

# Reduce vehicle miles traveled

## REDUCE PRIVATE VEHICLE TRAVEL AND ENCOURAGE ALTERNATIVE MODES OF TRANSPORTATION

**Description and purpose of strategy:** This fact sheet will help municipalities understand vehicle miles traveled (VMT) reduction strategies, including the economic and equity implications, best practices, and the state of practice. This fact sheet incorporates work-from-home policies and virtual workshop support as well strategies for collaboration with other entities to improve broadband access and encourage the use of public transit. This fact sheet also discusses how zoning strategies such as multifamily zoning and concentrated development in activity centers can be part of the solution.

**Content of fact sheet:** An overview of the costs and benefits of VMT reduction strategies, including encouraging virtual work, expanding broadband access, and expanding alternate forms of transportation.

**Implementation support:** This fact sheet expands upon strategies and actions from the Climate Actions Database, which can be found at: [capecodcommission.org/climate](https://capecodcommission.org/climate).

### BENEFITS

- Greenhouse gas (GHG) emissions reductions or sequestration
- Health improvement from reduced pollutants
- Increased recreation
- Lower maintenance/operational costs
- Environmental enhancement/protection
- Less damage to infrastructure
- Higher property values
- Increased resilience
- Job and economic growth

### COSTS

- Higher capital costs
- Higher maintenance costs
- Higher operational costs
- Additional time for municipal staff to implement

## KEY FINDINGS



**Equity:** Strategies to reduce potential economic burdens—including expanding vulnerable populations' access to broadband, public transit systems, and active transport systems—could help maximize potential benefits to these populations and ensure equitable distribution of outcomes.



**Financial benefits:** VMT reduction projects and programs can be cost-effective compared to conventional transportation projects, depending on local context and project characteristics.



**Non-market benefits:** Improvements in health from reduced pollutants and increased recreational opportunities are major benefits of some VMT projects.



**GHG reductions:** Reducing VMT often results in GHG emissions reductions.



**Ease of implementation:** Developing VMT reduction programs and policies provides support for a wide range of transportation projects and business practices. Community engagement should ensure that projects are designed to maximize equity benefits.

## BENEFIT COST ANALYSIS

Projects and programs designed to reduce VMT can vary widely depending on the nature of the work, which presents a challenge for estimating the benefits and costs of VMT reduction initiatives. Programs supporting VMT reduction can have many beneficial effects, including lower accident rates, reduced traffic congestion, increased physical activity (and associated health outcomes) from pedestrian and bicycle programs and projects, improved air quality, an improved sense of place, travel time savings, reduced travel expenses, and amenities such as attractive streetscapes and sidewalk cafes and retail establishments.

Major costs are associated with programs supporting VMT reduction, such as expanding and improving broadband access, expanding and improving access to public transit systems, and creating or improving active forms of transportation such as walking or bicycling. Costs could also include expenses for planning and re-zoning efforts. However, benefits associated with VMT reduction programs and projects continue to be accrued for many years following implementation.

Reductions in VMT are important to achieving decarbonization targets. One Massachusetts report estimates that a 1% reduction in the statewide growth rate of VMT from 2015 to 2030 would result in combined economic savings of \$2.3 billion annually, made up of transportation cost savings, reduced automobile collisions, and reduced vehicle and road repair costs ([Baxandall & Olivieri, 2015](#)). Another report prepared for the Commonwealth of Massachusetts ([The Cadmus Group and Evolved Energy Research, 2020](#)) estimates that pursuing VMT reduction transit policies (including enacting congestion charges, encouraging active transportation, expanding public transit, and implementing travel demand management policies) and community densification policies (increasing the proportion of households located in mixed-use areas) could reduce growth in daily VMT by over 30% in Massachusetts between 2015 and 2050.

However, VMT reductions are limited in opportunity. The effect of housing densification policies is limited because expected new development is usually small compared to the existing built environment. Other policy interventions, such as travel demand management and expanded public transit infrastructure, may need to be substantial to reduce VMT significantly. Costs associated with such substantial policy interventions may be significant and, in some cases, cost prohibitive. VMT reduction policies should be implemented alongside other policy interventions aimed at reducing GHG emissions.

### Encouraging work-from-home policies

During the COVID-19 pandemic, many workplaces temporarily ceased operations or shifted from traditional office work policies to work-from-home policies. In U.S. areas with stay-at-home orders, estimates indicate that average daily travel distance declined from 5 to 1 miles ([Riggs, 2020](#)) and traffic reductions ranged from 10 to 75 percent ([ITE, 2020](#)). Post-COVID, about three-quarters of all U.S. companies are adopting hybrid or work-from-home models permanently ([Tsipursky, 2023](#)). Research suggests that workers who work from home still travel by vehicle at a reduced rate despite lifting of stay at home orders ([Riggs, 2020](#)), resulting in reduced transportation emissions. In 2017, researchers estimated that work-from-home employees reduced their travel by 2,000 personal vehicle miles ([Magellan Advisors, 2022](#)). The table below shows estimates of avoided costs from VMT reduction. According to these figures, reducing VMT by 2,000 vehicle miles could result in average avoided transportation and emissions costs of approximately \$573 for each work-from-home employee, using the average cost of U.S. retail gasoline in February 2023 ([EIA, 2023](#)) and average U.S. vehicle emissions rates per vehicle for light-duty vehicles using gasoline ([Bureau of Transportation Statistics, 2023](#)).

### AVOIDED COSTS FROM VMT REDUCTION (\$/VEHICLE MILE)

CATEGORY	VALUES
<b>Avoided Transportation Costs</b>	
Congestion cost	\$0.08
Pavement maintenance cost	\$0.003
Noise pollution cost	\$0.001
Accident cost	\$0.04
Fuel cost	\$0.153
<b>Avoided Emissions Costs</b>	
NOX	\$0.0008
PM	\$0.0085
CO2	\$0.0002
TOTAL	\$0.2865

Note: Values adjusted to 2023 values. Calculations assume gas mileage for light duty vehicles of 22.9 miles/gallon.

Sources: [EPA COBRA \(2023\)](#), [Bureau of Transportation Statistics \(2020\)](#)

Businesses with hybrid or work-from-home policies benefit from better company branding, lower turnover rates, reduced carbon footprints, and lower overhead costs ([Davies, 2020](#)). Cost savings associated with these benefits vary by company, but often amount to tens of thousands of dollars in savings per year. However, businesses must also consider technical and communication challenges associated with work-from-home policy implementation, which may require costly investments in areas such as technological systems, development of cybersecurity policies, and employee training on security policies and cybercommunication. Additionally, work-from-home policies may be impossible or impractical for many industries on Cape Cod where in-person work is critical to operations, including major local industries like construction, hospitality, and tourism. For industries where in-person work is essential, other strategies should be pursued to reduce VMT from commuting, such as improving or subsidizing public transit systems, encouraging active transportation, or promoting ride-sharing opportunities.

### Virtual workshop support

Hosting and organizing workshops can be expensive and logistically challenging. Virtual workshops reduce expenses by eliminating the need to purchase office supplies, secure a location for the workshop, and travel to the workshop ([Dennison, 2023](#)). Despite the benefits of virtual workshops, some individuals may be deterred from hosting their workshop online due to the technological challenges involved. Providing support for virtual workshops may encourage businesses and individuals to transition to virtual workshops, resulting in reduced VMT and carbon emissions from travel.

### Improving broadband access

Broadband access helps individuals access important online services and is crucial to supporting work-from-home policies and virtual workshops. Improving broadband access allows individuals to reduce VMT by reducing travel needs. Individuals can use broadband access to complete tasks and acquire amenities that may previously have required travel. For example, individuals can use broadband to access healthcare services through telehealth, enroll in online fitness or educational programs, and even check out books and media from libraries. Additionally, broadband users can engage in work-from-home policies and virtual workshops, as previously discussed, which can reduce VMT by eliminating the need to commute to work or travel to workshops. Even with increased broadband access, actual reductions in VMT and GHG emissions depend on changes in employer policies and practices as well as consumer adoption of telecommuting or other activities that substitute for vehicular travel ([Magellan Advisors, 2022](#)).

Despite the benefits associated with broadband access, improving availability is costly. One California study estimates that it costs over \$300,000 to fully deploy one mile of broadband conduit as a standalone project ([Magellan Advisors, 2022](#)). Cost savings are achievable by installing conduit as part of a transportation project, which reduces the need for trench digging and decreases the cost to deploy broadband conduit to approximately \$54,000 per mile ([Magellan Advisors, 2022](#)).

## Improving public transit systems

Cape Cod provides its residents and visitors access to multiple forms of public transit, including bus lines, rail lines, ferries, and multimodal transit ([John A. Volpe National Transportation Systems Center, 2011](#)). Access to public transit systems is shown to significantly reduce traffic congestion, increase community access to services, create jobs and stimulate local economies, improve healthcare access while reducing costs, reduce individuals' transportation costs, reduce accidents, and reduce GHG emissions ([Ferrell, 2015](#)). One report prepared for the Commonwealth of Massachusetts ([The Cadmus Group and Evolved Energy Research, 2020](#)) estimates that pursuing VMT reduction transit policies (including congestion charges, encouragement of active transportation, expanding public transit, and implementing travel demand management policies) could reduce growth in daily VMT by over 30% in Massachusetts. Additionally, there is evidence that switching from a car to public transportation when commuting to work increases activity levels, which may result in improved health outcomes ([Morabia et al., 2010](#)). The benefits of public transit systems often outweigh the costs. Public transit systems pay for themselves in congestion relief alone in mid- to large-sized urban areas ([Ferrell, 2015](#)). Even in rural areas, certain types of public transit are often cost-effective. While some benefit cost analyses on public transit systems in rural U.S. communities find the costs of public transit slightly outweigh the benefits, other studies have found the benefits outweigh the costs, at times significantly ([Ferrell, 2015](#)).

Increased public transit service frequency and coverage, improvements to user experience (such as bus stop improvements), and other system improvements could encourage additional transit ridership. Additional GHG emissions reductions could be realized by transitioning from a fleet of fossil-fueled vehicles to zero-emission vehicles. [The transition to zero-emissions](#) vehicles is the currently at the Cape Cod Regional Transportation Authority (CCRTA) and is reflected in the CCRTA [10-Year Strategic Plan and 5-Year Capital Spending Plan](#), which provides substantial funding resources for the planned migration from fossil fuel vehicles to electric vehicles, supporting EV infrastructure and technician training.

## Encouraging active transportation

Active transportation includes all activities individuals can partake in to physically transport themselves, including walking, running, bicycling, rollerblading, and more. Benefits of active transportation include improved public fitness and health, transportation cost savings, reduced traffic congestion, increased traffic safety, energy conservation, and pollutant reductions ([Litman, 2023](#)). Projects and programs to encourage active transport as an alternative to travel in a personal vehicle include creating bicycle lanes, expanding access to sidewalks, creating trail systems (including walking trails), and more. Costs of implementing programs and projects to encourage active transportation include equipment expenses (e.g., shoes, bikes), time costs because of slower travel, and development costs. The scale of costs and benefits will vary depending on the nature of the project or program.

## Multifamily zoning and concentrating community development

Multifamily zoning provisions can enhance housing affordability, encourage more revenue-balanced community growth, improve land use, and accommodate a greater diversity of personal and community needs ([Massachusetts Housing Partnership, 2023](#)). By allowing denser, more compact and mixed-use communities, residents can shop, live, and access important services through means other than personal vehicles, such as through biking or walking ([Cape Cod Commission, 2023](#)). Locating multifamily housing near public transit systems further reduces reliance on private vehicles, thus reducing VMT, by providing residents access to destinations beyond walking or cycling distance ([Massachusetts Executive Office of Housing and Economic Development, 2023](#)).

## EQUITY

A few potential equity benefits for VMT reduction strategies for vulnerable populations include:

- **Reduced vehicular emission exposure.** Reducing VMT is likely to lead to reductions in fossil fuel use and thus reduced GHG emissions and pollution. Many vulnerable populations are exposed to vehicle emissions at disproportionate levels ([U.S. Federal Highway Administration, 2022](#)). Therefore, reductions in vehicular emissions could result in benefits from improved air quality for these populations.
- **Enhanced economic opportunity.** Many communities have limited access to personal vehicles and therefore rely on public transportation systems. Encouraging alternatives to private vehicle transportation such as public transportation, walking paths, and bicyclist paths could present additional (and safer) transportation options for all.
- **Improved access to services and reduced travel costs.** Increased multifamily development in activity centers could help residents access needed services (e.g., food, healthcare), reducing travel time and transportation-related costs of accessing those services.
- **Health and physical benefits.** There is a strong relationship between family income and physical activity, with low-income families reporting the lowest levels of physical activity ([Armstrong et al., 2018](#); [U.S. Department of Health and Human Services, 1996](#)). There are often financial and transportation-related barriers to accessing health care and fitness centers. VMT reduction strategies can encourage use of pedestrian and bicycle trails, which can lead to improved physical activity levels and health outcomes.

### Optimizing Equity During Implementation

Despite some of the benefits discussed above, VMT reduction strategies may also negatively impact equity efforts. For example, strategies that rely on tax increases for funding could place disproportionate financial burdens on low-income communities. Rural communities may also face disproportionate challenges given longer commutes. Communities located in remote areas. Additionally, benefits to quality of life resulting from VMT reduction strategies could potentially lead to gentrification and further the housing crisis.

VMT reduction strategies requiring digital skills and resources may be more difficult to access for vulnerable communities. Strategies will need to address the digital divide—that is, the lack of affordable internet access; affordable devices appropriate for an individual’s civic, social, and employment needs; and the skills necessary to engage digitally ([Cape Cod Commission, 2023](#)). Digitally focused VMT reduction strategies should assist communities with understanding digital access limitations and adoption challenges to digital equity to bridge the digital divide.

### CASE STUDY: IMPACTS OF RESIDENTIAL DEVELOPMENTS IN EASTERN MA

Between 2000–2005 in eastern Massachusetts, nine residential developments were constructed in suburban areas with varying built environment characteristics such as density, location, job accessibility, and neighborhood building age. In 2011, Massachusetts Institute of Technology (MIT) published a case study on how built environment characteristics in these developments affect VMT. Findings suggest that developments with high density, high land use mix, proximity to major roads, and moderate job accessibility result in the lowest VMT per residents ([Xia, 2011](#)).

Photo: Brad Hutchinson Real Estate, Inc., n.d.



## STATE OF PRACTICE

### General State of the Practice

Reducing VMT is an official goal of U.S. government policy ([U.S. Department of Transportation, 2014](#)). In the U.S. Department of Transportation's Fiscal Year 2022–2026 Strategic Plan, officials list supporting options to reduce trips and encourage active means of transportation, such as walking and bicycling, as a departmental strategy for advancing a sustainable transportation system.

### Cape Cod Context

According to the 2021 [Cape Cod Climate Action Plan](#), the average daily VMT on Cape Cod is over 8 million miles. Cape Cod's per capita VMT rate is significantly higher (30–40%) than the rest of Massachusetts. Cape Cod is working to invest in infrastructure and development patterns that support VMT reduction. The Cape Cod Commission regularly updates a Regional Policy Plan that articulates a growth policy for the region focused on growth in activity centers, with concentrations of community amenities (e.g., schools, hospitals, community centers) and business activities. The Regional Policy Plan encourages compact development patterns that reduce residents' distance from services and support alternative means of transportation such as walking and bicycling.

## IMPLEMENTATION

The specific actions that can be taken to implement VMT reduction programs and projects will vary according to the specifications of the work. Below are some options to reduce VMTs on Cape Cod:

- Support local organizations in implementing work-from-home policies.** Develop resources to support organizations transitioning from in-person to work-from-home policies. Ensure that the municipality has clear and reasonable work-from-home policies. Consider developing online resources and written resources to distribute to Cape Cod organizations. Consider designating one or more personnel to assist Cape Cod organizations with transitions to work-from-home policies.
- Expand broadband access strategically.** Incorporate broadband conduit deployment into planned transportation projects in remaining areas with limited access to broadband.
- Support local organizations and agencies in switching from in-person to virtual workshops.** Develop resources to support organizations and agencies in hosting virtual workshops. Consider developing online resources and written resources for distribution to Cape Cod organizations interested in hosting virtual workshops. Consider designating one or more personnel to assist Cape Cod organizations and agencies with implementing virtual workshops.
- Improve and expand public transit systems.** Work with the Cape Cod Regional Transit Authority to improve access to public transit systems by incorporating additional public transit stops, expanding routes, implementing public campaigns to encourage the use of public transit systems, providing clear signage and schedules for public transit, extending the hours of public transit operation, and increasing the frequency of public transit stops.
- Encourage active transportation.** Encourage active transportation by expanding trail systems, implementing complete streets, encouraging compact communities, creating bicycle lanes, and increasing access to sidewalks. Consider expanding multifamily zoning in appropriate areas and focusing development in activity centers.

#### REQUIRED EXPERTISE

**Internal:** Town planner, grant writer

**External:** Transportation engineer, network engineer

- **Encourage dense community development.** Allow new multifamily residential developments with alternative site patterns and/or a variety of housing types. Overlay multifamily zoning with mixed-use developments to improve walkable access to goods and services. Establish zones where multifamily housing is allowed by right. Provide density bonuses or other forms of zoning relief in exchange for including some affordable housing units.
- **Develop an organization to lead VMT reduction strategy development on the Cape.** Implement a Cape Cod transportation management association to coordinate VMT reduction approaches and leverage pooled resources to support initiatives.

Resources that may assist with implementing VMT reduction programs and projects are provided below.

FINANCIAL AND TECHNICAL SUPPORT	
<a href="#">MassTrails Grants</a>	Provides matching grants to communities, public entities, and nonprofit organizations to plan, design, create, and maintain a diverse network of trails, trail systems, and trails experiences.
<a href="#">National Telecommunications and Information Administration State and Local Implementation Grant Program</a>	Provides funding to assist state, local, and tribal government entities as they plan for the nationwide public safety broadband network.
<a href="#">Municipal Americans with Disabilities Act Grant</a>	Supports capital improvements specifically dedicated to improving access for persons with disabilities.
<a href="#">Massachusetts Safe Routes to School Program</a>	Works to increase safe biking and walking among elementary, middle, and high school students by using a collaborative, community-focused approach that bridges the gap between health and transportation.
<a href="#">Municipal Digital Equity Planning Services</a>	Assists municipalities in assessing the digital divide in their community and finding solutions towns can further through other state and local efforts.
ADDITIONAL INFORMATION	
<a href="#">Federal Communications Commission National Broadband Map</a>	Map of broadband access nationally that is useful in identifying areas of limited broadband access.
<a href="#">Making the Shift: How TMAs in Massachusetts Leverage Private Sector Resources to Achieve State Goals and Public Benefits</a>	Explores the impacts that Transportation Management Associations (TMAs) are yielding throughout the Commonwealth and how these impacts can be strengthened to achieve greater public benefits and cost-effectiveness. Useful in developing and implementing a Transportation Management Association for Cape Cod.