



Maryland Department of the Environment

2022 Annual Programmatic Status Report on Climate Change

In accordance with §2–1305 of the Environment Article

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Introduction

The Maryland Department of the Environment's (MDE or the Department) Annual Climate Change Report is written in accordance with the Greenhouse Gas Reduction Act (GGRA) reauthorization of 2016. Environment Article §2-1305 requires state agencies to report to the Governor and the Maryland Commission on Climate Change (MCCC), as well as the General Assembly in accordance with §2-1246 of the State Government Article, on the status of programs and activities pertaining to the reduction of greenhouse gas (GHG) emissions.

This report summarizes the programs that MDE leads to make progress on Maryland's GHG emission reduction goals. It also includes updates on recent regulations, laws, and initiatives that support emissions reduction in innovative ways.

Maryland has long been a global leader in the fight against climate change, with our first comprehensive Climate Action Plan published in 2008, followed shortly by the first GGRA law in 2009, along with our participation in the groundbreaking Regional Greenhouse Gas Initiative (RGGI). Our early and sustained effort in this area was recently recognized by the World Resources Institute when they found that Maryland was most successful among all 50 states to reduce GHG emissions while growing the economy.

Maryland is Vulnerable to Climate Change

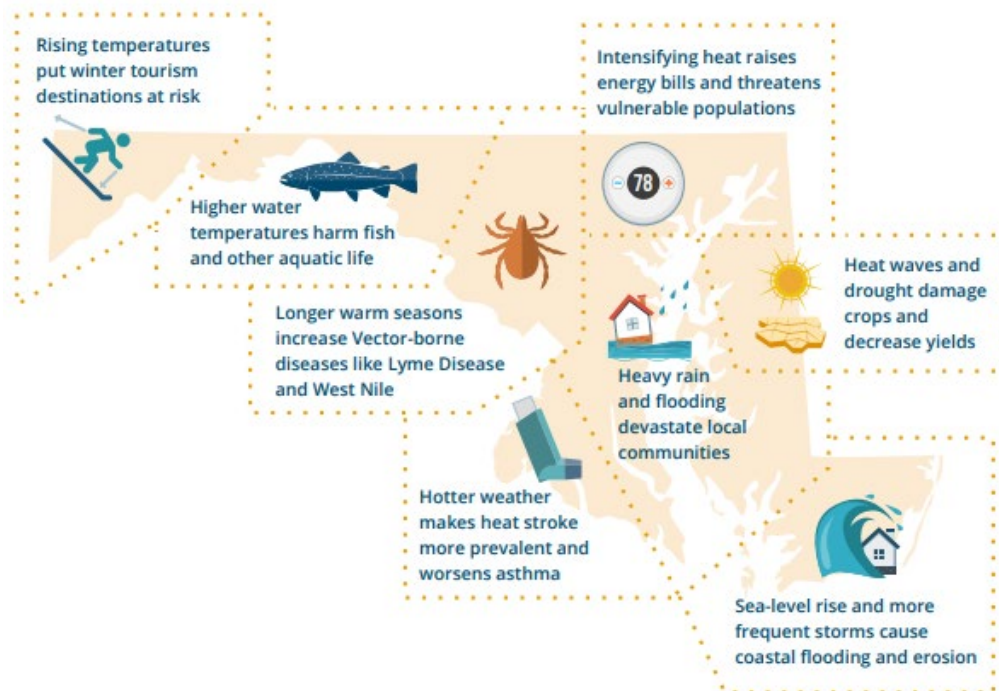
With 3,100 miles of shoreline, Maryland is one of the most vulnerable parts of the U.S. to the effects of sea level rise associated with climate change. Rising sea levels and increased storm duration and intensity could have devastating and far-reaching impacts on the Atlantic coast and the Chesapeake Bay ecosystem that affect the environmental,



recreational, and economic benefits enjoyed by Maryland and its visitors. Although Maryland's coastal areas are particularly vulnerable, all areas of the state are at risk. In general, climate change alters the severity, frequency, and distribution of existing issues that are directly or indirectly impacted by temperature and precipitation. This includes, but is not limited to:

- Impacts on coastal, bay, and inland water quality parameters that may change the viable uses of surface water, such as for irrigation, recreation, or human consumption;

- More frequent disruptions to urban and coastal infrastructure caused by extreme weather events and sea level rise that may indirectly impact the Maryland's economy by restricting the flow of goods and affecting days worked;
- Common stressors experienced among ecosystems, agriculture, fisheries, and forestry such as those caused by general changes in temperature and precipitation regimes, increased extreme weather events, and increased pressures from weeds, diseases, and pests;
- A higher probability of negative outcomes for disadvantaged/environmental justice (EJ) communities and individuals inherently more sensitive or with a reduced adaptive capacity for responding to the impacts of climate change; and
- Human health is affected by impacts on air quality, food and water supply, and extreme weather events.



Environmental and Climate Justice

EJ is a priority for MDE, which seeks the fair treatment and meaningful involvement of all people regardless of race, color, culture, national origin, income, and educational levels with respect to the development, implementation, and enforcement of protective environmental laws, regulations, and policies. Additionally, EJ means that no group of people (including racial,

ethnic, and socioeconomic groups) should bear a disproportionate share of the negative environmental consequences resulting from industrial, land use planning and zoning, municipal, and commercial operations, such as through Title V permits issued by environmental regulatory agencies.

Climate change can have differing social, economic, public health, and other adverse impacts on disadvantaged populations. Climate justice begins with recognizing the groups that bear

disproportionate climate change impacts and identifying how climate impacts exacerbate inequitable social conditions.



Climate change poses a significant threat to vulnerable communities with little adaptive capacity. The state must ensure that residents and businesses across all communities have ample opportunity to shape and comment on climate policy, direct resources from climate programs to help disadvantaged communities address climate change and benefit from the transition to clean energy, and to repair damage done by previous

policies.

The Maryland Commission on Climate Change

The [MCCC](#)¹, supported by MDE's Climate Change Program, has served as an overarching convening body in the state since its initial creation through Executive Order. The bipartisan, independent commission functions as both a facilitator of integrated multi-agency policy on climate change initiatives, as well as a transparent public body informing strategic direction of the state's programs. MCCC was codified in law in 2015, and is composed of 28 members representing state agencies, the legislature, local government, business, environmental nonprofit organizations, organized labor, philanthropic interests, and the university system. By serving to facilitate multi-agency, executive-level dialogue, MCCC establishes a framework for interagency collaboration on planning and program development.

¹ mde.maryland.gov/programs/Air/ClimateChange/MCCC/Pages/index.aspx

MCCC offered a comprehensive set of policy recommendations for new action in its [2021 Annual Report](#)². In 2020, the annual report included a recommendation that the state establish new goals to reduce GHG emissions by 50% by 2030 and achieve net zero by 2045. MDE's 2030 GGRA Plan, which was released in February 2021, set a goal of reducing emissions 50% by 2030 as recommended by the MCCC.

In 2022, the Climate Solutions Now Act (CSNA) became law. MDE was charged with developing proposals that allow the state to reach a 60% GHG emissions reduction compared to 2006 levels by 2031, and net zero by 2045. Under the CSNA, MDE will create the Building Energy Transition Implementation Task Force to evaluate potential programs, policies, and incentives for the reduction of GHG emissions from the buildings sector. MCCC must also develop several new reports and add four new working groups. MCCC currently has four working groups: GHG Mitigation Workgroup, the Adaptation and Resilience Workgroup, the Scientific and Technical Workgroup, and the Education, Communication, and Outreach Workgroup. The GHG Mitigation working group develops GHG reduction recommendations. The Adaptation and Resilience working group develops recommendations for dealing with the impacts of climate change. The Scientific and Technical working group follows the latest science to support MCCC's recommendations, and the Education, Communication and Outreach working group is the public affairs arm of MCCC.

Each of the four new working groups is required to have members of the legislature, cabinet level officers (or their designees) as well as numerous representatives of industry and environmental groups. Combined, the new working groups add 66 appointed positions to the 85 current positions on the pre-existing groups. The four new working groups established under CSNA are: (1) The Just Transition Employment and Retraining, which will focus on transitioning workers in fossil fuel industries to employment opportunities in a clean energy economy; (2) The Energy Industry Revitalization working group, which will focus on the possible impacts to small businesses and potential facility closures as the result of climate change policies; (3) The Energy Resilience and Efficiency working group, which will be primarily composed of representatives of electric energy companies and will focus on energy infrastructure improvements, transmission efficiency and battery backups; and finally, (4) The Solar Photovoltaic Systems Recovery, Reuse and Recycling working group, which will focus on options for recycling or reusing solar panels.

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[mde.maryland.gov/programs/Air/ClimateChange/MCCC/Documents/2021%20Annual%20Report%20FINAL%20\(2\).pdf](https://mde.maryland.gov/programs/Air/ClimateChange/MCCC/Documents/2021%20Annual%20Report%20FINAL%20(2).pdf)

MCCC serves as a forum for public dialogue on critical issues associated with climate change policy, including directing program benefits to disadvantaged communities. Meetings, including all working group meetings, are open to the public, giving all stakeholders, and advocates an opportunity to participate. MCCC is committed to ensuring equitable outcomes for all Marylanders, and particular attention is paid to communities disproportionately impacted by climate change.

MDE Environmental Justice Policy and Implementation Plan

Policy Statement

MDE implements environmental laws and programs to protect and restore the environment for the health and well-being of Marylanders. National studies show that EJ communities bear a disproportionate share of the negative environmental consequences resulting from industrial activities, land use planning and zoning, municipal and commercial operations, or the execution of federal, state, local programs and policies. MDE supports the goal of achieving environmental equity for all Maryland residents.

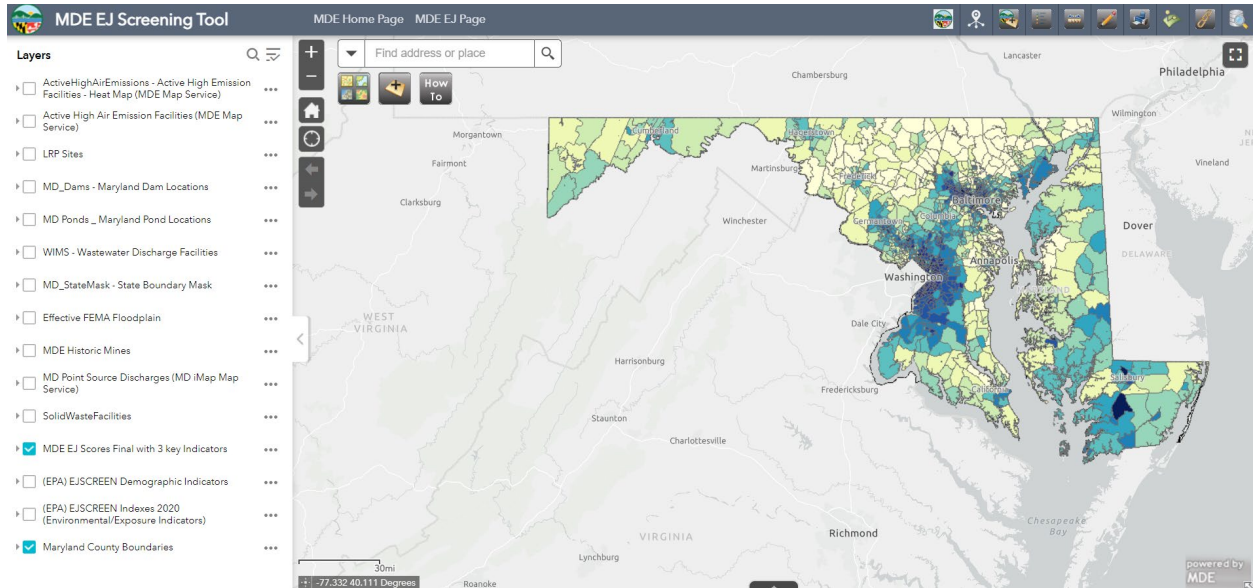
MDE has initiated enhanced compliance monitoring, enforcement, and compliance in communities with EJ concerns, such as Cheverly, Curtis Bay and Turners Station, and has developed enhanced communications and outreach for permitting actions in communities with EJ concerns. MDE also created an EJ Screening and Mapping Tool that provides data on communities with EJ concerns. In 2022, MDE undertook training on [MDE's EJ mapping tool](#)³ and began instituting actions to devote greater attention to underserved communities. These activities are in response to an MDE-wide policy and consistent with the CSNA of 2022. MDE will continue its multi-administration efforts to conduct additional compliance monitoring and enforcement, but also will use all these tools and strategies to provide infrastructure investments prioritized for communities with EJ concerns.

Accordingly, as MDE implements state laws and programs to protect and restore the environment, it aims to reduce existing inequities and avoid creating additional inequities in EJ communities wherever possible.

[Read MDE's policy.](#)⁴

³ mdewin64.mde.state.md.us/EJ/

⁴ mde.maryland.gov/Documents/MDE_EJ_Env%20Justice%20Policy_Final_Dec2020.pdf



MDE Environmental Justice Workgroup

MDE’s EJ Workgroup was formed on March 8, 2021, to lead the implementation of the MDE EJ Policy and Implementation Plan (MDE EJ Policy). The formation of the MDE EJ Workgroup was one of the early action items in the MDE EJ Policy. The objectives of the MDE EJ Policy are to reduce existing inequities and prevent future inequities in the environmental burdens carried by EJ communities. MDE’s EJ Policy set near-term and longer-term action items for the MDE EJ Workgroup to achieve during 2021, and beyond.

To date, the MDE EJ Workgroup has developed a plan for enhanced compliance monitoring and continues to develop a plan for enhanced communications and outreach for permitting actions in EJ communities. Future actions by the MDE EJ Workgroup include developing a plan to identify EJ community funding opportunities and to ensure more available funding for environmental restoration activities in EJ communities. Measures to track and evaluate the progress of MDE EJ Workgroup initiatives will also be developed and implemented to help ensure continued progress in meeting the goals of reducing existing inequities and preventing future inequities in the environmental burdens carried by EJ communities. MDE’s EJ Workgroup will also be considering climate change impacts on EJ communities as it completes additional action items in 2022. This may include additional compliance monitoring and enforcement elements as well as factoring climate change impacts into EJ community funding, and other initiatives.

Air and Radiation Administration (ARA) Programs and Initiatives

Regional Greenhouse Gas Initiative (RGGI)

Program Overview

RGGI comprises 12 states in the Northeast and mid-Atlantic regions. These states adopted market-based carbon dioxide (CO₂) cap-and-invest programs designed to reduce emissions of CO₂ from fossil fuel-fired electricity generators with a nameplate capacity of 25 megawatts or greater. RGGI states include [Maryland](#),⁵ Connecticut, Delaware, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Virginia. While Pennsylvania is considered an official RGGI state, there is litigation in court.

Participating RGGI states each require electricity generators to have acquired, through regional auction or secondary market transactions, one CO₂ allowance for every ton of CO₂ emitted over a 3-year compliance period. The RGGI program establishes a regional cap on CO₂ emissions from eligible sources, which is then reduced in subsequent years leading to a reduction in CO₂ emissions. Auction proceeds go to the Strategic Energy Investment Fund (SEIF), which is administered by the Maryland Energy Administration (MEA) and funds several state programs, including direct energy bill assistance, energy efficiency programs that reduce electricity demand, electric vehicle (EV) charging stations, and renewable energy projects that reduce CO₂ emissions. Under state law, more than half of all funds collected by Maryland are invested in energy assistance for low-income households, and energy efficiency in low- and moderate-income communities.

Implementation Milestones

Auctions

Maryland has successfully participated in all 57 regional auctions of CO₂ allowances with RGGI. As of September 2022, Maryland has generated \$969,904,153.28 in cumulative proceeds.

Comprehensive Program Review

RGGI participating states are committed to periodic review of their CO₂ budget trading programs to consider successes, impacts, and design elements. RGGI states completed the [First](#)

⁵ mde.maryland.gov/programs/Air/ClimateChange/RGGI/Pages/index.aspx

[Program Review](#)⁶ in February 2013, and completed the [Second Program Review](#)⁷ in December 2017, resulting in the [2017 Model Rule](#).⁸ Now the states have initiated the Third Program Review to consider further updates to their programs as of December 2021.

The Third Program Review is currently in a review period after public listening sessions to ascertain Program review objectives and timeline, and public meetings to review draft modeling assumptions.

Control Period

RGGI's fifth 3-year control period took effect on January 1, 2021, and extends through December 31, 2023, for the states of Maryland, Connecticut, Delaware, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Virginia. Virginia and Pennsylvania initiated their participation in 2021 and 2022, respectively.

The Cap

The RGGI cap was first established during the period from 2005-2007. The participating states decided upon a generation-based program rather than a consumption-based program because the states had authority to control electric generating sources within their jurisdiction. The initial cap was based on the average of 2000-2002 CO₂ emissions and the initial cap was set at 188,076,976 short tons of CO₂. After a stabilization period, the cap would be reduced starting in 2015 by 2.5% each year until 2018 for a 10% reduction. The participating states elected to revise the cap as part of the First Program Review to 91 million short tons of CO₂. During the Second Program Review, the states selected a regional cap of 75,147,784 tons of CO₂ in 2021, which will decline by 2.275 million tons of CO₂ per year thereafter, resulting in a total 30% reduction in the regional cap from 2020 to 2030.

Budget Adjustments

RGGI allows sources to bank allowances in two ways. Sources can use current vintage allowances to satisfy future compliance obligations. The participating states have also auctioned future vintage allowances in the past. These allowances often sell at prices lower than they would in the future.

⁶ rggi.org/program-overview-and-design/design-archive/2012-materials

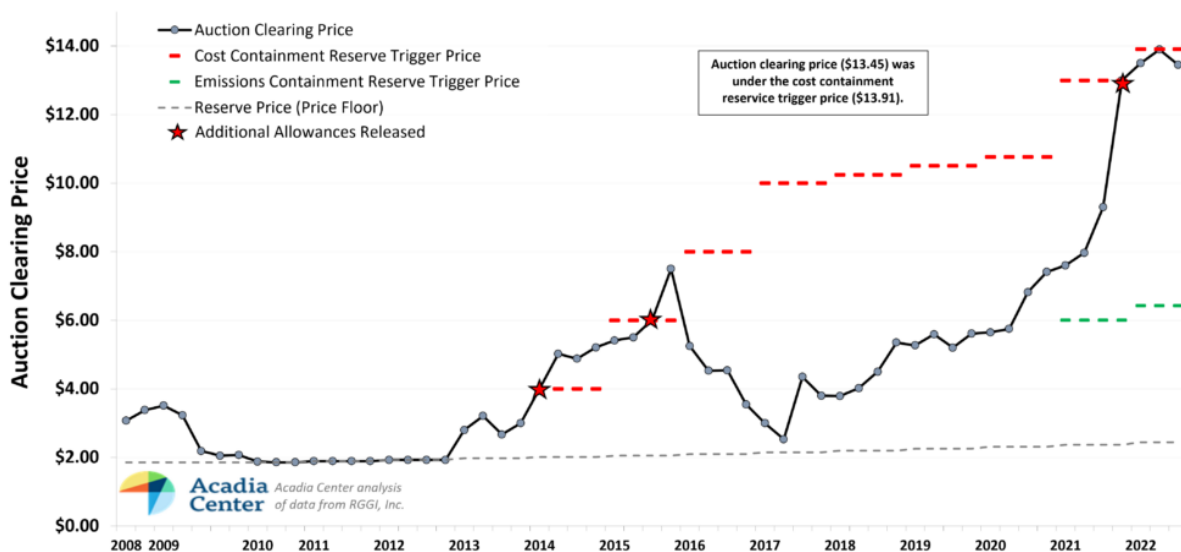
⁷ rggi.org/program-overview-and-design/design-archive/2016-materials

⁸ [rggi.org/sites/default/files/Uploads/Design-Archive/Model-Rule/2017-Program-Review-Update/2017 Model Rule revised.pdf](http://rggi.org/sites/default/files/Uploads/Design-Archive/Model-Rule/2017-Program-Review-Update/2017%20Model%20Rule%20revised.pdf)

The participating states addressed potential large banks of allowances through the Program Review process. The newly created Third Adjustment for Banked Allowances adjusts the budget for allocation years 2021 through 2025 with the timing and algorithm details included in the regulations. This addition helps to create a binding cap in light of the opportunity sources have to accumulate low-cost allowances while states implement the regulatory changes needed to establish the lower cap.

RGGI allowances in the secondary market have continued to sell for higher prices in 2022. RGGI prices have peaked at over \$14 this year, a stark increase from \$8 at the start of 2021.

RGGI allowances in the secondary market have been selling for increasingly higher prices in 2021. Auction 54 of Q4 2021 triggered the Cost Containment Reserve (CCR) with a clearing price of \$13. The CCR is a quantity of allowances in addition to the cap held in reserve that are utilized if emission reduction costs are higher than projected. The first three quarters of 2022 have not seen the CCR triggered.



Source: Acadia Center⁹

Offsets

Maryland currently recognizes three project categories eligible for the award of CO2 offset allowances: 1) Landfill Methane Capture and Destruction, 2) Sequestration of Carbon due to Reforestation, Improved Forest Management, or Avoided Conversion, and 3) Avoided Methane

⁹ acadiacenter.org/rggi-56th-auction-and-the-consequence-for-climate-and-clean-energy-transition/

Emissions from Agricultural Manure Management Operations. As of this report, there has been only one approved offset project in the RGGI program, which is the New Beulah Landfill Methane Capture and Destruction project located in Dorchester County. Offsets are just one option for compliance and are limited to a relatively small percentage (3.3%) of any compliance obligation. The RGGI offset program is intentionally quite strict to ensure the development of projects that would otherwise not exist in the absence of the program. Offset allowances are recognized across the RGGI states, regardless of the state of their origin.

RGGI with Geographic Expansion

In 2017, RGGI completed the Second Program Review and strengthened RGGI to continue steady, deeper reductions of GHG emissions by 2030. With the success of the initiative, Maryland and the other participating RGGI states are actively working to engage new participants in the program. The first-in-the nation carbon cap-and-invest program for power plants has been strengthened by implementing the participating states' plan to secure an additional 30% reduction in power plant emissions by 2030 and expanding the program to new participating states in the region to reduce pollution from power plants supplying electricity into Maryland.

Maryland has held a leadership role on the RGGI, Inc. Board of Directors over the last 5 years¹⁰ and led deliberations among the RGGI states to broaden participation to include New Jersey and Virginia. In July 2019, New Jersey finalized regulations allowing it to renew its participation in January 2020. Virginia also finalized regulations and has participated throughout 2022. However, Virginia may remove itself from RGGI. Although Pennsylvania has officially joined RGGI, a Commonwealth Court injunction was granted a delay, and Pennsylvania was removed from participation in Auction 57.

Short-lived Climate Pollutants (SLCPs)

SLCP Overview

SLCPs are air pollutants that have a relatively short lifetime in the atmosphere and a warming influence on our climate. As opposed to CO₂, which has an atmospheric lifetime of about 100 years, SLCPs atmospheric lifetime ranges from a few days to a few years. The most common SLCPs are methane, black carbon, and hydrofluorocarbons (HFCs). Methane is the second most emitted GHG in the U.S., accounting for about 10% of national emissions. Emissions of methane also contribute to ground level ozone. About 60% of all methane emissions are

¹⁰ Maryland's Secretary of the Environment is a Member at Large.

anthropogenic (from human activity) and are expected to increase. The primary sources are from agriculture, waste treatment, and the energy sectors. Capturing methane from these sources has the potential to improve air quality, provide fuel for industries, and displace more carbon-intensive fossil fuels.

Black Carbon is a component of fine particulate matter (PM), which is the result of incomplete combustion of fossil fuels and biomass, particularly from older diesel engines and forest fires. Black carbon has been identified as a risk factor for premature death. It warms the atmosphere by absorbing solar radiation, influences cloud formation, and darkens the surface of snow and ice, which accelerates heat absorption and melting.

HFCs are industrial chemicals primarily used for refrigeration and air conditioning. HFCs were created to replace extremely volatile chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) that were found to be ozone-depleting. The Montreal Protocol, a global agreement to protect the stratospheric ozone layer, phased out CFCs and HCFCs, and successfully drove industries to utilize HFCs as the prominent alternative. HFCs are not ozone depleting, but they do have a high global warming potential (GWP). Most [HFC emissions](#)¹¹ result from leaks in refrigeration and air-conditioning systems. These HFC emissions, though relatively low at present, are projected to increase globally at a rate of 8-15% per year.

Additionally, HFC use is expected to increase disproportionately in developing countries due to population growth, rapid urbanization, electrification and changing consumption patterns. Reducing HFCs could provide mitigation equivalent to 100 billion tons of CO₂ by 2050. Improving the energy efficiency of room air conditioning equipment alone can provide further mitigation of up to 100 billion tons of CO₂ equivalent by 2050. Maryland announced its intention to adopt regulations in 2020 to prohibit the use of high-warming HFCs, consistent with the vacated U.S. Environmental Protection Agency's (EPA) Significant New Alternatives Policy Program.

Maryland has several ongoing initiatives to address fugitive methane emissions. In late 2020, new regulations were promulgated for compressor stations and other related equipment. Currently, the focus is on volatile organic compounds (VOC) from municipal solid waste (MSW) landfills.

Methane Emissions from Sources in the Energy Industry

Program Overview

¹¹ ccacoalition.org/en/resources/hfc-initiative-factsheet

In 2018, EPA proposed amendments to relax the New Source Performance Standards (NSPS) for pollutant controls in the oil and gas industry that had previously been adopted in 2016. EPA proposed to reduce the sources subject to the rule, reduce the monitoring frequency and repair schedules of fugitive emissions at wells and compressor stations, remove methane detection, and only require testing and control of VOCs. MDE submitted written comments opposing EPA's proposed amendments. Despite opposition from several states and environmental organizations, the EPA finalized the amendments on August 13, 2020.

The natural gas energy industry can be divided into four segments: (1) production; (2) gathering and processing; (3) transmission and storage; and (4) distribution. Maryland began taking steps to restrict methane emissions from the value chain by establishing a law to ban hydraulic fracturing in the state—operations, which occur in the production segment. With no gas gathering and processing operations in the state, Maryland then turned to the transmission and storage segment. MDE used the EPA's 2016 NSPS reduction technologies and methane detection procedures as the basis for the state requirements in transmission and storage. Throughout 2018 and 2019, MDE held stakeholder meetings with industry leaders, environmental advocates, and concerned community citizens. In November 2020, Maryland finalized regulations to reduce vented and fugitive emissions of methane from both new and existing transmission and storage facilities. In May 2021, six existing facilities in Maryland began conducting surveys for methane leaks, repairs for all leaks that are found, and reporting to MDE.

MDE has met with industry leaders, environmental advocates, and other surrounding state governments to discuss and develop technology standards, and emission reduction targets. Currently, methane emission reductions are measured through the Public Service Commission (PSC) Strategic Infrastructure Development and Enhancement (STRIDE) program. The STRIDE program requires the three largest natural gas companies in Maryland to remove and replace the older leak prone piping infrastructure, thereby reducing the fugitive leaks from that infrastructure. Advanced monitoring technologies to detect leaks are undergoing research and development.

Implementation Milestones

Maryland regulations to reduce vented and fugitive emissions of methane from both new and existing natural gas transmission and storage facilities COMAR 26.11.41 were adopted on October 23, 2020 and became effective on November 16, 2020.

Federal Progress

On November 15, 2021, EPA released a national proposal for methane reduction in the oil and gas sector. This rule builds on the original 2016 rules and will surpass the adopted 2020 requirements. Methane and VOCs will be required to be measured and controlled at well sites meeting a threshold, at gathering and production sites, and at compression stations. EPA collected comments until January 31, 2022 and plans to finalize the regulations are in process. The key components included:

- a comprehensive monitoring program that focuses on sites with largest emissions;
- allowing monitoring compliance alternatives like using satellites to identify leaks;
- addressing pneumatic controllers that account for nearly 30% of methane emissions with a zero emission standard; and
- creation of some "example" standards that states would know EPA is guaranteed to approve.

Additionally, in the distribution sector of the natural gas industry, EPA announced its intent to propose leak detection and technology upgrades under the Pipeline and Hazardous Materials Safety Administration regulatory purview in 2022. These national requirements would strengthen fugitive methane control.

Methane Emissions from New and Existing Landfills

Program Overview

In 2018, a coalition of eight states, including Maryland, filed a lawsuit (California v. EPA) against the EPA over its failure to implement and enforce a critical landfill regulation. The regulation, which went into effect on October 28, 2016, requires new, modified, and reconstructed MSW landfills (the NSPS) as well as existing MSW landfills (emission guidelines or EG) to reduce emissions from methane-rich landfill gas. Despite litigation and other extenuating factors, MDE is in the process of developing state regulations.

MDE may update the current Maryland regulation (COMAR 26.11.19.20 - Control of Landfill Gas Emissions from MSW Landfills) and propose additional methane reduction measures. In September 2020 and June 2021, MDE held virtual stakeholder meetings to discuss regulation concepts that will build off the 2016 NSPS requirements for MSW landfills, but also include surface emissions monitoring for methane at smaller MSW landfills. The proposed regulations may go beyond the EPA requirements and establish a new methane emissions limit for MSW landfills, including requirements for installing gas collection and control systems, monitoring onsite methane emission levels, and reporting and recordkeeping. The regulations may apply to both active and closed landfills.

Federal Progress

On May 21, 2021, EPA finalized federal implementation plans (FIPs) for 42 states, including Maryland, for the stalled 2016 MSW landfill emissions guidelines. The existing MSW landfills in Maryland already meet and follow the EPA requirements.

HFCs

Program Overview

Under a federal Clean Air Act (CAA) program designed to identify and evaluate alternatives to stratospheric ozone-depleting substances, HFCs have been one of the most common alternatives. However, HFCs are extremely potent GHGs — one pound of certain HFCs is potentially as potent as 1,400 pounds of CO₂. After efforts to phase out HFC stalled at the federal level prior to 2021, states began establishing their own initiatives. Throughout 2019 and 2020, MDE met with industry leaders, environmental advocates, and other U.S. Climate Alliance (USCA) states to develop regulations. Maryland finalized HFC regulations in November 2020 that are consistent with rules and laws enacted by USCA states, such California, Washington, Vermont, New Jersey, and Colorado. The regulations also model the stalled EPA Significant New Alternatives Policy (SNAP) Rules 20 and 21, which phase out the use of certain HFCs in various end-uses — specifically in foam, aerosol propellants, refrigeration, and air-conditioning products and equipment — and will encourage the use of substances with lower GHG emissions that are widely available on the market. Other states in the USCA are expected to take similar steps.

In 2021, Maryland and other USCA states to petition EPA to:

- reinstate the HFC prohibitions established by SNAP Rules 20 and 21;
- adopt requirements like those that the California Air Resources Board (CARB) has proposed for specific high GWP end uses; and
- restore the HFC leak inspection, leak repair, retrofitting, reporting and maintenance requirements at least to the extent that EPA had established under its CAA Section 608 authority.

Implementation Milestones

Maryland HFC regulations COMAR 26.11.33 were adopted on October 6, 2020, and are effective as of November 2, 2020. Compliance deadlines began on January 1, 2021, for certain end-uses and will continue through January 1, 2024.

Challenges

In 2020, several companies approached MDE requesting an extension on compliance deadlines due to COVID-19 impacts on business operations. In response, MDE included a regulatory relief

statement in the technical support document that accompanied the regulations. The statement directs companies facing COVID-19-related compliance challenges to submit a plan for compliance for review in accordance with Section 2-611 of the Environment Article. Supply chain issues continued throughout 2021, and the Department has been corresponding with businesses on a case-by-case basis.

Federal Progress

On May 19, 2021, EPA proposed regulations for Phasedown of Hydrofluorocarbons: Establishing the Allowance Allocation and Trading Program under the American Innovation and Manufacturing Act. Maryland is on record supporting this national proposal and its climate benefits. EPA published their final rule mandating HFC phasedown by 85% by 2036. It will accomplish this by issuing a fixed quantity of transferable production and consumption allowances that companies must purchase and hold to produce or import hydrofluorocarbons. This is separate from a proposed rule on managing byproduct HFC-23 emissions, which was proposed September 2021, and withdrawn in June 2022 for duplicity.

Additionally, EPA has proposed SNAP Rules 23 and 24 to address refrigeration, air conditioning, fire suppressants and foams, and motor vehicle air conditioning in nonroad vehicles.

In late September 2022, the U.S. Senate ratified the Kigali amendment of the Montreal Protocol, allowing the U.S. to join 137 other nations in a joint phasedown of HFCs. This will lead EPA to release a new rule to phase down production and consumption of HFCs by 85% within 15 years. The rule will include measures to establish and manage an allowance and trading program and will introduce specific HFC product restrictions. Its main action areas include:

- Preventing illegal trade, production, use, and sale of HFCs,
- Managing HFC stocks to promote the recovery of HFCs from retired equipment, and
- Promoting the future use of HFC alternatives through support for research and testing.

Transportation

Multi-State Zero Emission Vehicle (ZEV) Task Force

On June 20, 2018, nine Northeast and west coast states, reaffirmed their strong commitment to a clean, low-carbon transportation sector with the release of a new Multi-State Zero Emission Vehicle (ZEV) Action Plan (Action Plan) for 2018-2021 to support the successful implementation of the states' ZEV programs. Maryland was a leader in this effort.

This Action Plan, built on the successes and lessons learned from implementation of an earlier 2014 ZEV Action Plan, presented 80 market-enabling recommendations for states, automakers,

dealers, utilities, charging and fueling companies, and other key partners to rapidly accelerate mainstream consumer adoption of ZEVs, including plug-in hybrid, battery electric, and hydrogen fuel cell vehicles.

The updated Action Plan was the work of the Multi-State ZEV Task Force, which was formed in 2013 under a Memorandum of Understanding (MOU) signed by the governors of California and seven other states that have adopted California's ZEV program – Connecticut, Maryland, Massachusetts, New York, Oregon, Rhode Island, and Vermont. New Jersey became the ninth ZEV state to join the coalition when they signed the MOU in May 2018. This Action Plan continues to serve as a guidance document for states as they continue to develop and implement policies and programs to increase the purchase and use of EVs.

The transportation sector is now the largest single source of GHG emissions across the nation. Light duty vehicles alone contribute almost 25% of total emissions. The state ZEV programs, which require automakers to deliver increasing numbers of ZEVs between now and 2025, are a key strategy in state climate plans.

On July 14, 2020, 15 states and Washington, D.C. announced a joint MOU committing to work collaboratively to advance and accelerate the market for electric medium and heavy-duty vehicles (MHDVs), including large pickup trucks. The goal is to ensure that 100% of all new MHDV sales are zero emission vehicles by 2050, with an interim target of 30% ZEV sales by 2030. Signatories of the MOU include the states of Maryland, California, Colorado, Connecticut, Hawaii, Maine, Massachusetts, New Jersey, New York, North Carolina, Oregon, Pennsylvania, Rhode Island, Vermont, Virginia, and Washington; the District of Columbia; and the province of Quebec, Canada. A regional effort is an effective way to target emissions from larger vehicles that commonly cross state lines.

To provide a framework and help coordinate state efforts to meet these goals, Maryland and the other signatory jurisdictions worked through the existing multi-state ZEV Task Force to develop and implement a ZEV Action Plan for trucks and buses. The Northeast States for Coordinated Air Use Management (NESCAUM) released the [final Action Plan](#)¹² in late July 2022. The action plan is built around the jurisdictions' commitments to make at least 30% of new MHD sales ZEVs by 2030, and 100% of sales by 2050 or sooner. The 2030 target ensures early progress to hasten vehicle fleet turnover and was made more attractive by favorable market developments.

Maryland and allied states continue to work together to pave the way for ZEVs to grow and flourish in the near future.

¹² nescaum.org/documents/multi-state-medium-and-heavy-duty-zev-action-plan.pdf/

A New Market Phase

The ZEV market is entering a new phase of development. In the 4 years since the release of this updated ZEV Action Plan, the cumulative number of ZEV sales in the United States has grown from 750,000 cars to more than 2 million vehicles. During that same time in Maryland, sales of ZEVs have almost quadrupled. Market changes and technology developments have laid a strong foundation for rapid growth of the emerging EV market. Battery costs are continuing to decline and the electric range of lower-cost battery EVs has increased significantly since 2018. Consumers can now choose from more than 60 different plug-in and fuel cell models, and all the major automakers have announced not only plans to significantly expand EV offerings across multiple market segments.

Key Action Plan Recommendations

The updated Action Plan represented a redoubling of state efforts to accelerate electrification of the light-duty vehicle market, and a recognition of the important role that public-private partnerships involving the automakers, dealers, utilities, and others play in the effort. Recommendations for states and other key partners in the updated Action Plan are focused on five priority areas:

- Raising consumer awareness and interest in EV technology;
- Building out a reliable and convenient residential, workplace and public charging/fueling infrastructure network;
- Continuing and improving access to consumer purchase and non-financial incentives;
- Expanding public and private sector fleet adoption; and
- Supporting dealership efforts to increase ZEV sales.

Read the [Multi-State ZEV Action Plan](#).¹³

Maryland has been working to implement the ZEV Action Plan recommendations. For years, the state has offered buyers various incentives for purchasing EVs. The Clean Cars Act of 2022, through MEA and the Maryland Department of Transportation (MDOT), established the Zero-Emission Vehicle Excise Tax Credit and the Medium-Duty and Heavy-Duty Zero-Emission Vehicle Grant Program. The Zero-Emission Vehicle Excise Tax Credit provides \$3,000 in incentives for each plug-in EV or fuel cell vehicle purchased, as well as \$2,000 or \$1,000 in incentives for three-wheeled or two-wheeled electric motorcycles or autocycles. The maximum price of the

¹³ nescaum.org/documents/2018-zev-action-plan.pdf

eligible vehicle is \$50,000, and the eligible year of purchase must be between July 2023 and June 2027. The Medium-Duty and Heavy-Duty Zero-Emission Vehicle Grant Program established a grant that would cover up to 20% of the cost for qualified medium-duty or heavy-duty zero-emission vehicles, vehicle supply equipment, and heavy equipment property. Qualifying vehicles must be at least 8,500 pounds and powered by electricity that is stored in a battery or produced by a hydrogen fuel cell. Overall, the state remains active in promoting EVs and promoting their emission-reducing benefits.

Volkswagen Mitigation Plan

On September 18, 2015, the EPA and CARB issued a Notice of Violation of the CAA to Volkswagen AG (VW), Audi AG, and Volkswagen Group of America, Inc. alleging that model year 2009-2015 Volkswagen and Audi diesel cars equipped with 2 liter and 3-liter engines included software that circumvented EPA and CARB emissions standards for nitrogen oxide (NO). Approximately 550,000 vehicles in the U.S. had "defeat devices" installed and approximately 16,000 were delivered to Maryland.

On October 25, 2016, the U.S. District Court for the Northern District of California approved a Partial Consent Decree between the U.S. Justice Department and VW regarding excess emissions of NO due to the installation of "defeat devices" on 2-liter diesel engines. The use of "defeat devices" has increased vehicle emissions of NO, resulting in adverse effects on air quality. The Consent Decree established an Environmental Mitigation Trust of \$2.7 billion to fully remediate the excess NO emissions from the affected 2 and 3 liter vehicles. The State of Maryland is eligible to authorize spending \$75.7 million from the VW Trust to use for specifically defined eligible mitigation projects. To guide the use of funds over the Trust's 10-year lifetime, Maryland has developed a Mitigation Plan that outlines the eligible projects Maryland will use to reduce excess NO emissions. More information on the Mitigation Plan can be found on [MDE's website](#).¹⁴

Benefit

Strategies for reducing NO emissions could also result in reductions of GHG emissions, including CO2 emissions and black carbon emissions. Applicants seeking funds from the VW Trust must submit a proposal to MDE that specifies, among other things, emission reductions from the planned project. The evaluation criteria for awarding funds includes benefits from reducing other pollutants such as CO2. As projects receiving funds from the VW Trust are implemented, MDE will track avoided or reduced CO2 emissions resulting from these projects. The evaluation

¹⁴ mde.maryland.gov/programs/Air/MobileSources/Pages/MarylandVolkswagenMitigationPlan.aspx

criteria for proposed projects also includes identifying benefits to EJ and underserved communities.

Implementation Milestones

Under the Environmental Mitigation Trust established in the 2016 settlement, Maryland is eligible to receive \$75.7 million for use on specifically defined mitigation projects to remediate the excess NO emissions. MDE was the lead agency tasked with developing Maryland's mitigation plan in accordance with the list of eligible projects and matching fund requirements required under Appendix D-2 of the Settlement. The draft plan placed priority on EV charging infrastructure, allocating the full 15% that is allowed for this category, and the replacement of older diesel engines with cleaner technologies. Electric buses and heavy-duty equipment such as trucks, boats and locomotives are potential projects that are eligible for funding.

MDE requested public comments on the draft plan and held public meetings in August 2018. Changes made to the draft plan in response to public comments include an increase in funding for local government projects and the addition of a pilot program of electric school buses. The plan has been finalized and approved by the Trustee. Vehicle replacement project proposals were accepted until May 6, 2019, at which time MDE submitted approximately 40 proposals to the Trustee for final approval. MDE has received Trustee approval on all proposals and has finalized agreements with most of the grantees; several of the projects have been completed. MDE expects a significant portion of the projects will be completed by the end of 2022. In addition, the department is in the process of reviewing remaining funds and looks to reopen some funding categories for proposals in 2022.

In August 2021, MDE and MEA awarded funds through two charging infrastructure programs, the Electric Corridor Grant Program (ECGP) and the Charge Ahead Grant Program (CAGP). These programs distribute funds to projects that install Level 2 EV stations and Level 3 EV DC Fast charging stations throughout Maryland. A list of selected sites is available on MDE's website (see above link). These awards were made during round one of funding under the VW Settlement for charging infrastructure. The second round of funding is currently underway, with a third planned to follow.

Partners

MDE has conducted extensive outreach with citizens, advocacy groups, local and state government, and the private sector, with a focus on communities that bear a disproportionate share of the air pollution burden. Citizen and advocacy group engagement is a priority for Maryland. MDE has met with citizens at community meetings to discuss funding opportunities,

as well as to obtain input on project opportunities. MDE has also worked closely with MEA and MDOT, and its business units such as the Port and Transit administrations, as well as the Baltimore Port Alliance to identify projects to implement at Port facilities and in Baltimore communities. See our [webpage](#) for project details.

Conclusion

The use of funds from the VW Trust to implement projects will provide air quality benefits, including reductions in GHG emissions, which contribute to meeting the policy goals in the 2030 GGRA.

Clean Cars

The Maryland Clean Cars Act required MDE to adopt regulations to apply California's Low-Emission Vehicle (LEV) standards to vehicles purchased in Maryland. The California program also includes a mandate for the sale of ZEVs. These standards further reduce vehicle criteria emissions and GHG emissions. By 2025, light-duty vehicles will emit 75% less smog-forming pollutants and 34% less GHG emission compared to the previous emission standards. The Advanced Clean Cars (ACC) Program also required an increase in ZEV production starting in 2018. In late 2022, CARB voted to adopt ACC II, which will have significant increases in ZEV adoption and implement significant emission reduction standards for gasoline cars and heavier passenger trucks. California is in the process of finalizing the ACC II Program, which will be implemented beginning 2026.

The Port Partnership

Program Overview

In December 2015, MDE, MDOT, and the MDOT Maryland Port Administration (MPA) entered into a voluntary agreement to work cooperatively to identify, develop, and, when appropriate, implement voluntary projects that will reduce GHG emissions and increase energy efficiency at the Port of Baltimore (POB). The Port Partnership work group is primarily focused on reducing emissions at the Port to help the state meet air quality and climate change goals, but also acknowledges the role that the Port plays in driving economic growth and creating jobs. The work group, made up of representatives from the participating agencies, has been meeting monthly to leverage resources and pool their knowledge to implement the agreement's goals efficiently and effectively. In December 2020, the partnership received significant support from MEA. The increased participation from important stakeholders resulted in an update to the 2015 Voluntary Agreement. In 2021, the MOU was renewed.

New Voluntary Agreement

MDOT MPA, MDOT, MDE's ARA, and MEA worked together on projects of mutual interest that have improved air quality and enhanced the port business environment. These innovative projects and programs have demonstrated both environmental and economic benefits to the region and the state. Since 2008, the Port of Baltimore has received \$11 million in EPA grants to upgrade and buy new equipment and vehicles. The POB Diesel Equipment Replacement Program has achieved over 3,300 tons of pollutant reductions since 2008. MDE, MDOT MPA, and MEA want to build on and enhance their prior cooperative efforts. By executing the agreement, the parties seek to improve air quality, achieve GHG reductions, and enhance public health, thereby benefiting the state and the region. They also seek to support a vibrant and thriving port business environment to benefit the state and the region.

The parties seek to engage and solicit input from stakeholders, including those that have been underserved and overburdened, and the private sector, when evaluating projects and programs to implement. The parties commit to working cooperatively to implement projects and programs that reduce air pollutants such as nitrogen oxides (NOx) and PM, and that further the policy objectives of the GGRA. This work should include projects and programs to increase climate resiliency, reduce air pollution, and lessen climate change impacts in communities.

The purpose of the updated agreement, in addition to adding MEA as a cooperative partner, is to document and confirm the parties' ongoing commitment to pursue mutually agreeable and cooperative efforts that will sustain and advance the economic health of the POB and protect the environment of the State of Maryland. It is recognized that MDOT MPA can only represent

its own programs and actions, and not those of private interests at the POB. The agreement also documents and confirms the parties' commitment to advancing the use of clean energy where practicable.

Benefits

As a result of this unique collaboration, Maryland has made great strides in implementing Port-related projects that have supported several emissions reduction grant-supported initiatives, such as projects funded by the federal Diesel Emission Reduction Act (DERA) grants. DERA-funded projects have supported the replacement of drayage trucks, cargo handling equipment, and installation of idle reduction equipment on switcher locomotives. To date, more than \$18 million have been invested into diesel emission reduction activities at the Port.

Agreement-supported projects to date will, over the lifetime of the equipment, reduce more than 2,500 tons of air pollutants, including NO_x, PM, hydrocarbons and carbon monoxide. The emission reduction activities at the Port will also result in significant reductions in GHG emissions, primarily CO₂ and black carbon.

The Port-related emission reduction projects continue. The partnership was successful in obtaining a \$2.4 million grant, as part of the 2018 DERA process, which have been used to upgrade drayage trucks, cargo handling equipment, and marine engines. In addition, there are several Port projects that will be funded as part of the VW Mitigation Plan (see above). Funding from the Mitigation Plan will be used to reduce diesel emissions from the legacy fleet, including drayage trucks and cargo handling equipment. All the projects will not only reduce key air pollutants, like NO and fine particulates, but will continue to provide significant reductions of CO₂ and black carbon.

The partnership also supports research opportunities. MDOT MPA sponsored fellows from the Environmental Defense Fund's (EDF) Climate Corps Program in the summers of 2018 and 2019 on two different research projects. The first project involved studying the potential effectiveness of natural gas fuel cell technology to reduce emissions. MDOT MPA is deploying a natural gas fuel cell to help with peak energy savings in one of its maintenance buildings because of this work. The second project looked at carbon sequestration at restored wetlands on dredged material and used Hart Miller Island (HMI) as the case study (see additional information below). The partnership plans to continue to implement new emission reduction programs between now and 2030.

Partners

In addition to the primary state agency partners, the work group's projects and initiatives have benefited greatly with the active involvement of others, including EDF, the Maryland Clean Energy Center, the U.S. Maritime Administration, and private port businesses. The work group also continues to place a high priority on involving key stakeholders, especially those in underserved areas, and has received direct input from residents of the Turner Station, Curtis Bay, and Brooklyn communities.

Conclusion

The work group will build on its initial successes by continuing to pursue ways for the POB to grow sustainably. Specifically, the work group will focus on developing future innovative emission reduction and energy-saving projects, projects which it has already identified potential funding sources for. Over the past 20 years, the state, through MDOT MPA, has worked diligently to identify and implement a variety of environmental programs, with a focus on climate initiatives for MDOT MPA and its tenants' operations, including the following items:

- Quantifying GHG and criteria air pollutant emissions from Port operations through land-side and water-side air emission inventories, which began in 2008 with the 2006 Comprehensive Baseline Inventory of Landside Air Emissions. Inventories help identify target areas for GHG reductions and track the progress of those programs.
- Promoting energy efficiency and grid resiliency through Port-wide energy audits and engaging with energy service companies to design, build, and fund projects that save energy (thereby reducing GHGs), reduce energy costs, and decrease operations and maintenance costs at Port and tenant facilities.
- Securing over \$18 million in federal and state funding to replace or retrofit older, less-efficient diesel engines in drayage trucks, cargo-handling equipment, harbor craft, and switcher locomotives. A highlight of the diesel emission reduction program is the Dray Truck Replacement Program, which provides funds to truck owners to help defray the cost of replacing older trucks with newer, more efficient models. Approximately 200 trucks have been replaced through this program. While primarily focused on reducing criteria pollutant emissions, the newer trucks are more efficient, resulting in reduced GHG emissions as well as fuel consumption.
- Reusing dredged materials for wetland and coastal habitat restoration projects. Along with providing habitat and water quality benefits, wetlands help store carbon and decrease storm surges, helping to enhance coastal resiliency in adjacent waterways.

- Instituting new technologies at Port terminals, such as optical character recognition cameras and software to track container movements at the terminal and instituting chassis pooling to reduce the number of truck moves, thereby, reducing trips, idling, and emissions.
- Partnering with community groups to promote environmental awareness and funding projects, such as the Schoolyard Greening Program, which replaces pavement at local schools with trees and planting to reduce stormwater runoff, provide greenspace, and promote carbon uptake.

GHG emission reductions from the partnership are included in the GGRA Plan. The partnership's goal is to implement new emission reduction projects through 2030 and beyond. By 2030, this partnership could achieve an additional reduction in GHG emissions approaching the 500,000 metric tons of CO₂e (carbon dioxide equivalent) level. The Port initiatives will not only help reduce emissions of CO₂, but it will also help reduce emission of black carbon, a very potent GHG. As this effort continues to grow, MDE plans to include GHG reductions in future plan updates.

Land and Materials Administration (LMA) Programs and Initiatives

Oil Control Program

Program Overview

The Oil Control Program (OCP) regulates oil handling activities in the state, including aboveground and underground oil storage facilities and oil-contaminated soil treatment facilities. Through a combination of staff and certified individuals, OCP oversees the installation, maintenance, operation, and removal of oil storage tanks. OCP also oversees the remediation of oil releases into the environment, ensuring that the cleanup protects health and the environment. OCP's oversight includes permitting activities and enforcement and compliance.

Current Activities

In Oil Operations Permits, OCP includes requirements that new aboveground storage tank facilities, and other oil handling facilities meet all federal, state, and local requirements for construction and use of lands near or in sensitive areas prone to floods (i.e., wetlands, 100-year flood zones).

Future Activities

Mapping of OCP Sites in Flood-Prone Areas; Identification of Additional Safeguards

OCP will map all oil remediation sites, underground storage tank and aboveground storage tank sites relative to flood prone areas. Based upon this information, OCP will evaluate whether and what additional safeguards are appropriate to avoid releases of oil that may be at higher risk of occurring in the event of extreme weather or flooding. These safeguards may include additional permit requirements or enhanced/targeted compliance efforts.

Implementation of Green Remediation Techniques

OCP will review and evaluate the use of green remediation techniques at state-lead remediation projects. Green remediation seeks to examine the environmental footprint of cleanup activities and reduce that footprint through best management practices (BMPs) that, for example, minimize total energy usage, maximize use of renewable energy sources, and minimize GHG emissions. OCP will first review the relevant guidance from EPA and the Interstate Technology and Regulatory Council (ITRC) to identify ways in which green remediation can be piloted at state-lead projects. Then, based on this "in-house" use, OCP will consider incorporating green

remediation techniques into its guidance documents used by external environmental consultants working oil remediation projects.

Land Restoration Program

Program Overview

The Land Restoration Program (LRP) oversees the cleanup of sites impacted by hazardous substances throughout the state. It does this through the Voluntary Cleanup Program, the controlled hazardous substances enforcement program, and its coordination with federal agencies on Superfund and federal facility sites. Generally, LRP's protect public health and the environment at sites historically contaminated by hazardous waste. Cleanups abate immediate uncontrolled discharges, ensure that contaminated soil does not pose a risk to public health and the environment, address groundwater contamination that may affect drinking water supplies or otherwise pose a risk to public health and the environment and address surface water discharges. LRP also documents and enforces long-term land use controls put in place to protect public health at sites with completed cleanups.

Current Activities

Encouraging Renewable Energy Projects on Brownfield Sites

LRP is working to encourage renewable energy projects on brownfield cleanup sites through several initiatives. In August 2019, Governor Hogan created a Renewable Energy Development and Siting Task Force to examine Maryland renewable energy siting issues with a focus on minimizing siting of utility-scale solar on farmland and maximizing renewable energy projects on Brownfield and other sites. In response to a recommendation of the Task Force, the Maryland General Assembly, during the 2020 legislative session, enacted legislation (Senate Bill 281) to encourage renewable energy development on Brownfield sites. The bill directs MDE to adopt regulations establishing a fee waiver for application to the Voluntary Cleanup Program for developers to locate clean or renewable energy projects on degraded lands, such as brownfields. On November 23, 2021, MDE adopted regulations establishing a waiver of the application fee, generally \$6,000, for Voluntary Cleanup Program applications that certify they will be used for renewable energy projects generating at least 2 MW per year of clean or renewable energy. The regulations became effective on January 1, 2022.

Additionally, LRP created a new [website](#)¹⁵ about renewable energy on brownfields to compile information and links to resources on siting renewable energy projects at brownfield sites.

¹⁵ mde.maryland.gov/programs/LAND/MarylandBrownfieldVCP/Pages/bf_info.aspx

LRP continues to work with Maryland Department of Planning (MDP) on highlighting the potential for renewable energy development on brownfields. LRP assisted in planning and presented at MDP's inaugural Maryland Statewide Brownfield Conference held on November 16 and 17, 2021. Presentations included those regarding renewable energy siting and development. All presentation materials from the meeting are available on MDP's [website](#).¹⁶

Protecting Cleanup Sites with Land Use Controls from Flooding and Extreme Weather

Often, cleanup sites under LRP oversight use land use controls (LUCs) to reduce or eliminate the risk of exposure to contaminants in the long term. These LUCs may include engineering controls such as caps and vapor mitigation systems, which must be maintained to ensure their effectiveness in the long term. LRP has created a map and a searchable table of flood prone sites with LUCs. The listing can be used as a tool to prioritize inspections of LUCs before or after a flooding event to ensure protection of human health and the environment.

Participating in Interstate Efforts to Promote Sustainable and Resilient Remediation

LRP participates as a member of the ITRC work group that drafted the [Sustainable Resilient Remediation guide](#)¹⁷ and training. Sustainable resilient remediation (SRR) is defined as "an optimized solution to cleaning up and reusing a hazardous waste site that limits negative environmental impacts, maximizes social and economic benefits, and creates resilience against increasing threats." LRP will coordinate with OCP to share information on SRR and OCP's evaluation of green remediation techniques.

Solid Waste Program

Program Overview

The Solid Waste Program (SWP) regulates solid waste and hazardous facilities throughout Maryland through permitting and enforcement activities, investigates and oversees the cleanup of open dumping cases, and regulates generators and transporters of hazardous waste and special medical waste. Solid waste facilities regulated by the SWP include municipal, construction and demolition debris, and land clearing debris landfills; municipal and medical waste incinerators; processing facilities; transfer stations; natural wood waste recycling facilities; and controlled hazardous substance facilities.

Current Activities

¹⁶ planning.maryland.gov/Pages/OurWork/envr-planning/brownfields/conference.aspx

¹⁷ srr-1.itrcweb.org/

Mapping and Identification of Solid Waste Facilities Potentially Susceptible to Flooding

Much of the SWP's climate efforts have focused on ensuring that regulated solid waste facilities are prepared for flooding and other extreme weather impacts. SWP has examined flood prone areas proximal to permitted solid waste facilities in Maryland based on National Oceanic and Atmospheric Administration sea level rise projections, and possible increases in 100-year flood elevations. SWP identified a few facilities that might be impacted, notably the Somerset County Landfill and a closed Dorchester County landfill; and a Baltimore County transfer station from increased precipitation-caused flooding in the Patapsco River basin. Additionally, many landfills are proximal to non-tidal streams, and while not subject to flooding, may encounter increased erosion or access issues due to flooding on public roads nearby due to larger precipitation events.

Outreach and Technical Assistance on Flooding and Extreme Weather Preparation and Recovery

The SWP has and will continue outreach and technical assistance to solid waste facilities on preparing for and recovering from extreme weather impacts. SWP has previously contacted local departments of public works (DPWs) to discuss risks due to weather events, including a presentation at a statewide Solid Waste Managers Meeting, and participates in the Baltimore regional disaster debris task force composed of county and state officials, approximately quarterly, most recently in June 2022. The SWP routinely communicates with DPWs and solid waste officials prior to and after tropical storms and other heavy weather events to help with disposal advice, or emergency disposal orders under Environment Article Sections 9-221 or 9-222 to manage disaster debris on an emergency basis. These are required to legalize temporary solid waste transfer stations and processing facilities that are set up after major storms to handle debris, so that local governments and the state can seek reimbursement from the Federal Emergency Management Administration (FEMA). For example, an emergency consent order was implemented with Somerset County to help the county address the storm debris generated from the tornado that struck Smith Island on August 4, 2022.

Facilitating Development of Renewable Energy on Closed Landfills

The SWP has created two fact sheets to facilitate the environmentally responsible development of solar projects on closed landfills. One fact sheet outlines the process and considerations for obtaining SWP approval of such projects. The other fact sheet lists current and potential solar projects at landfills throughout the state, including some successful case studies. Both fact sheets are included in [LRP's website](#)¹⁸ on renewable energy development on brownfields.

¹⁸ mde.maryland.gov/programs/LAND/MarylandBrownfieldVCP/Pages/Renewable-Energy-Siting-and-Development.aspx

Future Activities

COMAR 26.04.07 already requires flood plan assessments during the application process for all refuse disposal facilities. SWP will be requiring flood risk assessment plans for active facilities, via permit changes, which can be implemented as the permits come up for renewal.

Sustainable Materials Management (Resource Management Program)

Program Overview

On June 27, 2017, Governor Hogan signed Executive Order 01.01.2017.13, Waste Reduction and Resource Recovery Plan for Maryland. The order adopts a first-ever sustainable materials management (SMM) policy for Maryland that aims to minimize the environmental impacts of the materials' use throughout the entire lifecycle. The policy emphasizes environmentally and economically sustainable methods to capture and reinvest resources into our economy, including everything from metals and plastics to energy, nutrients, and soil. It initiates a stakeholder consultation process to establish ambitious, but achievable goals and to ensure tracking of complete materials management data. It also empowers new partnerships across state and local agencies, the agricultural, energy, and transportation sectors, environmental organizations, and recycling innovators.

MDE's Office of Recycling, within the Resource Management Program (RMP), implements MDE's SMM policy and initiatives. As part of this broader effort, RMP administers the Maryland Recycling Act, under which it reviews and approves county recycling plans that must demonstrate a recycling rate of at least 20 or 35%, depending on the county's population. RMP conducts a variety of other planning, outreach, and technical assistance work to support MDE's overall SMM policies.

Current Activities

Evaluating Progress Toward SMM Goals, Including GHG Emissions and Energy Goals

In April 2019, MDE published a set of SMM metrics and goals. These metrics go beyond the weight-based recycling rate that has traditionally been calculated under the Maryland Recycling Act, in an effort to better track the environmental outcomes of Maryland's SMM efforts. Among these metrics are reductions in the quantity of waste generated per person, per day, reductions in GHG emissions and reductions in energy usage as a result of the state's waste diversion activities. The GHG emissions and energy usage metrics use the EPA's WARM model. Beginning

in 2019, RMP tracks these metrics through its annual Maryland Solid Waste Management and Diversion Report.

Promoting Food Waste Diversion

RMP continues to focus on food waste as a priority area; food scraps make up almost 18% of all MSW that is disposed of in landfills and other disposal facilities in Maryland, where it generates GHGs. In recent years, RMP has worked with a variety of stakeholders to promote waste prevention, food donation, composting, and anaerobic digestion of food scraps. In 2021, MDE held its third Maryland Food Recovery Summit in December, which highlighted food scraps diversion as a climate change strategy with a panel of presentations on the topic.

Improving Markets for Recyclable Materials

An estimated 24% of all MSW disposed in Maryland is made up of materials that could have been recycled through traditional curbside recycling programs, and another 14% could have been recycled through channels outside the traditional curbside programs (e.g., electronics). Diverting more of this material from disposal will require not just enhanced collection of recyclables, but may create markets for those recyclable materials once collected.

To this end, MDE is launching a new recycling markets development initiative. During the 2021 legislative session, [HB 164 - Recycling Market Development](#)¹⁹ was signed into law by Governor Hogan. Under the new law, MDE evaluates the availability of markets for recyclables; identifies businesses in the state that use recycled materials; and promotes the development of markets for recycled materials and recycled products in the state. As part of this effort, MDE will consult with relevant stakeholders, including the Maryland Department of Commerce and other state agencies, local governments, recycling organizations, and representatives of industries that generate and use recyclable materials. More information on activities carried out under this law, a fact sheet, and information on recycling resources can be found on the Recycling Market Development [webpage](#).²⁰

Polystyrene Ban

MDE is tasked by the legislature to conduct outreach about the ban. The county departments of health or environmental protection oversee the enforcement and have the authority to assess

¹⁹ mde.maryland.gov/programs/LAND/Pages/LMA-Legislation.aspx

²⁰ mde.maryland.gov/programs/land/RecyclingandOperationsprogram/Pages/Recycling-Market-Development.aspx

finances for noncompliance. Details on the law, including links to the law, a copy of the Public Notice, and a FAQ page are available on MDE's *EPS Food Service Products Ban* [webpage](#).²¹

Future Activities

Promoting Solar Panel and Lithium Ion Battery Recycling

Renewable energy and EV adoption are important components of the state's overall climate change goals. In order to support these efforts, RMP will work to facilitate the proper recycling of waste streams generated by these beneficial technologies. Both solar panels and lithium ion batteries can be challenging to manage because both contain constituents that are potentially hazardous, solar panels are bulky, and lithium ion batteries can pose a risk of fire if not properly managed. Lithium ion batteries contain resources that are in critical need to create new batteries and are in scarce supply globally.

First, RMP will work with the SWP to create a fact sheet on solar panel recycling considerations. It will also follow developments in federal guidance on solar panel recycling and update its own information as needed. Second, RMP will create a website to act as a clearinghouse on lithium battery recycling opportunities – for EV batteries and smaller lithium ion batteries, including existing opportunities through local household hazardous waste collection programs and industry led programs. Finally, markets for lithium ion batteries and solar panels (including reuse opportunities) will be evaluated as part of the recycling markets initiative described above.

Further Enhance Food Waste Reduction and Recycling

In 2021, Solid Waste Management - Organics Recycling and Waste Diversion - Food Residuals was enacted, which phases in a requirement for certain businesses and institutions that generate large quantities of food residuals to divert those materials from disposal, through waste prevention, food donation, recycling (composting or anaerobic digestion), or animal feed. The requirement covers entities that generate more than a threshold quantity of food residuals per week (two tons starting in 2023; decreasing to one ton in 2024) and are located within 30 miles of an organics recycling facility that has capacity to and is willing to accept the entity's food residuals for recycling. The types of entities covered include individual schools, supermarkets, convenience stores, mini-marts, business or institutional cafeterias, and

²¹ mde.maryland.gov/programs/LAND/RecyclingandOperationsprogram/Pages/Expanded-Polystyrene-Food-Service-Products-Ban.aspx

cafeterias operated on behalf of state or local government, if these entities meet the quantity and location criteria described above.

RMP is conducting outreach to affected entities and has developed technical assistance resources that include, among other things, an online map that displays the location and contact information for organics recycling facilities and each facility's 30-mile radius. MDE is also developing regulations to implement the food residuals diversion requirements of the law. These regulations were developed using feedback collected in July 2022 from food residuals generators, food recovery and recycling organizations, and other interested parties. MDE published the proposed regulations on September 23, 2022. Outreach materials, technical assistance, and additional information regarding the law can be found [here](#).²²

EPA and the U.S. Department of Agriculture have a joint food loss and waste goal of 50% by 2030. EPA recently announced that it has reinterpreted that 50% goal to mean a reduction in the pounds of food per person that are sent to landfill, controlled combustion, sewer, co/anaerobic digestion, compost/aerobic digestion, and land application. This highlights the relative importance that EPA places on source reduction and food donation relative to other forms of food diversion (composting and anaerobic digestion). This is relevant from a climate change standpoint in that GHG emissions are reduced more from food waste prevention efforts and food donation than from other forms of food waste diversion. RMP will review EPA's recent interpretation and determine how to better prioritize and encourage source reduction and food donation efforts.

Biosolids Land Application (Resource Management Program)

Program Overview

The RMP regulates the treatment, storage, and land application of biosolids.

Current Activities

A significant quantity of biosolids generated in Maryland are managed through land application on agricultural land in-state, or export to other states for land application. Timing for land application is important, because there are restrictions on the time of year that biosolids may be land applied, as well as restrictions on application to saturated ground. Flooding or extreme weather can therefore impact the availability of land application as a means of managing biosolids. As a result, RMP has been in contact with wastewater treatment plants and land

²² mde.maryland.gov/programs/land/RecyclingandOperationsprogram/Pages/Solid-Waste-Management---Organics-Recycling-and-Waste-Diversion---Food-Residuals.aspx

application companies to encourage them to plan for adequate regular and emergency storage, taking into account potential weather impacts.

Animal Feeding Operations (Resource Management Program)

Program Overview

The RMP regulates over 500 animal feeding operations (AFOs) under a General Discharge Permit for Animal Feeding Operations. The permit requires each operation to have an approved Comprehensive Nutrient Management Plan and comply with certain BMPs designed to effectively protect water quality by containing animal manure, poultry litter and processed wastewater, separating the material from clean stormwater, and properly managing the material through on-site land application or export offsite. AFOs must have waste storage structures with adequate storage capacity to fully contain animal manure, poultry litter and process wastewater generated on site prior to land application or export. Flooding or extreme weather events have the potential to compromise the containment of wastes within these structures and could result in potential impacts to waters of the state.

Current Activities

RMP has conducted a review of AFOs to determine those that may be affected by flooding or sea level rise. To date, RMP has identified 33 existing AFOs that are in 100- and 500-year tidal and non-tidal floodplains. Specifically, RMP has created a map identifying 22 farms in the 100-year floodplain and 11 farms in the 500-year floodplain (facilities confirmed to be producing animals as of February 2022).

When an extreme weather event that could impact AFOs is anticipated, RMP has sent guidance and reminders to AFO operators about emergency preparedness at AFOs.

Future Activities

RMP will establish a system of prioritizing AFO inspections that considers, in addition to existing inspection priorities, enhanced inspections for AFOs that may be more susceptible to flooding, including those identified above. RMP will work on updating and improving the map of potentially flood prone AFOs to assist in this effort.

RMP will partner with the Natural Resources Conservation Service, Maryland Department of Agriculture (MDA), and local soil conservation districts to identify effective BMPs for existing AFOs located in tidal and non-tidal flood-prone areas. This partnership will also involve a process for evaluating new AFOs for permit coverage, considering areas currently or projected

to be subject to flooding as well as the structural condition and storage capacity of waste storage structures.

Finally, RMP will work with MDA to update and publish guidance on preparing for natural disasters on commercial poultry farms.

Water and Science Administration (WSA) Programs and Initiatives

Strategic and Management Action

Climate change is water change. Considering this, MDE's WSA adopted the following goal in its FY20-23 Strategic Plan:

Climate Resiliency: Adapt programs and decision making to factor in changing conditions and preparedness

Acting on this goal, MDE's WSA is incorporating the reduction of climate change vulnerabilities into routine business practices. In 2019, WSA conducted a qualitative risk assessment by identifying threats and assessing their likelihood and potential level of impact. This and further assessment have generated four top priority action areas for MDE's WSA:

1. Leveraging Science and Planning
2. Enhancing Regulatory Actions
3. Promoting Climate Resilient Water Resources and Infrastructure
4. Ensuring Emergency Preparedness and Response

To accelerate action on WSA's climate priority areas, WSA leadership circulated a *Climate Integration Policy and Guidance* memo to all staff members in July 2020. The memo was a call to "empower and compel all WSA to recommend and help integrate climate considerations into program communications, procedures, policies, regulatory and funding decisions."

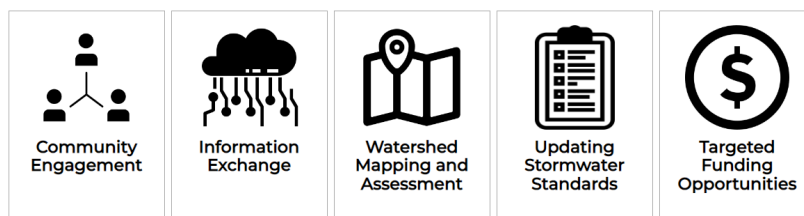
WSA also institutionalized a cross-program Climate Team to expedite action on these priority areas. During 2021-22 WSA Climate Sub-teams focused on the following topics:

1. Permits and Approvals
2. Stormwater and Flood Management
3. Erosion and Sediment Control
4. Drought Vulnerable Communities
5. Leadership and Accomplishments
6. Communications
7. Emergency Preparedness, and
8. Dam Safety

Featured WSA Initiatives

Urban Flooding and Stormwater Management

During 2022, MDE's WSA has been actively engaged in carrying out the A-StoRM strategy: [Advancing Stormwater Resiliency in Maryland \(A-StoRM\): Maryland's Stormwater Management Climate Change Action Plan](#).²³ This strategy was published in November 2021 in response to the amendments to Maryland's stormwater management statute ([SB 227 2021](#))²⁴.



Urban flooding occurs when heavy rainfall exceeds the capacity of soils to quickly infiltrate the water or exceeds the capacity of drainage systems to carry water away from roads and structures. Urban drainage systems are typically designed to convey stormwater volumes up to the 10-year storm, i.e., storms with a 10-percent chance of occurring in any year. When the rainfall exceeds the 10-year storm threshold, many drainage systems are designed to direct excess flow into the streets with curbs and gutters as the next level of water conveyance. This design is intended to balance drainage system cost with an acceptable level of modest street flooding.

In rare cases, perhaps once every 25 years (4% chance in any year), severe flooding occurs that exceeds the street curb capacity to contain the water. In these cases, attention turns away from drainage design to ensuring the physical integrity of the drainage elements to withstand the stresses of flooding and ensuring that critical infrastructure is not located near streams or in low lying areas where flooding waters can pool.

Several things are conspiring to undermine this rational drainage design framework and increase the risk of urban flooding. One is that some regions are experiencing an increased frequency of heavy rain events due to climate change, leading to an unacceptable occurrence of various degrees of flooding. Another is that stormwater management requirements of the past have not adequately considered watershed scale impacts of land development on downstream

²³ mde.maryland.gov/Documents/A-StoRMreport.pdf

²⁴ mgaleg.maryland.gov/2021RS/Chapters_noln/CH_641_sb0227e.pdf

flows. This is motivating the consideration of both future climate conditions and watershed scale analyses associated with stormwater management as part of the A-StoRM initiative.

WSA's A-StoRM report lays out a three-phased strategy:

Phase 1: (All of these activities are completed or underway in 2022)

- Consider rapid regulatory changes to adopt more recent historical design storm data.
- Develop design standards for environmental site design to account for future projections of rainfall impacts of climate change.
- Identify areas experiencing frequent flooding since 2000.
- Draft stormwater regulations that: 1) require the use of updated precipitation data; 2) require an increase in the minimum volume for environmental site design to the maximum extent practicable; and 3) address flooding events since 2000. Additional regulation changes may include modifications to required quantity management and requiring comprehensive watershed studies for areas with frequent flooding, which will also compel the development of flood management plans.
- Update the Comprehensive Flood Management Grant Program to direct funding to support comprehensive watershed studies, model development and capital project identification. (CFMGP, Env. Art. Title 5, Section 8).
- Create a stakeholder advisory group for consultation on the proposed regulations.

Phase 2: (All of these activities are underway in 2022)

- Work with the stakeholder advisory group on revised stormwater management regulations that factor in climate change, and consider comprehensive watershed management studies.
- Collaborate with MDP and DNR to update Maryland's Water Resources Element guidance to incorporate the results of the comprehensive watershed studies when planning for growth and development.

Phase 3:

- Adopt new regulations for stormwater management.
- Integrate comprehensive watershed studies and model development into local growth and development planning process.
- Continue to work with local governments, stakeholders, and the public to identify, document, and implement comprehensive solutions to flood prone areas.

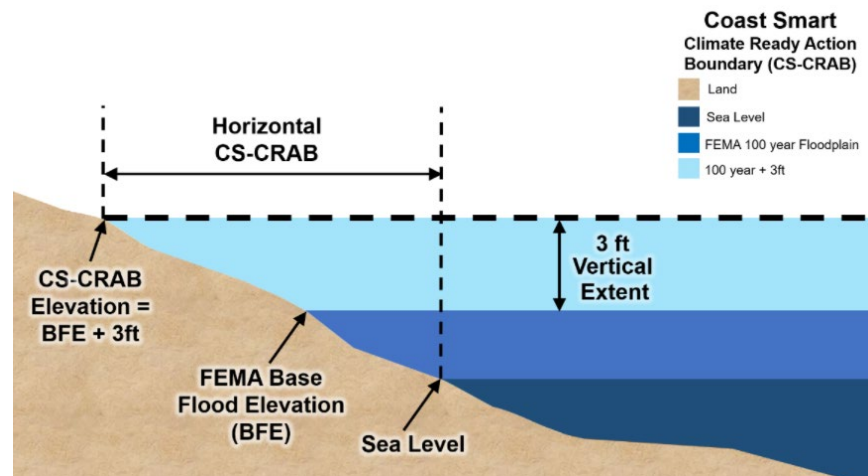
Improving the integration of stormwater quantity control and flood management must not only overcome scientific and engineering challenges, but the solutions must also be simple enough to work efficiently in a routine regulatory environment. Fortunately, WSA has experience

working on the forefront of stormwater management and has expertise outside of MDE to draw upon.

Additional details about A-StoRM activities are described in the section entitled, "WSA Accomplishments and New Initiative Highlights: 2019 - 2022" below.

CoastSmart Climate Ready Action Boundary (CS CRAB):

Climate change is increasing the threat of flooding due to more intense rainfall events, sea level rise, stronger coastal storm surges, and rising groundwater tables. These threats are exacerbated and complicated by legacies of development in flood prone areas, development that occurred under varying generations of stormwater management requirements or no requirements at all, and aging infrastructure.



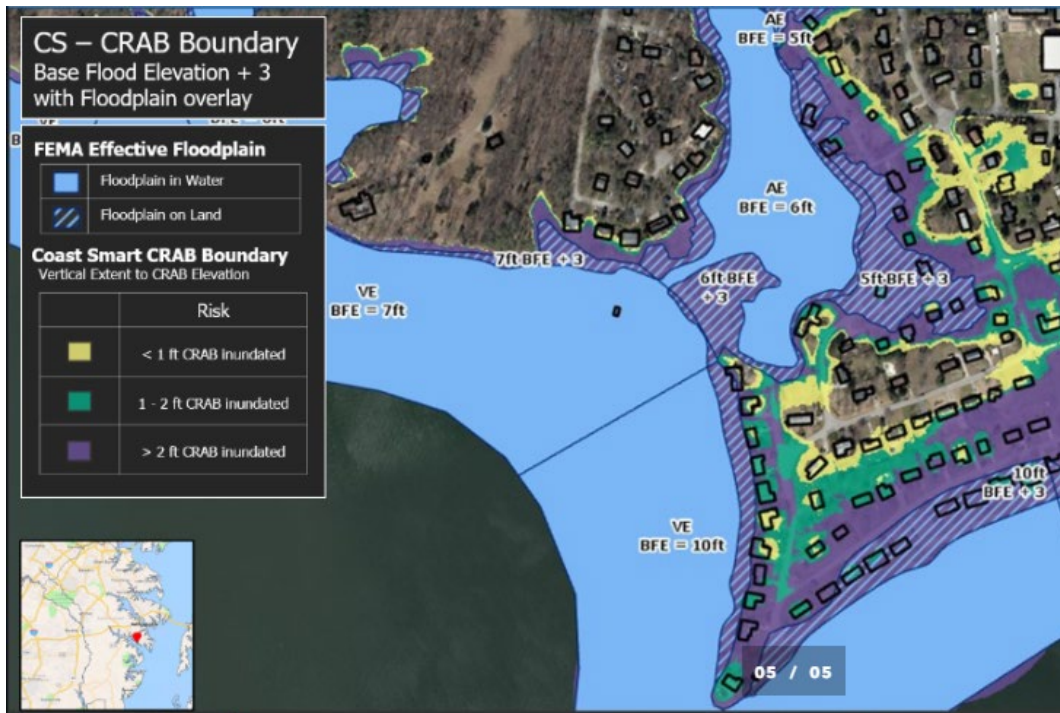
Riverine flooding occurs when a stream or river overflows its banks. Coastal flooding occurs due to cyclical high tides, wind-driven storm surges and climate change induced sea level rise, which can be exacerbated by land subsidence.

When flood waters rise, they also spread out across the landscape as depicted by the "horizontal" extent of water in the figure above, which depicts a coastal area (a riverine area is analogous). The land area between sea level and the FEMA base flood elevation (BFE)²⁵ is the 100-year floodplain (shown here in cross-section). The land area between the BFE and CS-CRAB elevation is what would be flooded if waters rose 3-feet above the 100-year flood level. WSA is proactively planning for flood events that exceed the one-in-100-year event.

To estimate where land would be inundated by riverine and coastal flood waters above the BFE, WSA's National Flood Insurance Coordinating Office facilitated the development of a mapping

²⁵ The base flood elevation is the high-water level of the 1% annual chance flood (also known as the 100-year flood). This is relevant to climate change, because the high-water level associated with a 1% chance flood is rising. A key cause of inland riverine flooding is increasing rainfall amounts. The cause of coastal area flooding is sea level rise and higher coastal surges associated with more intense storms.

tool. The tool shows how deep and extensive flooding would be for water levels that are 1, 2 or 3 feet above the BFE. A sample is provided in the figure below.



The hashed areas in the figure above show the current 100-year tidal floodplain. The solid purple, green and yellow show progressively more land area, and depths of flooding, if water levels exceed the 100-year Base Flood Elevation (BFE) by 1, 2, and 3 feet respectively.

The tool for coastal flooding was completed in 2020 and given the name CoastSmart Climate Ready Action Boundary (CS CRAB). During 2021, development of the riverine version of the mapping tool was initiated by WSA with an anticipated release in late 2022.

The CS CRAB tool supports decision making for capital investments that are subject to Maryland’s legislatively mandated [CoastSmart Construction Program](#).²⁶ A [Story Map](#)²⁷ is available that provides more information about the coastal version of CS CRAB. The [CS CRAB Tool](#)²⁸ and associated [GIS layers](#)²⁹ are available online.

WRE Guidance Climate Change Update

²⁶ dnr.maryland.gov/climateresilience/Documents/2020-Coast-Smart-Program-Documents/FINAL.pdf

²⁷ storymaps.arcgis.com/stories/bd1ab6827c77457a9c6aec5ca1eb4af2

²⁸ arcgis.com/home/item.html?id=93218f38c5014853bb308dacdaf23a9c

²⁹ geodata.md.gov/imap/rest/services/Environment/MD_CoastSmartCRAB/MapServer

In 2022, WSA partnered with MDP to release climate-enhanced guidance for the Water Resources Element (WRE) of local comprehensive land use plans. The WRE ensures that planned land development accounts for the area's water resources. Specifically, the WRE must 1) identify drinking water and other water resources that will be adequate for the needs of existing and proposed future development, and 2) Identify suitable receiving waters and land areas to meet the stormwater management and wastewater treatment and disposal needs of existing and proposed future development.

The revised guidance alerts local planners to the increasing risks that climate change is having on water resources and water related hazards. Planners are directed to assess existing flood risk areas that are likely to worsen, stormwater conveyance capacity limits to avoid creating new flood risks, siting of development relative to dam inundation areas, and the potential that climate extremes could trigger deeper drought conditions that warrant greater margins of safety for water supplies.

The guidance also uses the FEMA concept of "lifelines." Planners are urged to consider how more frequent and severe water hazards relate to other planning functions. More attention must be given to ensuring safe travel corridors between critical services and those who need them. Analyses should be conducted to ensure wildfire and hurricane evacuation corridors have sufficient capacity and are as redundant as possible. The location of industrial land use areas, which are often associated with hazardous materials, warrant special consideration relative to potential flooding, water supplies and other risks of human and natural environmental exposure.

The original 2007 WRE guidance remains unchanged and is available as a [Models and Guidelines](#)³⁰ document. The [2022 WRE Guidance Updates](#),³¹ which include climate change guidance, are now available online.

Permit Climate Enhancements

Enhancing regulatory actions to build climate resilience and adaptation is a top priority for WSA. Permits are central to this priority. WSA is systematically assessing permits for enhancement opportunities ranging from changes that can be made with existing knowledge and authority to changes that necessitate research or regulatory changes. The following example highlights enhancements to National Pollutant Discharge Elimination System (NPDES) municipal wastewater discharge permits based on existing knowledge and authority.

³⁰ planning.maryland.gov/Documents/OurProducts/Archive/72195/mg26-Water-Resources-Element.pdf

³¹ planning.maryland.gov/Pages/OurWork/envr-planning/water-resources-mg/2022/2022-guidance-update.aspx

In 2021, WSA staff developed special condition permit language to increase climate resilience for these discharge permits. In 2022, staff began incorporating the following conditions into individual permits and will continue to do so as permits are renewed.

General Climate Resilience: The new permit language explicitly requires routine maintenance of climate resilience-related infrastructures (i.e., holding tanks, emergency power supplies, etc).

Threshold for Requiring a Flow Capacity Management Plan: Peak flows have been added as a triggering criterion for requiring a local utility to develop a Flow Capacity Management Plan. This new criterion is added to the existing criterion of average flows exceeding 80% of the wastewater treatment plan's flow capacity. Overflows and By-Passes have also been added as a criterion for consideration in triggering capacity management plans.

Emergency Holding Facilities for Shellfish Protection: In applicable locations near shellfish harvesting waters, municipal wastewater treatment plants are required to have 24-hour storage capacity. Language will be added to the permit that explicitly prohibits non-sanctioned uses of emergency holding ponds to avoid displacement of the storage capacity. An annual inspection and documentation requirement will be added. A requirement will be added to record any event that triggers the use of the holding pond, including duration, quantity, cause(s), and aftermath actions. WSA's Compliance Program Inspectors will add this to their inspections.

Accountability for Adverse Events: The new permit language explicitly requires the permittee to take all reasonable steps to minimize or prevent, "any contributions to noncompliant discharges from increased frequency and intensity of extreme precipitation events."

In addition to enhancements to the NPDES municipal wastewater discharge permits, WSA is in the process of enhancing several NPDES general discharge permits. During 2019-2022, enhancements were proposed to the following draft general permits to promote resilience to heavy rainfall events and associated flooding: a) Stormwater Associated with Construction Activities, including a requirement to periodically update erosion and sediment control (E&SC) plans, and a new Stormwater Pollution Prevention Plan (SWPPP) requirement, b) Stormwater Associated with Industrial Activities, c) Stormwater permit for surface coal mining activities, and d) most recently the permit for seafood processing facilities with new SWPPP requirements.

WSA Accomplishments and New Initiative Highlights: 2019 - 2022

The following are highlights of accomplishments and new initiatives during 2019-2022. Many of these efforts were supported by WSA Climate Team activities.

Laws and Regulations

A-StoRM

In 2021, the Maryland General Assembly adopted amendments to the state's stormwater management statute ([2021 SB 227](#)³²). In response, WSA submitted a report to the General Assembly in November 2021 entitled, "Advancing Stormwater Resiliency in Maryland (A-StoRM): Maryland's Stormwater Management Climate Change Action Plan". It includes MDE's strategy for immediately updating water quantity control standards for watersheds where flooding events have occurred on or after January 1, 2000, and MDE's plans for updating all other stormwater management regulations. (Also see, "Featured WSA Initiatives", above, and "Communications, Policies and Procedures", and "Monitoring, Research and Analysis" below).

Cool and Cold Water Protection

In 2022, WSA is adopting clarifications to Maryland's regulatory antidegradation procedures for Tier 1 waters that have coldwater existing uses, redesignating some streams as Class III coldwater and identifying others as having unique coldwater existing uses (See [Antidegradation Policy](#)³³). As part of these regulatory changes, WSA is incorporating by reference (COMAR 26.08.02.04-1) a set of [procedures and policy for identifying coldwater existing uses](#)³⁴ so as to protect the unique biota (e.g., trout) that depend on these waters and the water quality required to support them. This action plus the Department's collaboration with DNR and other stakeholders to monitor for previously undiscovered and undesignated coldwater streams helps to enhance current and future protections for this important resource. In addition to these efforts to improve Maryland's water quality standards protections for cool and coldwater, WSA is also evaluating its coldwater protection mechanisms for its permitting programs. This effort has already resulted in improved screening for sensitive coldwater resources, which have led to more protective permit conditions but has also highlighted the need to revise the Stormwater Design Manual and the Standards and Specifications for Soil E&SC.

³² mgaleg.maryland.gov/2021RS/Chapters_noln/CH_641_sb0227e.pdf

³³ mde.maryland.gov/programs/water/TMDL/WaterQualityStandards/Pages/Maryland-2019-Triennial-Review-of-Water-Quality-Standards.aspx

³⁴

mde.maryland.gov/programs/water/TMDL/WaterQualityStandards/Documents/Cold%20Water%20Existing%20Use%20Determinations%20Policy%20and%20Procedures.pdf

Wetlands and Waterways Ecological Restoration

In 2022, WSA’s Wetlands and Waterways program began planning for a study required by legislation adopted in 2022 (Wetlands and Waterways Program Division – Authorizations Permitting for Ecological Restoration Projects – Required Study, [HB 869](#)³⁵). The study is intended to be a comprehensive analysis of the permitting ecological restoration projects and recommendations for permitting and/or regulatory updates found during the study. Although the legislation is not explicit about climate change, WSA intends to account for climate change considerations. The study is due June 1, 2024.

Dam Repair & Removal

Departmental legislation, adopted in 2020, strengthened MDE’s authority to require the repair or removal of unsafe dams (HB 177). This follows 2017 legislation making dam owner emergency action plans and exercises mandatory (HB 125). These legislative steps are building greater physical and institutional resilience to climate stresses.

Climate Resilience & the Bay Restoration Fund

In 2020, amendments to Chapter 44 of the Maryland Constitution expanded the criteria used to determine how to allocate funding from the Bay Restoration Fund (BRF) by including climate resiliency and flood control as issues for MDE to consider when determining the priority of funding for projects (Bay Restoration Fund – Authorized Uses, [HB 78 2020](#)³⁶). These changes involve programs administered by WSA, including:

- Stormwater projects that provide flood control and assist in mitigating repeated flooding events;
- Treatment works projects that increase the resilience to manmade or natural disasters such as extreme weather events and sea level rise;
- Projects undertaken by communities that are participants in the National Flood Insurance Community Rating System; and
- Projects that reduce risk of flood or coastal hazards in communities identified as “at risk” in the State Hazard Mitigation Plan.

Permits and Approvals

WSA is mainstreaming climate change resilience into permits. The following are steps being taken in that process.

³⁵ mgaleg.maryland.gov/2022RS/Chapters_noln/CH_465_hb0869t.pdf

³⁶ mgaleg.maryland.gov/2020RS/bills/hb/hb0078t.pdf

Climate Permit Tracker

In 2022, WSA finalized a system for tracking the review and climate enhancements of permits, authorizations, and other regulatory decision instruments.

NPDES Municipal Wastewater Discharge Permit and General Permits

(See "Featured WSA Initiatives" above).

Bermed Infiltration Pond - Suspension

In July 2021, MDE issued a 15-month suspension on the construction of Bermed Infiltration Ponds (BIPs). BIPs have been used as a means of sewage disposal in Talbot, Somerset and Dorchester counties in locations where traditional septic systems do not readily function. Site inspections indicate aging BIPs are beginning to fail or at risk of failure. The location of these systems tend to be in sensitive coastal areas subject to anticipated climate change impacts, including sea level rise, water table rise, and increased rainfall volume and intensity. WSA conducted an in-depth assessment of BIPs, which are to be finalized in a report in late 2022 or early 2023 that lays out steps for moving forward on managing BIPs.

Water and Sewer Plan Amendments

WSA water and sewer plan reviews now screen for various climate change vulnerabilities associated with water and sewer projects. This is intended to raise the awareness of planners and remind engineers of their professional responsibilities to incorporate climate change and resilience into their planning.

The Wetlands and Waterways Program is developing enhanced flood screening tools for permits that could lead to the modeling of larger storms in determinations of flooding impacts associated with waterway construction. Acknowledgement letters from MDE notify permit applicants of their responsibility for projects in flood vulnerable areas.

Riparian Tree Protection

During 2021, WSA's Wetland and Waterways Program enhanced its stream [restoration permit application package checklist](#)³⁷ to better protect mature riparian trees during stream restoration projects. The checklist enhances avoidance and minimization guidance that benefits climate change resilience.

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mde.maryland.gov/programs/Water/WetlandsandWaterways/PermitsandApplications/Pages/nontidal_permits.aspx

WSA Communications, Policies and Procedures

This section covers activities, including planning, standard operating procedures (SOPs), guidance (internal and external), correspondence, WSA webpages and social media, fact sheets and other forms of outreach.

WSA Policies

WSA's 2020-2023 Strategic Plan, finalized in 2019, identifies Climate Resiliency as one of the administration's primary goals. It calls for WSA to adapt programs and decision making to factor in changing conditions and preparedness.

In July 2020, WSA issued a Climate Integration Policy and Guidance memo that directs all WSA to review planning, regulatory, and fiscal programs to include consideration of sea level rise, storm surges and flooding, increased precipitation and temperature, and extreme weather events, consistent with Environment Article §2-1301 through 1306.

A-StoRM

WSA's stormwater management climate initiative, AStoRM, is a process to update the state's stormwater management regulations to enhance stormwater quantity controls. The A-StoRM initiative has recently involved the following communications and outreach actions (Also See "Laws and Regulations", and "Monitoring and Analyses"):

- A-StoRM HUB: This complex initiative, started in 2021, is supported by an information center called [AStoRM HUB](#)³⁸ launched in 2022.
- A-StoRM Regional Kickoff: In spring 2022, WSA's Stormwater, Dam Safety and Flood Management Program initiated its stakeholder engagement process with three regional meetings. A recording of one of these kickoff meetings is available [here](#).³⁹
- A-StoRM Stakeholder Consultation Group: In summer 2022, WSA's Stormwater, Dam Safety and Flood Management Program initiated engagement with a Stakeholder Consultation Group. The group is made up of experts across the regulatory, academic, and private sectors who are being asked to advise on proposals that are being vetted by several technical advisory groups (TAGs).

³⁸ sb-227-maryland.hub.arcgis.com/

³⁹ youtube.com/watch?v=CEvLovRg0i0&list=PLlgoHh4Po1J1aVVwT-EnWIFrttMKSZRZyk&index=1

- Stormwater Regulation TAG: WSA staff started a series of meetings with a newly formed Stormwater Regulation TAG in 2022, which will help develop and vet proposed regulatory changes.

WSA Climate Website

In 2021, WSA launched its [Climate Adaptation and Resilience Website](#).⁴⁰ During 2022, WSA began developing a Climate Change Dashboard, which will feature a set of top climate action priority areas. When completed, the dashboard will highlight key climate adaptation activity areas and track progress.

WSA Program Webpages

During 2022, WSA's seven programs enhanced their main webpages to begin highlighting how they contribute to climate change resilience and adaptation. See for example WSA's [TMDL webpage](#).⁴¹

Flood Awareness Month 2022

WSA staff participated in the planning and events of Maryland's 2022 Flood Awareness Month (FAM). The FAM is coordinated by the [Maryland Resiliency Partnership](#).⁴² In addition to a wide variety of educational outreach activities, WSA conducted a survey to assess baseline awareness of the 2021 FAM by which future awareness can be measured, and to assess the ways people get their information. WSA also produced flood awareness videos:

- Chaptico and Charlotte Hall - Water Rescue: youtu.be/uXG1EdHkgcs
- Leonardtown - Be the Help Until Help Arrives: youtu.be/YTzfmY7v4pA
- Frederick - Three Step Plan: youtu.be/GFu8l1GSA9E

Water & Wastewater Utility Climate Vulnerability Assessment Training

In summer 2022, WSA helped MDP host several of EPA's Climate Resilience Evaluation and Awareness Tool webinars.

Emergency Response SOPs

In 2022, WSA programs reviewed and updated their Emergency Response SOPs based on a newly adopted set of best practices.

⁴⁰ mde.maryland.gov/programs/Water/Pages/WSA_Climate_Change.aspx

⁴¹ mde.maryland.gov/programs/water/TMDL/Pages/index.aspx

⁴² md-resiliency-partnership-maryland.hub.arcgis.com/

Tabletop Exercise for Water and Wastewater

WSA assisted with coordinating and participated in an EPA-sponsored communication-based functional exercise (FE) event hosted by Maryland's Water/Wastewater Agency Response Network (MDWARN). The virtual FE provided an opportunity for participants to exercise emergency response capabilities in response to a hypothetical extreme weather scenario affecting water and wastewater systems. The purpose of MDWARN is to provide a method whereby water and wastewater utilities, that have sustained or anticipated damages from natural or human-caused incidents, can provide and receive emergency aid and assistance in the form of equipment, materials, and other associated services as necessary from other water and wastewater utilities.

Tabletop Exercise for Dam Safety

In spring 2022, WSA participated in a Western Maryland Collaborative Technical Assistance initiative conducted by FEMA. Among other things, the initiative included a tabletop exercise centered on the town of Oakland involving the scenario of an extreme rainfall event, of the type being driven by climate change, that placed several dams at risk of failure.

Drought Resilience

In 2022, WSA conducted a triennial review of [Maryland's Drought Monitoring & Response Plan](#)⁴³, which is recommended by the Plan. Although the plan is dated, it was deemed to be adequate. The review exercise prompted staff to update county contact information, organize outreach and notification materials and consider a review of the groundwater drought monitoring network.

Dam Removal Guidance

In 2022, WSA, in collaboration with DNR, initiated a process of enhancing its guidance for the removal of dams. Climate change places stress on aging dams and the removal of certain dams reduces risk. The dam removal guidance development is also motivated by the anticipation of a greater permitting demand due to the availability of increased federal infrastructure funding.

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mde.maryland.gov/programs/water/droughtinformation/Documents/mde.state.md.us/assets/document/drought/droughtreport.pdf

Water Resources Element (WRE) of Local Comprehensive Plan Climate Change Guidance

In 2022, the WRE Climate Change guidance was released via a [MDP website](#).⁴⁴ This followed work in 2021 when WSA partnered with other state agencies to develop guidance on climate change considerations for the existing WRE guidance. The purpose of the WRE, is to identify: “(1) drinking water and other water resources that will be adequate for the needs of existing and future development proposed in the land use element of the plan; and, (2) suitable receiving waters and land areas to meet stormwater management and wastewater treatment and disposal needs of existing and future development proposed in the land use element of the plan.”

Dam Inundation Hazard Mapping

In 2020, WSA’s Dam Safety Program secured funding from the FEMA Hazard Mitigation Grant Program for a dam inundation mapping project. This project will produce digital inundation maps for nearly all Maryland dams. The inundation maps will be hosted on a Dam Safety web portal and on [Maryland Flood Maps](#).⁴⁵ By providing this mapping, people will be more informed about potential flood dangers, more people could be encouraged to purchase flood insurance, emergency managers will have more information, and local governments will be able to make more informed land use decisions that make Maryland more resilient.

Chesapeake Bay Restoration 2-Year Milestones

EPA’s 2022 evaluation of Maryland’s 2020-2021 Watershed Implementation Plan (WIP) Milestones praised the state for meeting its commitment to the Principle’s Staff Committee 2020 climate change Directive. The Directive called on states to account for predicted nutrient load increases due to climate change conditions through 2025 in their existing 2019 Phase III (WIPs). - See more details below. [Maryland’s 2022-2023 WIP Milestones](#)⁴⁶ include new climate change action commitments.

Chesapeake Bay Climate Addendum for Nutrient Reductions

In 2021, WSA conducted technical analyses to support enhancements to the [Chesapeake Bay WIP](#)⁴⁷ that offset predicted increases in nitrogen and phosphorus loads estimated to occur in

⁴⁴ planning.maryland.gov/Pages/OurWork/envr-planning/water-resources-mg/2022/2022-guidance-update.aspx

⁴⁵ mdfloodmaps.net/

⁴⁶

mde.maryland.gov/programs/water/TMDL/TMDLImplementation/Documents/Milestones/2022_2023.Maryland.CB.Milestones_2.1.22.pdf

⁴⁷ mde.maryland.gov/programs/Water/TMDL/TMDLImplementation/Pages/Phase3WIP.aspx

2025. In 2022, staff produced an [Addendum](#)⁴⁸ to Maryland’s Phase III WIP that commits Maryland to achieving these additional nutrient pollutant reductions by 2025.

Temperature TMDLs

During 2022, WSA is continuing to develop temperature models for streams that exceed their temperature water criteria. These models will be used to develop TMDLs in specific geographical areas of concern, will set protective regulatory limits on heat loads to the stream, and establish a quantitative framework for reducing water temperatures. For example, WSA has collected continuous sub-hourly stream and air temperature data during the summers of 2020 and 2021 at 12 sites in support of temperature TMDLs in the watershed that drains to Prettyboy Reservoir in Baltimore County. Although these TMDLs are for the streams in this watershed, they will benefit the downstream drinking water reservoir temperature thereby lowering the risk of harmful algal blooms.

Carbon Sequestration Tracking

In 2022 WSA began collaborating with a multi-disciplinary MDE team to provide technical assistance in tracking and registering nutrient reduction and carbon sequestration using the same data management tools. This is part of a broader effort to formalize carbon sequestration accounting associated with natural and working lands restoration projects. This builds on the work of the Carbon Markets and Sustainable Tree Planting Commission, established by the [Tree Solutions Now Act of 2021](#),⁴⁹ and utilizes pay-for-success financing tools enabled by the [Conservation Finance Act of 2022](#).⁵⁰

Mid-Bay Dredged Material Island

In 2021, WSA worked with other State agencies to garner support for a joint state/federal working group to collaborate on the Mid-Bay islands design to include climate resiliency elements.

Ocean Acidification

[Maryland’s Ocean Acidification Action Plan](#)⁵¹ was developed in 2020 as a collaboration between MDE, DNR and University of Maryland Center for Environmental Science (UMCES). It is helping to guide action on reducing the causes, better understanding the science (See Monitoring

⁴⁸ mde.maryland.gov/programs/water/TMDL/TMDLImplementation/Documents/Phase-III-WIP-Report/MD_Climate_Change_Addendum_2022.pdf

⁴⁹ mgaleg.maryland.gov/2021RS/Chapters_noln/CH_645_hb0991e.pdf

⁵⁰ mgaleg.maryland.gov/2022RS/Chapters_noln/CH_238_sb0348e.pdf

⁵¹ mde.maryland.gov/programs/air/ClimateChange/MCCC/STWG/OA%20Action%20Plan%20updated.pdf

below), and improving communications among key partners, decision makers and stakeholders. WSA regularly presents at events hosted by the Mid-Atlantic Coastal Acidification Network , the International Alliance to Combat Ocean Acidification and work groups of Maryland’s Commission on Climate Change.

Construction Site Stormwater Control

In 2022, WSA continued development of climate awareness guidance for construction site erosion and sediment control that was initiated in 2021. The brief document focuses on avoiding and responding to triggering events that necessitate corrective action. When completed, guidance will be provided to responsible parties by site inspectors at pre-construction meetings.

Water Supply Utilities and Climate Change

MDE’s [guidance brochure](#)⁵² on climate adaptation for drinking water utilities was updated in 2021. Originally developed in 2016, the guidance addresses water availability and water quality issues. It provides links to a variety of resources.

Permit Correspondence Communications

Routine correspondence provides an opportunity to impart key climate change messages. In 2021, WSA’s Wetlands Program began adding language to permit application receipt acknowledgement letters advising permittees and their consultants to consider the effects of climate change when planning for projects that impact the 100-year nontidal floodplain and the potential for flood risks that might be associated with their projects.

Maryland Climate Change Adaptation Framework

WSA co-chaired the development of the Water Resources section of Maryland’s draft Climate Adaptation Framework, under the auspices of the Maryland Commission on Climate Change’s Adaptation and Resiliency Work Group (2020-2021).

Beneficial Use of Dredged Material for Climate Resilience

MDE’s [Innovative Reuse and Beneficial Use of Dredged Material Guidance Document](#)⁵³ supports projects like wetland enhancement, island restoration, and "thin layer placement," which build resilience to coastal storm surge and sea level rise. The guidance was updated by WSA in 2019.

⁵² mde.maryland.gov/programs/Water/water_supply/Documents/120516_CCbrochure_Web.pdf

⁵³

mde.maryland.gov/programs/Marylander/Documents/Dredging/FINAL_IBR_GUIDANCE_12.05.2019_MDE.pdf

Compliance Training

WSA presented at the 2021 MDE Inspector's Forum on a) Activities of the WSA Climate Team relevant to MDE field inspectors, b) the draft E&SC Awareness Guidance, and c) colleague survey on E&SC climate resilience enhancements.

Monitoring, Research and Analyses

Drought Vulnerability Resilience

In 2021 MDE Water Supply Program staff completed [a groundwater yield study](#)⁵⁴ in fractured rock areas of Maryland, which are vulnerable to drought. This set of studies provides a technical foundation for water appropriation permits that account for drought conditions; however, more data from specific local system sources is needed. In 2022 WSA Water Supply Program oversaw completion of a technical study of the viability of indirect potable water reuse treatment system for the City of Westminster in 2022. This technology could provide resilience to droughts in places where it is technically and financially viable.

A-StoRM, Identification of Flood-prone Areas

In 2022, WSA began a collaborative effort with local governments to identify and characterize flood-prone areas. This is a complex undertaking in part because there are many types of flooding, e.g., coastal, riverine flooding and pluvial flooding, and because flooding occurs at a variety of geographic scales ranging from a street intersection, to several backyards, to entire stream valleys. The causes of the flooding are similarly complex. This is part of the A-StoRM initiative described under *Laws & Regulations* section above.

Ocean/Coastal Acidification

When elevated CO₂ GHG, the hallmark cause of climate change, enters the atmosphere, large amounts dissolve into water bodies. This causes the water chemistry to shift in the direction of acidity, which among other things makes the formation of calcium-rich shells more difficult. To better understand and prepare for impacts from this phenomenon, during 2021 and 2022 WSA staff, in collaboration with DNR and UMCES, have been developing a set of carbonate system monitoring plans for the Chesapeake Bay. Ocean Acidification monitoring instrumentation for the partial pressure of CO₂ (pCO₂) has been made available to MDE as part of a partnership with the National Aeronautics and Space Administration to ground-truth new remote sensing

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mde.maryland.gov/programs/water/water_supply/Documents/ReliableDroughtYieldsPWS_wellsInFractured.pdf

technology. The remote sensing technology could also enable more efficient and rapid detection of potentially harmful bacteria and hazardous algal blooms.

Probable Maximum Precipitation (PMP) Study for Maryland Dams

A probable maximum precipitation (PMP) event is the greatest depth of precipitation at a particular location for a given duration that is meteorologically possible. This theoretical maximum is likely changing due to climate change. High- and significant-hazard dams must be structurally sound enough to safely pass a PMP storm event or 50% of the PMP storm event (respectively). In 2020, WSA secured funding to update Maryland PMP estimates via a three-phased process. The first phase was completed in 2021, and phase 2 is nearly complete in 2022. PMP depths have been derived by storm type (local, general, and tropical) and at durations required for proper hydrologic modeling analyses for any location and any basin within the state. Findings have been peer reviewed. Funding for Phase 3 has been secured for work in 2023, which will produce a final report, and a GIS PMP database and data access tool. These products will support Maryland's outreach and make the PMP research actionable by dam owners and their engineering consultants for designing BMP embankments, control structures, and axillary spillways.

Harmful Algal Blooms

Climate change induced warming of waters and more nutrient runoff from increased rainfall is predicted to cause more harmful algal blooms (HABs). In 2020, WSA invested in updated laboratory analysis equipment to automate enzyme-linked immunosorbent assay analyses used to identify waterborne toxins associated with HABs. By cutting the testing time for multiple HAB toxins by days, WSA can now more rapidly respond to multiple simultaneous emergency events that might require issuing hazard advisories to water supplies, shellfish harvesting areas and water contact recreation areas

Living Shoreline Protection

For several years MDE has directed EPA funding toward conducting a series of technical tidal shoreline analyses and the development of updated shoreline maps. The product is a Maryland Shoreline Stabilization Map. A tool that will better enable MDE permittees to more rapidly and effectively determine when living shoreline methods must be used as directed by Maryland's 2008 Living Shoreline Protection Act. Living shorelines are generally considered to provide more ecological benefits and climate resiliency.

Climate Water Resource Impact Research & Synthesis

WSA programs are tracking research undertaken by the Chesapeake Bay Program (CBP) to understand the methods and metrics used to forecast future climate conditions and anticipated impacts on water resources. These methods can directly affect regulations, calculations that determine limits on pollutants, and other technical regulatory requirements.

Modeling & Predicting Climate Impacts

WSA's Water Protection, Restoration and Planning Program is developing watershed hydrology models and exploring climate scenarios to quantify the effects of the future climate on water budgets, stream temperature, pollutant transport and floodplain deposition. These models are calibrated using high-resolution (sub-hourly) stream temperature and turbidity observations collected by the WSA Field Investigations and Environmental Response Program.

Funding

Chesapeake Bay Restoration & Climate Resilience Funding

In spring 2022, WSA coordinated with other state agencies to identify projects with climate resilience co-benefits to effectively use \$2.8 million of the *Most Effective Basin* funds provided by CBP. These funds, from the federal Infrastructure Investment and Jobs Act, gave priority to underserved communities.

Technical Assistance for Underserved Communities to Secure Climate Resilience Infrastructure

WSA led an effort to direct about \$400,000 toward helping underserved communities compete for future infrastructure grant funding. This will allow these communities to build climate resilience to flooding and other risks, while also helping to restore water quality.

Flood Management Infrastructure

Legislation has been adopted to restore funding to the [Comprehensive Flood Grant Management Program](#)⁵⁵ over several recent years. Between FY20-22 Governor Hogan and the Maryland General Assembly authorized over \$34 million in capital funding for flood mitigation, which can have Bay restoration co-benefits.

Flood Management & Capital Projects Planning

In 2022, WSA staff developed a proposal to fund three pilot projects to develop watershed flood analysis models and flood management plans. The pilots will guide development of

⁵⁵ mde.maryland.gov/programs/Water/StormwaterManagementProgram/Pages/floodmgmt.aspx

methodologies to help better integrate stormwater and flood management as part of the A-StoRM initiative.

Innovative Programs

Maryland's Tree Solution Now Act Implementation

In 2021, legislation passed to support the planting and maintaining of 5 million native trees in the state by 2031. A key focus of this effort is supporting tree equity through targeted native tree planting in underserved urban communities. The state is also working to optimize plantings to realize multiple co-benefits including carbon sequestration, improved air and water quality, and reducing urban heat island effects.

This law directly supports the state's ambitious climate mitigation goals, where the CSNA of 2022 targets a 60% reduction in GHG emissions by 2030 relative to a 2006 baseline. An important component of this effort is the growth of the state's natural carbon sinks, including through improved forest management, afforestation and reforestation, and urban tree planting. This work also builds from Maryland's leadership in the RGGI and USCA, as well as ongoing restoration work through the CBP.

The Act established the Maryland Commission for the Innovation and Advancement of [Carbon Markets and Sustainable Tree Plantings \(Trees Commission\)](#).⁵⁶ The commission is tasked with creating the Plan to plant 5 million trees by 2030, and to properly maintain them. In 2022, the Trees Commission offered several recommendations in pursuit of their goal, including:

- counting more non-native fruit and nut trees to support food security;
- optimizing the use of state-owned property, starting by expanding the review criteria;
- engaging the carbon market;
- supporting long-term management, including measures to grow forest product industries, and utilizing forest products in a way to maximize long-term carbon sequestration.

The Trees Commission has released its plan for growing 5 million trees. The plan specifically outlines implementation strategies and enabling infrastructure being advanced, namely:

- New forms of technical and financial assistance in rural and urban communities,
- Strategies for increasing the state nursery's seedling stock,

⁵⁶ <https://mde.maryland.gov/programs/air/ClimateChange/Pages/Trees-Commission.aspx>

- Outreach and engagement strategies for riparian forest buffer plantings,
- A new Urban Trees Grant program and plans to scale capacity-building,
- Understanding of existing tree loss mitigation policy and current best practices,
- Progress tracking in the development of new web and map-based tools,
- Alignment of tree tracking with existing accounting frameworks for carbon and nutrients,
- State engagement with the carbon market to clarify avenues for participation,
- Models for long-term tree maintenance and management, and
- New and existing partnerships to connect communities-of-practices and amplify impact

MDE, with support from DNR, MDA, and Chesapeake Bay Trust, is coordinating the tracking and implementation of this tree planting goal. Maryland is also partnering with a range of community-based organizations, nonprofit organizations, and local governments to ensure the long-term success of all tree planting, growing, and monitoring efforts.

Idle-Free Maryland

Program Overview

Idle-Free Maryland is a partnership between the state, the private sector and Maryland schools, which is designed to reduce unnecessary idling through outreach, education, and voluntary action. For now, the initiative focuses on three types of idling activities:

- Motorists who idle their cars for a variety of reasons;
- Idling by truckers; and
- Idling around schools.

Idling emits about 11 million tons of CO₂, 55,000 tons of NO_x, and 400 tons of PM in the U.S. each year. These pollutants contribute to climate change and can cause cancer, respiratory issues, reproductive effects, birth defects and other serious illnesses. Idling also impacts the health of Maryland streams, rivers, lakes, bays, and coastal waters, increasing the levels of nitrogen in the Chesapeake Bay. Reducing vehicle idling is increasingly seen to improve air quality and to help meet climate change goals.

The goal of the Idle-Free program is to significantly reduce idling by building awareness of its impact on communities. The program establishes partnerships with motorists, communities, and the transportation industries with the intention of reducing emissions from unnecessary idling by decreasing the social tolerance of idling through fact-based education. Resources have been created to help spread the word about idling's impact on health and the environment. The tools developed are aimed at educating motorists, schools, and transportation industries on ways to

implement an idle-reduction plan. The campaign includes a toolkit of more than 30 products, including fact sheets, social media materials, pledge sheets, signage, policies, and other communications media. This includes [resources developed specifically for implementation in schools](#).⁵⁷

Benefits

If every driver who took the pledge to be idle-free could reduce their idling by just 5 minutes a day, it would prevent 25 pounds of harmful air pollutants and 260 pounds of CO₂ from entering the atmosphere each year. Idle-Free Maryland reductions will help the state meet its climate change goals by reducing GHG emissions. The initiative will also reduce emissions of other air pollutants and help the state better protect public health by continuing to make progress on ground-level ozone and fine particulate air pollution. If half of Maryland drivers would make that “five minutes a day” commitment, more than 50 million pounds of pollutants per year could be prevented from entering Maryland’s air. Idle-Free Maryland will not only improve the air quality in Maryland communities, but also reduce the negative impact of air pollution on streams, rivers, lakes, bays, and the Chesapeake Bay.

Partners

MDE and its state partners, including MDOT, MEA, the Maryland Department of State Police, and the Maryland State Department of Education, are working with several key partners to implement Idle Free Maryland. These include the Maryland Motor Truck Association. MDE is working with individual schools, many of which are Green Schools, to assist in implementing their own idle reduction strategies. Green Schools is a program administered by the Maryland Association for Environmental and Outdoor Education (MAEOE) so that schools and their communities can evaluate and improve their efforts in environmental sustainability. So far, 55 partner schools and five state Green Centers, which work with schools to achieve their educational and environmental goals, have signed on as partners. MDE has participated in Green School evaluations, presented to teacher conferences, and sponsored a booth at MAEOE’s year-end Youth Summit where students could play games and get stickers while teachers could sign up their schools to become Idle-Free Maryland partners. Opportunities for further engagement with communities, local governments, school systems and additional transportation industry sectors are continually being sought out.

Conclusion

⁵⁷ mde.maryland.gov/programs/Air/MobileSources/idlefreeMD/Pages/index.aspx

The tools and resources to launch Idle-Free Maryland have been completed. Additional outreach and stakeholder engagement are planned to increase awareness of the program. MDE will continue to evaluate potential recognition and incentive programs to encourage involvement. There will also be increased emphasis on tracking the results from the Idle-Free campaign and identifying avoided emissions due to the implementation of the program. MDE expects the GHG emission reduction from this effort to exceed 100,000 metric tons of CO₂e by 2030.

Air Quality Partnership Project in Cheverly, Maryland

Program Overview

MDE has begun a partnership with the Town of Cheverly (Prince George's County) and the Center for Community Engagement, Environmental Justice, and Health (CEEJH), Maryland Institute for Applied Environmental Health at the University of Maryland School of Public Health. The purpose of the partnership is to conduct a project to monitor local air quality and determine whether any emissions sources in the Cheverly/Sheriff Road area are impacting it.

The partnership started when Cheverly, along with the town of Capitol Heights, worked with the CEEJH to create a hyper-local air sensor network to analyze local air quality. MDE assisted in this effort by using its regulatory monitors to calibrate the sensors. Cheverly's air quality sensor network includes 22 PurpleAir, Inc. (PA) sensors estimating fine PM_{2.5} concentrations, a high priority air pollutant.

MDE is engaged in this partnership in multiple ways. MDE implemented an intensive targeted inspection initiative in and around the Cheverly area, from June 1, 2021 through July 30, 2021. MDE has conducted inspections and observations at permitted emission sources and conducted area-wide scans and observations at non-permitted sources such as locations where diesel trucks or buses idle for long periods. Emissions from all these sources have the potential to influence air quality in the Cheverly area. In general, the Cheverly area appears to have a high volume of truck traffic and idling buses. Except for three violations related to uncontrolled dust, the targeted inspection initiative conducted by MDE showed compliance with air quality laws and regulations in the Cheverly area.

MDE also evaluated the potential correlation between higher levels of measured PM_{2.5} and traffic conditions. To determine how traffic may have been impacting air sensor measurements in the Cheverly area, MDE examined how traffic volume correlated with PM_{2.5} readings and vice-versa. When data from the network of sensors is coupled with traffic data and information obtained from MDE's field inspections of mobile and stationary sources of air pollution, it can allow influencing factors and conclusions to be drawn regarding local air quality.

Study Results

An overall finding based on traffic data analysis and evaluation of sensor data, was that wind direction in combination with emission sources seemed to have a greater impact on the PA sensors' PM2.5 levels than local Cheverly area traffic. A slightly higher PM2.5 trend appeared in the Cheverly PA data during periods with winds from the west-southwest direction. PM2.5 levels in the Cheverly area appear to be mostly below both the daily and annual health-based standards set by EPA. They are consistent with other urban PM2.5 levels across Maryland and the mid-Atlantic region, though the Pennsylvania data does show short-term spikes of high PM2.5 levels.

Action Taken

MDE identified 21 facilities as sources to inspect, of which three were issued Notices of Violation in July 2021. The three sites were located outside Cheverly and were producing large amounts of uncontrolled dust (PM10, larger particles than PM2.5). Upon reinspection later in 2021, all three sites had made marked improvements to dust levels. MDE will continue to work with other partners to conduct research and to utilize new techniques and tools to analyze potentially higher exposures to air pollution in areas that have EJ concerns.

The Maryland Green Registry

Program Overview

The Maryland Green Registry is a free voluntary program managed by MDE to promote and recognize sustainable practices at businesses and organizations of all types and sizes. Members share information on at least five environmental best practices and a measurable result for at least one of those practices. They also pledge to strive to continually improve their environmental performance year after year.

While there is not an emphasis on climate mitigation planning addressing issues like sea level rise or extreme weather events, the program does promote a proactive approach to environmental management that goes beyond regulatory compliance to increase efficiency in energy, water, and raw material usage. These operational improvements can help businesses to improve their resilience during periods of fluctuating prices or resource availability.

[The Maryland Green Registry website](https://mde.state.md.us/marylandgreen/Pages/Home.aspx)⁵⁸ houses tips and resources for best practices in the areas of environmental management and leadership, waste reduction, energy and water conservation, transportation, and green building design. The Green Registry also offers on-site technical

⁵⁸ mde.state.md.us/marylandgreen/Pages/Home.aspx

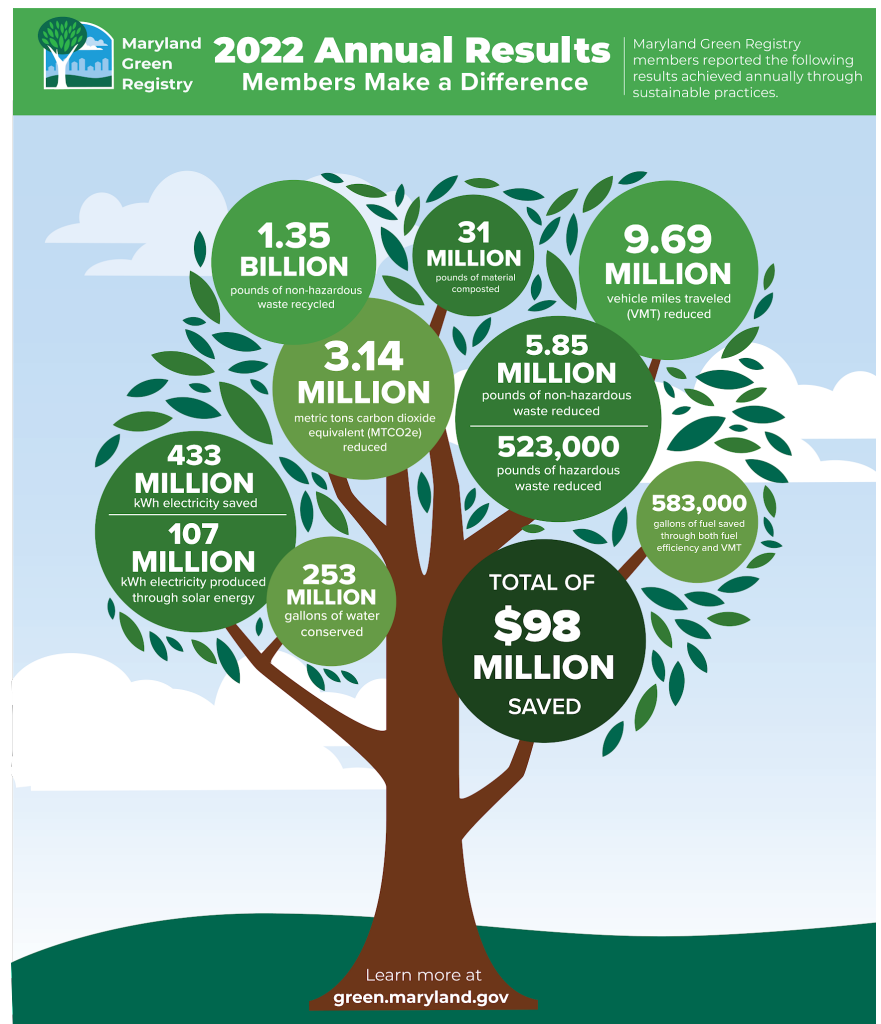
assistance to help members identify waste reduction and resource efficiency opportunities. The member profiles, which are maintained on the program’s website, serve as an additional resource for practical and proven sustainable practices.

GHG Emissions Reductions

The combined environmental results and cost savings shared by the 600 member organizations also help to build a strong case for undertaking voluntary practices that reduce GHG emissions. Collectively, members reported in FY22 saving more than 433 million kilowatt hours of electricity, reducing 9.69 million vehicle miles traveled, and conserving 253 million gallons of water, resulting in the reduction of 3.14 million metric tons CO₂ equivalent (mmtCO₂e), and \$98 million in costs savings. The program also provides opportunities to recognize significant environmental results and commitment to continual improvement through the annual Sustainability Leadership Awards. Many of these award winners have successfully reduced their carbon footprint and help to serve as a role model for others.

Enhancement Opportunities

Although the program is managed at MDE, it is presented publicly as a state government-wide program and fellow state agencies are encouraged to partner with the program to promote it with their constituencies. These partnerships are noted on the program [website](#)⁵⁹, but could be expanded and strengthened to expand membership. Web ads and other marketing assistance would also help to increase the online presence of the program.



⁵⁹ mde.maryland.gov/MarylandGreen/Pages/GreenMemberList.aspx

Funding

The program is funded through an EPA Pollution Prevention Grant with a 50/50 match of state funds. Approximately 0.5 full time employees are devoted to the management of the program. This funding allows members to join at no cost and eliminates any barrier of entry for many small businesses.

The Energy-Water Infrastructure Program

Program Overview

Between FY17 and FY20, the Energy-Water Infrastructure Program (E-WIP), which was initiated in 2015, awarded \$40 million in grants to water and wastewater systems throughout the state. E-WIP provided funds for the planning, design, and construction of projects that benefited both the environmental and economic interests of the state. As proposed, this dual-pronged program provided reliable and resilient infrastructure for communities throughout Maryland by implementing energy efficiencies, potentially reducing operating costs at water and wastewater treatment facilities. Funded projects included:

- Onsite waste to energy power generation by commissioning new combined heat and power (CHP) systems and other alternative energy sources.
- Upgrade or replace aging pumping stations, aeration systems and other equipment at water and wastewater facilities with more energy efficient equipment that will reduce their energy consumption by 20% or more.
- CHP and other alternative energy projects were funded at up to 100% of eligible project costs in state E-WIP grant funding, not to exceed \$3 million. Replacing aging pumping stations and other equipment were funded at up to 100% of the eligible project costs, not to exceed \$1 million.

Benefits

E-WIP helped jump-start the concept of energy-water infrastructure throughout Maryland. The projects under this concept continue to be funded under the Water Quality and Drinking Water Revolving Loan Fund Programs (WQSRF and DWSRF), which provide low interest loans and principal forgiveness. Currently, there are \$300 million of active energy-water infrastructure projects using WQSRF and DWSRF. The major benefits include electrical energy generation from the digester gas for plant usage, steam production to heat the new digestion process, and significant reductions in GHG emissions.

Hart Miller Island Carbon Sequestration

HMI is a state-owned former dredged material placement site located within the Chesapeake Bay near the mouth of Back River. The site was originally two separate islands, Hart Island and Miller Island, which were both eroding at a rapid pace. The Maryland Geological Survey predicted that Miller Island would be gone by 2008, and Hart Island by 2045. In 1970, Congress approved deepening of the POB navigation channels, and MDOT MPA began placing dredged material to join and restore Hart and Miller islands. HMI now includes wetlands, forests, trails, and sand beaches managed by DNR. The restored south area opened to the public in 2016 for wildlife viewing and recreation.

Along with restoring nearshore habitat and creating a resource for recreational activities, HMI serves as a potential CO₂ sink. MDOT MPA is currently investigating the amount and rate of carbon sequestration in the site to assess if HMI could be a significant carbon capture and storage opportunity. Closure and restoration of former dredged material sites, such as HMI, may provide sustainable and long-term sequestration of carbon through vegetation growth and creation of wetlands and marshes.

Federal Measures Impacting Maryland

The GGRA requires that MDE report on the state of any federal program designed to reduce GHG emissions. The following initiatives are led by EPA, but there are additional federal programs being implemented by other federal agencies such as the U.S. Department of Housing and Urban Development, U.S. Department of Energy, U.S. Department of Agriculture, and other agencies that are not specifically discussed in this chapter.

Power Sector Regulations

The Affordable Clean Energy Rule (ACE) repealed and replaced the Clean Power Plan (CPP). The ACE rule replaces a regulation adopted under CAA Section 111 to reduce CO₂ emissions from power plants with a system that defers to states to establish their own standards. The D.C. Circuit Court vacated the ACE rule in January 2021. As such, Maryland has no obligations under the ACE rule. The decision did not, however, reinstate the CPP. Ongoing changes in electric generation mean that the emission reduction goals in the CPP for 2030 have already been achieved. For now, EPA does not expect further action by states regarding CAA section 111(d). Maryland is well positioned to comply with future federal programs with RGGI and the Renewable Portfolio Standard.

Heavy Duty Trucks

The EPA and the U.S. Department of Transportation's National Highway Traffic Safety Administration jointly finalized standards for medium- and heavy-duty vehicles that would improve fuel efficiency and cut carbon pollution. The vehicle and engine performance standards would cover model years 2018-2027 for certain trailers and model years 2021-2027 for semi-trucks, large pickup trucks, vans, and all types and sizes of buses and work trucks. The final standards are expected to lower CO2 emissions by approximately 1.1 billion metric tons, save vehicle owners fuel costs of about \$170 billion, and reduce oil consumption by up to two billion barrels over the lifetime of the vehicles sold under the program.

In November 2018, EPA announced that it would begin updating NOx standards for heavy duty trucks via the Cleaner Trucks Initiative. In March 2022, EPA announced stronger standards for heavy duty trucks that will cut NOx emissions by up to 60% by 2045. This [Clean Trucks Plan](#)⁶⁰ applies to vehicles in Model Year 2027, with significant phase three GHG standards to apply as soon as 2030. The rule is anticipated to have far-reaching air quality improvements, especially for areas already overburdened by air pollution and diesel emissions.

GHG Emission Reductions from Electricity Consumption

GHG emissions from the energy supply sector in Maryland include emissions from fossil fuel-fired electricity generation and represent a substantial portion of the state's overall GHG emissions. Electricity demand in Maryland is expected to increase over time and thus, if unmitigated, GHG emissions will also likely increase. Due to approximately 50% of electricity consumption in Maryland being generated out-of-state in the surrounding PJM electricity grid region, state programs alone cannot effectively control GHG emissions from power consumed in Maryland.

Existing and proposed federal rules summarized in this section (Boiler Maximum Achievable Control Technology; GHG New Source Performance Standard; and GHG Prevention of Significant Deterioration Permitting Program) are expected to reduce GHG emissions from Maryland and out-of-state power generators.

Boiler Maximum Achievable Control Technology (MACT)

The Boiler MACT rule applies to any stationary source with a boiler or group of stationary sources with boilers that emit 10 tons per year of any single Hazardous Air Pollutant (HAP) or 25 tons per year of any combination of HAPs. The Boiler MACT rules require operators to

⁶⁰ nepis.epa.gov/Exe/ZyPDF.cgi?Dockkey=P1014874.pdf

conduct a boiler tune-up to improve efficiency, minimize fuel consumption, and reduce emissions. The Boiler MACT program's purpose is to reduce GHG emissions from in-state and out-of-state power generators.

The proposed changes come in response to remands issued as response to *U.S. Sugar Corp. v. EPA and Sierra Club, et al. v. EPA*, where the D.C. Court of Appeals found that certain boilers and process heaters were being wrongly excluded. EPA revised 34 of the 90 MACT emission limits for certain boiler subcategories. The rule was expected to be finalized in 2021 but was delayed. As of July 21, 2022, the final version has been submitted to the Federal Registrar and will be actionable 60 days after publication. The final rule's emission limits are nearly identical to those in the proposed amendments. The proposed amendments are expected to reduce PM emissions by 244 tons per year. The changes would cost \$21.5 million to industry per year, with estimated annual benefits of \$95-250 million.⁶¹

GHG New Source Performance Standard Program

EPA is using the New Source Performance Standards (NSPS) authority under the federal CAA to promulgate new regulations to reduce GHG emissions from fossil fuel-fired power plants. These standards apply to new electric generating units and are based on existing technologies. EPA is coordinating this action on GHGs with several other required regulatory actions for other pollutants, thereby enabling electric generating units to develop multi-pollutant strategies to reduce pollutants in a more efficient and cost-effective way than would be possible by addressing multiple pollutants separately.

The NSPS is fully enforceable through the federal CAA. MDE will implement the federal rules by adopting it into Maryland state regulations. MDE's Air Quality Compliance Program will ensure that utilities comply with the requirements and based on certified emissions reports, determine the amount of GHG reductions achieved.

In January 2021, EPA issued a final rule for determining when standards are appropriate for GHG emissions from stationary source categories under CAA section 111(b)(1)(A). This was in response to Executive Order 13783, "Promoting Energy Independence and Economic Growth" order. With this rule, EPA introduced a new understanding of the CAA, with relaxed regulation based on "Significant Contribution Findings" of specific pollutants. In March 2021, EPA asked the D.C. Circuit to vacate and remand the "significant contribution" final rule. The rule was vacated in April 2021.⁶²

⁶¹ [epa.gov/sites/default/files/2020-07/documents/placeholder_0.pdf](https://www.epa.gov/sites/default/files/2020-07/documents/placeholder_0.pdf)

⁶² [epa.gov/stationary-sources-air-pollution/nsps-ghg-emissions-new-modified-and-reconstructed-electric-utility](https://www.epa.gov/stationary-sources-air-pollution/nsps-ghg-emissions-new-modified-and-reconstructed-electric-utility)

GHG Prevention of Significant Deterioration Permitting Program

The Prevention of Significant Deterioration (PSD) program is a federal preconstruction review and permitting program. It applies to new major stationary sources and major modifications at existing sources. PSD requires the application of Best Available Control Technology to control emissions of certain pollutants, which now include GHGs. Sources subject to the requirements of the PSD program must evaluate and apply currently available measures and future technology as it develops to reduce GHG emissions. The PSD program's "increment" is the amount of pollution an area is allowed to increase.

The PSD program's increments prevent the air quality in clean areas from deteriorating to the level set by the National Ambient Air Quality Standards. The National Ambient Air Quality Standards is a maximum allowable pollution amount. A PSD program increment, on the other hand, is the maximum allowable increase in concentration that can occur above a baseline concentration for a pollutant. The baseline concentration is defined for each pollutant and, in general, is the ambient concentration at the time that the first complete PSD permit application affecting the area is submitted. Significant deterioration is said to occur when the amount of new pollution would exceed the applicable PSD increment. It is important to note, however, that the air quality cannot deteriorate beyond the concentration allowed by the applicable National Ambient Air Quality Standards, even if not all the PSD increment is consumed.