



# Maryland Department of the Environment

## 2021 Annual Programmatic Status Report on Climate Change

In accordance with §2–1305 of the Environment Article

December 31, 2021

MARYLAND DEPARTMENT OF THE ENVIRONMENT  
1800 Washington Boulevard | Baltimore, MD 21230 | [mde.maryland.gov](http://mde.maryland.gov)  
410-537-3314 | 800-633-6101 x3314 | TTY Users: 7-1-1

Larry Hogan, Governor | Boyd K. Rutherford, Lt. Governor | Ben Grumbles, Secretary | Horacio Tablada, Deputy Secretary

<b>Introduction</b>	<b>3</b>
Maryland is Vulnerable to Climate Change	3
Environmental and Climate Justice	5
The Maryland Commission on Climate Change	5
MDE Environmental Justice Policy and Implementation Plan	6
MDE Environmental Justice Workgroup	7
<b>Air and Radiation Administration Programs and Initiatives</b>	<b>8</b>
Regional Greenhouse Gas Initiative	8
Short-lived Climate Pollutants	11
Overview	11
Methane Emissions from Sources in the Oil and Gas Industry	12
Methane Emissions from New and Existing Landfills	14
HFCs	14
Transportation	16
Multi-State Zero Emission Vehicle Task Force	16
A New Market Phase	16
Key Action Plan Recommendations	17
Medium and Heavy-Duty Zero Emissions Vehicles Memorandum of Understanding	18
Volkswagen Mitigation Plan	18
Clean Cars	20
The Port Partnership	20
<b>Land and Materials Administration Programs and Initiatives</b>	<b>24</b>
Oil Control Program	25
Land Restoration Program	26
Solid Waste Program	27
Sustainable Materials Management	28
Biosolids Land Application	31
Animal Feeding Operations	32
<b>Water and Science Administration Programs and Initiatives</b>	<b>33</b>
Strategic and Management Action	33
Accomplishments and New Initiative Highlights: 2019 - 2021	33
Laws and Regulations	34
Permits and Approvals	35
Policies and Standard Operating Procedures	35
Plans and Guidance Documents	36

Programmatic, Staffing, and Human Resources	37
Monitoring and Analyses	37
Funding	38
Communications	38
Flood Protection and Pollution Prevention, and Dam Safety	39
Flood Protections and Pollution Prevention	39
Pollution Prevention - Construction Sites	40
Dam Safety	41
<b>Innovative Programs</b>	<b>43</b>
Maryland’s Tree Solution Now Act Implementation	43
Idle-Free Maryland	43
Air Quality Partnership Project in Cheverly, Maryland	45
The Maryland Green Registry	46
The Energy-Water Infrastructure Program	48
Hart Miller Island Carbon Sequestration	49
<b>Federal Measures Impacting Maryland</b>	<b>50</b>
Power Sector Regulations	50
Heavy Duty Trucks	50
GHG Emission Reductions from Electricity Consumption	51
Boiler Maximum Achievable Control Technology	51
GHG New Source Performance Standard Program	51
GHG Prevention of Significant Deterioration Permitting Program	52

## Introduction

The Maryland Department of the Environment's (MDE) 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 the 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 leader in the fight against climate change, with our first comprehensive Climate Action Plan published in 2008, followed shortly by the first GGRA becoming 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.

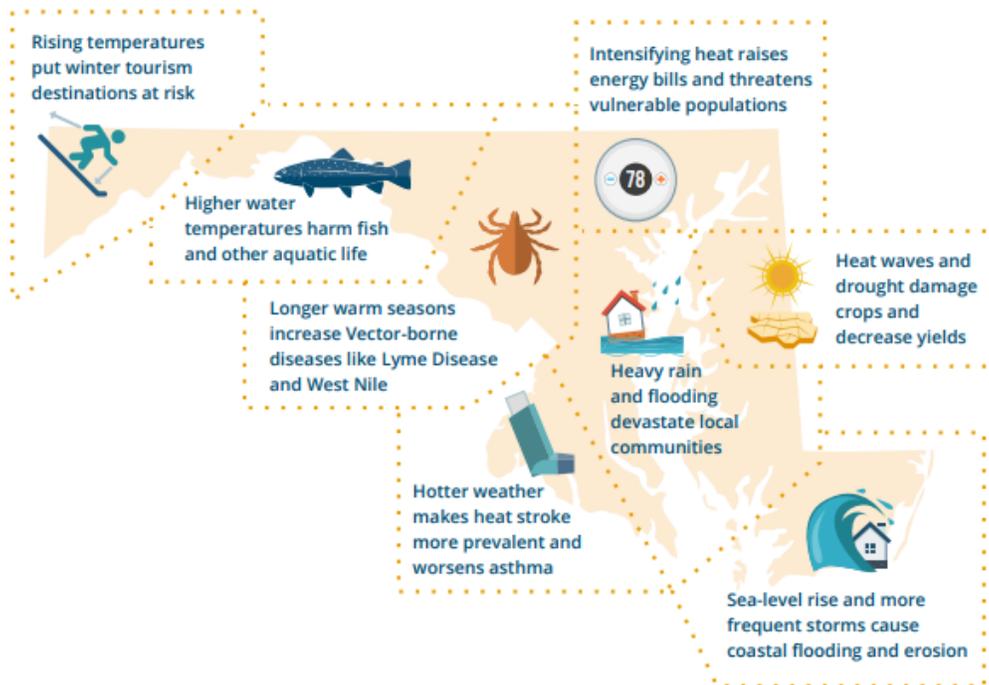
## Maryland is Vulnerable to Climate Change

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 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 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

Environmental 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.

As disadvantaged communities are disproportionately impacted by pollution, Maryland must ensure that equity and EJ are key principles of climate policies moving into 2022. The state also 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 to communities from previous policies.

### The Maryland Commission on Climate Change

The MCCC, supported by MDE's Climate Change Program, has served as an overarching convening body in the state since its initial creation in 2007. 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 and the legislature, local government, business, environmental nonprofit organizations, organized labor, philanthropic interests, and the state university system. By serving to facilitate multi-agency, executive-level dialogue, MCCC establishes a framework for interagency collaboration on planning and program development.

The MCCC offered a comprehensive set of policy recommendations for new action in its 2021 Annual Report. 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 is currently evaluating what Maryland's approach should be in the context of strong federal action and the new Nationally Determined Contribution (NDC). Maryland calculates its goals based on gross emissions instead of net emissions. Our 50% reduction is slightly more ambitious than the NDC.

Earlier this year, MDE's Climate Change Program finalized the state's 2030 GGRA Plan, which charts a path to meet or exceed our more ambitious 50% goal with increased federal support. The plan slightly over-achieves relative to the NDC under the Paris Agreement, so we see strong consistency between our existing plan and the new federal approach.

The MCCC serves as a forum for public dialogue on critical issues associated with climate change policy, including directing program benefits to disadvantaged communities. Commission meetings, including all working group meetings, are open to the public, giving all stakeholders, and advocates an opportunity to participate and be heard by the commissioners. The 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.

Accordingly, as MDE implements state laws and programs to protect and restore the environment, it looks to environmental laws and programs wherever possible in a manner that reduces existing inequities and avoids the creation of additional inequities in EJ communities.

[Read MDE's EJ policy.](#)

## **MDE Environmental Justice Workgroup**

MDE's EJ Workgroup was formed in 2021, to lead MDE's 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 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 EJ initiatives.

# Air and Radiation Administration Programs and Initiatives

## Regional Greenhouse Gas Initiative

### Program Overview

RGGI comprises 11 states in the Northeast and mid-Atlantic regions. These states adopted market-based carbon dioxide (CO<sub>2</sub>) cap-and-invest programs designed to reduce emissions of CO<sub>2</sub> from fossil fuel-fired electricity generators with a nameplate capacity of 25 megawatts (MWs) or greater. RGGI states include [Maryland](#), Connecticut, Delaware, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, Vermont, and Virginia. Pennsylvania could join as early as 2022.

Participating RGGI states each require electricity generators to have acquired, through regional auction or secondary market transactions, one CO<sub>2</sub> allowance for every ton of CO<sub>2</sub> emitted over a 3-year compliance period. The RGGI program establishes a regional cap on CO<sub>2</sub> emissions from eligible sources, which is then reduced in subsequent years leading to a reduction in emissions. Auction proceeds go to the Strategic Energy Investment Fund, which is administered by the Maryland Energy Administration (MEA), and funds several state programs, including energy efficiency programs that reduce electricity demand, and renewable energy projects that reduce CO<sub>2</sub> emissions. Under RGGI, 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, including EJ communities.

### Implementation Milestones

#### Auctions

Maryland has successfully participated in all 54 regional auctions of CO<sub>2</sub> allowances with RGGI. To date, Maryland has generated \$859,299,973.48 in cumulative proceeds.

#### Comprehensive Program Review

The RGGI participating states are committed to comprehensive, periodic review of their CO<sub>2</sub> budget trading programs, to consider successes, impacts, and design elements. The RGGI states completed the [First Program Review](#) in February 2013, and completed the [Second Program Review](#) in December 2017, resulting in the [2017 Model Rule](#). Now the states have initiated the Third Program Review to consider further updates to their programs as of December 2021.

The first step currently underway in the Third Program Review process is to hold public meetings where the RGGI states will discuss the Integrated Planning Model that will be used to conduct the analysis, and draft approaches, considerations, and questions to help determine the assumptions to be used in modeling scenarios.

### Control Period

RGGI's fifth 3-year control period took effect on Jan. 1, 2021, and extends through Dec. 31, 2023 for the states of Maryland, Connecticut, Delaware, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, Vermont, and Virginia.

### 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 emissions and the initial cap was set at 188,076,976 short tons of CO<sub>2</sub>. 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 CO<sub>2</sub>. During the Second Program Review, the states selected a regional cap of 75,147,784 tons of CO<sub>2</sub> in 2021, which will decline by 2.275 million tons of CO<sub>2</sub> 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.

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 been selling for increasingly higher prices in 2021 in particular. After starting the year at just over \$8, prices have bypassed \$13. Auction 54

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.

### 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 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.

### Continually Stronger 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 and as a national leader in the effort to combat climate change, 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 Board of Directors over the last 5 years 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 2021. As mentioned previously, Pennsylvania could officially join RGGI as soon as 2022.

## **Short-lived Climate Pollutants**

### **Overview**

Short-lived Climate Pollutants (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 years to a

few days. 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 anthropogenic and are expected to increase. The primary sources are from agriculture, waste treatment, and the energy sectors. Capturing methane from these sources can be cost effective, improve air quality, provide fuel for industry, vehicles and industry, and displace other 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. Most [HFC emissions](#) 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 CO<sub>2</sub> by 2050. Furthermore, improving the energy efficiency of room air conditioning equipment alone can provide further mitigation of up to 100 billion tons of CO<sub>2</sub> equivalent by 2050. Maryland announced its intention to adopt regulations in 2020 to prohibit the use of 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. Ongoing efforts to address solid waste landfills, wastewater treatment plants (WWTPs) and the distribution sector of the energy industry are currently being undertaken.

## **Methane Emissions from Sources in the Oil and Gas Industry**

### Program Overview

In 2018, EPA proposed amendments to relax the New Source Performance Standard (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, and remove methane detection and only require testing and control of volatile organic compounds (VOCs).

MDE submitted written comments opposing EPA's proposed amendments. Despite opposition from several states and environmental advocacy organizations, the EPA finalized the proposed amendments on Aug. 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 natural 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 natural gas 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 is currently in the process of evaluating and drafting regulatory options to address methane emissions from the last segment of the natural gas supply chain, the distribution segment. 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 Maryland Public Service Commission 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, which greatly reduces 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 Oct. 23, 2020, and became effective on Nov. 16, 2020.

## Federal Progress

On Nov. 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 will collect comments until Jan. 14, 2022, and plans to finalize the regulations in late 2022. Maryland may support this more aggressive and protective proposal nationwide.

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 states, including Maryland, filed a lawsuit against the EPA over its failure to implement and enforce a critical landfill regulation. The regulation, which went into effect on Oct. 28, 2016, requires new, modified, and reconstructed municipal solid waste (MSW) landfills (the NSPS) as well as existing MSW landfills (emission guideline 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 that would be more stringent than the EPA rules.

MDE may update the current Maryland regulation (COMAR 26.11.19.20 - Control of Landfill Gas Emissions from Municipal Solid Waste 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) for 42 states, including Maryland for the stalled 2016 MSW landfill EG. 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 CO<sub>2</sub>. After efforts to phase out HFC stalled at the federal level prior to 2021, states began establishing their own phase-out 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 as California, Washington, Vermont, New Jersey, and Colorado. The regulations also model the stalled EPA Significant New Alternatives Policy (SNAP) rules 20 & 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.

Additionally, in 2021 Maryland joined California and other USCA states to petition EPA to:

1. reinstate the HFC prohibitions established by SNAP Rules 20 and 21;
2. adopt requirements similar to those that California Air Resources Board (CARB) has proposed for specific high Global Warming Potentials end uses; and
3. 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 Oct. 6, 2020, and are effective as of Nov. 2, 2020. Compliance deadlines began on Jan. 1, 2021 for certain end-uses and will continue through Jan. 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 (AIM) Act. Maryland is on record supporting this national proposal and its climate benefits. Additionally, EPA has proposed SNAP regulations 23 and 24 to address refrigeration, air conditioning, fire suppressants and foams, and motor vehicle air conditioning in nonroad vehicles.

## Transportation

### Multi-State Zero Emission Vehicle Task Force

On June 20, 2018, nine states, including Maryland, 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.

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 ZEV 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 from the transportation sector. 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.

To support successful implementation of the ZEV programs, the MOU states committed to the collaborative development and implementation of the Action Plan.

### A New Market Phase

The ZEV market is entering a new phase of development. In the four years since the release of this updated ZEV Action Plan, the cumulative number of ZEV sales in the U.S. has grown from 750,000 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 electric vehicle (EV) market. Battery costs are expected to continue 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 plans to significantly expand EV offerings across

multiple market segments, and some have announced plans to phase out internal combustion engines completely over the next several years.

### **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](#).

Maryland has been a leader in working to implement the ZEV Action Plan recommendations. For years the state has offered buyers various incentives, financial and other, for purchasing EVs. The Clean Cars Act of 2021 created a one-year rebate to cover a growing backlog of rebates the state received over the amount budgeted in previous fiscal years. The vehicle incentive for plug-in hybrids and EVs provided up to \$3,000 in excise tax credit for qualifying vehicles with a sale price up to \$63,000. This incentive was only available for vehicles purchased before July 1, 2020. The Clean Cars Act of 2021 also extended the Electric Vehicle Recharging Equipment Rebate Program out to FY23, and increased the funding available to \$1.8 million per fiscal year. The Clean Cars Act of 2021 allows both residential and commercial entities to receive a rebate of 40% of the purchase and installation of electric recharging equipment with \$1.8 million in available funding. In addition to these programs, the state offers the Alternative Fuel Infrastructure Program and high occupancy vehicle lane access to plug-in vehicles. Through these efforts, Maryland now has more than 2,800 public Level 2 and 3 chargers throughout the state. In addition to these incentive-based programs, the state has been active in promoting EVs by performing outreach to build consumer awareness. Some of these efforts include hosting workplace charging events and participating in high profile events around the state.

Additionally, the Clean Cars Act of 2019 added fuel cell vehicles to be eligible for the excise tax credit and added them to the Electric Vehicle Infrastructure Council.

### **Medium and Heavy-Duty Zero Emissions Vehicles Memorandum of Understanding**

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 ZEVs by 2050, with an interim target of 30% ZEV sales by 2030. States signing the MOU are: Maryland, California, Connecticut, Colorado, Hawaii, Maine, Massachusetts, New Jersey, New York, North Carolina, Oregon, Pennsylvania, Rhode Island, Vermont, and Washington. To provide a framework and help coordinate state efforts to meet these goals, Maryland and the other signatory jurisdictions will work 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) is continuing to hold webinars and meetings to finalize sections of the Action Plan. The final Action Plan is due to be completed by June 2022.

### **Volkswagen Mitigation Plan**

On Sept. 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 diesel cars equipped with 2 liter and 3 liter engines included software that circumvented EPA and CARB emissions standards for nitrogen oxide (NoX). Approximately 550,000 vehicles in the U.S. had "defeat devices" installed and approximately 16,000 were delivered to Maryland.

On Oct. 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 NoX due to the installation of "defeat devices" on 2 liter diesel engines. The use of "defeat devices" has increased vehicle emissions of NoX, resulting in adverse effects on air quality. The Consent Decree established an Environmental Mitigation Trust of \$2.7 billion to fully remediate the excess NoX emissions from the affected 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 NoX emissions. More information on the Mitigation Plan can be found on [MDE's website](#).

### Benefit

Strategies for reducing NoX emissions could also result in reductions of GHG emissions, including CO2 and black carbon. 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 criteria for proposed projects also includes identifying benefits to EJ and underserved communities.

### Implementation Milestones

Under the VW 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 NoX 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 and the Charge Ahead Grant Program. 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](#). These awards were made during round one of funding under the VW Settlement for charging infrastructure. Two more rounds of funding will follow, with round two due to open imminently.

### 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 the opportunities for funding, as well as, to obtain input on project opportunities. MDE has also worked closely with MEA and Maryland Department of Transportation (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 communities around the Port of Baltimore (POB or Port). 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 Plan.

### **Clean Cars**

The Maryland Clean Car Program (Model Year 2011) – The Maryland Clean Cars Act of 2007 required MDE to adopt regulations to apply California’s Low-Emission Vehicle (LEV) standards to vehicles purchased in Maryland. The program also includes a mandate for the sale of ZEVs (adopted 2007). In 2012, Maryland adopted California’s stricter Low Emission Vehicle Standards 3 (Cal LEV III). 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 (AAC) Program also required an increase in ZEV production starting in 2018. California is in the process of finalizing the ACC II Program, which will be implemented beginning 2026. The ACC II will have significant increases in the ZEV mandate as well as implementing significant emission reduction standards for light duty vehicles. Maryland is working with California and the other section 177 states to finalize this program.

### **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 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 efficiently and effectively leverage resources and pool their knowledge to implement the agreement's goals. In December 2020, the partnership received significant support from MEA. The increased participation from important stakeholders, like MEA, resulted in an update to the 2015 Voluntary Agreement.

### New Voluntary Agreement

MDOT MPA, MDOT, MDE, 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 POB 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 NoXs 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 Voluntary 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 Voluntary 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 in excess of 2,500 tons of air pollutants, including NoXs, 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 Section 4.5.11). Funding from the plan will be used to reduce diesel emissions from the legacy fleet, including drayage trucks and cargo handling equipment. The partnership also supports research opportunities. MDOT MPA sponsored fellows from the Environmental Defense Fund (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 as a result 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 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 EJ 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 have not been 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 CO<sub>2</sub>e (CO<sub>2</sub> equivalent) level. The Port initiatives will not only help reduce emissions of CO<sub>2</sub>, 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 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 OCP and certified individuals, the 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 (REDS) 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 passed an Administration bill in the 2020 legislative session (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 Oct. 8, 2021, MDE published proposed 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 public comment period ended Nov. 8, 2021.

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

LRP is also working with Maryland Department of Planning (MDP) to highlight the potential for renewable energy development on Brownfields, including at MDP’s 2021 Brownfield Conference.

## 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 in order 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](#) 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 SWP include municipal, construction and demolition debris, and land clearing debris landfills; municipal and medical waste incinerators; processing facilities; transfer stations; and natural wood waste recycling facilities.

### Current Activities

#### Mapping and Identification of Solid Waste Facilities Potentially Susceptible to Flooding

Much of 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 the 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 from sea level rise; 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

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 September 2021. The SWP routinely communicates with county DPWs and solid waste officials prior to and after tropical storms and other heavy weather events to offer assistance 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 Agency (FEMA).

### 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](#) on renewable energy development on Brownfields.

### 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**

### 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 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 on Dec. 1, 2021. This year's summit 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, perhaps more importantly, 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](#) passed. Under the new law, MDE will evaluate the availability of markets for recyclables; identify businesses in the state that use recycled materials; and promote 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.

### 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 fines for noncompliance. Details on the law, including links to the law, a copy of the Public Notice, are available on MDE's *EPS Food Service Products Ban* webpage at [mde.maryland.gov/programs/LAND/RecyclingandOperationsprogram/Pages/Expanded-Polystyrene-Food-Service-Products-Ban.aspx](https://mde.maryland.gov/programs/LAND/RecyclingandOperationsprogram/Pages/Expanded-Polystyrene-Food-Service-Products-Ban.aspx).

### 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 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, Maryland passed HB 264/SB 483, Solid Waste Management - Organics Recycling and Waste Diversion - Food Residuals. The law phases in a requirement for certain businesses and institutions that generate large quantities of food scraps 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 (2 tons starting in 2023; decreasing to 1 ton in 2024) and are located within 30 miles of an organics recycling facility that has capacity to and willingness 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 cafeterias operated on behalf of state or local government, if these entities meet the quantity and location criteria described above.

In preparing to implement the new law, MDE will be working to create a variety of technical assistance resources, including maps and information for businesses and institutions to assist them in complying with the requirements.

EPA and U.S. Department of Agriculture (USDA) has 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 Program Overview**

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

## **Animal Feeding Operations**

### Program Overview

RMP regulates over 500 animal feeding operations (AFOs) under a General Discharge Permit for AFOs. The permit requires each operation to have an approved Comprehensive Nutrient Management Plan and comply with certain BMPs to protect water quality by containing animal manure, separating it from clean stormwater, and properly managing it through on-site land application or export off site. AFOs must have adequate storage capacity to fully contain animal manure generated on site prior to its land application or export. Flooding or extreme weather impacts to these structures could result in potential impacts to water quality at AFOs.

### 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 may be impacted by the 100- and 500-year flood. Specifically, RMP has created a map identifying 22 farms in the 100-year flood plain and 11 farms in the 500-year flood plain (based on the active farms as of March 2020). These farms are concentrated on the lower Eastern Shore, mostly Somerset County.

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

### Future Activities

RMP will establish a system of prioritizing AFO inspectors that consider, 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 work with the USDA Natural Resources Conservation Service, Maryland Department of Agriculture (MDA), and local soil conservation districts to identify BMPs for existing AFO located in flood-prone areas, and a process for evaluating new AFOs for permit coverage, taking into account areas currently or projected to be subject to flooding.

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

# Water and Science Administration Programs and Initiatives

## Strategic and Management Action

WSA implements federal and state laws to regulate the built and natural environments so that all communities are safe and vibrant. Maryland's climate is changing, with more rain, higher water levels in the Chesapeake Bay and ocean, and more extreme weather. Climate change is water change. Considering this, WSA adopted the following goal in its FY20-FY23 Strategic Plan: Climate Resiliency: Adapt programs and decision making to factor in changing conditions and preparedness.

Acting on this goal, WSA is incorporating the reduction of climate change vulnerabilities into routine business practices and across all programs. In 2019, WSA conducted a qualitative risk assessment by identifying threats and assessing their likelihood and potential level of impact. This generated three top priority action areas:

1. Emergency Preparedness and Response
2. Dam Safety
3. Flood Protection and Pollution Prevention

To accelerate action on these three priority areas, WSA leadership circulated a Climate Integration Policy and Guidance memo to all members in July 2020. The memo was a call to “empower and compel all WSA staff 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. The 2020-21 Climate Team focused on the following five activity areas:

- Permits and Approvals
- Dam Safety
- Erosion and Sediment Control
- Drought Vulnerable Communities, and
- Communications

## Accomplishments and New Initiative Highlights: 2019 - 2021

The following are highlights of accomplishments and new initiatives during 2019-2021. These efforts were supported by WSA Climate Team activities.

## Laws and Regulations

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

Chapter 44 of the Maryland Constitution in 2020 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 (HB 78). The law also specifies that the types of stormwater control measures a local government can receive BRF funding for include stormwater measures relating to water quality, climate resiliency, or flood control. MDE has updated its [Integrated Project Priority System](#) used to score all clean water applications, including BRF and Clean Water State Revolving Fund, to incorporate climate resiliency and flood control. These changes include awarding additional points for:

- 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.

WSA is developing cool water designated use criteria that will increase water temperature protections in Maryland. This will enhance protection of forested stream buffers and other water temperature mitigation measures that improve climate change resilience.

In response to 2021 amendments to Maryland's stormwater management statute (SB 227), WSA submitted a [report to the General Assembly](#) that includes:

- MDE's plans for immediately updating water quantity control standards for watersheds where flooding events occurred on or after Jan. 1, 2000;
- MDE's plans for updating all other regulations adopted under our stormwater management statute.

## Permits and Approvals

WSA is mainstreaming climate change resilience into permits. In 2020, WSA provided two draft permits to the public for comment. These were for stormwater management associated with construction activities and for industrial stormwater management.

In addition, WSA developed new draft permit conditions for municipal wastewater discharge permits intended to address growing climate change threats. The draft special conditions are intended to enhance emergency preparedness to water-driven climate events, better protect shellfish waters from bypasses, and improve capacity management planning for peak discharge volumes.

As noted in the subsection on legislation, the program responsible for stormwater management initiated planning to update stormwater quantity control regulations and design standards. This initiative recognizes the need for a longer planning horizon, watershed scale considerations, and closer integration with flood management.

Water and Sewer Plan Amendment approvals now screen for flooding vulnerabilities associated with water and sewer projects. This is intended to raise the awareness of planners and remind engineers of their professional responsibilities.

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.

The Deep Creek Lake dam operation water appropriations permit, for Brookfield Renewables, uses more current data to ensure that dam releases protect cold-water fisheries from the warming effects of climate change and accounts for more average annual rainfall.

## Policies and Standard Operating Procedures

MDE's National Flood Insurance Program Coordinating Office was nominated for FEMA's Cooperating Technical Partners 5<sup>th</sup> Annual Recognition Program for its [Maryland Climate Ready Action Boundary \(CRAB\) Map Viewer](#) (2021). Maryland has ranked in the top 10 states every year and is using this boundary for implementation of [Maryland's Coast Smart Program](#).

MDE's program for stormwater management has revised MS4 permit guidelines to provide additional credit for over-sized practices. In addition to improving pollutant removal, these upsized stormwater control practices will capture more runoff volume to enhance climate change resilience to localized flooding.

During 2020, WSA began investigating enhancements of policies and procedures for dam removal. The removal of certain dams reduces risk of failure and can have environmental benefits. However, the process of removing dams is complex and must consider environmental impacts and potential downstream flooding impacts.

### **Plans and Guidance Documents**

WSA's 2020-2023 Strategic Plan, finalized in 2019, identifies climate resiliency as one of the 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 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.

Maryland's 2019 [Chesapeake Bay Watershed Implementation Plan](#) (WIP) includes a climate change strategy section. 2021 WIP enhancements are identifying additional nutrient reduction strategies to offset future increases due to climate change.

[Maryland's Ocean Acidification Action Plan](#) was developed in 2020 as a collaboration between MDE, DNR and University of Maryland Center for Environmental Science. It is helping to guide action on reducing the causes, better understanding the science, and improving communications among key partners, decision makers and stakeholders.

Guidance for the Water Resources Element of local comprehensive land use plans was updated in 2021 to consider climate change. This was a collaboration with MDP.

Development of climate awareness guidance for construction site erosion and sediment control was initiated in 2021. When completed, guidance will be shared by site inspectors at pre-construction meetings.

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

Climate resiliency techniques have been incorporated into Total Maximum Daily Loads (TMDL) implementation guidance for Phase I MS4 jurisdictions. These jurisdictions are required to develop TMDL implementation plans for specific pollutants associated with urban and suburban stormwater management.

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

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

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

### **Programmatic, Staffing, and Human Resources**

To expedite implementation of WSA's 2020 Climate Change Integration Policy Memo, a matrix team approach was instituted. At the end of 2020, a dozen members volunteered to be members of WSA's Climate Team for a one-year period. WSA's second Climate Team was constituted in 2021 for the 2022 term.

In September 2021, WSA consolidated its National Flood Insurance Coordination Office into the newly named Stormwater, Dam Safety and Flood Management Program. This reorganization will help align flood protection efforts with related stormwater, climate resilience and adaptation initiatives.

### **Monitoring and Analyses**

Climate change induced warming of waters and generation of more nutrient runoff is predicted to increase the incidence of harmful algal blooms (HABs). Laboratory analysis equipment and enzyme-linked immunosorbent assay has been updated with automated “Cube” instrumentation. 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.

Ocean acidification monitoring instrumentation for the partial pressure of CO<sub>2</sub> has been made available to MDE as part of a partnership with the National Aeronautics and Space Administration to ground-truth new remote sensing technology. The remote sensing technology could also enable more efficient and rapid detection of potentially harmful bacteria and hazardous algal blooms.

A state agency carbonate system monitoring plan, related to coastal acidification, is being developed in collaboration with the DNR and the University of Maryland Center for Environmental Science.

## Funding

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

WSA secured funding to begin updating Maryland's Probable Maximum Precipitation estimates used for designing and upgrading dams to be resilient to extreme storms. Regarding Dam Safety, WSA is identifying funding mechanisms for privately owned dams facing emergencies or in need of repair, for cases in which owners do not have sufficient financial resources.

## Communications

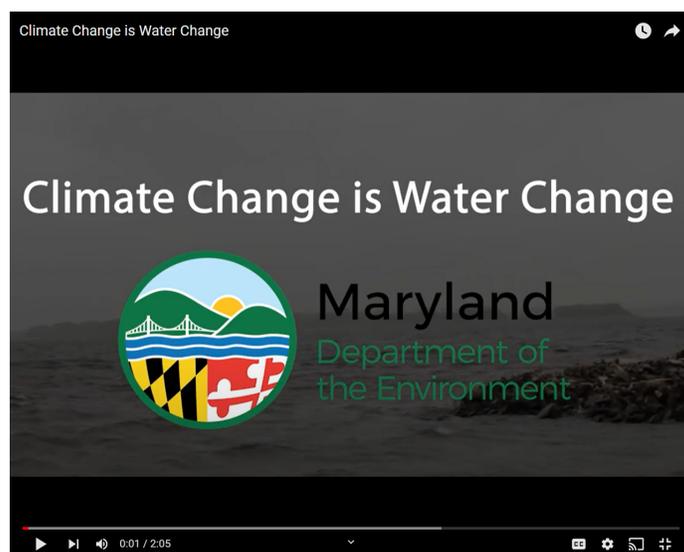
[WSA's Climate Adaptation and Resilience website](#) was developed in 2021. The website features WSA's [Top Three Climate Action Priority Areas](#).

WSA regularly presents on the topic of ocean and coastal acidification at events hosted by the Mid-Atlantic Coastal Acidification Network, the International Alliance to Combat Ocean Acidification and work groups of MCCC.

WSA and MDE's Office of Communications participated in developing and carrying out Maryland's 2021 Flood Awareness Month campaign in coordination with the Maryland Resiliency Partnership. Governor Hogan also issued a [proclamation to declare April to be Flood Awareness Month](#) in Maryland.

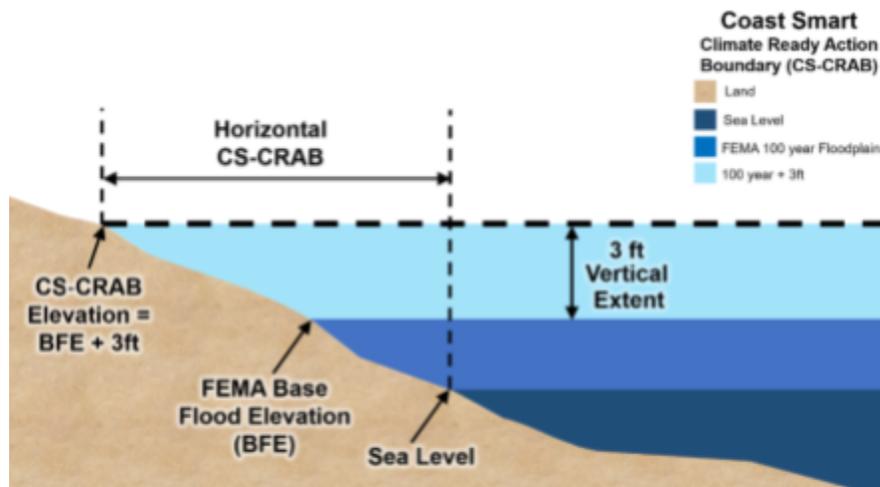
Video and live presentations at the 2021 MDE Inspector's Forum on a) activities of the WSA Climate Team relevant to MDE field inspectors, b) the draft Erosion & Sediment Control Climate (E&SC) Awareness Guidance, and c) colleague survey on E&SC climate resilience enhancements.

Wetlands and Waterways permit application receipt acknowledgement letters have been revised to include a flood risk disclosure statement. This disclosure statement puts applicants on notice regarding the climate risks and vulnerabilities when working in wetlands and waterways.



## Flood Protection and Pollution Prevention, and Dam Safety

### Flood Protections and Pollution Prevention



CS CRAB Accounts for rising waters spreading across the land

### Flood Protection

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 before modern stormwater management requirements, and aging infrastructure.

### Riverine and Coastal Flooding

Riverine flooding occurs when a stream or river overflows its banks. Coastal flooding occurs due to sea level rise or wind-driven storm surges. When flood waters rise, they also spread out across the landscape. To better understand the implications of riverine and coastal flooding, MDE's National Flood Insurance Coordinating Office facilitated the development of a mapping tool that shows where and how deep flooding will occur if flood levels rise 1, 2 or 3 feet above the base flood elevation<sup>1</sup>. The tool for coastal flooding was completed in 2020, and given the name CoastSmart Climate Ready Action Boundary (CS CRAB). During 2021, a riverine version of the

<sup>1</sup> 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 intensities. The cause of coastal area flooding is sea level rise and higher coastal surges associated with more intense storms.

mapping tool has been under development by the department with an anticipated release in early 2022.

The CS CRAB tool supports decision making for capital investments that are subject to Maryland's [CoastSmart Construction Program](#). A [story map](#) is available that provides more information about the coastal version of CS CRAB. The [CS CRAB Tool](#) and associated [GIS layers](#) are available online.

### Urban Flooding and Stormwater Management

Urban flooding occurs when heavy rainfall, storm surge, or high tides exceed the capacity of drainage systems to infiltrate stormwater into the soil or carry water away from roads and structures<sup>2</sup>. It can be persistent, or it can result from a temporarily clogged drainage pipe or channel. Urban flooding can be exacerbated by the loss of soil infiltration or drainage conveyance capacity due to land development. Consequently, stormwater management associated with development plays a role in avoiding or mitigating urban flooding.

During 2021, MDE's Stormwater, Dam Safety and Flood Management Program began a process to identify the locations and causes of urban flooding. Unlike areas at risk of riverine flooding, which are identified on FEMA floodplain maps, currently there is no statewide system for mapping areas prone to urban flooding and there is also a gap in FEMA floodplain mapping for identifying and accurately mapping these areas. Due to the fact that urban flooding is often highly localized, MDE will work collaboratively with local governments during 2022 to systematically identify these areas. The information gathered on urban flooding will help to inform the enhancement of stormwater management quantity control measures called for in 2021 legislation that amended Maryland's Stormwater Management statute (See [Senate Bill 227](#)). WSA's overall plan for enhancing stormwater quantity control was provided in a Nov. 1, 2021 report to the General Assembly, entitled [Advancing Stormwater Resiliency in Maryland \(A-StoRM\) Maryland's Stormwater Management Climate Change Action Plan](#).

### **Pollution Prevention - Construction Sites**

Construction sites are vulnerable to intense storms associated with climate change that threaten more pollution. As an initial response, WSA is enhancing Maryland's General Permit for Discharges from Stormwater Associated with Construction Activities (Construction GP).

The most prominent concern is sediment pollution from soil erosion. A Construction GP requires adherence to an approved erosion control plan.

---

<sup>2</sup> Source: National Academy of Sciences Consensus Study Report Highlights, *Framing the Challenge of Urban Flooding in the United States*, April 2019.

The plan must meet the minimum conditions of the 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control (2011 ESC Handbook). Maryland’s new draft Construction GP includes language that foreshadows shifting expectations. Engineers, and others responsible for sediment and erosion control, must account for the impacts of climate change in terms of “the expected amount, frequency, intensity, and duration of precipitation.” The Construction GP also includes the concept of Stream Protection Zones, consisting of a natural buffer from the site’s earth disturbances to the edge of the stream and more robust control practices. Until the 2011 ESC Handbook can be enhanced to account for climate change, these new permit provisions give state and local government field inspectors more authority to ensure the intent of erosion and sediment controls is achieved in the face of new risks posed by climate change.

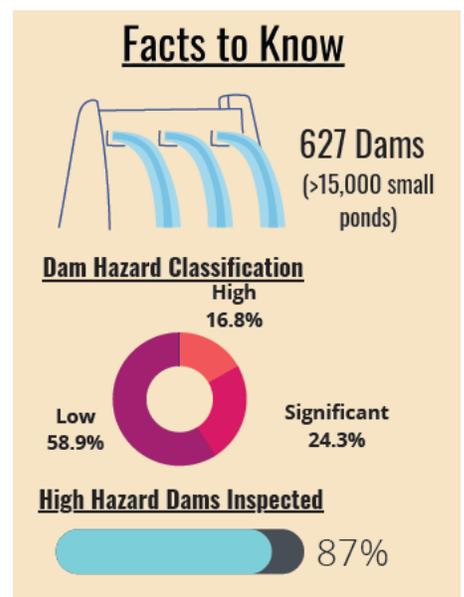


Super Silt Fence: MDOT SHA Field Guide

The Construction GP now allows the use of flocculants that promote the clumping of fine sediments. This increases the effectiveness of settling and filtering processes that help control sediment runoff. The use of these flocculants requires the development of a stormwater pollution prevention plan (SWPPP) that details best practices for storage, handling, and use. A SWPPP will also be required for other pollutants that are commonly associated with construction activities (equipment fuels, grease and oil, detergents, solvents, fertilizers, etc.). These substances are also at greater risk of discharge under the additional stresses of climate change.

### Dam Safety

As climate change increases the capacity for air to hold more moisture, the theoretical maximum amount of rainfall from a storm is increasing. This relates to the concept of probable maximum precipitation (PMP), which 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. In



2020, WAS's Dam Safety Division secured consulting services to update Maryland's PMP estimates.

A priority for assessing Maryland's vulnerability to climate change is to consider the implications of dams being breached. In 2020, MDE took steps, in partnership with the Maryland Environmental Service, to investigate this question for Maryland's high- and significant-hazard dams. These dam breach analyses will generate maps of inundation areas below dams.

Dam inundation maps will support updates to dam emergency action plans (EAPs). In 2017, HB 125 was adopted by Governor Hogan to make EAPs mandatory for high- and significant-hazard dams and require annual plans. To facilitate this, and other dam owner responsibilities, MDE has highlighted the threats posed by climate change at its annual Dam Owner Safety Conference since 2019. Additionally, beginning in late 2020, MDE and the FEMA Dam Safety Program, initiated a [Collaborative Technical Assistance](#) (CTA) process targeted to western Maryland.

This intensive CTA emergency planning initiative involves monthly interactions with dam owners, local governments, emergency responders, and other key stakeholders. The activities not only support individual dam EAPs, but, according to FEMA, also provide the basis for improving local "emergency operations plans, emergency action plans, hazard mitigation plans, floodplain management plans, business continuity plans, and Threat and Hazard Identification and Risk Assessments (THIRA)" so that they "give greater consideration to dam-related emergencies." The western Maryland CTA initiative will culminate in a tabletop exercise in 2022 in which these plans are tested. The information and partnerships generated by the CTA process can support the development of community climate resilience-building project proposals for soliciting federal infrastructure and hazard mitigation grant funds.

## Innovative Programs

### Maryland's Tree Solution Now Act Implementation

In 2021, Maryland passed a law to mandate 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 2030 Maryland GGRA Plan lays out a pathway for achieving a 50% 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 Chesapeake Bay Program.

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 CO<sub>2</sub>, 55,000 tons of NoXs, 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 as a way to improve air quality and to help meet climate change goals.

The goal of the Idle-Free Maryland 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](#).

### Benefits

If every driver who took the pledge to be idle-free could reduce their idling by just five minutes a day, it would prevent 25 pounds of harmful air pollutants and 260 pounds of CO<sub>2</sub> 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, MDOT, MEA, 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

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.

Projected emission reductions from the Idle-Free initiative through 2030 have not been included in the 2030 GGRA Plan. MDE expects the GHG emission reduction from this effort to exceed 100,000 metric tons of CO<sub>2</sub>e by 2030. As the program matures, MDE will consider including realized reductions in future updates to the plan.

## **Air Quality Partnership Project in Cheverly, Maryland**

### Program Overview

MDE has begun a partnership with the Town of Cheverly 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 the Cheverly, along with 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 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 of these sources have the potential to influence air quality in the Cheverly area. With the exception of 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<sub>2.5</sub>, and traffic conditions. In order to determine how traffic may have been impacting air sensor measurements in the Cheverly area, MDE examined how traffic volume correlated with PM<sub>2.5</sub> 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' PM 2.5 levels than local Cheverly area traffic. A slightly higher PM 2.5 trend appeared in the Cheverly PA data during periods with winds from the west-southwest direction. PM 2.5 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 PM 2.5 levels across Maryland and the mid-Atlantic region, though the PA data does show short-term spikes of high PM 2.5 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 (PM<sub>10</sub>, larger particles than PM<sub>2.5</sub>). 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 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](#) 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 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.

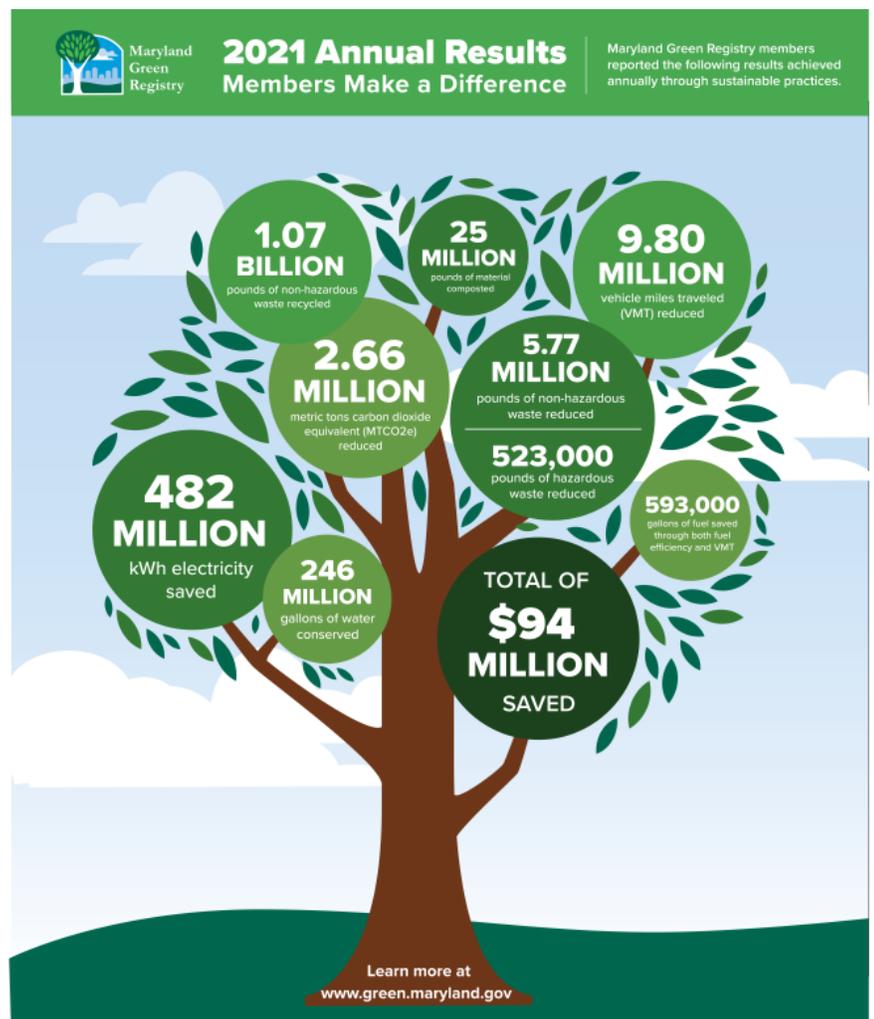
### Greenhouse Gas Emissions Reductions

The combined environmental results and cost savings shared by the nearly 600 member organizations also help to build a strong case for undertaking voluntary practices that reduce GHG emissions. Collectively, members reported in FY20 saving more than 482 million kilowatt hours of electricity, reducing 9.8 million vehicle miles traveled, and conserving 246 million gallons of water, resulting in the reduction of 2.66 million metric tons CO<sub>2</sub>e, and \$94 million in cost 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, 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.

### Funding

The program is funded through EPA's Pollution Prevention Grant with a 50/50 match of state funds. 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 facilities and WWTPs. 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 and Miller islands, which were both eroding at a rapid pace. The DNR Maryland Geological Survey predicted that Miller Island would be gone by 2008, and Hart Island by 2045. In 1970, the U.S. 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 and is managed, in part, by DNR as a state park. 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 CO<sub>2</sub> 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. Housing and Urban Development, Department of Energy, USDA, 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 CO<sub>2</sub> emissions from power plants with a system that defers to states to establish their own standards. Despite being repealed, the CPP is currently sitting with the D.C. Circuit Court.

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 in regard to 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 CO<sub>2</sub> emissions by approximately 1.1 billion metric tons, save vehicle owners fuel costs of about \$170 billion, and reduce oil consumption by up to 2 billion barrels over the lifetime of the vehicles sold under the program.

In November 2018, EPA announced that it would begin updating NO<sub>x</sub> standards for heavy duty trucks via the Cleaner Trucks Initiative. They are currently still evaluating a number of technologies, and will soon propose official rulemaking. In August 2021, EPA announced plans to go further and reduce GHG emissions and other harmful air pollutants from heavy duty vehicles. These will be announced shortly, and will apply to model year 2027 and beyond.

## **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 portion of the state's overall GHG emissions. 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 NSPS; 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 conduct a boiler tuneup to improve efficiency, minimize fuel consumption, and reduce emissions. The Boiler MACT program's purpose is to reduce GHG emissions from both Maryland 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 DC 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 may take until 2022. 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.

### **GHG New Source Performance Standard Program**

EPA is using 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 a number of 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. The MDE Air Quality Compliance Program will then

ensure that the utilities comply with the requirements. Based on certified emissions reports, the MDE will be able to 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, in line with Executive Order 13990 to review the previous administration’s policies, EPA asked the D.C. Circuit to vacate and remand the “significant contribution” final rule. The rule was vacated in April 2021.

### **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 of the PSD increment is consumed.