



# 2019 Status Report

*Required under the*

**Maryland Commission on Climate Change Act**

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**2019**

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## Introduction

The 2014 Executive Order (01.01.2014.14) and the 2015 Maryland Commission on Climate Change Act (Act) expanded the membership of the Maryland Commission on Climate Change (MCCC) and required it to maintain a comprehensive action plan with 5-year benchmarks to achieve science-based reductions in Maryland's GHG emissions. The MCCC has submitted annual reports<sup>1</sup> from 2015 to 2018 to address the requirements of the Act.

In 2016, Maryland passed a reauthorization of the Greenhouse Gas Reduction Act (GGRA), which sets the goal of reducing CO2 emissions in the state by 40 percent from 2006 levels by 2030.

The Maryland Department of Transportation (MDOT) is currently updating the MDOT 2019 GGRA Draft Plan to address the requirements of GGRA including:

- Analyzing the feasibility of greenhouse gas (GHG) mitigation measures; and
- Ensuring that the measures are implemented in an efficient and cost-effective manner

Upon the development of this plan, MDOT will coordinate with the Maryland Department of Environment (MDE) to ensure seamless integration of the findings into the Maryland Final GGRA Plan to be submitted to the Governor and General Assembly.

### MDOT's Transportation Role

MDOT's [mission](#) communicates the importance of a customer-driven transportation system. The mission, along with the seven goals identified in the Maryland Transportation Plan (MTP), guides MDOT through statewide transportation planning, programming, and coordination across its transportation business units (TBUs) to facilitate the strategic development of Maryland's intermodal transportation system. MDOT developed the 2040 MTP through an interactive outreach process. The final goals objectives, strategies, and performance measures to address the Maryland's transportation priorities were released in January 2019. The goals of the plan are as follows:

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; and
7. Provide better transportation choices and connections.

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<sup>1</sup> Maryland Commission on Climate Change Annual Reports  
<http://www.mde.state.md.us/programs/Air/ClimateChange/MCCC/Pages/MCCCReports.aspx>

These goals, along with their objectives and strategies, are supportive of policy advancement and strategy implementation consistent with the goals and requirements of the GGRA and the MCCC.

MDOT is a leader in the development, tracking, and reporting of performance measures that drive MDOT and its TBUs to achieve and maintain exceptional standards in meeting the transportation demands of Maryland residents and users of the transportation system. This State Agency Report partly draws from three sources of performance and budgetary/financial reporting systems: 1.) the annual Attainment Report, 2.) the quarterly MDOT Excellerator, and 3.) the annually updated, six-year Consolidated Transportation Program (CTP).

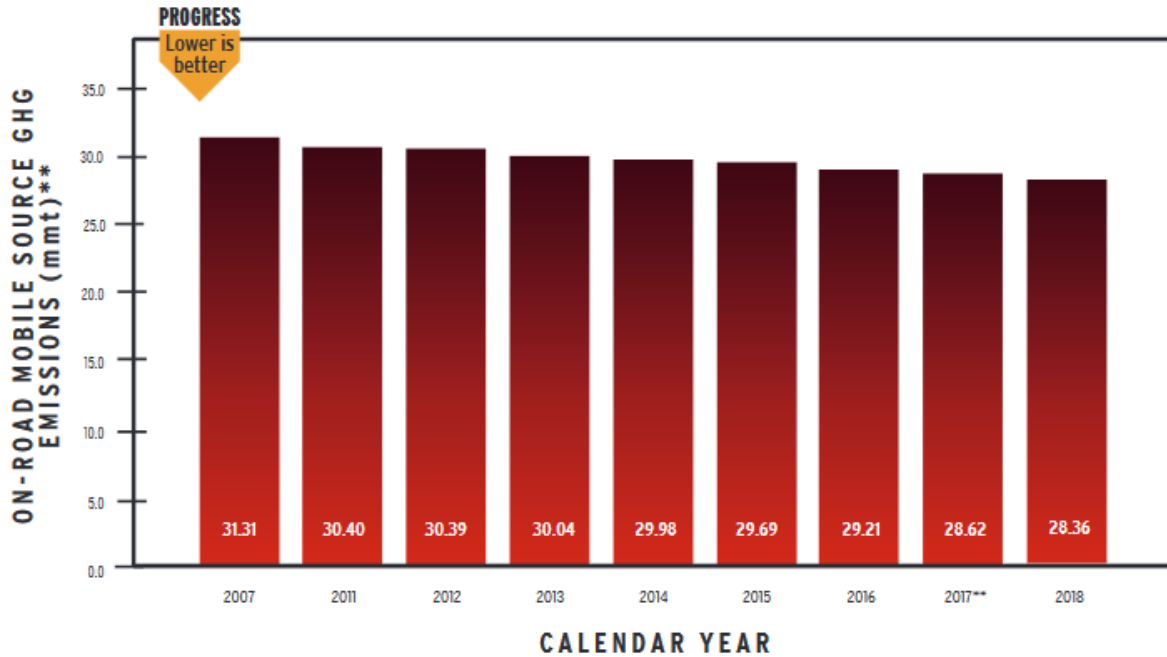
**Attainment Report:** The [Annual Attainment Report on System Performance](#) serves as an annual statewide report on “Transportation System Performance” that explores how MDOT’s TBUs have worked together in the past year and assesses progress toward achieving the goals and objectives of the [Maryland Transportation Plan](#) . Each chapter presents the progress made and the future strategies for each of the seven MTP goals outlined above.

Several measures within the Attainment Report are indicators for GHG emissions, such as vehicle miles traveled (VMT), transit ridership, transit service reliability, roadway congestion, traffic safety, quality of the bicycle and pedestrian environment, and regional emissions. A couple of new measures have been introduced as of the 2018 Attainment Report goals and objectives update. This includes the number of formal or informal telework arrangements and the total number of electric vehicles (EVs) registered in Maryland.

Within the Attainment Report, MDOT annually estimates total GHG emissions from on-road transportation in Maryland based on current VMT data and fleet characteristics. Figure 1 illustrates the downward trend of GHG emissions in Maryland while Figure 2 highlights continued VMT growth.

On-road transportation GHG emissions continue to decrease in Maryland as the efficiency of the on-road vehicle fleet improves even as VMT growth continued in 2017 (1.6% increase) and 2018 (1.5% increase).

**Figure 1. Transportation-Related Greenhouse Gas Emissions CY 2007-2018**

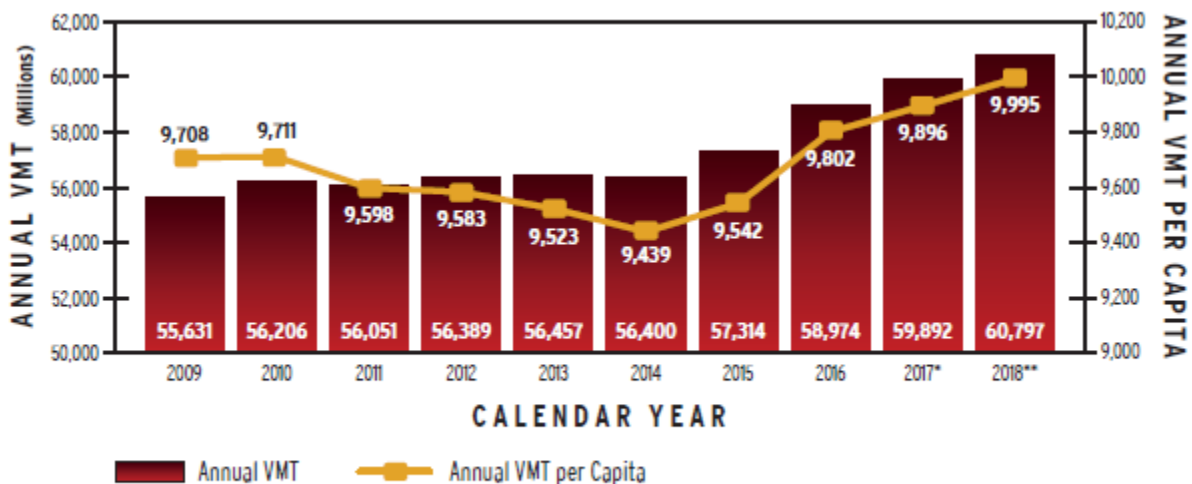


**Target:** 25% below 2006 emissions by 2020. For on-road transportation, the goal equals 23.5 mmt CO<sub>2</sub>e in 2020 and 40% below 2006 emissions by 2030\*

\* The MDOT selected GHG emission reduction goal is consistent with the statewide target set in the 2009 Greenhouse Gas Reduction Act and the subsequent 2016 Greenhouse Gas Reduction Act reauthorization.

\*\* MMT CO<sub>2</sub>e stands for million metric tons of carbon dioxide equivalents, the standard unit of measurement for GHG emissions. Emissions are calculated using the most recent data and version of EPA's MOVES model available at time of analysis. MOVES2014a is used for analysis year 2016, 2017, and 2018. 2017 annual VMT revised to reflect actual MDOT SHA reported 2017 HPMS VMT.

**Figure 2: Total VMT and VMT per Capita CY 2009-2018**



\* 2017 VMT data revised from previous report.

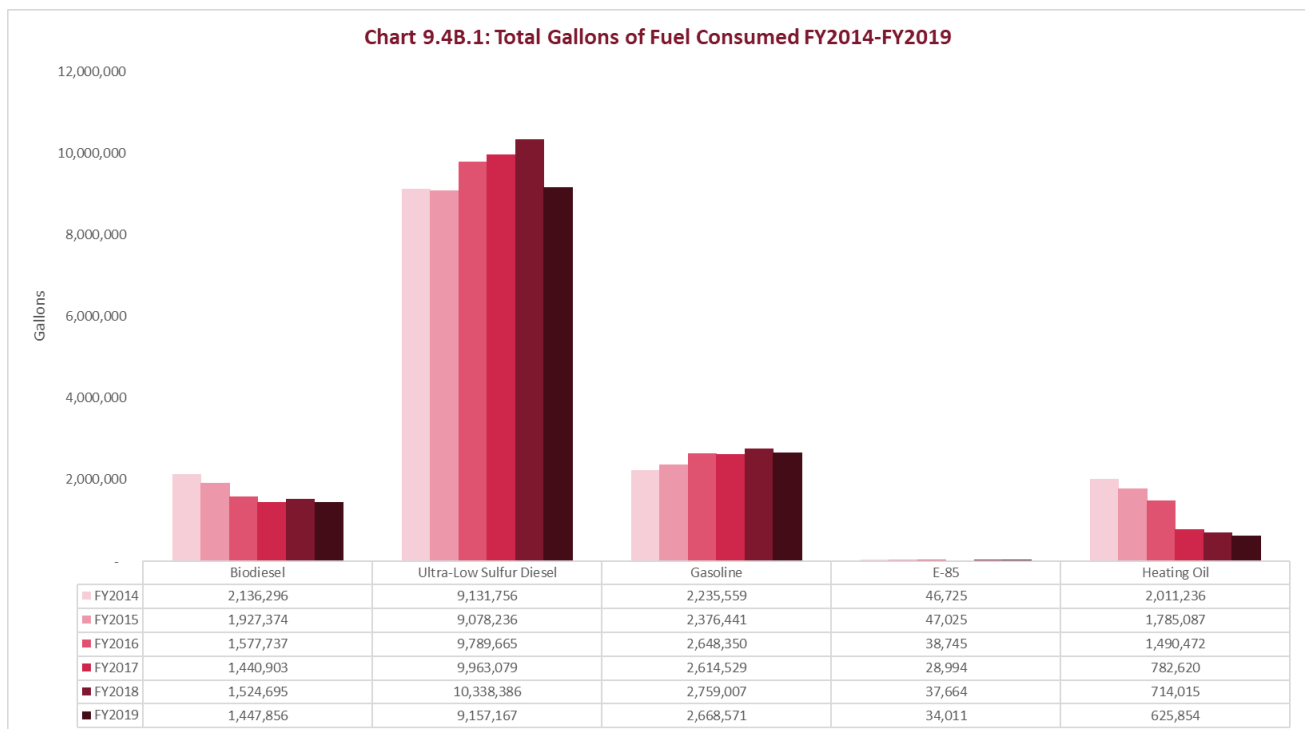
\*\* 2018 data is preliminary and subject to change.

**MDOT Excellerator:** MDOT publishes the MDOT Excellerator<sup>2</sup>, a performance management system that summarizes tangible results of MDOT’s performance on a quarterly basis. This program is a living, evolving performance process that is in a constant state of evaluation, analysis, and action. The results represent critical data points that drive daily business decisions.

Several measures within the MDOT Excellerator are indicators for GHG emissions or may be used as proxies for estimating GHG emissions, including the percent of tolls collected by cash, reliability of highway travel, average highway incident duration, and peak hour congested VMT highway trends.

Tangible Result #9 within the Excellerator, “Be a Good Steward of the Environment”, notes the following objective: “MDOT will be accountable to our customers for the wise use of limited resources and impacts on the environment when designing, building, operating and maintaining a transportation system.” Measures relevant to GHG emissions include average MDOT light-duty fleet miles per gallon, the total gallons of fuel consumed quarterly by the MDOT fleet, and total conventional energy use and renewable energy generation. **Figure 3** shows the total gallons of fuel consumed by MDOT.

**Figure 3. Total Gallons of Fuel Consumed by MDOT FY 2014-2018**



**Consolidated Transportation Program:** The goals of the MTP and the associated measures that illustrate Maryland’s progress reflect the diversity of current and future transportation conditions, challenges, and needs. The [Consolidated Transportation Program](#), the State’s six-year capital investment program for transportation, identifies funding for specific road, bridge, transit,

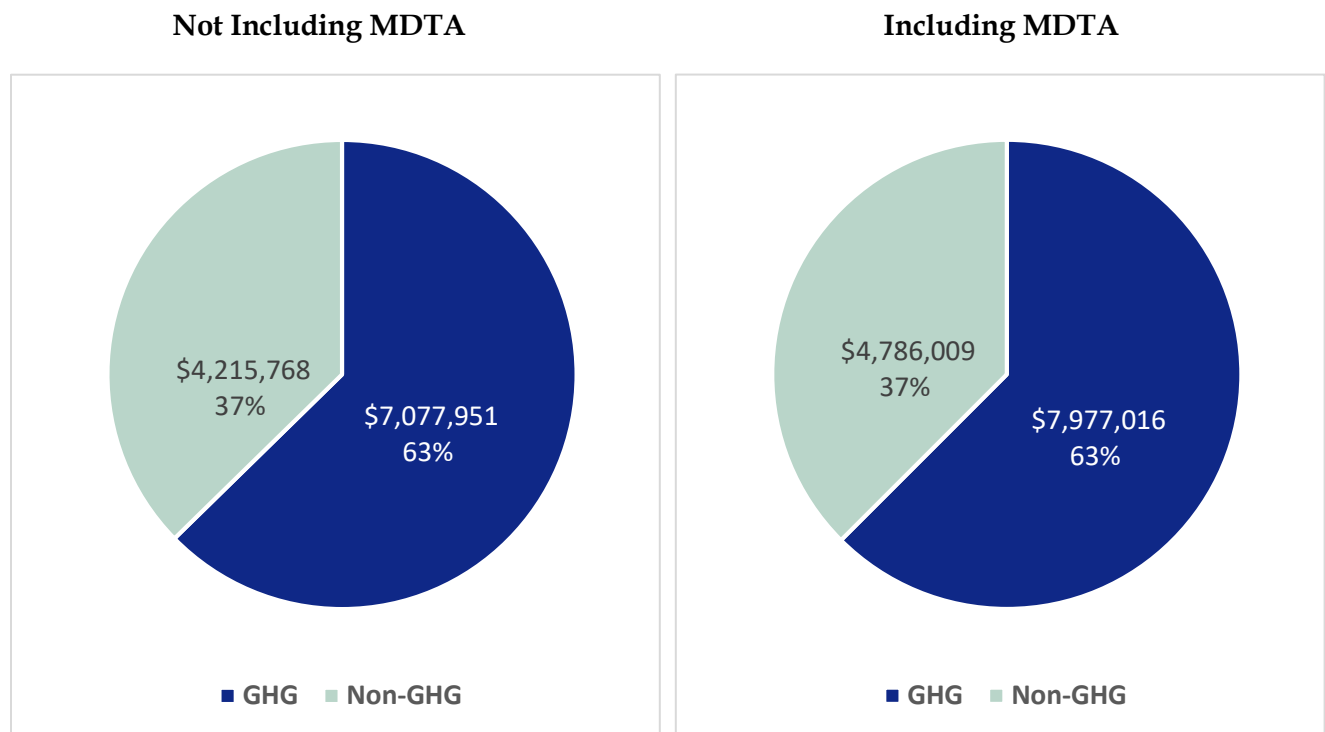
<sup>2</sup> MDOT Excellerator Performance Management System  
<http://www.mdot.maryland.gov/newMDOT/Planning/Excellerator/MDOTExcellerator>

aviation, port, pedestrian, and bikeway projects based on the priorities established in the MTP. Many of the goal areas identified in the MTP include projects and programs in the CTP that directly or indirectly yield GHG emission reductions from transportation system users or the actual operation of the transportation system itself.

MDOT uses this report to document the share of CTP funding dedicated to GHG-beneficial projects. Within the FY 2019–2024 CTP, MDOT estimates that 63 percent, (approximately \$7.077 billion) of Maryland’s \$11.293 billion six-year capital program (excluding Maryland Transportation Authority (MDTA), capital salaries, wages, and other costs) is associated with investments that could reduce GHG emissions by 2020 and beyond. Figure 4 shows these GHG-beneficial projects. Even when including the MDTA, which is primarily funded through toll revenues and bonding capacity, the share is approximately 63 percent. Overall, \$4.786 billion of the six-year capital program (37 percent) is committed to projects that maintain and preserve Maryland’s multimodal transportation system.

Compared to the FY 2018 – FY 2023 CTP, the FY 2019 – FY 2024 CTP sets aside \$1.475 billion more funding for GHG-beneficial projects. Excluding the MDTA, \$7.077 billion are planned for GHG-beneficial capital projects. Including the MDTA, that amount increases to \$7.977 billion.

**Figure 4. FY 2019-2024 CTP GHG-Beneficial Projects in the Major Capital Program**



The successful maintenance, operation, and expansion of Maryland’s transportation system requires extensive coordination between MDOT and a diversity of federal, state, regional, and local partners. This coordination is extremely critical given the shared approach between multiple government agencies as well as private entities in delivering Maryland’s transportation system. Regulatory, financial, political, legal, and contractual matters, among others, create a



complex framework within which MDOT manages Maryland's transportation system. This framework guides how MDOT, other transportation planning agencies, and transportation service providers function. The consideration of climate change is one of many factors embedded within this framework.

More than any other sector, the performance of Maryland's transportation system as well as MDOT's ability to maintain and enhance the system, is influenced by social, technological, and economic trends (including fuel prices, which have a significant impact on travel activity). Emerging trends toward a "sharing economy" in transportation, vehicle technology, fuel advancements including electric and autonomous/connected vehicles, and changing logistics and supply chain patterns will greatly impact use of the transportation system. These trends will considerably shape Maryland's ability to reduce GHG emissions from the transportation sector over the coming decades. In many cases Maryland, and MDOT specifically, has little control in how these trends will play out.

## **The Role of Transportation in Maryland GHG Emissions**

According to the State of Maryland 2017 Greenhouse Gas Emission Inventory, shown in Figure 5, the transportation sector in 2017 accounted for 38 percent of the statewide emissions (34 percent on-road and 4 percent non-road). This increase in share from 34 percent to 38 percent is attributable to several factors, including high VMT growth relative to other economic sectors and methodology changes.

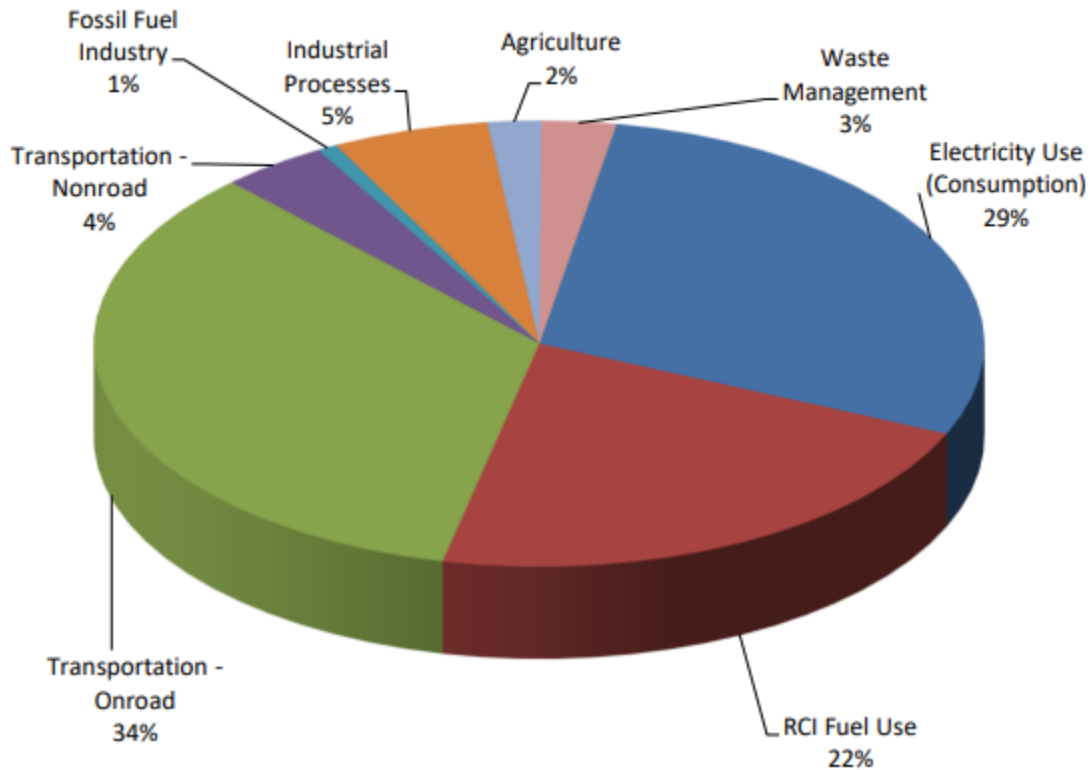
The Maryland Greenhouse Gas Emission Inventory shows that total GHG emissions decreased by 18% between 2014 and 2017. As total GHG emissions have fallen the percentage of statewide emissions originating from traffic has increased due to GHG emissions dropping in other sectors more rapidly than GHG emissions from the transportation sector ([Maryland Periodic GHG Emissions Inventory 2014 & 2017](#)).

The 38 percent share for the transportation sector can be partially attributed to the extensive pass-thru transportation in Maryland, resulting in a higher emissions impact proportional to Maryland's economy. In fact, 24 percent of daily auto VMT and 50 percent of daily truck VMT has at least one point, origin or destination, outside of Maryland. Due to the significant amount of VMT passing entirely through Maryland or originating/ending outside of Maryland not all transportation emission reductions can be achieved by MDOT and other state agencies.

MDOT programs can directly impact GHG emissions from on-road vehicles. Levers to impact emissions from aviation, marine, rail, and non-road sources are indirect and primarily focus on operations within the boundaries of the Port of Baltimore and Maryland's airports. MDOT has limited influence over the remainder of commercial operations where most of the emissions occur.

Overall Maryland's GHG emissions are trending in the right direction. While it is true that transportation GHG emissions rose to 38% in 2017 the total Maryland GHG emissions are still in line to meet the emission reduction goals outlined in the GGRA. Part of this can be attributed to fleet turnover time which often lags behind more immediate GHG reduction strategies found in other sectors. It takes time to replace older fleet vehicles with newer more fuel-efficient vehicles.

Figure 5: 2017 GHG Emissions by Sector, State of Maryland 2017 GHG Inventory



Source, MDE's 2017 Inventory

## Understanding and MDOT Reporting Approach

The Act requires submission of an annual report by each department reflecting progress toward meeting the GGRA goals. MDOT's 2019 Status Report includes the following sections:

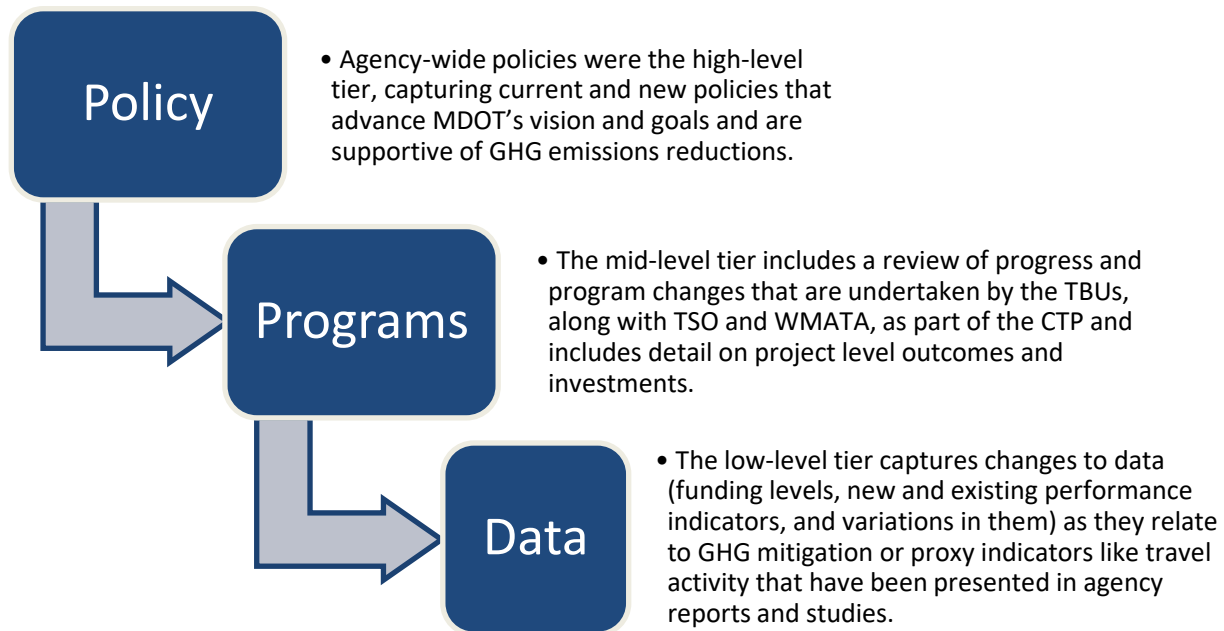
- **Introduction** – A general summary of MDOT's role and climate change-related planning efforts to date.
  - The introduction reads as follows: 2-1305(A)(1) "EACH STATE AGENCY SHALL REVIEW ITS PLANNING, REGULATORY, AND FISCAL PROGRAMS TO IDENTIFY AND RECOMMEND ACTIONS TO MORE FULLY INTEGRATE THE CONSIDERATION OF MARYLAND'S GREENHOUSE GAS REDUCTION GOAL"
- **Impacts of Climate Change/Climate Adaptation** – A description of each TBUs efforts regarding transportation system adaptation to climate change and resiliency planning.
  - This section generally addresses: 2-1305(A)(2) "THE REVIEW SHALL INCLUDE THE CONSIDERATION OF: (I) SEA LEVEL RISE; (II) STORM SURGES AND FLOODING; (III) INCREASED PRECIPITATION AND TEMPERATURE; AND (IV) EXTREME WEATHER EVENTS."

- This section also generally addresses annual status reporting required in 2-1305(C)(1) & (2) as it relates to MDOT's efforts to incorporate climate change considerations into planning, regulatory, and fiscal programs.
- **Annual Status Report on Actions to Support Maryland's GHG Reduction Efforts** - This section includes four status reports for the policy options associated with the transportation sector in the 2015 GGRA Plan. Each of the four status reports - Transportation Technologies, Public Transportation, Pricing Initiatives, and Other Innovative Transportation Programs - report on accomplishments and ongoing actions to support GHG emission reductions.
  - This section generally addresses: 2-1305(C)(1) & (2) "REPORT ANNUALLY ON THE STATUS OF PROGRAMS THAT SUPPORT THE STATE'S GREENHOUSE GAS REDUCTION EFFORTS OR ADDRESS CLIMATE CHANGE"

### 2019 Annual Status Report Summary

Updates to the annual status reports followed a tiered review approach. Three tiers of review were conducted to account for full scope of activities in 2019 - policy, programmatic, and data.

**Figure 6. Annual Status Report Approach**



Successes highlighted in each status report document feature MDOTs ongoing commitment to a multimodal and multifaceted approach to mitigating GHG emissions including plans, programs, and projects that will support GHG emission reductions across Maryland through 2020 and beyond.

2019 Status Report Accomplishment Highlights	
<b>Adaptation and Resilience</b>	The MDOT State Highway Administration (SHA) developed a statewide coastal vulnerability ArcGIS Online viewer. Data from the vulnerability viewer enable consideration of risk into all aspects of planning, programming, and project development to ensure resilient and reliable transportation. Vulnerability assessment data is available for counties to utilize and has been incorporated into county reports that will provide roadway vulnerability information for all state and locally maintained roads. A second pilot study for the Federal Highway Administration (FHWA) was created to develop processes that would integrate extreme weather and climate risk into asset management and planning.
	MDOT Maryland Transit Administration (MTA) Environmental Planning Division (EPD) is updating the climate change focused Vulnerability Plan developed in 2016. This update will utilize refined findings in the development of adaptation measures and resiliency planning.
<b>Transportation Technologies</b>	MDOT's leadership of the Zero Emission Electric Vehicle Infrastructure Council (ZEEVIC) continues to build opportunities, financial incentives, and promotion of the purchase of EVs and the installation of electric vehicle supply equipment (EVSE) to support the State's EV goals. As of September 31, 2019, the total battery-electric and plug-in hybrid electric vehicles registered in Maryland is 22,144. There are also 628 publicly accessible charging stations and 1,785 publicly accessible charging outlets throughout Maryland as of September 31, 2019.
	MDOT SHA's investment into a "progressive" design-build approach to improve reliability and reduce congestion in the I-270 corridor is an example of a project that will utilize innovative and technology focused approaches to manage congestion.
	MDOT SHA's Coordinated Highways Action Response Team (CHART) program continues to yield substantial GHG reductions associated with the efficient management of incidents, traveler information, and other on-road infrastructure technologies that reduce delay.
<b>Public Transportation</b>	The launch of BaltimoreLink in June 2017 provided more people with faster and more reliable access to transit, jobs, and services in the region. Since the launch of BaltimoreLink, on-time performance (OTP) has dramatically improved to a high of 71.4% in March 2019. Over five miles of dedicated bus lanes are producing an average travel time savings of nine percent, with up to 31 percent travel time savings in some corridors.
	Supported by two Transportation Investments Generating Economic Recovery (TIGER) Grant awards from United States Department of Transportation (USDOT), MTA is working with Baltimore City to deliver the North Avenue Rising project and Montgomery County to deliver the US 29 Bus Rapid Transit (BRT) project. Both projects will provide enhanced and more efficient transit options in these critical corridors. As of the 2018-2023 CTP, planning and design is underway for the North Avenue Rising project while stakeholder coordination continues for the US 29 BRT project.

<b>Transportation Pricing</b>	MDOT MTA continues to work with Maryland’s metropolitan planning organizations (MPOs), major employers, and universities to expand transportation emission reduction and monitoring (TERM) programs, aimed at providing commuters and students access to financial incentives and information to support ridesharing and transit use.
	MDTA continues to update the technical capabilities and efficient operations of toll facilities, including strategic planning and procurement of new tolling hardware and software which supports an eventual shift to all-electronic tolling.
<b>Bicycle and Pedestrian</b>	In the FY2019–2024 CTP, there is over \$175 million programmed to bicycle and pedestrian investments, including ongoing support of Maryland’s bikeways and bikeshare programs.

### Actions and Recommendations

Throughout 2018 and early 2019, MDOT has worked on developing the Draft 2018 GGRA Plan focused on the 40 by 30 goal. This process included:

- Stakeholder input into 2030 strategy selection and evaluation;
- Considerations for cross-sectoral consistency in assumptions, particularly regarding land use and development;
- Alignment of statewide input and methodology with federal guidelines;
- Continued evaluation of best available statewide inputs to emission modeling processes including areas not covered by MPO travel models;
- Estimation of strategy co-benefits including social equity, public health, and other environmental benefits; and
- A workshop with MDOT and partner agency staff, including MCCC and Mitigation Work Group members to present the process and findings.

MDOT will continue to work closely with State and local partners, as well as stakeholders, on the development of the Final GGRA Plan.

## Climate Change Adaptation and Resilience

### Program Description and Objectives

Throughout 2019, MDOT continued to participate on the Adaptation and Response Working Group (ARWG) of the MCCC and to coordinate with other state agencies to develop vulnerability assessments and resiliency plans to address the current and future impacts of climate change on the transportation network.

TBU	Accomplishments
<b>MDOT State Highway Administration</b>	The MDOT State Highway Administration (SHA) developed a statewide coastal vulnerability ArcGIS Online viewer. Data from the vulnerability viewer enable consideration of risk into all aspects of planning, programming and project development to ensure resilient and reliable transportation. Vulnerability assessment data is available for counties to utilize and has been incorporated into county reports that will provide roadway vulnerability information for all state and locally maintained roads. A second pilot study for the Federal Highway Administration was developed to develop processes that would integrate extreme weather and climate risk into asset management and planning.
<b>MDOT Maryland Transit Administration</b>	In view of more refined and up-to-date projections for sea level rise, flooding and hurricane storm surge data sets, the MDOT Maryland Transit Administration (MTA) Environmental Planning Division (EPD) is updating the climate change focused Vulnerability Plan developed in 2016. This update will utilize refined findings in the development of adaptation measures and resiliency planning. Implementation of the adaptation measures will provide security and resilience for the agency assets identified as susceptible to sea level rise, hurricane storm surge, and flooding events.
<b>MDOT Maryland Port Administration</b>	<p>The MDOT Maryland Port Administration (MPA) began development of a resilience program for climate change with its 2010 vulnerability assessment of port infrastructure and has incorporated several Coast Smart best management practices (BMPs) into design engineering for new terminals, structures, and dredged material management facilities.</p> <p>A significant portion of the MDOT MPA’s terminals and facilities are in the 100-year flood plain and subject to impacts of climate change, including frequent and severe rain events. Although it would be both disruptive to operations and cost prohibitive to attempt to raise facilities, MDOT MPA will include enhanced resiliency when undertaking new construction or rehabilitation of existing facilities. In 2018, for example, MDOT MPA studied existing storm water management infrastructure as part of a berth reconstruction plan at Dundalk Marine Terminal (DMT) to identify potential improvements that could be implemented concurrently to enhance terminal resilience and adaptation. As a result, a multi-phase plan was developed to protect cargo at the terminal from flooding due to severe rain events, sea level rise and storm surge.</p>
<b>MDOT Maryland Aviation Administration</b>	Over the past few years, MDOT Maryland Aviation Administration (MAA) participated in the development of the Coast Smart Construction Guidance through the Coast Smart Construction Council. During the meeting process, MDOT MAA received sea level rise/inundation mapping from the Maryland Department of Natural Resources (DNR), and included the 2-foot, 5-foot, and 10-foot projected sea level rise as a layer superimposed on the Airport Layout Plan (ALPs) for Martin State Airport to assist with future planning efforts.



TBU	Accomplishments
<b>Maryland Transportation Authority</b>	MDTA is continuing to develop a framework that creates the process and methodologies to support in identifying vulnerabilities as well as developing adaptation measures for improved infrastructure resiliency. This framework can be used for a variety of climate stressors including sea level rise, storm surge, temperature, precipitation, and extreme weather events.
<b>MDOT The Secretary's Office</b>	MDOT The Secretary's Office (TSO) continues to be an active member of the ARWG as well as the Coast Smart Council. During the 2018 Legislative Session, MDOT TSO and MDOT SHA provided input and technical support for proposed changes to the application of Coast Smart siting and design criteria. MDOT has committed to working with the Maryland Department of Natural Resources to establish coast smart siting and design criteria to address sea level rise inundation and coastal flood impacts on State and local projects.

## Implementation Activity

Each MDOT TBU has documented actions to improve transportation network resiliency to climate change.

### MDOT State Highway Administration

- Completed the MDOT State Highway Administration (SHA) coastal vulnerability assessment for 14 Counties and Baltimore City. The coastal assessment includes data on flood depth grids for 2015, 2050, and 2100 containing two sea level measures (Mean Sea Level and Mean Higher High Water) and five storm scenarios, 10%, 4%, 2%, 1%, 0.2%.
- Worked with Salisbury University's Eastern Shore Regional GIS Cooperative to develop a storm surge model based on actual impacts from Hurricane Florence in North Carolina.
- Worked with the Office of Structures, Highway Development, Planning, and Coordinated Highways Action Response Team (CHART) to determine use and integration of vulnerability data into consideration for design, performance, and operations and document in the pilot study for the Federal Highway Administration (FHWA).
- Participating on the Coast Smart Council workgroup to develop Nuisance Flood Plan guidance for local governments.
- Created a data driven methodology to review flooded roadway segments in the coastal areas for both state and local facilities.

### Maryland Transportation Authority

- Coast Smart recommendations are considered and incorporated into design during drainage repair projects and new state projects, most recently the Nice Bridge.
- Floodplain and sea level rise layers are included in MDTA GIS data. Using this data, MDTA assessed, at high-level, the vulnerability of its nine maintenance facilities for sea level rise, storm surge, precipitation, and temperature for years 2050 and 2100. This vulnerability assessment provided insight on the potentially most vulnerable assets. Overall, this study can provide MDTA with planning level information needed to prioritize and allocate resources.

- MDTA includes the 2050 and 2100 sea level rise mapping into NEPA/MEPA review of projects.

### **MDOT Maryland Transit Administration**

The Maryland Transit Administration (MTA) Environmental Planning Division (EPD) is updating MDOT MTA's Climate Change Vulnerability Assessment with the latest projections for sea level rise, flood events, and hurricane storm surge to refine the 2016 identification of infrastructure and assets vulnerable to these events. Adaptation of the high-risk locations will be conducted through MDOT MTA's Asset Management Planning and system preservation program.

- EPD is updating the GIS dataset developed on the previous Vulnerability Assessment plan, which includes all MDOT MTA assets, current and planned. Layers within the dataset outline the potential impacts of sea level rise at 2-, 4-, and 6-feet above mean sea level. In addition to identifying vulnerable assets, the layers outline core transit routes and locations where these routes will be impacted by each of the scenarios.
- MDOT MTA will incorporate 2050 and 2100 sea level rise mapping in its conceptual planning for capital projects to ensure relevant design criteria, as outlined in the Maryland Coast Smart Construction Program, and will be taken into consideration in preliminary engineering.
- MDOT MTA is developing a toolkit to provide a menu of short-term and low-investment solutions to address and protect the identified high-risk locations. The toolkit will count with the input provided by the different modes and divisions (i.e., Engineering) within MDOT MTA.
- MDOT MTA's infrastructure impacted by extreme weather events is inspected, maintained and replaced through the agency system preservation program. For example, MDOT MTA addressed different light rail locations suffering progressive erosion and stabilization problems due to rain events and washouts, such as Twin Oaks area, North Linthicum chain marker SW 309, Warren Road chain marker NE 760, and Industry Lane grade crossing chain marker NW 742.

### **MDOT Maryland Port Administration**

Resiliency measures are being implemented at the Port of Baltimore. The list below demonstrates the variety of projects that ensure flood resistant infrastructure and reduce the Port's carbon footprint.

- Evaluating and improving stormwater management conveyance infrastructure
- The new Inventory Control Building at Dundalk Marine Terminal (DMT) was elevated to +10 ft. (elevate).
- Forced main storm water vaults were installed at DMT Lot 304 and at C Street to prevent rain-event flooding (mitigate).
- Improved DMT Lot 304, DMT 11/12 deck and heavy lift pad, FMT Berth 3, DMT Berth 4 with durable concrete mix and corrosion-resistant reinforcement (mitigate)



- Filling and raising the elevation of the FMT Wet Basin and South Locust Point Fruit Slip as much as possible yet allow for cargo operations seamlessly with adjacent lots.
- Installed two forced main storm water vaults at DMT to prevent recurrent flooding due to frequent and severe rain events.
- Installed computer-controlled high mast lighting on marine terminals to reduce electrical consumption.
- Upgraded lighting, occupancy sensors, and programmable thermostats at MPA facilities.
- Installed an energy management control system and HVAC upgrades at the World Trade Center.
- Converted a fuel oil HVAC system at Building 91A, DMT, to a natural gas HVAC system.

To ensure continuity of operations during an emergency, MDOT Maryland Port Administration (MPA) installed backup generators at key MDOT MPA facilities, including security, maintenance, and operations. To avoid flooding impacts, these generators were placed at elevations of +10 feet.

#### **MDOT Maryland Aviation Administration**

- MDOT Maryland Aviation Administration (MAA) is the owner of Martin State Airport, where a tenant added a small addition to an existing building in the 10-year inundation area. There have been no other projects at Martin State Airport that have occurred in areas of projected sea level rise/inundation.
- BWI Marshall continues to modernize its fleet of shuttle buses, with several new 60-foot articulated, “clean diesel” busses providing round-the-clock transportation between the terminal, parking facilities, and BWI Rail Station. These buses provide increased capacity and improved comfort and amenities for the customers thus helping BWI Airport remain “The Easy Come, Easy Go Gateway to the Washington-Baltimore Region.”

#### **MDOT The Secretary’s Office**

- MDOT The Secretary’s Office (TSO), in partnership with the Maryland Department of Natural Resources (DNR) and the U.S. Army Corps of Engineers (Baltimore District), have initiated a study to investigate solutions for coastal storm risk management in the tidally influenced Baltimore metropolitan area.

### **Enhancement Opportunities**

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

#### **MDOT State Highway Administration**

- Integration of the coastal vulnerability data into asset management and project development.

- Participating with the “Maryland Resiliency Partnership” in collaboration with MDE, Maryland Emergency Management Agency (MEMA), Federal Emergency Management Agency (FEMA), and the DNR.
- Integrating system resiliency into the current planning processes by utilizing vulnerability data in development of a highway project prioritization tool.
- Piloting studies with the Transportation Research Board (TRB) under the National Cooperative Highway Research Program related to future precipitation and translation of forecasted weather to impact projections.
- Coordinating with other states and participating in TRB and American Association of State Highway and Transportation Officials (AASHTO) research to remain on the cutting-edge regarding climate resiliency and adaptation.

#### **Maryland Transportation Authority**

- MDTA will utilize the vulnerability data of nine maintenance facilities to inform the prioritization and allocation of resources.

#### **MDOT Maryland Transit Administration**

- Utilizing updated information from MDOT MTA’s Climate Change Vulnerability Assessment to develop and implement mitigation or adaptation measures at sites identified as a high- or very high-risk to MDOT MTA services.
- Developing cost estimates to complete adaptation measures in coordination with relevant state agencies, including the MEMA.
- Integrating updated results of the Climate Change Vulnerability Assessment into the agency’s Environmental and Sustainability Management System (ESMS), Asset Management Plan and system preservation program as appropriate.

#### **Maryland Port Administration**

- Developing robust GIS and engineering tools to help estimate risks, vulnerabilities, and costs.
- Considering feasibility of incentives to partners/tenants to help reduce GHG emissions, for example clean diesel, dray replacements, new technologies, etc.
- Raising the elevation of the land surrounding reconstructed berths at DMT was deemed infeasible, so MDOT MPA completed a study to determine the best approach for mitigating potential future impacts from climate change and severe weather events, particularly extreme rain and flooding. A multi-phased upgrade to the storm water management system and a system of storm surge barriers is currently being designed as an alternative that would help protect all 575-acres of DMT, and the valuable cargo that crosses the terminal. Updating emergency preparedness plans periodically, including tenant notification SOPs and coordinated cargo moves to higher locations.
- Stockpiling and reuse of dredge materials for use in raising terminals and other land/infrastructure projects.

- Initiating a study to determine carbon sequestration in the created wetland/coastal ecosystems at Hart Miller Island.
- Sponsored a workshop entitled Use of Dredged Material to Protect Low-Lying Areas of the Chesapeake Bay with the University of Maryland Center for Environmental Science (UMCES) to enhance understanding of vulnerable areas around the bay, and the state of technology for using dredged material to increase resiliency and help protect these areas.
- Continuing to provide technical assistance to the Turner Station Conservation Teams' effort to advance the Fleming Park shoreline restoration project. The conceptual design involves using dredged material to restore/create wetlands as well as an eroded shoreline as targeted climate change resiliency measures.
- Investigating the possible reuse of up to 23,000 CY of dredged material in a brownfield restoration project that will remediate a contaminated shoreline and provide enhanced green space along the Middle Branch of the Patapsco River.
- Undertaking a GHG emission inventory and footprint analysis for MPA terminals.

## **Funding**

MDOT SHA has a dedicated position to develop vulnerability studies and integrate infrastructure resiliency throughout the agency, as well as manage GHG and energy reduction efforts. State DOTs are required to develop risk-based Transportation Asset Management Plans (TAMPs) in the fulfillment of Moving Ahead for Progress in the 21<sup>st</sup> Century (MAP-21) requirements (23 U.S.C. 119(e)(1), MAP-21 § 1106). In addition, the most recent surface transportation law, the Fixing America's Surface Transportation (FAST) Act (23 CFR 450.306) requires improved resiliency and reliability of the transportation system. MDOT SHA addresses these requirements by incorporating vulnerability data into the asset management program. MDOT SHA can use FHWA Federal-Aid Highway funding for the State Planning and Research Program to accomplish this work as well as grant opportunities from FHWA.

FEMA/MEMA grants may be an option for MDOT projects. MDOT MTA has been in consultation with MEMA to identify adaptation and resiliency projects eligible for funding. MDOT MTA has also dedicated positions to develop asset management, sustainability, and resiliency plans, and coordinate their findings through the agency's ESMS. MDOT MTA can use Federal Transit Administration (FTA) formula funding to support this effort.

MDOT TSO has agreed to the role of "Non-Federal Sponsor" for the City of Baltimore Coastal Storm Risk Management Study and shall provide funding to support preparation of the project management plan and 50 percent of the shared study costs in accordance with the provisions of the MDOT agreement with the Department of Army. This agreement was executed in August 2019.

## **Challenges**

MDOT is in various stages of resiliency work. Because of the vulnerability assessments and time required to implement systemic organizational change, some TBUs are still planning and others are already implementing adaptation measures. The increased cost of adaptation is unknown for

many projects at this time; however, the vulnerability assessments are ongoing and provide data for the determination of adaptation needs.

While infrastructure adaptation may increase costs, it could also increase the life span, improve reliability, and reduce maintenance requirements for the infrastructure. It is important to consider and quantify all benefits now and in the future. MDOT is thoughtfully approaching the challenges of evaluating and changing current practices. Utilization of new technologies and procedures need to be evaluated and considered in construction, engineering, planning, and operations and maintenance that can reduce potential impacts from extreme weather events and sea level rise. New procedures may also include the use of natural or nature-based features that can provide the benefit of coastal resiliency while also providing carbon sequestration benefits.

## GGRA Program Status – Transportation Technologies

### Program Description and Objectives

Transportation technologies continue to represent the most significant opportunity to reduce GHG emissions from the transportation sector. Accelerating progress in on-road vehicle technology, fuels, and intelligent transportation systems (ITS), which improve system efficiency, is having a measurable impact on major travel indicators and GHG emissions.

State and federal initiatives that set fuel economy standards and reduce tailpipe emissions of light-duty and medium- / heavy-duty vehicles include:

- The Maryland Clean Car Program that incorporates the California low emission vehicle (LEV) standards and zero emissions vehicle (ZEV) mandates;
- Corporate Average Fuel Economy Standards (CAFE) for light-duty model years 2008-2011;
- The National Fuel Economy Program – Phase 1 for model years 2012 to 2016; Phase 2 for model years 2017 to 2025;
- Medium-/Heavy-Duty Vehicle Standards (trucks, buses, and trailers) – Phase 1 for model years 2014 to 2018; Phase 2 for model years 2018 to 2027; and
- Federal Renewable Fuels and Tier 3 Fuel Standards.

Maryland is also taking a proactive role in promoting the adoption of on-road technologies that can have life-saving benefits as well as GHG benefits. In addition to chairing the Zero Emission Electric Vehicle Infrastructure Council (ZEEVIC), MDOT also leads a workgroup dedicated to ensuring that connected and automated vehicle (CAV) technology is deployed safely and thoughtfully on Maryland’s roads.

MDOT’s CHART program utilizes ITS technologies to enhance travel, reduce traffic congestion, and address capacity inefficiencies that contribute to GHG reductions. This work includes the deployment of cameras, traffic detectors, weather sensors, dynamic message signs, traffic websites, and telecommunications networks.

### Implementation Milestones

- Based on the annual reporting for CHART, the program’s efforts cleared almost 30,000 incidents and assisted approximately 44,000 stranded motorists on Maryland roadways. The program contributes to improved mobility, reliability, and safety by efficiently responding to incidents,

ANNUAL CHART BENEFITS (REDUCTIONS)	
Delay:	38.6 million vehicle hours
Fuel:	7.2 million gallons
GHG:	65,400 metric tons
Cost:	\$1.5 billion

reducing the duration of the incident, and coordinating with emergency response agencies. The effectiveness of CHART in detecting and managing incidents provides measurable benefits in delay, fuel consumption, emissions reductions, and cost savings.

- Environmental Protection Agency’s (EPA) annual GHG Performance Report formally documents the status of auto manufacturer’s compliance with the GHG fuel economy standards that took effect in the 2012 model year. Findings show that:
  - New vehicle estimated real-world CO2 emissions are at a record low and fuel economy is at a record high
  - Manufacturers have made significant improvements in fuel economy and CO2 emissions over the last 5 years
  - Sport utility vehicles (SUVs) continue to gain market share, with truck SUVs achieving record low CO2 emissions and record high fuel economy
  - All large manufacturers are in compliance with the GHG standards through the 2017 model year
  - Average new vehicle fuel economy and horsepower continue to increase, while weight remains constant
  - Manufacturers continue to adopt a wide array of advanced technologies
  - The automobile industry continues to innovate, improve, and meet the GHG standards
- MDOT continues to be an active participant on the AASHTO Committee on Environment and Sustainability, Air Quality, Climate Change, and Energy Subcommittee and the Clean Vehicles and Fuels Workgroup of the Transportation Climate Initiative (TCI).
- Maryland is emerging as a national leader in CAV technology and is building on this progress by developing CAV strategic plans that document opportunities, challenges, priorities, strategies, and recommendations to help guide the State in planning and implementing CAV technology. MDOT led the effort to finalize an official Maryland Vision for CAV and MDOT Strategic Plan.

### **Maryland’s Zero Emission Electric Vehicle Infrastructure Council**

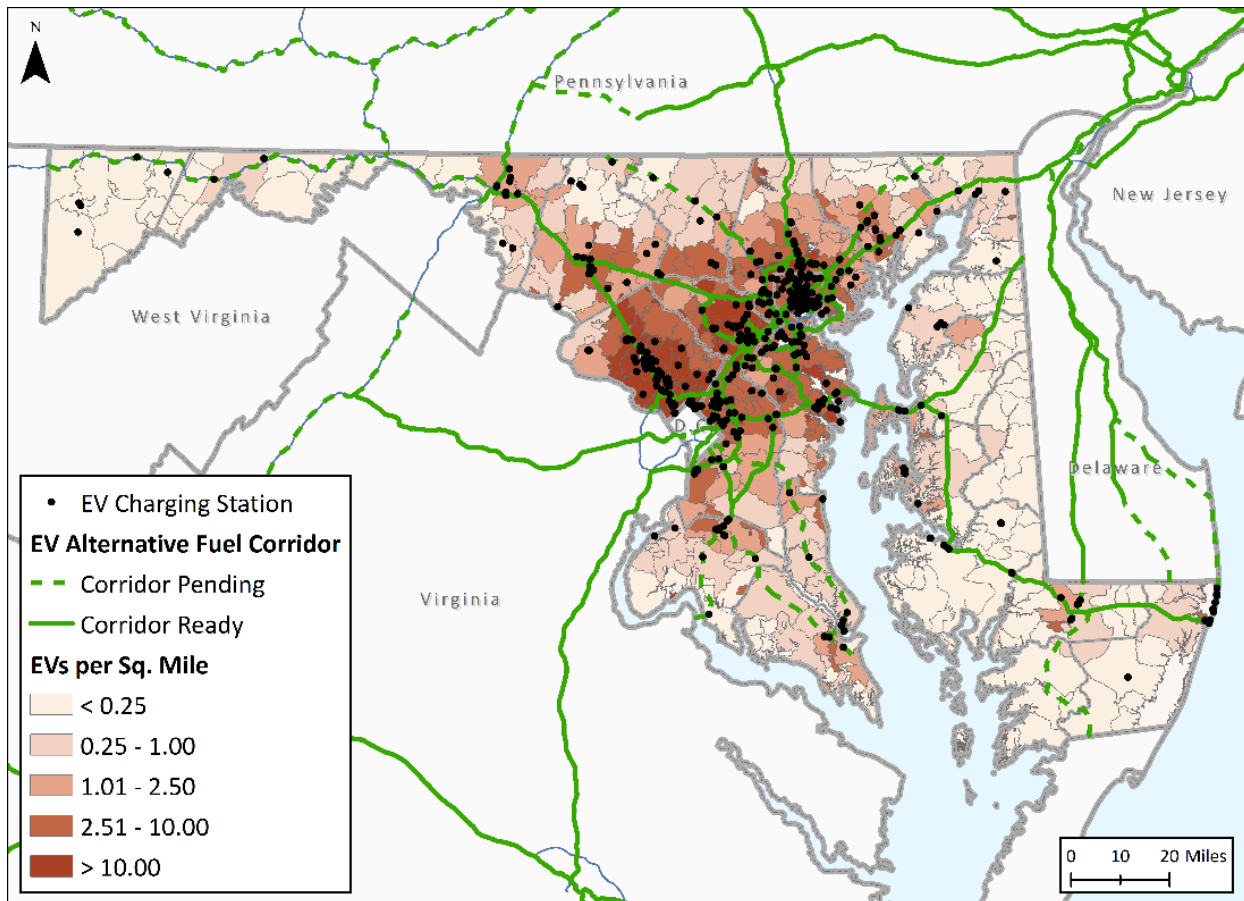
MDOT continues to lead the ZEEVIC, a legislatively established body, comprised of a diverse group of stakeholders whom are dedicated to attaining Maryland’s zero emission vehicle and supporting infrastructure goals. MDOT’s leadership of ZEEVIC builds opportunities, financial incentives, and promotion of EVs, and the installation of EVSE to support the State’s EV goals. Due to the passage of the Clean Cars Act of 2019, (HB 1246) the council was renamed the Zero Emission Vehicle Infrastructure Council (ZEEVIC). The new council seeks to focus on all zero emission vehicles including electric and hydrogen fuel cell vehicles.

ZEEVIC has made progress on several vital initiatives and is continuing to work on removing barriers to the adoption of EVs. In 2018, Maryland’s work was recognized by the Electrification Coalition, which designated Maryland as a top tier or Tier 1 EV state when they issued their inaugural [ZEV Scorecard](#). Maryland was second only to California and was ranked highly for work on incentives, publicly available EVSE, and public outreach.

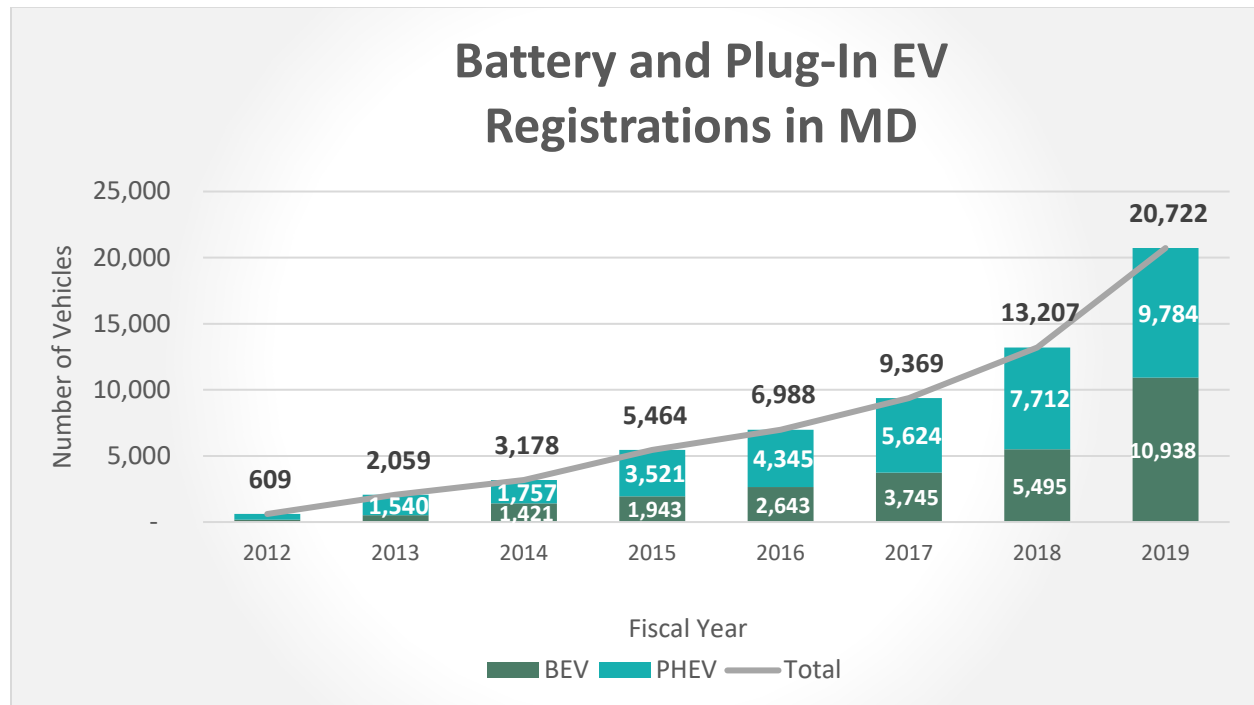
- In April 2019, US 1, I-97, I-795, MD 140, MD 32, MD 100, MD 4, MD 5/MD 235, US 13, and MD 528 were designated as EV Charging Corridors. As of 2019, Maryland now boasts over 1,000 centerline miles of EV Charging Corridors under the designation approach within the FAST Act.
- MDOT's public outreach efforts have included direct public outreach to over 3,600 Maryland citizens in 12 counties. The direct outreach efforts are tracked, along with the total EV registrations and publicly available charging infrastructure, on [MDOT's updated ZEEVIC website](#).
- MDOT is also working to complete an EV Signage Plan, focusing first on the acquisition, installation, and maintenance of EV signage on Maryland's FHWA designated alternative fuel corridors.

Figure 7 illustrates the existing electric vehicle ownership, available charging infrastructure, and the alternative fuel/EV corridors as of June 2019. Detailed and current monthly data can be found on ZEEVIC's website. Figure 8 demonstrates the continued growth of EVs in Maryland since 2012. Even as the number of registered EVs grows exponentially, attaining the State goals remains a challenge.

**Figure 7: Existing Maryland Electric Vehicle Density and Charging Station Locations**



**Figure 8: Existing Maryland Battery and Plug-In Hybrid Electric Vehicle Registrations**



### Renewable Energy

- MDOT continues to lead the way in renewable energy: MDOT issued Master Services Agreements (MSAs) to six qualified contractors to design, construct, commission, finance, operate, and maintain photovoltaic (PV) energy facilities at MDOT locations throughout Maryland. The MSAs provide MDOT with the flexibility of developing PV energy systems quickly and efficiently. The GHG benefit has increased by 10 percent over the last year and resulted in 15 metric tons of reductions.

**Table 1: MDOT Renewable Energy Facilities**

Solar and Wind Technologies - Lifetime Totals (as of October 2019)				
	Capacity (kw)	Generation (kWh)	CO2 (lbs)	Install Date
MAA	505	4,550,000	13,747,825	Sep-11
MDTA	---	178,360	278,063	Apr-13
MPA (Cruise Terminal)	249.6	1,970,000	5,944,922	Aug-12
MPA (Shed 10)	505.44	2,630,000	7,947,059	Aug-12
MTA	535.39	4,080,000	12,324,820	Feb-12
<b>Total:</b>	<b>1795.43</b>	<b>13,408,360</b>	<b>40,242,689</b>	-

- The RFP allows Maryland Counties, municipalities, instrumentalities of the State, and other non-State of Maryland governments or government agencies and not for profit 501 (c) (3) organizations within the State of Maryland to use MDOT's Master Solar Contract to install



PV systems on their properties. Numerous organizations within the State of Maryland have already contacted MDOT to inquire about how they can use the contract.

## Enhancement Opportunities

Technology innovations are the largest contributor to GHG reductions for the transportation sector. Maryland, and other leadership states, have played an active role in encouraging technological advances and more stringent national standards.

- MDOT encourages continued 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. The evaluation effort should include consideration of safety, congestion, and equity issues including public health, economic, and workforce impacts.
- Through the State Agency Working Group of ZEEVIC, MDOT will continue to review state fleet procurement procedures and practices and provide direction on procurement of EVs and other ZEVs, and associated charging/filling station installation guidance and targets by October 2019.
- The Maryland Public Service Commission (PSC) initiated PC44 to launch a targeted review of electric distribution systems in Maryland. As a result of PC44, utilities in Maryland have been granted approval by the PSC for the installation of over 5,000 EV chargers statewide. MDOT will continue to work with the utilities, the PSC, and our State, local, and federal partners to ensure the strategic, sustainable, and reliable installation of EV charging infrastructure in Maryland.
- Ensuring that adequate infrastructure is in place for emerging technologies such as EVs and CAVs will require continued collaboration across the region and the nation. MDOT will continue to participate in regional discussions, such as the TCI Clean Vehicles and Fuels Work Group and in discussions taking place at the national level through AASHTO and the TRB.
- For the light-duty fleet beyond the 2025 national fuel economy standards, MDOT encourages EPA and National Highway Traffic Safety Administration (NHSTA) to continue promoting more stringent fuel economy standards.
- Technology enhancements in the non-road sector (construction equipment, port and airport support vehicles, locomotives, and marine engines) could result in additional GHG reductions. MDOT MPA has replaced 173 Drayage Trucks with an ongoing goal to replace 50 trucks per year and continues to progressively pursue DERA grants to replace or repower diesel engines, marine vessels, and cargo handling equipment. MDOT MAA proactively incorporates alternative fueled buses and is adjusting their shuttle bus fleet requirements and reducing the fleet from 75 to 65 coaches.

## Funding

The transportation technology standards are implemented by the vehicle manufacturers at no cost to the State. There may be additional costs to the consumers purchasing new vehicles, but the costs can be offset by reduced fuel costs over the life span of the vehicle.

In the near-term, Maryland will continue to invest in EV and EVSE incentives. Under the federal Volkswagen Settlement, Maryland has submitted proposals and is seeking opportunities to enhance EVSE availability through the National ZEV Investment Plan and the Maryland Volkswagen Mitigation Plan.

MDOT has committed \$16.3 million for FY 2019 and \$117.5 million over the next six-years to improve, maintain, and enhance the CHART program with on-road operational technologies and strategic capacity/operational enhancements. In total, in the 2019-2024 CTP, MDOT estimates that \$330.2 million is committed to projects that will enhance transportation technologies, including CHART, or relieve critical bottlenecks at intermodal facilities, which will result in overall better management and operations of Maryland's multimodal transportation system, particularly for medium- and heavy-duty freight vehicles.

In addition, in the 2019-2024 CTP, \$1.93 billion is committed to MDOT SHA projects that relieve key bottlenecks on Maryland's roadway network through strategic capacity enhancements. In the short-term, these projects are expected to mitigate delay and the additional GHG emissions generated by inefficient and low-speed travel by passenger and commercial vehicles.

## Challenges

While technologies offer the most significant GHG emissions reduction potential for the transportation sector, the full potential of GHG benefits will not be fully achieved until the fleet turns over with newer fuel efficient and GHG-beneficial vehicles. The federal technology standards will not be fully implemented until model year 2025 for light-duty vehicles and model year 2027 for medium-/heavy-duty vehicles.

EPA issued a proposed rulemaking in August 2018, *The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021-2026 Passenger Cars and Light Trucks*. This rule will roll back the national fuel economy standards for post-2020 model years to 2020 standards. This will reduce the GHG benefits as the fleet continues to turnover. By freezing at the 2020 fuel economy standard, the fleet will not meet the 54.5 mpg equivalent standard by 2025. This could result in a loss of two million metric tons of GHG benefits in Maryland, assuming the manufacturers adjust production to address the lower standards. Many states, including Maryland have sued the EPA to block the weakening of vehicle emissions standards.

While MDOT has made significant progress in EV adoption and the installation of EVSE, the work is not complete. MDOT must continue to address known barriers to EV acceptance, including ensuring that charging is available to those who live in urban environments, multi-unit dwellings, or in homes governed by homeowner's associations.

## **Estimated Greenhouse Gas Reductions**

As noted in the introduction section, even as VMT has increased in Maryland by over 3.5 percent in 2018 compared to 2017, estimated on-road GHG emissions have continued to decrease, by 0.9 percent in 2018 from 2017, primarily due to transportation technologies.

## **GGRA Program Status – Public Transportation**

### **Program Description and Objectives**

Public transportation emits roughly 40 to 50 percent less GHG emissions per passenger mile than an average single occupancy vehicle (SOV). The programs in this policy option include transit initiatives that support a goal of increasing public transit ridership and intercity transportation initiatives that support MARC and other intercity transit services such as Amtrak, thus reducing VMT and GHG emissions.

MDOT works with metropolitan planning organizations (MPOs) and other local agencies in Maryland to implement projects aimed at advancing the multimodal transport system. These include transportation demand management programs (such as MDOT's Commuter Choice Maryland and MWCOC's Commuter Connections), transit-supportive enhancements including bicycle and pedestrian access projects, bicycle parking and bike racks on buses, and coordination with expanding bike share programs. There is an emphasis on improving service quality and reliability, better aligning of transit service to demand, and improved transit information dissemination to customers. MDOT MTA is also focused on sustainability and in moving towards a more efficient fleet.

### **Public Transportation Initiatives**

#### *Program Description and Objectives*

To maintain and enhance operations of the current public transportation system while strategically expanding services to support more Marylanders, systematic and coordinated actions are needed. These actions increase the availability, attractiveness, and convenience of public transportation, improve the operational efficiency of the system, and increase system capacity. Two results of this program are the Purple Line (under construction) and the BaltimoreLink transit system (implemented in 2017). Each of these projects address high priority operational and capacity goals within the densely populated Washington, D.C. and Baltimore metro regions. Ongoing actions include the implementation of innovative transit solutions such as transit signal prioritization, off-board payment, and grade-separated right-of-way.

Actions related to land use planning, including Maryland's commitment to transit oriented development (TOD), incentives for riding transit, and non-motorized access improvements are also necessary to continue to enable Maryland's residents and commuters to have safe, efficient, and affordable transportation options.

### **Intercity Transportation Initiatives**

#### *Program Description and Objectives*

Improvements to Maryland's intercity passenger transportation systems is one approach to addressing intercity mobility constraints. Improvements to MARC are helping to enhance connectivity, reliability, and access to intercity passenger rail, for both commuting and leisure trips for millions of Maryland residents, employees, and visitors. In addition, through

coordination with the Northeast Corridor Commission, the Federal Railroad Administration (FRA), and Amtrak, Maryland is supporting planning to address key bottlenecks to enhance the reliability of high-speed rail. This program overall includes the continued maintenance, operations, and expansion of intercity passenger rail, high-speed rail, and intercity bus services in Maryland as well as improved connections between air, rail, intercity bus, and regional or local transit systems.

MDOT MTA continues to work with CSX and Amtrak to improve infrastructure on the MARC Brunswick, Camden, and Penn Lines, including improved signals, track improvements, and station area enhancements, including at Baltimore Penn and Washington Union Stations. The launch of BaltimoreLink added and enhanced several commuter bus routes to improve regional mobility including connections between Baltimore and Annapolis as well as between Baltimore and Anne Arundel County.

## Implementation Milestones

Support for transit investments are presented in MDOT's annual capital program, the CTP. Highlighted projects recently implemented or planned through the CTP include:

- After the signing of a \$900 million Full Funding Grant Agreement and a \$5.6 billion Public Private Partnership (P3) contract, construction has begun in the Purple Line project corridor between Bethesda and New Carrollton. The Purple Line will include direct connections to Metrorail in four locations (serving three Metrorail lines), all three MARC Train lines, Amtrak, and local bus services. The segment between Bethesda and Silver Spring will include a parallel hiker/biker trail as well. This project will improve transit accessibility for anyone working in, living in, or visiting the Washington metro area while supporting economic development and reducing the environmental impact of transportation in the region. The Purple Line will have 21 stations. It will also connect to MARC, Amtrak, and local bus services and is projected to have 74,000 daily riders by 2040. The current construction timeline estimates a 2020 service opening.
- MDOT MTA was one of six agencies that received a Mobility On-Demand (MOD) On-Ramp program grant from the Shared Use Mobility Center. The On-Ramp program, part of a partnership with FTA, provides an opportunity for public transportation agencies and other transportation providers with promising MOD concepts to receive expert assistance to develop business plans and other project-building strategies. Through its MOD On-Ramp grant, MDOT MTA is developing a microtransit pilot to serve parts of the several large-scale industrial and retail job sites in Anne Arundel County. An RFP to solicit a vendor for this pilot will be issued in Fall 2019.
- Following 18 months of planning and public outreach, BaltimoreLink successfully launched on June 18, 2017. Key features of this enhanced service include essential connections to job centers and better integration between MDOT MTA transit services, such as CityLink, LocalLink, MetroLink, Light RailLink, and MARC. BaltimoreLink network is providing more people with access to transit, jobs, and services in the region with an estimated 130,000 additional people within a ¼ mile access to frequent transit operating every 15 minutes or less during peak and midday periods. Eleven percent more jobs are accessible within 30 minutes and BaltimoreLink added a number of public

schools, libraries, pharmacies, hospitals, and supermarkets to the frequent transit network. Although ridership on MDOT MTA transit services declined initially after BaltimoreLink was implemented it has since stabilized and is rebounding. On-time performance for MDOT MTA's core bus service rose from 59.5 percent prior to the launch of BaltimoreLink, to 71.4 percent in March 2019.

- Improved technologies supporting MDOT MTA bus system operations and reliability including automatic vehicle locator system deployment, enhancements to MDOT MTAs Central Control Center, and improvements and expansion to camera systems for safety and security. MDOT's 2019-2024 CTP includes a total of \$6.4 million for replacement of CAD/AVL systems as part of mobility improvements for FY 2018 and 2019.
- The "Beyond the Bus Stop" program is improving amenities for both riders and operators at bus stops around the network through adding real-time information signage and shelter improvements to bus stops, comfort stations for bus operators at Cedonia Loop and Patapsco Light Rail Station, and additional blue light phones at bus stops.
- MDOT MTA's construction program is undertaking an ongoing replacement and mid-life overhaul of Light Rail, Metro, and MARC rail cars to improve passenger comfort, vehicle reliability, and overall performance.
- MDOT MTA has a grant application and selection process for an upcoming Transit Innovation Grant aimed at incorporating innovative transit-related investments to modernize Maryland's transit options. It is a competitive, state-funded program to support locally planned, designed, and constructed or operated transit projects. Grant funds were awarded to Baltimore City for signage and maps, Cecil County to develop the Easy Pay Mobile Ticketing and Transfer System, Charles County to install security camera systems at two park-and-ride facilities, Howard County for the rollout of a modern mobile fare payment system for the Regional Transportation Agency of Central Maryland (RTA), and Queen Anne's County to purchase a scheduling software system.
- MARC BWI Rail Station upgrades and repairs will provide a more passenger-friendly station with additional seating and a new pedestrian overpass connecting the garage and station. Construction began in October 2018 and completion of the renovated MARC BWI Rail Station is anticipated in Fall 2019.
- MDOT in partnership with the Montgomery County Department of Transportation, conducted a corridor planning study to identify transportation needs and evaluate alternatives to accommodate high frequency, reliable Bus Rapid Transit (BRT) service on US 29 between Burtonsville Park and Ride and the Silver Spring Transit Center (approximately 14 miles). The study resulted in a successful joint application to the United States Department of Transportation's (USDOT) Transportation Investment Generating Economic Recovery (TIGER) program and a groundbreaking for the project was held in October 2018. Construction of the BRT service on US 29, known as the "Flash," is currently underway with operations scheduled to begin in 2020.
- MDOT and Baltimore City submitted a successful joint application to the USDOT's TIGER program to support a \$27.3 million program of improvements to the North Avenue corridor, in Baltimore City. The \$10 million from the TIGER grant compliments \$14.7 million in funds committed by MDOT, \$1.6 million from FHWA, and \$1 million from Baltimore City. The North Avenue Rising project is a unique suite of proposed

transportation investments intended to improve corridor and regional mobility and leverage these transportation improvements with other city, state, and private development initiatives to revitalize the surrounding area. The North Avenue Rising project includes dedicated bus lanes, new bike facilities, enhancing MTA Metro and Light Rail stations, targeted improvements at major bus stops, improved sidewalks, streetscaping, and needed roadway re-pavement along the corridor. Construction of this project will begin in Summer 2019 with completion anticipated by the end of the CY 2021.

- The Washington Metropolitan Area Transit Authority (WMATA) CIP includes \$1.8 billion of funding from Maryland to match federal formula funds received directly by WMATA as well as Maryland's share of additional funds for WMATA capital projects over the FY 2020 through FY 2025 period. The CIP is focused on safety, infrastructure rehabilitation and replacement, and maintaining the Washington region's transit system in a state of good repair. In the coming year, the system will see continued revitalization of the railcar fleet with additional 7000-series railcars completing commissioning, modernization of bus facilities, purchase of buses and paratransit vehicles, streamlined fare collection, additional traffic signal prioritization, new radio and wireless systems for customers, first responders, and employees, track rehabilitation, traction power, and station infrastructure and water mitigation in priority areas. The FY 2020 budget also included funding for running every Red Line train to the Glenmont Station terminus in Montgomery County; previously only half of all trips served the three stations between Silver Spring and Glenmont.
- MDOT MTA and locally operated transit services (LOTS) continue to regularly update and renew their bus fleets to maintain the average age of the fleet, yielding reliability benefits, and environmental benefits through reduced emissions, fuel consumption, and noise.
- MDOT has also made significant progress in re-invigorating its statewide Transportation Demand Management program, Commuter Choice Maryland. Commuter Choice Maryland provides on-going statewide support to employers seeking assistance with implementing workplace commuter benefits and assisting commuters with finding affordable, convenient ways to get to work other than driving alone. MDOT TSO, MDOT MTA, and MDOT SHA all work in-concert through the Commuter Choice Maryland Workgroup to conduct program activities and provide program overall guidance. Commuter Choice Maryland also works in concert with Maryland's county-based Travel Demand Management (TDM) Specialists and programs as well as local stakeholders throughout the state and other state agencies including the Maryland Department of Commerce to serve employers and commuters. Program accomplishments between January 2018 and June 2019 include:
  - Connected with 12,418 commuters and business owners via online and in-person outreach, including participation at Maryland events such as Artscape, the Maryland State Fair, business summits, and other engaging events.
  - The Commuter Choice Maryland website had over 42,000 visits. During this time the program produced numerous pieces of new collateral materials and infographics on topics including implementing commuter benefits, telework, vanpooling, and using transportation options for employers and commuters that were made accessible via the website.

- Conducting periodic webinars for employers on topics such as on establishing Commuter Benefits programs and the Maryland Commuter Tax Credit, creating a bike and walk friendly workplace, and ridesharing and establishing a telework program. These webinars were promoted to over 7,000 businesses.
- In tax year 2018, nearly 1,200 individuals were taking advantage of commuter benefits at companies that enjoying the benefits of the Maryland Commuter Tax Credit. Commuter Choice Maryland actively promotes the Maryland Commuter Tax Credit, which allows eligible employers to claim a portion of the eligible costs of providing commuter benefits to participating employees. The tax credit is 50 percent of the cost of providing the commuter benefits up to a maximum of \$100 per month for each employee. Commuter Choice Maryland launched a new, easy-to-use online portal for businesses to register for the Maryland Commuter Tax Credit.

## Enhancement Opportunities

Any enhancement of this program requires resource infusion in the form of capital or operating investments to provide new and improved services to areas that are lacking service or could be better served by existing services.

Implementation of BaltimoreLink provides a good example of how to expand service and enhance efficiency with a comparatively low capital commitment. Another example, through support from the MDOT Bikeways Program, is MDOT MTA's effort to retrofit its fleet of bi-level MARC cars to accommodate two full size bicycles per car. Investments like this help address first- and last-mile access to transit issues.

Enhancements to the currently funded program will create opportunities to increase transit service and reliability, which can increase ridership, in terms of capturing choice transit riders, but also create economic opportunity for Maryland residents with limited transportation options. The Purple Line, BaltimoreLink, North Avenue Rising, and US 29 BRT are all examples of innovative partnerships for service expansion and improvements in developing areas and corridors, where the investment in transit can help to spur further mixed-use and transit-supportive development. These projects are also using existing infrastructure and new technologies to optimize service delivery and reliability. Ongoing planning by MDOT MTA and MDOT SHA for BRT, and MDOT MTA and WMATA activities regarding transit signal priority, bus-only lanes, and other on-board bus communication and location technologies will help maintain service quality while meeting public demand for reliable service. MDOT MTA's forthcoming Microtransit pilot program will introduce new options for riders designed to decrease wait times and increase the convenience of taking transit.

MDOT continues to incorporate responsive and innovative investments, such as the inclusion of a P3 contract for the Purple Line and the establishment of a transit grant for innovative transit projects. Other longer-term transit investments include the MARC Cornerstone Plan, which includes key priorities and investments to provide safe, efficient, and reliable MARC service, enhanced asset management practices, as well as potential enhancements and service improvements.



Expanding investment in Commuter Choice Maryland and local TDM programs as the reach and role of these programs continues to grow will be beneficial. In FY 2020, for the first time MDOT MTA is requiring that local TDM programs report the number and information on employers whom they serve. Many of the local programs, with several notable exceptions, have had little capacity to work directly with employers in the past. As Commuter Choice Maryland continues to expand its presence statewide, more employers are requesting assistance and looking to both staff at Commuter Choice Maryland and their local TDM programs for assistance. Increasing staff capacity for local TDM programs to enable them to devote resources to serving employers will maximize the impact of the state's investment in the program. Expanding resources to promote the Maryland Commuter Tax Credit, and potentially expanding the tax benefits it provides, would also enhance the ability of Commuter Choice Maryland to help achieve MDOT's goals.

MDOT MTA has been leading ongoing and new studies, with a focus on a new Regional Transit Plan for Central Maryland that will define public transportation goals for Central Maryland including Anne Arundel County, Baltimore County, Baltimore City, Harford County, and Howard County, ongoing BRT corridors studies in partnership with Montgomery and Howard Counties and MDOT SHA, and transit development plans for multiple local operators.

There are other areas of implementation which could be targeted for more aggressive short-term strategies. These strategies will need additional funding through the CTP, as well as funding through other non-transportation sources as well as possible legislative support. These include continued bus replacement to cleaner alternatives and hybrid technologies (As part of the MDOT MTA bus replacement program, 140 buses began delivery in FY 2018 and FY 2019, with 350 additional clean diesel buses expected for delivery in the FY 2019–2024 period.), ongoing technical support to local jurisdictions and partnerships (such as MDOT and WMATA joint development agreements) to help promote and create TOD projects, continued funding, evaluation, and expansion of county-based TDM programs in the Baltimore and Washington regions, and enhancing multimodal connections, particularly for bicycles and pedestrians in accordance with the Maryland Bicycle and Pedestrian Master Plan update released in 2019, and expanding .

## **Funding**

Transit investments are strongly supported in the FY 2019–FY 2024 CTP, including MARC maintenance, facilities and operational improvements, BaltimoreLink operations, support of the WMATA in the Capital Region, and support of LOTS across Maryland.

- MDOT MTA directs funding and statewide assistance to LOTS serving each of Maryland's 23 counties, providing approximately \$179.1 million in grants in FY 2019 through FY 2024. MDOT MTA continues to invest in transit infrastructure statewide, enabling Maryland's residents and commuters to have safe, efficient, and affordable transportation options. The US 29 BRT and North Avenue Rising projects together were awarded \$20 million by USDOT's TIGER grant program. The BaltimoreLink project also benefits from the North Avenue Rising project's \$10 million grant. Grant funding is incredibly helpful for project implementation. For grants, such as the TIGER Grant, to be successful, MDOT must commit to provide matching funds as noted above.

- The Purple Line presents a new and innovative approach to transit infrastructure funding by using a P3 agreement. The innovative P3 project delivery creates a predictable, transparent, and streamlined approach, incorporating best practices and lessons learned from other states and countries, while addressing the transportation and economic development needs of Marylanders. This agreement provides the Purple Line with \$5.6 billion of funding, with an additional a \$900 million grant US DOT grant also supporting this project. In 2018, MDOT MTA also received a \$2 million grant from the FTA Pilot Program for TOD planning. This funding will be used to support economic development and TOD planning for Purple Line station communities.
- In total, in the 2019-2024 CTP, MDOT estimates that \$4.485 billion is programmed to be spent on transit projects that help increase transit reliability, convenience, and accessibility, resulting in a more competitive system that helps to reduce emissions through mode shift from vehicle trips in addition to reducing emissions from transit service. This includes funding for WMATA and an estimated \$428 million programmed to be spent on MARC service and operations improvements. These improvements will be beneficial not just to MARC but will benefit all intercity rail operations on the Northeast Corridor.

## Challenges

MDOT works to provide multimodal connections throughout the State's transportation system so that users have a variety of options including public transit. Bicycling and pedestrian modes, while they are now being measured more consistently than in previous years, will be further developed to supplement use of public transit with other non-SOV alternatives in accordance with the goals and projects outlined in the Maryland Bicycle and Pedestrian Master Plan Update. First- and last-mile connectivity is an area that is constantly changing as Maryland focuses on innovative transit planning and "complete streets" functionality.

As national trends continue to show an increase in VMT and decrease in transit ridership, MDOT is working to develop solutions that address modern preferences, including the launch of its mobile payment application CharmPass in 2019 that allows mobile payment for all BaltimoreLink services, Commuter Bus, and MARC commuter rail, continued investment in travel time reduction and facility-wide comfort, and increased efforts to work with employers throughout the state to expand the availability and use of commuter benefits and increase the economic competitiveness of doing business in Maryland. These customer-oriented services and investments are intended to soften the environmental impact of transportation in the region and support continued economic growth amid shifting travel trends. MDOT also continues to be on the forefront of planning for new mobility, including planning for CAVs, MDOT MTA's forthcoming innovative Microtransit pilot, and integrating modern fare payment and integration with private service providers through the statewide Transit Innovation Grants. This view of public transportation and demand management playing an integral role within the larger transportation system helps MDOT reach its goals of maximizing accessibility, mobility and connectivity for all Marylanders.

## Estimated Greenhouse Gas Reductions

MDOT's Annual Attainment Report includes measures presenting transit ridership, commute mode share, total passenger and revenue miles of service, total transit investment, and on-time performance that serve as key indicators of progress towards the program goals and resulting GHG benefits. Table 2 shows the weekday and annual transit usage as reported by MDOT MTA and other contracted services and as presented in the 2019 Attainment Report. Ridership or passenger mile traveled are indicators of potential GHG emission reduction benefits from transit. Other indicators include revenue vehicle miles of service and/or average fleet age or fuel consumption data which are indicators of total transit operation emissions. MDOT MTA tracks these measures and others annually through its annual Transit Modernization Report as well as on a quarterly basis on its performance improvement website and via the Excellerator. MDOT also coordinates with employers and colleges to provide transit passes thereby reducing SOV travel, vehicle emissions, and congestion.

**Table 2: Maryland Transit Ridership Trends by Mode 2009-2018**

FISCAL YEAR	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018*
<b>TRANSIT RIDERSHIP-MDOT MTA DIRECT-OPERATED SERVICES (THOUSANDS)</b>										
CORE BUS	75,694	74,926	78,390	79,535	80,071	75,780	78,697	75,619	69,587	63,730
BALTIMORE METRO	13,567	13,364	14,588	15,364	15,208	14,632	13,901	12,222	10,960	8,738
LIGHT RAIL	8,644	8,158	8,655	8,540	8,647	8,106	7,657	7,431	7,414	7,401
<b>TRANSIT RIDERSHIP-CONTRACTED SERVICES AND LOTS (THOUSANDS)</b>										
MARC	8,021	8,096	8,233	8,452	9,062	9,168	9,246	8,962	9,185	9,322
CONTRACTED COMMUTER BUS	3,974	3,859	4,097	4,290	4,187	4,017	4,034	3,928	3,866	3,841
MOBILITY PARATRANSIT & TAXI ACCESS	1,450	1,481	1,660	1,900	2,084	2,289	2,495	2,556	2,746	2,941
LOTS	45,635	45,700	40,243	40,908	40,281	42,500	39,441	38,476	39,818	41,096

\* 2018 data is preliminary and subject to change.

## GGRA Program Status – Pricing

### Program Description and Objectives

Pricing encompasses several programs that provide incentive for using GHG-beneficial modes of transportation. MDOT promotes activities covered under Commuter Connections and Commuter Choice Maryland, including:

- Ride sharing
- Guaranteed ride home
- Transportation demand program management
- Outreach and education (Clean Air Partners)
- Parking cash-out subsidies
- Transportation information kiosks
- Local car sharing programs, telework partnerships
- Parking fees
- Vanpool programs

This program also provides disincentive for using modes of transportation that are not GHG-beneficial. Primarily, this includes an expansion of electronic toll collection on facilities operated by the MDTA. Toll-collection technology also continues to be upgraded throughout the system.

On the user side, these programs provide avenues for employers and employees to take an active role in encouraging alternative modes of transportation beyond transit. MDOT's pricing programs also account for non-commute trips so that users have choice beyond their daily work trip.

### Implementation Milestones

The CTP documents MDOT's support for a variety of TDM programs. These programs tend to align with Maryland's Transportation Emission Reduction Measures (TERMs) and address the operational, management, and financial aspects of each project listed in the CTP. Investments listed in the CTP support emission reductions in air quality non-attainment and maintenance areas in Maryland via congestion mitigation, ridesharing, and commuter incentive programs.

Specific programs include the Commuter Connections program (managed by the Metropolitan Washington Council of Governments (MWCOG)) and the Commuter Choice Maryland program (managed by MTA). Each of these programs offer commuters and students in the MWCOG region access to financial incentives, ride sharing, guaranteed ride home, and traveler information to support alternative transportation. MDOT also continues to support the Telework Partnership, transit-focused marketing and subsidy programs, and statewide park-and-ride facilities with the aim of encouraging rideshare and transit use.

As part of ongoing refinement of its TDM approach, MDOT initiated a listening campaign in 2017 and wrapped it up in 2018. This campaign surveyed 2,138 commuters and interviewed 28 businesses throughout the state to gauge the state of TDM in Maryland. The survey yielded findings that will be used to inform programmatic recommendations and next steps.

Electronic toll collection system upgrades continue to expedite the toll collection process, reduce delays at toll plazas, decrease emissions, and are available at all eight toll facilities across the state.

GHG emissions are significantly reduced when tolls are collected electronically, due to reduced queuing and idling at toll collection plazas.

## Enhancement Opportunities

Expansion of Maryland's TDM program offerings, geographic scope, and incentives would require additional funding and potential legislation regarding tax credits and incentives. Other opportunities, such as expanded coordination with services such as Uber and Lyft, to enhance access to transit and encourage ridesharing, are emerging possibilities to expand the scope of traditional TDM programs. MDOT will continue to add capacity, provide better transit access, and maintain park and ride lots, while providing information to the public to increase awareness about the possibilities of carpooling and taking transit.

Within USDOT's surface transportation reauthorization, the FAST Act, the Surface Transportation System Funding Alternatives (STSFA) grant program funds projects to test the design, implementation, and acceptance of user-based alternative revenue mechanisms. The program helps to address some of the concerns outlined in *Beyond Traffic*, the USDOT report issued in 2016 that examines the challenges facing America's transportation infrastructure over the next three decades. USDOT announced funding for eight projects in August 2016<sup>3</sup> and again in February 2019<sup>4</sup> that piloted innovative ways to raise transportation revenue including revised road usage charges and user fees. The projects address common challenges involved with implementing user-based fees such as public acceptance, privacy protection, equity, and geographic diversity.

As of 2019, several of these projects have been completed and are already being used to inform policy in their respective states such as Missouri DOT's new registration fees<sup>5</sup> and California's adjustment of road user charges<sup>6</sup>. MDOT will continue to monitor these research projects and their implementation. MDOT continues to monitor the progress of these studies, future grant funding opportunities, and other pricing technologies in order to apply relevant findings to Maryland's transportation system.

## Funding

In the FY 2019-2024 CTP, MDOT sets aside roughly \$28 million over the next six-years to support TERM programs. These programs cover 15 counties in Maryland that are in air quality non-attainment or maintenance status. These funds are also augmented by additional federal and local funds.

The CTP lays out \$86.2 million in all-electric tolling (AET) funding over the next six-years to continue implementation across Maryland's tolled transportation network. This program has entered the construction and engineering phase and is being complemented by efforts that phase out toll booths in areas that already have high electronic toll usage. MDOT has already begun to

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<sup>3</sup> <https://www.fhwa.dot.gov/pressroom/fhwa1648.cfm>

<sup>4</sup> <https://www.fhwa.dot.gov/pressroom/fhwa1902.cfm>

<sup>5</sup> <https://house.mo.gov/billtracking/bills181/commit/rpt1723/Transportation.pdf>

<sup>6</sup> [http://www.dot.ca.gov/road\\_charge/resources/final-report/docs/final.pdf](http://www.dot.ca.gov/road_charge/resources/final-report/docs/final.pdf)

phase out cash at Baltimore's Key Bridge and the Hatem Bridge on US 40; these facilities are expected to be cashless in October 2019.

## **Challenges**

Per MDOT's Commuter Choice 2017-2018 survey, commuters face several challenges when considering non-SOV options - time, work hours, lack of telework options, and lack of program awareness. Respondents identified financial incentives, guaranteed rides home, and telework options as the top three incentives to use alternative travel options.

TDM offsets vehicle congestion by offering financial and quality-of-life incentives for Marylanders to use public transit, carpool, walk, or bicycle instead of driving alone. Increased TDM program use can be encouraged by expanding financial incentives, promoting telework options, and enhancing alternative modes of transportation such as guaranteed rides home, transit, and ridesharing.

One of the major difficulties is the lack of non-SOV options due to time spent commuting and work hours. Transit timetables may pose a challenge to commuters who work nontraditional shifts and uncertain commute times can be challenging for system users with strict work schedules. Additionally, some employers that may be able to offer telework options do not. In the Commuter Choice survey, 25.8 percent of commuters cited permission to telework as a reason to use alternative transportation. Addressing this challenge would require reaching out to employers and other third-party agencies, all while continuing to reach out to the users of the transportation system and educate them on options such as carpooling and guaranteed rides home.

Program awareness continues to pose a challenge to TDM program use because many users of the system are not aware of what is available to them. Commuters and employers cite themselves as financially motivated but may not be taking advantage of the financial incentives available to them because they are unaware. Educating users on their options would require additional outreach and partnerships with agencies that operate services such as bikeshare and ridesharing.

## **Estimated Greenhouse Gas Reductions**

According to MDOT's 2019 Attainment Report the number of daily VMT decreased by 3.9 million. Despite a slight reduction in VMT savings due to park-and-ride construction in 2018 and low post-recession fuel costs, savings overall increased due to increased park-and-ride usage and promotion of non-SOV alternatives.

Table 3 shows the estimated annual regional VMT reductions due to TERMS. The Annual Attainment Report also tracks the percent of toll transactions collected electronically. In FY 2018, it was estimated at 83 percent. The total number of total toll transactions increased by a percent. Recent gains in toll transactions can be attributed to an increase in total traffic and a public outreach program encouraging users to use an E-ZPass. In May 2018, Governor Hogan also eliminated the \$7.50 transponder fee so that transponders were free for new customers.

**Table 3: Annual VMT Reductions Attributed to TERMS CY2019**

**ESTIMATED ANNUAL REGIONAL VMT REDUCTION THROUGH TERMS\*\*\***



PROGRAM	PROGRAM DESCRIPTION	DAILY REDUCTION IN VEHICLE TRIPS*	DAILY REDUCTION IN VMT*
<b>COMMUTER CONNECTIONS TRANSPORTATION EMISSIONS REDUCTION MEASURES**</b>			
Guaranteed Ride Home	Provides transit users or carpoolers up to four rides home per year in a taxi or rental car in the event of an unexpected personal or family emergency	6,398	181,335
Employer Outreach	Supports marketing efforts to increase employee awareness and use of alternatives to driving alone to work every day	102,625	1,841,429
Integrated Rideshare	Promotes other alternative transportation services to employers and to the general public. Commuter information system documentation is provided with comprehensive commute information, to include regional TDM software updates, transit, telework, park-and-ride and interactive mapping	1,779	51,340
Commuter Operations and Ridesharing Center	Updates and maintains the Commuter Connections database for ride-matching services and provides information on carpooling, vanpooling, telecommuting, bicycling and walking for the Washington-Baltimore metropolitan region	19,949	401,327
Telework Assistance	Provides information to employers in Maryland on the benefits of telecommuting and assists in setting up new or expanded telework programs for employers	14,839	361,204
Mass Marketing	Promotes and communicates the benefits of alternative commute methods to single-occupant vehicle commuters through the media and other wide-reach communications	10,133	163,250
<b>MDOT MTA TRANSPORTATION EMISSION REDUCTION MEASURES</b>			
MDOT MTA College Pass	Offers a subsidized monthly transit pass to full- or part-time students enrolled in greater Baltimore metropolitan area colleges or universities	1,247	9,847
Transit Store in Baltimore	Provides customer access to transit information and for purchases of transit passes. Some 15-20% of total transit pass sales occur through this outlet	3,376	56,959
MDOT MTA and SHA Park-and-Ride*		51,845	874,629

\* The impacts shown reflect the current definitions and most recent data available for each of the measures. Data are estimated.

\*\* The Commuter Connections program is run through the Metropolitan Washington Council of Governments. The reduction in trips and VMT for Commuter Connections reflect reductions for all of the Metro Washington region, including Maryland, District of Columbia and Virginia.

\*\*\* MDOT MTA data is collected every five years.

## **GGRA Program Status – Multimodal Freight**

### **Program Description and Objectives**

MDOT's freight programs address the State's need to consider the role of freight in reducing GHG emissions as heavy-duty trucks represent only 5 percent of the vehicles on the road but account for more than 20 percent of transportation emissions nationally. Maryland's freight profile is multimodal and serves varied industries via trucks, trains, cargo planes, and ships. Per the 2019 Attainment Report, trucks alone moved 204,476 tons of cargo and faced 5,504 hours of delay on Maryland's roadways. These hours of delay not only mean lost production and supply, but also results in increased rate of emissions due to idling and congestion. Improving freight infrastructure reduces idling, congestion, and bottlenecks across the transportation system and supports the State in its goal of improving goods movement.

### **Implementation Milestones**

The State Rail Plan (SRP) and Strategic Goods Movement Plan (SGMP) were released in 2015 and 2017, respectively. These plans lay out MDOT's goals and objectives for moving freight throughout the state. While the SRP addresses passenger and freight rail, the SGMP focuses exclusively on freight. Each of these documents lists rail- and freight-specific goals that align with MDOT's overall goals. The SRP in particular established the Freight Stakeholder Advisory Committee (FSAC), a body focused on examining freight throughout Maryland. The FSAC is a key part of the implementation process for GHG-reducing freight programs since they recommend freight projects and initiatives. The SGMP builds on this and addresses issues pertinent to port, rail, highway, and air freight. As part of the SGMP, MDOT developed a Corridor Priority Tool to evaluate truck volumes, freight density, intermodal connections, and bottlenecks to identify Maryland's critical urban and rural freight corridors and to prioritize freight-related projects.

GHG-beneficial freight milestones are implemented under MDTA and MDOT SHA. Per the FY 2019-2024 CTP, MDTA has set aside \$747.7 million for the construction and expansion of express toll lanes on critical freight corridors. Implementing cashless express tolls cuts back on idling time and congestion, translating to fuel savings GHG reductions from freight trucks.

MDOT SHA is implementing over ten freight-related projects. Phase two of the Traffic Relief Plan (TRP) and planning activities in support of the TRP focus on smart traffic signals in order to mitigate congestion. Many of SHA's projects are concerned with capacity and operational improvements to existing roads and bridges. Improved capacity and operations mean fewer bottlenecks and congestion, and ultimately fewer volatile compounds being released into the atmosphere. TSO also addresses freight with its Intermodal Rail Incentive Program.

### **Enhancement Opportunities**

Improving Maryland's freight infrastructure and programs would require agency coordination, additional funding, and political intervention in some cases. The multimodal nature of freight provides numerous enhancement opportunities and allows MDOT to be innovative in its approach to goods flow and movement.



The FAST Act sets aside funding specifically for the National Highway Freight Program (NHFP). Funding was authorized for Federal FY 2016 through Federal FY 2020, and is meant to help states and MPOs “improve the efficient movement of freight on the National Highway Freight Network (NHFN)” and support general freight goals relating to innovation, advanced technology, freight connectivity, congestion reduction, and environmental impact mitigation. Within the FAST Act, the Infrastructure for Rebuilding America (INFRA) grant program authorizes funding for more generic freight projects that address goals such as efficiency and reliability of freight infrastructure, intermodal connectivity, and reduced congestion and bottlenecks. Funding for freight-specific INFRA grants have also been authorized through FFY 2020.

The FAST Act and INFRA grant program have provided multiple opportunities for MDOT to fund its enhancement projects. Beyond the FAST Act and INFRA, MDOT will seek to take advantage of any Federal freight funding opportunities and continue to monitor Federal freight requirements.

The SGMP noted reducing freight bottlenecks, enhancing port operations and throughput, and improving freight infrastructure through technology enhancements and capacity as the path forward to maintain Maryland’s market position.

## **Funding**

The CTP lists \$931.7 million in freight-related GHG-beneficial programming. TSO, SHA, and MDTA take the lead in funding but other TBUs can also contribute to GHG-beneficial freight programs since freight is inherently multimodal.

For AET, \$86.2 million is set aside. This program is already active along active freight corridors that process general traffic and goods movement. MDOT has already begun to phase out cash at Baltimore’s Key Bridge and the Hatem Bridge on US 40 and these facilities are expected to be cashless in October 2019.

The National Freight Program (NFP) provided new sources of funding for Maryland with the passage of the FAST Act. Over the next five years, Maryland’s NFP allocation will be \$95.6 million. In addition, a new Federal discretionary program (INFRA) will help to fund larger projects supporting freight. The SGMP identified Maryland’s segments within the NHFN which are eligible for the NFP.

## **Challenges**

Freight’s multimodality presents numerous opportunities for innovation and growth, but this same versatility can also present challenges. Compounding this, the variety of industries that freight serves also have their own challenges. The 2018 SGMP highlights challenges facing freight by industry.

**Agriculture and Mining:** Farms often must compete on at least a national scale, if not a global scale due to food prices and availability. In order to be competitive, these farms require feed and fertilizer and must also be able to ship products out as quickly as possible. Additionally, demand for locally sourced fresh food places pressure on freight operators to move agricultural products in a timely and efficient manner. Most of the quarries and mines in the state extract materials

used within Maryland's construction industry. These materials are also some of the heaviest to transport.

**Construction and Energy:** Residential and commercial construction demand has been rising in Maryland, meaning that more materials will need to be supplied throughout the state. This also means increasing demand for energy consumption, leading to more production facilities and additional construction. In recent years there has also been increasing demand for renewable energy materials such as wind turbines and solar cells.

**Manufacturing:** Common manufacturing processes use hazardous materials, which may require expedient removal. Generally, manufacturing is always concerned with speed of delivery to the wholesaler or consumer.

**Wholesale Trade and Transportation:** The Panama Canal's mid-2016 expansion allowed the transit of larger vessels. As of 2018, the Port of Baltimore was ranked as the 19<sup>th</sup> busiest port in North America based on inbound and outbound cargo. Increased cargo tonnage through the Panama Canal could mean an increase in tonnage processed at the Port of Baltimore, and increased need for highway, rail, and air capacity.

**Retail Trade and Health Care:** Shifts in retail trade have led retailers to use space that would otherwise be brick-and-mortar shopping for order fulfillment instead. These order fulfillment centers may not be an industrial warehouse, and therefore may have to use roads that are not optimized for freight movement. Timeliness is a challenge for both retail and healthcare but has more emergent implications for healthcare. Medical devices and services must make use of highways and railways that may experience congestion or be unreliable to operate on.

**Government and Knowledge:** Maryland's proximity to Washington, D.C. and inclusion in the region's economy makes it a prime transporter of government-related transportation and the accommodation of industries based on knowledge and intangible services. Congestion on roadways may translate to missed meetings or press conferences, and trucks transporting government goods and services require reliability in order to keep operations running.

Overall, each of these industries have a few challenges that overlap with another. For instance, although rail is one of the more GHG beneficial options for freight, industries will sometimes have to share the railway with passenger rail. This can lead to bottlenecks and delays, especially in places where the infrastructure is too outdated to accommodate increased capacity. Truck drivers need highways that are not only free of congestion, but also physically reliable so that they can move goods and services with minimal delay and damage. Congestion is also detrimental to industries that require timeliness, such as agriculture and healthcare. In these cases, the consequence of congestion is spoilage of goods and loss of profits, in addition to potentially negative human-scale consequences.

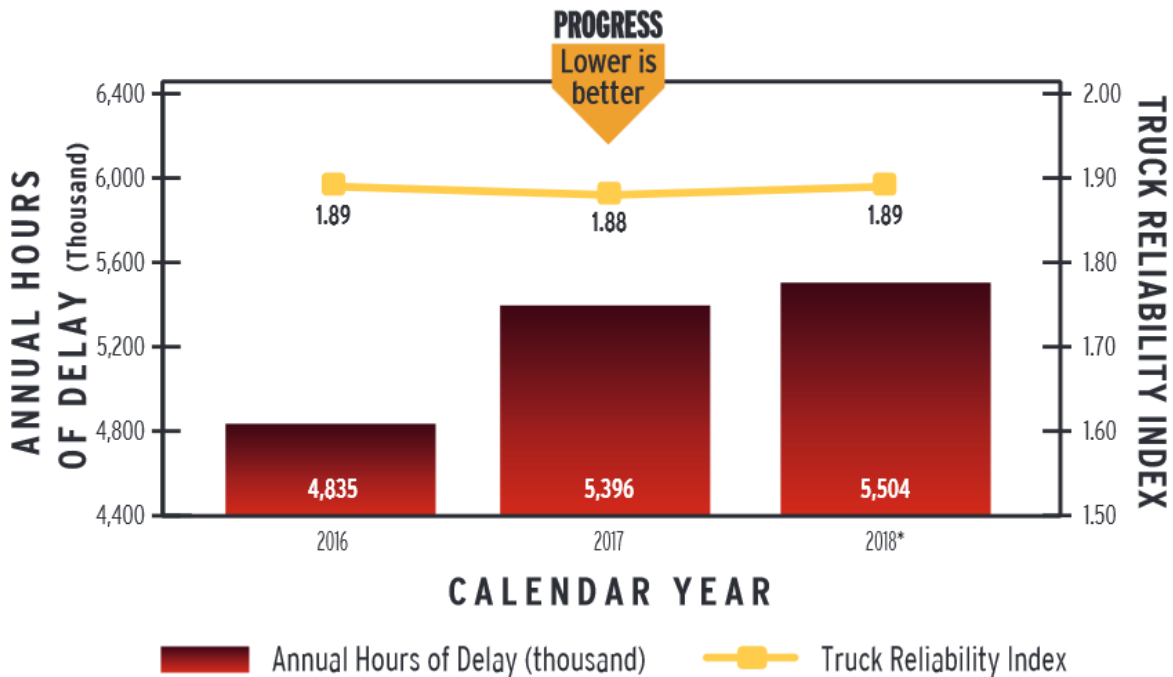
## **Estimated Greenhouse Gas Reductions**

Annual hours of delay experienced by truck operators on Maryland's highways has steadily increased from CY2016-2018 as presented in Figure 9. This increase is due to a growing economy along with strong growth in cargo movement through the Port, low unemployment rates, and

low gas prices. Roadway projects also contribute to the delay as MDOT works to improve capacity and reliability for the long term.

TBUs that deal with freight are also implementing projects that reduce GHG emissions. For example, MPA replaced 172 of its older dray trucks in order to cut back on emissions. MPA also assisted in installing idle-reduction technology for locomotives that use the Port.

**Figure 9: Annual Hours of Delay for Trucks, and Truck Reliability Index CY2016-2018**



**Target:** 6,070 thousand hours of truck delay in 2021, Truck Reliability Index of 1.88 in 2021

\* 2018 data is preliminary and subject to change.

## GGRA Program Status – Bike and Pedestrian Initiatives

### Program Description and Objectives

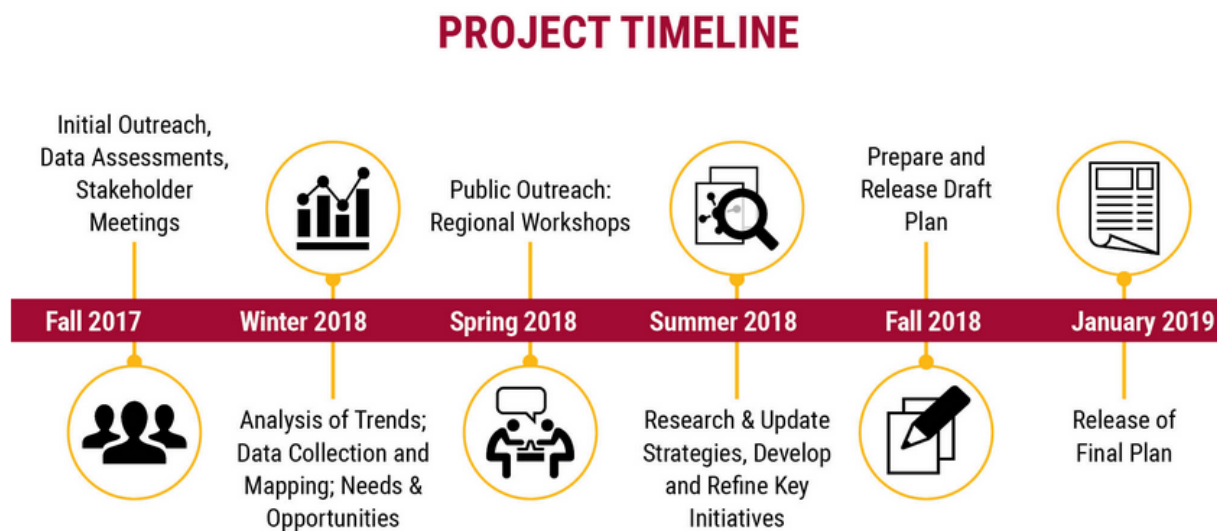
This program is part of the State's effort to reduce GHG and other tailpipe emissions from passenger vehicles by providing active transportation alternatives to vehicle use. Building connected and comfortable infrastructure to support additional bicycle and pedestrian travel in urban areas increases access to and use of public transit which in turn supports the State's goal of increasing transit ridership. In addition, MDOT continues to work together to advance bike and pedestrian friendly designs and policies to promote safety and respect of all transportation system users.

### Implementation Milestones

MDOT's 2040 Bicycle and Pedestrian Master Plan Update establishes a 20-year vision for bicycling and walking as transportation in Maryland and provides guidance and investment strategies to support bicycling and walking in the state.

The 2040 Bicycle and Pedestrian Master plan update was delivered to the General Assembly in January 2019. The plan's goals include expanding travel choices and improve multimodal connectivity and advancing biking and walking as economic development strategy.

Figure 10. Bike/Pedestrian Plan Update Timeline



The following implementation elements were identified in the 2018 GGRA plan update, consistent with the Bicycle and Pedestrian Master Plan:

- Bike sharing programs will continue to expand in many Maryland communities, with financial and technical assistance from MDOT. Successful programs are operating in Baltimore City, Anne Arundel, Howard, Montgomery, and Prince George's Counties.
- MDOT MTA has installed bicycle parking at the 83 MARC train stations it manages. 934 bicycle parking spaces are available throughout the MARC system, including both rack spaces and bicycle lockers. In the past year, MDOT MTA has worked to improve bicycle parking at Camden Station by upgrading uncovered wave racks to covered inverted U racks. MDOT MTA has also conducted bicycle parking utilization studies at Penn Station and Frederick to assess usage, which showed utilization rates of 50% and 43%, respectively. Several similar studies are planned in the coming year. Finally, there are bikeshare stations at or adjacent to four MDOT MTA rail stations, with planned expansion at College Park and Greenbelt. Additionally, all MDOT MTA buses include bike racks.
- Bike Accommodations are considered for all applicable roadway projects, of which 78 roadway capacity and bridge upgrade projects in the CTP include accommodations for bicycles and pedestrians. MDOT SHA has improved an additional 62.5 directional miles of roadways for bicycle access in FY 2018.
- Six bike projects were funded in FY 2019 and nine projects funding in FY 2020 under the Maryland Bikeways Program. Since the Bikeways program inception in 2012, 102 bike network projects have been completed. The projects include a mix of design, minor retrofit, and construction projects. Additional projects will be solicited through the annual Bikeways grant cycles.
- MDOT SHA completed 12 sidewalk projects totaling 6.5 miles of both newly constructed and reconstructed sidewalks through the Sidewalk Construction for Pedestrian Access Program. Other MDOT SHA funding programs that enhance bicycle and pedestrian safety and access as part of roadway expansion or maintenance projects, or as standalone improvements include the Sidewalk Reconstruction for Pedestrian Access Program, Urban Reconstruction Program, and Bicycle Retrofit Program. In FY 2019, total allocation for sidewalk retrofit projects and ADA retrofit projects totaled \$10.3 million.
- MDOT SHA's bicycle committee continues to improve bicycle guidance and policies for MDOT SHA roadways, with recent work including revisions to the Bicycle Design Guidelines.
- MDOT staff continue to support the Maryland Bicycle and Pedestrian Advisory Committee (MBPAC), which was created by statute to advise all state agencies on matters pertaining to bicycling and walking. MBPAC's recent work includes advising on the development of the Bicycle and Pedestrian Master Plan and supporting local jurisdictions at the regional level by holding meetings at different locations across the state.

## Enhancement Opportunities

MDOT recognizes bicycle and pedestrian travel as integral elements of the broader transportation network and supports investments in local bicycle transportation projects that provide access to transit.

MDOT is leading the bicycle and pedestrian priority area (BPPA) program by supporting localities in area designation, plan development and implementation to improve conditions for walking and biking. [To date, BPPA Plans have been developed for Tilghman Island and Prince George's Plaza Metro, and a plan for Hagerstown is currently being developed and is anticipated to be completed by the end of December 2019.](#) Additional designated BPPAs include Bethesda, Rockville Town Center, Silver Spring CBD, Shady Grove, Takoma Langley Crossroads, and Wheaton CBD.

MDOT has several activities planned for 2019 and 2020 to support increased use of active travel modes and reduced GHG emissions.

- MDOT MVA continues to update the Maryland Strategic Highway Safety Plan which includes bicycle and pedestrian safety as a major “emphasis area.” Several action items are being coordinated through this effort.
- MDOT works closely with area MPOs to support their efforts on bicycle and pedestrian transportation. Numerous pedestrian and bicycle planning efforts are underway in Maryland jurisdictions and MPOs, including
  - a pedestrian master plan, a Complete Streets design guide, and multiple Safe Routes to School plans in Montgomery County;
  - a non-motorized access study in the Eastover and Forest Heights areas of Prince George's County;
  - a BPPA plan in Hagerstown;
  - a sidewalk inventory, assessment, and action plan in Mount Rainier;
  - a sidewalk design and conceptual plan in Chesapeake Beach; and
  - a Complete Streets Design manual in the City of Baltimore.
- MDOT SHA has completed Phase 1 of planning for the Bike Spine Network. The network aims to connect major activity centers, guide the planning and construction of bicycle facilities and is being prepared for publication on the SHA's GIS portal, where it will be vetted by stakeholders. In Phase 2, MDOT SHA will work with the office of tourism to aggregate designated bicycle routes and points of interest to develop regional maps to encourage bicycling in the state.
- In 2017, the Maryland General Assembly created the Task Force to Study Bicycle Safety on Maryland Highways. The Task Force's purpose was to study and make recommendations on issues related to bicycle safety on highways, including, infrastructure and traffic control devices, policy implementation, public education, funding, bicycle infrastructure design, siting, and best practices.<sup>7</sup> The Task Force delivered its recommendations and findings to the Maryland General Assembly on December 18, 2017. Since then, the General Assembly has

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<sup>7</sup> [http://www.mdot.maryland.gov/newMDOT/Planning/Bike\\_Walk/Task-Force.html](http://www.mdot.maryland.gov/newMDOT/Planning/Bike_Walk/Task-Force.html)

passed legislation establishing: a new Complete Streets policy and program (HB 744 of 2018), legislation establishing a new fund for pedestrian safety educational programming and physical design changes (SB 460 of 2019). The legislation requires MDOT to designate a Vision Zero Coordinator and submit an annual Vision Zero status report to the Governor (HB 885 of 2019). In addition, MDOT has advanced several elements of the Bike Safety Task Force report that are within its purview and legislated mandate, including addressing the Task Force's recommendations through the 2040 Bicycle and Pedestrian Master Plan and strengthening the Pedestrian and Bicycle Emphasis Area Team that coordinates actions to address safety as part of the Strategic Highway Safety Plan.

## Funding

GHG beneficial funding for bike and pedestrian projects totals \$166.8 million in the FY 2019 – FY 2024 CTP. This MDOT estimate include 103 funded roadway expansion projects include pedestrian and bicycle elements, in addition to the Bikeways Program and the Transportation Alternatives Program (TAP), which focus on bicycle and pedestrian projects. MDOT manages several ongoing programs that provide funding for pedestrian and bicycle improvements, including: ADA Retrofit Program, Sidewalk Retrofit Program, Bicycle Retrofit Program, Urban Reconstruction Program, and management of the FHWA Transportation Alternatives program (TAP). In September 2018, MDOT announced \$17.2 million in grants for 43 projects to support improvements for bike and pedestrian connectivity across the state. It includes \$1.9 million in state funds from the Maryland Bikeways Program, as well as \$1.3 million in federal funding from the Recreational Trails Program, and \$14 million in federal funding from TAP.

**Bikeways Program:** MDOT's Bikeways Program supports bicycle transportation projects by providing necessary funding to implement the 2009 Statewide Trails Plan and the 2019 Bicycle and Pedestrian Master Plan. Since its inception in FY 2012, the Bikeways Program has awarded \$21 million to 151 local bicycle transportation projects. Grant applications are solicited and awarded on an annual basis.

**Bikeshare:** Bikeshare networks throughout Maryland are being supported by MDOT using a variety of funding sources. I FY 2019, TAP awarded funds to expand bikeshare in Prince George's County. As of fall 2019, 11 new stations had been added along the Route 1 corridor between Mt. Rainer and College Park, with five Greenbelt stations anticipated in summer 2020. Bikeshare expansion builds on prior years support from the TAP and Bikeways programs for bikeshare stations along the Bethesda Trolley Trail, Grosvenor Metro station, and the National Harbor area. Bikeshare projects make efficient use of limited transportation resources, by extending the reach of transit through efficient bike networks and connect more people to destinations.

**Recreational Trails Program:** MDOT SHA administers this federally funded program which provides support for the development, maintenance, and implementation of recreational-use trail projects. In FY 2019 MDOT awarded \$1,259,778 in grants, supporting 19 projects across the state.

**Transportation Alternatives Program (TAP):** MDOT works with its local, state and MPO partner agencies to allocate and administer federal funding through the TAP. One of the major focus areas of TAP is to enhance pedestrian and bicycle facilities, and for Safe Routes to School and environmental mitigation. In FY 2019 \$ 14,020,130 was awarded to 18 projects. These projects

represented improvements in pedestrian access, canal restoration along heavily trafficked areas, and bicycle facilities.

## Challenges

Strong local partnerships are the key to improving bicycle and pedestrian infrastructure. While MDOT seeks design solutions to better accommodate people walking and biking on state roadways and transit, many of the most critical infrastructure and maintenance issues remain under local control. Local entities are also more acutely aware of the challenges and opportunities that their bicycle and pedestrian infrastructure presents and can use tools and benchmarks that are available at a national level. MDOT programs and technical assistance have been geared toward helping ensure that local jurisdictions have the tools necessary to strategically improve the network.

In the [Federal Fiscal Year 2018 National Highway Safety Plan](#), MDOT documented the goal to reduce the number of non-motorized fatalities and serious injuries, on all roads in Maryland from 685 (2004–2008 average) to 433 or lower by December 31, 2020. To make measurable progress on these goals, state and local agencies meet on a regular basis to ensure progress on the identified action items. Beyond that, local jurisdictions have established their own goals regarding roadway safety for all users. Montgomery County, for instance, is the first county in Maryland to establish a “Vision Zero” set of guidelines.

## Estimated Greenhouse Gas Reductions

Under the goal of Community Vitality, MDOT’s Annual Attainment Report documents the number of additional directional miles of bicycle lanes, which steadily helps to increase the bicycle level of comfort (BLOC) on Maryland’s roads. Figures 11 and 12 show both metrics along with their annual (or time-bound) targets as tracked by MDOT SHA as part of the Attainment Report. MDOT SHA has also recently updated the methodology used to measure BLOC in 2015, which resulted in a stronger promotion of bicycling as a mode of travel. MDOT has exceeded its target of 59 percent of its state-owned roadway centerline miles with a BLOC of grade “D” or better since the year 2016. The total directional miles improved for bicycle access stands at 336.8 miles in the year 2018.



Figure 11. Percentage of State-owned Roadway Directional Miles Within Urban Areas that have Sidewalks and Percent of Sidewalks that Meet ADA Compliance

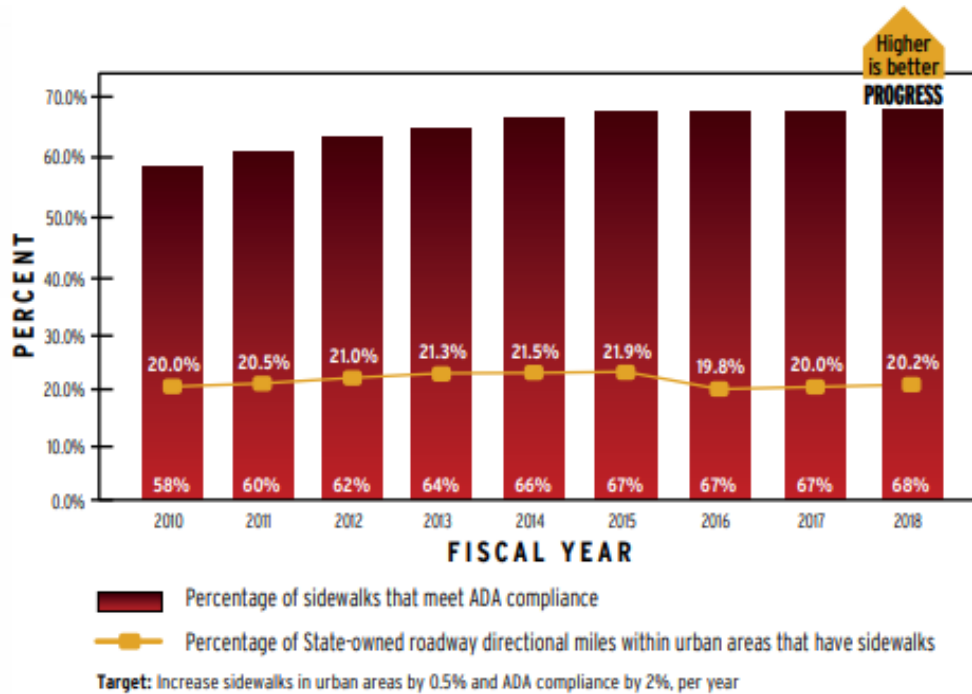
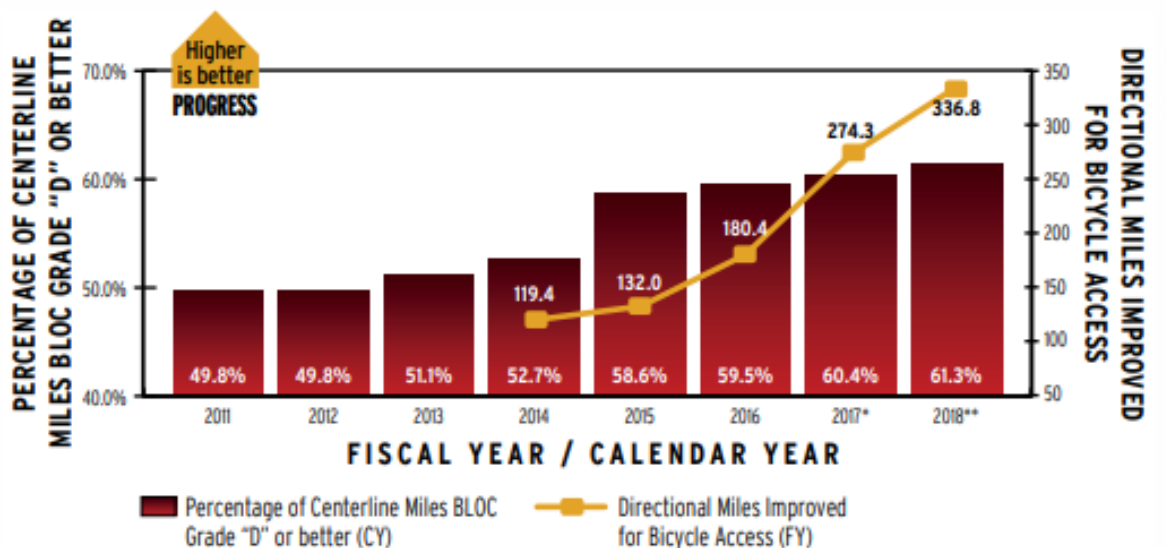


Figure 12. Percent of State-owned Roadway Centerline Miles with BLOC Level "D" or Better



**Target:** 59% BLOC Grade "D" or Better, 2% Directional Miles Improved per Year

\* 2017 BLOC data revised from previous report.

\*\* 2018 BLOC data is preliminary and subject to change.

\*\*\* This measure will be replaced by a new measure based on traffic level of stress metrics.