- Pursuing policies to incentivize efficient electrification, such as using cold climate heat pumps and load flexibility measures, could result in significant mitigation of load growth by 2031 to 0.2-1.2% compound annual growth per year.
- Historically in Maryland, there was significant load growth in the 1980s of 4.9% per year and more moderate growth of 1.2-1.5% from 1990 to 2010. Load declined between 2010 and 2020.
- These results show that peak load growth through 2031 with high electrification of the building sector will be comparable to or less than the growth rate the Maryland system has seen over the past 40 years.

The studies mentioned above by Brattle, E3, and LBNL highlight the importance of energy efficiency and peak-shifting measures to mitigate electric system costs as electrification proceeds. These studies also show that the policies in *Maryland's Climate Pollution Reduction Plan* can be implemented while growing the electric system at rates below historic levels.

[7] Low Income and Disadvantaged Communities (LIDAC) Benefits Analysis

This low-income and disadvantaged communities (LIDAC) Benefits Analysis contains the following elements, per CPRG Planning Grant guidance:

- Identification of LIDACs using Census block group IDs (see Appendix C).
- Specific climate impacts or risks to which LIDACs are vulnerable.
- Expected benefits to LIDACs associated with CCAP GHG reduction measures.
- A summary of planned and/or ongoing engagement with representatives and residents of LIDACs to inform CCAP development and implementation.

Everyone deserves clean land, clean water, and clean air. However, many income-burdened and disadvantaged communities, especially those located next to industry, have been disproportionately impacted by pollution. State Government is committed to addressing the disproportionate effects of climate change in these communities. Efforts by the State of Maryland will help to ensure that communities of every culture, race, ethnicity, and socioeconomic background get fair protection from environmental and health hazards, as well as equal access to the decision-making process for environmental policies.

Environmental justice is defined under Maryland state law as "equal protection from environmental and public health hazards for all people regardless of race, income, culture, and social status." Our state is increasingly dealing with severe storms and other effects of climate change, such as extreme heat events and poor air quality from wildfires. The people most affected by these environmental challenges are our most underserved and overburdened communities in Maryland.

LIDAC Identification

Under the CPRG Program, EPA defines low-income and disadvantaged communities as any community that meets at least one of the following characteristics:

- Any census tract that is included as disadvantaged in the Climate and Economic Justice Screening Tool (CEJST);

- Any census block group that is at or above the 90th percentile for any of EPA EJScreen's Supplemental Indexes when compared to the nation or relevant state; or,
- Any geographic area within tribal lands as included in EPA EJScreen. (The CPRG program considers that federally recognized tribes meet the definition of disadvantaged communities for the purposes of this grant program).

Although Maryland has state-specific definitions of low-income and disadvantaged communities, EPA requires use of the above for CPRG implementation grants. Therefore, for this CCAP, MDE used the federal Climate and Economic Justice Screening Tool (CEJST) to identify census tracts that the tool designates as disadvantaged in the state and the EPA EJScreen tool to identify census block groups that are at or above the 90th percentile for any of EJScreen's Supplemental Indexes.

The Council on Environmental Quality developed the CEJST tool to help identify disadvantaged communities that will benefit from programs included in the Justice40 Initiative. In Maryland, 278 census tracts (19.8%) are identified as disadvantaged by the CEJST tool, while the EPA EJ Screen IRA Disadvantaged Communities tool identifies 1,048 census block groups (25.7%), including a population of 1,387,832 Marylanders. The full list of the census block group IDs that are identified as LIDACs in Maryland are included in Appendix C. The following figures display LIDACs in Maryland as identified using CEJST and the EPA EJScreen tool.

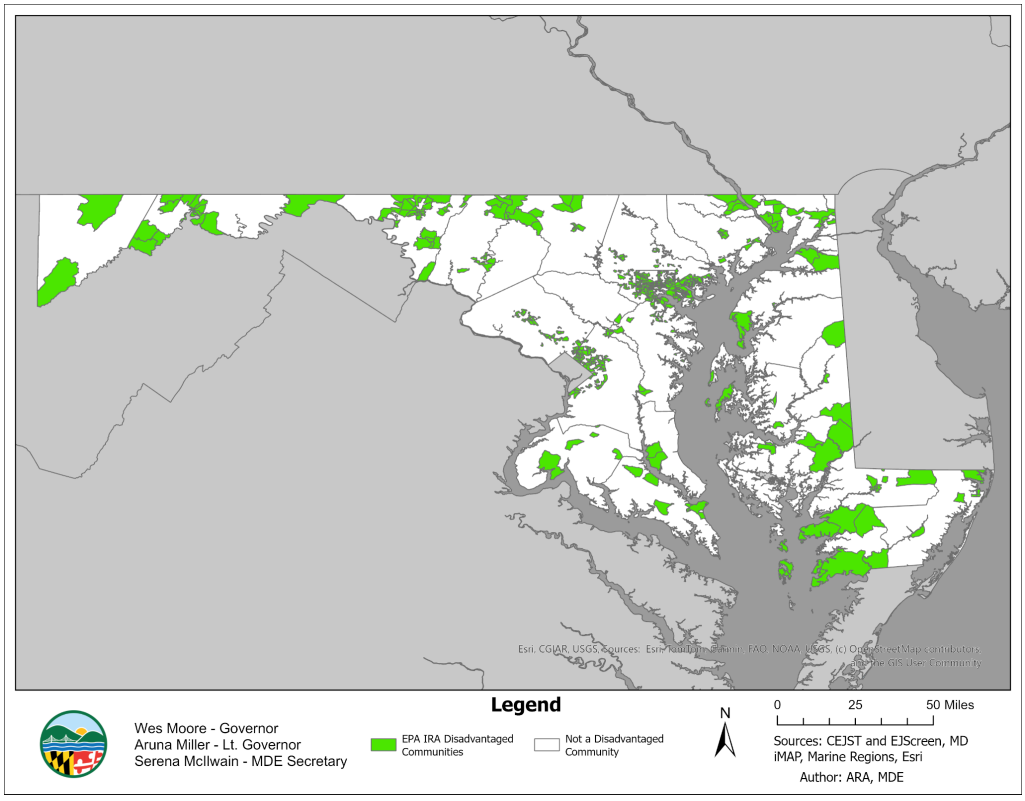

Figure 23. State of Maryland LIDACs as Identified Using CEJST and EPA EJScreen

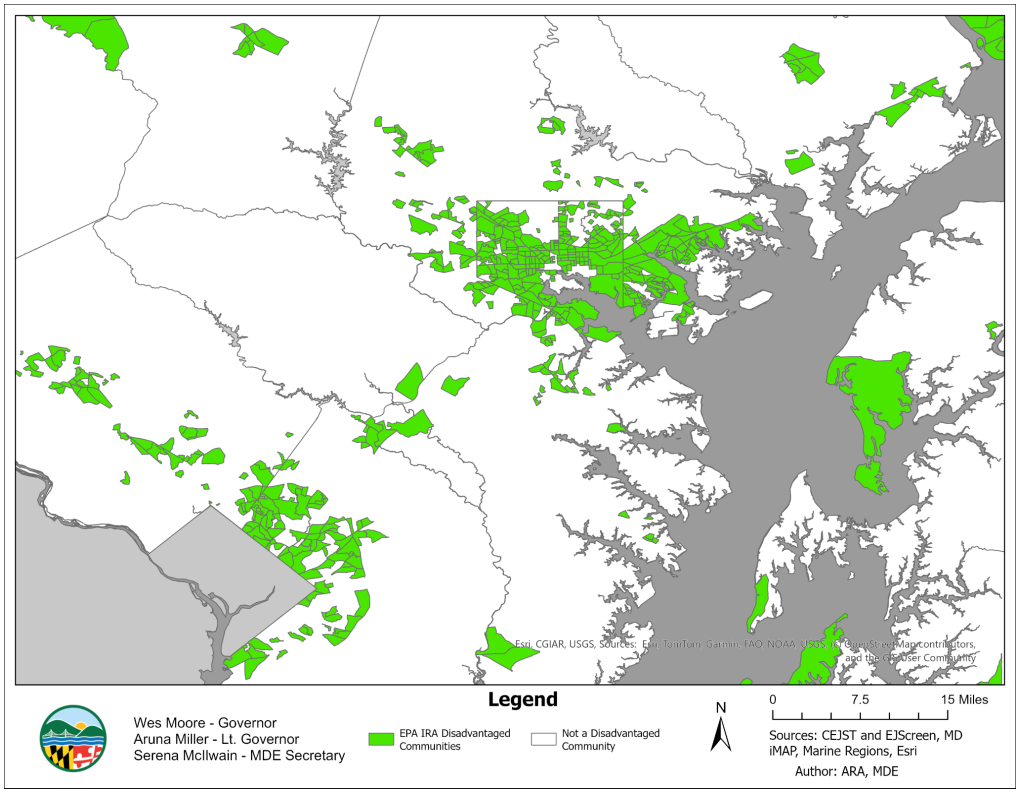

Figure 24. Central Maryland LIDACs as Identified Using CEJST and EPA EJScreen

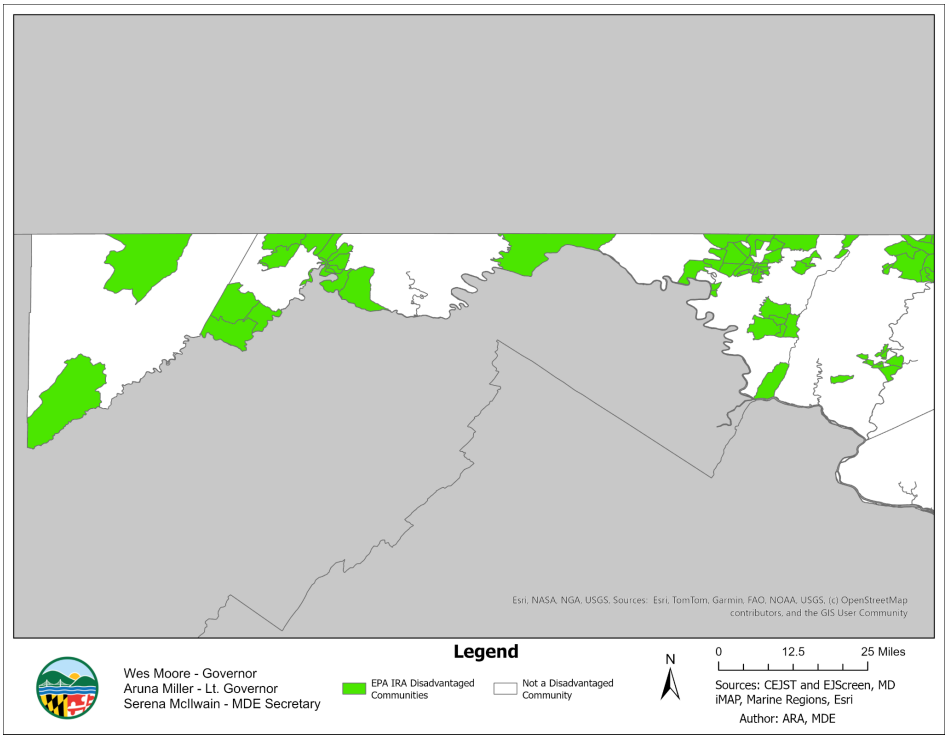

Figure 25. Western Maryland LIDACs as Identified Using CEJST and EPA EJScreen

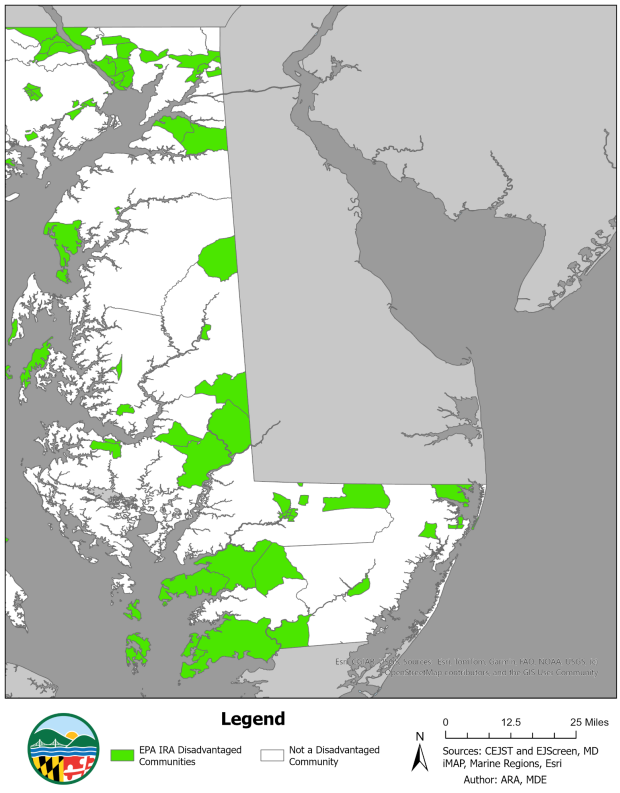

Figure 26. Eastern Maryland LIDACs as Identified Using CEJST and EPA EJScreen

Climate Impacts and Risks to Maryland's LIDACs

MDE has developed a Climate Vulnerability Map within the MDEnviroScreen that identifies communities disproportionately affected by climate impacts in Maryland. MDE, in consultation with the CEJSC, has developed a methodology for identifying communities disproportionately affected by climate impacts.

Per the CSNA, this methodology at minimum includes:

- Underserved communities,
- Overburdened communities, and
- Areas that are vulnerable to climate impacts, such as flooding, storm surges, and urban heat island effects.

This method uses an established climate change vulnerability framework, which establishes the possibility of harm from climate impacts, or hazards, as a function of (1) the degree of exposure to the hazard, (2) existing sensitivity to the hazard, and (3) adaptive capacity, or the degree to which the affected community could mitigate the potential for harm by taking action.

To understand the geographical distribution of risk, this methodology uses existing spatially explicit climate and equity data developed and/or used by MDE and DNR . Climate hazard data was also sourced from The Trust for Public Land and U.S. Drought Monitor.

Benefits of GHG Reduction Measures to Maryland's LIDACs

State Economic Benefits in LIDACs

It is necessary to recognize that all households are not impacted equally by the proposed policies. Low-income Marylanders spend 10 percent more of their income on energy cost compared to the state average. *Maryland's Climate Pollution Reduction Plan* will help all Marylanders enjoy the benefits of living without dependence on fossil fuels. In LIDACs, the cost of natural gas utility service continues to rise. Many LIDACs in Maryland currently do not have the infrastructure or programs in place to easily transition to an all-electric household. The policies outlined in *Maryland's Climate Pollution Reduction Plan* make it possible for LIDACs to receive the benefits of lower energy cost from transitioning away from fossil fuel.

Income inequalities impact the implementation of energy saving techniques in low- and moderate-income households across the state. Energy-saving opportunities such as weatherization, rooftop solar, and building electrification are often inaccessible for LIDACs. Therefore, the policies outlined in *Maryland's Climate Pollution Reduction Plan* prioritize and provide equitable assistance to help low-income households ease the burden of energy costs. As Maryland advances GHG reductions and climate goals, these policies ensure no Marylanders are left behind.

From 2024 to 2031, up to 27,400 additional jobs will be generated under the new policies. Job growth is modeled to be most significant in the LIDACs in Baltimore County, Baltimore City, Allegany County, and Prince George's County. LIDACs are at the center of the climate action plan and will receive most of the economic investment from the new policies outlined in the plan. Over the long term (2024 – 2050), approximately 10,048 jobs per year will be generated, with a majority of job gains in the construction and transportation occupations, followed by installation/maintenance/repair and management. From 2024 to 2031, Marylanders will experience a $2.5 billion increase in their personal income and residents of LIDACs will benefit from significant wage increases throughout Maryland.

State Public Health Benefits in LIDACs

The most significant economic benefits Marylanders will experience under *Maryland's Climate Pollution Reduction Plan* are savings related to health care and health outcomes. With the implementation of *Maryland's Climate Pollution Reduction Plan*, residents will experience reductions in mortality, nonfatal heart attacks, and minor restricted activity days. Burdens such as transportation, access, and cost impact residents of LIDACs acutely when accessing health care. By improving public health through emissions reduction, *Maryland's Climate Pollution Reduction Plan* will improve health outcomes in LIDACs and across the state. Preventing adverse health impacts under these policies will deliver additional health benefits of $142 million to $321 million by 2031 and $13 billion to $20 billion between 2030 to 2050. LIDACs stand the most to gain because they will receive the dual benefits of reduced health care expenditures and lower incidence of adverse health outcomes.

Using COBRA modeling, Baltimore City, Baltimore County, Prince George's, and Allegany counties have the greatest estimated total health benefits from *Maryland's Climate Pollution Reduction Plan* per capita. Most of the census tracts that are identified in the State of Maryland under the CEJST tool are in the same counties.

The reductions in $PM_{2.5}$ and O_3 levels will have the most dramatic impact in urban population centers, particularly Baltimore City, due to a higher number of emission sources and industrial co-pollutants. LIDACs in urban areas, particularly Baltimore City, will experience significant improvement to public health under the GHG reduction plan. Baltimore City is estimated to have the largest per capita reduction in asthma exacerbation overall. Additional decreases in adverse respiratory symptoms are expected to be significant in Baltimore City and the communities south and west of the city.

LIDACs in Baltimore City, Prince George's County, and Howard County will see the greatest reduction in minor restricted activity days per capita. These benefits are not limited to urban LIDACs; there are also notable benefits in rural counties along Maryland's Eastern Shore and Garrett County in Western Maryland that are estimated to see significant total health benefits delivered in 2031 ($233,000 - $525,000).

In Maryland, 19.8% of census tracts and 25.7% of census block groups are identified as disadvantaged. Providing benefits to LIDACs is central to the success of the GHG reduction plan. The health burdens of climate change, such as severe storms and extreme heat, are heavier in LIDACs. These burdens are compounded by unequal pollution from industry and poor air quality from wildfires, and result in higher rates of high health impacts. The GHG plan targets LIDACs and works toward environmental justice in Maryland.

Engaging with Maryland's LIDACs

State Government acknowledges the correlation between many minority, low-income, and limited English proficiency communities and a disproportionately high burden from pollution. A top priority for State Government is to address the disproportionate burden to LIDACs through new financial investments in communities with EJ concerns, increased inspections and compliance, the development of new regulations which address cumulative impact, and expanded opportunities for community engagement in program design and implementation.

State Government is addressing these environmental disparities by building relationships with communities and making sure they have the tools and knowledge to be involved in the processes. MDE has developed partnerships with community groups in Cheverly, Turner Station, and Curtis Bay, three distinct disadvantaged communities according to CEJST and MD EJScreen, to develop community led hyper-local air monitoring networks. With funding from the American Rescue Plan (ARP) MDE is engaging directly with residents in LIDACs to understand air quality concerns and build community science capacity.

The department has taken following actions to engage with LIDACs in Maryland:

- Appointed an Assistant Secretary for Environmental Justice, an Environmental Justice Coordinator and a Community Liaison responsible for helping communities have a seat at the table when environmental decisions are made in their communities and ensuring no one is left behind when it comes to funding, permits, authorization, enforcement and outreach.
- Collaborated with the Curtis Bay community on the "Collaborative Investigation of Coal Dust, Air Pollution, and Health Concerns in Curtis Bay, South Baltimore, Maryland, USA, 2022-2023" report, a scientific study documenting coal dust in the air around the CSX coal terminal.
- Participated in community advisory boards to create spaces for collaboration in Baltimore City, Baltimore County and Prince George's County.
- Developed guidelines for an enhanced public participation process at the request of community residents to increase honesty and transparency in agency actions.
- Partnered with community members to develop data sharing guidelines to increase community control of air quality research and ensure outcomes are being properly reported.
- Secured one of the largest environmental crime fines in state history by securing $1.75 million in criminal fines against a biomedical waste incinerator in Curtis Bay.
- Engaged the Westernport community to bolster protections of the North Branch Potomac River, while also balancing its economic and recreational uses.
- Redesigned the interface of MDE's environmental screening tool for an improved user experience and improved the identification of overburdened communities by using higher resolution sensitive population data from the Maryland Department of Health (MDH) and a higher accuracy method to evaluate proximity to pollution burden sources.
- Coordinated the development of Climate Implementation Plans (CIPs) with each Maryland state agency in accordance with Executive Order 01.01.2024.19, which identified specific ways that agencies can advance environmental justice.

MDE's stakeholder engagement processes are supported by the Maryland Chesapeake Conservation and Climate Corps program, managed by the Chesapeake Bay Trust. The Corps program promotes and protects the environment by providing young adults with opportunities to gain career skills and become more engaged through meaningful community service. Specifically, the expanded programmatic focus on climate change is

designed to promote climate justice, assist Maryland in achieving its GHG emissions reduction targets, and mobilize, educate, and train young adults to deploy clean energy technology. Climate Corps members support the development of outreach and engagement plans and materials.

In developing *Maryland's Climate Pollution Reduction Plan*, MDE conducted environmental justice listening sessions throughout the state to hear and learn about residents' lived experiences, discuss concerns, and identify opportunities and key actions that MDE and other state and local agencies can undertake to address inequities and ensure direct benefits to communities. These listening sessions are one of several channels of communication that MDE has opened to increase agency transparency and include communities in the decision-making process.

MDE supports and coordinates with the Commission on Environmental Justice and Sustainable Communities (CEJSC) to advance environmental justice. CEJSC is a twenty-member body that is tasked with advising the State government on environmental justice and analyzing the effectiveness of State and local government laws and policies to address issues of environmental justice and sustainable communities.

[8] Workforce Planning Analysis

To adequately address climate change and meet Maryland's GHG reduction targets, smart changes will be needed across every sector of the economy. Due to its wide scope, climate action presents enormous opportunities for statewide, high-quality job growth and skilled-training and development of Maryland's workforce. Economic analysis done by Towson University's Regional Economic Studies Institute estimates a significant net gain of jobs in Maryland from the full implementation of CCAP climate measures.

- A net gain of 27,400 jobs[18] is estimated between 2024 and 2031.
- A net gain of 271,305 jobs is estimated between 2024 and 2050.

State government is collaboratively administering climate related workforce programs with employers and industry partners to:

- Address business workforce needs by focusing on industry sector strategies that seek long-term solutions to sustained skills gaps and personnel shortages;
- Address the needs of workers by creating formal career paths to good jobs, and sustaining or growing middle class jobs;
- Encourage mobility for Maryland's most hard-to-serve jobseekers through targeted job readiness training; and
- Foster better coordination among the public and private sectors and workforce, economic development, and education partners around the State.
- Ensure employers have the talent they need to compete and grow

While nuanced work and many actions are needed to implement this plan, jobs focused on electrification, clean and renewable energy generation, and building energy performance upgrades are at the heart of the climate-smart economy transition in Maryland.

Priority Occupations to Get to Net-Zero

Clean Energy Economy Technology

Fortunately, most of the technologies needed to transition to a clean energy economy are not only readily available but they are also the most popular. Renewable energy systems started being built faster than new fossil fuel power plants in the U.S. in 2014. Heat pumps

[18] More precisely, job years, where one job year is defined as one job for one year.

began outselling gas furnaces in the U.S. in 2022. In 2024, the best-selling car model in the world was an electric vehicle.

The clean energy transition is well underway as manufacturers are producing zero-emission devices fast enough to meet demand. Installing all of these new devices requires the work of skilled technicians. Continued job growth is expected for electricians, heat pump device installers, renewable energy installers, and professionals involved with developing, financing, and managing small and large infrastructure projects.

Some of the technologies that are part of the transition - including electrolyzers for hydrogen production, vehicle-to-grid electronics, industrial heat pumps, and networked geothermal systems - are available today but not at the scale that is needed for the future. Job growth related to developing, manufacturing, and installing these and other emerging technologies is expected.

Technologies that are necessary to achieve net-zero emissions - including carbon capture and storage (CCS) and direct air capture (DAC) - need rapid development to be deployed in time for Maryland to hit its goals. Modeling for this plan shows that CCS and DAC would need to start being deployed within the next 10 years and that DAC would need to pull around 10 MMTCO2e out of the air in 2045 for Maryland to achieve net-zero emissions within the state. This challenge is not unique to Maryland; CCS and DAC are likely necessary technologies for the world to achieve net-zero emissions. Job growth related to research, development, manufacturing, and installing these emerging technologies is expected.

Priority Occupations and their Primary Roles

Table 14 below highlights the current employment rates and wages[19] of the priority occupations in Maryland related to implementing the climate measures in this plan. The priority occupations included in the table below are meant to capture the workforce related to the following:

- Efficient electrification of equipment for Heating, Ventilation, Air Conditioning, and Refrigeration (HVAC-R) and domestic water heating systems
- Building energy performance upgrades (e.g. insulation, air-sealing, thermal bridge reduction, high performance windows and doors, etc.)
- Clean energy deployment of solar power, wind power, and geothermal systems
- Battery storage systems

[19] "Standard Occupational Classification." *Bureau of Labor Statistics*. www.bls.gov/soc/home.htm Data retrieved May 23, 2025.

- Electrical charging infrastructure for vehicles

Table 14. Priority Occupations for Implementing Maryland's CCAP Measures

Occupation (Standard Occupational Classification Code)	Employment - Maryland May 2024	Annual Median Wage - Maryland May 2024	Employment - U.S. May 2024	Annual Median Wage - U.S. May 2024
First-Line Supervisors of Construction Trades and Extraction Workers (47-1011)	15,850	$76,800	806,080	$78,690
Carpenters (47-2031)	10,460	$60,130	697,740	$59,310
Construction Laborers (47-2061)	20,280	$46,320	1,057,660	$46,730
Electricians (47-2111)	14,750	$65,650	742,580	$62,350
Insulation Workers, Floor, Ceiling, and Wall (47-2131)	890	$58,870	38,610	$48,680
Plumbers, Pipefitters, and Steamfitters (47-2152)	11,490	$63,270	455,940	$62,970
Roofers (47-2181)	2,520	$52,010	136,740	$50,970
Solar Photovoltaic Installers (47-2231)	490	$58,420	396,870	$59,810
Heating, Air Conditioning, and Refrigeration Mechanics and Installers (49-9021)	6,380	$65,000	1,531,700	$48,620
Maintenance and Repair Workers, General (49-9071)	22,290	$49,790	28,280	$51,860

Maryland's median income wages for priority climate change occupations are mostly similar to the national average; notable exceptions are HVAC-R workers and insulation workers, who earn 34% and 21% more than the U.S. National average, respectively. The Maryland 2021 Clean Energy Industry Report found that many clean energy positions earn higher wages compared to the statewide economy. The clean-energy occupations earned a premium over the statewide entry-level hourly wage.

Industry Analysis for Priority Occupations

Historical Growth

The *Maryland 2021 Clean Energy Industry Report* details historical clean energy employment across Maryland utilizing the U.S. Department of Energy's *2021 U.S. Energy and Employment Report (USEER)* data collection beginning in 2016 through the end of 2020. The annual *USEER* surveys energy employers in each state to establish a yearly report of workforce levels across energy sector jobs.

The report found that the highest concentration of clean energy industry employment by major value chain segments in the state compared to federal-defined industries (construction, manufacturing, wholesale trade, etc.) was in construction as well as professional and business services. At the end of 2020, seven in ten clean energy jobs, or 54,200 workers, were clean energy construction workers in Maryland. This indicates that approximately 67% of the clean energy labor force was involved in residential, commercial, and industrial building construction; contracting and electrical work; insulation and weatherization; or plumbing and heating, air conditioning, and ventilation work. Additionally, the construction industry segment includes clean energy workers engaged in building new renewable power plants or clean electricity generation facilities.

Overall, Maryland's clean energy economy supported approximately 81,301 clean energy workers across the state and accounted for 3% of all jobs in the state. Between 2016 and 2019, clean energy job growth accounted for 8.9% of all new job growth in Maryland, equaling approximately one in ten new jobs.

This report further details employment across five key technology sectors of the clean energy economy: energy efficiency, clean energy generation, alternative transportation, clean grid and storage, and clean fuels. In Maryland, the largest technology source of clean energy jobs was the energy efficiency sector. Workers in this sector are involved in the research, manufacture, sales, installation, repair, or professional service support of technologies and services designed to improve the efficiency of buildings. The energy efficiency sector employed more than 65,400 workers, indicating that more than eight in ten clean energy jobs across the state (82% of total clean energy employment) were accounted for by energy efficiency workers.

The second largest technology source of jobs was the clean energy generation sector, composed mainly of solar workers. The jobs in this sector are involved in the research, development, production, manufacture, sales, installation, maintenance, repair, or professional services that support low and carbon-free electricity generating technologies. Clean energy generation firms accounted for 13% (approximately 10,700 jobs) of all clean energy employment. Solar accounts for the largest share of clean energy

generation jobs, with 57% and over 6,100 workers. Wind energy jobs were the third largest share of clean energy generation jobs with roughly 930 wind energy jobs (approximately 8.7% of clean energy generation jobs). Maryland's wind energy sector is projected to create jobs over the next several years with offshore wind projects in the development pipeline.

The U.S. Department of Energy released the more recent *2024 U.S. Energy and Employment Report (USEER)*, providing updated data on Maryland's energy employment in the state. In 2023, Maryland had 127,479 energy workers in the state. Maryland's energy workforce represented 1.5% of all U.S. energy jobs and the energy sector represented 4.7% of total state employment in 2023. Energy efficiency was the highest major energy technology application with 67,772 workers. The electric power generation sector employed 15,807 workers in the state and solar electricity had the highest electric power generation employment.

Projected Growth

The Maryland Department of Labor's 2024 EARN Report[20] estimates that specialty Trade Contractors are projected to add 4,807 jobs (4.4% growth) between 2022 and 2032, with specific subsectors showing strong growth. Foundation, Structure, and Building Exterior Contractors (1,538 jobs, 7.0% growth) and Building Equipment Contractors (1,751 jobs, 3.0% growth) are essential for constructing and outfitting buildings. This aligns with EARN Maryland's focus on skilled trades, with a need for trained professionals in structural work, HVAC, electrical, and plumbing systems. Building Finishing Contractors (339 jobs, 2.0% growth) and Other Specialty Trade Contractors (1,140 jobs, 7.5% growth) show demand for skilled trades involved in interior finishes and niche construction services.

A Workforce Needs Assessment was completed for the Maryland Energy Administration (MEA) to identify the baseline workforce of fully qualified energy efficiency workers, project the future energy efficiency workforce demand, and provide resources to utilize for workforce training and development opportunities. This assessment utilized data for Maryland from the *2023 U.S. Energy and Employment Report (USEER).*

Maryland had 125,007 energy workers in 2022. Over half of the energy workers in the state that year were accounted for in the energy efficiency sector, with a total of 66,570 workers. A projection of energy efficiency labor demand by 2033 was conducted to determine the lower and upper end estimates for the projected increase in number of workers required. This projection analysis provides a range of potential increases in

[20] See Maryland Department of Labor's 2024 EARN Report here: https://www.labor.maryland.gov/earn/earnannrep2024.pdf

energy efficiency workforce demand to meet the future workforce demand in 2033, including a 34% increase of workers (22,608 workers) to potentially doubling the current workforce in the state (64,000 workers).

The lower end estimate only considers current incentives and cost-effective measures, and is derived from incorporating utility programs and the IRA, MEA, and Maryland Department of Housing and Community Development incentives for residential building efficiency. The total number of workers needed for the lower end estimate would be 89,178 total workers, which would be an increase in workers by 34% (22,608 workers).

The upper end estimate is derived from meeting energy efficiency targets for residential and commercial buildings in Maryland. The total number of workers needed for the upper end estimate would be 130,570 workers, which would be an increase in workers by 96% (64,000 workers).

Potential Workforce Shortages and Strategies to Address These Challenges

Identifying potential workforce shortages and solutions to address these challenges is key to ensuring Maryland will be able to implement climate measures with enough time to meet the state's required emissions reduction targets. Collaboration and organized efforts between the business community, trade associations, and government play a critical role to establish targeted programs and provide incentives.

Current Needs for Clean Energy

The Maryland 2021 Clean Energy Industry Report included a comprehensive clean energy training inventory to provide an understanding of the occupational and geographic distribution of local existing clean energy-related training programs in Maryland. The inventory includes 148 training programs in the state available for the clean energy workforce. Most of the training programs focus on energy efficiency improvements to new and existing structures and electrical systems as well as renewable energy generation technology that primarily targets Maryland workers in the wind and solar industries.

Attracting New Climate Related Employers

The Maryland Department of Commerce's Office of Strategic Industries and Entrepreneurship is focused on the growth and development of the state's strategic industry sectors. The energy sector is a target sector for growth, and Commerce's staff

includes an Energy Program Manager dedicated to supporting the industry. Commerce has two primary areas of focus for growing the energy industry sector and supporting the creation of jobs:

- **Encouraging the formation and growth of clean energy startups and technology development** – Innovation in the clean energy sector is one way to grow the industry and spur job creation in Maryland. Commerce works directly with clean energy entrepreneurs and startups to connect them with resources to support their growth. Specifically, Commerce administers the Innovation Investment Tax Credit program, which fosters the growth of Maryland's technology sectors by incentivizing investment in early-stage companies to increase the number of companies developing innovative technologies in Maryland, increasing overall investments in current and emerging technology sectors, and increasing the number of individual investors actively investing in Maryland technology companies.
- **Business attraction** – Commerce actively works to attract clean energy companies to Maryland. Commerce attends several clean energy conferences throughout the year, meeting with companies to pitch Maryland as a location of choice for new business investment. Commerce has several incentive programs available to support the attraction of clean energy jobs to the state, including Advantage Maryland conditional loans, the More Jobs for Marylanders tax credit program, the Job Creation tax credit program, and Partnership for Workforce Quality workforce training grants.

Shoring-Up the Offshore Wind Workforce

Maryland's PSC awarded offshore wind renewable energy credits (RECs) to two developers who will build off the coast of Maryland. In the decision, PSC attached conditions to the approval that included that developers create a minimum of 10,324 direct jobs during their development, construction, and operating phases of their offshore wind projects. To foster the development of a workforce to support the emerging offshore wind industry, the Department of Labor developed a strong talent pipeline through the Good Jobs Challenge grant. The nearly $23 million grant supports both entry-level and mid-level training programs to grow and sustain the state's offshore wind workforce.

By investing in high-quality, locally led workforce systems with training in manufacturing, transportation, logistics, and skilled trades, the Maryland Works for Wind program creates and upskills electricians, carpenters, ironworkers, and many other jobs needed for the clean energy transition. With emerging technologies in mind, training programs

continue to enhance their curriculum to meet the demands for offshore wind. Upon completion of the grant, over 3,800 individuals will have benefited from a workforce development program related to offshore wind and placed into high-quality jobs. In July 2025, the Maryland Department of Labor (MDL) will partner with the Maryland Energy Administration (MEA) to administer $2.5 million of funding to increase skills training and supportive services that prepare Marylanders for careers in sectors that support the offshore wind industry.

Employment Advancement Right Now (EARN) Maryland

Another important workforce program to address potential shortages is the Maryland Department of Labor's nationally recognized workforce solution, Employment Advancement Right Now (EARN) Maryland program. Investing in clean energy jobs was identified as a key sector impact in the 2024 EARN Report. The State of Maryland connects businesses with available grant funding to support their workforce development programs. These grants are administered partially through the EARN Maryland program targeting high-projected-growth industry sectors through existing workforce development organizations and industry partners. The EARN Maryland program is industry-led and designed with flexibility to ensure Maryland employers have the workforce needed to compete and grow while simultaneously preparing Marylanders for meaningful careers.

Four of the 10 focus areas of the EARN Maryland program directly support the implementation of measures in this plan (green jobs, transportation, manufacturing, skilled trades), ensuring a pipeline of highly-skilled individuals are available to work on projects that will help the state meet its climate goals. The EARN Maryland program has the flexibility to support all industries that fall into the clean energy transition as this statewide initiative is industry-driven and responsive to workforce needs. On an annual basis, EARN adjusts the grant structure by sector. Thus, as demand for clean energy projects increases, clean energy sectors are anticipated to receive greater funding from EARN.

In a recent study on the economic impact of EARN Maryland, the Business Economic and Community Outreach Network at Salisbury University found that for every dollar the state invests into the program, an additional $18.16 in economic activity is created.

Solar Energy & Battery Storage

The 2024 EARN Report shows that 'solar photovoltaic installer' is the fourth highest projected growth occupation in the entire economy with an expected increase of 37.1%. This growth is crucial, as projections show Maryland will need upwards of 15,000 solar workers by 2030 to meet demand. To effectively address this demand, the Solar Installation Training Partnership (SITP) has developed a strong employer engagement strategy that maintains a 91% placement rate for its graduates.

Similarly, Power52, a 501(c)3 non-profit with a mission to break the cycle of poverty, unemployment, underemployment, and incarceration in underserved urban communities, is modifying curriculum to meet evolving trends in solar energy systems. As solar energy systems become more integrated with storage solutions, an increase in demand for expertise in energy storage and battery technology has also emerged. In response, Power52 is expanding its curriculum to include specialized training on battery storage systems and microgrid technology.

Workforce Longevity in Climate Related Industries: Career Pathways for Youth

The Department of Service and Civic Innovation (DSCI) was established by the Serving Every Region Through Vocational Exploration (SERVE) Act of 2023 to promote service and volunteerism in the state of Maryland. The Act also called for the creation of the Maryland Climate Corps to "conserve and restore State and local parks and engage in other climate or environmental projects."

In addition to coordinating with existing conservation programs already working in the state, DSCI will work with other state agencies to prepare Marylanders for high-demand climate jobs. Maryland's first of a kind service-to-career pathways–Maryland Corps and Service Year Option–emphasize exposure and skills required for green jobs of the future. In the SERVE Act, the climate is listed as a call-out area to ensure that members are placed in roles in high-demand sectors aligned with the needs of Maryland. These DSCI's service programs are another way Maryland recruits, trains, and retains talent in the clean energy sector. Federal grant funding can be braided with existing service and AmeriCorps funding streams to maximize climate workforce preparation.

Similar to the Climate Corps program, the Chesapeake Bay Trust manages the Maryland Chesapeake Conservation and Climate Corps (CCCC) program which increases access to green careers in the Chesapeake Bay Watershed. The CCCC program places individuals (ages 18-25) with nonprofit and government agencies to gain hands-on environmental and

leadership experience and training in professions that restore and protect the environment and natural resources.

State Agency Partners

Green workforce development is a priority of the Moore-Miller Administration. Twenty-five executive branch State agencies submitted Climate Implementation Plans (CIPs) to Governor Moore's Office in November of 2024. The CIPs are discussed in more detail in the next section on but relevant to this section, many CIPs included job creation and workforce development for climate-related work. Numerous state agency CIPs include plans to transition current positions or hire new positions to fulfill their commitments to climate action. Workforce related highlights from State Agency Partners CIPs include:

- **Maryland Department of Aging** - Encourage older adult participation in the climate change workforce.
- **Maryland Department of Agriculture** - Expand climate smart agricultural practices among farmers and producers.
- **Maryland Department of Disabilities** - Work with other agencies to ensure apprenticeship and workforce development programs for clean energy jobs will recruit people with disabilities and provide reasonable accommodations for workers with disabilities.
- **Maryland State Department of Education** - Adopt environmental literacy standards with a focus on climate change as well as preparing high school students with career technical education (CTE) Pathways for a changing climate.
- **Maryland Department of Emergency Management** - Help local governments fund new positions for climate action.
- **Maryland Energy Administration** - Support a trained clean energy workforce and improve data systems to capture data on job creation (e.g., work hours).
- **Maryland Department of the Environment**- Train contractors to expand their businesses by meeting the increasing demand for zero-emission equipment. Maryland's CPRG Implementation Grant: Clean Corridors Coalition prioritizes LIDAC residents in workforce development and job creation.

- **Maryland Department of General Services** - Provide staffing for the Statewide Green Purchasing Committee to train procurement professionals how to align purchasing power with climate goals.
- **Maryland Department of Housing and Community Development** - Increase climate action in the construction sector by adopting higher efficiency standards, clean energy and EV ready requirements, and climate supportive materials.
- **Maryland Department of Juvenile Services** - Evaluate its workforce programs to include training opportunities that connect youth with green jobs.
- **Maryland Department of Natural Resources** - The Department of Natural Resources's Innovative Technology Fund supports climate job growth and retention. A registered apprenticeship for Park Technicians will be designed to train participants to operate climate adaptation practices.
- **Maryland Department of Public Safety and Correctional Facilities** - Expand workforce development programs for which incarcerated individuals might be eligible including solar panel installation, composting, and tree implantation.

Stakeholder Engagement on Workforce

The Maryland Commission on Climate Change (MCCC) is a multi-stakeholder Commission that meets regularly and provides annual climate solution recommendations to the state. Under the CSNA, the MCCC was required to create four additional working groups, including the Energy Industry Revitalization Working Group and the Just Transition Employment and Retraining Working Group. The Just Transition Employment and Retraining Working Group focuses on transitioning Maryland workers in fossil fuel industries to employment opportunities in a clean energy economy. A report from this working group will be released in 2025 focusing on how Maryland can foster a just transition across different sectors during the clean energy transition.

CSNA also charged the Energy Industry Revitalization Working Group to produce a report on the impact of the energy transition on small businesses and existing power facilities in Maryland. In 2021, small businesses accounted for 97% of total firms and 45% of total employment in Maryland. The report found that 24% of total small businesses, or 21,551 small businesses, employing 252,205 people would be affected by the energy transition. Some impacts will be positive, such as new industry growth through renewable energy deployment, while other impacts may be negative, such as potential disruptions to operation with the phasing out of fossil fuel energy facilities.

The report also found that the power facilities that generated the most electricity had the highest number of employees. Additionally, the report assessed wages associated with each type of electricity generation across North American Industry Classification System (NAICS) industries. In 2023, the majority of solar jobs were construction (64%) while operations and maintenance made up a smaller portion (8%). To meet solar deployment goals, construction and operation jobs will likely grow over the next decades. However, a high growth rate means that construction jobs will make up a larger portion of solar's industry crosscut in upcoming years. This will make its wage profile different compared to more established fossil fuels. Historically, solar and wind wages have been lower than fossil fuel wages. As newer industries, solar and wind often do not have the same labor protections through unionization as more established fossil fuel jobs. However, unionization rates for renewable energy are increasing.

[9] Stakeholder Education, Communication, Outreach, and Engagement

Engaging stakeholders has been and remains a priority in the development and implementation of Maryland's climate action plans. Listed below are the ways that Maryland engages with local governments, other state agencies, the business community, public-interest groups, and the general public throughout the development of this plan.

Interagency and Intergovernmental Coordination

Maryland has long recognized the need for a whole-of-government approach to address climate change. Collaboration across government is inextricably bound to Maryland's successes and strategies to implement its climate policies. By working together, sharing resources, and synchronizing efforts, Maryland's state agencies, regional councils, and local governments are much better positioned to maximize positive outcomes.

Figure 27. State agencies created Climate Implementation Plans to meet the requirements of Executive Order 01.01.2024.19 and demonstrate a commitment to fighting climate change.

In June of 2024, the State of Maryland doubled-down on its whole-of-government approach with Governor Wes Moore's signing of Executive Order 01.01.2024.19 - *Leadership by State Government: Implementing Maryland's Climate Pollution Reduction Plan*[21]. E.O. 01.01.2024.19 required 25 executive branch agencies to work together to develop

[21] See E.O. 01.01.2024.19 here: https://governor.maryland.gov/Lists/ExecutiveOrders/Attachments/52/EO%2001.01.2024.19%20Leadership%20by%20State%20Government-%20Implementing%20Maryland%27s%20Climate%20Pollution%20Reduction%20Plan_Accessible.pdf

agency-specific Climate Implementation Plans (CIPs) within five months and take immediate action to implement *Maryland's Climate Pollution Reduction Plan*.

The 25 state agencies included in this executive order ranged from those with high climate planning expertise, to agencies with some existing integration of climate change in their work, to agencies that are just beginning to formally consider how their mission overlaps with climate change. The agencies familiar with planning and implementing climate considerations in their work have been able to sharpen, expand, and update their approach, while agencies that are newer to climate action have taken important first steps.

The executive order also established a Governor's Subcabinet on Climate to enhance the necessary collaboration and coordination needed to address climate change as a whole-of-government. The Subcabinet on Climate is a committee of the Governor's Executive Council, chaired by the Secretary of the Environment with the Governor's Chief Sustainability Officer serving as vice-chair. The Subcabinet on Climate formally consists of 11 department heads, the Governor's Chief Sustainability Officer, and the Governor's Chief Resilience Officer.

Since its inception, the Climate Subcabinet and a CIP Working Group containing senior staff from all agencies have met regularly to discuss and coordinate the collective actions needed to implement *Maryland's Climate Pollution Reduction Plan* as well as opportunities for supporting actions within the direct sphere of influence of each agency. The scope of considerations span new agency policies, programs, and actions, as well as analyses of existing measures that can be re-shaped to better align with the State's climate goals.

The Climate Subcabinet and CIP Working Group have worked not only to align with Maryland's climate plan and targets, but also other work efforts and mandates by state government, including:

- The 2024 State Plan[22], which sets the priorities for Maryland,
- Maryland's Annual GHG Spending Analysis[23] to help track climate investments
- The Governor's Performance Subcabinet which tracks progress on the Governor's Priorities[24]

[22] See the 2024 State Plan here: https://governor.maryland.gov/priorities/Documents/2024%20State%20Plan.pdf
[23] See Maryland's Annual GHG Spending Analysis here: https://mde.maryland.gov/programs/air/ClimateChange/MCCC/Documents/GHG%20Reduction%20Spending%20Report%20FY24.pdf
[24] See Maryland's Governor's priorities here: https://priorities.maryland.gov/

Another key takeaway from the Subcabinet on Climate is that it has been key to each agency greatly improving its understanding of the other agencies' functions. This is vital because some agencies provide critical support services and programs that enable other agencies to create an effective CIP. For example, the Department of General Services (DGS) staffs the Maryland Green Building Council, manages construction projects and procures energy for over half of Maryland's state agencies. The Department of Budget and Management manages the procurement of state owned vehicles and their quickest possible transition to a zero-emission fleet.

The Subcabinet on Climate publishes an annual report to the Governor, detailing the progress of implementing *Maryland's Climate Pollution Reduction Plan* and the State Agency CIPs. The Subcabinet on Climate Annual Report[25] is publicly available.

Regional and Local Coordination

The CPRG Program has provided new opportunities for Maryland's state government to interact and collaborate with regional and local governments. In addition to the State of Maryland's Planning Grant under the CPRG Program, three metropolitan statistical area (MSA) councils that include Maryland jurisdictions were awarded CPRG Planning Grants.

- **State of Maryland:** Statewide coordination and planning led by the Maryland Department of the Environment (MDE)
- **Baltimore-Columbia-Towson, MD:** This MSA is led by the Baltimore Metropolitan Council[26] and comprises Anne Arundel County, Baltimore City, Baltimore County, Carroll County, Harford County, Howard County, and Queen Anne's County.
- **Philadelphia-Camden-Wilmington, PA-NJ-DE-MD:** Led by the Delaware Valley Regional Planning Commission[27]. This MSA includes Cecil County, Maryland.
- **Washington-Arlington-Alexandria, DC-VA-MD-WV:** Led by the DC Department of Energy and Environment (DOEE) and the Metropolitan Washington Council of Governments (MWCOG)[28]. This MSA covers four Maryland counties, Charles County, Frederick County, Montgomery County, and Prince George's County.

[25] See the Subcabinet on Climate Annual Report here: https://mde.maryland.gov/programs/air/ClimateChange/Documents/Agency%20Climate%20Implementation%20Plans/Climate%20Subcabinet%20Report%202024.pdf
[26] Learn more about the Baltimore Metropolitan Council here: https://www.baltometro.org/
[27] Learn more about the Delaware Valley Regional Planning Commission here: https://www.dvrpc.org/cprg/
[28] Learn more about the Metropolitan Washington Council of Governments here: https://www.mwcog.org/

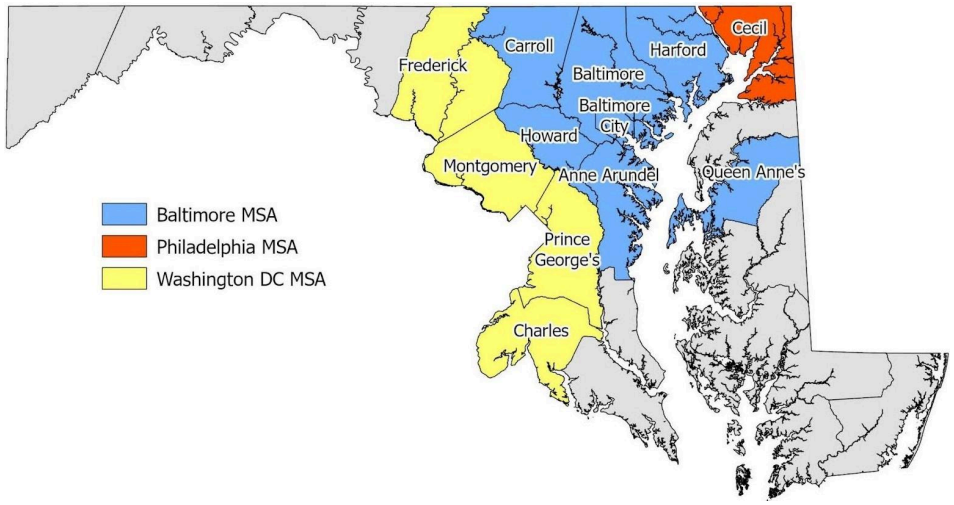

Figure 28. MSA Jurisdictions in Maryland

For the 12 counties that were not part of an MSA awarded a CPRG Planning Grant, MDE created a Local Government Climate Action Support Program. The Local Government Climate Action Support Program complements the CPRG Planning Grants to ensure Maryland State Government expands its commitment of leaving no one behind, covering the following counties: Allegany, Calvert, Caroline, Dorchester, Garrett, Kent, Somerset, St. Mary's, Talbot, Washington, Wicomico, and Worcester.

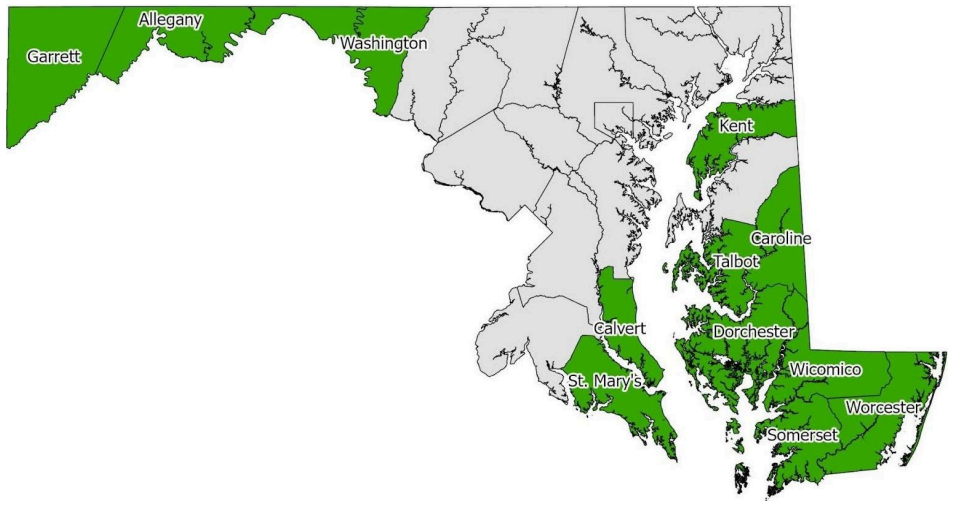

Figure 29. Maryland Local Government Climate Action Support Program Jurisdictions

This local support program has three primary objectives:

- Help local governments in Maryland identify high priority GHG emissions reduction projects with important social, ecological, and economic co-benefits.

- Align efforts within Maryland to maximize the best possible outcomes in reducing harmful pollution and climate change.
- Build capacity across all of Maryland for project planning, design, financing, implementation, and tracking to help meet the State's ambitious climate action goals.

By filling out a simple request form,[29] Maryland's rural counties get access to technical assistance from MDE's local government support partner, the University of Maryland's Environmental Finance Center (EFC). For more than a decade the EFC has been helping local governments implement environmental projects and has been an invaluable connector to state agencies and their programs.

Public and Stakeholder Engagement

MDE built upon previous outreach efforts for the PCAP to conduct public and stakeholder engagement for the CCAP. Highlights include the following:

Maryland Commission on Climate Change (MCCC)

The MCCC is chaired by MDE's Secretary and consists of members who represent state agencies and the legislature, local government, business, environmental non-profit organizations, organized labor, philanthropic interests, and the University System of Maryland (USM). The MCCC's eight working groups came together to produce the Commission's 2024 Annual Report[30] with 27 recommendations for the Governor and the General Assembly.

Local Government Climate Action Support Program

Launched in March 2025, the MDE's technical assistance partner is conducting a 'Community Connects' series via the Local Government Climate Action Support Program. The Community Connects series is held each month featuring a lightning presentation followed by a group discussion with experts and other technical assistance providers for local governments on emerging issues and current funding opportunities. The team for

[29] To view the request form for the Local Government Climate Action Support Program, please click here: https://docs.google.com/forms/d/e/1FAIpQLSfeBScF8iiR0wxaw5UOlOeUDxrrN1x31d8BxEGAt8lCo6NiKw/viewform

[30] See the Maryland Commission on Climate Change 2024 Annual Report here: https://mde.maryland.gov/programs/air/ClimateChange/MCCC/Documents/MCCC%20Annual%20Report%202024/MCCC_Annual_Report_2024_508.pdf

this program also plans to continue its participation in annual conferences with the Maryland Municipal League and Maryland Association of Counties.

Updated Website

MDE's Communications Team refreshed the MDE Climate Change website[31] to include an interactive version of *Maryland's Climate Pollution Reduction Plan*. This included significant updates to the CPRG webpage to reflect development milestones and add a form to join MDE's communications lists.

Outreach for New State Policies

Maryland's Building Energy Performance Standards (BEPS) was finalized in late 2024. MDE has presented on BEPS to nearly 4,000 stakeholders at 87 separate events and regularly provides updates to its BEPS email list of 1,250 subscribers. Two complimentary policies, a Clean Heat Standard (CHS) and a Zero-Emission Heating Equipment Standard (ZEHES), are currently in development. Outreach for these policies has included public listening sessions, stakeholder discussions, and attendance at various working groups. Recordings of public events can be found on MDE's YouTube[32] page.

Public Outreach Events

Every year, MDE's Communications Team participates in a variety of state- and local-level events. These serve to engage the public in MDE's work, promote educational and financial resources for Marylanders, and facilitate discussion on environmental action.

Climate Disclosure

Given Maryland's new membership in the Under2 Coalition, MDE submitted the state's first comprehensive climate disclosure with the international nonprofit CDP[33] in 2024 and is currently working on its 2025 disclosure. The State joins several of its local governments in disclosing in order to measure, compare, and benchmark its environmental impact over time.

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[31] See the MDE Climate Change website here: https://mde.maryland.gov/programs/air/ClimateChange/CPRP/Pages/Overview.aspx

[32] To watch MDE's working group meetings and stakeholder outreach recordings, please see the YouTube channel here: https://www.youtube.com/@mdenvironment

[33] Learn more about CDP here: https://www.cdp.net/en

iv. Acronyms and Definitions

Acronyms

Acronym	Long Form
ACC	Advanced Clean Cars
ACF	Advanced Clean Fleets
ACT	Advanced Clean Trucks
AFC	Alternative Fuel Corridor
BAT	Best Available Technology
BEPS	Building Energy Performance Standards
BGE	Baltimore Gas and Electric Company
BMC	Baltimore Metropolitan Council
CAFE	Corporate Average Fuel Economy
CCAP	Comprehensive Climate Action Plan
CEA	Clean Energy Advantage Loan Program
CEJA	Clean Energy Jobs Act
CEJSC	Maryland Commission on Environmental Justice and Sustainable Communities
CHS	Clean Heat Standard
C-PACE	Commercial Property Assessed Clean Energy
CPS	Clean Power Standard
COBRA	Co-Benefits Risk Assessment Health Impacts Screening and Mapping Tool
CPRG	EPA's Climate Pollution Reduction Grant Program
CPRP	*Maryland's Climate Pollution Reduction Plan* (December 2023)
CSNA	Climate Solutions Now Act of 2022
DGS	Maryland Department of General Services
DHCD	Department of Housing and Community Development
DNR	Maryland Department of Natural Resources

DOE	Department of Energy
DOEE	DC Department of Energy and Environment
DSCI	Department of Service and Civic Innovation
DVRPC	Delaware Valley Regional Planning Commission
EPA	Environmental Protection Agency
EV	Electric Vehicle
EVSE	Electric Vehicle Supply Equipment
EWIP	Energy-Water Infrastructure Program
GCCS	Gas Collection and Control Systems
GDP	Gross Domestic Product
GGRA	Greenhouse Gas Emissions Reduction Act
GGRF	Greenhouse Gas Reduction Fund
GHG	Greenhouse Gas
GWP	Global Warming Potential
IBC	International Building Code
IECC	International Energy Conservation Code
IPPU	Industrial Processes and Product Use
IRA	Inflation Reduction Act
IRC	International Residential Code
kWh	Kilowatt-hour
LEED	Leadership in Energy and Environmental Design
LIDAC	Low Income Disadvantaged Community
MACo	Maryland Association of Counties
MBPS	Maryland Building Performance Standards
MCAP	Maryland Clean Energy Capital Program
MCCC	Maryland Commission on Climate Change
MCEC	Maryland Clean Energy Center

MDA	Maryland Department of Agriculture
MDE	Maryland Department of the Environment
MD-JARC	Maryland Jobs Access Reverse Commute Program
MDOT	Maryland Department of Transportation
MEA	Maryland Energy Administration
MML	Maryland Municipal League
MMTCO2e	Million metric tons of carbon dioxide equivalent
MSA	Metropolitan Statistical Area
MSW	Municipal Solid Waste
MTA	Maryland Transit Administration
MWCOG	Metropolitan Washington Council of Governments
MWIFA	Maryland Water Infrastructure Financing Administration
NEVI	National Electric Vehicle Infrastructure Plan
OPC	Office of People's Counsel
PCAP	Priority Climate Action Plan
PE	Potomac Edison Company
PEPCO	Potomac Electric Power Company
PPA	Power Purchase Agreement
PSC	Public Service Commission
RECs	Renewable Energy Credits
RGGI	Regional Greenhouse Gas Initiative
RPS	Renewable Portfolio Standard
SEIF	Strategic Energy Investment Fund
SMECO	Southern Maryland Electric Cooperative, Inc.
SMM	Sustainable Materials Management
TDM	Transportation Demand Management
TOD	Transit-Oriented-Development

USM	University System of Maryland
VMT	Vehicle Miles Traveled
WGL	Washington Gas Light Company
ZEHES	Zero-Emission Heating Equipment Standard
ZEV	Zero-Emission Vehicles
ZEVIP	Zero-Emission Vehicle Infrastructure Plan

Definitions

Term	Definition
Benefits	Direct changes in air pollution (e.g., PM2.5, VOCs) that result from a GHG reduction measure.
Building Energy Performance Standards (BEPS)	Requires certain buildings 35,000 square feet or larger to achieve specific energy efficiency and direct emissions standards, including achieving net-zero direct emissions by 2040. Historic properties, public and nonpublic elementary and secondary schools, manufacturing buildings, agricultural buildings, and federal buildings are exempt. There are approximately 9,000 covered buildings in Maryland located across all counties.
Clean Heat Standard (CHS)	A performance-based approach to reducing GHG emissions from the building sector. CHS is designed to broadly decarbonize covered sectors in a manner that is market-based and friendly to customer choice in coordination with other programs. It complements and supports the achievement of other policies including energy codes and standards, EmPOWER, BEPS, and ZEHES.
Clean Power Standard (CPS)	A policy that will complement the RPS to ensure that all electricity consumed in the state is generated by clean and renewable sources of energy by 2035.
Co-Benefits Risk Assessment Health Impacts Screening and Mapping Tool (COBRA)	A screening model used regularly in the research community, COBRA is a free, easy-to-use EPA model employed as a preliminary analysis of health impacts and monetized benefits from environmental policy changes.
Commission on Environmental Justice and	CEJSC is a twenty member body that is tasked with advising the State government on environmental justice and analyzing the effectiveness of State and local government laws and policies to address issues of environmental justice and sustainable communities.

Sustainable Communities (CEJSC)	
Climate Solutions Now Act (CSNA) of 2022	The CSNA of 2022 requires Maryland to achieve a 60% reduction in GHG emissions (from 2006 levels) by 2031 and net-zero emissions by 2045. It establishes the most ambitious GHG reduction goals of any U.S. state.
Co-Benefits	Positive effects beyond the stated goal of a GHG reduction measure (e.g., improved public health outcomes, economic benefits, increased climate resilience).
Department of Service and Civic Innovation (DSCI)	DSCI was established by the Serving Every Region Through Vocational Exploration (SERVE) Act of 2023 to promote service and volunteerism in the state of Maryland.
Electric Vehicle Supply Equipment (EVSE)	EVSE-installed means having an EV charging device that is fully installed and ready to use at a parking space.
EmPOWER Maryland	Maryland's energy efficiency program, administered by the six largest utilities and the Maryland Department of Housing and Community Development, to help homeowners, renters, and businesses save energy and money. The program provides incentives and technical assistance to improve insulation, seal air leaks, and install energy-efficient appliances in homes and buildings.
EV-ready	EV-ready means having electrical panel capacity and wiring in place to easily install a level-2 EV charger in the future.
Global Warming Potential (GWP)	A measure of the warming impact of a particular gas over a particular time horizon. GWP values allow for aggregating emissions of the different GHG s into a single metric, known as carbon dioxide equivalent, and reported in the inventory in million metric tons (MMTCO2e). In the context of Buy Clean, GWP is a measure of a product or a material's contribution to global warming, for example as reported in an Environmental Product Declaration, expressed as carbon dioxide equivalent per unit of material.
Greenhouse Gas (GHG)	GHGs include the air pollutants carbon dioxide (CO2), hydrofluorocarbons (HFCs), methane (CH4), nitrous oxide (N2O), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6).
Greenhouse Gas Reduction Fund (GGRF)	The second-largest allocation in the IRA was the creation of the $27 billion Greenhouse Gas Reduction Fund (GGRF). The goal of the GGRF is a historic investment to mobilize financing and private capital to address the climate crisis, ensure our country's economic competitiveness, and promote energy independence while delivering

	lower energy costs and economic revitalization to communities that have historically been left behind.
Greenhouse gas (GHG) Inventory	A list of emission sources and sinks and the associated emissions quantified using standard methods.
GHG Reduction Measure	Implementable actions that reduce GHG emissions or enhance carbon removal. Measures that enhance "carbon removal" are those that increase the removal of carbon dioxide from the atmosphere through, for example, the uptake of carbon and storage in soils, vegetation, and forests.
Low Income Disadvantaged Community (LIDAC)	Communities with residents that have low incomes, limited access to resources, and disproportionate exposure to environmental or climate burdens. LIDACs are any Census tract that is included as disadvantaged in the Climate and Economic Justice Screening Tool (CEJST) and/or any census block group that is at or above the 90th percentile for any of EJScreen's Supplemental Indexes when compared to the nation or state, and/or any geographic area within Tribal lands and indigenous areas as included in EJScreen.
Maryland's Climate Pathway	A report released in June 2023 by MDE and the University of Maryland Center for Global Sustainability showing a package of policies that could achieve the state's climate goals.
Maryland Register	An official publication of the State of Maryland that is published every two weeks.
Measure	A measure is a policy, program, action, or a grouping of two or more, containing a specific, tangible action(s) that will reduce emissions. Measures have clear responsible parties and quantifiable attributes.
Net-zero emissions	Net-zero emissions means that the total GHG emissions from Maryland's economy will be equal to the GHGs removed from the atmosphere through natural and technological systems annually.
National Electric Vehicle Infrastructure (NEVI) Plan	Developed in partnership with MEA, NEVI serves as the foundational first step for a strategic buildout of a robust ZEV infrastructure network. The NEVI Plan details the strategy for awarding $63M of NEVI funds to build out and certify Maryland's 23 EV Alternative Fuel Corridors (AFCs).
PJM	A regional transmission organization (RTO) that coordinates the movement of wholesale electricity in all or parts of 13 states and the District of Columbia (including Maryland).
RGGI	A collaborative program among 11 East Coast states to reduce CO2 emissions from power plants through a regional cap and invest program.

Renewable Energy Production Tax Credit	The Renewable Energy Production Tax Credit is an IRA-funded program providing a per kilowatt-hour tax credit for electricity generated by solar and other qualifying technologies for the first 10 years of a system's operation.
Renewable Portfolio Standard (RPS)	Requires approximately 50% of electricity consumed in Maryland to be generated by renewable resources by 2030 and modifies definitions of qualifying resources.
Strategic Energy Investment Fund (SEIF)	The Strategic Energy Investment Fund (SEIF) distributes funding from Maryland's participation in the RGGI and other programs to provide incentives for decarbonization projects across sectors of Maryland's economy.

v. Appendices

Appendix A. Annual Change in PM2.5 Between Baseline and Control Scenarios (µg/m^3)

County	2030	2035	2040	2045	2050
Allegany	0.27	0.31	0.28	0.27	0.23
Anne Arundel	0.86	1.02	1.08	1.09	1.04
Baltimore	0.98	1.14	1.18	1.17	1.10
Baltimore City	1.07	1.24	1.28	1.28	1.21
Calvert	0.39	0.49	0.55	0.55	0.53
Caroline	0.28	0.33	0.37	0.37	0.34
Carroll	0.73	0.85	0.89	0.88	0.82
Cecil	0.43	0.51	0.59	0.59	0.56
Charles	0.32	0.40	0.45	0.46	0.44
Dorchester	0.22	0.27	0.30	0.30	0.28
Frederick	0.51	0.60	0.62	0.62	0.57
Garrett	0.24	0.27	0.22	0.22	0.17
Harford	0.88	1.02	1.08	1.07	1.00
Howard	1.33	1.55	1.57	1.56	1.45

Kent	0.43	0.51	0.56	0.56	0.53
Montgomery	0.85	1.00	1.02	1.01	0.94
Prince George's	0.63	0.78	0.84	0.85	0.81
Queen Anne's	0.37	0.44	0.48	0.48	0.46
Somerset	0.16	0.19	0.21	0.21	0.19
St. Mary's	0.25	0.31	0.35	0.35	0.33
Talbot	0.31	0.37	0.41	0.41	0.39
Washington	0.29	0.33	0.34	0.34	0.30
Wicomico	0.19	0.22	0.25	0.25	0.23
Worcester	0.16	0.18	0.21	0.21	0.19

Appendix B. Annual Change in O_3 Between Baseline and Control Scenarios (ppb)

County	2030	2035	2040	2045	2050
Allegany	1.14	1.20	0.96	0.96	0.79
Anne Arundel	1.32	1.51	1.79	2.02	2.05
Baltimore	1.27	1.44	1.80	1.99	2.01
Baltimore City	1.32	1.50	1.80	2.02	2.06
Calvert	1.01	1.08	1.25	1.35	1.30
Caroline	0.97	0.96	1.17	1.26	1.20
Carroll	1.11	1.25	1.56	1.69	1.68
Cecil	1.01	1.01	1.36	1.47	1.44
Charles	0.89	0.97	1.10	1.15	1.07
Dorchester	0.88	0.87	1.04	1.09	1.01
Frederick	0.98	1.05	1.19	1.27	1.21
Garrett	1.30	1.40	0.88	0.87	0.66
Harford	1.19	1.28	1.64	1.81	1.82
Howard	1.29	1.49	1.76	1.96	1.97

Kent	1.09	1.11	1.39	1.52	1.50
Montgomery	1.10	1.24	1.40	1.52	1.48
Prince George's	1.17	1.34	1.57	1.72	1.71
Queen Anne's	1.06	1.08	1.32	1.44	1.41
Somerset	0.74	0.73	0.88	0.90	0.81
St. Mary's	0.85	0.89	1.02	1.07	0.99
Talbot	1.01	1.04	1.24	1.34	1.29
Washington	0.91	0.95	0.98	1.00	0.89
Wicomico	0.81	0.79	0.96	1.00	0.92
Worcester	0.74	0.72	0.90	0.92	0.84

Appendix C. Identification of Low Income and Disadvantaged Communities in Maryland from CEJST and EPA EJScreen

County	State	Census Block Group ID
Allegany County	Maryland	240010002001
Allegany County	Maryland	240010002003
Allegany County	Maryland	240010005001
Allegany County	Maryland	240010005002
Allegany County	Maryland	240010006001
Allegany County	Maryland	240010006002
Allegany County	Maryland	240010007001
Allegany County	Maryland	240010007002
Allegany County	Maryland	240010008001
Allegany County	Maryland	240010008002
Allegany County	Maryland	240010010001
Allegany County	Maryland	240010010002
Allegany County	Maryland	240010011001
Allegany County	Maryland	240010011002
Allegany County	Maryland	240010013002
Allegany County	Maryland	240010015021
Allegany County	Maryland	240010015031
Allegany County	Maryland	240010015032
Allegany County	Maryland	240010017002
Allegany County	Maryland	240010017003
Allegany County	Maryland	240010020003
Allegany County	Maryland	240010021003
Allegany County	Maryland	240010022002
Allegany County	Maryland	240010022003
Allegany County	Maryland	240010023001
Allegany County	Maryland	240010023002
Allegany County	Maryland	240010023004
Anne Arundel County	Maryland	240037061022
Anne Arundel County	Maryland	240037063031
Anne Arundel County	Maryland	240037064041
Anne Arundel County	Maryland	240037064042

Anne Arundel County	Maryland	240037066003
Anne Arundel County	Maryland	240037080042
Anne Arundel County	Maryland	240037080043
Anne Arundel County	Maryland	240037302043
Anne Arundel County	Maryland	240037302051
Anne Arundel County	Maryland	240037302052
Anne Arundel County	Maryland	240037302061
Anne Arundel County	Maryland	240037302062
Anne Arundel County	Maryland	240037303002
Anne Arundel County	Maryland	240037304041
Anne Arundel County	Maryland	240037305111
Anne Arundel County	Maryland	240037305132
Anne Arundel County	Maryland	240037305142
Anne Arundel County	Maryland	240037312071
Anne Arundel County	Maryland	240037313123
Anne Arundel County	Maryland	240037401081
Anne Arundel County	Maryland	240037501011
Anne Arundel County	Maryland	240037501012
Anne Arundel County	Maryland	240037501013
Anne Arundel County	Maryland	240037501014
Anne Arundel County	Maryland	240037501021
Anne Arundel County	Maryland	240037501022
Anne Arundel County	Maryland	240037502011
Anne Arundel County	Maryland	240037502012
Anne Arundel County	Maryland	240037508031
Anne Arundel County	Maryland	240037508033
Anne Arundel County	Maryland	240037508034
Anne Arundel County	Maryland	240037509001
Anne Arundel County	Maryland	240037509002
Anne Arundel County	Maryland	240037509003
Anne Arundel County	Maryland	240037510002
Anne Arundel County	Maryland	240037515001
Anne Arundel County	Maryland	240037515002
Baltimore County	Maryland	240054001001
Baltimore County	Maryland	240054001002

Baltimore County	Maryland	240054001003
Baltimore County	Maryland	240054011012
Baltimore County	Maryland	240054011021
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Baltimore County	Maryland	240054015074
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Baltimore County	Maryland	240054023072
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Baltimore County	Maryland	240054025031
Baltimore County	Maryland	240054025032
Baltimore County	Maryland	240054026022
Baltimore County	Maryland	240054026043
Baltimore County	Maryland	240054032012
Baltimore County	Maryland	240054034012
Baltimore County	Maryland	240054034013
Baltimore County	Maryland	240054034023
Baltimore County	Maryland	240054034024
Baltimore County	Maryland	240054041022
Baltimore County	Maryland	240054042014
Baltimore County	Maryland	240054042021
Baltimore County	Maryland	240054042022
Baltimore County	Maryland	240054042023
Baltimore County	Maryland	240054042024
Baltimore County	Maryland	240054042025
Baltimore County	Maryland	240054044043
Baltimore County	Maryland	240054045011
Baltimore County	Maryland	240054045013

Baltimore County	Maryland	240054045014
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Baltimore County	Maryland	240054045022
Baltimore County	Maryland	240054045023
Baltimore County	Maryland	240054085032
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Baltimore County	Maryland	240054085071
Baltimore County	Maryland	240054085074
Baltimore County	Maryland	240054114122
Baltimore County	Maryland	240054114131
Baltimore County	Maryland	240054114132
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Baltimore County	Maryland	240054201002
Baltimore County	Maryland	240054203011
Baltimore County	Maryland	240054203021
Baltimore County	Maryland	240054203022
Baltimore County	Maryland	240054203031
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Baltimore County	Maryland	240054204022
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Baltimore County	Maryland	240054205002
Baltimore County	Maryland	240054206001
Baltimore County	Maryland	240054206002
Baltimore County	Maryland	240054206003
Baltimore County	Maryland	240054207011
Baltimore County	Maryland	240054207012
Baltimore County	Maryland	240054207021
Baltimore County	Maryland	240054208001
Baltimore County	Maryland	240054209001
Baltimore County	Maryland	240054209002
Baltimore County	Maryland	240054209003
Baltimore County	Maryland	240054210001

Baltimore County	Maryland	240054211011
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Baltimore County	Maryland	240054211021
Baltimore County	Maryland	240054211022
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Baltimore County	Maryland	240054212002
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Baltimore County	Maryland	240054503001
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