



➔ **DRAFT** Implementation
Considerations for On-Road
Transportation Greenhouse Gas
Emissions Reduction Strategies

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List of Abbreviations

BLS – Bureau of Labor Statistics
CCMS – Climate Change Mitigation Study
CRS – Carbon Reduction Strategy
DDOT – District Department of Transportation
EV – Electric Vehicle
FHWA – Federal Highway Administration
FTA – Federal Transit Administration
GHG – Greenhouse Gas
HCT – High-Capacity Transit
HID – Housing in Downtown
HOT – High Occupancy Toll
HOV – High-Occupancy Vehicle
LRPTF – Long Range Plan Task Force
MBUF – Mileage-Based User Fee
MDOT – Maryland Department of Transportation
MWCOG – Metropolitan Washington Council of Governments
PAYD – Pay-As-You-Drive
RGGI – Regional Greenhouse Gas Initiative
STSFA – Surface Transportation System Funding Alternatives
TCI – Transportation and Climate Initiative
TDM – Transportation Demand Management
TNC – Transportation Network Company
TOD – Transit-Oriented Development
TPB – Transportation Planning Board
TRIP – Transit Ridership Incentive Program
TSMO – Transportation Systems Management and Operations
VDOT – Virginia Department of Transportation
VMT – Vehicle Miles Traveled
VPPP – Value Pricing Pilot Program
WMATA – Washington Metropolitan Area Transit Authority

Introduction

On-Road Transportation Greenhouse Gas Reduction Strategies

In 2022, the National Capital Region Transportation Planning Board (TPB) adopted Resolution R18-2022 on the Adoption of On-Road Transportation Greenhouse Gas (GHG) Reduction Goals and Strategies. In the resolution, the TPB decided to set aspirational GHG reduction targets for the on-road transportation sector, adopted priority on-road transportation GHG reduction strategies, and identified other strategies for further exploration.

Specifically, the TPB adopted the following seven on-road transportation GHG reduction strategies as priorities:

1. Improve walk/bike access to all TPB-identified high-capacity transit stations.
2. Increase walk/bike modes of travel – Complete the TPB’s National Capital Trail Network by 2030.
3. Convert private- and public-sector, light-, medium-, and heavy-duty vehicles, including public transit buses, to clean fuels by 2030.
4. Deploy a region-wide, electric vehicle (EV) charging network, including refueling stations for alternate fuels.
5. Add additional housing units near TPB-identified high-capacity transit stations and in COG’s Regional Activity Centers.
6. Reduce travel times on all public transportation bus services.
7. Implement transportation system management & operations (TSMO) improvement measures at all eligible locations by 2030.

The TPB also identified the following seven strategies for “further exploration in coordination at the local and state levels”:

1. Take action to shift growth in jobs and housing from locations currently forecast to locations near TPB-identified high-capacity transit stations and in COG’s Regional Activity Centers to improve the jobs-housing balance locally.
2. Make all public bus transportation in the region fare-free by 2030.
3. Make all public rail transportation in the region fare-free by 2030.
4. Price workplace parking for employees – only in Activity Centers by 2030 and everywhere by 2050.
5. Convert a higher proportion of daily work trips to telework by 2030 and beyond.
6. Charge a new fee per vehicle mile of travel (VMT) by motorized, private, passenger vehicles in addition to the prevailing transportation fees and fuel taxes [mileage-based user fee].
7. Charge a “cordon fee” (Commuter tax) per motorized vehicle trip for all vehicles entering Activity Centers, by 2030.

To build on this work, COG/TPB staff requested this study to examine implementation issues and considerations associated with the seven strategies identified for further exploration plus an additional nine strategies recommended by ICF in consultation COG staff and the TPB Technical Committee, which provided feedback during and following its meeting on March 1, 2024. ICF identified these strategies based on a review of Transportation Carbon Reduction Strategy (CRS) documents of the District of Columbia, Maryland, and Virginia as well as the climate action plans of several member jurisdictions. ICF also reviewed CRS documents from California, Minnesota, Oregon, Pennsylvania, and Washington as well as national-level documents. The strategies include:

8. Implement a carbon pricing program or increase in fuel taxes.
9. Implement pay-as-you-drive (PAYD) insurance requirements.
10. Implement employer-based parking cash-out program requirements.
11. Reduce VMT associated with school-based trips.
12. Incentivize electric bicycle (e-bike) adoption.
13. Disincentivize parking through parking reforms.
14. Convert existing highway lanes to high-occupancy toll (HOT) lanes.
15. Expand microtransit / first mile-last mile service in the region.
16. Expand programs to incentivize carpooling and vanpooling.

Implementation Considerations

In this study, each of the strategies selected for further exploration is assessed in relation to implementation issues that are important for state and local governments to consider. ICF identified these implementation issues based on a review of the TPB's 2021 Climate Change Mitigation Study (CCMS),¹ TPB's Synthesized Policy Framework, the federal Carbon Reduction Program, the U.S. Environmental Protection Agency's Carbon Pollution Reduction Grants Program, and the Federal Highway Administration (FHWA)/Federal Transit Administration (FTA) Planning Emphasis Areas. These include:

- **Relative effectiveness in reducing GHG emissions:** The potential to reduce GHG emissions is important to understand for developing a comprehensive transportation GHG reduction strategy. This includes both the *level of impact* and likely *timeframe for achieving benefits*. For purposes of evaluation, the timeframe was considered as the amount of time needed to realize the GHG reduction benefits of the strategy. This timeframe often involves two components: 1) the time needed for implementation of the strategy (e.g., time for changes in policy or investments to occur), and 2) the timeframe for the implemented strategy to affect vehicle

¹ ICF, Fehr & Peers, and Gallop Corporation, "TPB Climate Change Mitigation Study of 2021: Scenario Analysis Findings," Final Report (National Capital Region Transportation Planning Board, Metropolitan Washington Council of Governments, January 7, 2022), <https://www.mwccog.org/tpb-climate-change-mitigation-study-of-2021/>; ICF, Fehr & Peers, and Gallop Corporation, "TPB Climate Change Mitigation Study of 2021: Technical Appendix" (National Capital Region Transportation Planning Board, Metropolitan Washington Council of Governments, January 7, 2022), <https://www.mwccog.org/tpb-climate-change-mitigation-study-of-2021/>; ICF, Fehr & Peers, and Gallop Corporation, "TPB Climate Change Mitigation Study of 2021: Additional Transportation Scenarios Analysis: TPB Survey Identified Scenarios," Final Report (National Capital Region Transportation Planning Board, Metropolitan Washington Council of Governments, June 3, 2022), <https://www.mwccog.org/events/2022/5/18/tpb-climate-work-session/>.

travel or vehicle choices. (For instance, land use policies like zoning changes can be implemented relatively quickly but the effects of the strategy require significant time to fully manifest, as new land use development occurs. Consequently, this strategy is rated as having a long timeframe for achieving benefits.)

- **Implementing organizations, legislative authority, and enabling actions:** Some strategies may require actions at the federal, state, or local levels, and, in some cases, by the private sector (e.g., employers, developers) or individual households. This assessment discusses *organizations that need to be involved in implementation* of the strategy and the *legislative authority* necessary to implement each strategy, as well as *enabling actions* that may be necessary in the case where there is no current authority.
- **Costs associated with implementation:** These include costs borne by governments/public sector (which ultimately must generally generate revenues from the public) as well as costs to the private sector and households for each strategy.²
- **Implication of the strategies on other regional goals and priorities:** This includes an assessment of both potential benefits and adverse effects. Drawing from the TPB Principles and Goals,³ these have been consolidated into the following topics for assessment:
 - **Accessibility & Affordability:** Impacts on mobility, access to jobs/education/health care and other destinations, and affordability of access
 - **Environmental Quality:** Impacts on air quality, water quality, and other aspects of the natural environment
 - **Equity:** Impacts on different population groups within the region, particularly low-income and historically disadvantaged populations and those who have been overburdened by the transportation network
 - **Infrastructure Condition:** Impacts on state of good repair and on existing infrastructure
 - **Livability & Prosperity:** Impacts on community and economic vitality, including community quality of life, job creation and economic activity, and a sense of place
 - **Reliability & Efficiency:** Impacts on travel time reliability and efficient system operations
 - **Resiliency:** Implications for addressing potential threats from climate change and severe weather, as well as other natural and human-caused hazards
 - **Safety:** Impacts on fatalities and serious injuries, as well as public safety
- **Other considerations:** This is a “catch all” assessment to address any other factors that may be useful to consider. For each strategy, as appropriate, a discussion of potential indirect or unintended consequences and actions to consider to best support positive outcomes from the strategy is included.

² Potential social costs and savings (i.e., changes in externality costs) are considered as part of a strategy’s implications for other regional goals and priorities.

³ MWCOG, TPB’s Synthesized Policy Framework, 2022. <https://www.mwcog.org/documents/2024/02/06/tpb-synthesized-policy-framework/>.

Study Approach

In assessing the strategies in relation to these implementation considerations, ICF drew from various information sources. These include research conducted previously for COG/TPB for the Long-Range Plan Task Force (LRPTF) and the CCMS, as well as reviews of literature on these strategies. ICF consulted studies conducted by COG and its member jurisdictions as well as relevant legislation, news articles, academic literature, case studies, program evaluations, and other reports, as well as data from the FTA and the Bureau of Labor Statistics (BLS). No modeling or scenario analysis was conducted to assess the impacts of strategies. The assessments are qualitative and reflect the study team's best judgment on the impacts of strategies and associated implementation issues.

Summary of Findings

Table 1 below provides a high-level assessment of the 16 strategies assessed in relation to the implementation considerations. This is followed by descriptive assessments of each strategy. Several observations are highlighted here in relation to this assessment:

- Many of the strategies that could have the largest impact at reducing GHG emissions in the near-term involve increasing the price of vehicle travel, which can be challenging politically and raise concerns in terms of equity and affordability.** A new VMT fee (Strategy 6), cordon fees (Strategy 7), and a carbon pricing program (Strategy 8) would likely have the largest GHG emissions benefits by affecting a large portion of travel and providing an immediate price disincentive for driving after implementation. However, these strategies have relatively limited adoption to date in the United States and tend to face political challenges. Policies to shift development to high-capacity transit stations and Regional Activity Centers to improve the jobs-housing balance (Strategy 1) could also have a relatively large GHG emissions benefit, but these benefits take a longer time to be achieved due to the slow pace of development.
- While public agencies can implement policies or regulations to advance these strategies, the GHG impact of many of the strategies depends heavily on factors outside of the control of public agencies. Some strategies that in theory have high impacts may not fully achieve the potential benefits due to lack of control by public agencies.** Some strategies are directly implementable by public agencies (e.g., e-bike incentives, fare-free transit, microtransit, conversion of general use lanes to HOT lanes, etc.), but several of the strategies depend heavily on the private sector for implementation. Consequently, there is uncertainty about the extent to which public agency efforts would yield large impacts. Specifically, strategies like land use policies and incentives to support transit-oriented development (TOD) (Strategy 1), pricing workplace parking for employees (Strategy 4), PAYD insurance (Strategy 9), employer-based parking cash-out programs (Strategy 10), and unbundling parking from leases (Strategy 13) should be relatively high impact in theory. But since land use development, insurance policies, and parking arrangements are not directly "implemented" by government but involve mandates, incentives, or encouragement of private sector decisions, there are uncertainties about the extent to which public policies can directly shape the intended outcomes. The impact of these strategies depends on: 1) the effectiveness of the intended approach if the outcomes of the strategy could be fully achieved, and 2) the effectiveness of government policies or actions at achieving the desired strategy outcomes. For instance, regulatory approaches and incentives, such as changes in zoning and development requirements, can foster development that reduces

GHG emissions, but the level of impact is still influenced by market forces and factors somewhat outside the control of zoning agencies. Similarly, states could incentivize or require insurance companies to offer PAYD insurance, but it is not clear whether states could legally mandate that only PAYD insurance be offered, to what extent the insurance market would offer attractive PAYD policies, and to what extent consumers would choose this type of insurance. Similarly, public agencies could disincentivize parking through parking reforms, but it is unclear to what extent property owners would unbundle lease costs in response to incentives.

- **Although the strategies are generally implementable at the state or local scales, to be most effective, many require considerable coordination across state and regional partners.** For instance, while fare-free bus and rail (Strategies 2 and 3) could readily be implemented (and fare-free bus has already been implemented in some jurisdictions), at a regional scale, fare-free services would require important discussions among jurisdictions regarding funding mechanisms and contributions. Charging a cordon fee for all vehicles entering Activity Centers (Strategy 7) would require extensive coordination across jurisdictional boundaries regarding setting pricing levels and establishing boundaries for the cordon so as not to disadvantage specific areas. While actions to shift growth in jobs and housing to high-capacity transit stations and Regional Activity Centers (Strategy 1) are broadly supported across the region, actions that could shift development across different jurisdictional boundaries face challenges as individual jurisdictions seek to maximize tax revenue and community benefits to their residents. Overcoming these challenges is feasible but will likely require focused efforts among regional partners.
- **The GHG emissions effects of the strategies depend heavily on how the strategies are implemented and how much incremental changes can be achieved.** The effects of pricing strategies such as VMT-fees, carbon pricing, and pricing workplace parking depend heavily on the price levels selected, and it would likely be politically challenging to implement policies that appear to impose high costs on the public. Telework (Strategy 5) is already at a high level historically, so the incremental effects of additional policy actions are somewhat uncertain. Similarly, while more can be done, land use policies to support development around high-capacity transit stations and in Regional Activity Centers are already in place to some degree throughout the region.
- **As with GHG impacts, the effects of strategies on regional goals and priorities depend heavily on how the strategies are implemented in practice.** In many cases, the positive or negative impacts of a strategy on regional goals depend heavily on how specific policy actions are implemented, including how revenues are used from policies that involve pricing. For instance, pricing strategies such as pricing workplace parking (Strategy 4), a new VMT fee (Strategy 6), a cordon fee for vehicles entering Activity Centers (Strategy 7), implementing a carbon pricing program (Strategy 8), and converting existing general use highway lanes to HOT lanes (Strategy 14) raise potential equity concerns in relation to the ability of low-income persons to pay. However, the way the programs are structured (e.g., toll credits, rebates to low-income households, use of revenues to pay for enhanced transit services) will have a large impact on these equity implications and these programs can be structured to enhance equity. Moreover, these strategies impose some additional costs on households but also can yield overall savings based on how the revenues are invested and actions that households may take to use more efficient vehicles or reduce vehicle ownership, and through reduction of social costs such as health issues due to poor air quality.

- Costs of implementation vary, with some strategies creating significant fiscal impacts on public agencies while others are net revenue generators.** With respect to their fiscal impacts, the costliest strategies for the public sector would likely be fare-free bus and rail (Strategies 2 and 3) due to the loss of farebox revenue. Other strategies that involve providing public-sector incentives, like expanding programs to incentivize carpooling and vanpooling (Strategy 16), would require public sector funds. In contrast, the strategies that involve pricing – specifically VMT fees (Strategy 6), a cordon fee (Strategy 7), carbon pricing (Strategy 8), and converting general use lanes to HOT lanes (Strategy 14) would be net revenue generators for the public sector. Parking reform (Strategy 13) would also likely generate revenues associated with higher public parking fees or parking impact fees for development. For the private sector, most of the strategies would pose either mixed/uncertain or negligible costs. While the public would bear the costs of paying for pricing mechanisms, pricing policies would result in benefits to society, since the reduction in VMT would likely result in reductions in the externalities associated with motor vehicle traffic (e.g., air pollution, noise, injuries due to accidents, etc.).
- By reducing motor vehicle emissions, the strategies should all have beneficial impacts on air quality and public health.** This is an important co-benefit of these GHG reduction strategies. At the same time, it is important to note that the air quality impact of converting existing general use traffic lanes to HOT lanes (Strategy 14) would require further study due to potential increased traffic congestion in the general use lanes and diversion of some traffic from highways to arterial roadways. If implemented, this strategy would best be paired with carpool/vanpool incentives (Strategy 16) and other strategies to address traffic diversion.
- Since all the strategies reduce VMT, they also may also have beneficial effects on other goals such as safety, reliability, and efficiency. However, these impacts are relatively small or uncertain.** For an individual household, reducing vehicle travel reduces exposure to the risk of motor vehicle crashes. From a regional perspective, reduced VMT likely would yield safety benefits and reduce congestion, but regional effects are somewhat uncertain. During the COVID-19 pandemic when VMT dropped considerably, roadway fatalities and serious injuries increased (due to more excessive speeding, more reckless behavior, and other factors). Consequently, most strategies are rated as having a “negligible” impact on safety, as well as on resiliency, infrastructure condition, and reliability and efficiency, unless the strategy directly focuses on one of these aspects. For instance, by bringing together more dense development and lowering traffic speeds, TOD (Strategy 1) was rated as having a benefit for safety. Converting general use travel lanes to HOT lanes (Strategy 14) was rated as having a benefit for reliability and efficiency since the HOT lanes are designed with dynamic pricing to provide reliable travel times.
- Several strategies would work best if paired together.** The most effective approach would likely pair “sticks” (strategies that disincentivize driving) with “carrots” (strategies that expand, enhance, or incentivize using transit, ridesharing, bicycling, walking, or telework). This combination of strategies could provide synergistic effects by providing the public with viable options and alternatives to driving, while addressing affordability and equity concerns and likely leading to more public support. At the same time, some strategies in combination may have counteracting effects. For instance, increasing telework (Strategy 5) could diminish the impacts of workplace parking pricing (Strategy 4) and carpool/vanpool incentives (Strategy 16), since fewer workers would be traveling to worksites; however, the net impact of combining strategies would be greater than a single strategy.

Table 1: Overview of Impacts of Strategies on Implementation Considerations

Strategy		GHG Reduction		Revenues & Expenditures			Regional Goals & Priorities							
		Impact	Timeframe	Public Sector	Private Sector	Households/ Individuals	Accessibility & Affordability	Environmental Quality	Equity	Infrastructure Condition	Livability & Prosperity	Reliability & Efficiency	Resiliency	Safety
1	TOD	●	🕒🕒🕒	-	-	\$	⊕	⊕	⊕	○	⊕	⊕	⊕	⊕
2	Fare-Free Bus	🕒	🕒	(\$\$\$)	-	\$	⊕	⊕	⊕	○	⊕	○	○	○
3	Fare-Free Rail	🕒	🕒	(\$\$\$)	-	\$	⊕	⊕	⊕	○	⊕	○	○	○
4	Work Parking Pricing	🕒	🕒🕒	(\$)	\$	(\$\$)	⊖	⊕	○	○	○	○	○	○
5	Telework	🕒	🕒	(\$)	-	\$	⊕	⊕	⊖	○	⊖	○	⊕	○
6	VMT Fee	●	🕒🕒	\$\$\$	(\$)	(\$\$)	○	⊕	○	⊕	○	⊕	○	○
7	Cordon Fee	●	🕒🕒	\$\$	(\$\$)	(\$)	○	⊕	○	○	○	⊕	○	○
8	Carbon Pricing	●	🕒🕒	\$\$\$	(\$\$)	(\$\$\$)	○	⊕	○	⊕	○	⊕	○	○
9	PAYD Insurance	🕒	🕒🕒	(\$)	-	\$	⊕	⊕	⊕	○	○	○	○	○
10	Parking Cash-out	🕒	🕒	(\$)	(\$)	\$	⊕	⊕	⊕	○	○	○	○	○
11	School-Based VMT	🕒	🕒	(\$)	-	(\$)	○	⊕	○	○	○	○	○	○
12	E-Bike Incentive	🕒	🕒	(\$)	-	\$	⊕	⊕	⊕	○	○	○	⊕	○
13	Parking Reform	🕒	🕒	\$	-	-	⊕	⊕	○	○	⊕	○	○	○
14	Convert to HOT Lanes	🕒	🕒🕒	\$\$	-	(\$\$)	○	○	○	⊕	○	⊕	○	○
15	Microtransit	🕒	🕒	(\$\$)	-	\$	⊕	⊕	⊕	○	⊕	○	○	○
16	Carpool/Vanpool Incentives	🕒	🕒	(\$\$)	-	\$	⊕	⊕	○	○	○	○	○	○

KEY: Relative Impact: 🕒 Low ● Medium ● High **Relative Timeframe:** 🕒 Short 🕒🕒 Medium 🕒🕒🕒 Long
Relative Cost: (\$) Low (\$\$) Medium (\$\$\$) High **Revenue Generation/Savings:** \$ Low \$\$ Medium \$\$\$ High
 - Mixed/Uncertain/Negligible **Impact on Goals:** ⊕ Positive ⊖ Negative ○ Mixed / Uncertain ○ Negligible

Evaluation of Strategies

Strategy 1: Take action to shift growth in jobs and housing from locations currently forecast to locations near TPB-identified high-capacity transit stations and in COG's Regional Activity Centers to improve the jobs-housing balance locally.

This strategy involves shifting planned employment and housing growth from currently forecast locations within the region to other locations within the region near high-capacity transit stations and in Regional Activity Centers to improve the jobs-housing balance.⁴ This strategy, as adopted by the TPB for further exploration, is defined as improving jobs-housing balance locally, and so may be focused on shifting development within jurisdictional boundaries (e.g., within individual counties) rather than across county or state boundaries, which would be more impactful from a regional perspective.

Relative effectiveness in reducing GHG emissions

Level of Impact: Land use patterns play a significant role in travel demand and mode share, and TOD is recognized as a highly effective strategy to reduce GHG emissions by reducing the distance between housing and employment centers, thereby reducing vehicle travel-associated emissions, as well as making transit and active modes more convenient relative to driving, thus reducing VMT.

The TPB's LRPTF analyzed a scenario to optimize the regional jobs-housing balance by shifting development across the region (shifting about 98,000 jobs anticipated in 2040 from the Western to the Eastern subregion), moving jobs and housing to areas around rail stations and Activity Centers with high-capacity transit, and adding 130,000 more households to the region (with the largest share moving to the Western subregion) to reduce long-distance "in-commuters." The LRPTF found that this strategy would significantly reduce GHG emissions, estimating about a 4% reduction in regional on-road GHG emissions compared to the baseline forecast for 2040, far higher than any other initiative scenario examined, with the exception of the travel demand management initiative (which included significant telework and pricing).⁵ The CCMS examined a similar set of land use change assumptions for 2030 and 2050 (Scenario MS.1), shifting jobs growth from the Western subregion to the Eastern subregion, increasing jobs and housing at rail stations and Activity Centers with high-capacity transit, and building more housing in the region (adding 77,000 more households by 2030 and 126,000 more households by 2050 compared to the baseline forecast). While the land use strategy was bundled with other strategies and not reported separately in the CCMS, the land use analysis estimated that this strategy would reduce regional light-duty (passenger car and passenger truck) VMT by about 2.3% in 2030 and by about 4.1% in 2050 compared to the baseline forecast for those years. The study did not account for any emissions impacts due to changes in traffic congestion.

Overall, these GHG impacts at a regional scale are large compared to other strategies, but it should be noted that these scenarios involved shifts in development across jurisdictional boundaries and included significant additions of housing within the region in Activity Centers, while this strategy adopted for study by the TPB specified improving the jobs-housing balance locally. Moreover, jurisdictions across the region already have

⁴ High-capacity transit (HCT) means fixed-guideway transit, i.e., Metrorail, commuter rail, light rail, streetcar, and bus rapid transit (BRT).

⁵ ICF et al., "An Assessment of Regional Initiatives for the National Capital Region: Technical Report on Phase II of the TPB Long-Range Plan Task Force" (Metropolitan Washington Council of Governments, National Capital Region Transportation Planning Board, December 20, 2017), 52-55, <https://www.mwcog.org/documents/2017/12/20/long-range-plan-task-force-reports-projects-regional-transportation-priorities-plan-scenario-planning-tpb/>.

land use plans that generally target high-density development for high-capacity transit locations and Activity Centers, so the extent to which the public sector can influence further shifts in development may be somewhat limited, and market demands play a significant role in driving development decisions. There are some metro station areas, for instance, which have been targeted for TOD for many decades but have been relatively slow to develop compared to than others, so incentives or other non-traditional strategies might be needed beyond land use planning authorities.

Timeframe of Effectiveness: Land use changes occur slowly, and it can take years to decades for development densities in transit station areas to grow significantly. From amending land use plans and zoning to designate an area for TOD (a potentially protracted process in itself) to seeing development come to fruition, it can take a decade or more—from concept to design to construction to occupancy, with many intermediate opportunities for delay or derailment. It is also worth noting that the vast majority of future land use is already on the ground, with employment, population, and households forecast to grow by only 23–26% from 2020 to 2045. As such, the opportunity to affect future land use is somewhat limited in the short and medium terms.⁶

Implementing organizations, legislative authority, and enabling actions

Organizations Involved: TOD involves a wide array of public and private stakeholders. On the public side, local governments have the primary authority for land use development planning and zoning. In addition, WMATA owns land around many of its rail stations and has a joint development real estate program and strategic plan designed to accelerate partnerships and the delivery of TOD by offering properties through ground lease or sale. On the private side, real estate developers, lenders, and investors play a key role in development decisions, and react in response to market demands from prospective employers, employees, and residents.

Legislative Authority: Local governments have primary authority of land use planning and zoning in jurisdictions within the COG region. Although Maryland and Virginia both are Dillon’s Rule states, in which localities only possess powers specifically delegated to them by state law, generally local and county governments have the tools needed to manage growth within their jurisdictions. For instance, in both states, counties may develop comprehensive development plans, implement zoning ordinances, and create service districts. In practice, however, strong local autonomy can complicate regional coordination. At the state level, Maryland and Virginia have relatively limited roles in channeling growth to certain areas.

However, state and local governments play roles through transportation investments and by providing targeted economic incentives. For instance, the More Jobs for Marylanders Incentive Program promotes the growth of manufacturing in Maryland by providing tax incentives for manufacturing job creation, and in 2019, the program was expanded to non-manufacturers that locate or expand in Opportunity Zones. (However, this program will sunset in June 2024.)⁷ Incentive programs like this could potentially be implemented or expanded to target development to high-capacity transit station areas. The District of Columbia has introduced the Housing in Downtown (HID) Program to encourage conversion of underutilized office space to residential development by providing a 20-year property tax abatement to developers converting space.⁸

⁶ DesJardin, Paul. “Cooperative Forecasting: Update on Round 9.2 and Planning for Round 10.0.” Presented at the Technical Committee of the National Capital Region Transportation Planning Board, held at the Metropolitan Washington Council of Governments, Washington, D.C., March 4, 2022. <https://www.mwcog.org/events/2022/3/4/tpb-technical-committee/>.

⁷ Maryland Department of Commerce, More Jobs for Marylanders Incentive Program. <https://commerce.maryland.gov/fund/programs-for-businesses/more-jobs-for-marylanders>

⁸ Office of the Deputy Mayor for Planning and Economic Development, Housing in Downtown Program. <https://dmped.dc.gov/page/housing-downtown-hid-program>

Costs associated with implementation

Public Sector: In general, denser development in transit-oriented locations is less costly than sprawling development in terms of infrastructure provision. However, TOD can pose upfront costs to the public sector in the form of water, sewer, and electric infrastructure provision, if not already constructed. It can also pose costs in the form of social service provision (e.g., schools and libraries that may need to be built or expanded in denser locations). Many of these costs (e.g., local road network) can be passed on to the developer or recouped in the form of greater property tax revenue, assuming the development attracts employers and residents, thus increasing its tax base. While tax abatement programs to encourage development in TOD and targeted Activity Centers can in the short-run cost local governments tax revenue, in the long-run they should support a stronger local tax base.

Private Sector: TOD poses upfront costs to the private sector in the form of land acquisition cost, construction costs, and development fees. However, private sector actors expect to recoup these costs in the form of commercial and residential rents as well as property value increases.

Households/Individuals: TOD generally results in cost savings for residents by reducing vehicle ownership needs and travel needs. However, its effect on nearby property values is generally positive, and if not managed well, TOD can cause gentrification and displacement of lower-income residents.

Implications for regional goals and priorities

Accessibility & Affordability: TOD promises improved accessibility to employment, education, healthcare, and other destinations. TOD can also improve housing affordability by increasing the supply of housing, particularly if it involves inclusionary zoning whereby developers are required or incentivized to set aside units for low- or moderate-income households. However, TOD can lead to displacement by increasing adjacent property values, thereby pricing out lower-income households.

Environmental Quality: Though TOD is a more intense form of development, its overall effect on environmental quality is positive to the extent that it concentrates development and reduces sprawl, thus preserving open space elsewhere in the region. It also improves air and water quality by reducing not only GHGs but also the criteria pollutants associated with VMT, and multi-family housing reduces per capita residential energy use as well.

Equity: While TOD does not inherently advance equity, well managed development can support equity when incorporating strategies such as inclusionary zoning, robust community engagement, and community benefits agreements.⁹ By reducing auto dependency, TOD also generally supports more equitable access for lower-income households, older adults, youth, and persons with a disability.

Infrastructure Condition: By reducing VMT and encouraging mode shift, TOD would reduce demands on roadway infrastructure but increase demands on transit infrastructure. For instance, transit operators may need to increase frequency and/or capacity to accommodate increased ridership without increasing wait or travel times.

Livability & Prosperity: TOD may increase quality of life by reducing time spent commuting and placing more destinations within walking or biking distance. It can also reduce social isolation and create a unique sense of place, although the strength of this effect depends on the urban design quality of the development itself.

⁹ All-In Cities, Equitable transit-oriented development, 2022. <https://allincities.org/toolkit/equitable-transit-oriented-development>.

Reliability & Efficiency: TOD offers benefits for travel efficiency and potentially reliability by reducing VMT, thus reducing congestion, as well as facilitating transit use. By bringing more density of development to transit-oriented locations, TOD helps enhance the efficiency of transit service provision.

Resiliency: Municipalities can leverage the TOD process to increase resiliency by incentivizing or mandating the installation of green infrastructure. In 2023, for example, Arlington amended its zoning ordinance to relax setback requirements and permit stormwater management facilities such as detention ponds and vaults, flood walls, and overland relief measures on public property.¹⁰ Also, there is evidence that living in denser arrangements may promote resiliency by fostering greater social connectedness.¹¹

Safety: TOD promotes safety to the extent that it reduces VMT and thus reduces injuries and fatalities associated with traffic. It can also promote public safety by reducing the distance and thus response times for first responders.

Other considerations

While increasing TOD and enhancing jobs-housing balance is recognized as a valuable strategy to reduce transportation GHG emissions and support other community benefits, the policy mechanisms supporting TOD are at least partially already in place within many jurisdictions, and broader shifts across jurisdictional boundaries would likely require interagency collaboration that can be challenging given competition among jurisdictions for tax revenue and development. The competition for the new FBI Headquarters and the location of major sports venues in the region shows that while the region generally works together effectively, jurisdictions also sometimes compete for desired development.

¹⁰ Arlington County, Stormwater Management Zoning Study, March 2023. <https://www.arlingtonva.us/Government/Projects/Plans-Studies/Environment/Stormwater-Management-Zoning-Study>

¹¹ NPR, Neighborhood Connections Key To Surviving A Crisis, January 2013. <https://www.npr.org/2013/01/03/168509385/neighborhood-connections-key-to-surving-a-crisis>

Strategy 2: Make all public bus transportation in the region fare-free by 2030.

Fare-free bus transportation can reduce GHG emissions by reducing the cost of traveling by bus relative to driving, thus encouraging modal shifts from driving to transit and reducing VMT. In the MWCOG region, examples of fare-free bus transportation include Alexandria DASH, Farifax CUE, and Montgomery County's Ride On, although the latter service has since reinstated some fares.¹²

Relative effectiveness in reducing GHG emissions

Level of Impact: Making bus transit fare-free would have a modest impact on regional GHG emissions. Bus and rail transit make up approximately 6% of all person-trips in the MWCOG region¹³, so even a large percentage increase in ridership would yield a relatively small impact on regional on-road GHG emissions. Bus fares also are currently relatively low when considering riders who currently have discounted or free fares and employees who receive transit subsidies from their employer (roughly 64% of core employees, 31% of middle ring employees, and 14% of outer ring employees).¹⁴

Timeframe of Effectiveness: This strategy would have a rather immediate impact on emissions and it could be implemented relatively quickly, pending funding availability and community outreach initiatives.

Implementing organizations, legislative authority, and enabling actions

Organizations Involved: Making public buses fare-free primarily falls within the purview of the transit agency and/or local government providing service. Revenues would need to be offset and may require local, state and/or federal funds.

Legislative Authority: Transit agencies have considerable latitude in setting (or waiving) fares. In 2021, for example, Alexandria City Council voted to make the Alexandria DASH service fare-free (the program had suspended fares in 2020 in response to the COVID-19 pandemic) and the Alexandria Transit Company adopted a Fare Free Framework Policy to establish the scope, goals, and evaluation metrics of the program. As Metro is legally required to balance its budget, this strategy would entail changing state/local contributions to Metro, which would require legislative action in Maryland, Virginia, and the District of Columbia to allocate the funding and work out funding shares.

Costs associated with implementation

Public Sector: The primary cost of this strategy would fall on transit providers in the form of foregone revenue from bus fares. For example, making Alexandria DASH fare-free entailed foregoing \$3.5–4 million in fare revenues in 2022 (\$2.00/ride).¹⁵ For comparison, WMATA collected over \$47.55 million in bus fares in 2022,

¹² Northern Virginia Transportation Commission, Zero-Fare and Reduced-Fare Options for Northern Virginia Transit Providers, September 2021. <https://novatransit.org/uploads/studiesarchive/Zero-Fare%20and%20Reduced-Fare%20White%20Paper%20Final%202021-08-30.pdf#page22>

¹³ National Capital Region Transportation Planning Board, 2017/2018 Regional Travel Survey. <https://www.mwcog.org/file.aspx?D=HcOqbzivuFayTfyAlhvUJhe72nkkosOrz2TZl%2bOIFXE%3d&A=3b5jINJv7k8i9DmLKmqJ5c9bglZ451b3ROE2zs1pReQ%3d>

¹⁴ MWCOG, 2022 State of the Commute Survey Report from the Metropolitan Washington Region.

<https://www.mwcog.org/documents/2023/08/14/state-of-the-commute-survey-report--carsharing-state-of-the-commute-telework-travel-surveys/>

¹⁵ Arlington DASH, DASH Fare Free Program Report FY 2022. https://dashbus.com/wp-content/uploads/DASH-Fare-Free-Program-Report-FY-2022_FINAL.pdf

which accounted for 22.3% of fare revenues.¹⁶ WMATA is currently facing a fiscal cliff exacerbated by decreased ridership, leading to an anticipated operating budget shortfall when federal COVID-19 aid is depleted by 2025.¹⁷ Foregoing fare revenue would require collecting additional revenues from other sources or could put transit at risk of service cuts, which would work against GHG reduction goals. Alexandria DASH recouped this revenue with a \$1.5 million increase in its city subsidy as well as a \$2.6 million grant from Virginia's Transit Ridership Incentive Program (TRIP); however, this is not a long-term funding source. Transit providers could also face increased operational and capital costs associated with meeting increased demand. The Long-Range Plan Task Force found that reducing certain Metrorail fares and eliminating fares altogether for low-income residents would result in 128,000 additional transit person trips per day and would reduce revenues by more than \$100 million.¹⁸ However, eliminating fares would also eliminate some costs, in terms of infrastructure and labor associated with collecting fares. For example, Alexandria DASH saved \$50,000 in cash collection services and \$8,000 in app-based mobile ticketing expenses as well as \$5 million in foregoing the purchase and installation of new farebox equipment.

Private Sector: Private transportation providers like taxi services and Transportation Network Companies (TNCs) might lose business as a result of fare-free bus transportation, as the cost of bus travel falls even further relative to these services. However, local businesses in transit-station areas may benefit.

Households/Individuals: Fare-free bus transportation would directly reduce household transportation costs for people who use the services and would yield larger household savings for those who choose to reduce vehicle ownership.

Implications for regional goals and priorities

Accessibility & Affordability: By definition, fare-free bus transportation improves affordability. Fare-free buses can enhance access to opportunities for lower-income people if bus fares are a barrier.

Environmental Quality: To the extent that fare-free bus transportation reduces VMT, it would reduce criteria pollutants and improve air quality.

Equity: This strategy should enhance equity by reducing the cost of transportation for existing bus riders, who are disproportionately from historically disadvantaged populations, and supporting the needs of low-income riders.

Infrastructure Condition: This strategy would have negligible impacts on infrastructure condition; reducing VMT would put reduced wear on roadway infrastructure.

Livability & Prosperity: This strategy could increase quality of life and economic activity by reducing barriers to engaging in recreational and commercial activities. However, fare-free services sometimes raise concerns about use of the system.

Reliability & Efficiency: This strategy would have negligible impacts on system reliability and efficiency. It could potentially increase crowding and wait times in some areas if the transit operator does not increase

¹⁶ FTA, 2022 Agency Profile – Washington Metropolitan Area Transit Authority.

https://www.transit.dot.gov/sites/fta.dot.gov/files/transit_agency_profile_doc/2022/30030.pdf

¹⁷ Northern Virginia Transportation Commission, "2023 report on the Performance and Condition of Washington Metropolitan Area Transit Authority," December 2023, <https://novatransit.org/uploads/studiesarchive/2023AnnualReportonWMATA.pdf>.

¹⁸ TPB, An Assessment of Regional Initiatives for the National Capital Region, December 2017.

<https://www.mwcog.org/documents/2017/12/20/long-range-plan-task-force-reports-projects-regional-transportation-priorities-plan-scenario-planning-tpb/>

service in proportion with demand. However, it generally decreases boarding times by eliminating time spent paying or validating fares.

Resiliency: This strategy would have no discernible impact on resiliency.

Safety: This strategy would have negligible impacts on transportation safety. Public safety concerns, such as crime, vagrancy, and litter, however, sometimes arise with fare-free services.

Other considerations

While studies show that transit fares impact ridership, research suggests that the frequency and reliability of bus service play a more substantial role in encouraging transit ridership than bus fares. A survey of respondents in seven regions by TransitCenter found that only 16% of bus riders from households making over \$75,000 identify bus fare as an important issue to be improved, while 25% of riders do from households making under \$25,000. However, even low-income bus riders rated fares as less important to address than frequency of service, crowding, safety, and reliability.¹⁹

The implications of this strategy depend in part on whether it would be implemented independent of or in conjunction with fare-free public rail transportation and other policies such as adjustments to bus services. Absent fare-free rail transportation, fare-free bus transportation would encourage some shifts from rail to bus, which could stress bus services where rail capacity is available.

Revenue sources need to be identified to operate bus services in the absence of fare-box revenue, and the revenue sources that are used (e.g., local property taxes, sales taxes, parking fees, etc.) could have some implications on equity and other regional goals.

¹⁹ TransitCenter, Who's on Board, 2019: How to Win Back America's Transit Riders, 2019. https://transitcenter.org/wp-content/uploads/2019/02/TC_WhosOnBoard_Final_digital-1-1.pdf

Strategy 3: Make all public rail transportation in the region fare-free by 2030.

Fare-free public rail transportation would entail free use of Metrorail, as well as commuter rail services MARC and VRE. Fare-free rail service is intended to reduce GHG emissions by reducing the cost of traveling by train relative to driving, thus encouraging mode shifts and reducing VMT.

Relative effectiveness in reducing GHG emissions

Level of Impact: Making rail transit fare-free would have a modest impact on regional GHG emissions. Bus and rail transit make up approximately 6% of all person-trips in the MWCOG region²⁰, so even a large percentage increase in ridership would yield a relatively small impact on regional on-road GHG emissions.

Timeframe of Effectiveness: This strategy would have a rather immediate impact on emissions and it could be implemented relatively quickly, pending funding availability.

Implementing organizations, legislative authority, and enabling actions

Organizations Involved: Making public rail transportation fare-free would require agreement among all the funding agencies that support Metrorail, given the funding structure that is currently used to support Metrorail service and lack of a dedicated on-going funding stream. State, local, and federal agencies would need to offset the fare revenue lost in order to maintain service levels. If commuter rail services, MARC and VRE, were included, both Maryland and Virginia would need to identify additional funding for these services to maintain current service levels.

Legislative Authority: As Metro is legally required to balance its budget, this strategy would entail changing state/local contributions to Metro, which would require legislative action in Maryland, Virginia, and the District of Columbia to allocate the funding and work out funding shares.

Costs associated with implementation

Public Sector: The primary cost of this strategy would fall on state and local governments in the form of revenues that would need to be collected to compensate for eliminated rail fares. In 2022, for example, WMATA collected over \$161.57 million in rail fares, which accounted for 76% of total transit fare revenues.²¹ For Metro in particular, passenger revenue accounted for 87% of total revenues in 2022. WMATA is currently facing a fiscal cliff exacerbated by decreased ridership, leading to an anticipated operating budget shortfall when federal COVID-19 aid is depleted by 2025.²² Transit providers could also face increased operational and capital costs associated with meeting increased demand. The Long-Range Plan Task Force found that reducing certain Metrorail fares and eliminating fares altogether for low-income residents would result in 128,000 additional transit person trips per day and would reduce revenues by more than \$100 million.²³ However, eliminating fares would also eliminate the costs, in terms of infrastructure and labor, associated with collecting fares (although WMATA has recently implemented new fare gates in many stations).

²⁰ National Capital Region Transportation Planning Board, 2017/2018 Regional Travel Survey. [mwcog.org/transportation/data-and-tools/household-travel-survey/](https://www.mwcog.org/transportation/data-and-tools/household-travel-survey/)

²¹ FTA, 2022 Agency Profile – Washington Metropolitan Area Transit Authority. https://www.transit.dot.gov/sites/fta.dot.gov/files/transit_agency_profile_doc/2022/30030.pdf

²² Northern Virginia Transportation Commission, "2023 report on the Performance and Condition of Washington Metropolitan Area Transit Authority," December 2023, <https://novatransit.org/uploads/studiesarchive/2023AnnualReportonWMATA.pdf>.

²³ TPB, An Assessment of Regional Initiatives for the National Capital Region, December 2017. <https://www.mwcog.org/documents/2017/12/20/long-range-plan-task-force-reports-projects-regional-transportation-priorities-plan-scenario-planning-tpb/>

Private Sector: Private transportation providers like taxi services and Transportation Network Companies (TNCs) might lose business as a result of fare-free rail transportation, as the cost of rail travel falls relative to these services. Amtrak could also lose business on shorter, intra-regional routes. However, local businesses in transit-station areas may benefit.

Households/Individuals: Fare-free rail transportation would directly reduce household transportation costs for people who use the services and would yield larger household savings for those who choose to reduce vehicle ownership.

Implications for regional goals and priorities

Accessibility & Affordability: By definition, fare-free rail transportation improves affordability. Fare-free rail can enhance access to opportunities for lower-income people if rail fares are a barrier.

Environmental Quality: To the extent that fare-free train transportation reduces VMT, it would reduce criteria pollutants and improve air quality.

Equity: This strategy may advance equity by reducing the cost of transportation for rail riders. However, it might exacerbate equity concerns if not implemented together with free bus service, given current demographic disparities between bus and rail riders.²⁴

Infrastructure Condition: This strategy would have negligible impacts on infrastructure condition; it may place greater stress on rail stations and trains themselves in the form of increased ridership.

Livability & Prosperity: This strategy may increase both quality of life and economic activity by lowering the cost of transportation, thus reducing barriers to engaging in recreational and commercial activities.

Reliability & Efficiency: This strategy would have negligible impacts on system reliability and efficiency; it may adversely affect travel time reliability if ridership increases beyond the capacity of the rail system.

Resiliency: This strategy would have no discernible impact on resiliency.

Safety: This strategy would have negligible impacts on transportation safety. Public safety concerns, such as crime, vagrancy, and litter, however, sometimes arise with fare-free services.

Other considerations

The impact and implications of this strategy largely depend on whether it is implemented independent of or in conjunction with fare-free public bus transportation. Absent fare-free bus transportation, fare-free rail transportation could pose further costs by shifting revenue-generating trips from bus to rail.

²⁴ DC Council Budget, Fare-Free Bus Funding & Metro For D.C., 2022. <https://www.dccouncilbudget.com/metro-for-dc-study#:~:text=D.C.%20residents%20who%20ride%20the%20bus%20are%2060%20percent%20more,have%20household%20incomes%20above%20%2475%2C000.>

Strategy 4: Price workplace parking for employees – only in Activity Centers by 2030 and everywhere by 2050

Instead of offering free parking, this strategy would charge employees for parking their personal vehicle at work. Pricing workplace parking increases the overall cost of driving to work. The higher cost is intended to encourage mode shifts to transit and ridesharing and discourage single occupancy vehicle use, thus decreasing VMT and corresponding GHG emissions.

Relative effectiveness in reducing GHG emissions

Level of Impact: Pricing workplace parking for employees would have a moderate impact on GHG emissions. The strategy affects commute trips, which represent roughly 20% of typical weekday trips.²⁵ The scale of impact depends on the price, number of participating employers, and availability of alternative modes. The TPB Long-Range Plan Task Force studied this strategy as part of Initiative 10: Amplified Employer-Based Travel Demand Management. Along with higher rates of telework, the initiative assumed 90% of workplace parking in Activity Centers cost an average of \$6 per day, either as an increase in cost or as parking cash-out. The initiative resulted in significant improvements to congestion and a 6% reduction in overall VMT. This strategy was overall the most effective in reducing VMT and emissions, although a large portion of the VMT decrease is likely attributable to telework strategies.²⁶ One key challenge is the lack of policy mechanism for public agencies to require employers to charge their employees for parking; consequently the real world impact of efforts to get employers to charge their employees for parking would be limited.

Timeframe of Effectiveness: Drivers would immediately face higher driving costs once the policy were implemented. In theory, a reduction in VMT would occur immediately as well. However, given the limited mechanisms that public agencies have to require employers to charge for parking, it likely would take time through education, incentives, and/or employer trip-reduction ordinances for employers to undertake the action of charging for parking. Moreover, parking is embedded into building leases for many employers, and in suburban areas would require establishing mechanism to charge employees.

Implementing organizations, legislative authority, and enabling actions

Organizations Involved: Pricing workplace parking largely involves the private sector as implementation and administrative responsibility falls to employers. State and local governments play a limited role in parking markets outside of provision of public parking and on-street parking. Local governments could conceptually implement Transportation Demand Management (TDM) ordinances that require employers to charge for parking, but it is unclear whether such a restrictive requirement would be legal or politically feasible. Federal tax law includes parking as a tax-free qualified transportation fringe benefit, which creates incentives for employers to offer free or subsidized parking for their employees. Consequently, changes in federal tax law would be needed to remove incentives for employers to offer free parking to employees. State and local governments could potentially work with business associations, Chambers of Commerce, and other entities to encourage shifting to paid parking, or provide incentives for employers to eliminate free parking.

Legislative Authority: It would likely fall to state governments to pass new laws to mandate or provide incentives to encourage employers to price parking. This is demonstrated by parking cash-out policies: the

²⁵ TPB, "2017–2018 Regional Travel Survey Briefing: Initial Findings of Observed Daily Trips," October 2020.

<https://www.mwcog.org/documents/2020/01/21/regional-travel-survey-presentations-regional-travel-survey-tpb-travel-surveys/>.

²⁶ TPB, "Phase II Detailed Technical Report – An Assessment of Regional Initiatives for the National Capital Region," December 2017, <https://www.mwcog.org/documents/2017/12/20/long-range-plan-task-force-reports-projects-regional-transportation-priorities-plan-scenario-planning-tpb/>.

Council of the District of Columbia passed the Transportation Benefits Equity Amendment Act of 2020 to require employers to offer parking benefits and Maryland provides tax credits to employers to do the same.²⁷ ²⁸ However unlike cash-out policies, pricing workplace parking is a source of revenue rather than a cost for employers, although businesses offer free or subsidized parking as a way to attract employees and due to tax benefits associated with providing this benefit.

Costs associated with implementation

Public Sector: Pricing workplace parking encourages a mode shift to public transit. The increased transit demand may call for increased service. New state legislation would also lead to enforcement costs. As with the DC parking cash-out law, the government can ensure compliance by requiring employers to submit reports on their compliance.

Private Sector: Pricing workplace parking may require employees to invest in parking gates or other technology to charge for parking, but revenue from the priced parking is likely to offset such costs.

Households/Individuals: The cost of this program largely burdens individuals. Commuters who choose to or have no other choice but to continue driving to work would have to pay to park and those who shift modes may face longer, less convenient commutes. In the long run, shifting to transit could reduce household travel costs if it allows households to shed a vehicle.

Implications for regional goals and priorities

Accessibility & Affordability: Pricing workplace parking may decrease accessibility to employment. The measure makes driving to work less affordable by charging new fees. The increased price may restrict individuals to specific employers accessible via public transit. Even if funds were used to support transit, some individuals may not have options to use transit.

Environmental Quality: To the extent that the strategy reduces VMT, it would reduce criteria pollutants and improve air quality.

Equity: Pricing workplace parking would pose a larger burden to low-income households in locations without public transit access and those in jobs without telework options compared to higher-income households and those with more options for telework. At the same time, employers who provide free parking are currently subsidizing the cost of providing free parking, possibly through lower wages. Pricing workplace parking is more equitable in requiring those who utilize the parking to pay for it rather than distributing the cost of providing that parking across all employees.

Infrastructure Condition: Pricing workplace parking encourages users to shift from the roadway to the transit system, which may correspond to shifting infrastructure wear and funding needs.

Livability & Prosperity: This measure incentivizes a commute mode shift to public transit, which would reduce congestion but may lead to longer commutes. The reduced demand for parking may also support development with less parking or the redevelopment of existing infrastructure in the long term.

Reliability & Efficiency: Pricing workplace parking would increase public transit use and place more pressure on the system. However, the measure would reduce roadway congestion and improve travel time reliability.

Resiliency: This measure would have no discernable impact on resiliency.

²⁷ D.C. Official Code § 23-113 (2020). <https://code.dccouncil.gov/us/dc/council/laws/23-113>.

²⁸ Maryland Department of Transportation, "Cash in Lieu of Parking," <https://www.mdot.maryland.gov/tso/pages/index.aspx?pageid=51>.

Safety: Pricing workplace parking promotes safety to the extent that it reduces VMT and thus reduces injuries and fatalities associated with traffic.

Other considerations

While pricing workplace parking would conceptually be straightforward for offices, there are a number of logistical considerations that could create challenges. Outside of Activity Centers, it may be difficult to value parking since there is often ubiquitous and plentiful free parking. It could also be challenging for establishments with free parking for customers to charge employees, although one solution is to charge for long-term parking and provide free short-term parking. Applying this strategy with Strategy 7, charging a cordon fee, may be especially effective to discourage driving in Activity Centers by charging drivers for both entering and parking in the area. In the near term, if requirements were only placed on employers in Activity Centers, this might encourage some employers to move to locations outside of Activity Centers, which would work against land use goals. To enforce priced workplace parking outside of Activity Centers, local governments may need to increase the price of public parking to match the new cost of employer-provided parking and implement residential parking permit programs to avoid parking from spilling over into neighborhoods. Moreover, many employers in the current environment are still working on encouraging employees to return to the office, and this policy could work against this goal.

Strategy 5: Convert a higher proportion of daily work trips to telework by 2030 and beyond.

Teleworking refers to approved employee use of information and communication technology to work from home or other satellite locations. Increasing the proportion of telework decreases the number of daily commute trips.

Relative effectiveness in reducing GHG emissions

Level of Impact: Converting a higher proportion of daily work trips to telework conceptually would be a moderately to highly effective strategy to reduce GHG emissions. Increasing telework decreases the number of commute trips and corresponding VMT. The TPB Long-Range Plan Task Force assessed the impact of telework as part of Initiative 10: Amplified Employer-Based Travel Demand Management, which resulted in the largest GHG reduction.²⁹ The significant VMT reductions caused by COVID-19 stay-at-home orders also demonstrate the potentially large impact of telework, although non-telework actions contributed to the observed reduction. At the same time, there are concerns that telework allows individuals to live further away from employment, leading to further commutes on in-person work dates.³⁰ Despite increased teleworking post-COVID-19, total VMT has not declined as much as expected.³¹ While the share of commute and work-based trips out of total daily trips has declined, the share of home-based trips has increased. Individuals who telework are more likely to make midday trips rather than combining trips with commutes. Moreover, following the reduction in COVID-19 travel restrictions, a high share of employees still continues to telework daily or work on a hybrid schedule post-pandemic, thus it is unclear to what extent telework can be increased further.

Timeframe of Effectiveness: This measure has a relatively quick timeframe of effectiveness. VMT, and thus GHG emissions, are reduced immediately after implementation of an increased telework schedule.

Implementing organizations, legislative authority, and enabling actions

Organizations Involved: Telework largely involves an agreement between employers and employees. As such, employers are the most notable among involved organizations. Public agencies can, however, promote telework.

Legislative Authority: This would be a difficult strategy to require legislatively. State and local governments could potentially mandate employers limit work trips, if allowed by state law, or offer incentives and technical assistance in setting up telework programs. Maryland and Virginia already have offered telework incentive and assistance programs.

Costs associated with implementation

Public Sector: This measure reduces the number of daily commute trips, driving or otherwise. As a result, WMATA and other transit providers would face a revenue decrease corresponding to lower commute

²⁹ TPB, "Phase II Detailed Technical Report – An Assessment of Regional Initiatives for the National Capital Region," December 2017, <https://www.mwcog.org/documents/2017/12/20/long-range-plan-task-force-reports-projects-regional-transportation-priorities-plan-scenario-planning-tpb/>.

³⁰ Hook, Andrew, "A systematic review of the energy and climate impacts of teleworking," 2020, <https://doi.org/10.1088/1748-9326/ab8a84>.

³¹ George, Caroline, and Adie Tomer, "With commuting down, cities must rethink their transportation networks," September 2023, <https://www.brookings.edu/articles/with-commuting-down-cities-must-rethink-their-transportation-networks/>.

ridership. WMATA is currently facing a fiscal cliff exacerbated by decreased ridership, leading to an anticipated operating budget shortfall when federal COVID-19 aid is depleted by 2025.³²

Private Sector: Telework requires employers to provide employees adequate information and communication technology to work from home.

Households/Individuals: Telework yields cost savings for employees who can reduce their expenses on commuting (whether by personal vehicle or transit) and associated expenses (e.g., lunches, dry cleaning).

Implications for regional goals and priorities

Accessibility & Affordability: Teleworking allows individuals to work from anywhere without long commutes, thus increasing accessibility and affordability.

Environmental Quality: To the extent that the strategy reduces VMT, it would reduce criteria pollutants and improve air quality.

Equity: Telework is not an option for all employees. In-person interaction is a primary function of many jobs, as observed with “essential workers” during the COVID-19 pandemic. Many such jobs have lower salaries than those with teleworking opportunities. For example, the annual mean wage in the National Capital Region in 2022 was \$83,900 but was \$37,530 for food preparation and serving related occupations, \$38,820 for building and grounds cleaning and maintenance occupations, and \$55,290 for sales and related occupations.³³ As a result, increased telework could exacerbate equity issues.

Infrastructure Condition: This strategy would have negligible impacts on infrastructure condition; it may place less stress on transit and highway systems.

Livability & Prosperity: Telework decreases overall trips into Activity Centers, which poses concerns for the economic vitality of such communities. Local restaurants and businesses may go out of business because of fewer customers. In Winter 2021, the Downtown DC economy was performing at only 16% of pre-pandemic levels.³⁴ Business activity has still not recovered to pre-pandemic levels. Full time telework could reshape residential patterns, which could trigger migration from city centers and Activity Centers to more suburban, exurban, or rural areas, or movement of employees to outside of the region.

Reliability & Efficiency: Decreased daily commute trips would lessen peak-period road congestion and transit ridership, which could improve travel time reliability. However, it may also lead to more traffic at different parts of the day, due to additional mid-day trips and non-commute trips, which could potentially reduce travel time reliability.

Resiliency: Severe weather events may have less impact given more individuals would not be in Activity Centers and facing commutes home.

Safety: Converting daily work trips to telework promotes safety to the extent that it reduces VMT and thus could reduce injuries and fatalities associated with traffic. However, overall safety impacts are somewhat uncertain and depend on many factors not directly affected by telework.

³² Northern Virginia Transportation Commission, “2023 report on the Performance and Condition of Washington Metropolitan Area Transit Authority,” December 2023, <https://novatransit.org/uploads/studiesarchive/2023AnnualReportonWMATA.pdf>.

³³ U.S. Bureau of Labor Statistics, “May 2022 Metropolitan and Nonmetropolitan Area Occupational Employment and Wage Estimates, Washington-Arlington-Alexandria, DC-VA-MD-WV,” https://www.bls.gov/oes/current/oes_47900.htm#35-0000.

³⁴ Downtown Business Improvement District Corporation, “DowntownDC Economy Update,” Winter 2021, https://www.downtowndc.org/wp-content/uploads/2021/03/20210309_DDC-Economic-Update_Winter-2021_Edit-07.pdf.

Other considerations

The impact of federal employee telework should also be noted particularly for the District of Columbia as the largest single employer in the District is the federal government. The 2024 joint National Capital Planning Commission and COG Workforce Scenario Planning Study anticipates increased federal teleworking would lead to decreased office utilization, fewer employees living and paying for housing in close-in Activity Centers, and decreased public transit ridership.³⁵ Notably, peak-hour congestion has mildly improved and mid-morning congestion has increased between 2019 and 2023 despite higher teleworking rates.³⁶ Furthermore, decreased public transit revenue may have long-term impacts on accessibility and affordability as agencies may have to decrease service. Increasing telework may also pose issues for the real estate market with office buildings already facing lower real estate prices.³⁷

³⁵ National Capital Planning Commission, & MWCOG, "Workplace Scenario Planning Study," February 2024, https://www.ncpc.gov/docs/Workplace_Scenario_Planning_Study_February2024.pdf.

³⁶ Laris, Michael, "7 ways the pandemic changed the Washington commute," September 2023, <https://www.washingtonpost.com/transportation/2023/09/22/changed-dc-commute/>.

³⁷ Armus. Teo, "D.C.'s suburbs, not just downtown, are feeling the crunch of remote work," August 2023, <https://www.washingtonpost.com/dc-md-va/2023/08/05/empty-office-buildings-vacancy-rate-suburbs-virginia/>.

Strategy 6: Charge a new fee per vehicle mile of travel (VMT) by motorized, private, passenger vehicles in addition to the prevailing transportation fees and fuel taxes [mileage-based user fee].

Charging drivers for every mile travelled on a defined roadway network is referred to as Mileage-Based User Fees (MBUF), or VMT fees. Compared to flat transportation fees, MBUFs decrease VMT by making every trip an additional cost for drivers. The Montgomery County Climate Action Plan identifies “advocate for a vehicle carbon/gas tax or VMT tax” as one of the transportation actions in the plan.³⁸ An MBUF, along with all repricing strategies, addresses the current underpricing of driving from a societal perspective when accounting for externalities. Driving is associated with many externalities such as air pollution, noise, injuries and fatalities from crashes, maintenance costs, and enforcement costs. An MBUF shifts these costs from society to the driver.

Relative effectiveness in reducing GHG emissions

Level of Impact: Establishing an MBUF would be a highly effective strategy to reduce GHG emissions. MBUF has largely been considered as an alternative to prevailing transportation fees and fuel taxes, primarily as an alternative to a fuel tax.³⁹ A pilot program in Portland, Oregon found charging a per-mile rate equivalent to the current gas tax decreased VMT by 11 to 14.6 percent.⁴⁰ The CCMS evaluated a scenario (MS.2) that included a VMT fee of \$0.05–0.10/mile, a \$10 cordon fee in downtown District of Columbia, as well as land use changes, reduced transit fares, pricing workplace parking, increasing telework, and reducing vehicle trips to school. Although the study findings did not report the independent impact of the VMT fee, the underlying analysis found the incremental effects of the VMT fee and cordon fee together would result in approximately a 4.8% reduction in VMT in 2030 and a 6.7% reduction in 2050. A large portion of this effect is estimated to be due to the VMT fee, since the cordon fee only applied to a relatively small portion of trips in the region.⁴¹ Some researchers have found that VMT fees/MBUFs are among the most effective strategies for reducing VMT and GHG emissions.⁴²

Timeframe of Effectiveness: Drivers would immediately face the new fees after policy implementation and theoretically decrease VMT. The time needed to implement an MBUF could be relatively brief given that processes can be set up for odometer reporting and tracking of VMT. However, in practice, there are various implementation issues that need to be addressed comprehensively, including how to monitor VMT, how often to charge fees, and how to establish MBUF systems within a regional context (e.g., charges for residents of each state based on location of vehicle registration).

³⁸ Montgomery County, Montgomery County Climate Action Plan, June 2021.

<https://www.montgomerycountymd.gov/climate/Resources/Files/climate/climate-action-plan.pdf>.

³⁹ U.S. Government Accountability Office, “Highway Trust Fund, Federal Highway Administration Should Develop and Apply Criteria to Assess How Pilot Projects Could Inform Expanded Use of Mileage Fee Systems,” 2022, <https://www.gao.gov/assets/gao-22-104299.pdf>.

⁴⁰ Boarnet, Marlon, Steven Spears, Susan Handy, and Caroline Rodier, “Impacts of Road User Pricing on Passenger Vehicle Use and Greenhouse Gas Emissions,” September 2014, https://www2.arb.ca.gov/sites/default/files/2020-06/Impacts_of_Road_User_Pricing_on_Passenger_Vehicle_Use_and_Greenhouse_Gas_Emissions_Policy_Brief.pdf.

⁴¹ Unpublished analysis underlying TPB, Climate Change Mitigation Study of 2021 – Scenario Analysis Findings Final Report, January 2022. <https://www.mwcog.org/file.aspx?D=oFE4jNtXw9C5rNMklqJLQWJZaSAKJnXP2%2bF4D7uqADY%3d&A=6CyU6zHtH63RQpvcNZZ41HdQobl vCs3BvGGddc1Ldh0%3d>

⁴² See, for example, slide 18 of Jonn Axsen and Long Zoe, “Public Acceptance of Vehicle Pricing Policies for Climate: A Review of Insights for Successful Implementation (TRBAM-24-04870)” (Transportation Research Board 103rd Annual Meeting, January 7–11, 2024, Washington, D.C., January 9, 2024), <https://annualmeeting.mytrb.org/OnlineProgram>; or p. 5 of Caroline Rodier, “Review of International Modeling Literature: Transit, Land Use, and Auto Pricing Strategies to Reduce Vehicle Miles Traveled and Greenhouse Gas Emissions,” *Transportation Research Record* 2132, no. 1 (January 1, 2009): 1–12, <https://doi.org/10.3141/2132-01>.

Implementing organizations, legislative authority, and enabling actions

Organizations Involved: State transportation agencies would most likely be responsible for administering a MBUF program. In 2022 the Virginia Department of Motor Vehicles introduced a Mileage Choice Program for drivers with fuel-efficient vehicles as an alternative to a flat highway use fee which is paid upfront and based on the average annual Virginia VMT. The flat highway use fee was introduced for drivers with fuel-efficient and electric vehicles who do not pay fuel tax. Participants in the mileage choice program would save money if they drive less than the average annual Virginia VMT (11,600 miles).⁴³ Virginia's Mileage Choice Program is currently administered by the Department of Motor Vehicles and Emovis, a private technology company, is contracted to collect mileage reports, payments, and provide customer support. The Maryland Department of Transportation is also conducting a pilot MBUF simulation with the Eastern Transportation Coalition to test its feasibility.⁴⁴ Several states have conducted pilots to test MBUFs through the Surface Transportation System Funding Alternatives (STSFA) program.

Legislative Authority: State legislatures would likely need to establish an MBUF. The Virginia General Assembly established the Mileage Choice Program, which is open only to drivers with fuel-efficient vehicles.⁴⁵

Costs associated with implementation

Public Sector: This measure would create a revenue stream for the public sector. The fees paid by drivers could be invested back into the transportation system.

Private Sector: This measure would have a limited effect on the private sector, except for the fees that would be paid, including by businesses and freight shippers. Additionally, states may opt to contract with private companies, such as Emovis, to administer the program.

Households/Individuals: Households and individuals would be the most burdened by this measure. The fee directly charges individuals for use of the roadway system. If an MBUF were implemented as an alternative fee rather than an additional fee as proposed, it could lead to savings for households who decide to decrease their VMT.

Implications for regional goals and priorities

Accessibility & Affordability: In order to reduce VMT, MBUF actively decreases the affordability of driving. This would likely reduce the number of non-essential trips, but not prevent individuals from continuing to access necessary goods and services.

Environmental Quality: To the extent that the strategy reduces VMT, it would reduce criteria pollutants and improve air quality.

Equity: This measure introduces a new fee which could present a larger burden for low-income households. As such, low-income drivers are more likely to reduce non-essential trips rather than those with a higher willingness to pay. Additionally, areas without adequate public transit would have limited alternatives to avoid fees. However, implemented as an alternative to a flat registration fee, a MBUF benefits lower-income households who tend to drive less than higher-income households.

⁴³ Virginia Department of Motor Vehicles, "DMV Introduces New Mileage Choice Program," 2022, <https://www.dmv.virginia.gov/news/dmv-introduces-new-mileage-choice-program>.

⁴⁴ The Eastern Transportation Coalition, "Maryland Mileage-Based User Fee, Frequently Asked Questions," https://tetcoalitionmbuf.org/wp-content/uploads/2024/01/TETC_MBUF_Flyer_MD-FAQ-1.pdf.

⁴⁵ Code of Virginia § 46.2-773, <https://law.lis.virginia.gov/vacode/46.2-773/>.

Infrastructure Condition: Generated revenue could be invested in improving transportation infrastructure.

Livability & Prosperity: This strategy would discourage non-essential driving trips, such as recreational and commercial activities, potentially harming livability and prosperity. However, it may correspondingly encourage living in more compact and walkable places, improving livability and prosperity.

Reliability & Efficiency: An MBUF would decrease VMT, thus improving congestion and may have benefits for travel time reliability.

Resiliency: This strategy would have no discernable impact on resiliency.

Safety: The measure would promote safety to the extent that it reduces VMT and thus reduces injuries and fatalities associated with traffic. However, there are various privacy concerns associated with tracking VMT, such as with plug-in devices that monitor vehicles' locations.⁴⁶

Other considerations

The motor fuel tax is currently the largest revenue source for federal and state transportation infrastructure spending. Such revenues contribute to the highway account of the Highway Trust Fund, which the Congressional Budget Office expects to be exhausted in 2028.⁴⁷ However, the increasing adoption of EVs has created the need for a new revenue source, with MBUFs as the leading alternative.⁴⁸ This is of special concern given need for funding for maintenance of bridges, roadways, and other transportation infrastructure.

⁴⁶ The Eastern Transportation Coalition, "Mileage-Based User Fee Exploration 2019 Passenger Vehicle Pilot," March 2021, <https://tetcoalitionmbuf.org/wp-content/uploads/2021/09/TETC-2019-Passenger-Vehicle-Pilot-Report.pdf>.

⁴⁷ Congressional Budget Office, "Testimony on the Status of the Highway Trust Fund: 2023 Update," October 2023, <https://www.cbo.gov/publication/59634>.

⁴⁸ Bipartisan Policy Center, "Mileage-Based User Fee Pilot Programs and the IJJA," February 2022, <https://bipartisanpolicy.org/blog/mileage-based-user-fee-pilot-programs-and-the-ijja/>.

Strategy 7: Charge a “cordon fee” (commuter tax) per motorized vehicle trip for all vehicles entering Activity Centers, by 2030.

A cordon fee is a congestion pricing charge paid by vehicles to enter a specific area, usually within a city center that has high traffic congestion. Implementing a cordon fee has been proposed for downtown Washington, DC in the past, and this strategy would extend the concept of a cordon fee to all of MWCOG’s designated Activity Centers by 2030. This strategy would raise the cost of driving into Activity Centers relative to other modes, with the goal of encouraging mode shifts to transit, ridesharing, and active transportation modes. Examples of cordon fees exist in London, Stockholm, and other cities.⁴⁹

Relative effectiveness in reducing GHG emissions

Level of Impact: Depending on the amount of the fee, this strategy may be a moderately to highly effective strategy to reduce GHG emissions. The CCMS evaluated a scenario (MS.2) that included a \$10 cordon fee in downtown District of Columbia among other strategies considered in this report, including a VMT fee of \$0.05–0.10/mile, land use changes, reduced transit fares, pricing workplace parking, increasing telework, and reducing vehicle trips to school. Although the study findings did not report the independent impact of the cordon fee, the underlying analysis found the incremental effects of the cordon fee and VMT fee together would result in approximately a 4.8% reduction in VMT in 2030 and a 6.7% reduction in 2050. A large portion of this effect is estimated to be due to the VMT fee, since the cordon fee only applied to a relatively small portion of trips in the region.⁵⁰

Timeframe of Effectiveness: As defined, this strategy would not take effect until 2030. While a cordon fee would have a rather immediate impact on GHG emissions, as evidenced by the example of New York City, implementing a cordon fee can take years, from laying the legal foundation to gaining stakeholder buy-in to procuring and installing the technology to communicating the fee to the public.

Implementing organizations, legislative authority, and enabling actions

Organizations Involved: In the public sector, this strategy would likely need to involve municipalities, counties, and each of the states to authorize and establish the cordon and pricing scheme. In the private sector, it would include vendors of the infrastructure used to collect the cordon fee as well as businesses located within Activity Centers in terms of the implications of the fee for their employees and customers.

Legislative Authority: Implementing a cordon fee in all 141 Activity Centers in the MWCOG region would be extremely complex, requiring the approval of the municipalities and counties with Activity Centers as well as enabling legislation by Maryland, Virginia, and the District of Columbia.

⁴⁹ See, for example, Jonn Axsen and Long Zoe, “Public Acceptance of Vehicle Pricing Policies for Climate: A Review of Insights for Successful Implementation (TRBAM-24-04870)” (Transportation Research Board 103rd Annual Meeting, January 7–11, 2024, Washington, D.C., January 9, 2024), <https://annualmeeting.mytrb.org/OnlineProgram>; Kimberly Nicholas and Paula Kuss, “What Are the Most Effective Ways to Get Cars out of Cities?,” *The Guardian*, April 16, 2022, sec. Environment, <https://www.theguardian.com/environment/2022/apr/16/12-most-effective-ways-cars-cities-europe>; Paula Kuss and Kimberly A. Nicholas, “A Dozen Effective Interventions to Reduce Car Use in European Cities: Lessons Learned from a Meta-Analysis and Transition Management,” *Case Studies on Transport Policy*, February 10, 2022, <https://doi.org/10.1016/j.cstp.2022.02.001>.

⁵⁰ Unpublished analysis underlying TPB, Climate Change Mitigation Study of 2021 – Scenario Analysis Findings Final Report, January 2022. <https://www.mwco.org/file.aspx?D=oFE4jNtXw9C5rNMklqULQWJZaSAKJnXP2%2bF4D7uqADY%3d&A=6CyU6zHtH63RQpvcNZZ41HdQoblVc3S3BvGGddc1Ldh0%3d>

Costs associated with implementation

Public Sector: While the public sector stands to benefit from the revenues generated by a cordon fee, it would also bear the costs associated with the installation and operation of the cordon fee system.

Private Sector: On the one hand, businesses located within the cordon may lose revenue to the extent that potential customers opt not to drive into the cordon. On the other hand, they may gain revenue to the extent that the reduction in VMT is offset by an increase in foot traffic or transit access if the fees are used to fund transit, which has been associated with increased commercial activity. Depending on the structure of the fee, businesses may bear the cost in the form of increased shipping costs.

Households/Individuals: Drivers residing outside and working inside of the cordon, and vice versa, would bear the heaviest burden of the fee. To mitigate this impact, however, as with the proposed cordon fee in New York City, drivers could be charged only once per day. TNC and taxi riders may also feel the cost in the form of higher fares. People residing or working adjacent to the cordon may also bear the cost of increased congestion on local roads related to drivers avoiding the cordon. However, transit riders would benefit from improvements to the transit system if the revenues were allocated accordingly.

Implications for regional goals and priorities

Accessibility & Affordability: As an additional cost to driving, a cordon fee would have an adverse impact on affordability. However, it may have a positive impact on affordability to the extent that the revenues are used to subsidize transit fares. A cordon fee would have a positive impact on accessibility to the extent that it reduces congestion within the cordon and facilitates increased pedestrian activity, assuming it includes exemptions for people with conditions necessitating vehicle access.

Environmental Quality: To the extent that a cordon fee reduces VMT, it would reduce criteria pollutants and improve air quality.

Equity: The implications of a cordon fee on equity depend on several factors, including the structure of the fee, the means of its collection, and the presence of exemptions for auto-dependent populations.⁵¹ For example, the proposed cordon fee in New York City includes a 50% discount after the 10th trip per calendar month for low-income drivers.⁵² A cordon fee may also present equity issues for those residents of traditionally disadvantaged communities who are poorly served by transit or bicycle/pedestrian infrastructure, and thus less able to substitute transit or active modes for driving. A cashless fee collection system would also present a barrier to unbanked drivers.⁵³

Infrastructure Condition: While a cordon fee may reduce stress on the local road network within the cordon, it may increase stress on the road network outside the cordon to the extent that drivers re-route around the cordon to avoid paying the fee. It would also increase stress on the transit system to the extent that it results in higher ridership. In 2015, for example, WMATA predicated that implementing a \$5 cordon fee in downtown District of Columbia would increase transit ridership by 30% in 2040.⁵⁴

⁵¹ Michael Manville, Gregory Pierce, and Bryan Graveline, "Guardrails on Priced Lanes: Protecting Equity While Promoting Efficiency," 2022, <https://doi.org/10.1016/j.trip.2022.100652>.

⁵² MTA, Central Business District Tolling Program. <https://new.mta.info/document/131571>

⁵³ FHWA, Income-Based Equity Impacts of Congestion Pricing, December 2008. <https://ops.fhwa.dot.gov/publications/fhwahop08040/fhwahop08040.pdf>

⁵⁴ Greater Washington Partnership, Capital Region Blueprint for Regional Mobility. <https://greaterwashingtonpartnership.com/blueprint/solution-2.html>

Livability & Prosperity: Charging a cordon fee may improve community and economic vitality, quality of life, and sense of place within Activity Centers to the extent that municipalities take advantage of reduced VMT to reallocate surplus vehicle infrastructure (e.g., travel lanes, parking spaces) to people in the form of sidewalks, bike lanes, outdoor dining areas, parklets, etc.

Reliability & Efficiency: Charging a cordon fee is designed to improve travel efficiency and may improve reliability by reducing congestion within the cordon and raising revenues for transit, although its effects beyond the cordon are less certain.

Resiliency: On its own, charging a cordon fee does not have discernable implications for resiliency. However, by reducing VMT, it may free up space within the cordon for the installation of green infrastructure.

Safety: Charging a cordon fee may improve safety by reducing congestion and thus improving response times for first responders.

Other considerations

MWCOG member agencies should consider the possibility that implementing a cordon fee in all Activity Centers could encourage sprawl or otherwise shift economic activity outside of the region. Other challenges include potential tensions between this strategy and municipal “back to office” initiatives that aim to stimulate economic activity and commercial real estate in central business districts.

Implementing a cordon fee raises many questions about the geographic scope of the cordon, the price, structure, and collection of the toll, potential exemptions, and the allocation of the revenues generated by the fee. As the first example in the country, New York City’s proposed cordon fee may prove instructive in terms of designing, implementing, and evaluating the strategy. However, the New York City example also raises the specter of cross-jurisdictional conflict, with New Jersey suing the MTA and FHWA over the impact of the policy.⁵⁵ Implementing a cordon across multiple Activity Centers would exponentially increase the complexity of the program design.

⁵⁵ Winnie Hu and Elise Young, The New York Times, New Jersey Challenges N.Y.C. Congestion Pricing in Federal Court, April 2024. <https://www.nytimes.com/2024/04/03/nyregion/nj-congestion-pricing-federal-court.html>

Strategy 8: Implement a carbon pricing program or increase in fuel taxes.

Carbon pricing has often been identified by economists as a very promising strategy for reducing carbon emissions from transportation by increasing the cost of using carbon-intensive travel. Carbon pricing actions include implementing a cap-and-trade program — limiting the total transportation sector GHG emissions, issuing emissions permits, and allowing emitters to trade them — or instituting a carbon tax based on the carbon content of the fuel (e.g., essentially an increase in fuels taxes, which would vary based on type of fuel)⁵⁶. Carbon pricing would encourage both a shift toward using cleaner vehicles (e.g., electric vehicles, more fuel-efficient vehicles) and reduced vehicle travel. The Montgomery County Climate Action Plan identifies “advocate for a vehicle carbon/gas tax or VMT tax” as one of the transportation actions in the plan.⁵⁷ The funds generated through carbon pricing may be used to support transit service and support sustainable transportation modes. DC, Maryland, and Virginia all have an established state fuel tax, which could be raised by the jurisdictions. Maryland is also a part of the Regional Greenhouse Gas Initiative (RGGI), a cap-and-invest program in eleven Northeast states where fossil-fuel-fired electric power generators are required to hold allowances equal to their CO₂ emissions (Virginia ceased its RGGI participation in 2023).⁵⁸ The RGGI CO₂ cap represents a regional budget for CO₂ emissions from the power sector. A similar cap-and-invest program could also be developed for transportation fuels, and a concept for a regional Transportation and Climate Initiative (TCI) for this purpose was developed among 13 Northeast and Mid-Atlantic states and the District of Columbia.⁵⁹

Relative effectiveness in reducing GHG emissions

Level of Impact: A carbon pricing program or fuel tax increase would be a highly effective strategy to reduce GHG emissions. A cap-and-trade program directly limits the amount of GHG emissions by regulating transportation fuel suppliers. As such, its effectiveness is dependent on the established cap and flexibility of carbon offsets. The effectiveness of increasing fuel taxes is dependent on the level of the tax.

Timeframe of Effectiveness: Demand-side carbon pricing works by raising the price of carbon. Supply-side carbon pricing programs work by reducing the allowable carbon emissions over time (which, in turn, results in an increase in the price on carbon), and as such can have relatively rapid effects that continue to reduce emissions levels over time. Once implemented, a cap would be immediately in effect and theoretically decrease annually. In the case of demand-side carbon pricing, drivers would also immediately face increased fuel prices and adjust VMT (and potentially over the longer term their vehicle choices) accordingly. The time required to implement such a policy is dependent on political will.

Implementing organizations, legislative authority, and enabling actions

Organizations Involved: A regional carbon pricing program or fuel tax increases would require legislative action by each of the state legislatures. A cap-and-trade program involves fuel suppliers who would purchase GHG emission allotments.

⁵⁶ Resources for the Future, Carbon Pricing 202: Pricing Carbon in the Transportation Sector. Sep. 10, 2020. <https://www.rff.org/publications/explainers/carbon-pricing-202-pricing-carbon-transportation-sector/>.

⁵⁷ Montgomery County, Montgomery County Climate Action Plan, June 2021. <https://www.montgomerycountymd.gov/climate/Resources/Files/climate/climate-action-plan.pdf>.

⁵⁸ The Regional Greenhouse Gas Initiative, “About the Regional Greenhouse Gas Initiative,” https://www.rggi.org/sites/default/files/Uploads/Fact%20Sheets/RGGI_101_Factsheet.pdf.

⁵⁹ Transportation and Climate Initiative. <https://www.transportationandclimate.org/content/about-us>

Legislative Authority: Action from the state legislature is required to establish a cap-and-trade program or increase fuel taxes.

Costs associated with implementation

Public Sector: Carbon pricing and fuel taxes are revenue generators for the public sector. For example, revenue from the California cap-and-trade program funds the Greenhouse Gas Reduction Fund. \$26.4 billion has been spent from the fund since 2013, 40% of which to transportation infrastructure and operations.⁶⁰

Private Sector: A cap-and-trade program requires transportation suppliers in the private sector to purchase GHG emission allotments, in addition to decreasing supply. However, suppliers are likely to pass on costs to individuals through increased fuel prices.

Households/Individuals: Costs of both measures would largely fall on households and individuals who would face increased fuel prices, although these costs could be mitigated with credits and dividends for qualifying users.⁶¹

Implications for regional goals and priorities

Accessibility & Affordability: Both measures decrease the affordability of driving. However, the generated revenue can be directed into transit, bicycling, and walking. In California, 10% of annual revenues from cap-and-trade go to transit and intercity rail and 5% to low carbon transit operations. These investments can help to support increased access to affordable travel options.

Environmental Quality: To the extent this measure reduces VMT and over the long-term encourages shifts to fuel efficient and electric vehicles, it would reduce criteria pollutant emissions and improve air quality.

Equity: Increased transportation fuel costs may be a larger burden to lower-income individuals. However, investments in public transit, bicycling, walking, and other travel options, as well as credits for low-income households may be offered to address these equity concerns. The carbon pricing scheme used in Canada provides low- and moderate-income households a rebate. The Canadian government estimates that 8 out of 10 households get more money back than they spend on the fuel charge.⁶²

Infrastructure Condition: Generated revenue can be invested in improving transportation infrastructure.

Livability & Prosperity: This strategy does not directly affect quality of life or economic growth, but indirectly may have impacts over the long-run by encouraging less driving and transit-oriented development. Any pricing mechanism that lowers driving, including carbon pricing, should reduce the externalities caused by automobile travel (e.g., air pollution, noise, injuries and deaths from accidents, costs of providing police services).

Reliability & Efficiency: This strategy may improve transportation system efficiency, and potentially reliability, to the extent that it reduces VMT, thus reducing congestion.

Resiliency: This measure has no discernable impact on resiliency, although revenues may be used to support resiliency projects.

⁶⁰ Legislative Analyst's Office, "California's Cap-and-Trade Program: Frequently Asked Question," 2023, <https://lao.ca.gov/Publications/Report/4811>.

⁶¹ MIT Climate, "Will companies pass on the cost of a carbon tax to consumers?" January 2022, <https://climate.mit.edu/ask-mit/will-companies-pass-cost-carbon-tax-consumers>.

⁶² "How Carbon Pricing Works," Environment and Climate Change Canada, April 11, 2024, <https://www.canada.ca/en/environment-climate-change/services/climate-change/pricing-pollution-how-it-will-work/putting-price-on-carbon-pollution.html>.

Safety: The measure promotes safety to the extent that it reduces VMT and thus reduces injuries and fatalities associated with traffic.

Other considerations

Existing cap-and-trade programs have faced implementation pitfalls. State participation in RGGI is dependent on current state officials and intra-state agreement. Virginia joined RGGI in 2020 under the Clean Energy and Community Flood Preparedness Act and generated over \$827 million of revenue in two years. However, Governor Glenn Youngkin issued an executive order in 2022 to begin withdrawing from RGGI and the State Air Pollution Control Board voted to officially leave the program. Under Governor Chris Christie, New Jersey also temporarily withdrew from the program in 2011 but rejoined in 2020. Pennsylvania's RGGI regulation is currently under a court injunction.^{63 64}

While the RGGI addresses power plants, which buy allowances from the states through quarterly auctions, transportation is more challenging given the individual actions of households and travelers and considerations in regard to how to put the carbon cap on fuel suppliers, how revenues would be used, and how to address equity concerns for low-income residents.

The TCI program was launched by state environment, energy, and transportation agencies through a Declaration of Intent in 2010.⁶⁵ The multi-state coalition of Northeast and Mid-Atlantic states, including DC, Maryland, and Virginia, announced plans for a transportation sector cap-and-invest program or other pricing mechanism in 2018.⁶⁶ In December 2019, TCI released a draft Memorandum of Understanding (MOU) outlining a regional program that would cap carbon dioxide emissions from the transportation sector and invest millions of dollars annually to achieve further emission reductions. Despite ongoing collaboration and planning amongst all involved states, only three states (Massachusetts, Connecticut, and Rhode Island) and DC signed the final MOU in 2020. At that time, TCI noted that eight other states would continue to collaborate with TCI with the opportunity to join at any point.⁶⁷ However, by late 2021, no additional states signed the memorandum and without commitment from additional states, two of the participating states withdrew.⁶⁸

A 2021 report found that just over 15% of emissions, across more than 80 countries or regions, are currently subject to a carbon price.⁶⁹ In the U.S., California and Washington are the only current states with existing cap and trade programs addressing transportation. After one year, Washington State's cap-and-trade program has received backlash from citizens because of increased gas prices. Let's Go Washington, an advocacy group, submitted a petition to the office of the Washington Secretary of State to repeal the cap-and-trade program, which will appear on the November 2024 ballot. The leading Republican gubernatorial candidate is also campaigning on promises to revoke the program. While the governor does not have the power to overturn

⁶³ Chanatry, Hannah, "Virginia Lawmakers Try to Use Budget to Rejoin RGGI – But Success is Questionable," March 2024, <https://insideclimatenews.org/news/16032024/virginia-regional-greenhouse-gas-initiative/>.

⁶⁴ Regional Greenhouse Gas Initiative. <https://www.rggi.org/program-overview-and-design/elements>

⁶⁵ TCI. https://www.transportationandclimate.org/sites/default/files/TCI%20Timeline_formatted_10.20.pdf

⁶⁶ TCI, "Draft Memorandum of Understanding of the Transportation and Climate Initiative," December 2019, https://www.transportationandclimate.org/sites/default/files/FINAL%20TCI_draft-MOU_20191217.pdf.

⁶⁷ TCI, "Massachusetts, Connecticut, Rhode Island, D.C. are First to Launch Groundbreaking Program to Cut Transportation Pollution, Invest in Communities," December 2020, <https://www.transportationandclimate.org/final-mou-122020>.

⁶⁸ DeCosta-Klipa, Nik, "RIP TCI: Massachusetts ditching regional effort to curb emissions amid crumbling support," November 2021, <https://www.boston.com/community/readers-say/2021/11/18/massachusetts-transportation-climate-initiative/>.

⁶⁹ "G20 Zero-Carbon Policy Scoreboard," Executive Summary (BloombergNEF, February 2021), 16, <https://about.bnef.com/blog/g20-countries-climate-policies-fail-to-make-the-grade-on-paris-promises/>.

previous legislation, the governor can propose changes to the legislature to approve.⁷⁰ Carbon pricing in Canada has had more successes, due, in part to the rebate program, but there continues to be debate on the topic.⁷¹

⁷⁰ Stang, John, "Cap-and-trade, climate change return to the 2024 WA Legislature," January 2024, <https://crosscut.com/politics/2024/01/cap-and-trade-climate-change-return-2024-wa-legislature>.

⁷¹ John Paul Tasker, "Ottawa to Hike Federal Carbon Tax to \$170 a Tonne by 2030," Canadian Broadcasting Corporation, December 11, 2020, <https://www.cbc.ca/news/politics/carbon-tax-hike-new-climate-plan-1.5837709>.

Strategy 9: Implement pay-as-you-drive insurance requirements.

Currently, most drivers pay a fixed premium for auto insurance that does not vary based on the mileage they travel month to month. Pay-as-you-drive (PAYD) insurance involves a mileage-based fee structure for these vehicle insurance costs, and so has many of the same effects as a VMT-fee but would not be a new fee on consumers. By converting a fixed payment into a variable payment based on miles traveled, this premium structure would incentivize driving less. Several insurers currently offer PAYD insurance, and this strategy would expand this option or require this option to be offered. PAYD insurance is noted in the Maryland CRS as an “emerging carbon reduction innovation.”

Relative effectiveness in reducing GHG emissions

Level of Impact: PAYD insurance could be a highly effective strategy to reduce GHG emissions. Previous studies have found the measure could reduce passenger VMT between 8 and 20 percent for those participating, depending on the amount of the insurance fees.^{72, 73, 74} One key challenge is the lack of a clear policy mechanism for public agencies to require insurance agencies to provide PAYD and for consumers to opt in. Consequently, the real-world impact of efforts is reliant on private sector cooperation.

Timeframe of Effectiveness: Once participating in PAYD insurance, drivers are immediately incentivized to decrease their VMT and hence their emissions.

Implementing organizations, legislative authority, and enabling actions

Organizations Involved: The measure largely involves private insurance companies who provide and manage the auto insurance. State insurance commissions and state legislatures would be the key organizations that would create incentives or requirements for insurance companies to offer PAYD insurance.

Legislative Authority: PAYD insurance is legal and being offered in the District of Columbia, Maryland, and Virginia.^{75,76} Creating PAYD insurance requirements or incentives to encourage more adoption of this pricing model would involve state action. For instance, the Oregon state legislature passed a bill to incentivize insurers to offer pay-per-mile insurance by giving a \$100 tax credit per policy; the credit is available to firms that provide motor vehicle insurance policies that are at least 70 percent based on a mile-based rating plan or a time-based rating plan.⁷⁷ It is unclear whether states have the legal authority to require PAYD insurance, but to date no state has required it to be offered or limited auto insurance to this type of offering.

Costs associated with implementation

Public Sector: Assuming public agencies would provide incentives, the public sector would need funds to provide the incentives for companies.

⁷² Bordoff, Jason, and Pascal Noel, “Pay-As-You-Drive Auto Insurance: A simple Way to Reduce Driving-Related Harms and Increase Equity,” 2008, <https://www.brookings.edu/research/pay-as-you-drive-auto-insurance-a-simple-way-to-reduce-driving-related-harms-and-increase-equity/>.

⁷³ Greenberg, Allen, and John Evans, “Pay-to-Save Transportation Pricing Strategies and Comparative Greenhouse Gas Reductions: Responding to Final Federal Rule of Existing Electric Utility Generating Units,” 2015, <https://doi.org/10.3141/2530-14>.

⁷⁴ Litman, Todd, “Distance-Based Vehicle Insurance Feasibility, Costs and Benefits,” 2011, <https://vtpi.org/tca/>.

⁷⁵ Guensler, Randall, Adjo Amekudzi, Jennifer Williams, Shannon Mergelsberg, and Jennifer Ogle, “Current State Regulatory Support for Pasy-As-You-Drive Automobile Insurance Options,” <https://transportation.libguides.com/c.php?g=851090&p=6090024>.

⁷⁶ Nerdwallet, “Pay-Per-Mile Car Insurance: What You Need to Know.” May 12, 2023. <https://www.nerdwallet.com/article/insurance/pay-per-mile-car-insurance#companies-that-offer-pay-per-mile-insurance>

⁷⁷ Oregon Legislative Assembly, “House Bill 3871,” 2001, https://www.oregonlegislature.gov/bills_laws/archivebills/2001_HB3871.pdf.

Private Sector: If mandated, there would be some implications on the insurance business model, but it seems unlikely to cause significant costs to insurers.

Households/Individuals: PAYD insurance allows vehicle owners to pay less for insurance if they reduce their VMT, reducing their insurance costs; unless auto claims drop, some rates would presumably be raised to cover these costs. Those who drive less would benefit most.

Implications for regional goals and priorities

Accessibility & Affordability: This strategy can improve the affordability of vehicle ownership while simultaneously discouraging driving. PAYD insurance can be more affordable than flat-fee insurance if participants opt to drive less.

Environmental Quality: To the extent this measure reduces VMT and congestion, it would reduce criteria pollutant emissions and improve air quality.

Equity: This measure poses potential equity benefits by allowing vehicle owners to control their insurance prices. Low-income drivers can select more affordable insurance rather than higher-cost flat fee insurance or driving uninsured. Moreover, insurance that uses information on mileage (as well as potentially other information on driving patterns) provides a means for insurers to shift away from using non-causal factors, such as age, sex, and marital status, which may be viewed as unfair.⁷⁸

Infrastructure Condition: This strategy has limited/no direct discernible impact on infrastructure condition, except to the extent that reduced VMT reduces wear and tear on roads and bridges; increased transit use could yield additional repair needs for public transit.

Livability & Prosperity: This measure has no discernible impact on livability and economic development, except to the extent that such policies might encourage more demand for walkable transit-oriented places.

Reliability & Efficiency: This strategy may improve transportation system efficiency, and potentially reliability, to the extent that it reduces VMT, thus reducing congestion.

Resiliency: This measure has no discernible impact on resiliency.

Safety: Low-income vehicle owners may be less likely to drive uninsured as PAYD insurance is a more affordable option. The strategy promotes safety to the extent that it reduces VMT and thus reduces injuries and fatalities associated with traffic.

Other considerations

Despite promising potential, to date, implementation has been limited and it is somewhat unclear how the public sector can incentivize this offering. Some insurance companies have concerns about how to verify mileage; efforts typically involve drivers installing devices in their vehicles to track mileage, or other forms of reporting such as a photo of the odometer. Drivers do not appear to be aware of the concept or offering, and some surveys have found that drivers are not particularly interested in PAYD offerings.⁷⁹

⁷⁸ Cappelletti, Anthony, Pay-as-You-Drive Insurance and Usage-Based Insurance: A Look at Two Recent Articles in the NAAJ, Society of Actuaries. December 2022. <https://www.soa.org/publications/gi-insights/2022/december/gii-2022-12-cappelletti-2/>

⁷⁹ One study found that only 28% of drivers over the age of 65 said this type of insurance would interest them, and less than half of younger drivers said they would be interested, largely due to concerns that tracking devices would gather incriminating information about their driving behavior. Rawes, Erika. "What the Heck is Pay-As-You-Drive Insurance?" MotorBiscuit, January 17, 2015. <https://web.archive.org/web/20230128033859/https://www.motorbiscuit.com/what-the-heck-is-pay-as-you-drive-insurance/>

Strategy 10: Implement employer-based parking cash-out program requirements.

Parking cash-out programs provide employees with the option to give up a free or employer-subsidized parking benefit with a payment by their employer that may be used for transit, vanpools, or other options that do not involve driving. The payment may be in the form of a tax-free transit or vanpool benefit or taxable cash. Employers offer parking cash-out programs as a way to incentivize sustainable travel options and ensure more equitable benefits without eliminating free or subsidized parking. While any employer may offer cash-out, to achieve widespread adoption, government agencies would need to either incentivize or mandate parking cash-out for employers.

Relative effectiveness in reducing GHG emissions

Level of Impact: An employer-based parking cash-out program would be moderately effective in reducing GHG emissions. A FHWA scenario analysis estimated that a city-level monthly parking cash-out ordinance could reduce commute VMT by 3 to 15 percent in these cities (which ranged in their parking prices and availability of transit).⁸⁰ The analysis found that impacts would be largest in locations with high parking costs and good transit services. Parking cashout may be offered in the form of a transit or vanpool benefit (tax-free qualified transportation fringe benefits). As a result, parking cash-out is somewhat similar to providing a transit benefit program but typically also requires the employer to offer employees the option of accepting taxable cash instead of the tax-free parking. While cash-out more closely ties benefits with forgoing driving, its effects may be limited somewhat since many employers offer transit subsidy programs in the region.

Timeframe of Effectiveness: Once the policy were implemented, employees would be immediately incentivized to reduce VMT.

Implementing organizations, legislative authority, and enabling actions

Organizations Involved: Although a parking-cash out program falls to employers, public agencies play a key role in implementation through incentives or mandates that require employer participation. State and/or local agencies could implement such incentives or requirements. For instance, the District of Columbia passed a Parking Cash Out Law (Transportation Benefits Equity Amendment Act of 2020), which requires employers with 20 or more employees in DC that offer parking benefits to provide a “clean air transportation benefit” to employees who decline the parking benefit, pay a Clean Air Compliance fee, or implement a transportation management plan.⁸¹ However, it is only in its infancy in terms of implementation and enforcement due to the COVID-19 pandemic. The State of Maryland offers a \$100 per person tax credit to employers who offer parking cash-out option or other qualified commuter benefits (such as transit or vanpool benefits) to employees.⁸² In Montgomery County, county law requires that every employer with 25 or more full- or part-time employees in

⁸⁰ U.S. Department of Transportation Federal Highway Administration, An Assessment of the Expected Impacts of City-Level Parking Cash-Out and Commuter Benefits Ordinances. <https://ops.fhwa.dot.gov/publications/fhwahop23023/ch1.htm#:~:text=Cash%2Dout%20programs%20can%20be,to%20not%20drive%20to%20work>.

⁸¹ District Department of Transportation, Everything You Need to Know about the DC Parking Cashout Law. March 17, 2022. <https://godcgo.com/everything-you-need-to-know-about-the-dc-parking-cashout-law/>

⁸² Maryland Department of Transportation, “Cash in Lieu of Parking,” <https://www.mdot.maryland.gov/tso/pages/index.aspx?pageid=51>.

a transportation management district to submit a Traffic Demand Management Plan, which may include offering parking cash-out benefits.⁸³

Legislative Authority: State legislatures in Maryland and Virginia would need to take action to add or expand incentives or mandate participation in parking cash-out programs. As a Dillon Rule state (which only grants localities governments the authorities specified by the state), it does not appear that local governments in Virginia have the authority to require employer trip reduction programs or require cash-out. However, they can provide incentives.

Costs associated with implementation

Public Sector: For mandates, such as the District of Columbia's Parking Cash Out Law, agencies would need funds for education and enforcement. For incentives, the public sector needs revenues to provide tax credits, incentives, and outreach.

Private Sector: There would be costs associated for employers in offering the parking cash out benefit to their employees.

Households/Individuals: The cash out would reduce the cost of using transit, ridesharing, or other options.

Implications for regional goals and priorities

Accessibility & Affordability: Parking cash-out would not directly affect land use accessibility of access to transportation services, but would make commuting via public transit more affordable by providing payments to those already using and those newly shifting to transit, which could enhance access to jobs.

Environmental Quality: To the extent this measure reduces VMT and congestion, it would reduce criteria pollutant emissions and improve air quality.

Equity: Compared to only offering free parking at work, this measure would be more equitable to all employees. Compared to charging all employees for parking, it also does not place any burden on those who must drive to work due to personal circumstances. Moreover, lower-income households less likely to own a personal vehicle receive payments that can be used to subsidize transit costs.

Infrastructure Condition: This strategy has limited/no direct discernible impact on infrastructure condition, except to the extent that reduced VMT reduces wear and tear on roads and bridges.

Livability & Prosperity: This strategy does not directly affect community livability but could achieve benefits by reducing vehicle travel. If only implemented in certain parts of the region, it could have potential economic effects in terms of the interest by businesses in locating within certain jurisdictions.

Reliability & Efficiency: A parking cash-out program promises to reduce congestion during peak commute time, improving travel time reliability. Alternatively, the measure may decrease the reliability and efficiency of public transit by placing additional stress on the system.

Resiliency: This measure would have no discernable impact on resiliency.

Safety: This measure promotes safety to the extent that it reduces VMT and congestion, and thus reduces injuries and fatalities associated with traffic.

⁸³ Montgomery County Department of Transportation, Welcome to Your Transportation Management District.

<https://www.montgomerycountymd.gov/dot-dir/commuter/tmd/index.html#:~:text=County%20law%20requires%20that%20every%20employer%20with%2025, days%20of%20notification%20from%20the%20Department%20of%20Transportation>

Other considerations

In theory, parking cash out does not have to cost businesses anything if they are able to shed their parking, instead paying those costs to individual employers. In practice, for many businesses, the cost of parking is embedded in their leased or owned parking facilities, and they cannot reduce the amount they pay for parking by offering cash out to their employees. It is often difficult for employers, particularly in suburban locations, to determine an appropriate value for parking to cash out. Hybrid work arrangements post pandemic also create some challenges in determining the appropriate amount to cash out. If employees are only coming into the office twice a week, the value of the parking they are giving up may be considerably less than the value of a monthly parking pass, and there are questions about offering cash in lieu of parking for employees who may be working from home and already saving commuting costs. Offering a transit benefit, which is already available to many residents of the region, or a vanpool benefit thus often seems to be a fairer way of offering a commuter benefit to employees.

Strategy 11: Reduce VMT associated with school-based trips.

VMT associated with school trips could be reduced through a range of policies to encourage school bus use, such as by limiting parental drop-offs, restricting student parking, and/or significantly increasing the price of student parking. Outreach, education, and incentives also could be used to encourage school bus use and/or public bus use (e.g., free student bus passes), as well as facilitating school-based carpooling, walking, and biking to school (e.g., “walking school bus” programs, incentives, and promotions). Provision of safe bicycle parking and improved pedestrian and bicycle connections to schools (e.g., Safe Routes to Schools infrastructure investments) would also be a supporting implementation mechanism. These efforts can target public schools, private schools, community colleges, and universities.

Relative effectiveness in reducing GHG emissions

Level of Impact: Reducing VMT associated with school-based trips would likely have a small to moderate impact on reducing transportation GHGs. School trips make up approximately 9% of typical weekday person trips in the District of Columbia region, which is a fairly sizeable share of trips.⁸⁴ Of these trips, approximately 49% are taken in a private vehicle, based on data from the region’s travel survey, with a median school trip length of 2.0 miles.⁸⁵ Consequently, reducing school-based vehicle trips could have a measurable effect on regional transportation emissions. Note, however, that if additional bus services need to be provided, these would create some off-setting emissions, whether direct tailpipe emissions or associated with electricity. Also, many programs are already in effect to support sustainable travel options to school; for instance, students ride for free on Metrobus, Metrorail, and DC Circulator within the District of Columbia to get to school and school-related activities, and students in Fairfax County can sign up for a free Student Bus Pass SmarTrip card.

Timeframe of Effectiveness: The reduction of vehicle school trips would occur almost immediately after establishing policies, programs, and investments. As far as the time required for implementation, many of the mechanisms associated with this strategy would be relatively quick to implement, since they would involve policies and programs that can be funded. Improvements to pedestrian and bicycling infrastructure connections as well as the acquisition of additional buses would take some time but also are likely to be relatively quick in terms of implementation compared to major infrastructure projects.

Implementing organizations, legislative authority, and enabling actions

Organizations Involved: Public and private schools, colleges, and universities would be the primary implementors of this strategy, with funding support from local governments. State and local transportation agencies also would be involved in infrastructure-related efforts, such as enhancing bicycle and pedestrian infrastructure. Public transit providers and safety educators would also be involved.

Legislative Authority: Public schools and local governments have the authority to implement programs, which may be supported by state funds. Local governments may need to pass ordinances or mechanisms for private school compliance.

⁸⁴ TPB, “2017–2018 Regional Travel Survey Briefing: Initial Findings of Observed Daily Trips,” October 2020.

<https://www.mwcog.org/documents/2020/01/21/regional-travel-survey-presentations-regional-travel-survey-tpb-travel-surveys/>.

⁸⁵Data provided by TPB from 2017–2018 Regional Travel Survey. Note that the percentage in a private vehicle includes college students, not just through secondary education.

Costs associated with implementation

Public Sector: Publicly funded schools may need to increase school bus service and may need additional funding for incentives and enforcement of restrictions on drop-offs.

Private Sector: Privately funded schools would face similar costs as public schools, assuming they were required to participate.

Households/Individuals: No direct impact on household costs; shifting to sustainable modes could reduce vehicle fuel costs.

Implications for regional goals and priorities

Accessibility & Affordability: This measure may improve access and affordability if schools provide more options to travel to school, such as free school buses or support for carpooling. Furthermore, improved school bus service may increase accessibility. However, often vehicle trips to school occur because parents choose to send their child to a school outside of their regularly assigned school due to special programs (e.g., immersion programs, special academic programs), for which school bus services are not provided. Some school-based trips are also associated with before or after school activities, for which bus services may be limited. Restricting private vehicle access to schools could potentially reduce access for some families to these programs and activities. Increasing the price of parking at school or on-campus could also reduce affordability, particularly for low-income studies.

Environmental Quality: To the extent that the strategy reduces VMT, it would reduce criteria pollutants and improve air quality.

Equity: School and district-wide efforts to reduce VMT may benefit students already walking, biking, or taking public transportation to school. These students may benefit from organized carpooling efforts, safety education, and potentially increased school bus service. It could also enhance equity by ensuring that lack of access to a vehicle is not a barrier to participation in special programs, if school districts provide additional transportation.

Infrastructure Condition: Additional bus service, if implemented, would create additional bus fleet maintenance requirements. Otherwise, this strategy has limited/no direct discernible impact on infrastructure condition, except to the extent that reduced VMT reduces wear and tear on roads and bridges.

Livability & Prosperity: This measure could enhance livability through fostering more community connections via walking and biking to school, as well as carpooling among families, and support for public transit. At the same time, restrictions to personal travel and drop-offs to school could potentially cause challenges for some students with special needs, after school activities, after school jobs, or other responsibilities that make driving or being dropped off more efficient than using a bus or public transportation. Students may face much longer rides to school, which could impact sleep schedules and other personal needs.

Reliability & Efficiency: While bus services are generally more efficient than individual trips, some bus trips may become less efficient if schools must provide bus services to individuals who choose to opt into special programs and to support transportation for after school activities.

Resiliency: This measure has no discernable impact on resiliency.

Safety: This measure promotes safety to the extent that it reduces VMT and congestion, and thus reduces injuries and fatalities associated with traffic. Students may be educated on how to safely use public transportation as well as walking and biking infrastructure.

Other considerations

The national bus driver shortage may create issues if the primary alternative to parents driving students to work is school or public buses. It would be inefficient for schools to provide bus service for specialized programs or provide service for all after and before school activities. Furthermore, schools may need to limit flexibility of parents to choose alternative schools to avoid new policies.

Strategy 12: Incentivize electric bicycle (e-bike) adoption.

E-bike adoption incentives are designed to encourage individuals to purchase e-bikes, which can be used to replace shorter car trips, thereby reducing VMT. Incentives could be offered in the form of purchase rebates or tax credits.

Relative effectiveness in reducing GHG emissions

Level of Impact: While the impact of this strategy depends on the value of the incentive, it would likely have a relatively small to moderate impact on GHG emissions. A large share of trips taken are under a few miles and may be conducive to shifting from driving to e-bike. Nationally, over half of all trips are under 5 miles and it has been estimated that shifting one-quarter of short vehicle trips from cars to e-bikes could cut overall passenger VMT by about 3 percent in urban areas.⁸⁶ Moreover, when looking at experiences internationally there is significant potential for growth in bicycling in the U.S. with a high-quality bicycling network. However, e-biking is not as conducive to certain types of trips, and the population of incentive-sensitive prospective e-bike adopters in the near-term is likely to be relatively small without large subsidies. Note that some e-bike trips also may substitute for transit trips. Studies have found a VMT reduction of 1.2 to 5.5 miles per day for e-bike riders.⁸⁷

Timeframe of Effectiveness: Incentive programs would be relatively quick to implement, assuming funding availability. However, supply-chain issues in the e-bike industry could slow adoption.

Implementing organizations, legislative authority, and enabling actions

Organizations Involved: E-bike incentives involve public sector entities (states, counties, municipalities) that fund and administer the programs as well as e-bike manufacturers and retailers. Some electric utilities also offer e-bike incentives. Incentives can also be offered by social sector organizations like bicycle advocacy groups and Transportation Management Associations that advocate and publicize the programs.

Legislative Authority: States and local governments have the authority to enact e-bike incentives. The District of Columbia enacted an e-bike incentive with the Electric Bicycle Incentive Kickstarting the Environment Act of 2023.⁸⁸ Maryland and Virginia are currently considering enacting e-bike rebates at the state level as is the City of Alexandria.⁸⁹

Costs associated with implementation

Public Sector: The largest cost associated with this strategy would be the rebates or tax credits themselves, which are typically furnished by state or local government. There would also be the cost of administering the program in terms of qualifying e-bike models and reviewing applications as well as advertising the program.

Private Sector: No direct costs. To the extent that incentivized e-bikes would be used for commuting, employers may face increased energy costs from in-office battery charging. Manufacturers and retailers likely

⁸⁶ Rocky Mountain Institute, This E-Bike Impact Calculator Can Help Cities Accelerate E-Bike Adoption, 2023. <https://rmi.org/this-e-bike-impact-calculator-can-help-cities-accelerate-e-bike-adoption/>

⁸⁷ Johnson, N., Fitch-Polse, D., & Handy, S. (2023). *Impacts of E-bike Ownership on Travel Behavior: Evidence from three Northern California rebate programs*. Davis, CA: National Center for Sustainable Transportation.

⁸⁸ Juiced Bikes, 2023 Guide to U.S. E-Bike Rebates & Tax Credits, July 20, 2023. <https://www.juicedbikes.com/blogs/news/2023-guide-us-ebike-rebates-and-tax-credits>

⁸⁹ Wyatt Gordon, Virginia Mercury, Alexandria is exploring e-bike incentives. Could a statewide program be next?, January 3, 2024. <https://viriniamercury.com/2024/01/03/alexandria-is-exploring-e-bike-incentives-could-a-statewide-program-be-next/>

stand to benefit from this strategy in the form of increased sales of bikes, accessories, and maintenance services.

Households/Individuals: Incentives would lower the costs of purchasing e-bikes, yielding savings for individuals who purchase them.

Implications for regional goals and priorities

Accessibility & Affordability: By lowering the level of effort required to ride, particularly with children or cargo, e-bikes make cycling accessible to people with a wider range of ages and abilities. An incentive definitionally increases affordability (with instant rebates preferable to tax credits in reducing the upfront liquidity required) and e-bikes are a very affordable way to travel after purchasing one. As a result, e-bike adoption helps to support access and affordability.

Environmental Quality: To the extent that e-bikes reduce VMT, they would reduce criteria pollutants and improve air quality.

Equity: Given their price, current e-bike owners tend, on average, to have higher incomes. However, developments in lithium-ion batteries, bicycle frame molding and material sourcing have lowered the cost of an e-bike in recent years. E-bike incentives may advance equity if they are sensitive to applicants' income levels, such as through income-based incentives or income limits, as well as outreach to historically disadvantaged populations.

Infrastructure Condition: This strategy would have negligible impacts on infrastructure condition; decreased VMT may place less stress on roads and bridges.

Livability & Prosperity: This strategy may increase livability and prosperity by conferring greater mobility as well as access to employment, healthcare, and recreational destinations.

Reliability & Efficiency: This strategy may improve transportation system efficiency, and potentially reliability, to the extent that e-bikes reduce VMT, thus reducing congestion.

Resiliency: This strategy may increase resiliency to the extent that e-bike batteries could be used as power sources as well as by reducing dependency on cars in the event of an emergency.

Safety: With heavy batteries and top speeds of up to 28mph, e-bikes can easily exceed the weight and speed of conventional bikes, posing safety risks to riders as well as pedestrians. To the extent that this strategy increases cycling rates overall, it may yield increased serious injuries by virtue of putting more cyclists on the roads where they are vulnerable to collision with cars and trucks. Also, faulty e-bike batteries have started fires in residential and commercial structures.

Other considerations

Having safe cycling infrastructure that separates motor vehicle traffic and cyclists is important for encouraging people to opt for e-bikes and biking in general. The existing transportation infrastructure in most places is designed around motor vehicles. Providing dedicated bike lanes, secure bike parking facilities, and charging stations specifically for e-bikes would help to address barriers to e-bike adoption. Increased biking, both using e-bikes and traditional bikes, is also associated with positive health outcomes.

Strategy 13: Disincentivize parking through parking reforms.

This strategy focuses on disincentivizing parking, and hence reducing VMT, through parking reforms. Disincentives to parking could be implemented through an array of mechanisms include reducing or eliminating minimum parking requirements for new development, adding parking caps or maximums, increasing impact fees and taxes associated with parking, placing restrictions on new surface lots, and implementing performance pricing (higher peak-period pricing) for on-street parking, among others. For commercial and residential buildings, it could involve unbundling the cost of parking from building leases or sales, including from apartment rental leases.⁹⁰

Relative effectiveness in reducing GHG emissions

Level of Impact: This strategy in concept would have a moderate to high impact on emissions since research suggests that parking availability and cost are key determinants of vehicle ownership and vehicle use. In practice, the impact would depend on the extent to which policies reduce the amount of parking available and/or wind up unbundling parking charges from owning or leasing/renting property.

Timeframe of Effectiveness: While parking reforms could be implemented relatively quickly, it would likely take months to years for people to shift their travel behaviors or shed their vehicles in response to them.

Implementing organizations, legislative authority, and enabling actions

Organizations Involved: Parking reforms are largely under the purview of county or municipal governments in relation to their role in zoning and development (e.g., parking minimums, parking caps, impact fees) as well as in relation to their role in regulating and providing public parking on-street and off-street in garages. Governments have a limited role, however, in private real estate and rental transactions. Consequently, aside from their role in approvals for new development, governments have a somewhat limited role in their ability to encourage or require property owners to unbundle the cost of parking from building leases and sales. These decisions are largely made by residential and commercial property owners as well as property management companies. Governments potentially could encourage property owners to unbundle these costs, as Arlington County has been encouraging through its TDM program efforts and site development approval process for new development. States also play a role in regulation of rental agreements and could potentially play a role through housing programs and policies. For instance, in 2023, California passed a law to take effect in 2025 that includes new rules that mandate that landlords of new residential buildings with 16 or more units charge parking fees separately from rent in specific counties.⁹¹

Legislative Authority: There is considerable precedent for parking reform in the MWCOG region. In 2016, the District of Columbia eliminated parking requirements in various zones and reduced parking requirements near transit.⁹² In 2023, the Maryland General Assembly considered a bill prohibiting Montgomery County from requiring new off-street parking for residential development within 0.25 miles of a Metro station.⁹³ Also in 2023, Fairfax County adopted reduced parking minimums, especially near transit.⁹⁴

⁹⁰ Parking Reform Network, What is Parking Reform?. <https://parkingreform.org/what-is-parking-reform/>

⁹¹ California Apartment Association. Governor signs law mandating unbundled parking fees for new apartments, October 13, 2023. <https://caanet.org/governor-signs-law-mandating-unbundled-parking-fees-for-new-apartments/>

⁹² Parking Reform Network, Washington DC. https://parkingreform.org/mandates-map/city_detail/WashingtonDC_DC.html

⁹³ Maryland General Assembly, Montgomery County – Off-Street Parking Requirements Near Mass Transit Stations MC/PG 106-23. <https://mgaleg.maryland.gov/mgaweb/Legislation/Details/HB0819?ys=2023RS>

⁹⁴ DCist, Fairfax Supervisors Approve Plan to Reduce Parking Requirements, September 27, 2023. <https://dcist.com/story/23/09/27/fairfax-supervisors-approve-plan-to-reduce-parking-requirements/>

Costs associated with implementation

Public Sector: Parking reforms could generate additional revenue for the public sector in the form of permit and meter fees as well as fines.

Private Sector: Parking reforms like reducing or eliminating mandatory parking minimums could reduce the cost of development for residential and commercial developers.

Households/Individuals: Parking reforms like unbundling parking fees from rental leases could reduce rents for tenants without cars, and reducing or eliminating mandatory parking requirements could reduce the prices of goods and services, to the extent that businesses pass these costs along to consumers.

Implications for regional goals and priorities

Accessibility & Affordability: While certain parking reforms like performance pricing increase the cost of parking to drivers, parking reforms overall are likely to improve affordability of housing generally by lowering land acquisition and construction costs, which can be passed on to renters and homeowners in the form of lower rents and mortgages.⁹⁵

Environmental Quality: To the extent that the strategy reduces VMT, it would reduce criteria pollutants and improve air quality.

Equity: This strategy would advance equity to the extent that it shifts the cost of providing parking from all of society to those who use it most, who are disproportionately higher income.

Infrastructure Condition: This strategy would have no discernible impact on infrastructure condition. The only effects would be the extent to which reduced VMT reduces wear and tear on roads and bridges; additional transit riders could put some additional wear on transit vehicles and infrastructure.

Livability & Prosperity: This strategy may improve community and economic vitality, quality of life, and sense of place to the extent that developers adjust the design of new development to reduce parking and repurpose parking infrastructure for people rather than cars.

Reliability & Efficiency: This strategy would improve transportation system efficiency and may improve reliability by reducing congestion. Performance-based parking could reduce congestion by reducing cruising in search of parking spaces. On the other hand, limiting parking in some developments might lead to increased needs to search for available parking.

Resiliency: By facilitating reductions in parking infrastructure, this strategy could create space for the installation of green infrastructure.

Safety: This strategy promotes safety to the extent that it reduces VMT and thus reduces injuries and fatalities associated with traffic.

Other considerations

Decoupling parking from residential leases would likely have a co-benefit of reducing housing costs. This strategy would have greater impact in conjunction with TOD (Strategy 1).

⁹⁵ Todd Litman, Victoria Transport Police Institute, Parking Requirement Impacts on Housing Affordability, February 7, 2024. <https://vtpi.org/park-hou.pdf>

Strategy 14: Convert existing highway lanes to high-occupancy toll (HOT) lanes.

Unlike most HOT lanes projects, which have involved additional lane capacity and/or conversion of existing high-occupancy vehicle (HOV) lanes, this strategy involves converting existing free highway general use lanes to HOT lanes. For instance, an interstate with four or five lanes in each direction could be converted to two HOT lanes and two or three general use lanes in each direction. The revenues raised through tolls could be used to support public transit. This approach could significantly reduce “free” highway capacity, incentivize carpools, and provide more reliable bus transit service.⁹⁶

Relative effectiveness in reducing GHG emissions

Level of Impact: This strategy could have a moderate impact on emissions if implemented regionally along all interstate highways (assuming technically feasible), although the overall implications are somewhat uncertain. The conversion of general use lanes to tolled would encourage shifts from driving alone to ridesharing and transit and by reducing overall vehicle trip-making (some trips that otherwise would have been made would be eliminated as individuals choose not to travel due to congestion or toll costs). The beneficial effect would be greater if implemented in conjunction with express bus services and rideshare support. At the same time, this strategy would be likely to lead to more traffic congestion in the remaining general use lanes and diversion of traffic to parallel arterial roadways, which would likely offset some of the emissions benefits. Consequently, it has been suggested that incentivizing ridesharing is an important pairing strategy, so as not to increase congestion on the other general-purpose lanes.

Timeframe of Effectiveness This strategy would start paying dividends in terms of GHG reduction upon the opening of the facility, and the reduction would accumulate over the life of the facility. While not constructing new lanes, this strategy would likely require the design and construction of access points to the lanes (either new highway on/off ramps or access points within the highway), reconstruction of highway interchanges to connect the new HOT lanes, and installation of tolling infrastructure, which would likely take many years to plan and develop. It would also require lane restriping, signage, and driver education to operate effectively.

Implementing organizations, legislative authority, and enabling actions

Organizations Involved: This strategy would involve MDOT (including the Maryland Transportation Authority), VDOT, DDOT, and FHWA, as well as the Metropolitan Washington Airports Authority (Dulles Toll Road) and private operators (Dulles Greenway). The conversion of existing lanes most likely would not involve other private concessionaires to operate the facilities but would involve coordination with existing express lanes toll operators like Transurban Operations (95, 395, 495 Express Lanes) and the I66 Express Mobility Partners (66 Express Lanes).

Legislative Authority: Federal approval would be needed to implement tolls along existing highway lanes. Imposing tolls on federal-aid highways is generally prohibited under Title 23, Section 166, with certain exceptions. Title 23 Section 129 (General Toll Program) allows toll-financed construction to be used for new highways, new lanes added to existing highways, reconstruction of non-Interstate highways, and reconstruction or replacement of bridges or tunnels. Title 23 Section 166 provides authority for public agencies to convert HOV lanes to HOT lanes by allowing toll-paying vehicles that do not meeting minimum

⁹⁶ FHWA Office of Operations, HOT Lanes, Cool Facts, June 18, 2020.
<https://ops.fhwa.dot.gov/publications/fhwahop12031/fhwahop12027/index.htm>

occupancy standards to use the lanes.⁹⁷ FHWA may approve redesignation of existing highway lanes to HOV lanes if they “facilitate more efficient use of any Federal-aid highway” (23 CFR 810.108(b)). FHWA also established the Value Pricing Pilot Program (VPPP), under which tolls may be imposed on existing toll-free highways, bridges, and tunnels, as long as variable pricing is used to manage demand. Although no funds have been authorized for the program after Fiscal Year 2012, FHWA can still confer tolling authority under the program in situations that cannot be accommodated under the mainstream tolling programs (Sections 129 and 166).⁹⁸

Costs associated with implementation

Public Sector: Converting general use lanes to HOT lanes would generate revenues that could be used for the ongoing maintenance of the facilities, transit services, and related projects to manage demand and support effective use of the facility. The facility owner would bear the upfront costs of restriping the roadway, any reconstruction or ramp work, updating the signage, and educating drivers.

Private Sector: The private sector would likely not be involved in conversion, but it is possible that a private sector contractor could be used to bear the costs of construction, installation, and operation of the tolling infrastructure in exchange for collecting toll revenues.

Households/Individuals: Drivers of vehicles under the occupancy limit for the facility would bear the cost of the toll, albeit voluntarily.

Implications for regional goals and priorities

Accessibility & Affordability: Impacts on access depend heavily on whether enhanced express bus services would be implemented to support improved transit options. As with other HOT lanes, these facilities can help to provide fast, reliable transit services along highways where transit service would otherwise be challenged due to traffic congestion. By replacing existing general use lanes with HOT lanes that are designed to operate near free flow, the newly configured highways would reduce the overall vehicle throughput on the highway (one concept paper showed options yielding a 6–12% reduction in vehicle throughput during peak hours by shifting from approximately 2,100 vehicles per hour at a speed of 32 miles per hour to 1,722 vehicles per hour at a speed of 56 miles per hour for the converted lanes).⁹⁹ However, overall passenger throughput could conceptually be maintained or enhanced with extensive transit service and ridesharing. By maintaining some general use lanes, travelers would have the choice to pay a toll, and no one would be forced to pay more for travel; however, the free travel lanes would be more congested over more hours of the day, which would limit access to jobs and other destinations that are not served via express bus services.

Environmental Quality: This strategy would likely reduce overall criteria air pollutants from motor vehicles due to less overall VMT but impacts on localized air quality would need further study due to potential hotspots due to increased traffic congestion in the general use lanes and diversion of traffic to arterial roadways.

Equity: The impact of this strategy on equity would largely depend on how the revenues generated were deployed. Converting free lanes to tolled would make travel more costly financially or more time consuming

⁹⁷ FHWA Center for Innovative Finance Support, Federal Highway Tolling Programs.

https://www.fhwa.dot.gov/ipd/fact_sheets/tolling_programs.aspx.

⁹⁸ FHWA Center for Innovative Finance Support, Value Pricing Pilot Program.

https://www.fhwa.dot.gov/ipd/tolling_and_pricing/tolling_pricing/vppp.aspx

⁹⁹ Decorla-Souza, Patrick. January 2022, “Converting Existing General-Purpose Lanes to High-Occupancy/Toll Lanes: An Exploratory Evaluation.” Public Works Management & Policy (pre-publication version).

https://www.researchgate.net/publication/358176874_Converting_Existing_General-Purpose_Lanes_to_High-OccupancyToll_Lanes_An_Exploratory_Evaluation

due to congestion in the general use lanes for those who cannot afford to pay the tolls (compared to adding new HOT lane capacity without reducing general use lane capacity, which generally benefits travel time in all lanes). If the revenues were used to add new express bus transit, the strategy would benefit bus riders, who tend to be lower-income and more often from historically disadvantaged populations. In this case, tolling may support equity by yielding a transfer of funds from those with higher incomes who pay the tolls to those with lower incomes who benefit from new transit options and free reliable rideshare options. Express transit options along the Beltway could help to bridge the east-west divide and enhance access to jobs within reasonable transit travel time.

Infrastructure Condition: Adding tolling to existing lanes would generate additional revenue that could be used to support highway infrastructure maintenance. To the extent that it reduces VMT, the strategy may prolong the life of the facility.

Livability & Prosperity: Converting existing general use lanes to priced lanes would likely divert some highway traffic to other roadways, such as arterials and local roadways, which may increase traffic congestion, air pollution, and vehicle safety concerns in neighborhoods. Over the long-term, pricing might encourage people to live closer to their work and shift toward transit, which could yield some community benefits.

Reliability & Efficiency: This strategy would provide an increased option for fast, reliable travel along highways for transit, carpools, and those who choose to pay. Dynamic tolling provides the greatest benefit in terms of ensuring reliable travel times.

Resiliency: This strategy would have limited impact on resiliency. However, separated toll lanes could help to ensure faster time for emergency vehicles to respond to a threat.

Safety: The safety impacts of this strategy are somewhat uncertain. This strategy may improve safety by reducing lane changes and merging activity as well as separating transit buses and larger passenger vehicles from other vehicles.¹⁰⁰ However, the entry/exit points for the HOT lanes may create conflict points without substantial investments in new ramps.

Other considerations

This strategy would be an alternative way to support the region's aspirational initiative to "expand the express highway network." However, it is worth noting that out of the 53 operating HOT facilities in the US in 2022, none had been created from general-purpose lanes (as opposed to existing HOV lanes or new lanes), given the political barriers to doing so.¹⁰¹ There are only a few cases in the U.S. where conversion of general use lanes to HOVs for peak hours has been attempted, and public success has been challenging, with several of the projects shortly reversed.¹⁰² As demonstrated with the proposal for cordon pricing in New York and other parts of the world, the public is likely to be very skeptical of the benefits, and it would likely be very politically challenging for elected officials and decision-makers to make the case for the benefits of converting free lanes to restricted and paid use.

¹⁰⁰ Texas A&M Transportation Institute, Managed (HOV-HOT) Lanes. <https://mobility.tamu.edu/mip/strategies-pdfs/added-capacity/technical-summary/managed-hov-hot-lanes-4-pg.pdf>

¹⁰¹ Patrick Decorla-Souza, Converting Existing General-Purpose Lanes to High-Occupancy/Toll Lanes: An Exploratory Evaluation, January 2022, https://www.researchgate.net/publication/358176874_Converting_Existing_General-Purpose_Lanes_to_High-OccupancyToll_Lanes_An_Exploratory_Evaluation

¹⁰² California Center for Sustainable Communities at UCLA, Petroleum Policy Brief Series, "High-Occupancy Vehicle Network Expansion through Lane Conversion rather than New Construction." <https://www.next10.org/sites/default/files/10%20High-Occupancy%20Vehicle%20Lanes.pdf>

Many of the major highways in Northern Virginia already have existing HOT lanes, and so this strategy would need to consider whether the conversion of lanes would be only along existing highways that currently do not have express/HOT lanes to create a network of express lanes or whether the conversion of lanes along highways with existing HOT lanes would also be considered.

Strategy 15: Expand microtransit / first mile–last mile service in the region.

Microtransit is typically an on-demand service that uses app-enabled trip requests and payment to complement fixed-route transit service. Expanding microtransit service can reduce emissions by solving the first/last mile problem for potential transit users, thereby reducing VMT. Existing microtransit programs in the region include DC Neighborhood Connect¹⁰³ and Montgomery County Flex, which was the first in the region.¹⁰⁴ This strategy has the potential to bring more people within easy access of fixed route transit, which could result in mode shifts and even reduced vehicle ownership if the microtransit service connections are low-cost or free and reliable. Microtransit may be structured with different service modes, such as using a fleet of vans branded as public transit or using transportation network companies (TNCs) such as Uber and Lyft.¹⁰⁵

Relative effectiveness in reducing GHG emissions

Level of Impact: This strategy could have a relatively small to moderate impact on emissions to the extent that it facilitates mode shift and reduces VMT. In 2022, the microtransit operator Via found that 40.8% of its rides replaced private vehicle trips, corresponding to a 35.2% decrease in GHG emissions, relative to projected emissions without its service.¹⁰⁶

Timeframe of Effectiveness: This strategy would have a relatively immediate impact on emissions, allowing time for people to adjust their travel behaviors, with the GHG reduction accumulating the longer (and wider) the service is in operation. This strategy could be implemented relatively quickly (much more quickly than bus or rail transit expansion), particularly if utilizing agreements with existing TNCs. Still, it could take months to more than a year to procure vehicles and/or contract with operators, as well as advertise the service to the public to raise their awareness of the services. For example, Montgomery County Flex entailed a year-long marketing campaign consisting of focus groups and a public forum, press releases and media appearances, texts, emails, and social media posts, and traditional and digital advertising.¹⁰⁷

Implementing organizations, legislative authority, and enabling actions

Organizations Involved: This strategy would be led by local governments (including their transit agencies) if implemented at the local level, such as at particular transit station service areas. Regional scale implementation would require partnerships across agencies and likely with WMATA to establish program parameters and mechanisms for funding, marketing, payment options, and consistency of program offerings. MWCOG could play a role in coordination of these agreements.

Legislative Authority: Municipalities and counties generally have the authority to initiate and expand microtransit service in their jurisdictions.

Costs associated with implementation

Public Sector: While microtransit services are often operated by a private vendor, the public sector—whether the municipality, state, or transit agency—would bear the cost of the program. While models differ in terms of

¹⁰³ Department of For-Hire Vehicles, DC Neighborhood Connect. <https://dfhv.dc.gov/page/dc-neighborhood-connect>

¹⁰⁴ Montgomery County Department of Transportation, Flex. <https://www.montgomerycountymd.gov/dot-transit/flex/>

¹⁰⁵ American Public Transportation Association, Transit and TNC Partnerships. <https://www.apta.com/research-technical-resources/mobility-innovation-hub/transit-and-tnc-partnerships/>

¹⁰⁶ Via Transportation, How microtransit helps reduce emissions, April 21, 2023. <https://ridewithvia.com/resources/how-microtransit-helps-reduce-emissions>

¹⁰⁷ Montgomery County Department of Transportation, Ride On Flex Microtransit Performance Assessment, August 2020.

https://www.montgomerycountymd.gov/DOT-Transit/Resources/Files/timetables/Flex%20Microtransit%20Performance%20Assessment%20-%20Final%20Report%20-%20Updated%20_11_2021.pdf

vehicle procurement and driver recruitment, microtransit providers typically charge an implementation fee for the service, customize an app, and train drivers and dispatchers. There are additional costs associated with marketing the program to users.¹⁰⁸

Private Sector: No direct costs. Private transportation providers like taxi services and TNCs may lose ridership to microtransit services.

Households/Individuals: These services should reduce transportation costs for travelers. Depending on the fare structure, riders may pay an additional fare for microtransit service, or it may be included in their transit fare like a free transfer.

Implications for regional goals and priorities

Accessibility & Affordability: As a first mile–last mile solution, microtransit can increase access to fixed–route transit and thus enhance access to jobs, health care, and other destinations. It can increase affordability by reducing the cost of private TNC or taxi rides for individuals. For those who choose to reduce car ownership, their household would save the fuel, insurance, maintenance, and other costs that vehicle ownership entails.

Environmental Quality: To the extent that microtransit trips replace private vehicle trips and induce vehicle shedding, this strategy would reduce the criteria pollutant emissions associated with vehicle travel.

Equity: The impact of microtransit on equity depends on the design of the program and the inclusion of provisions to serve historically disadvantaged populations. Absent such provisions, private operators may opt not to serve lower–income communities.¹⁰⁹ It is also important to consider the fare structure and payment system for low–income individuals, older adults, and unbanked people.¹¹⁰

Infrastructure Condition: This strategy would have limited/no direct discernible impact on infrastructure condition; the only effects would be the extent to which reduced VMT reduces wear and tear on roads and bridges; additional transit riders could put some additional wear on transit vehicles and infrastructure.

Livability & Prosperity: Microtransit can improve quality of life by putting more destinations within reach via transit and could potentially enhance economic activity in transit station areas.

Reliability & Efficiency: Demand–responsive microtransit would enhance the efficiency of transit service for travelers and enable transit agencies to focus fixed route service on routes that provide the highest ridership. On–demand microtransit can provide a relatively low–cost mechanism to provide transit service to locations where it is not financially viable to provide fixed route service.

Resiliency: This strategy would have a negligible impact on resiliency. However, microtransit vehicles (if purchased/procured by public agencies) could potentially be repurposed for other functions during emergencies.

Safety: This strategy may improve safety by substituting for some biking or walking trips along dangerous road segments; it also might yield some safety benefits by reducing VMT.

¹⁰⁸ GoMaine, Microtransit Literature Review & Case Studies, May 2023.

<https://www.maine.gov/mdot/transit/docs/2023/MaineDOT%20Microtransit%20White%20Paper%20FINAL.pdf>

¹⁰⁹ University of Oregon Urbanism Next, Microtransit. <https://www.urbanismnext.org/technologies/microtransit>

¹¹⁰ GoMaine, Microtransit Literature Review & Case Studies, May 2023.

<https://www.maine.gov/mdot/transit/docs/2023/MaineDOT%20Microtransit%20White%20Paper%20FINAL.pdf>

Other considerations

Microtransit to support first-mile last-mile connections works best when there are strong core fixed route transit services. Free bus and/or rail services could potentially complicate fare structures in relation to microtransit.

Strategy 16: Expand programs to incentivize carpooling and vanpooling.

While MWCOG jurisdictions are already promoting carpooling and vanpooling through programs like Commuter Connections, which includes a guaranteed ride home program, ridematching, and vanpool financial support (Pool Rewards),¹¹¹ regional partners could consider additional support strategies through added marketing, financial incentives and prizes, and/or additional targeted programs. For instance, this strategy could include a scaled up IncenTrip app (CommuterCash) traveler incentive program to encourage reducing vehicle trips;¹¹² Flextime Rewards program, which operates through the IncenTrip app to encourage employees who commute along specific congested corridors to avoid vehicle trips during peak hours.¹¹³

Relative effectiveness in reducing GHG emissions

Level of Impact: While research shows that financial incentives can motivate changes in travel behavior, overall this strategy would have a moderate effect on regional transportation GHG emissions. Commute trips make up about 21% of all person trips within the MWCOG region.¹¹⁴ Studies of employee-based trip reduction and transportation demand programs have generally found reductions in VMT of about 4–6%, or about 1% regionally.¹¹⁵ From 2020 to 2023, it is estimated that the Commuter Connections program reduced 209,000 tons of CO₂ per year,¹¹⁶ which amounts to roughly 1% of regional on-road transportation sector emissions in 2020.¹¹⁷ Increased marketing and incentives could potentially help shift additional mode shifts to carpooling and vanpooling, even in parts of the region with limited transit services.

Timeframe of Effectiveness: Impacts would be quick, but changes in travel behavior can take time (months to a few years) to manifest as commuters learn about the programs, try them out, and sustain participation. Incentives could be implemented relatively quickly with additional funding and building on existing program efforts.

Implementing organizations, legislative authority, and enabling actions

Organizations Involved: This strategy would largely require implementation by MWCOG and member jurisdictions that participate in Commuter Connections. Employers and vanpool operators also would play an important role in success.

Legislative Authority: As an extension of the existing Commuter Connections program, this strategy would not require additional legislative authority.

¹¹¹ Commuter Connections. <https://www.commuterconnections.org/>

¹¹² Commuter Connections, IncenTrip. <https://www.commuterconnections.org/incenTrip-app/>

¹¹³ Commuter Connections, Flextime Rewards Program. <https://www.commuterconnections.org/flextime-rewards-program/>

¹¹⁴ Metropolitan Washington Council of Governments, 2017–2018 Regional Travel Survey Briefing: Initial Findings of Observed Daily Trips. <https://www.mwcog.org/documents/2020/01/21/regional-travel-survey-presentations-regional-travel-survey-tpb-travel-surveys/>

¹¹⁵ Susan Shaheen, Adam Cohen, and Alexandre Bayen, The Benefits of Carpooling, October 2018. <https://escholarship.org/content/qt7jx6z631/qt7jx6z631.pdf>

¹¹⁶ Commuter Connections, Transportation Demand Management (TDM) Analysis Report, November 21, 2023.

<https://www.commuterconnections.org/wp-content/uploads/2021-2023-TDM-Analysis-Evaluation-Report-Final-Draft-112123.pdf>

¹¹⁷ MWCOG, Community-Wide Greenhouse Gas Inventory Summary, December 2022.

<https://www.mwcog.org/file.aspx?D=vctpsw7kJ7mBXo5fDiocOsHJqqhRNOYFFWHsg8E3adw%3d&A=7cVAWp5XhXkwxoiiGO1TLzOBOP4%2bGtQUxWiaE8jH9B8%3d>

Costs associated with implementation

Public Sector: In FY 2023, the Commuter Connections program was budgeted for nearly \$7,000,000, with roughly 52% from Maryland, 40% from Virginia, and 10% from the District of Columbia¹¹⁸ The cost of expanding the program would likely be borne by these funders.

Private Sector: Participating employers would bear the cost of offering commuter benefit programs to their employees in the form of pre-tax or direct commuter benefits.¹¹⁹ However, they may recoup some of this cost in the form of higher morale and lower turnover among employees.¹²⁰

Households/Individuals: Individuals participating in the incentive programs would have reduced transportation costs and would benefit from the financial incentives.

Implications for regional goals and priorities

Accessibility & Affordability: This strategy would not directly change location accessibility, transit, or other transportation services but would increase affordability and could increase access to carpooling, vanpooling, and other options as more people choose to use these options.

Environmental Quality: To the extent that the strategy reduces VMT, it would reduce criteria pollutants and improve air quality. It is estimated that the Commuter Connections program reduced nitrogen oxides (NOx) and volatile organic compounds (VOC) by 0.457 tons and 0.375 tons respectively per day from 2021 to 2023.¹²¹

Equity: This strategy may enhance equity by increasing affordability and ability of individuals to match with other commuters in carpools or vanpools. However, the effects depend on the structure of the incentive programs (e.g., if financial incentives go to those who were driving, who tend to have higher incomes, this might not enhance equity).

Infrastructure Condition: This strategy would have negligible impacts on infrastructure condition; decreased VMT may place less stress on roads and bridges.

Livability & Prosperity: Relative to driving, carpooling/vanpooling can improve quality of life by facilitating in-commute activities, whether productive or recreational in nature, as well as promoting social ties among participants.

Reliability & Efficiency: This strategy would improve transportation system efficiency and may improve reliability by reducing congestion, particularly during peak hours. It is estimated that the Commuter Connections program reduced 2,883 hours of delay per day from 2021 to 2023.¹²²

Resiliency: Enhanced carpool/vanpool networks and relationships among individuals potentially could support travel needs during emergency situations.

¹¹⁸ Commuter Connections, FY 2023 Work Program for the Commuter Connections Program for the Greater Washington Metropolitan Region, March 16, 2022. <https://www.commuterconnections.org/wp-content/uploads/FY2023-CCWP-FINAL-031622-1.pdf>

¹¹⁹ Virginia Department of Rail and Public Transportation, ConnectingVA, Employee Commuter Benefits. <https://connectingva.drpt.virginia.gov/employee-commuter-benefits/>

¹²⁰ Indeed, What Are Commuter Benefits (And Should You Offer Them)?. <https://www.indeed.com/hire/c/info/commuter-benefits>

¹²¹ Commuter Connections, Transportation Demand Management (TDM) Analysis Report, November 21, 2023.

<https://www.commuterconnections.org/wp-content/uploads/2021-2023-TDM-Analysis-Evaluation-Report-Final-Draft-112123.pdf>

¹²² Commuter Connections, Transportation Demand Management (TDM) Analysis Report, November 21, 2023.

<https://www.commuterconnections.org/wp-content/uploads/2021-2023-TDM-Analysis-Evaluation-Report-Final-Draft-112123.pdf>

Safety: This strategy may increase safety by reducing the number of cars on the road as well as encouraging safer driving behaviors.¹²³ For example, the Commuter Connections TDM Analysis Report found that the program avoided 2.193 crashes per day from 2021 to 2023.¹²⁴

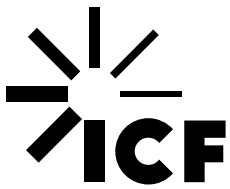
Other considerations

The design of the incentive program would need to be considered carefully. Incentives that were targeted to those who were driving to work to encourage shifts in time or mode would need to consider how to verify previous commuting behavior, how long to continue to pay incentives, and how and whether to reward individuals who are already using transit and other options. This strategy could potentially work against the strategy to increase telework if the program encourages travel by carpools, vanpools, or shifting travel time rather than telework. It may have a greater impact if implemented in conjunction with conversion of lanes to high-occupancy toll lanes.

¹²³ BlaBlaCar, Carpooling and road safety. <https://blog.blablacar.in/blablalife/reinventing-travel/environment/ridesharing-road-safety>

¹²⁴ Commuter Connections, Transportation Demand Management (TDM) Analysis Report, November 21, 2023.

<https://www.commuterconnections.org/wp-content/uploads/2021-2023-TDM-Analysis-Evaluation-Report-Final-Draft-112123.pdf>



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