

Performance Analysis Summary

Why the TPB Forecasts Performance

The TPB measures and forecasts future performance as one way of tracking progress on the goals and priorities presented in the TPB Policy Framework (see Chapter 3). The performance analysis considers how well the anticipated transportation system will accommodate current and forecast travel demand and address mobility, accessibility, and environmental challenges such as greenhouse gas (GHG) emissions. It also examines how future expected changes to the transportation system advance key regional goals and strategies 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.

Regional Performance Analysis Approach for Visualize 2045

This performance analysis of Visualize 2045 uses output from the TPB's travel demand model, which forecasts where, when, and how people will travel around the region in coming decades. To make its predictions, the model relies on the latest regional population and job growth forecasts from the Metropolitan Washington Council of Governments, information on existing travel patterns from the TPB's *Household Travel Survey*, and the future transportation system laid out in the constrained element of Visualize 2045.⁴³

The analysis examines more than twenty performance measures to understand how typical travel and commuting characteristics will change over time. It examines how the existing highway and transit networks serve the region and the 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. [Learn more about TPB performance measures at Visualize2045.org or view a summary online.](#)

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 (see Chapter 4). How will travel in this region more normally operate in a post-COVID-19 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? While many of these questions are beyond the scope of this analysis, the TPB does conduct planning and analyses to examine these, and other possible futures that might occur. See Chapter 6 to learn more about TPB planning activities.

Various 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-19 travel conditions. While the pandemic has changed many recent travel characteristics in the region, less is known about its impact 10 to 25 years from now and, as a result, has not been incorporated into this analysis.⁴⁴ Existing transit service, and its associated frequencies, headways, and hours of operation, reflect December 2019 schedules. Transit fares and highway tolls are current to January 2021. And vehicle fleet data, or the type of vehicles people and business use to travel and conduct business, is current to December 2020.

⁴³ Unless otherwise noted, the results of this analysis use the following input data: MWCOC's Round 9.2 Cooperative Forecasts of land activity, TPB's Gen2/Version 2.4 Travel Demand Model, 2020 Vehicle Registration Data, and EPA's MOVES 2014b Mobile Emissions Model. Results of this analysis use a 2023 base year “Today” scenario and are for the TPB Planning Area. These findings are based on regional model estimates that come with a degree of uncertainty.

⁴⁴ Further, transit service, like frequencies, headways, and hours of operation, reflect December 2019 schedules. Transit fares and highway tolls are current to January 2021. And vehicle fleet data, or the type of vehicles people and business use to travel and conduct business, is current to December 2020.

Performance Analysis Results

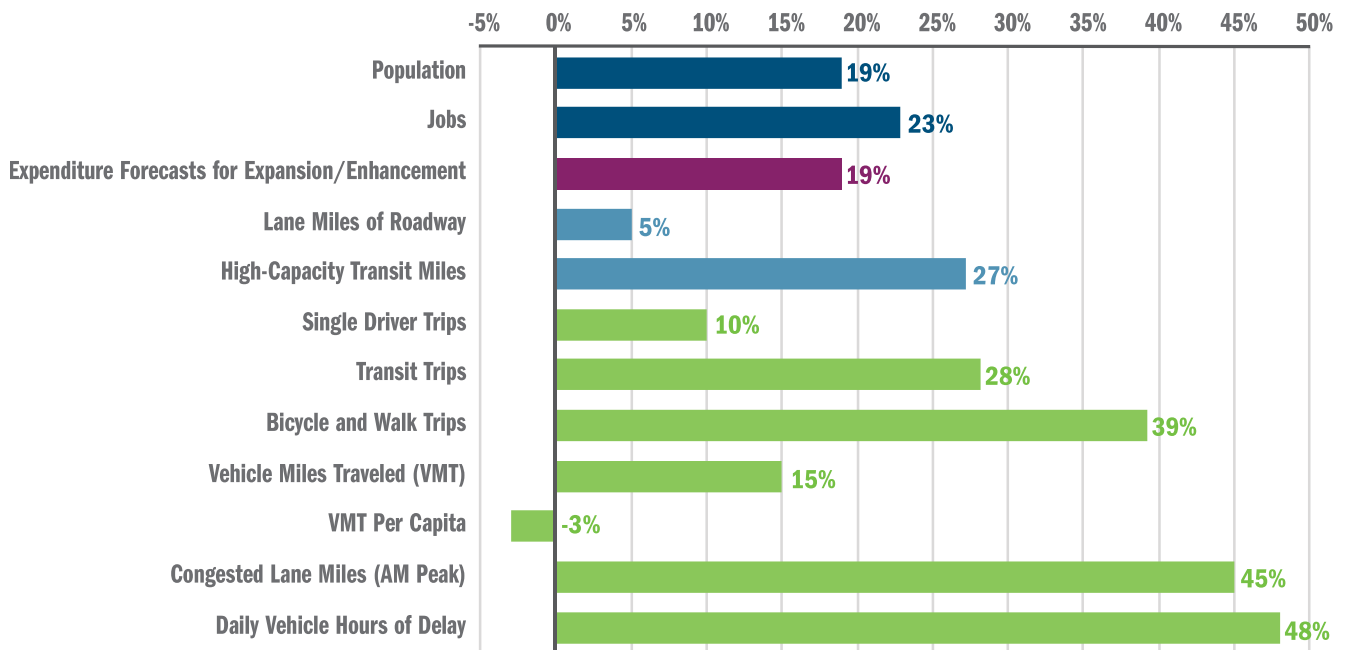
The performance analysis of Visualize 2045 forecasts that the region will make progress on many of its goals, due in part to the inclusion of projects that align with the Aspirational Initiatives TPB calls on its members to advance. See Chapter 7 for examples of projects in the constrained element that advance the initiatives. The land-use inputs in this analysis, COG’s Round 9.2 Cooperative Forecast data, suggest that the region is looking to bring jobs and housing closer together through targeted density increases in certain parts of the region (see population weighted density analysis in Chapter 2).

People will have more and improved travel options in 2045 and that is reflected in the performance forecasts. The region will increase availability and use of High-Capacity Transit (HCT) and other “reliability-enhanced” modes (such as rail, bus rapid transit, walk and bike, and High Occupancy Toll and High Occupancy Vehicle lanes), decrease driving per person, and improve average

access to jobs. Growth will likely continue to place heavy demands on the transportation network. The region expects 19 percent growth in population and 23 percent increase in jobs by 2045 compared to 2023.⁴⁵ While this growth is expected throughout the region, it will likely be focused in Activity Centers and HCT station areas, where 67 percent of jobs and 24 percent of residents are predicted to be located.

However, the region’s financial obligations to maintain and operate the existing system limit the availability of funds for system expansions and enhancements, providing for an additional five percent in roadway miles and 27 percent increase in HCT miles compared to 2023.⁴⁶ Roadway and transit demand increases will likely place more stress on an already stressed transportation network, increasing delay and congestion and reducing auto-based job access for parts of the region (Figure 8.13).

Figure 8.13: Performance Overview (Travel Demand Model outputs present data for years 2023 and 2045, therefore percentage increases vary from other reporting in this plan that is based on COG Round 9.2 Cooperative Forecast with 2020 as the base year.)



⁴⁵ Population and Job figures presented in this section use a 2023 base year and are different from figures presented in other sections of this plan, notably Chapter 2. These figures are calculated from the Gen2/Ver. 2.4 Travel Demand Model as informed by COG’s Round 9.2 Cooperative Land-Use Forecasts.

⁴⁶ High-Capacity Transit miles includes additional transit service mileage from Metrorail, light rail and streetcar, bus rapid transit, and commuter rail. While not included in this figure, commuter rail infrastructure improvements within existing transit service, like planned third and fourth tracks, are documented within this plan’s project listings and TIP.



How is Travel Expected to Change in the Region Over Time?

Residents of the region are likely to be driving fewer miles per person in 2045 than they do today. Even though regional population is expected to increase by nearly 19 percent, on average, driving per person in the region, including residents, freight, and all other travel, is forecast to increase by 15 percent, resulting in a nearly three percent decline in vehicle miles traveled per capita (Figure 8.14). When examining vehicle miles traveled by isolating the analysis to only residents of the region, vehicle miles traveled per capita declines by an even greater amount (Figure 8.15). These findings suggest that travel behavior in the region does respond to changes to the land use and transportation infrastructure environment, particularly that of the region’s residents. These can include people making shorter trips due to jobs and housing being in closer proximity, using non-auto-based modes more often as more infrastructure is built, and changes to travel behavior due to the impact of congestion and delay.

Figure 8.14: Total Roadway VMT (Travel Demand Model outputs present data for years 2023 and 2045, therefore percentage increases vary from other.)

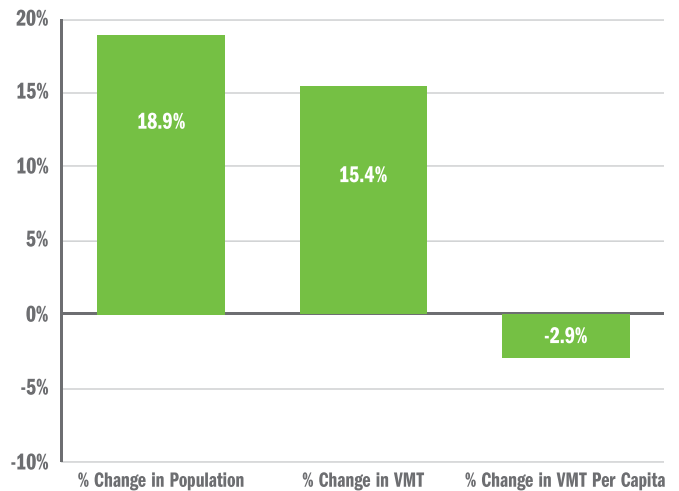
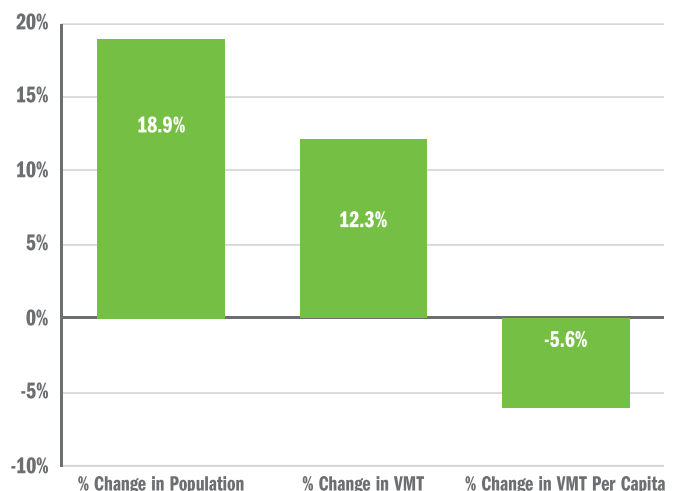


Figure 8.15: Resident VMT (Travel Demand Model outputs present data for years 2023 and 2045, therefore percentage increases vary from other.)



Consistent with the TPB's goals, more people will choose to walk, bike, take transit and ride together rather than drive alone (Figures 8.16 and 8.17). However, a large portion of the region continues to be auto dependent. By 2045, 78 percent of travel for all trips in the region will be auto-based, either single-occupant or high-occupancy vehicle and carpool. Over time, the rate of growth of single occupant vehicle is less than high-occupancy vehicle and carpool, estimating that by 2045 more trips will be taken with multiple individuals in a car than single occupancy (Figure 8.17).

Figure 8.16: All Trips by Mode, Today – 2045

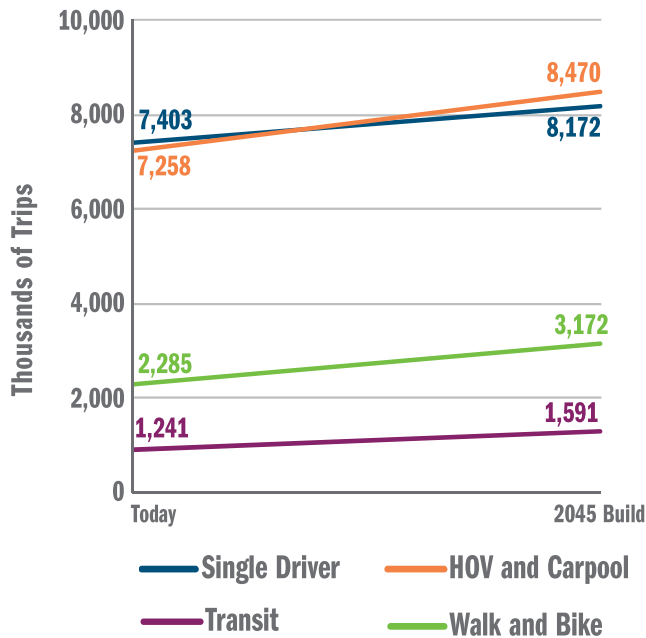
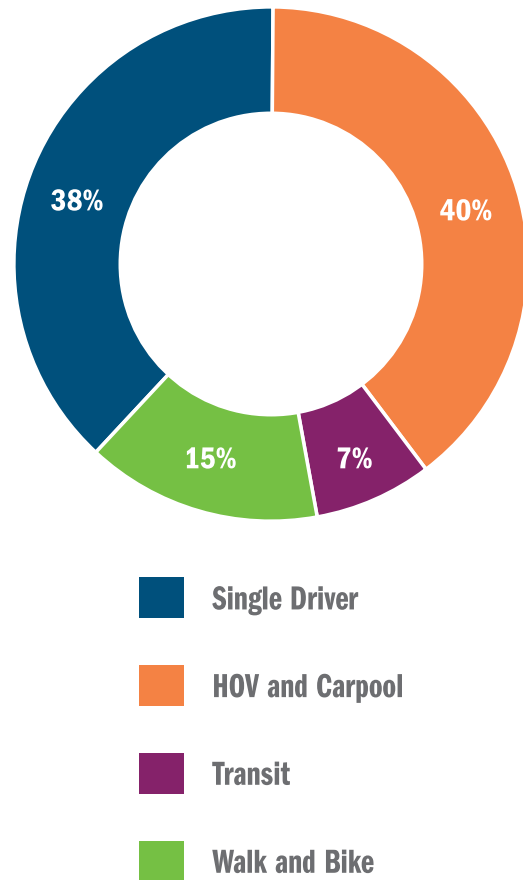


Figure 8.17: Mode Share, All Trips, 2045



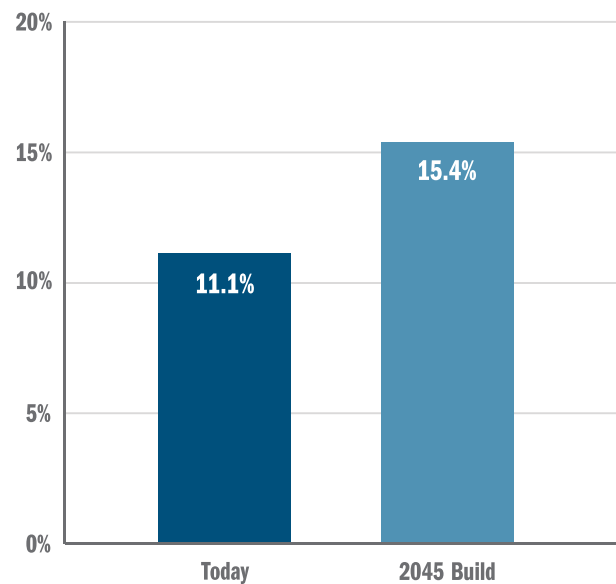
John Sonderman/Flickr



While most projects in the plan are intended to improve reliability in the region through some type of infrastructure expansion or enhancement, a subset of projects described here as “Reliability-Enhanced” modes tend to provide additional enhancements to offer reliability and congestion mitigation. “Reliability-Enhanced” modes include express toll lanes/high-occupancy toll (HOT) lanes with dynamic toll rates, high occupancy vehicle (HOV) lanes, the Inter-County Connector in Maryland, Dulles Airport Access Road in Virginia, Metrorail, commuter rail, light rail, streetcar, bus rapid transit, long-haul express buses, and walk and bike travel.

The region continues to add transportation projects aimed at enhancing reliability and mitigating congestion. Forecasts estimate that a greater percent of regional travel will be on these modes, from 11 percent today to 15 percent in 2045 (Figure 8.18). The addition of these types of projects suggests greater mode choices can lead to less dependency on single-occupant vehicle travel and individuals seeking greater reliability in their travel.

Figure 8.18: Percent of Daily Person Miles Traveled on “Reliability-Enhanced” Modes



How Does the Plan Support Traveling to Work?

In the two years since the start of the COVID-19 pandemic in this region, commuting characteristics for many workers have changed dramatically. While many jobs classified as “essential” still required travel to a job location, many others could be or were optimized for episodic or permanent telework. It is still unclear if the long-term implications of these changes will remain, and, as a result, the TPB conducted this analysis reflective of pre-COVID-19 pandemic conditions. See Chapter 2 for more information on today’s travel characteristics.

For forecasted commuting characteristics, travel model outputs suggest much of the pre-COVID-19 characteristics will likely be similar in 2045. The majority of commute travel in the outer suburbs will be dominated by single-occupant vehicle travel, commute travel in the inner suburbs will continue to be via a wide range of travel options, and in the region’s core, where transit is most readily available, a much greater share of commuting trips will be taken on transit (Figure 8.19).

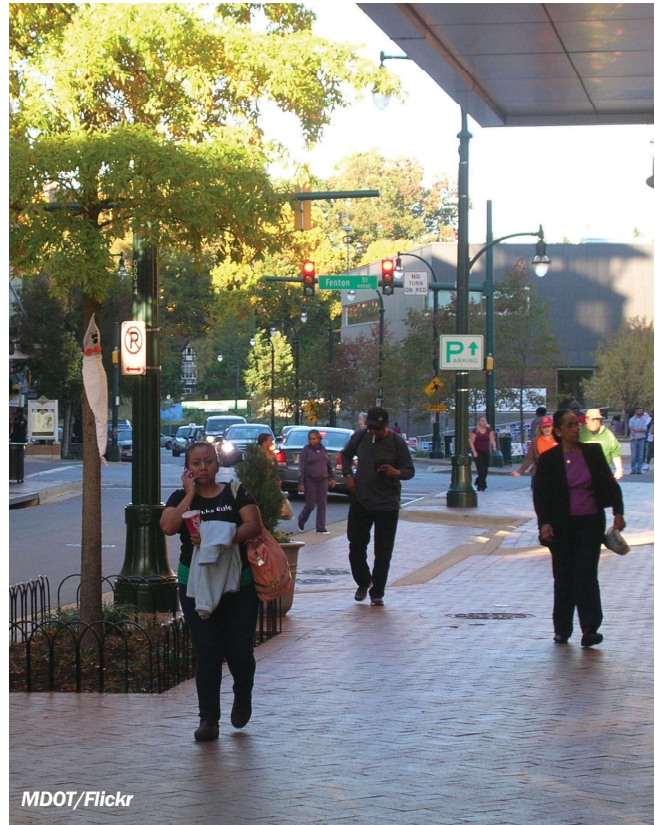
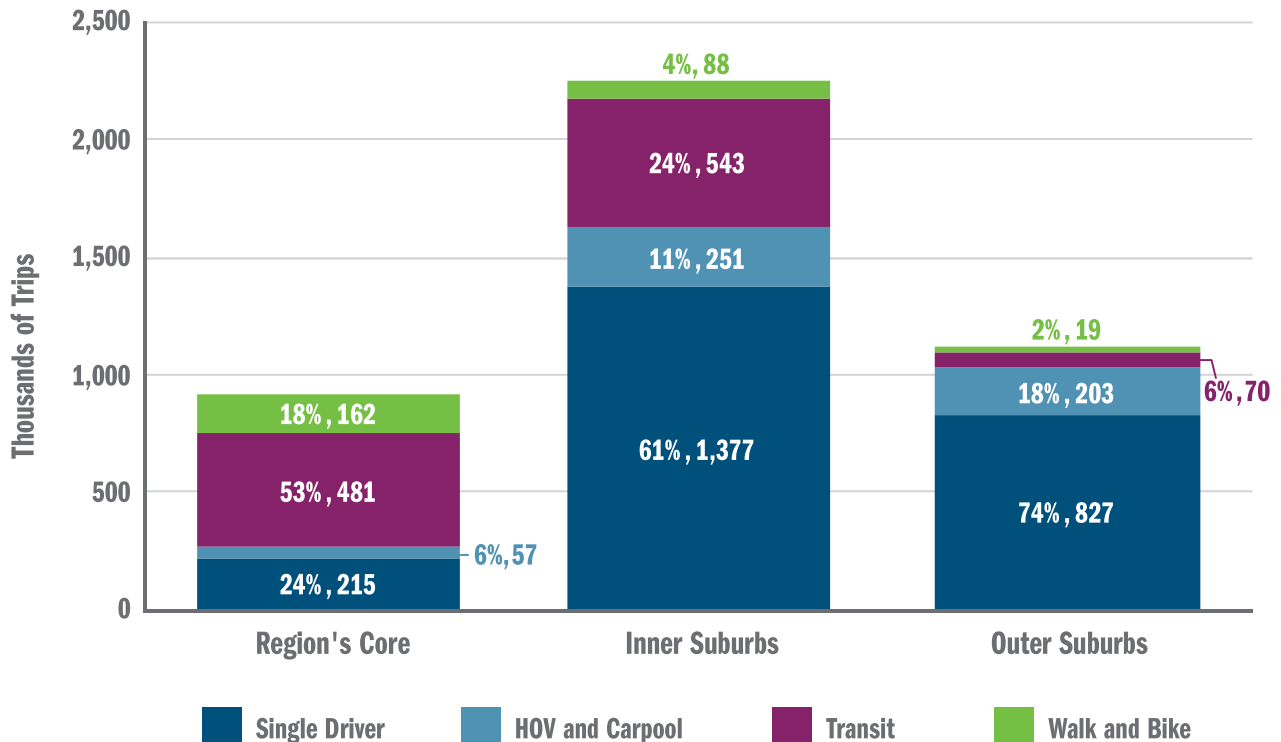


Figure 8.19: Work Trips by Mode and Geography, 2045



How Are New Transit Projects Forecast to Impact the Region?

The TPB's members are responding to the TPB's Aspirational Initiative to "Expand Bus Rapid Transit and Transitways" and "Move More People on Metrorail." By 2045, the region is planning to add an additional 27 percent of HCT miles compared to 2023, including additional light rail, streetcar, and bus rapid transit service. While not included in this figure, commuter rail infrastructure improvements and expansion, such as planned third and fourth tracks, will enhance existing transit service and are part of this plan. This section provides findings on how transit changes may impact the region.

Many more people and jobs are predicted to have better access to HCT (Figure 8.20).⁴⁷ In 2045, 27 percent of the region's population is forecast to live in close proximity to a HCT station, up from 18 percent today. In addition, nearly half of all jobs are forecast to be in close proximity to a HCT station, up from 41 percent today. These increases can be attributed to the additional HCT service planned for the region but also forecasts expecting more people and jobs close to these transit services.

Analyzing transit performance, through the number of jobs accessible during a 45-minute morning commute, the region is expected to see gains, and many smaller parts of the region will experience moderate gains. By 2045, the average number of jobs accessible within a 45-minute transit commute will increase from 414,000 to 553,000, a nearly 34 percent increase (Figure 8.21). Examining the geographic distribution of these changes shows that most places that currently have access to transit will experience increases in job access, and parts of the region where new transit projects are planned are also forecasted to gain access to additional jobs (Figure 8.22). These gains are likely linked to the forecast increase in jobs near existing transit stations and the expansion of higher quality transit service to more areas of the region, particularly Activity Centers and HCT station areas.

Figure 8.20: Percent of Population and Jobs in Proximity to High-Capacity Transit

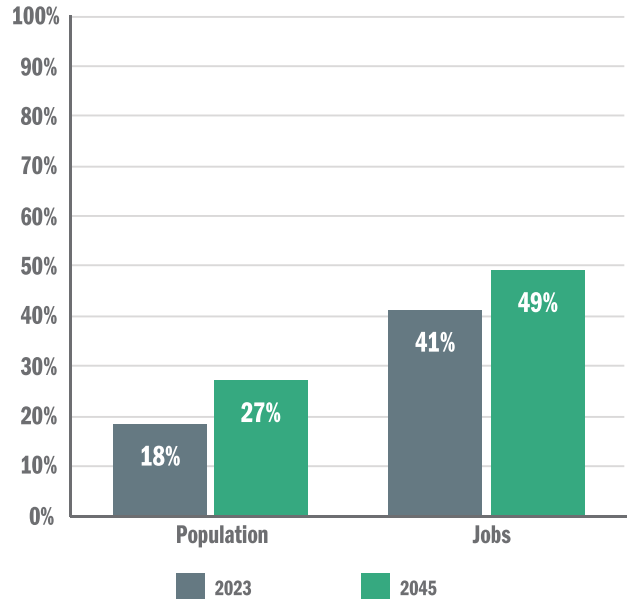
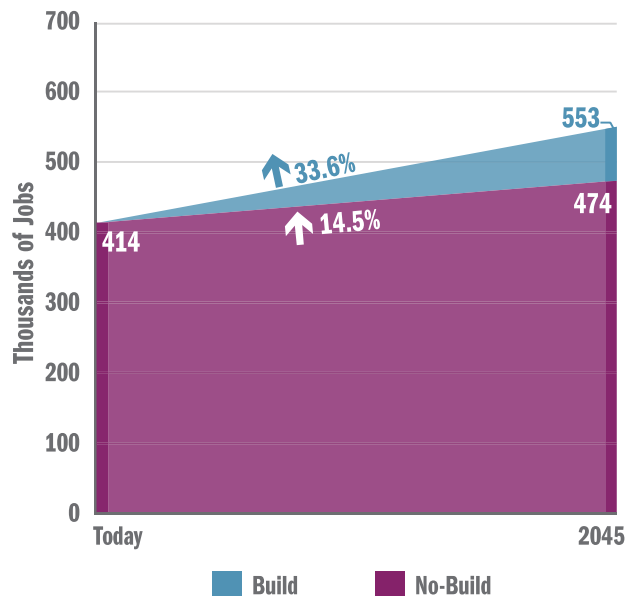


Figure 8.21: Change in Access to Jobs by Transit, Today – 2045



⁴⁷ For this measure, close proximity is defined as within a half-mile of High-Capacity Transit.

Figure 8.22: Geographic Detail of Change in Access to Jobs by Transit, Today – 2045

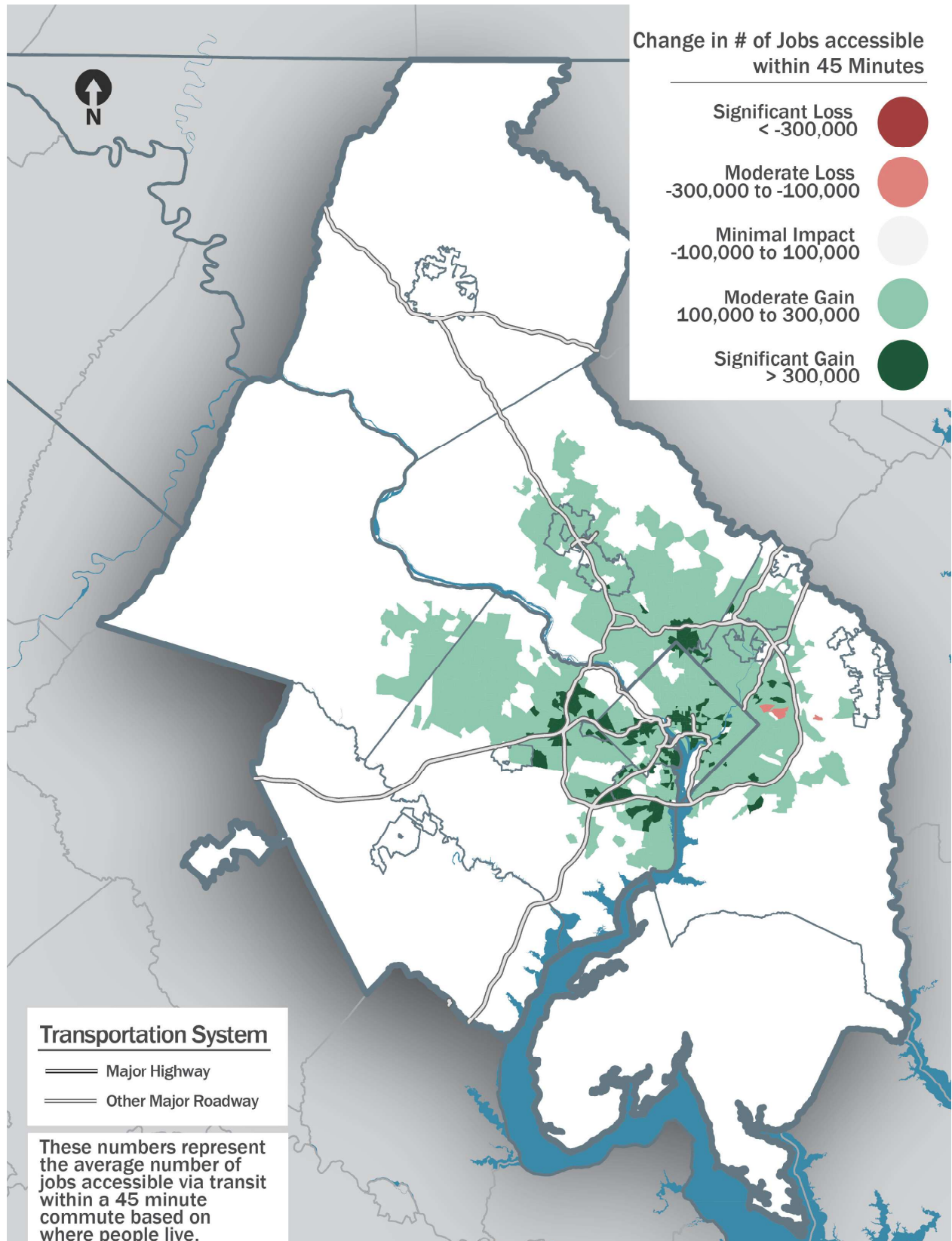
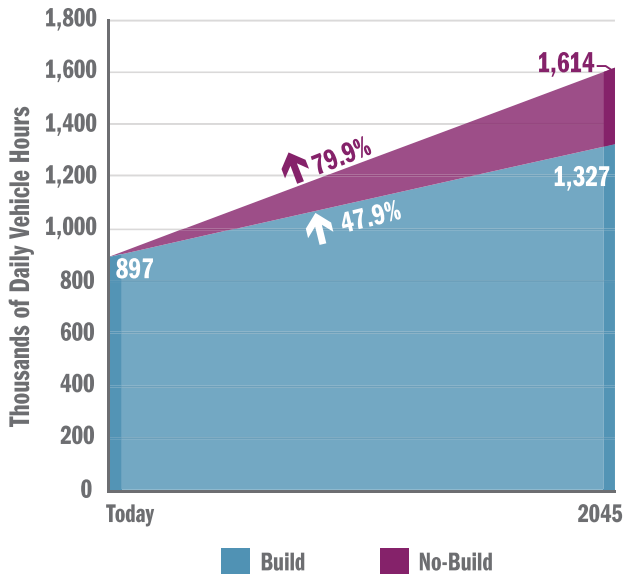


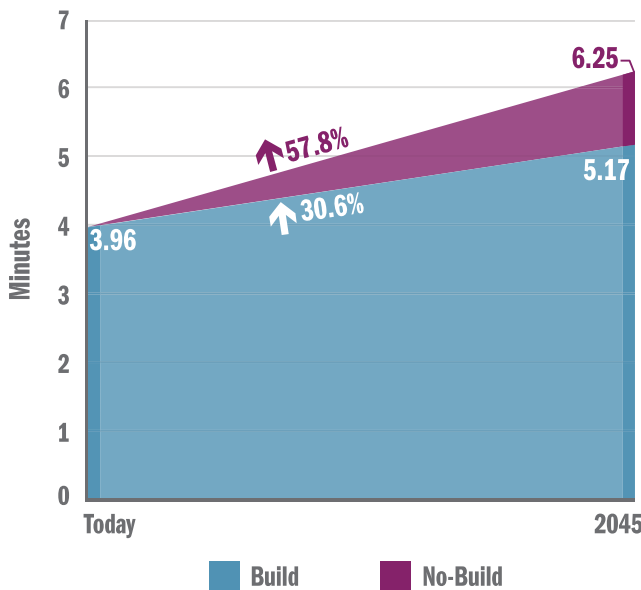
Figure 8.23: Total Daily Vehicle Hours of Delay, Today – 2045



How Will the Highway Network Serve the Region?

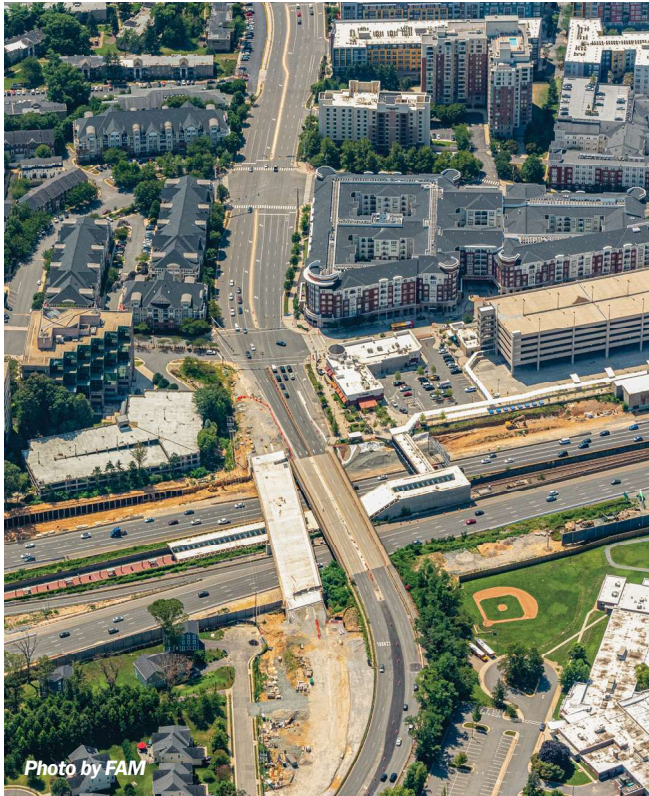
Between today and 2045, the region’s estimated increases in population and jobs, 19 and 23 percent, respectively, from 2023, will contribute to producing more trips across all modes, including single occupant vehicle and high occupancy vehicle and carpool trips. In addition, the region’s financial obligations to maintain and operate the existing system limits the availability of funds for system expansions and enhancements, providing for a five percent increase in roadway miles from 2023. These increases in roadway demand and financial constraint for roadway expansion and enhancement will likely contribute to more stress on an already stressed highway network, forecasting increases in delay, congestion, and reducing access to jobs via auto for parts of the region. This is one of the reasons the TPB’s documented CMP focuses on managing travel demand.

Figure 8.24: Average Minutes of Delay Per Trip, Today – 2045



Highway congestion is forecast to get worse in the coming decades, though moderated by the projects in Visualize 2045. Even though 13 percent of the region’s roadways are forecast to be congested during the morning commute in 2045, these roadways tend to be heavily used and have an outsized impact on congestion and delay.⁴⁸ Total daily vehicle hours of delay, which represents time spent in traffic in congested conditions, are forecast to increase by nearly 48 percent (Figure 8.23). A similar measure, average vehicle delay per trip, shows an increase of delay of nearly one minute and fifteen seconds or nearly 31 percent (Figure 8.24). In both metrics, by building the projects in Visualize 2045, congestion and delay are predicted to be at lower levels than if not built. Delay and congestion would have increased by nearly 80 percent and 58 percent in 2045 if projects were not built, respectively.

⁴⁸ Congested is defined as a road segment with a traffic volume equal to or greater than the capacity of the road segment.



Analyzing roadway performance through the number of jobs accessible during a 45-minute morning commute, the region as a whole will likely see a modest gain in access while parts of the region will experience varying changes in job accessibility, from significant losses to significant gains. By 2045, the average number of jobs accessible within a 45-minute auto commute will increase by 13,000, a little over a 1 percent increase (Figure 8.25). If the region builds no new transportation projects but continues to expect increases in population and jobs, average access to jobs is forecast to decrease by nearly 10 percent for the region. These differences suggest that the transportation projects in Visualize 2045 will make a difference in providing people with access to the jobs while seeking to minimize the impact of congestion in delay.

The geographic distribution of changes in job access during a 45-minute commute in the morning is not forecasted to be equally shared in the region. The region’s core, western suburbs, and northern suburbs are forecast to experience a moderate to significant gain in job access. Forecasts identify moderate to significant declines in accessibility by auto on the eastern side of the region and areas inside the Capital Beltway (Figure 8.26). Two factors are likely to contribute: The anticipated increase in congestion and delay decreasing accessibility to parts of the region by car and the additional jobs expected in this region between today; and 2045 being located largely in the western part of the region, increasing accessibility for areas near those jobs but likely reducing access to those beyond a 45-minute commute.

Figure 8.25: Change in Access to Jobs by Auto, Today – 2045

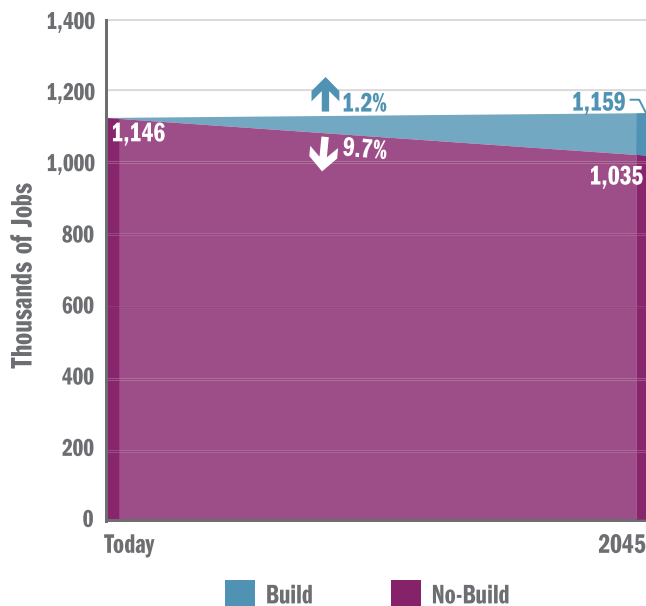
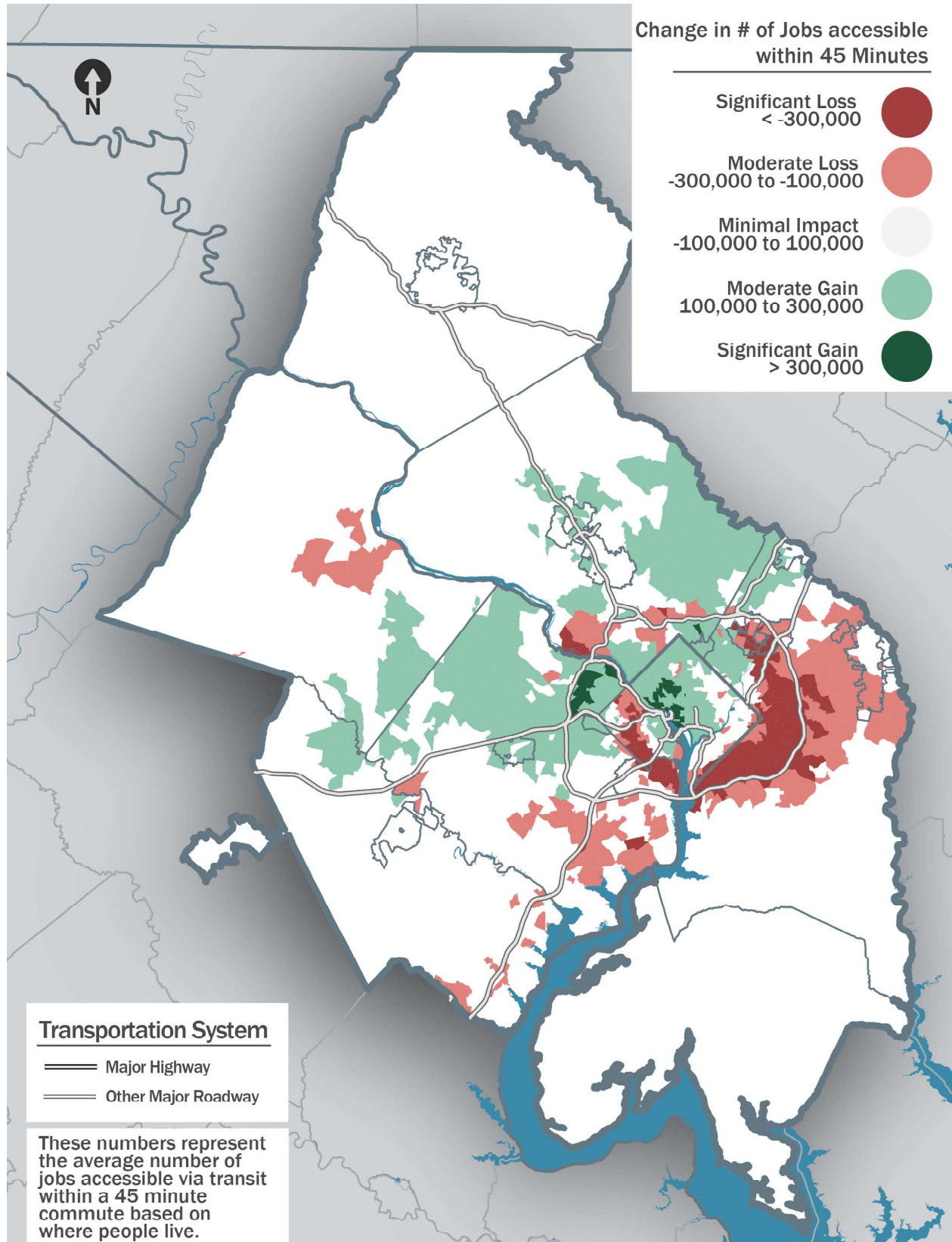


Figure 8.26: Geographic Detail of Change in Access to Jobs by Auto, Today – 2045

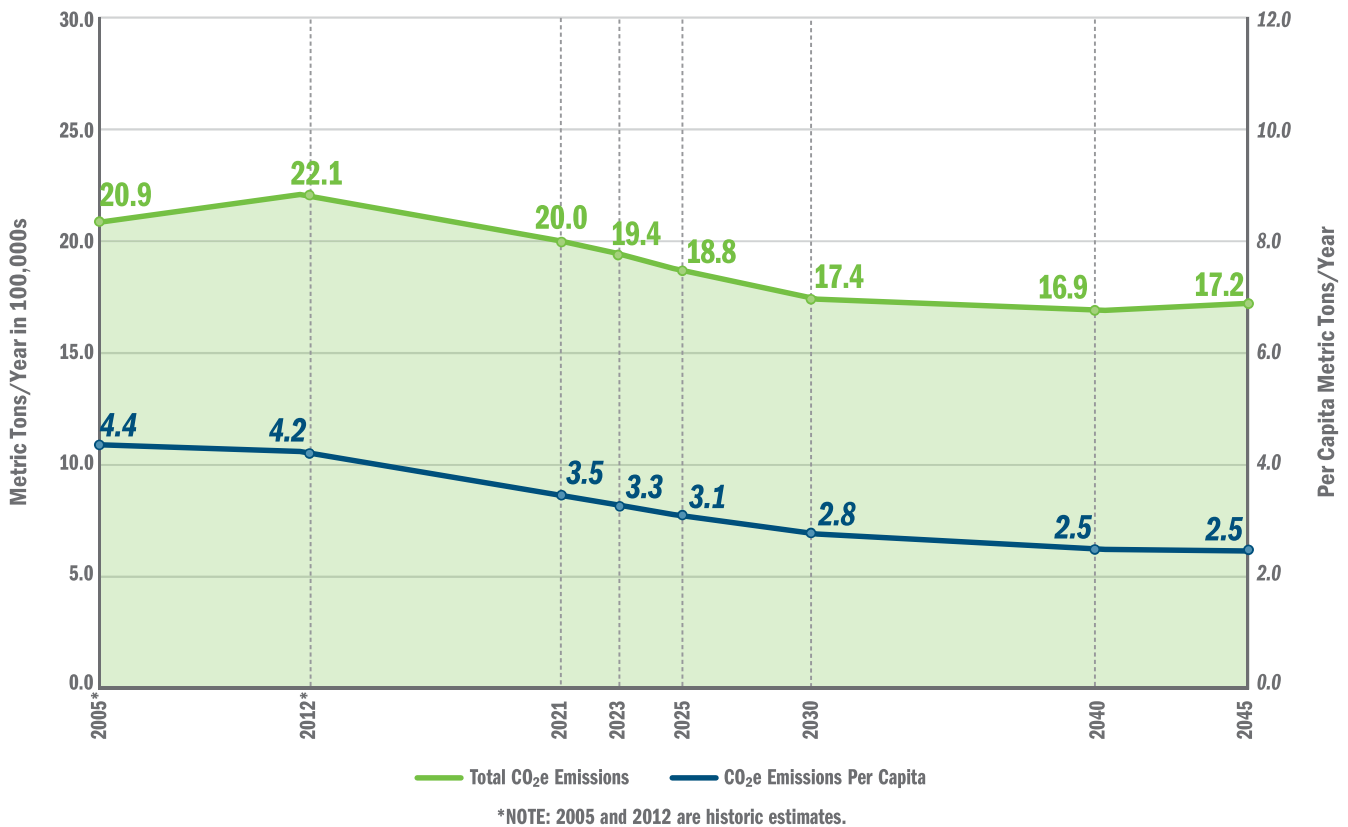


Greenhouse Gases

Unlike the two specific pollutants regulated by federal law in this region, greenhouse gases (GHGs), such as carbon dioxide, are not regulated by the federal government and are therefore not included in the Air Quality Conformity analysis. GHGs are generated by many sectors of the economy, e.g., energy, built environment, transportation, and waste. Due to the role of the transportation sector as a contributor to GHG emissions, the TPB has been tracking these emissions and has recently endorsed regional goals for reducing GHGs. Learn more about climate mitigation goals and activities in Chapters 3 and 6. In 2010, the TPB started proactively estimating and reporting future greenhouse gas mobile source emissions (as carbon dioxide equivalent or CO₂e) in the long-range transportation plan.

Since 2005, absolute annual GHG emissions in the on-road transportation sector have decreased by seven percent. By 2045, the latest analysis shows that annual GHG emissions are forecasted to be nearly 18 percent below 2005 emissions levels, or 11 percent below 2023 emissions levels, with a slight uptick between 2040 and 2045. Greenhouse gas emissions per capita are expected to decrease by 24 percent between 2023 and 2045 (Figure 8.27). The emissions reductions are largely attributed to increased fuel efficiency standards, but the uptick between 2040 and 2045 occurs as cleaner vehicles have saturated the fleet, and the benefits from fuel efficiency standards can no longer keep pace with projected VMT increases.

Figure 8.27: 2022 Update to Visualize 2045 Greenhouse Gas Mobile Source Emissions CO₂e and CO₂e Per Capita



*Since the TPB adopted the 2018 plan, the historic 2005 GHG emissions estimates were re-benchmarked using updated tools and planning assumptions and are consistent with both COG's 2030 Climate Energy and Action Plan and the TPB's Climate Change Mitigation Study of 2021. Therefore, the data varies slightly from past reporting.