CONGESTION MITIGATION AND AIR QUALITY PROGRAM PERFORMANCE

Performance-Based Planning and Programming

June 2018

National Capital Region
Transportation Planning Board

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ABOUT THE TPB
The National Capital Region Transportation Planning Board (TPB) is the federally designated metropolitan planning organization (MPO) for metropolitan Washington. It is responsible for developing and carrying out a continuing, cooperative, and comprehensive transportation planning process in the metropolitan area. Members of the TPB include representatives of the transportation agencies of the states of Maryland and Virginia and the District of Columbia, 24 local governments, the Washington Metropolitan Area Transit Authority, the Maryland and Virginia General Assemblies, and nonvoting members from the Metropolitan Washington Airports Authority and federal agencies. The TPB is staffed by the Department of Transportation Planning at the Metropolitan Washington Council of Governments (COG).

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CMAQ PROGRAM PERFORMANCE

This report summarizes the federal requirements for the National Capital Region Transportation Planning Board (TPB), which is a Metropolitan Planning Organization (MPO), in the establishment of performance measure targets associated with the CMAQ Program. These include unified urbanized targets for the performance measures of Peak Hour Excessive Delay (PHED) and Mode Share in the area of traffic congestion and targets for Emissions Reduction for applicable pollutants and precursors for the nonattainment/maintenance area within the TPB planning area boundary. The targets described in this report meet the MAP-21/FAST performance-based planning and programming (PBPP) requirements and are consistent with the target setting approaches of Maryland, Virginia, and the District of Columbia. These 2018 targets were approved by the National Capital Region Transportation Planning Board (TPB) at its regular meeting on June 20, 2018.

Overview of Performance-Based Planning and Programming Requirements

Under the Moving Ahead for Progress in the 21st Century Act (MAP–21) and reinforced in the Fixing America's Surface Transportation (FAST) Act, federal surface transportation regulations require the implementation of performance management requirements through which states and MPOs will "transition to a performance-driven, outcome-based program that provides for a greater level of transparency and accountability, improved project decision-making, and more efficient investment of federal transportation funds."

The Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) have been gradually issuing a set of rulemakings, initially proposed and subsequently final, for the implementation of this performance-based planning and programming (PBPP) process. Each rulemaking lays out the goals of performance for an area of transportation, establishes the measures for evaluating performance, specifies the data to be used to calculate the measures, and then sets requirements for the setting of targets.

Under the PBPP process, states, MPOs, and providers of public transportation must link investment priorities to the achievement of performance targets in the following areas:

- Highway Safety;
- Highway Assets: Pavement and Bridge Condition;
- System Performance (Interstate and National Highway System, Freight Movement on the Interstate System, and the Congestion Mitigation and Air Quality Improvement Program); and
- Transit Safety and Transit Asset Management.

The final Statewide and Metropolitan Planning Rule, published May 27, 2016, provides direction and guidance on requirements for implementation of PBPP, including specified measures and data sources, forecasting performance, target-setting, documentation in the statewide and metropolitan long-range transportation plans and Transportation Improvement Programs (TIPs), and reporting requirements. The initial part of the PBPP process will require coordination and agreement on specific responsibilities for each agency in accordance with the planning rule.

NATIONAL HIGHWAY SYSTEM

A number of the MAP-21 performance measures apply to the National Highway System[1]. The National Highway System (NHS) includes the Interstate Highway System as well as other roads important to the nation's economy, defense, and mobility. The NHS was developed by the U.S. Department of Transportation (DOT) in cooperation with the states, local officials, and metropolitan planning organizations (MPOs). With the adoption of MAP-21 on October 1, 2012, the NHS became the "enhanced-NHS" by adding roads that were previously classified as principal arterials but not yet part of the System. These Interstate and Non-Interstate roadways on the NHS are the primary roadways for the assessment of Performance-Based Planning and Programming. When performance measures refer to the Interstate or Non-Interstate roadways on the NHS, it is MAP-21 "enhanced-NHS."

States DOTs designate the NHS and may make modifications to the NHS by either removing or adding additional roadways, through coordination with and approval by FHWA. The NHS designated as of 2015 is the basis for the performance measures and the data collected in the NPMRDS.

Overview of CMAQ Program Performance Measures

The FHWA published the System Performance: Highway and Freight, Congestion Mitigation and Air Quality (CMAQ) Final Rule on January 18, 2017, with an effective date of May 20, 2017. The State departments of transportation (DOTs) then had one year until May 20, 2018 to set their initial targets. The rule requires states to set targets for three performance measures concerning Highway and Freight: 1) Interstate Travel Time Reliability (TTR), 2) National Highway System (NHS) TTR, and 3) Freight Reliability (Truck Travel Time Reliability (TTTR) Index). In addition, the FHWA requires states to set three performance measures concerning CMAQ: 1) Peak Hour Excessive Delay (PHED), 2) Mode Share, and 3) Emissions Reduction.

This report covers the two CMAQ Program: Traffic Congestion performance measures and the CMAQ Program: Emissions Reduction performance measure. It provides an overview of the measures, data collection, and the methodology utilized for target setting. Additionally, information concerning the CMAQ Program in general is presented, as well as details concerning CMAQ project selection and programming for the states of Virginia, Maryland, and the District of Columbia.

[1] https://www.fhwa.dot.gov/planning/national_highway_system/nhs_maps/

Table 1: Summary of CMAQ Program: Traffic Congestion and Emissions Reduction Measures

	Performance Measures
CMAQ Program: Traffic Congestion	Peak Hour Excessive Delay – Annual hours of peak hour excessive delay per capita
	Mode Share – Percent of Non-SOV Travel on the NHS
CMAQ Program: Emissions Reduction	Emissions – CMAQ-funded projects on-road mobile source total emissions reduction for each applicable criteria pollutant and precursor

Source: TPB

TARGET SETTING AND COORDINATION

PHED

Applicable State DOTs and MPOs collectively establish a single target for each applicable urbanized area for the first performance period by May 20, 2018. As part of a phased implementation approach, only four-year targets will be reported in the State's baseline performance period report due by October 1, 2018. There is no requirement for States to report two-year targets or baseline condition for this specific measure in the report for the first performance period. With the first mid performance period progress report, due October 1, 2020, four-year targets may be adjusted, and two-year condition/performance will be reported as baselines.

Mode Share

Applicable State DOTs and MPOs must collectively establish a single, unified two-year and four-year target for each applicable urbanized area for the first performance period by May 20, 2018. A baseline report for the first performance period is due October 1, 2018 and must include two and four-year targets and a description of the data collection method used.

Emissions Reduction

State DOTs, with coordination from the MPO, must establish statewide two and four-year targets for total emissions reduction of on-road mobile source emissions for each performance period for all nonattainment and maintenance areas within the state boundary, for each applicable criteria pollutants and precursors. State DOTs must set targets by May 20, 2018 and targets must be reported to FHWA by October 1, 2018. MPOs, in coordination with State DOTs, must establish two and four-year targets for all nonattainment and maintenance areas within the metropolitan planning area. Targets are to be rest within 180 days after state DOTs have set their targets. In both cases, the targets shall reflect the anticipated cumulative emissions reductions to be reported by State DOTs in the CMAQ Public Access System for CMAQ projects included in the Statewide Transportation Improvement Program (STIP).

In addition to the responsibility of MPOs setting targets, MPOs that have a population of over 1 million people within a nonattainment or maintenance area must prepare a CMAQ Performance Plan. The CMAQ Performance Plan will be attached to the Biennial Performance Reports prepared by the respective state DOTs. The performance plan will provide information on projects associated with the reduction of emissions, as well as target and methodology information for the emissions reduction. performance measure.

MPO Coordination with State DOTs

MPOs are required to establish their performance targets in coordination with their state partners and these *targets should be data-driven and realistic*. The requirement for these targets to be evidence based and predictive of anticipated outcomes does not supersede or diminish any aspirational targets to which local, regional, or state jurisdictions are committed. Coordination is essential between the MPO and State DOTs in setting the CMAQ Program targets. Both are to work together to share data, review strategies, and understand outcomes.

TPB staff has worked in close coordination with the Virginia Department of Transportation (VDOT), Maryland Department of Transportation (MDOT) and District Department of Transportation in the development of these performance targets.

CMAQ Program: Traffic Congestion – PHED and Mode Share Performance Measures

PHED

PHED is based on the calculation of all segments of the National Highway System. PHED is defined as the extra amount of time spent in congested conditions defined by speed thresholds that are lower than a normal delay threshold. For this measure, the speed threshold is 20 mph or 60% of the posted speed limit, or whichever is greater. The FHWA requires that the data collected must occur during the weekdays (Monday through Friday), with a required morning peak timeframe of 6:00AM – 10:00AM, and a choice between two evening peak timeframes: 3:00PM – 7:00PM or 4:00PM – 8:00PM. TPB staff have used the earlier PM peak (3:00PM – 7:00PM) for all calculations; the same PM peak is also being used by the State DOTs.

Data for all peaks was collected for the region from the National Performance Management Research Data Set (NPMRDS), using a widget created by RITIS. Regional Integrated Transportation Information System (RITIS) is an automated data sharing, dissemination, and archiving system that includes many performance measure, dashboard, and visual analytics tools that help agencies to gain situational awareness, measure performance, and communicate, managed by the University of Maryland CATT Lab. The RITIS widget is designed to assist with performance measurement target creation using NPMRDS data.

PHED Forecasting and Target Setting

After the collection of data there are two general approaches that may be utilized for forecasting performance: the extrapolation of measured performance or the use of travel demand model data.

- Travel Demand Model
    - In 2016 TPB produced a travel demand model which produced congestion/related outputs for modelled years 2016, 2020,2025, etc. Forecasting will be achieved by utilizing such outputs as AM Peak Hour VMT estimates to project change in congestion, applying the percentage increases to measured performance.
    - Use of the travel demand model takes into account near-term predicted changes in population, employment and other factors that increase travel demand, as well as changes in the highway and transit network.
- Extrapolation of Measured Performance
    - For this approach, measured data for the previous years of 2014 through 2017 is extrapolated, via linear regression, through the year 2021. This would cover both the two and four-year targets. This approach would result in either a fitted line or a best fit curve as a means of forecasting.
    - The extrapolation method captures trends over time but depends upon consistent data.
- Averaging
    - Taking both the results from the Extrapolation of Measured Performance and the Travel Demand Model and averaging those methodologies.

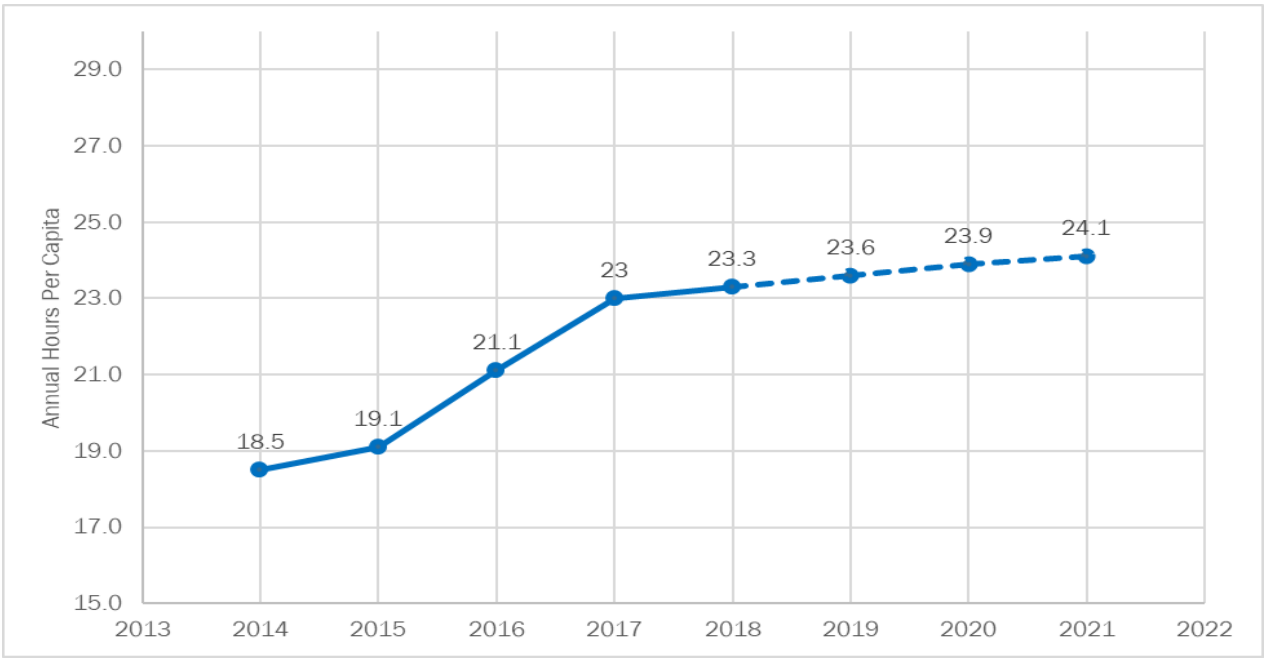
Table 2: Summary of PHED measured in Annual Hrs./Capita*

	2014	2015	2016	2017
Peak Hours of Excessive Delay (PHED) for the Washington, DC-MD-VA Urbanized Area	**18.5**	**19.1**	**21.1**	**23.0**

Source: NPMRDS, RITIS

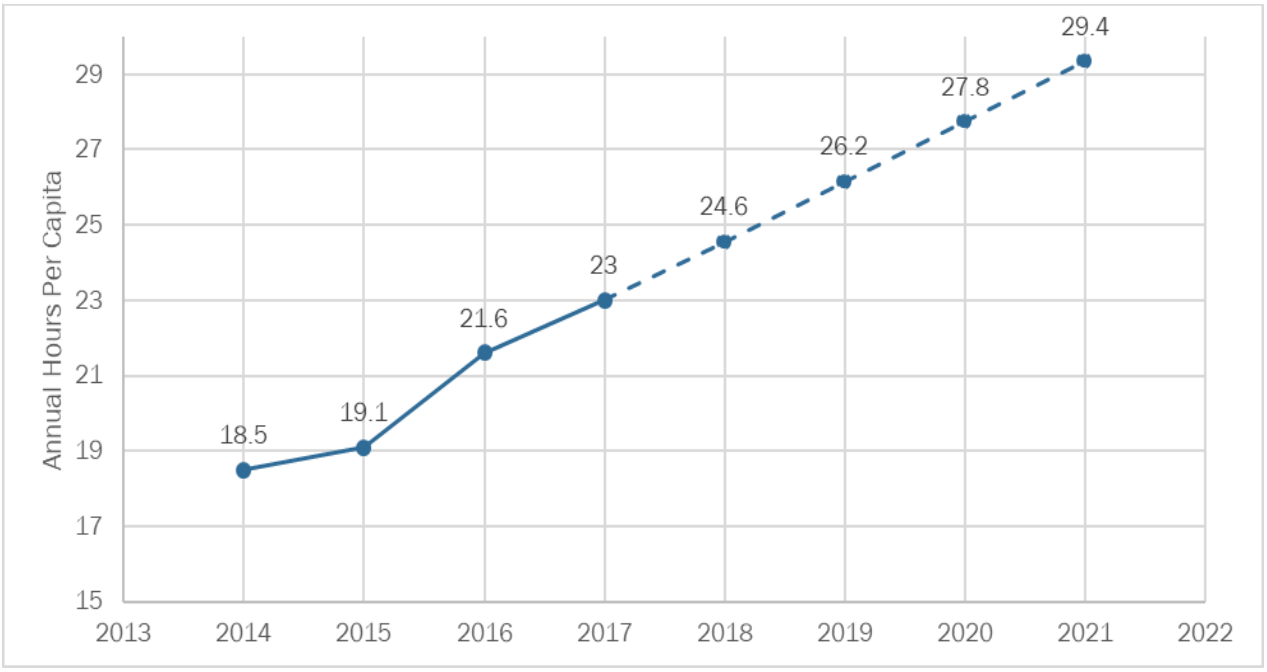
*Morning peak timeframe of 6:00AM – 10:00AM and evening peak timeframe of 3:00PM – 7:00PM

Figure 1: Travel Demand Model applied to PHED (2018 - 2021)



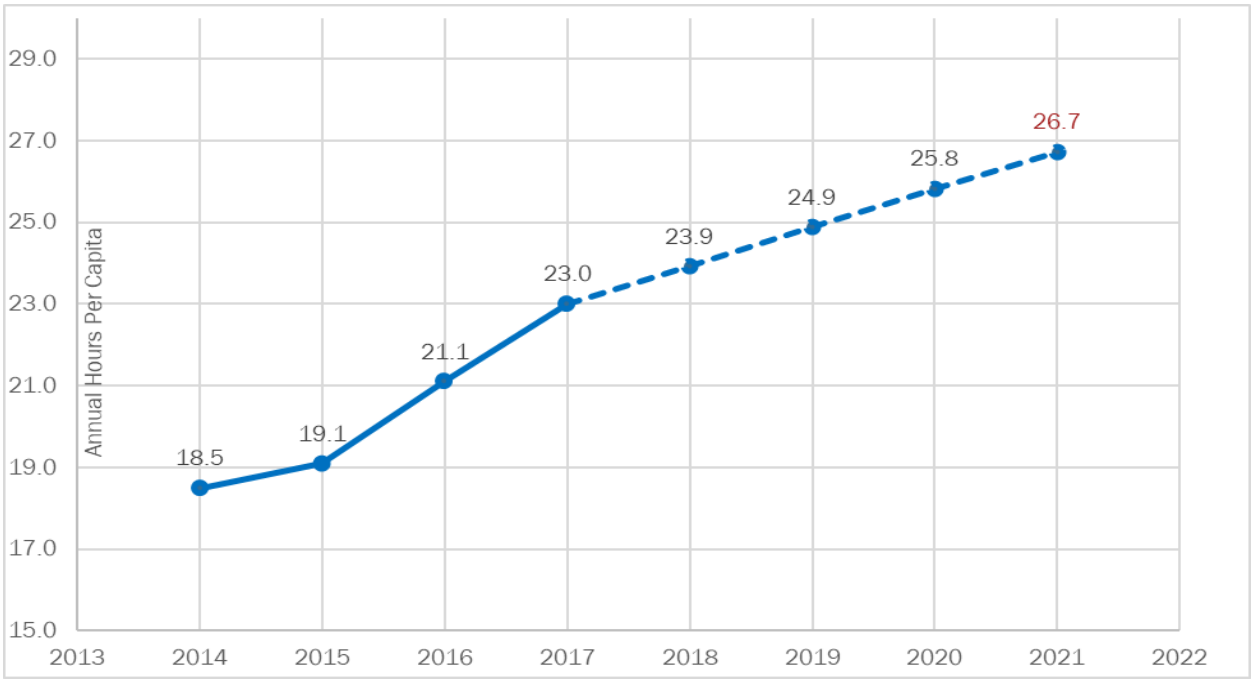
Source: TPB

Figure 2: Extrapolation of PHED (2018 - 2021)



Source: TPB

Figure 3: Averaging of Travel Demand Model and Extrapolation of PHED (2018 - 2021)



Source: TPB

Figure 1 shows an application of the second methodology using the TPB Travel Demand Model. For the purposes of forecasting PHED in the TPB region, the forecasted population and the VHD (Vehicle Hours Delay) was used from the travel demand model. From these two sets the compounded growth rate was calculated. This rate of growth was then applied to most recent data (2017) showing the amount of growth from 2017 to 2025. With these two endpoints, the other points in between were calculated, providing a forecasted target.

For comparative purposes, Figure 2 shows the extrapolation of PHED data based on linear regression. Due to the increase in 2017, this leads to an extrapolation of PHED increasing more rapidly than forecast by the travel demand model. Lastly, Figure 3 shows the averaging of the previous two methods, which is the selected method for setting a 4-year target.

Mode Share

Mode Share is a calculation of the percent of Non-SOV Travel within the urbanized area. Non-SOV Travel, defined by the FHWA, applies to travel occurring on modes other than driving alone in a motorized vehicle and includes travel that is avoided by telecommuting, it is a measure of the percentage of all surface transportation occurring in the urbanized area. An urbanized area is defined as having a population of at least 1 million people in a nonattainment/maintenance area for any of the criteria pollutants under the CMAQ program. For the TPB region, this includes the Washington DC-MD-VA urbanized area (UZA).

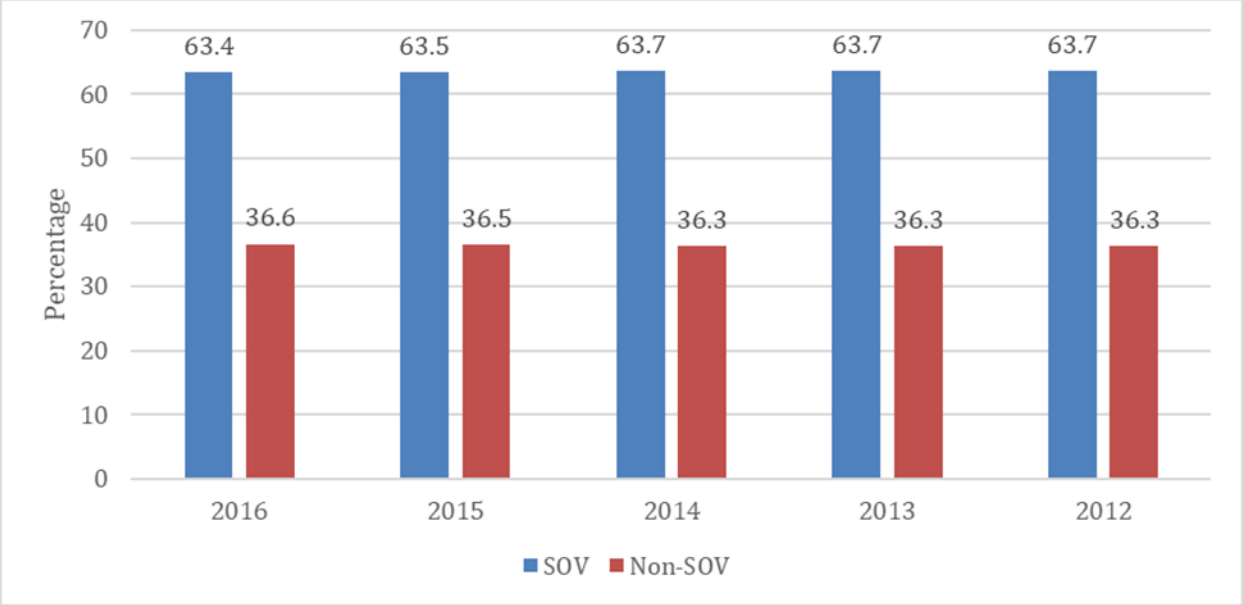
The FHWA has provided three data collection models as a means of estimating the required performance targets. Model A allows use of the U. S. Census Bureau's American Community Survey (ACS) data found in the table titled "Journey to Work." Model B allows for data collected from

localized surveys. Model C involves estimating the percent of non-SOV based on volume measurements of actual use for each mode of transportation, including telework. For purposes of this region's measure, Model A was utilized.

In selecting this model, explicit guidelines are detailed on how to utilize the ACS data. Data is to be obtained from the "Journey to Work" dataset, labeled *DP03*. These data sets contain the five-year estimates of the economic characteristics of those surveyed. Within, this dataset is a breakdown on how people commute to work, either by driving alone (SOV) or car-pooling, public transportation, walking, other means, or working at home (Non-SOV).

Figure 3 was created from the "Journey to Work" DP03 dataset. The original datasets showed a breakdown between modes of transportation people utilized to get to work, Figure 3 combines that data and makes a clear indication of SOV versus Non-SOV percentages. Figure 3 contains this information starting in 2012 and concluding with the most recent dataset published in 2016. There has not been significant change in the rate of SOV or Non-SOV travel within the Washington UZA.

Figure 4: Summary of Non-SOV data from ACS (2012 - 2016)



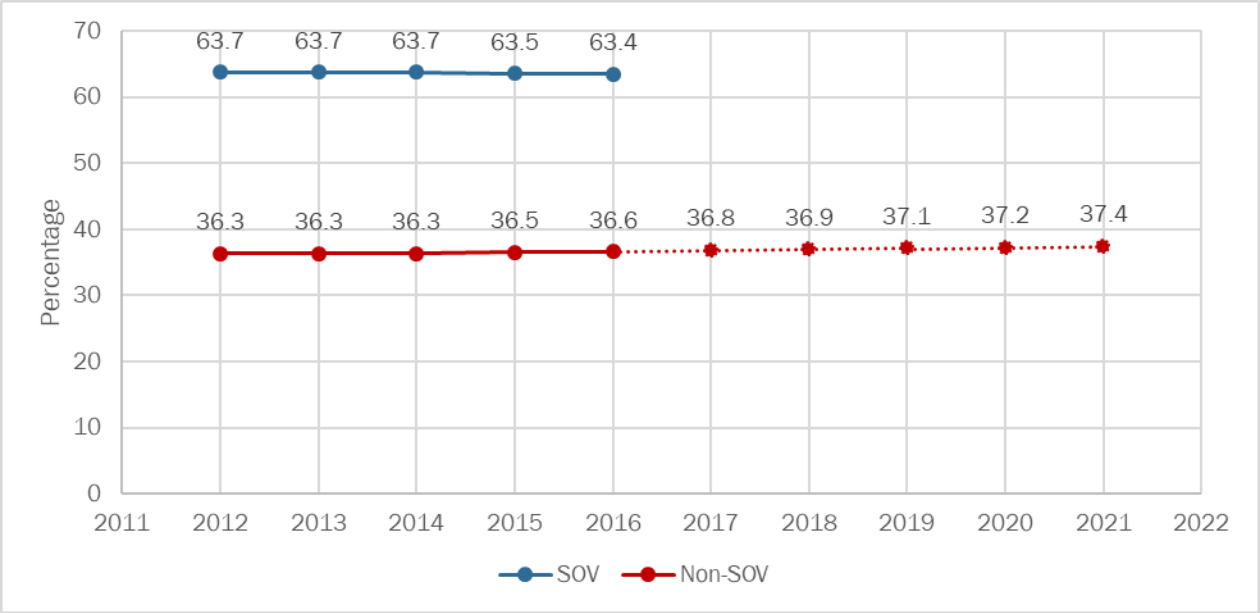
Source: American Community Survey, US Census Bureau

The TPB is responsible for setting both two-year (2018, 2019) and four-year (2018, 2019, 2020, 2021) unified targets with Virginia, Maryland, and District of Columbia Departments of Transportation. In determining the unified targets for both two and four years, there is no formula or calculation specified. The FHWA only requires estimations for target projections. Without the restrictions of calculations and formulas for target setting, there are a few methodologies that can be used by the TPB to determine their targets. The approach selected was a combination of a straight-line projection and use of data from the travel demand model.

Figure 4 illustrates the application of forecasted Non-SOV work trip travel through year 2021 with input from the TPB Travel Demand Model. Initially, a five-year average was calculated from years 2012 – 2016. Next, the absolute change of SOV work trips from years 2016 to 2025 was calculated

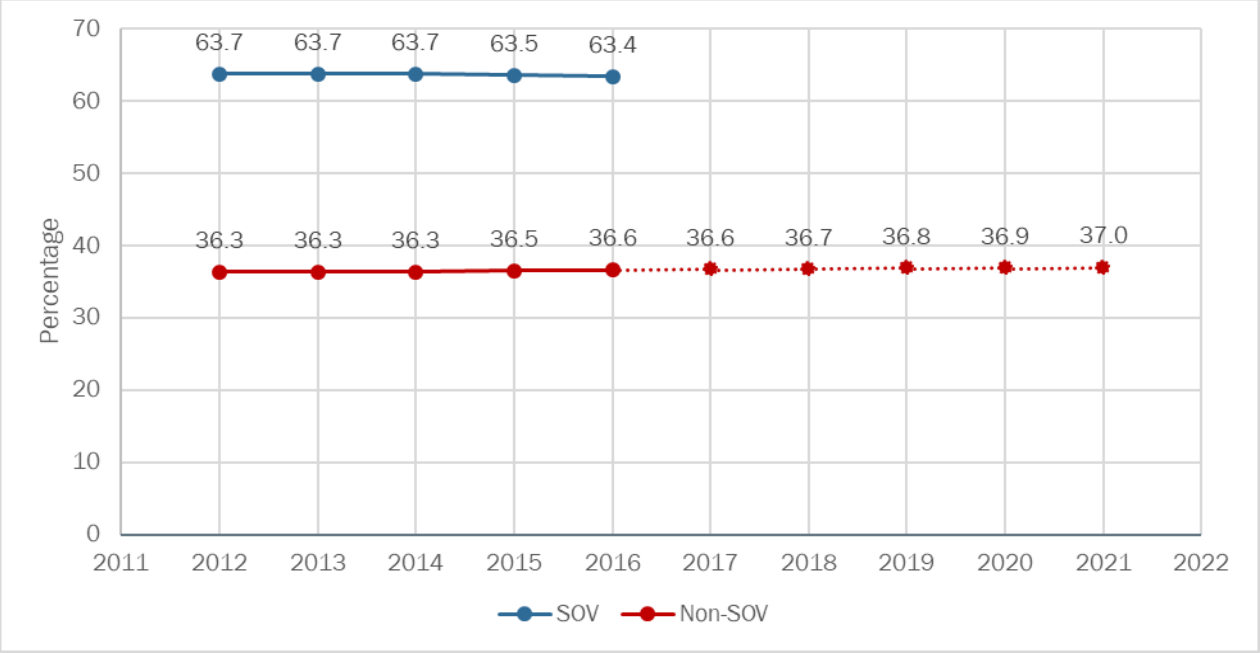
and then converted to the actual percentage change. This percent change was then applied to the five-year average. Since this was a calculation of SOV work trips, this percent was subtracted from 100 percent to calculate the Non-SOV work trip percentage. Figure 5 shows the extrapolation of the ACS data from years 2012 – 2016. Lastly, Figure 6 shows the averaging of the previous two methods, which is the selected method for setting the 2-year and 4-year targets.

Figure 5: Use of Travel Demand Model on Non-SOV data (2018 - 2021)



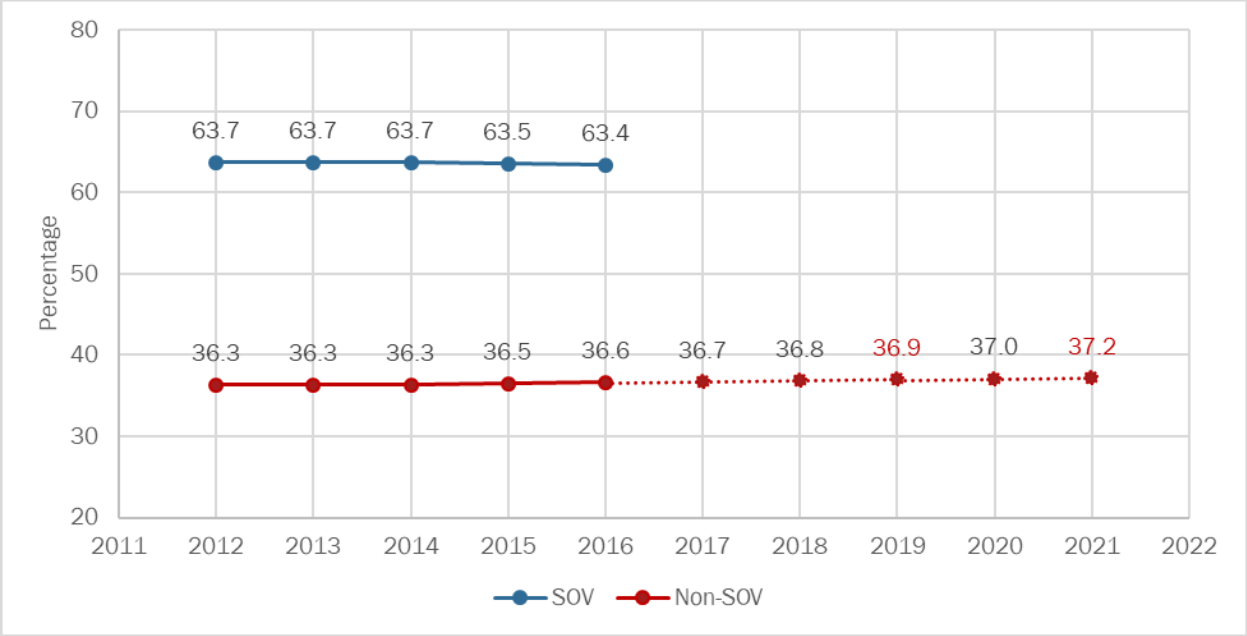
Source: TPB

Figure 6: Extrapolation of Non-SOV data (2018 - 2021)



Source: TPB

Figure 7: Averaging of Travel Demand Model and Extrapolation for Non-SOV data (2018 - 2021)



Source: TPB

TPB Methodology for Target Setting

In terms of developing a methodology, TPB staff have chosen the use of the averaging of the Travel Demand Model and Extrapolation approaches for forecasting future performance and setting targets for the Washington DC-MD-VA urbanized area (UZA). These targets include 2-year and 4-year targets for mode share: Non-SOV and a 4-year target for PHED, as initially required in the federal rulemaking. The targets cover calendar years 2018 through 2021. A summary of the targets is presented in Table 3.

Table 3: CMAQ Program Targets: Mode Share and Peak Hour Excessive Delay (PHED)

Performance Measure	CY 2018 – 2019 Two Year Target	CY 2018 – 2021 Four Year Target
Peak Hour Excessive Delay (PHED)	~~Not Required~~	26.7 Hours
Mode Share (Non-SOV)	36.9%	37.2%

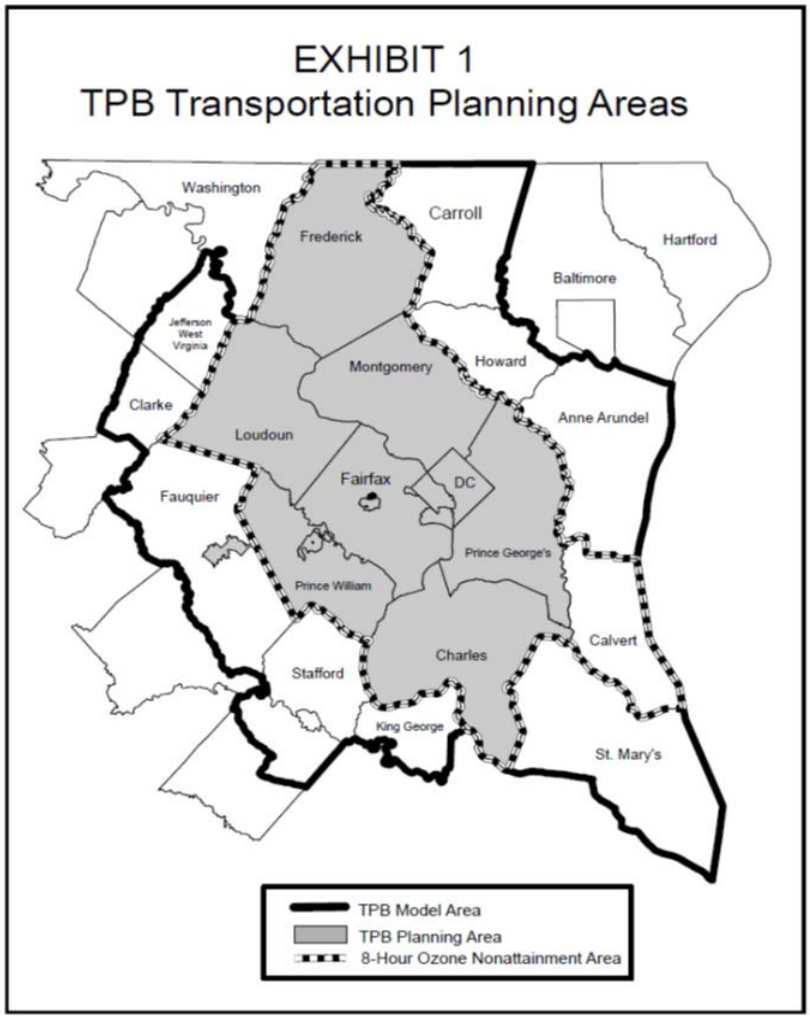
Source: TPB

CMAQ Program: Emissions Reduction

Emissions reduction is defined as the total on-road mobile source total emission reductions for each applicable criteria pollutant and precursor for a nonattainment area. For the nonattainment area in the TPB region, the applicable criteria pollutants are Volatile Organic Compounds (VOCs) and Nitrogen Oxides (NOx). This performance measure applies to projects that receive or are programmed for CMAQ funding. Data was collected from the CMAQ Public Access System, as specified in the federal rulemaking. State DOTs report emissions reductions information in the Public Access System for CMAQ funded projects in their Statewide Transportation Improvement Program (STIP).

It should be noted that the regional nonattainment area includes Calvert County; however, this county is not part of the TPB planning area. Maryland DOT and Calvert County are conducting a separate performance measure analysis for emissions reduction for that part of the nonattainment area.

Figure 8: Map of TPB Planning Area and Regional Nonattainment Area



Source: TPB

FEDERAL REQUIREMENTS FOR CMAQ PROJECT FUNDING

The Congestion Mitigation and Air Quality (CMAQ) program supports two important goals of the U.S. Department of Transportation: improving air quality and relieving congestion. While these goals are not new elements of the program, they were strengthened in SAFETEA-LU and further bolstered in provisions added to the MAP-21. Growing highway congestion continues to rise at a faster rate than transportation investments. Reducing congestion is a key objective of federal surface transportation policy, and one that has gathered increasing importance in the past several years. The costs of congestion can be an obstacle to economic activity. In addition, congestion can hamper quality of life through diminished air quality, lost personal time, and other negative factors. Accordingly, the CMAQ Program includes federal funds programmatically allocated to each state for funding applicable projects.

A CMAQ project must meet three basic criteria: it must be a transportation project, it must generate an emissions reduction, and it must be in or benefit a nonattainment or maintenance area. Additionally, as with all Federal-aid projects, CMAQ projects must be included in the MPO's current transportation plan and Transportation Improvement Program (TIP) (or the current Statewide Transportation Improvement Program (STIP) in areas without an MPO). In nonattainment and maintenance areas, the project also must meet the conformity provisions contained in section 176(c) of the CAA and the transportation conformity regulations. Lastly, all CMAQ-funded projects need to complete National Environmental Policy Act (42 U.S.C. 4321 et seq.) (NEPA) requirements and satisfy the basic eligibility requirements under titles 23 and 49 of the United States Code.

The District of Columbia, Maryland, and Virginia departments of transportation each receive CMAQ funding and allocate it annually to fund applicable projects. Each state follows its own selection process for identifying and funding CMAQ projects; for Maryland and Virginia many such projects are funded elsewhere in the state than the TPB planning area. Projects are selected on various criteria, only one of which is estimated emissions reduction benefits. Projects are not required to have quantifiable emissions reduction benefits; a quantitative assessment is sufficient. All projects awarded annually must be entered into the CMAQ Public Access System (PAS). Data for the CMAQ Emissions Reduction performance measure for the region is taken from the quantified benefits included in the projects listed in the PAS that have been funded in the region. Table 3 lists the quantified benefits, if any, included in the PAS for the region for recent years (2014 to 2017). Further information on each state's CMAQ project process and methodology for forecasting future performance and setting targets follows.

Table 4: Summary of Regional CMAQ Projects Emissions Reduction of VOC and NOx (2014 - 2017)

FISCAL YEAR	VOC (kg/day)	NOx (kg/day)
2014	8.087	11.688
2015	0.072	0.816
2016	3.672	5.956
2017	2.532	4.074

Source: CMAQ Public Access System

MARYLAND CMAQ PROJECT PROGRAMMING

The Maryland Consolidated Transportation Program (CTP) is a six-year capital budget for transportation projects, where CMAQ programming is determined during the one-year development process. CMAQ projects selected for programming are done so based on criteria provided by the CTP. Projects should meet all federal and legal requirements; support departmental program priorities; meet all federal match requirements to maximize federal revenue; support State plans and objectives; support existing project commitments and uphold intergovernmental agreements; and lastly support alternative modes of transportation (transit, bike, pedestrian). Projects selected for programming must be included in the STIP and must also be consistent with local plans and be included in the regional MPO long-range plan.

In addition to this formalized process, a more intuitive process is used within MDOT to fund applicable projects. A majority of the CMAQ funding is used for transit projects (bus replacements, MARC, and light rail). Funding for some signal synchronization and for the CHART program, have also utilized CMAQ funds.

Maryland Methodology for Target Setting

The target setting methodology utilizes a combined approach of historic trends and anticipated CMAQ projects programmed over the next four years. The targets were established using historic CMAQ trends, averaging emissions from FY2014 through FY2017 CMAQ projects, and the known FY2018 – FY2021 programmed projects. MDOT primarily uses two analysis tools for estimating emissions benefits of CMAQ projects. MAQONE, a Maryland specific tool for analyzing off-network projects that uses MD MOVES emission rates and it is populated with county-level defaults. Also the FHWA Emissions Calculator Toolkit, which supports a number of project types developed by FHWA to analyze CMAQ projects

The targets were adjusted to represent the average emission rates of light-duty vehicles declining over time due to the federal vehicle and fuel standards, Tier 3 along with the fleet turnover of older vehicles. Adjustments were not applied to diesel vehicle replacements. For recommended MPO targets, the statewide target was allocated to the MPO based on project location as reported in the updated FHWA's PAS.

Targets reflect the anticipated cumulative emissions reduction to be reported in the CMAQ PAS for new projects over the next four years. The Maryland CMAQ projects are programmed through MDOT's Maryland Transit Administration (MTA) and State Highway Administration (SHA).

VIRGINIA CMAQ PROJECT PROGRAMMING

Within the region, the Northern Virginia Transportation Authority (NVTA) coordinates Northern Virginia's annual programming of federal CMAQ projects as well as Regional Surface Transportation (RST) funds. CMAQ funds contribute to the attainment and maintenance of the National Ambient Air Quality Standards (NAAQS).

The recommendation of programming is done through the Regional Jurisdiction and Agency Coordinating Committee (RJACC). Final approval is given by the Commonwealth Transportation Board (CTB). VDOT provides local matches for approved CMAQ projects, but only if the project utilizes the

funds within an established timeline. Recipients have 24 months to obligate the funds and then 48 months to expend the funds. CMAQ projects are eligible for potential funding after an application submission, a Transportation Emissions Estimation Models (TEEM) worksheet submittal for air quality benefit calculation, and a resolution of support from the respective governing bodies.

DISTRICT OF COLUMBIA CMAQ PROJECT PROGRAMMING

Currently the District of Columbia department of transportation does not have any additional steps in determining CMAQ programming beyond the federal requirements. A majority of the CMAQ programs that have been selected for funding have involved bike lanes and TDM. In the future, the department plans to add additional requirements, other than the federal minimum standards, in the programming of CMAQ projects.

District of Columbia and Virginia Methodology for Target Setting

Both the District of Columbia and the state of Virginia have selected a similar methodology for target selection for the emissions reduction performance measure. Both departments of transportation will be listing and calculating the total emissions reduction for CMAQ programmed projects for years 2018 to 2021.

TPB Methodology for Target Setting

In terms of developing a methodology that could be utilized for target setting, TPB staff considered four techniques. First, taking the average past years' data and setting targets reflective of those averages. Second, setting a trend line based on past years' data and setting targets based on those projections. Third, using the percentage of CMAQ funding in the TIP and the cost-effectiveness (kg/ton), created by a ratio, of quantified CMAQ projects in the CMAQ Public Access System to forecast future emissions and thereby creating targets. Fourth, list expected CMAQ projects for the next four years and analyze emissions benefits. This fourth method was suggested from FHWA presentations and webinars; however, it is not a requirement. The fourth method was utilized for target setting.

Based on the available quantified data and the information provided by the District of Columbia, Maryland, and Virginia departments of transportation, the TPB has summed the forecast emissions reduction benefits forecast by each state for CMAQ projects planned in the region. The combined emissions reduction is then used to set the 2-year and 4-year targets for the two applicable pollutants.

Table 5: CMAQ Program Targets: On-Road Mobile Emissions Reduction

		FFY 2018 – 2019 Two Year Target	FFY 2018 – 2021 Four Year Target
Total Emissions Reductions for the TPB portion of the Washington DC-MD-VA nonattainment area	Volatile Organic Compounds (VOCs)	1.838 (kg/day)	2.195 (kg/day)
	Nitrogen Oxides (NOx)	4.019 (kg/day)	4.703 (kg/day)

Source: TPB