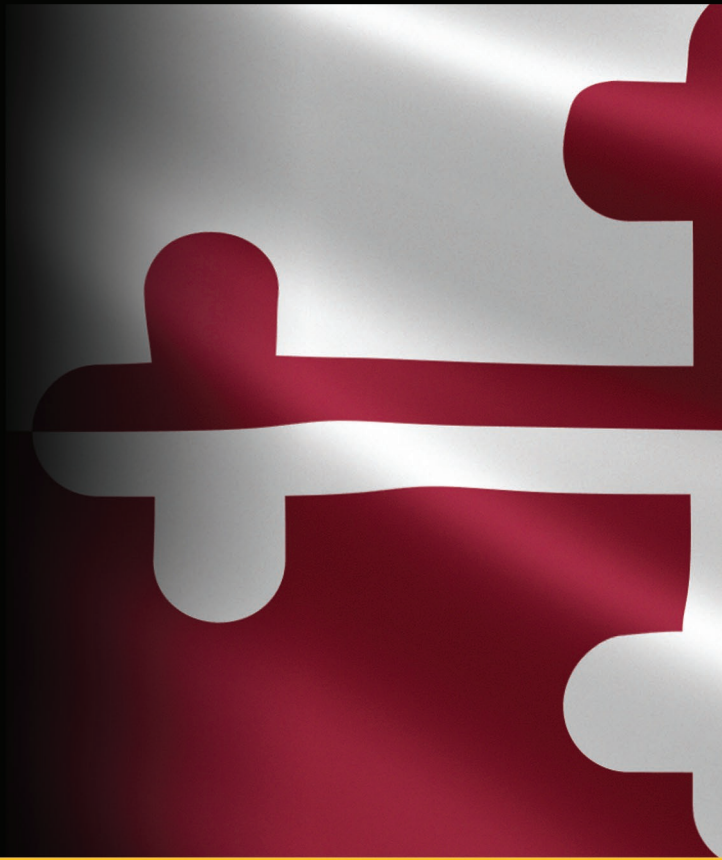


2022

STATUS REPORT



Required under the
Maryland Commission on
Climate Change Act
[§2-1305] MSAR 14367





The 2015 Maryland Commission on Climate Change (MCCC) Act required the MCCC and its participating agencies, including the Maryland Department of Transportation (MDOT), to maintain a comprehensive action plan with 5-year benchmarks to achieve science-based reductions in Maryland's Greenhouse Gas (GHG) emissions. This 2022 Status Report meets the requirements of the MCCC Act (§2-1305) by sharing MDOT's progress towards achieving emission reduction targets and highlights recent and planned actions to continue to mitigate the impacts of climate change and reduce transportation sector GHG emissions.

OVERVIEW

MDOT Approach

MDOT is a member of the MCCC and works with other state agencies, elected officials, and experts who advise the Governor and General Assembly "on ways to mitigate the causes of, prepare for, and adapt to the consequences of climate change."

The Maryland Greenhouse Gas Reduction Act (GGRA) required the Maryland Department of Environment (MDE) to submit a plan that reduces statewide GHG emissions by 40% from 2006 levels by 2030 ("40 by 30"). The Climate Solutions Now Act of 2022 (CSNA) adjusted these statewide GHG emissions goals to include a net-zero carbon emissions goal by 2045 and a requirement to reduce GHG emissions statewide by 60% from 2006 levels by 2031.

MDOT has worked in coordination with MDE, other agencies, and partners to develop strategies for the transportation sector to achieve these goals.

MDOT's annual reports provide a review of recent, ongoing, and planned activities across three different tiers—policy, programs, and data. This Status Report draws from four sources of planning, performance, and budgetary/financial reporting systems:

- (1) The 2040 Maryland Transportation Plan (MTP)
- (2) The Consolidated Transportation Program (CTP)
- (3) The Annual Attainment Report on Transportation System Performance (AR)
- (4) The MDOT GGRA Plan (Appendix J to the [2030 GGRA Plan](#))

MD. Environment Code Ann. §2-1305 (2021)

The agencies shall report annually on the status of programs that support the State's greenhouse gas reduction efforts or address climate change.

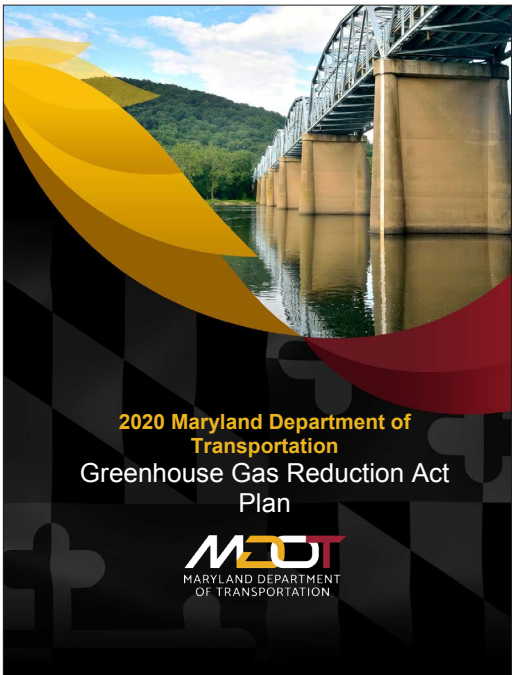
The report required shall include:

- (i) Program descriptions and objectives;
- (ii) Implementation milestones, whether or not they have been met;
- (iii) Enhancement opportunities;
- (iv) Funding;
- (v) Challenges;
- (vi) Estimated greenhouse gas emissions reductions, by program, for the prior calendar year; and
- (vii) Any other information that the agency considers relevant.



Direct input from staff across all of MDOT’s five transportation business units (TBUs) and one Authority inform the insights from these planning, performance, and budgetary reporting systems. This report presents a mix of information reflecting projects, programs, and initiatives from fiscal year (FY) 2022, as well as progress towards policy scenarios outlined in the [2020 MDOT GGRA Plan](#).

The GGRA Plan lays out strategies—both funded and unfunded—also categorized by the manner of reducing emissions through adoption of transportation technologies, improving system efficiency, reducing vehicle miles traveled (VMT), mitigating congestion, infrastructure design opportunities for clean energy use, and ensuring that the transportation infrastructure is resilient to impacts of climate change. The figure below shows the scenario construct of the MDOT GGRA plan. While the vast majority of the strategies are addressed under the reference case (fuel economy standards and electric vehicles (EVs) projections), MDOT’s CTP and the Metropolitan Planning Organization (MPO) plans and programs cover the funded strategies that are discussed throughout the report. Throughout this update, the relevant GHG reduction strategies are indexed by policy scenario and strategy number listed in the 2020 MDOT GGRA Plan. [Appendix B](#) provides a reference to each GHG mitigation strategy referenced in this document, with strategy descriptions and associated assumptions.



REFERENCE CASE

- Current VMT growth trend through 2030
- Existing federal GHG emission standards (light-duty vehicles and medium-/heavy-duty trucks)
- EV market share consistent with meeting zero emission vehicle (ZEV) Mandate

**POLICY SCENARIO 1
“On-the-Books”**

- Funded and committed transportation projects, programs, and initiatives through 2023
- MPO plans and programs, VMT growth, lead-by-example strategies, and other federally funded strategies

**POLICY SCENARIO 2
“Emerging & Innovative”**

- Expanded and accelerated traditional and emerging MDOT programs (unfunded), enhanced ZEV market share with a regional clean low-carbon fuel standard
- New and innovative transportation strategies, partnerships, and technologies

Climate change constitutes a significant risk to the safety, equity, and sustainability of the transportation system and the people and businesses it serves. The Status Report is MDOT's annual review and analysis of the past FY's strategies and actions toward climate change, resilience, and adaptation, as well as reduction and mitigation of GHG emissions. This year's report is being developed as federal and state mandates in late 2021 and early 2022 have accelerated the push to address Maryland's climate change priorities. The analysis and reporting set the stage for future strategies and actions. The report is organized across the following climate change mitigation strategies: Investment, Climate Change Resilience and Adaptation, Transportation Technology, Congestion Mitigation, VMT Reduction, and Infrastructure Design.



Approximately
\$9.1 billion
of Maryland's
major capital program
supports reducing
GHG emissions for
FY 2022.

MDOT Commitment through Investment

Investment is key to implementation of emission reduction projects. MDOT has demonstrated a longstanding commitment of funding projects, programs, and initiatives that support GHG mitigation and resilience. This is demonstrated not only through its capital program funding priorities, but also through its commitment to meeting federal and state climate change mandates.

Climate Change Resilience and Adaptation

Maryland has been a leader in integrating the climate change resilience and adaptation into agency processes by identifying system vulnerabilities, coordinating with partners and stakeholders on responding to the challenges, and communicating the potential risks and benefits of action for transportation system users.



More than
52,300 registered
EVs in Maryland
in FY 2022, 50%
more EVs than
the previous year.

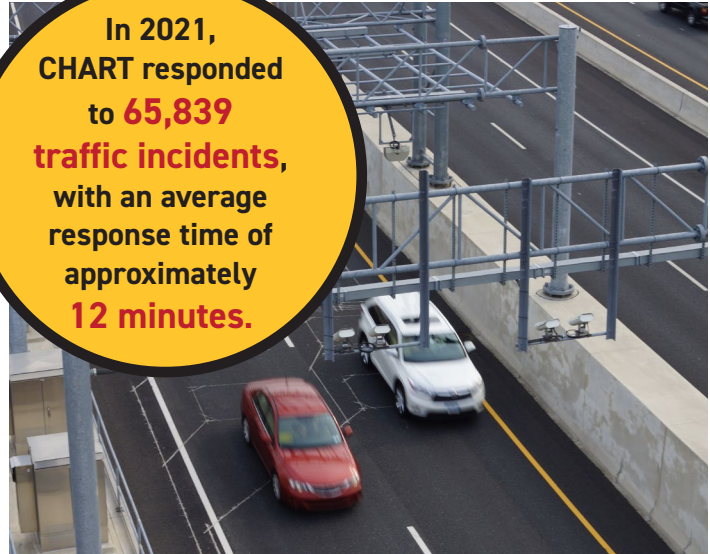
Transportation Technology

MDOT has facilitated the development of strategies to accelerate the adoption of low-carbon and emission reduction vehicle and infrastructure technologies. MDOT is leading various initiatives including the Maryland Zero Emission Electric Vehicle Infrastructure Council (ZEEVIC), connected and automated vehicle (CAV) technology, and providing regulatory and policy support to facilitate the adoption of these low-carbon and emission reduction technologies to help achieve the GGRA targets.

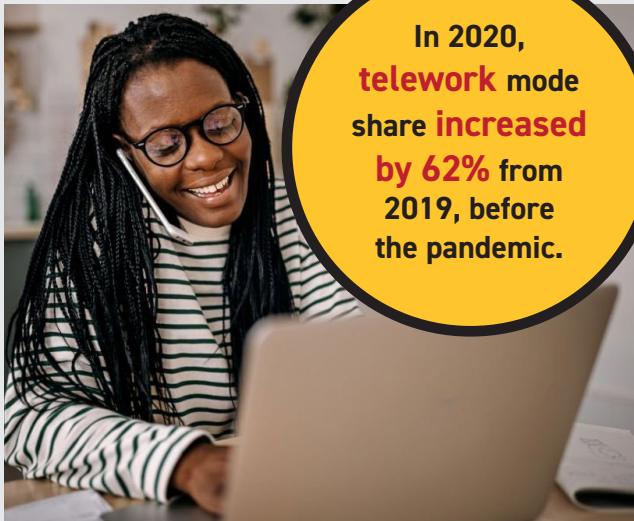
Congestion Mitigation

Congestion mitigation programs and projects improve passenger and freight reliability, efficiency, air quality and enhances the quality of life for Marylanders. MDOT's commitment to reducing congestion through various initiatives—including the deployment of Transportation Systems Management and Operations (TSMO) strategies—improve the safety, security and reliability of our transportation network. Other initiatives, such as the Coordinated Highways Action Response Team (CHART), focus on optimizing the transportation system by improving incident response times and providing traveler information (Maryland 511) and 24/7 traffic monitoring and management to improve efficiency.

In 2021,
CHART responded
to **65,839**
traffic incidents,
with an average
response time of
approximately
12 minutes.



In 2020,
telework mode
share **increased**
by **62%** from
2019, before
the pandemic.



VMT Reduction

Policies and strategies that support a shift to less carbon intensive modes, or that promote trip consolidation or avoidance, improve travel conditions by shifting away from single occupant vehicle use. MDOT MVA has implemented alternative service delivery mechanisms, including web-based transactions to reduce the number of in-person visits required at their locations. Other strategies include transportation demand management programs that reduce trips through telework and compressed schedules; promote transit, ridesharing, and active commuting; and connect employers and commuters to transportation options and incentives ([PS 1.1](#)).

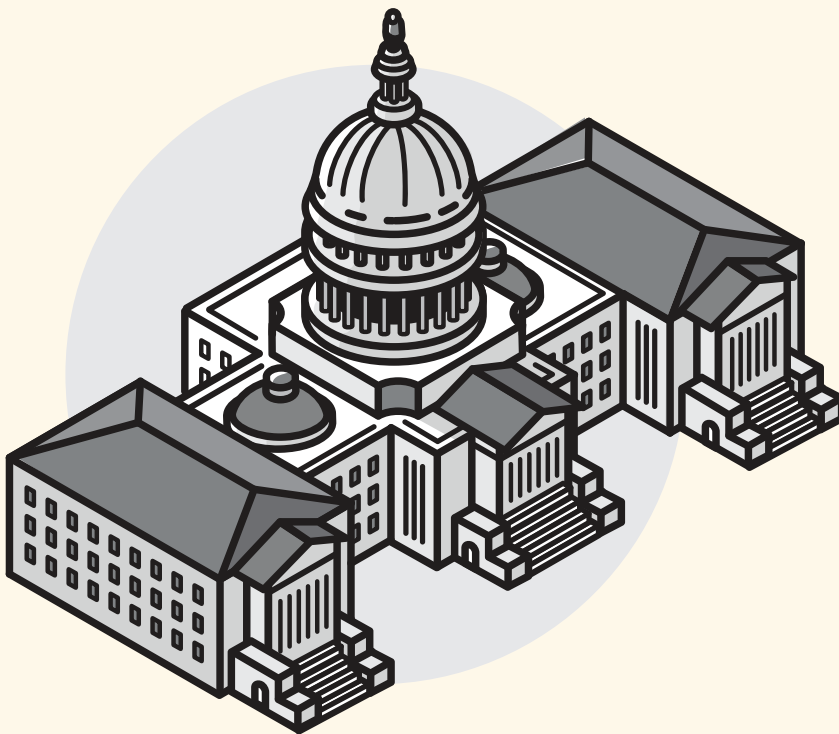
Infrastructure Design

MDOT continues to take steps to ensure that its assets and facilities are designed to be resilient to the impacts of climate change while also supporting the goal of reduced GHG emissions throughout its transportation system. This includes projects that focus on renewable energy systems, energy efficiency upgrades, long-term resilience of transportation assets and infrastructure, and that incorporate future needs and changing technology.



Infrastructure Investment and Jobs Act (IIJA) in Maryland

The 2021 IIJA (Bipartisan Infrastructure Law) authorized \$1.2 trillion nationally for spending, with \$550 billion of that total advancing “new” investments and programs. The IIJA establishes several new programs aimed at mitigating the impacts of climate change and increasing the resilience of the transportation system. It supports several climate priorities, including a 50% to 52% reduction in national GHG emissions by 2030 from 2005 levels and net-zero emissions by 2050.



Maryland will receive more than \$7 billion over a five year period, resulting in millions of dollars annually to support GHG emissions reductions and enhanced climate resilience. New formula funding programs include requirements or incentives for holistic planning activities to address these topics within Maryland's transportation system.

The IIJA established the Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) formula program to help make surface transportation more resilient to natural hazards, including climate change, sea-level rise, flooding, extreme weather events, and other natural disasters.

Maryland is expected to receive \$107 million through the five-year formula funding of federal cost share to invest in resilience improvements. The development of a Transportation Resilience Improvement Plan (TRIP) can reduce the non-federal cost share by up to 10% if the TRIP provisions are incorporated into the MTP.

The Carbon Reduction Program (CRP) was established to reduce transportation sector emissions. Nationally, \$6.4 billion will be allocated to this program, with Maryland receiving about \$18 million per year between federal fiscal year (FFY) 2022 and FFY 2026. The program requires each state to prepare a Carbon Reduction Strategy (CRS) in coordination with MPOs. The CRS must be submitted to USDOT by November 2023 and updated every four years thereafter.

The IIJA established a National Electric Vehicle Infrastructure (NEVI) formula program to provide funding to states to strategically deploy EV charging infrastructure and establish an interconnected network to facilitate data collection, access, and reliability. Funding under this program is directed to alternative fuel corridors (AFCs) for EVs in an effort to build out the national network. Maryland will receive about \$57.5 million between FFY 2022-2026.



INTRODUCTION

MDOT Mission, Goals, and Investments

The MDOT mission emphasizes the importance of a customer-driven transportation system:



MISSION STATEMENT

The Maryland Department of Transportation is a customer-driven leader that delivers safe, sustainable, intelligent, exceptional, and inclusive transportation solutions in order to connect our customers to life's opportunities.

There are seven goals supporting MDOT's mission as documented in the MTP:

1. Ensure a safe, secure, and resilient transportation system
2. Facilitate economic opportunity and reduce congestion in Maryland through strategic system expansion
3. Maintain a high standard and modernize Maryland's multimodal transportation system
4. Improve the quality and efficiency of the transportation system to enhance the customer experience
5. Ensure environmental protection and sensitivity
6. Promote fiscal responsibility
7. Provide better transportation choices and connections

The seven goals also help advance MDOT's approach to adapt to and combat climate change, including:

- Delivery of the state's transportation infrastructure program that conserves and enhances Maryland's natural, historic, and cultural resources,
- System preservation, safety and security, and quality of service goals that drive MDOT's progress towards improving resilience and transitioning to a more efficient transportation system, and
- Commitment to multimodal accessibility and mobility for all transportation system users, helping to mitigate congestion and shift travel to less emission intensive modes.

PLAN



2040 Maryland Transportation Plan

(January 2019)

The MTP establishes a 20-year vision for multimodal transportation in Maryland that outlines the state's transportation policies and priorities and helps guide statewide investment decisions for all modes of transportation.

INVEST



Maryland Consolidated Transportation Program

(FY 2022-2027)

The CTP is MDOT's fiscally constrained six-year capital budget for all State transportation projects. MDOT works with residents, businesses, local jurisdictions and local and state elected officials to include projects in the CTP.

EVALUATE

2022 Annual Attainment Report

*On Transportation System
Performance*

The annual AR provides an overview of the transportation system, investment strategies, and mobility and accessibility outcomes. MDOT assesses progress toward achieving its overarching goals by aligning performance measures and data with each MTP goal area and objective.

MDOT has been integrating various planning, management, and implementation efforts that are critical both from a climate change perspective and to advance technology for an integrated, smart, cleaner, and more autonomous and connected system. The MDOT Office of Climate Change Resilience and Adaptation (OCCRA), housed within the MDOT Secretary's Office (MDOT TSO), is also working with the MDOT TBUs to incorporate climate change mitigation, resilience, adaptation and risk management into planning, project development, asset management, maintenance, design, construction, and operations.

All of these documents work together to guide MDOT's priorities and future investments. Integrated long-range and strategic plans, such as the MTP, Statewide Freight Plan, the recently updated Statewide Rail Plan, Strategic Highway Safety Plan (SHSP), and the GGRA Plan, among others, create an opportunity for MDOT to connect statewide goals with its overall mission.



THE STATE OF GHG EMISSIONS

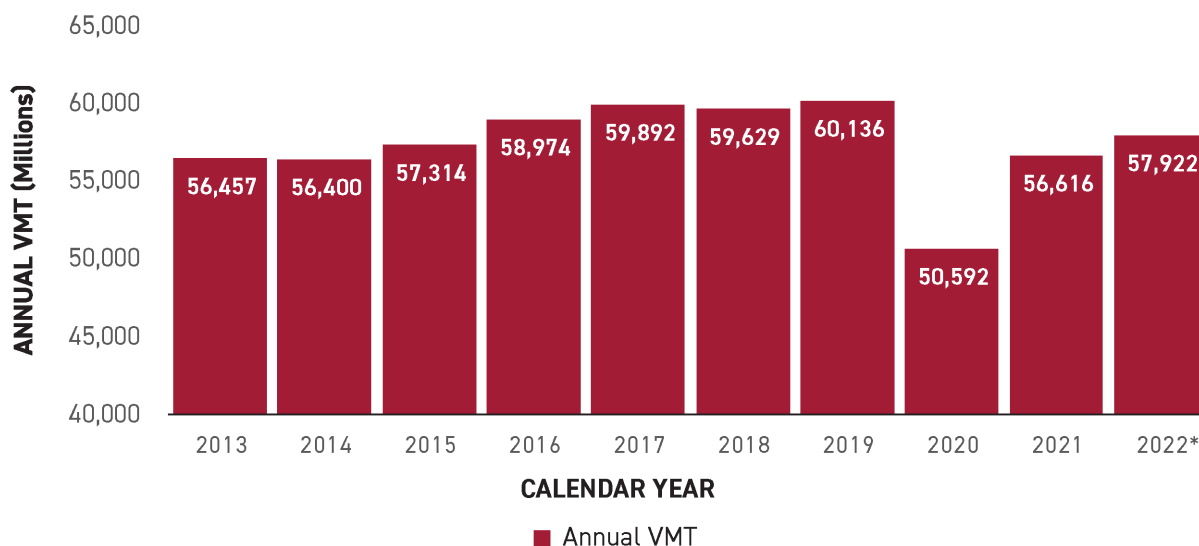
GHG Emissions from Transportation

MDOT produces an annual GHG inventory for on-road vehicles in conjunction with the AR. In addition, the National Emissions Inventory (NEI) is developed by the US Environmental Protection Agency (EPA) through consultation with state agencies every three years. The current inventory, developed for 2020, shows transportation as the largest contributor of GHG emissions followed by electricity use and residential, commercial, and industrial (RCI) fuel use. The transportation sector accounts for 35% of the total GHG inventory with on-road gasoline and diesel vehicles representing 82% of the total. Off-road (aviation, marine, rail) represents the remaining percentage of the transportation sector. GHG emissions from on-road transportation is primarily a product of two trends: VMT and the efficiency (miles per gallon) of the fleet. The GHG on-road emissions have decreased every year between 2006 and 2019, with significant reduction in 2020 related to the COVID-19 pandemic. Both 2021 and 2022 are below 2019 levels as post-pandemic travel recovers.

Vehicle Miles Traveled

As a proxy for increased economic activity, the movement of people and goods is measured through VMT. The figure below shows the VMT trend. Over the years VMT rose and then stabilized from 2017-2019. Pandemic restrictions and return-to-work outcomes spurred a sharp drop, with historic lows in 2020 (16% decrease in VMT compared to 2019); and then a 12% increase in VMT in 2021 compared to 2020. For 2022, projected VMT was still down by nearly 4% compared to pre-pandemic levels in 2019.

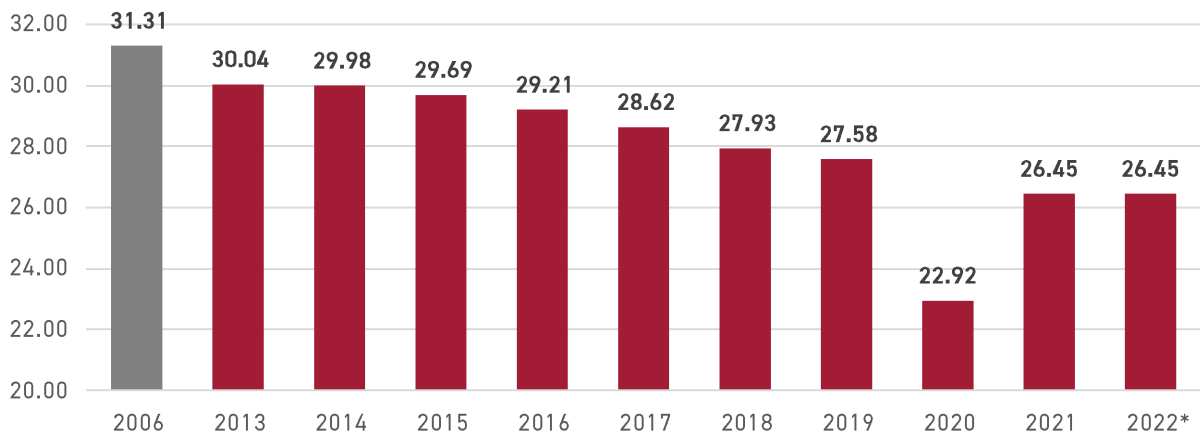
Annual VMT



*2022 data is predicted.



Total GHG Emissions from On-Road Mobile Sources



GHG EMISSIONS (MMTCO2e/YEAR)

*2022 data is predicted.

On-Road Vehicle Fleet

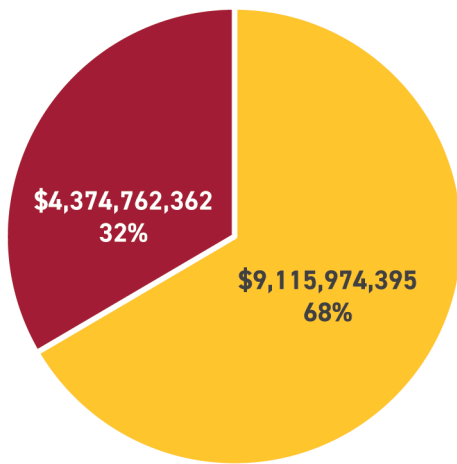
Efficiency of the on-road vehicle fleet continues to improve, as older vehicles are replaced with newer models that meet more stringent GHG emission standards. EVs are a growing share of the fleet — as of June 2022, there are over 52,000 registered EVs in Maryland — a 50% increase from the previous October. EVs are a growing share of the on-road fleet, and in 2022 topped 1% of vehicles on the road. The combination of these trends results in a decline in GHG emissions from on-road transportation during the last decade. There were significant emissions decreases in 2020 driven by reduced travel during the earlier period of the pandemic. Between 2020 and 2022, there is a visible increase in GHG emissions by almost 15%, shown above. However, such fluctuation can be attributed largely to exceptional changes in driving behavior during COVID-19 pandemic. On a long-term trend between 2007 and 2021, GHG emissions have decreased by more than 11%. Longer-term changes to travel behavior as a result of the pandemic, such as teleworking, shifts in transit demand, and increased freight activity, are still being studied and considered as the transportation system rebounds from COVID-19 impacts. However, the permanence of these behavioral and cultural changes is still evolving, which will have some impact on the decarbonization pathways and mitigation strategies that will need to be implemented to respond to such changes.



MDOT'S CLIMATE CHANGE COMMITMENT

As a means to understanding and demonstrating the overall commitment to reducing GHG emissions and minimizing climate change impacts, MDOT continues to track the total share of CTP funding dedicated to projects that will help Maryland meet its climate change goals.

Major Capital CTP Projects Including MDTA



■ GHG ■ Non-GHG

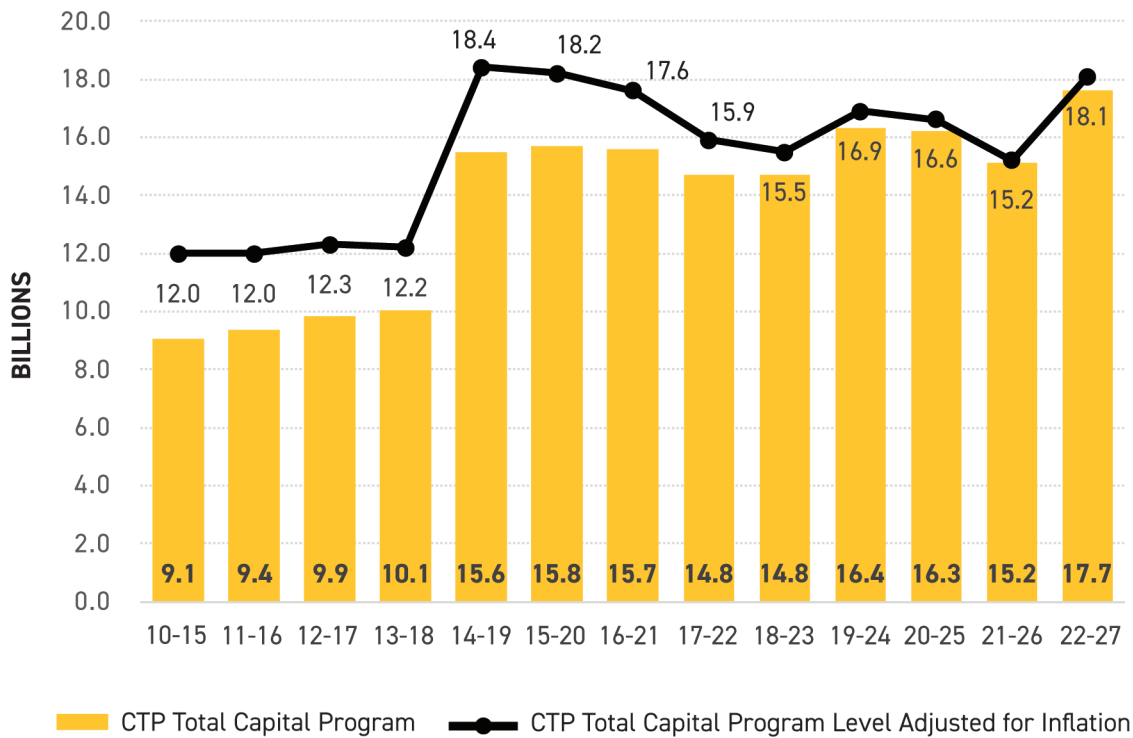
Within the FY 2022–2027 CTP, 68% (approximately \$9.1 billion) of Maryland’s major capital program are investments that will potentially reduce GHG emissions through 2030 and beyond. This share excludes spending on minor capital programs, such as system preservation and maintenance activities, which are essential to maintain the state’s transportation system to meet its performance goals. The Maryland Transportation Authority’s (MDTA) capital projects are included in MDOT’s six-year capital program submitted with the Governor’s budget to the legislature and in this share of GHG emissions-reducing investments. However, MDTA is a separate revenue-generating agency from MDOT and does not receive any funding from the Transportation Trust Fund.

The 32% of major capital investments that are not considered GHG beneficial are primarily associated with spending that enhances customer service across the MDOT TBUs and preserves and maintains Maryland’s multimodal transportation system. These investments are critical to meeting MDOT’s responsibilities to its customers and for keeping the system in a state of good repair. Many of the system preservation activities, such as bridge rehabilitation, stormwater management, and pavement preservation, also promote a more resilient transportation system, particularly to severe weather events—which is a priority objective of the MCCC.



The commitment to GHG-beneficial projects has steadily increased during the last nine iterations of the CTP, with the current estimate of 68% in the FY 2022 – 2027 CTP representing the highest estimated share since tracking began. This increased from 65% in the FY 2021 – 2026 CTP and 63% in the FY 2019 – 2024 CTP (both excluded MDTA's capital projects). The increase is reflective of additional financial support for MDOT Maryland Transit Administration (MDOT MTA) and Washington Metropolitan Area Transit Authority (WMATA), prioritizing investments that address roadway bottlenecks and transit on-time performance, and expanding safe and accessible bicycle and pedestrian networks. As seen in the graph below, the FY 2022 – 2027 CTP is the largest program yet.

MDOT Total Capital Program Levels (\$ in Billions)





CLIMATE CHANGE ADAPTATION AND RESILIENCE

MDOT's Commitment and Role

Maryland has been a leader in integrating climate change resilience and adaptation into agency processes by identifying system vulnerabilities, coordinating with partners and stakeholders responding to the challenges, and communicating the potential risks and benefits of action to transportation system users.

MDOT continues to develop and implement a comprehensive system-of-systems approach for enhancing resilience and mitigating risks and vulnerabilities, while improving agency response through planning, maintenance, management, and communications. MDOT's approach focuses on enhancing multimodal transportation infrastructure resilience through best practices to mitigate impacts, respond to transportation disruptions, and recover to normal operations. MDOT is making steady progress across the TBUs in close coordination with other agency partners, key stakeholders, and system users through information sharing and outreach.

Accomplishments

MDOT State Highway Administration (MDOT SHA) finalized an internal Climate Resilience Strategy document that was developed to identify opportunities for integrating the results of vulnerability assessments and climate risk analyses into existing asset management systems and processes. The multi-disciplinary document draws from expertise across the agency including planning, design, maintenance, and operations.

MDOT Maryland Port Administration (MDOT MPA) delivered a virtual presentation at the 2021 United Nations Climate Change Conference, or COP26. This spotlight on the MDOT MPA's climate change strategies reflect the TBU's innovation and leadership in advancing resilience and adaptation.

MDOT coordinated the development of a public outreach video with other state agencies for Flood Awareness Month in April. The educational video was designed to bring awareness to flooding and flood resiliency in Maryland and highlighted the importance of preparedness.

In October 2021, the MDOT Urban Tree Program was established to help communities replace trees removed during construction of a transportation facility project. Managed by MDOT OCCRA, the Program prioritizes the replacement of trees in communities affected by environmental justice issues or the urban heat island effect. In its first year, the MDOT Urban Tree Program supported three projects across Maryland, which will result in the planting of over 200 trees.



In 2022, MDOT MPA and the US Army Corps of Engineers advanced the Barren Island portion of the Mid-Chesapeake Bay Aquatic Ecosystem Restoration Project. MDOT MPA also convened the Mid-Bay Resiliency Working Group, a collaborative effort across state and federal resource agencies and stakeholders, to maximize the coastal resilience benefits of the project. The Barren Island Project will restore 72 acres of wetlands habitat, protect and preserve sub-aquatic vegetation, and enhance water quality.

The Kitten Branch Stream Restoration is a compensatory mitigation project for unavoidable impacts to Kitten Branch as a result of safety related airfield improvements at BWI Thurgood Marshall Airport. The restoration was constructed in 2014 and ongoing monitoring and adaptive management continues. Project objectives of channel stability, vigorous vegetative establishment, and low invasive species coverage continue to improve. In FY 2022, a Phase 3 Adaptive Management Repair Project was completed to enhance geomorphic stability.

MDTA developed and delivered a series of internal presentations within its engineering disciplines to identify climate stressors and hazards for their respective assets. This provides insight on potentially vulnerable and critical assets and specifically, where implementation of Coast Smart siting and design criteria is applicable. MDTA also conducted a series of working sessions on developing how to integrate climate resiliency as part of project development.

MDOT MTA further refined the Adaptation and Resiliency Toolbox (ARToolbox) which aids in implementing adaptation measures for sites and assets identified as priorities due to their vulnerability to a changing climate. Recent updates to the ARToolbox include an interactive geographic information systems (GIS) hub highlighting previous and current resiliency planning efforts within the agency. GIS resources have also been created to ensure full consideration of equity in resiliency planning, grant funding opportunities and guidance for future projects, and inclusion of extreme heat into the identified hazards. The ARToolbox was utilized in 2021 for the submission of three stand-alone resilience projects under the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Grant Program (HMGP).





Each of the MDOT TBUs is leading actions to improve transportation network resilience to climate change. These actions include best practices and investments that adapt transportation assets to climate change impacts and actions, including multi-agency coordination, which can improve overall transportation network resilience. In broad terms, the MDOT TBUs' accomplishments can be categorized by three connected focus areas.

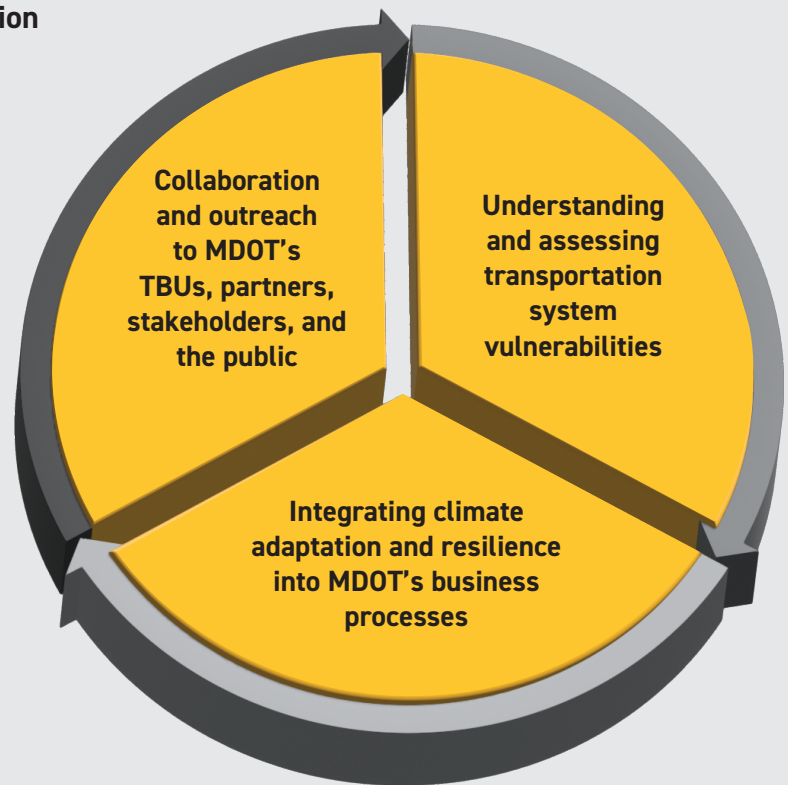
Understanding and Assessing Transportation System Vulnerabilities

The MDOT TBUs have been undertaking and completing vulnerability and risk assessments and developing tools and plans to assess and analyze the impacts of climate change on statewide transportation infrastructure.

MDOT SHA developed the Emergency Relief Tool that assists in data collection following a natural disaster or other catastrophic event. The application is designed to collect key data for affected sites located on and along the MDOT SHA's transportation network and allows a state employee to enter specific details onsite in real-time while assessing the damage that occurred. The data is stored and can be easily accessed from the ArcGIS application and website to create site specific records and reports.

MDOT SHA also developed County Stat Sheets utilizing data in the Climate Change Vulnerability Viewer (CCVV) for coastal counties. The two-page document identifies key areas and roadways, both state and local, that are vulnerable to flooding as well as identifies potential next steps in building system resilience for further consideration.

The MDOT SHA Asset Managers continued to define, document, and apply frameworks for assigning criticality scores to assets and asset class networks for the purposes of enterprise risk management and prioritizing investment to keep assets in a state of good repair.



Integrating Climate Resilience and Adaptation into MDOT's Business Processes

The results of vulnerability and risk assessments are being incorporated into MDOT's business processes to adapt and manage climate risk and integrate the knowledge into agency decision-making.

The basis for MDOT asset management is the Department Asset Management Policy and Principles adopted in 2017. In 2020, MDOT Maryland Aviation Administration (MDOT MAA) submitted its first Asset Management Plan (AMP) to support the MDOT Asset Management Policy. The foundation of the AMP included the MDOT MAA Strategic Plan and the Airport Technology Master Plan and addressed five core asset classes – pavement, fleet, IT, structures, and facilities. Since then, key activities have included improvements to the Maximo database, deployment of EZMax Mobile, annual condition assessments, GIS integration, and State of Good Repair Financial Forecasting.



MDOT SHA worked to update National Environmental Policy Act (NEPA) documentation criteria to include Coast Smart Legislation and additional resilience information. This will support improved project-level tracking and reporting opportunities for climate resilience. MDOT SHA also used climate resilience data and considerations for the development of the MD 90 Planning and Environmental Linkages (PEL) Study and Needs Assessment. As part of this effort, a standard reporting guide was created, resulting in a climate resilience inventory that integrates climate-related data and information into a PEL report. This additional analysis will inform in the NEPA phase of the project study.

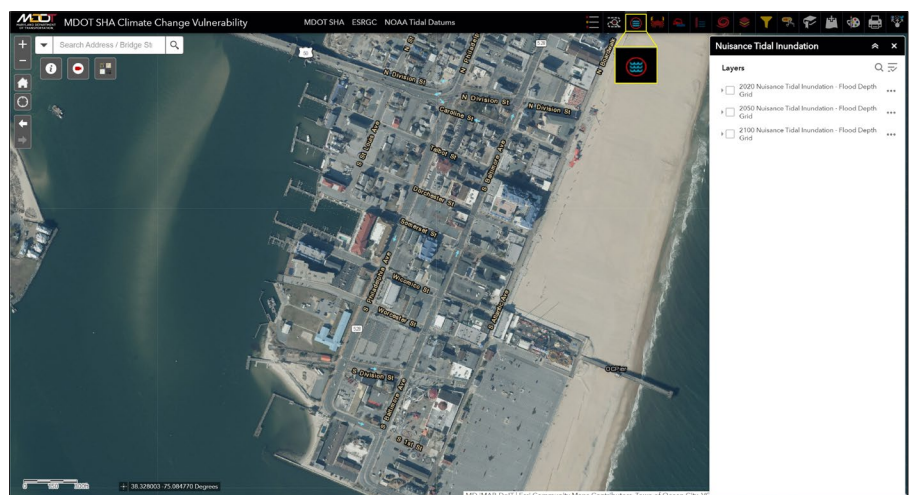
Collaboration and Outreach to MDOT TBUs, Partners, Stakeholders, and the Public

Working collaboratively with the Maryland Department of Natural Resources (DNR), MDOT MAA finalized a Forest Conservation Easement (FCE), encompassing over 122 acres, including 84 acres of Wetlands of Special State Concern (WSSC). The FCE benefits rare, threatened, and endangered (RTE) species located within the easement, and MDOT MAA by serving as forest mitigation to support ongoing development at BWI Thurgood Marshall Airport.

MDOT MPA enlisted its 6th Environmental Defense Fund (EDF) Climate Corps Fellow during the summer of 2022. The Fellow developed a method to estimate the potential sequestration of GHGs at the Paul S. Sarbanes Ecosystem Restoration Project at Poplar Island, and recommended next steps to increase the accuracy of the estimates and inform future restoration project designs. The work built upon similar analysis performed by a previous EDF Fellow at Hart Miller Island.

MDOT SHA is updating CCVV flood depth grid data, with the support of Salisbury University's Eastern Shore Regional GIS Cooperative. This beneficial work will provide more accurate projections of potential impact for areas affected by coastal flooding. This data will be utilized to update MDOT SHA's Hazard Vulnerability Index (HVI) and Vulnerability Assessment Scoring Tool (VAST) analysis results. The data will also be published as a webservice, which will make the updated data available to partnering agencies, local jurisdictions, MPOs, and other stakeholders interested in flood projection data.

MDOT SHA also launched the CCVV Story Map to provide a detailed user guide and to demonstrate how the data in the tool can be used to inform decision-making.



MDOT SHA was awarded a FEMA Building Resilient Infrastructure and Communities (BRIC) grant to assist with funding of planning and design efforts for three priority areas impacted by nuisance flooding and storm surge during storm events along MD 249 in St. Mary's County. MDOT SHA continues to work with FEMA through the Maryland Department of Emergency Management (MDEM) to utilize this funding source.

MDOT participated in the Maryland Flood Awareness Month in April 2022, partnering with various state agencies to raise awareness about the many flood hazards faced by individuals and communities across the state.

MDOT MPA completed the sixth successful year working with MDE to implement air quality improvement projects under the Voluntary Air Agreement. Originally signed in 2015 and updated in 2021, the agreement commits MDOT, the Maryland Energy Administration (MEA), and MDE to develop and implement projects that reduce air emissions or increase energy efficiency at the Port, while recognizing the importance of climate change and providing a greater focus on stakeholder engagement with underserved and overburdened communities.

Strategies Under Development

Opportunities for ongoing planning and implementation build on the significant progress already made by each of the MDOT TBUs and expansion of these resources to support planning, management, and operational decisions across multiple agencies, including other state and local partners.

MDOT SHA is working to incorporate climate resilience into a module in their ongoing database development efforts. Incorporating climate resilience into the database will provide an opportunity to notify project managers that a project may be considered vulnerable to climate impacts early in project initiation. It will serve as further notification that resilience discussions should be coordinated with the appropriate offices for additional input. The database will also improve tracking and reporting mechanisms to assist with compliance of legislative requirements.

MDOT SHA is also working with staff at the Critical Area Commission to increase the level of consideration for resilience measures during design for improved reporting and compliance opportunities. This collaboration is working to identify concepts to be explored that would normally be included in bridge design, such as scour protection (riprap, etc.), that could be used as resilience measures.

MDOT SHA is continuing to study flooding in localized areas of concern and incorporating climate data projections to increase climate resilience early in project development.

MDOT MAA is developing a Sustainability Plan to ensure that investments make the organization more sustainable while protecting the environment, conserving resources, maintaining of economic growth, and benefiting local communities. The Plan will establish goals and performance metrics across four pillars of sustainability – environment, social, human, and economic. Additionally, MDOT MAA is working on the preparation of a Solid Waste Reduction Plan and expansion of a food waste composting program, as the state waste stream diversion goal has been challenging to achieve due to both shrinking recyclable markets and demand for only high quality, uncontaminated recycling streams.

Wilson Point Road is the sole access point to Martin State Airport and the Wilson Point Community. This road experiences storm related flooding, particularly during periods of high tide, impacting access for all stakeholders. While MDOT SHA works to design roadway improvements to mitigate the issue, MDOT MAA is programmed to begin design of a closed- system midfield drainage improvement project that will alleviate the airport's contribution to surface runoff in this area thereby improving operational resilience and community access.

The Chesapeake Bay Crossing Study: Tier 2 NEPA will include an assessment of sea level rise in the design, engineering, and comparison of alternatives. This will include an evaluation of opportunities to reduce risk and vulnerability to inundation. MDTA is also developing flood protection projects that consider sea-level rise to protect the tunnels at Fort McHenry and Baltimore Harbor.



Risk and Opportunities

MDOT seeks to prioritize and champion climate resilience across the agency. Opportunities to enhance MDOT's work in this area includes:

- Identifying partners and data sources to better understand, analyze, and track flooding in areas outside of the 100-year and 500-year floodplain.
- Identifying additional extreme weather events and climate hazards, other than flooding, to incorporate into the CCVV and project level climate resiliency considerations.
- Participating with the Maryland Silver Jackets team and the Maryland Resiliency Partnership in collaboration with MDE, MDEM, FEMA, and DNR. Collaborating with these agencies to leverage funding, data, tools, and discuss policy modifications to advance Maryland's resilience objectives.
- Increasing capabilities within the CCVV to efficiently utilize data from the One Maryland One Centerline Program, which aims to create a sustainable, current, authoritative, and multi-use centerline dataset through collaborative partnerships between federal, state, and local partner owners of Maryland's public roadways.
- Proactively identifying grant and alternative funding sources that can be utilized to initiate projects that improve climate resilience, reduce GHG emissions, or improve network reliability during extreme weather events.
- Developing a resilience investment strategy that complements the existing risk assessment work and the adaptation actions taking place on a project-specific basis. Working to identify partners for coordination in development of a resilience investment strategy for MDOT SHA that identifies project needs and planning-level costs to identify resilience investment needs, where they can be met with internal resources, and where funding gaps may remain.





GREENHOUSE GAS MITIGATION STRATEGY MATRIX



Transportation Technology:

Maryland is one of the best marketplaces in the United States for EVs. According to the National Conference of State Legislatures (2022), the State is recognized as

having policies that promote hybrid and electric vehicles. Maryland's supportive policies, regulations, pilot programs, and incentives for new vehicle technologies keep the state on a course for increased EV market penetration. Maryland's leadership in implementing the ZEV Memorandum of Understanding (MOU) will continue to increase overall fleet efficiency across multiple modes and vehicle types. New vehicle technologies, including EVs, could reduce average annual CO2 emission from each vehicle by 34% (or 1.5 metric tons (MT)) through 2030.



VMT Reduction: Mitigating the growth in VMT relative to population growth is crucial to reducing GHG emissions. The strategies to change traveler behavior are complex, with

success contingent on land use, transit, and housing. They are also dependent on consumer confidence in travel technologies, knowledge of non-single occupant vehicle (SOV) transportation options and ease of adopting them, and perception of value and time that determine the need and purpose of travel activity. As the fleet becomes more efficient, VMT strategies are also less effective at reducing GHGs. Eliminating rail bottlenecks, such as the current project to allow double-stacking through the Howard Street Tunnel, can support increased movement of goods by rail on a per ton moved basis.



Where Do Greenhouse Gas Emission Reductions in the Transportation Sector Come From?



Congestion Mitigation: Reducing inefficient travel associated with traffic congestion is a primary focus of MDOT in how it manages and operates the multimodal

transportation system. For example, a car operating at 25 mph emits 25% more CO2 per mile than a car operating at 50 mph.



Infrastructure Design: MDOT TBUs have been developing and implementing design changes to agency business processes that have mitigated emissions, and in some

cases, have had positive impacts on the environment, including nature-based design solutions.



TRANSPORTATION TECHNOLOGY

Transportation technologies represent the most significant opportunity to reduce GHG emissions from the transportation sector, especially during this transformative time. As the market trends and consumer receptions for new technologies, such as EVs, continues to grow, greater opportunities are anticipated. Vehicle technology improvements continue to evolve and are becoming more reliable and less costly, helping to broaden their market share. Progress in on-road vehicle technology and fuel alternatives also provide measurable GHG emissions benefits and improve system efficiencies. MDOT has facilitated the development of strategies to accelerate the adoption of low-carbon and emission reduction vehicle and infrastructure technologies that are shaping the future.

MDOT's Commitment and Role

Maryland is taking a proactive role in promoting the adoption of EVs and supporting infrastructure through incentives and building out Alternative Fuel Corridors (AFCs). These and other vehicle technology improvements have enhanced safety features, life-saving benefits and GHG emission reduction benefits. In addition to chairing Maryland ZEEVIC, which provides a public forum for EV infrastructure information, MDOT also leads a working group dedicated to ensuring that CAV technology is deployed safely and thoughtfully on Maryland's roads.



**MARYLAND
ZERO EMISSION**
Electric Vehicle Infrastructure Council

Accomplishments

Maryland continues to be a leader in the deployment of ZEVs and infrastructure. Maryland was ranked as the sixth best state by the American Council for Energy-Efficient Economy for its policy and program efforts supporting electrification deployment in 2020. Highlights describing Maryland's leadership role include:



- Maryland was among the first states in the nation to submit their NEVI Plan to the Joint Office ahead of the August 1st deadline.
- As of June 30, 2022, there are over 52,300 registered EVs in Maryland – a 50% increase from the previous year ([PS 2.14](#)).
- MDOT's leadership of the Maryland CAV Working Group continued in 2022. The CAV Working Group convened three times in 2022 for networking, demonstrations, and information-sharing among public and private partners.
- With FHWA's designation of the Intercounty Connector/MD200 as a pending EV AFC, Maryland now has a total of 23 EV AFCs.
- Maryland was successful in seeking FHWA's designation of I-95, I-695, and I-495 as 'pending' hydrogen AFCs, which are the first hydrogen AFCs designated in the state.

MDOT has approved installation of Utility-owned EV charging stations on 17 MDOT-owned sites. Installation of these publicly accessible charging stations was authorized under the Public Charger component of the Public Service Commission's PC44 EV Pilot Program. MDOT has joined Maryland Department of General Services (DGS) and MEA to facilitate the Utility company installations of EV chargers on 37 State-owned sites to date.

Maryland is working to strategically deploy EV charging infrastructure to build-out and to certify the state's 23 EV AFCs, as required under the NEVI Formula Program. MDOT, in coordination with MEA and key state agencies, developed and submitted the Maryland NEVI plan to the Joint Office for approval on July 15, 2022. The plan serves as the foundation to create a convenient, accessible, reliable, and equitable EV charging network within Maryland and supports a national charging network. With the approval of the plan by the Joint Office on September 14, 2022, MDOT will receive over \$57 million in NEVI Formula Funds after federal set asides between FY 2022-2026 to first invest along and build-out Maryland's AFCs. Once all corridors are certified, MDOT can begin investing and deploying charging infrastructure within communities.



MDOT supports fleet modernization efforts that will reduce energy use and lower GHG emissions from the transportation sector. MDOT continues to transition portions of its vehicle fleet to EVs. MDOT is actively replacing its light-duty passenger fleet with EV models in response to legislation passed in 2021 and 2022 ([PS 1.12](#)). MDOT MTA is planning facility upgrades and installation of charging infrastructure, in preparation for introducing zero emission buses (ZEBs) into MDOT MTA's transit bus fleet ([PS 1.5](#)).

MDOT MPA was also awarded funds from EPA's Diesel Emission Reduction Act (DERA) program to replace older cargo-handling equipment and dray trucks with more efficient models, including the purchase of two new fully electric dray trucks by RoadOne, and a third electric dray truck by Keen Transport, providing a savings of over 11,000 gallons of fuel per year. MDOT MPA recently used available Volkswagen (VW) settlement funding to acquire an all-electric forklift that will replace two existing diesel forklifts. In addition, MDOT MPA took ownership of two new Mustang Mach-E electric fleet vehicles, and additional EV fleet purchases are being planned.

MDOT continues to support the electrification and deployment of medium- and heavy-duty vehicles. MDOT MTA has planned for the Zero Emission Bus Pilot to begin in FY 2023, which consists of three 60', four 40' buses, and the construction of associated infrastructure. MDOT MPA participated with RoadOne and IKEA in a month-long pilot of a fully electric dray truck to transport containers between the Port of Baltimore and IKEA's distribution center in Perryville ([PS 1.10](#)).



Maryland continues to emerge as a national leader in CAV technology and is building on previous progress to help guide the state in planning and implementing CAV technology. In spring 2022, MDOT SHA conducted a Self-Driving Vehicles Survey to understand the opportunities and challenges around autonomous vehicles (AV). The results will be used to help identify Maryland-specific responses to model in future scenario planning for AV alternative analysis that will support congestion reduction and lower GHG emissions.

MDOT MPA's Seagirt Marine Terminal received four new ship-to-shore container cranes measuring 450 feet tall and weighing about 1,740 tons each. The new cranes are fully electric and emit zero emissions.



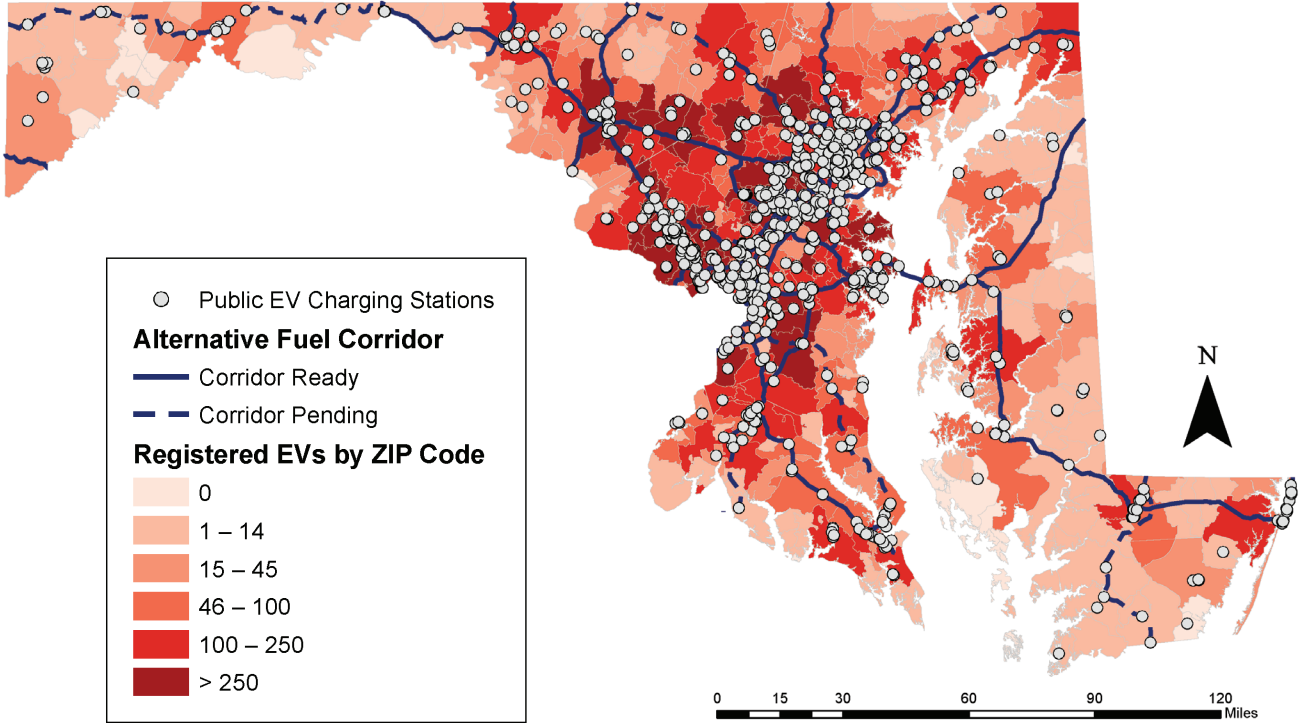
Strategies Under Development

MDOT facilitates research and evaluation of the GHG emission reduction potential of vehicle and infrastructure technologies, including CAVs, EVs, and other ZEVs; transportation network companies shared rides; and system operations. Evaluating these emerging technologies includes considering safety, congestion, and equity issues, such as public health, economic, and workforce impacts. MDOT SHA funded a Freight AV Feasibility Study for FY 2023 to identify civil projects for AV freight vehicles, which will support the reduction in fuel consumption by heavy vehicles ([PS 1.3](#), [PS 2.17](#)). MDOT will continue to refine its estimation of GHG benefits due to congestion relief and fuel efficiency as a result of CAV adoption.

MDOT will also continue to review state fleet procurement procedures and practices as well as work with the Department of Budget and Management (DBM) to identify fleet vehicles eligible for conversion that will comply with purchase requirements as part of the CSNA of 2022. MDOT MPA is developing an EV Roadmap to assist with the transition of their light-duty vehicles to ZEVs ([PS 1.12](#)). MDOT will also continue working with DGS to identify and install charging infrastructure at MDOT sites to support its fleet electrification efforts.

MDOT continues to invest in fleet modernization and infrastructure deployment measures. MDOT MTA is continuing to implement their transition to zero emission buses and will be issuing a request for proposal (RFP) for the next purchase of battery electric buses. MDOT MTA is also identifying the path forward for potentially transitioning their mobility fleet to ZEVs ([PS 1.5](#)).

To support the build-out and certification of the 23 EV AFCs, MDOT, in coordination with MEA, is developing the Round 1 NEVI Formula Funding Program. MDOT released a request for information in late September to solicit feedback and recommendations for the new NEVI Program.



MDOT MAA will be welcoming eight electric buses in early 2023 with funds available through the VW Mitigation Trust Fund (PS 1.11). The electric buses will be a new addition to the current fleet of 40 clean diesel coaches and 20 compressed natural gas vehicles. In preparation, MDOT MAA is developing four dual electric charging stations and associated infrastructure to supplement its present inventory of 10 EV charging stations at BWI Thurgood Marshall Airport.

Risks and Opportunities

Maryland has made significant progress in EV adoption and electric vehicle supply equipment (EVSE) installation. To further accelerate EV adoption, Maryland continues to support EV and EVSE incentives. MDOT will also be enhancing EVSE availability through the NEVI program.

MDOT is working with the utilities, the PSC, and state, local, and federal partners under Public Conference 44 (PC44) to ensure the strategic, sustainable, and reliable installation of EV charging infrastructure in Maryland. In collaboration with ZEEVIC, MDOT will also work to address barriers to EV adoption to ensure that charging is available to those who live in rural communities, urban environments, multi-unit dwellings, or in homes governed by homeowner's associations.



While technologies offer the most significant GHG emissions reduction potential on the transportation sector, the true potential of GHG reduction benefits will not be fully achieved until the fleet turns over with newer fuel-efficient vehicles. In addition, in December 2021, the EPA finalized a revised federal GHG emission standard for both passenger cars and light-duty trucks for model year 2023 through 2026. In March 2022, EPA issued proposed rulemaking for more stringent heavy-duty vehicles and engines starting with model year 2027. The more stringent standards will achieve additional GHG reduction benefits and improved fuel economy as the fleet continues to turnover.

With the designation of hydrogen AFCs in Maryland, the state will be positioned to use federal funds when available to support potential hydrogen programs. MDOT will continue to work with ZEEVIC to identify opportunities for fuel cell electric vehicles and infrastructure adoption and incorporation in the state.



Strategy Benefits

The 50% increase in registered EVs in Maryland since October 2021 equates to approximately 17,400 additional EVs (PS 2.14) on Maryland roads and a 0.046 MMT CO₂e reduction in GHG emissions. This CO₂e reduction in GHG emissions equates to removing almost 10,000 gasoline-powered cars off the road for one year or over 5,700 home's energy use for one year.

With travel rebounding back to pre-pandemic levels, transportation technologies will continue to play a critical role in the reduction of GHG emissions.



CONGESTION MITIGATION

MDOT's Commitment and Role

Traffic congestion and idling, or operating vehicles at low speed, can increase GHG emissions as a result of additional fuel use and reduced engine efficiency at low speeds. Reducing congestion not only reduces emissions, but also helps improve air quality, travel reliability, and quality of life for Marylanders.

The MDOT integrated approach to congestion mitigation is administered under the TSMO umbrella of programs at the MDOT SHA ([PS 1.2](#), [PS 2.3](#)). The agency's TSMO approach, and other TBU multimodal programs and projects, result in emission reductions by decreasing delay to improve mobility, reliability, and safety for transportation system users. MDOT SHA's TSMO strategies leverage decreasing delays technology to optimize capacity that is limited by congestion.

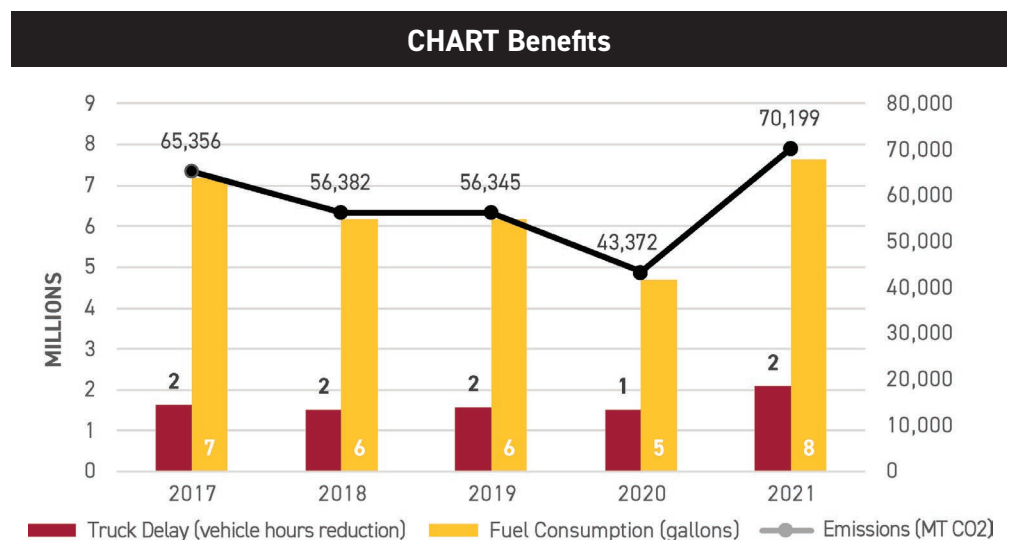
Among the programs and initiatives targeting congestion mitigation, MDOT SHA's CHART program utilizes ITS technologies to enhance travel and address capacity inefficiencies to reduce GHG emissions ([PS 1.2](#)).

Accomplishments

During 2021, MDOT SHA's CHART program provided a total of 65,839 incident responses and disabled vehicle assists on Maryland highways. The average incident response time in 2021 was 12.25 minutes. The results of these efforts include nearly 8 million gallons of fuel and more than 2 million hours of truck delay, in addition to the emissions reduction (more than 70,000 mt CO₂). The total number of responses by CHART follows the increase in VMT from 2020 to 2021 following emergence from the COVID-19 pandemic.

As of October 2021, all MDTA toll facilities are fully electronic (cashless), meaning drivers no longer stop their vehicle to pay tolls, which reduces delays and forgoes the need for idling, thereby improving fuel efficiency ([PS 1.8](#)).

MDOT SHA has a new Maryland Roadway Performance Tool to help see congestion on the state roadway network with other data for a richer understanding of what is occurring to support better decision-making for solutions.



US 1 Innovative Technology Corridor Project

To ease recurring and non-recurring congestion and improve safety on the US 1 corridor, MDOT implemented several Active Traffic Management (ATM) elements through the US 1 Innovative Technology Corridor project (PS 1.2). The project limits consist of the US 1 corridor in Howard County (MD 32 to I-95) as well as key east/west arterial feeders like MD 175, all of which experience severe traffic detours from I-95 and MD 295. The ATM elements of the project include, but are not limited to, 12 closed-circuit television (CCTV) cameras, nine dynamic message signs (DMS), and 17 Dedicated Short-Range Communications/cellular vehicle-to-everything (DSRC/CV2X) roadside units (RSUs) (PS 1.2).



NB US 1 at MD 32
Pedestal DMS



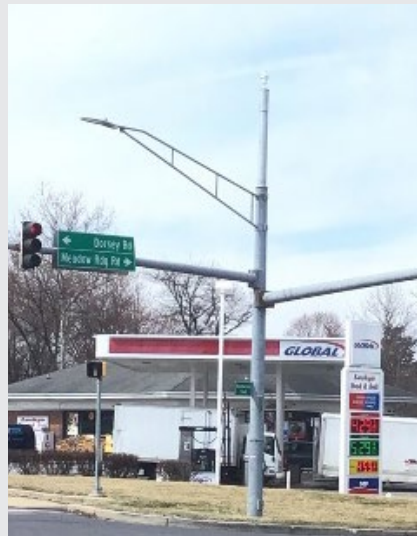
EB MD 175, west of I-95 Direction
Specific DMS Signs



WB MD 100, East of US 1 Overhead DMS.



MD 175 at I-95 SB Ramp Stand
Alone CCTV Pole



US 1 at MD 103 CCTV on Extension Pole



US 1 & MD 100 DSRC/
C-V2X RSU/OD Sensor.

The DSRC/CV2X RSUs help build a traffic flow profile within the transportation network, including assisting in the identification of congestion and bottlenecks under normal versus abnormal scenarios (incidents, work zones, events). This will improve travel efficiency, which will then lead to fewer emissions and secondary incidents. The construction for the program is complete, new assets are being integrated, and all devices are expected to be operational in fall 2022.

Strategies Under Development

MDOT is developing strategies to improve the efficiency of its roadways and transportation systems. With a focus on a connected and automated future, MDOT is taking a strategic system-of-systems approach to developing ATM and integrated corridor management solutions. The MDTA continues the I-95 Express Toll Lane (ETL) Northbound extension construction, which will reduce recurring congestion and improve air quality.

MDOT SHA and MDTA are leading several ongoing TSMO projects to enhance the customer experience with new technologies for safe, efficient, and reliable transportation mobility and operations. One of these is the I-695 TSMO project, focused on part-time shoulder use (PTSU) for the entire limits of the project area. PTSU provides multiple benefits due to the additional capacity available during the defined operational periods, allowing for travel time savings, reduced delays, and increased throughput. PTSU also provides environmental benefits such as reduced emissions and improved fuel consumption while not significantly impacting noise levels.

Several other congestion-relief strategies are being utilized in major ongoing projects across MDOT. ITS Solutions for Chesapeake Bay Bridge Oversaturation assists in better assessment and control of the traffic flow across US 50. The Freeway Incident Traffic Management (FITM) Tool supports decisions on strategies for incident response and the need for detouring operations. The Incident Management Unit (IMU) within the Maryland State Police (MSP) is a dedicated team in service of safety and road closures for fatal and serious injury crashes. A curbside congestion project at BWI Thurgood Marshall Airport planned for FY 2023 will improve multimodal connectivity and efficiency.

Maryland is also creating visualization tools using inclusive data to support MDOT's customers including MPOs, local governments, regional organizations, and the private sector with transparent system performance information that can identify bottlenecks so that MDOT can work collaboratively with stakeholders to resolve them.

The Maryland Statewide Freight Plan is under development and includes strategies to reduce GHG emissions, make freight even more efficient, and to optimize Maryland's transportation network ([PS 1.3](#)).

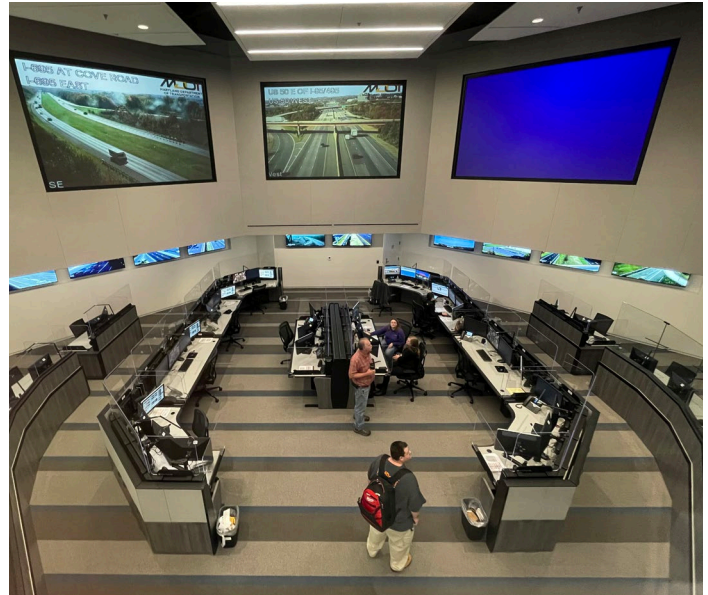
Ports America Chesapeake, one of MDOT MPA's major tenants, has added a new gate complex at the Seagirt Marine Terminal. Additional terminal optimization projects, as well as the expansion of the Howard Street Tunnel to enable containers to be double stacked, will improve the efficiency of the national freight transportation system, reducing fuel consumption and associated emissions on a regional level. Following the Environmental Assessment, the Federal Railroad Administration prepared a Finding of No Significant Impact (FONSI) representing a final NEPA approval for the project. As a result, CSX was able to finalize engineering, obtain permits and advance the project to construction, breaking ground in November 2021.



Risks and Opportunities

Increasing demands on Maryland's transportation system due to dense development and economic activity, particularly due to increases in freight travel, continue to result in reliability challenges. As a result, even relatively minor disruptions can lead to significant system-wide delays. Harnessing technology through the deployment of systems along roadways and in vehicles to reduce delays, clear traffic incidents efficiently, and provide accurate and real-time traveler information continues to help transportation agencies and system users make better decisions to manage or avoid congestion.

Establishing freight movement improvements on roadways such as on I-695 using innovative TSMO capacity expansion opportunities and working with public private partnerships to offer enhanced operational management are the most efficient ways for growing freight flows.



Strategy Benefits

An evaluation of the CHART program found that the reduction in carbon dioxide (CO₂) emissions of 70,199 metric tons (MT) resulted in a total savings of \$45.41 million (PS 1.2). Thus, CHART operations in 2021 generated a total net benefit of \$1.87 billion, as outlined in the table below. Most benefits were produced from the reduction in delay due to CHART's efficient incident response and management, especially along the major corridors, which are the primary contributors to traffic congestion in Maryland.

MDOT recognizes that delay and reliability affect freight movement and supply chain reliability, which can in turn impact economic development. MDOT tracks the reduction in annual hours of delay experienced by truck operators on Maryland's highways, which increased from 1,490,000 hours in 2020 to 2,100,000 hours in 2021. This increase in delay reduction, which is connected to the number of incidents CHART responded to, is due to the VMT increase in 2021 in recovery from the COVID-19 pandemic.

CY2021 CHART BENEFITS	
Truck Delay (vehicle hours reduction)	2,096,000
Fuel Consumption (gallons)	7,650,000
Emission (MT CO ₂)	70,199
TOTAL COST SAVINGS (\$)	\$1,875,250,000



VMT REDUCTION

MDOT's Commitment and Role

MDOT programs and initiatives help reduce VMT and SOV travel by investing in and supporting transit, cycling and walking, carpooling, vanpooling, telework, and transportation demand management (TDM) strategies. For transit, there is an emphasis on improving service quality and reliability, better aligning transit service to demand, and improving transit information dissemination to customers. MDOT TBUs work together to advance bike and pedestrian-friendly designs and policies to promote safety and opportunities for all transportation system users. MDOT provides leadership in TDM practices through its Commuter Choice Maryland program and by continuing valuable partnerships with the Metropolitan Washington Council of Governments (MWCOCG) and all of its MPOs.



Accomplishments

incenTrip



MDOT prioritizes efforts to support Maryland's transit system and the riders that use it. MDOT's Commuter Choice Program launched the incenTrip statewide mobile app and continues to promote alternative commute options to employers and commuters through a variety of outreach activities. The free, mobile application is aimed at helping Maryland commuters save time and money, while also earning cash rewards when they take transit, rideshare, or use other alternatives to driving alone during the peak commute times.

To increase transit service and connections, MDOT is constructing the Purple Line in Montgomery and Prince George's Counties ([PS 1.4](#)). The Purple Line is a 16-mile light rail line that will extend from Bethesda in Montgomery County to New Carrollton in Prince George's County. It will provide a direct connection to the Metrorail Red, Green, and Orange Lines at Bethesda, Silver Spring, College Park, and New Carrollton. The Purple Line will also connect to MARC, Amtrak, and local bus services. As a transit system separate from Metro, it will operate mainly in dedicated or exclusive lanes, allowing for fast, reliable transit operations.

The Commuter Choice Maryland Employer Partner Program, which recognized employers and organizations for their leadership in offering transportation benefits and creative program incentives to their employees, continues to grow in partnership with MPOs and local TDM program managers. The Program will include more than 50 companies by the end of 2022.

Walking and biking became increasingly popular in Maryland during the COVID-19 pandemic. In September 2021, Governor Hogan announced \$16.8 million to advance 42 bicycle and pedestrian projects across Maryland (PS 1.9). The package includes \$12.4 million in federal funding through the Transportation Alternatives Program (TAP), \$1 million through the Recreational Trails Program (RTP), and nearly \$3.4 million in state funding through MDOT’s Kim Lamphier Bikeways Network Program.

To focus on pedestrian opportunities, MDOT launched the third annual Walktober campaign, a month-long celebration, in partnership with various state agencies, county governments, and local and national non-profit organizations. Focusing on increasing safety, encouraging group walks, and visioning for a better walking environment, multiple individual events and programs took place.

To assist local agencies in estimating bicycle infrastructure costs, MDOT also released a Bikeways Project Cost Estimator tool for use with grant applications or other project planning purposes. To improve assessments of bicycle infrastructure, MDOT is transitioning to a Level of Traffic Stress (LTS) metric for measuring how ‘bikeable’ roadways are for various cycling audiences. LTS uses metrics to reflect a person’s comfort level while biking more accurately between destinations. MDOT completed a statewide bike-ability analysis of all public roadways based on traffic speeds, volumes, and quality of bicycle facility. As part of developing this tool, an inventory of all on-road and shared-use paths accessible by bicycle was developed. MDOT will continue to develop LTS-based metrics including intersection analysis and bicycle network analysis. The Table located below shows the first year of data that is available.

LTS	Target Audience	Bicycle Facility Types	FY22 (thousands of miles)
1	Almost everyone	Protected bikeways, side paths	39.6
2	Interested, but concerned	Bike lanes, bike boulevards	314.8
3	Enthused and confident	Bike lanes, shared lanes, shoulders	461.9
4	Strong and fearless	No bike facility or on arterial roadways	3,357.7
5	Bike Access Prohibited	Bicycle access is prohibited by managing roadway agency	844.9

Strategies Under Development

In the Washington region, the Purple Line Capital Crescent Trail is funded for construction. Preparations are underway for the Masonville Cove Connector with a Memorandum of Agreement executed in July 2022. The shared use path will be a segment of a network of Baltimore trails which will create additional connectivity for users of the Gwynn Falls Trail and the Baybrook Connector providing ways to reduce GHG emissions locally as well (PS 1.9).

MDOT MTA released a draft Statewide Transit Plan (STP) that will provide a 50-year vision of coordinated local, regional, and intercity transit across the state. This plan will define public transportation goals and strategies for Maryland’s rural, suburban, and urban regions with a vision toward increasingly coordinated, equitable, and innovative mobility (PS 1.6). MDOT MTA is developing the STP with input from a broad range of partners, including other state agencies, local and regional governments, public and private transit providers, business and non-governmental organizations, and the public. The STP will build from existing state, regional, and local plans and identify and address a number of strategic themes such as economic opportunity, safety, resiliency, and equity.

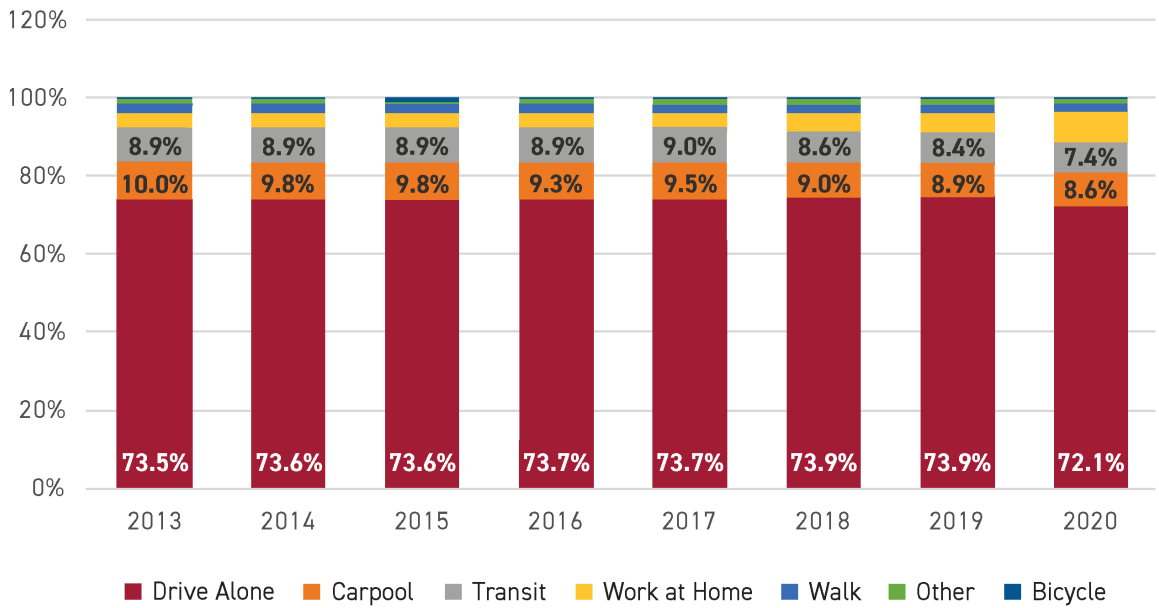
MDOT is beginning to develop a CRS as required by the CRP enacted through IJA. There are several eligible activities that may be eligible for funding under the CRP that support VMT reduction strategies, including public transportation projects; on and off-road trail facilities for pedestrians, bicyclists, and other nonmotorized forms of transportation; and dedicated bus lanes.

Risks and Opportunities

Pre-pandemic data showed an increase in telework, which accelerated during the pandemic, the figure located on the next page shows a 47% increase in telework mode share from 2019 (5.0%) to 2020 (8.1%). The future of telework remains uncertain as employers’ hybrid policies take hold across the public and private sectors. While there has been a measurable

increase in telework, traffic congestion continues to increase, likely due to a combination of hybrid work policies, COVID-related concerns regarding using transit and ridesharing, and challenges with restoring pre-pandemic transit ridership in many parts of the state. As traffic volumes continue to rebound from peak pandemic levels, the total number of crashes and incidents remain high. The severity of the crashes and higher percentage of commercial vehicle-related incidents is still a concern. Not only is this a safety consideration but contributes to congestion in terms of the increase to emergency management incidents.

Commute Mode Share 2013-2020



Source: American Community Survey 2020 5-year estimates

Commuter Choice Maryland continues to seek additional state and local organizations, nonprofits and private sector companies as partners for its Commuter Choice Maryland Employer Partner Program. Through the program, Commuter Choice Maryland partners with organizations to help them promote commuter benefits, and recognizes employers across the state who are leaders in promoting alternative commuting options and benefits. These partners help Maryland achieve important goals such as reduced traffic congestion, cleaner air and fewer GHG emissions, as well as increased economic opportunity (PS 1.7).

In the Washington, D.C., metropolitan region, Commuter Connections is a regional network of transportation organizations that offer a host of free services and programs to assist employers and commuters with making smart choices about their commuting needs.



Strategy Benefits

The Masonville Cove Connector will restore safe and equitable access to the waterfront as part of construction at the Masonville Dredged Material Containment Facility. Congestion Mitigation and Air Quality Improvement Program (CMAQ) funding will support traffic signal synchronization, ride sharing, transit improvements, transit bus replacements, and Metro rail-car upgrades. MDOT’s incenTrip application functions statewide as a congestion mitigation effort. IncenTrip encourages Maryland travelers and employers to increase the use of public transportation, ridesharing (carpooling and vanpooling), walking, biking, teleworking, and alternative work schedule.



INFRASTRUCTURE DESIGN

MDOT's Commitment and Role

MDOT is establishing itself as a leader in developing innovative and environmentally friendly infrastructure design that results in a range of benefits, including reducing GHG emissions, minimizing climate impacts, and enhancing resilience. MDOT continues to take steps to ensure that its assets and facilities are powered and designed to minimize their environmental impact. A large piece of this is keeping MDOT assets in a state of good repair and updating facilities when necessary to optimize energy efficiency. This asset management, from facilities to vehicles, reduces the environmental impacts but also makes them more resilient to climate impacts. Additionally, MDOT takes steps—through programs such as Complete Streets—to ensure its infrastructure and roadways are designed to safely promote low-impact forms of travel.

Accomplishments

The MDOT TBUs continue to upgrade facilities to reduce their environmental impacts and create greater efficiencies.

MDOT MPA installed new interior and exterior light-emitting diode (LED) lighting in several areas throughout the Dundalk Marine Terminal (DMT) and South Locust Point Marine Terminal, which will reduce electricity usage, enhance worker safety, and help lower GHG emissions.

MDOT MPA continues to implement its Innovative Reuse and Beneficial Use (IRBU) Strategy, to explore feasible reuse applications for dredged material. MDOT MPA awarded contracts to support applied research into innovative uses of dredged material to aid in future decision-making.

MDOT MAA completed Phase 1a of the BWI Thurgood Marshall Taxiway T Reconstruction project, which included reconstructing 26,000 square yards of existing asphalt taxiway in concrete and replacing the taxiway lighting and signage with high efficiency LED lighting systems, enhancing airfield safety at night and reducing energy demand and operational costs. Subsequent phases are being designed and programmed for construction over the next five fiscal years.

MDOT TSO also aided MDOT SHA and MDOT MPA in submitting applications for the Federal Highway Administration Climate Challenge grants to quantify the potential for GHG emission reductions from innovative pavement projects.



Strategies Under Development

MDOT MPA is already experiencing the effects of climate change and is implementing a variety of innovative climate mitigation efforts as part of the Dundalk Marine Terminal Resiliency Improvement Project. The improvements will better protect the terminal infrastructure, cargo, and personnel during extreme rainfall and storm surge events. The project

consists of the installation of a new box culvert with lateral drainpipes to increase stormwater drainage capacity; tidal gates to prevent tidally influenced water from entering the storm drains; and a sea curb surrounding the terminal to prevent overtopping of floodwater during storm surge events.

MDOT SHA is planning several infrastructure projects for FY 2023, and is identifying opportunities through its operations and maintenance programs to meet specific GHG emission reductions and direct emission targets at its facilities.

MDOT MAA is optimizing energy efficiency at BWI Thurgood Marshall Airport by replacing 20- to 30-year-old HVAC system in Concourse DX-DY, set to be complete in summer 2023, and installing Pre-Conditioned Air (PC Air) and 400 Hz ground power at four aircraft gates.

MDOT has established an MDOT-wide task force to focus on enterprise resiliency. The task force has started the process of developing a TRIP, in response to the opportunity provided under the PROTECT program in IIJA. The final TRIP will take a systems approach to planning for immediate and long-range activities and investments, align with existing plans in the state like the MTP, CTP and State Hazard Mitigation Plan, include risk-based assessments of vulnerabilities to current and future weather events, include the existing regulatory and standard environment in Maryland, consider natural infrastructure contributions to the plans and ensure resilience of community assets.

Risks and Opportunities

Infrastructure design changes and evolution may span longer timeframes until their complete implementation. Additionally, it may be some time before realizing or accounting of the estimated resulting comprehensive benefits.

Balancing the costs of routine maintenance and keeping assets in a state of good repair with innovative technologies is vital. Across the TBUs, MDOT ensures that its assets are running as efficiently as possible.

Strategy Benefits

The BWI Thurgood Marshall A/B Connector and Baggage Handling System improvement project, currently in design, is projected to achieve a 24% energy cost saving through improved lighting, chiller replacement, hot water heating, building design, and control systems. This includes upgrades of the central utility plant and lighting improvements on the adjacent lower-level roadway to comply with the Maryland State Energy Code.

Through the Baltimore Gas & Electric (BGE) Empower Maryland – Small Business Energy Solutions program, MDOT MAA implemented lighting improvements at four facilities at Martin State Airport. These improvements, funded with a 71% BGE grant, are estimated to reduce annual energy use in those facilities by 63% and save over \$5,600 per year in operating expense.



Several TBUs facilities are capturing renewable energy through solar programs, such as MDOT MAA's solar array on the BWI Thurgood Marshall Daily Garage. In FY 2022, total solar production by all of MDOT's TBUs was 620.1 megawatt hours (MWH), enough to power about 57 houses for a year. In FY 2022, the tenth year of MDOT MTA's energy performance contract (EPC), 9,669,340 kilowatt-hours (kWh) and \$1.45 million were saved. Activities to reduce energy include lighting retrofits, LED lighting upgrades, and photovoltaic array.



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