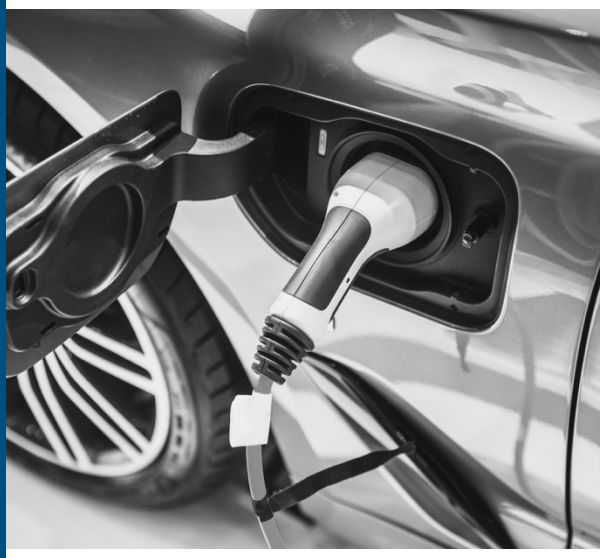
VISUALIZE 2050



Visualize 2050 Planning and Programming Process

Modeling of Travel Demand and Mobile Emissions

Part 16 of 27

National Capital Region
Transportation Planning Board

December 2025

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OVERVIEW OF THE MODELING OF TRAVEL DEMAND AND MOBILE EMISSIONS

The TPB measures and forecasts future performance of the National Capital Region Transportation Plan (NCRTP) as one way of tracking progress on the goals in the TPB Policy Framework. The performance analysis considers how well the anticipated transportation system will accommodate current and forecast travel demand and address mobility, accessibility, and environmental challenges. It also examines how expected changes to the transportation system might advance regional goals in the TPB's policy documents. The results of the analysis can help decision-makers and the public better understand what changes to current plans and funding might be needed to achieve different future outcomes.

The performance analysis examines more than twenty performance measures to portray how typical travel and commuting characteristics will change over time. It also examines how the existing highway and transit networks serve the region and what will be the likely impact of planned projects. This analysis is one of many that the TPB conducts to understand the region, as presented throughout this plan and other products. The TPB uses performance measures from other planning activities to check progress on the goals and priorities presented in the TPB Policy Framework. More information on the TPB performance measures can be found at Visualize2050.org.

TPB'S ROLE AND KEY STAFF

The TPB staff develops, maintains, and improves—with consultant assistance—a series of regional travel demand forecasting models that are used for the regional transportation planning process in the National Capital Region. At any given time, the TPB staff maintains at least two regional travel demand models: one or more adopted, production-use models and one or more developmental models. A production-use model is one that is used in planning studies conducted by the TPB, such as an analysis of the NCRTP or an air quality conformity analysis and is made available to outside parties. A developmental model is one that is currently under development by TPB staff and is generally not made available to outside parties, since it is not yet considered a finished product. Currently, Gen2/Ver2.4.6 Travel Model is the production-use trip-based travel model used in the Visualize 2050 activities. Key technical assumptions in the Visualize 2050 analysis are summarized below:

- New Land Activity Forecasts - Round 10.0 of the Cooperative Forecasts
- December 2023 Vehicle Registration Data/Vehicle Identification Number (VIN) Data
- New Projects and Updates to Existing Project Submissions
- No Metrorail capacity constraint to and through the regional core[1]
- Gen2/Version 2.4.6 Travel Model, which is an aggregate, trip-based model
- EPA's MOVES4.0.1 Mobile Emissions Model

Emissions estimates are developed using the EPA's Motor Vehicle Emission Simulator (MOVES) model. The most recent version of this model, MOVES4, was first released in August 2023, and the MOVES4.0.1 "patch" to the MOVES4 model referenced above was released in January 2024.[2] Inputs to the MOVES model include 1) travel-related inputs and 2) non-travel-related inputs. The

[1] *In the past (2001-2018), it was assumed that Metrorail capacity to and through the regional core would be constrained due to funding limitations. This constraint was reflected in the travel model. However, in 2018, WMATA received new dedicated funding from the District of Columbia, suburban Maryland, and Northern Virginia, which meant that the transit authority would likely have the funds to handle its peak volumes to/through the regional core. Thus, in 2018, WMATA requested that this procedure stop being used. The last model to use this procedure was the Ver. 2.3.70 Model.*

[2] U.S. Environmental Protection Agency (2024). *MOVES4 Update Log*. https://www.epa.gov/moves/moves4-update-log

travel-related inputs are produced by the Gen2/Version 2.4.6 Travel Model.[3] The non-travel-related inputs are obtained directly from state agencies (i.e., air agencies and departments of motor vehicles) or developed based on observed meteorological data. For more information, please refer to the Visualize 2050 Air Quality Conformity Analysis Report.

Within COG's Department of Transportation Planning (DTP), the Travel Forecasting & Emissions Analysis (TFEA) Team takes the lead in all travel demand modeling and mobile emissions modeling work. Table 16.1 lists the current members of the TFEA Team.

TABLE 16.1: KEY STAFF

TPB Staff	Title	Role
Kanti Srikanth	Executive Director	Staff Director for the Transportation Planning Board (TPB)
Mark Moran	Program Director, Travel Forecasting and Emissions Analysis	Program Lead
Dusan Vuksan	Program Manager, Model Application Group	Model Application Group Lead
Feng Xie	Program Manager, Model Development Group	Model Development Group Lead
Meseret Seifu	Principal Transportation Engineer	Model Development Group
Jian (Jim) Yin	Principal Transportation Engineer	Model Development Group
Ray Ngo	Principal Transportation Engineer	Model Development Group
Glenn Lang	Transportation Engineer II	Model Development Group
Jane Posey	Principal Transportation Engineer	Model Application Group
Jinchul (JC) Park	Principal Transportation Engineer	Model Application Group
Wanda Owens	Senior Transportation Engineer	Model Application Group
Anant Choudhary	Transportation Engineer IV	Model Application Group
Ho Jun (Daniel) Son	Transportation Engineer IV	Model Application Group

[3] *See, for example,* National Capital Region Transportation Planning Board. (July 11, 2023). *User's Guide for the COG/TPB Gen2/Version 2.4.6 Travel Demand Forecasting Model.* https://www.mwcog.org/transportation/data-and-tools/modeling/model-documentation

TPB Staff	Title	Role
Erin Morrow	Transportation Engineer IV	Model Application Group
William Bacon	Transportation Engineer III	Model Application Group
Nazneen Ferdous	Transportation Engineer IV	Model Application Group
Rob d'Abadie	Transportation Engineer IV	Model Application Group

Role of TPB Committees

Regional travel demand models are developed under the guidance of the Travel Forecasting Subcommittee (TFS), a subcommittee of TPB's Technical Committee. The TFS was formed in 1991 to provide oversight of activities related to development of the regional travel demand forecasting model. The TFS is one of several subcommittees that report to the TPB Technical Committee, which, in turn, reports to the National Capital Region Transportation Planning Board (TPB).

The mission of the TFS is to "provide guidance to, review of, and oversight to the COG/TPB information, analysis, and forecasting systems, and to serve as a forum for coordinating and enhancing such systems throughout the greater Washington region" (adopted April 21, 1995). As of FY 2005, the Travel Monitoring Subcommittee was merged into the TFS, so the mission of the TFS also includes oversight of travel monitoring activities.

The TFS is composed of representatives from TPB member jurisdictions, state departments of transportation (DOTs), the Washington Metropolitan Area Transit Authority (WMATA), and any other transit or regional agencies that desire to participate. Also invited to participate are consultants engaging in travel demand forecasting. Although consultants are not formal members of the subcommittee, they nonetheless provide valuable review of and comment about COG/TPB work activities. In return, consultants keep posted on the latest developments of the region's travel forecasting process, thereby supporting work they are doing in corridor and sub-regional studies for their clients. More information on the subcommittee can be obtained on the TFS website.[4]

ROLE OF KEY PLANNING AGENCIES

The TPB's Regional Travel Demand Forecasting Model is developed and maintained by TPB staff, with some consultant assistance. The TPB Travel Model is used by outside entities, such as state DOTs or consultants, to do project-planning work throughout the metropolitan Washington region. Additionally, some state DOTs do their own travel demand modeling for some urban areas within their state boundaries and/or have their own state-wide travel demand forecasting model.[5] Additionally, some counties in Maryland and/or Virginia develop their own travel models, which are

[4] Metropolitan Washington Council of Governments (September 20, 2024). *Travel Forecasting Subcommittee.* https://www.mwcog.org/committees/travel-forecasting-subcommittee/

[5] *See, for example* Maryland State Highway Administration (October 2013). *Maryland Statewide Transportation Model (MSTM), Ver. 1.0, Model Validation Report and User's Guide.* http://smartgrowth.umd.edu/assets/documents/presto/2.900_mstm_documentation_oct152013.pdf ; OR Maryland State Highway Administration, University of Maryland, Cambridge Systematics, Inc., and University of Memphis (April 30, 2018). *An Activity-Based Maryland Statewide Transportation Model – MSTM Version 2. Final Report.* https://app.box.com/s/x83x7onceewustomhz0qty6bo2j2ha6v

often derived from the regional travel model, but with more detailed zone systems in the county of interest.[6] TPB staff provide support, when possible, to state DOTs and counties developing their respective models. In many cases, such agencies are invited to share their modeling work with the region via a presentation at the TPB's Travel Forecasting Subcommittee.

PUBLIC ENGAGEMENT

Travel demand modeling documentation is described in detail on the relevant web page.[7] The public can submit a request for any off-the-shelf technical modeling data and/or the production-use travel model.[8] In FY 2024, the TFEA team serviced about 40 travel-model-related data requests and about 12 mobile emissions-related data requests to departments of transportation, member jurisdictions, consultants, and private citizens.

In addition, the public may provide comments at TPB meetings as information is shared with the Board for decision-making. For example, in the past, the public has provided comments to the TPB regarding the methodology and assumptions related to past air quality conformity analyses and GHG scenario planning technical exercises.

Similarly, TPB staff members have provided briefings that summarized findings of technical studies to both the TPB's Community Advisory Committee and the Community Leadership Institute.

Finally, TPB staff members are closely involved with the academic community in the region and often provide guest lectures on travel forecasting and planning to graduate students in the region (e.g., Virginia Polytechnic Institute and State University and Georgetown University).

PLANNING UNCERTAINTIES

Long-range planning at the TPB seeks to help area decision-makers and residents "visualize" the region's future. The TPB recognizes that many external future factors may impact mobility and accessibility. How will travel in this region more normally operate in a post-Covid environment? In particular, what will be the impacts of telework? How will climate change and resiliency, changes to the global economy, and the impact of new technology—particularly vehicle automation and electrification—affect the location of people and jobs, how people travel, and funding to invest in and maintain the system? Studying and forecasting the impact of each of these mentioned planning uncertainties is beyond the scope of a normal performance analysis of the LRTP or an air quality conformity analysis of the LRTP, but the TPB staff has conducted some past studies to examine some of these factors.[9].

Various modeling methodology assumptions, largely driven by federal requirements for the air quality conformity analysis, are included in the TPB's travel demand model to provide a long-range forecast of where, when, and how people will travel around the region. Notably, much of the underlying data is reflective of and validated to pre-Covid travel conditions. While the coronavirus pandemic changed many recent travel characteristics in the region, less is known about its impact

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[6] *See, for example,* Krishna Patnam and Navid Kalantari (November 20, 2020). *COG/TPB Travel Forecasting Subcommittee, Overview of the Recent Transportation Modeling Activities at M-NCPPC, Prince George's County Planning Department.* https://www.mwcog.org/events/2020/11/20/travel-forecasting-subcommittee/

[7] Metropolitan Washington Council of Governments (July 21, 2023). *Model Documentation.* https://www.mwcog.org/transportation/data-and-tools/modeling/model-documentation/

[8] Metropolitan Washington Council of Governments (July 21, 2023). *Data Requests.* https://www.mwcog.org/transportation/data-and-tools/modeling/data-requests

[9] *See for example*, ICF and the National Capital Region Transportation Planning Board (August 2024). *Regional Electric Vehicle Infrastructure Implementation Strategy, Final Report.* https://www.mwcog.org/documents/2024/09/04/regional-electric-vehicle-infrastructure-implementation-revii-strategy-climate--energy-climate-change-electric-vehicles/*, which forecasted possible locations for future electric vehicle charging infrastructure based on three different deployment scenarios.*

10 to 25 years from now and, as a result, post-Covid assumptions have not been incorporated into this analysis. Existing transit service, and its associated frequencies, headways, and hours of operation, reflect December 2023 schedules. Transit fares and highway tolls reflect the June 2024 conditions. Vehicle fleet data, which contains information about the types of vehicles people and business use to travel and conduct business, is current to December 2023.

ADDITIONAL RESOURCES

This section contains links to additional information regarding the production use Gen2/Ver. 2.4.6 Travel Model. The User's Guide and the Transmittal Package memo can be accessed using the links below:

- User's Guide for the COG/TPB Gen2/Version 2.4.6 Travel Demand Forecasting Model. Metropolitan Washington Council of Governments, National Capital Region Transportation Planning Board, July 13, 2023.
- Transmittal Package: TPB Gen2/Ver. 2.4.6 Travel Demand Forecasting Model, Transportation Networks, and Land Use Data Associated with the Air Quality Conformity Analysis of the 2022 Update to Visualize 2045 with Revised Transit Networks. Memorandum, July 12, 2023.

The highway and transit networks report can be found in the following link:

- Highway and Transit Networks Used in the Air Quality Conformity Analysis of the 2022 Update to Visualize 2045 and the FY 2023-2026 TIP (Gen2/Ver. 2.4 Travel Model). Metropolitan Washington Council of Governments, National Capital Region Transportation Planning Board, June 15, 2022.

In 2021, the Gen2/Ver. 2.4 Travel Model was validated to year-2018 conditions.[10] The work was documented in the following memo:

- "Year-2018 Validation of TPB Version 2.4 Travel Model." Memorandum, August 17, 2021.

[10] Due to the small differences in model outputs between the Gen2/Ver. 2.4 Travel Model and Gen2/Ver. 2.4.6 Travel Model, it was decided by TPB staff that there is no need to re-validate the Gen2/Ver. 2.4.6 Model to the year-2018 conditions.