Are Vehicle Travel Reduction Targets Justified?

Why and How to Reduce Excessive Automobile Travel

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Many current planning practices result in economically-excessive vehicle travel. Vehicle travel reduction targets can guide planning decisions to create more accessible, multi-modal communities where people can meet their needs with less driving.

Abstract

During the Twentieth Century, automobile travel grew steadily so it made sense to invest significant resources in roadway expansions. This created a self-reinforcing cycle of automobile dependency and sprawl which reduced non-auto travel options and increased transportation costs. Per capita vehicle travel has peaked and current demographic and economic trends are increasing non-auto travel demands. This is a good time to consider planning reforms that respond to changing consumer demands and community goals. To guide these reforms, some jurisdictions establish vehicle travel reduction targets. These can help align individual planning decisions with strategic objectives. This report investigates why and how to implement these targets. It describes examples of targets, ways to determine optimal levels of vehicle travel, identifies effective vehicle travel reduction strategies, and evaluates criticisms.

A condensed version of this report was presented at the World Conference for Transportation Research in Montreal, Canada 19 July 2023.
An efficient and equitable transportation system must be diverse in order to serve diverse demands, including the needs of travellers who cannot, should not, or prefer not to drive. Vehicle travel reduction targets help align planning decisions to support these objectives.

Table of Contents

Introduction ................................................................................................................................. 2
Examples of Targets .................................................................................................................. 4
Vehicle Travel Variability ......................................................................................................... 5
How Much Vehicle Travel is Optimal? What Should be Reduced? ........................................... 7
  Maximizing Accessibility (Not Mobility) ................................................................................ 7
  Economic Analysis ............................................................................................................... 7
  Economic Principles ............................................................................................................. 8
  Summary .............................................................................................................................. 11
Vehicle Travel Reduction Strategies ........................................................................................ 12
Potential Savings and Benefits ................................................................................................ 14
Examples .................................................................................................................................. 15
Evaluating Criticisms ................................................................................................................ 18
Conclusions ............................................................................................................................. 23
References ............................................................................................................................... 24
**Introduction**

Many people are malnourished, but probably not the way you think. More people now suffer from excessive calories than a shortage. Older policies designed to make sweet and rich food abundant and cheap, such as corn, milk and beef subsidies, are inappropriate for people suffering from obesity. Public health requires improving food quality rather than quantity.

Similarly, many transportation planning practices created when mobility was scarce are designed to maximize vehicle travel, with little consideration for other modes or planning goals. “Predict and provide” planning, which expanded roadways in anticipation of traffic growth, created a self-reinforcing cycle of automobile-dependency and sprawl. This type of planning fails to serve people who cannot, should not, or prefer not to drive, and increases many costs. Creating more multimodal and efficient transportation systems requires “decide and deliver” planning, as illustrated below.

**Figure 1 From Predict-and-Provide to Decide-and-Deliver** (Lyons 2020)

<table>
<thead>
<tr>
<th>Predict and Provide</th>
<th>Decide and Deliver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dispersed development</td>
<td>More compact development</td>
</tr>
<tr>
<td>Increased parking supply</td>
<td>Reduced auto travel</td>
</tr>
<tr>
<td>Auto-oriented land use planning</td>
<td>Efficient parking management</td>
</tr>
<tr>
<td>Non-auto modes stigmatised</td>
<td>Smart Growth policies</td>
</tr>
<tr>
<td>Reduced travel options</td>
<td>Non-auto modes celebrated</td>
</tr>
<tr>
<td>Cycle of Automobile Dependency and Sprawl</td>
<td>Improved non-auto options</td>
</tr>
<tr>
<td>Cycle of Multimodalism and Smart Growth</td>
<td>Multimodal planning</td>
</tr>
</tbody>
</table>

“Predict and provide” transportation planning expanded roads and parking facilities in anticipation of future demands, creating a self-reinforcing cycle of automobile dependency and sprawl. “Decide and deliver” planning sets multimodal travel targets and implements policies to achieve them.

Current demographic and economic trends – aging population, urbanization, changing preferences, rising fuel prices, plus growing concerns about affordability, public health and environmental protection – are increasing non-auto travel demands and the benefits of serving those demands. This is therefore a good time to reassess planning practices to ensure that they respond to changing needs. Transportation planning is undergoing a paradigm shift, a fundamental change in the way that problems are defined and potential solutions evaluated (Boarnet 2013; Litman 2013). The old paradigm evaluated transportation system performance based primarily on mobility, measured as vehicle travel speed and distance. The new paradigm evaluates performance based on accessibility, the time and money required to access services and activities (Sundquist, McCahill and Brenneis 2021). The following table compares these approaches.
Table 1  Changing Transportation Planning Paradigm (Litman 2013)

<table>
<thead>
<tr>
<th>Definition of Transportation</th>
<th>Old Paradigm</th>
<th>New Paradigm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobilitiy (physical travel), mainly automobile travel.</td>
<td>Accessibility (people’s overall ability to reach services and activities).</td>
<td></td>
</tr>
<tr>
<td><strong>Modes considered</strong></td>
<td>Automobile travel is considered better due to its speed.</td>
<td>Multi-modal: Walking, cycling, public transport, automobile, telework and delivery services.</td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td>Congestion reduction; roadway cost savings; vehicle cost savings; and reduced crash and emission rates per vehicle-kilometer.</td>
<td>Congestion reduction; affordability; accessibility for non-drivers; public fitness and health; energy conservation and emission reductions; and efficient land use (reduced sprawl).</td>
</tr>
<tr>
<td><strong>Performance indicators</strong></td>
<td>Vehicle traffic speeds, roadway Level-of-Service (LOS), distance-based crash and emission rates.</td>
<td>Quality of accessibility for various groups. Multi-modal LOS. Various economic, social and environmental impacts.</td>
</tr>
</tbody>
</table>

The old planning paradigm favored automobile-oriented transportation improvements. The new paradigm expands the range of objectives, impacts and options considered in a planning process.

The new paradigm is more multimodal and comprehensive: it recognizes the unique and important roles that non-auto modes play in an efficient and equitable transportation system, and the need to balance often-conflicting objectives (SSTI 2018).

To implement multimodal planning many jurisdictions are establishing vehicle travel reduction (often called vehicle miles travelled or VMT reduction) targets. These help align individual, short-term decisions with strategic goals to create more diverse and efficient transportation systems. They encourage transportation agencies to invest in non-auto modes, implement TDM incentives, and implement Smart Growth policies that create more compact, multimodal communities where residents can spend less time and money on driving.

To apply the new paradigm, transportation planning shifts from maximize LOS (roadway level-of-service) to minimizing VMT (vehicle miles travelled) (Lee and Handy 2018). Using this approach, proposed projects are approved if they reduce per capita vehicle travel, and are rejected or mitigated if they increase vehicle travel (CAPCOA 2021).

These changes are controversial. Critics argue that vehicle travel reduction targets are costly, unfair, and harmful to consumers and the economy, and constitute a “war on cars.” Technological optimists claim that electric and autonomous vehicles are better solutions to transportation problems (Curry 2022). Robert Poole (2009) called VMT reduction goals a “terrible idea” and challenges proponents to prove they are cost effective.

This study responds to that challenge. It describes examples of vehicle travel reduction targets, examines why and how communities establish such targets, evaluates criticisms, describes ways to optimize vehicle travel, and identifies effective vehicle travel reduction policies. This should be of interest to policy makers, practitioners (engineers, planners and analysts) and anybody who wants a more diverse, responsive, affordable and efficient transportation system.
Examples of Targets
Many jurisdictions have targets to reduce vehicle travel, increase non-auto travel, and create more compact communities (ACEEE 2019; Klein 2020; Thorwaldson 2020). Below are examples.

Countries, States and Provinces
- **British Columbia**: reduce light-duty vehicle travel 25% and double non-auto trips by 2030 (CleanBC 2021).
- **California**: reduce per capita light-duty VMT 25% by 2030 and 30% by 2045 (Newsom 2022).
- **Colorado**: major projects must support emission reduction targets (Degood and Zonta 2022).
- **Israel**: cut car travel by half (Zagrizak 2022).
- **Minnesota**: reduce vehicle travel 14% by 2040 and 20% by 2050 (Bellis 2021).
- **New Zealand**: reduce light-duty vehicle travel 20% by 2035 (NZMoE 2022).
- **North Carolina**: Implement various TDM strategies to reduce traffic problems.
- **Oregon**: reduce light-duty vehicle travel 20% by 2040.
- **Quebec**: reduce solo car trips 20% by 2023 (MdT 2018).
- **Scotland**: reduce vehicle travel by 20% by 2030 (Reid 2020).
- **United Kingdom**: half of all urban journeys will be by active modes by 2030 (DfT 2020).
- **United States**: reduce greenhouse gas pollution 52% from 2005 levels in 2030 (White House).
- **Washington State**: 30% reductions by 2035 and 50% by 2050 (WSL 2008).

Regions and Cities
- **Boston**: Locate every home within 10 minutes of public transit, bike-, and car-share by 2050.
- **Columbus**: Create “smart mobility hubs,” to help residents travel without a car.
- **Minneapolis**: reduce VMT 40% by 2040 by increasing non-auto travel and compact development.
- **Orlando**: most local trips are done on foot, bike, carpooling, or transit.
- **Phoenix**: 90% of residents are within a half-mile of transit and 40% commute by non-auto modes.
- **Portland**: reduce vehicle travel and associated emissions by 45%.
- **San Antonio**: reduce average daily vehicle-miles per capita from 24 now to 19 by 2040.

These targets have various goals. Older programs were intended to reduce local congestion and local pollution and so focused on reducing urban-peak travel, but recent programs have a wider range of economic, social and environmental goals, which justify broad vehicle travel reductions. Vehicle travel reduction targets can support planning reforms to create more multimodal transport systems in order to support social equity and economic efficiency objects.

Professional organizations are developing tools to achieve these targets and evaluate their benefits and costs (ABAG 2021; Caltrans 2020; F&P 2022; Tomer and George 2023).
Vehicle Travel Variability
The amount that people travel varies significantly, depending on community design and transportation policies, as illustrated below.

**Figure 2** Per Capita Vehicle Travel in Selected Urban Regions (FHWA 2018)

Vehicle travel ranges from less than 20 to more than 40 daily vehicle-miles per capita.

Similar variations occur within regions, as illustrated below. Households located in compact, walkable neighborhoods drive 30-60% less than comparable families located in auto-dependent areas. This demonstrates the feasibility of significant vehicle travel reductions.

**Figure 3** Geographic Variation in Household VMT (CNT 2022)

This heatmap shows how average annual motor vehicle miles per household vary in a typical urban region, Nashville, Tennessee. Households in central neighborhoods average about half the amounts in automobile-dependent, sprawled areas.

This illustrates how compact, multimodal development can reduce vehicle travel.
The table below summarizes factors that affect vehicle travel. This information can help identify vehicle travel reduction strategies. These factors have synergistic effects. For example, transit improvements may have little effect alone, but cause much larger vehicle travel reductions if implemented with TDM incentives and compact development policies.

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Factors Affecting Vehicle Travel (Litman 2021; CARB 2015)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor</td>
<td>Definition</td>
</tr>
<tr>
<td>Demographics</td>
<td>Age, gender, income, employment and caregiving responsibilities</td>
</tr>
<tr>
<td>Regional accessibility and centricity</td>
<td>Location relative to regional urban center. Portion of jobs in city centers.</td>
</tr>
<tr>
<td>Density</td>
<td>People or jobs per unit of land area (acre or hectare).</td>
</tr>
<tr>
<td>Mix</td>
<td>Proximity between activities (housing, services, jobs, etc.)</td>
</tr>
<tr>
<td>Roadway design</td>
<td>Street scale, design and management.</td>
</tr>
<tr>
<td>Quality of non-auto travel options</td>
<td>Quantity, quality and safety of sidewalks, crosswalks, paths, bike lanes, public transit, carsharing, and telework.</td>
</tr>
<tr>
<td>Parking supply and management</td>
<td>Number of parking spaces per building unit or acre, and how parking is managed and priced.</td>
</tr>
<tr>
<td>Transportation prices</td>
<td>Vehicle, fuel, parking and road prices.</td>
</tr>
<tr>
<td>TDM incentives</td>
<td>Policies and programs that encourage efficient travel.</td>
</tr>
<tr>
<td>Convenience</td>
<td>Ease of obtaining information and using non-auto modes.</td>
</tr>
<tr>
<td>Perception</td>
<td>Social status of non-auto modes and urban locations.</td>
</tr>
</tbody>
</table>

This table describes various factors that can affect travel behavior.

People sometimes assume that vehicle travel reductions are only feasible in dense urban areas that have high quality public transit services, but some non-auto modes (such as e-bikes, ridesharing and telework), and many TDM and Smart Growth strategies can be effective in suburban and rural areas (Morton, Huegy, and Poros 2014).
How Much Vehicle Travel is Optimal? What Should be Reduced?
This section describes various factors to consider when determining optimal levels of vehicle travel, and therefore appropriate vehicle travel reduction targets and policies.

Maximizing Accessibility (Not Mobility)
The ultimate goal of transportation planning is to maximize accessibility, people’s ability to reach desired services and activities. Various factors affect accessibility including mobility by various modes, and proximity, the distances between activities and therefore development density and mix (Levinson and King 2020). Many planning decisions involve trade-offs between these factors, such as when wider roads and faster traffic reduce walkability, when money is invested in highways rather than public transit, and when sprawl reduces proximity. An increase in mobility is not necessarily beneficial; it can reflect a decline in accessibility which forces people to drive farther to reach desired services and destinations, and vehicle travel reduction programs increase overall accessibility by creating more compact and multimodal communities.

Economic Analysis
Like most goods, vehicle travel benefits tend to decline marginally with more consumption since users rationally make the most beneficial trips first, and add lower-value trips as their mobility increases, as illustrated below. The benefits curve has a long-tail, meaning that as driving becomes cheaper people travel more although their marginal benefits are small. On the other hand, unit costs tend to increase as more vehicle travel adds congestion and displaces other modes. As a result, net benefits (benefits minus costs) tend to decline and can become negative at high annual mileage levels, indicated by net benefits below zero. This is economically inefficient and tends to be inequitable since vehicle traffic imposes external costs – delay, risk and pollution – on other people, and by displacing non-auto modes and increasing sprawl, reduces non-drivers’ accessibility. A transportation system becomes more equitable and efficient by favoring higher-value trips and more affordable and efficient modes, over lower-value trips, and expensive, resource-intensive modes.

**Figure 4  Vehicle Travel Benefit, Cost and Net Benefit Curves**

As vehicle travel increases marginal benefits tend to decline since motorists rationally make the most beneficial trips first and add lower value trips as their driving increases. Costs, however, tend to increase with annual mileage due to increased congestion and displacement of other modes. As a result, net benefits (benefits minus costs) decline and can become negative at high annual mileage levels.
Economic Principles
The following principles can help determine optimal levels of vehicle travel and the portion that can be considered inefficient.

1. Consumer Sovereignty
Consumer sovereignty means that planning decisions respond to consumer demands, including latent demands. Based on this principle, optimal vehicle travel is what travellers would choose if planning invested in the modes that travellers want to use. Experience described later in this report indicates that non-auto travel often increases and automobile travel declines where communities improve non-auto modes. This indicates that more responsive planning tends to reduce vehicle travel. Current demographic and economic trends – aging population, rising fuel prices, changing consumer preferences, increased health and environmental concern – are increasing non-auto demands, justifying more multimodal planning for the future.

2. Fair Share Planning
Basic fairness requires that travellers receive similar shares of public resources unless there are specific reasons to do otherwise. For example, if walking currently has 12% mode share (portion of total trips), at least 12% of infrastructure funding or road space should be devoted to pedestrian facilities, and more if that would increase pedestrian mode shares, or to achieve strategic goals such as affordability and public health. Currently, most North American communities devote much less to non-auto modes than their potential mode shares, as illustrated below, indicating that non-auto modes deserve much larger shares of investments.

![Figure 5: Non-auto Spending Versus Demand (Litman 2022)](chart)

Non-auto modes receive less than 10% of total transportation infrastructure spending, which is less than their share of total trips, traffic deaths, potential trips or users.

3. Efficient (“Use Pays”) Pricing
Another basic principle is that prices (what users pay for a good) should reflect the marginal cost of producing that good, unless there are specific reasons to do otherwise. In other words, consumers should “get what they pay for and pay for what they get.” For example, if a vehicle trip imposes $5 in roadway costs, motorists should pay fees of those amounts. This ensures that society does not spend $5 worth of resources on a trip that users value less, and prevents non-drivers from being forced to subsidize motorists. Trips that motorists take if driving is underpriced but forego if charged cost recovery prices are economically inefficient; the trip’s costs exceed their benefits, making society worse off overall.
Automobile travel is currently significantly underpriced; North American motorists only pay directly about half of their roadway costs, only a small portion of their parking costs, and are seldom charged for the congestion, risk and pollution costs they impose on others (Cui and Levinson 2018; ICF 2021; Litman 2019). In addition, some vehicle charges, such as insurance premiums, taxes and registration fees, are fixed, unrelated to the amount that a vehicle is driven, although the costs they represent do increase with annual mileage, resulting in cross-subsidies from motorists who drive less than average to those who drive more than average.

**Figure 6** Vehicle Costs (Litman 2019)

Efficient pricing could significantly reduce vehicle-travel. For example, road user fees currently only cover about half of roadway costs; cost-recovery road user fees would add about 5¢ per vehicle-mile, which would reduce vehicle travel about 5%; cost recovery parking fees typically reduce driving by 10-30% compared with unpriced parking; a $50 per tonne carbon tax would add about 50¢ per gallon of gasoline, which would reduce driving about 6%; and distance-based vehicle insurance could reduce vehicle travel about 10% (CAPCOA 2021). This suggests that efficient pricing would reduce vehicle travel 30-50% (Butner and Noll 2020; Litman 2014).

### 4. Comprehensive Analysis

A fourth principle is that planning analysis should consider all significant goals and impacts, and individual short-term decisions should support strategic, long-term goals. For example, when deciding between expanding a roadway or improving public transit service, the analysis should consider how they affect strategic goals such as increasing affordability, improving public health, and reducing pollution emissions, not just traffic speeds. Conventional planning often overlooks important goals and impacts, as indicated in the following table.
Are Vehicle Travel Reduction Targets Justified?: Why and How to Reduce Excessive Automobile Travel
Victoria Transport Policy Institute

Table 3  Impacts Typically Considered in Transportation Planning

<table>
<thead>
<tr>
<th>Usually Considered</th>
<th>Often Overlooked</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Travel speeds and congestion delays</td>
<td>• Affordability (savings to lower-income households)</td>
</tr>
<tr>
<td>• Parking convenience</td>
<td>• Independent mobility for non-drivers</td>
</tr>
<tr>
<td>• Vehicle operating costs</td>
<td>• Chauffeuring costs</td>
</tr>
<tr>
<td>• Crash rates</td>
<td>• Induced vehicle travel</td>
</tr>
<tr>
<td>• Pollution emission</td>
<td>• Public fitness and health</td>
</tr>
</tbody>
</table>

Conventional transportation project evaluation considers some impacts but often overlooks others.

Optimal vehicle travel depends on demographic and geographic factors. Affluent suburbs and rural areas can have high automobile mode shares, but as incomes decline and densities increase planning should be more multimodal and favor affordable modes, as illustrated below.

**Figure 7  Optimal Automobile Mode Shares**

In affluent rural areas and suburbs it may be appropriate to plan for high levels of automobile travel, but optimal auto mode shares decline as densities increase and incomes decline, and should be less than 30% in most urban neighborhoods.

Conventional planning ignores these factors, resulting in more auto-oriented planning than is efficient and fair.

To the degree that planning overlooks these goals and impacts it tends to overinvest in automobile facilities and underinvests in affordable and resource-efficient modes than is optimal, resulting in excessive motor vehicle travel (Butner and Noll 2020; Shill 2019). This is particularly true in cities, where traffic impacts are particularly severe, and in communities that place high values on affordability, social equity and environmental protection.
Summary
The table below summarizes common planning biases that violate these economic principles.

<table>
<thead>
<tr>
<th>Type of Distortion</th>
<th>Effects</th>
<th>Reforms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elite bias. Policy makers and planners favor automobile travel and undervalue other modes.</td>
<td>Prioritizes automobile travel over other modes in policy, planning and investments.</td>
<td>Better analysis, guidance and tolls for multimodal planning. Include non-drivers in planning.</td>
</tr>
<tr>
<td>Undercounting non-auto travel (in surveys) and undervaluing non-auto travel demands.</td>
<td>Underinvests in non-auto modes relative to their demands (including latent demands) and potential benefits.</td>
<td>More comprehensive travel data, including latent demands. Recognize data biases.</td>
</tr>
<tr>
<td>Incomplete impact analysis. Little consideration of affordability, social equity, safety, public health, and environmental goals.</td>
<td>Favors automobiles over more affordable, inclusive and resource-efficient modes, and higher speed roadways over complete streets.</td>
<td>More comprehensive impact analysis, additional performance targets and more multimodal planning.</td>
</tr>
<tr>
<td>Mobility-based performance indicators (e.g., roadway level-of-service and travel time index).</td>
<td>Favors faster modes, higher roadway design speeds, and sprawl over compact development.</td>
<td>Consider other planning goals beside speed. Apply accessibility-based planning.</td>
</tr>
<tr>
<td>Overvaluing travel time savings. Valuing speed over other goals such as affordability, health and livability.</td>
<td>Favors faster modes and higher roadway design speeds over slower modes and complete streets.</td>
<td>Use realistic travel time values. Account for the costs higher traffic speeds.</td>
</tr>
<tr>
<td>Ignoring induced travel impacts. Overvalues road expansion benefits.</td>
<td>Overinvests in roadway expansions and underinvests in alternatives.</td>
<td>Account for induced vehicle traffic in planning analysis.</td>
</tr>
<tr>
<td>Dedicated road and parking funds, but not for other modes.</td>
<td>Favors automobile infrastructure over investments in other modes.</td>
<td>Least-cost transportation planning. Multimodal planning.</td>
</tr>
<tr>
<td>Automobile underpricing (unpriced roads, parking, risk, pollution, etc.)</td>
<td>Increases automobile travel and reduces non-auto travel demands.</td>
<td>More efficient pricing and more investments in non-auto modes.</td>
</tr>
<tr>
<td>Parking minimums. Local mandates for off-street parking.</td>
<td>Increases automobile ownership and use, degrades walking conditions, and encourages sprawled development.</td>
<td>Reduce or eliminate parking mandates. More efficient parking management.</td>
</tr>
<tr>
<td>Sprawl-oriented development policies. Density restrictions and parking minimums.</td>
<td>Creates dispersed communities that increase travel distances and provide poor non-auto access.</td>
<td>Smart Growth policies that create more compact, multimodal communities.</td>
</tr>
</tbody>
</table>

Many common policies and planning biases result in economically excessive vehicle travel.

These biases favor automobile travel over other modes, and sprawl over compact development, and together contribute to the self-reinforcing cycle of automobile dependency and sprawl. Although individually their impacts may seem modest and justified, they are cumulative and synergistic. For example, parking minimums in zoning codes create large parking lots that reduce walkability, underprice driving, and increase sprawl; together these biases significantly increase automobile travel and reduce use of non-auto modes.
Vehicle Travel Reduction Strategies

Various strategies have proven to be effective at increasing transportation system efficiency and reducing vehicle travel (TfA and SGA 2020; TTI 2022). The table below lists examples.

<table>
<thead>
<tr>
<th>Improve Options</th>
<th>TDM Incentives</th>
<th>Smart Growth Policies</th>
<th>Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transit improvements</td>
<td>Road space reallocation</td>
<td>Complete streets</td>
<td>Commute trip reduction programs</td>
</tr>
<tr>
<td>Walking and cycling</td>
<td>Congestion pricing</td>
<td>Smart growth/New urbanism</td>
<td>School and campus transport</td>
</tr>
<tr>
<td>improvements</td>
<td>Distance-based fees</td>
<td>Transit oriented development</td>
<td>management</td>
</tr>
<tr>
<td>Rideshare programs</td>
<td>Parking cash out</td>
<td>Parking management</td>
<td>Freight transport management</td>
</tr>
<tr>
<td>Flextime</td>
<td>Parking pricing</td>
<td>VMT developer fees</td>
<td></td>
</tr>
<tr>
<td>Telework</td>
<td>Fuel or carbon tax increases</td>
<td>Car-free planning</td>
<td>TDM marketing</td>
</tr>
<tr>
<td>Carsharing</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Various strategies can help reduce vehicle travel. These tend to have synergistic effects, so the most effective programs include a combination of positive and negative incentives to reduce driving.

Many of these strategies reflect the economic principles described earlier. For example, improving non-auto travel options, and Smart Growth policies that improve housing options in multimodal neighborhoods, reflect consumer sovereignty and fair share planning. Many TDM incentives reflect efficient pricing. Many of these strategies help achieve multiple community goals and so are justified by comprehensive planning.

New tools, such as California’s Vehicle Miles Traveled-Focused Transportation Impact Study Guide (Caltrans 2020), and the San Francisco TDM Tool (www.sftdmtool.org), predict how policies and programs affect vehicle travel, and how to achieve VMT reduction targets. The Brooking Institute’s Building for Proximity (Tomer and George 2023), and GreenTRIP Connect (connect.greentrip.org) calculate how location and development policies can reduce driving, parking facility costs and emissions. The Cool Climate Network (coolclimate.berkeley.edu) produces interactive heat maps showing where infill development can reduce household emissions. Many jurisdictions are starting to use these tools to plan vehicle travel reduction programs (Belis 2021; DeGood and Zonta 2022). Some proposed road building projects have been halted or revised to avoid increasing traffic and emissions (Morris 2023).

Vehicle travel reduction programs tend to be most effective if implemented as an integrated program that includes both positive and negative incentives (STTI 2018). Various examples described later in this report indicate that cost-effective programs can typically reduce affected vehicle travel by 5-15% if they only include positive incentives (improved travel options and encouragement campaigns); 10-30% if they include financial incentives (cost recovery road tolls and parking fees, and distance-based insurance pricing), and 20-60% if they also include Smart Growth development policies (upzoning, infill and reduced parking minimums).

The following table summarizes the impact of various vehicle travel reduction strategies. They tend to become more effective and cost effective if implemented as an integrated program.
### Table 6  Travel Reduction Impacts (CARB 2015, Kuss & Nicholas 2022, VTPI 2020)

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Description</th>
<th>Typical Travel Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficient parking pricing and management</td>
<td>Charge cost-recovery parking fees with rates that vary by demand. Cash out and unbundle parking. Eliminate parking mandates.</td>
<td>5-15% reduction in vehicle ownership and 10-30% reduction in affected vehicle trips.</td>
</tr>
<tr>
<td>Active and micro modes (walking, bicycling, e-bikes and variants)</td>
<td>Improve walking and bicycling conditions, and encourage their use. Include e-bikes in electric vehicle subsidy programs. Create compact 15-minute neighborhood.</td>
<td>Infrastructure improvements increase active and micro mode travel 50-100% and reduce driving 5-15%. Compact, walkable communities reduce driving 20-40%.</td>
</tr>
<tr>
<td>High quality public transit</td>
<td>Frequent, fast, convenient, comfortable transit services. Amenities such as free wifi, and improved payment systems.</td>
<td>Service improvements increase affected transit travel 20-50%, and reduce auto travel 5-15%, and sometimes more.</td>
</tr>
<tr>
<td>Smart Growth, New Urbanism, Transit-oriented development</td>
<td>Develop compact, mixed-use neighborhoods around high quality public transit.</td>
<td>Residents tend to walk, bike and use public transit 20-100% more, and drive 20-60% fewer annual miles.</td>
</tr>
<tr>
<td>Commute, school and campus transport management programs</td>
<td>Improve non-auto travel options and encourage their use with financial incentives (parking pricing and cash out).</td>
<td>Programs that only use persuasion reduce driving 5-15%, those that provide financial incentives reduce auto trips 10-30%.</td>
</tr>
<tr>
<td>Roadway redesigns to favor sustainable modes</td>
<td>Improve sidewalks, add bike- and bus lanes, and reduce traffic speeds. Apply complete streets policies.</td>
<td>Non-auto travel typically increases 20-100%, and auto travel declines 10-30%. Reducing traffic speeds reduces VMT.</td>
</tr>
<tr>
<td>Efficient road pricing</td>
<td>Motorists pay cost-recovery tolls on urban highways and fees to enter city centers</td>
<td>10-30% reduction in affected road traffic volumes.</td>
</tr>
<tr>
<td>Distance-based pricing</td>
<td>Vehicle insurance and registration fees are prorated by average annual mileage.</td>
<td>Up to 15% if total insurance premiums and registration fees are prorated.</td>
</tr>
<tr>
<td>Vehicle sharing</td>
<td>Provide car- and bikesharing services in urban neighborhoods.</td>
<td>12-15 private cars replaced by each shared car.</td>
</tr>
<tr>
<td>Freight transport management</td>
<td>Require or encourage shippers to use efficient vehicles and logistics.</td>
<td>Can reduce freight vehicle travel and emissions 10-30%.</td>
</tr>
<tr>
<td>Limited traffic zone</td>
<td>Limit vehicle trips to central city areas.</td>
<td>10-20% reduction in city-centre cars.</td>
</tr>
<tr>
<td>Personalized travel planning</td>
<td>Residents encouraged to use non-auto modes. Transit fare discounts.</td>
<td>6-12% reduction in car use by participants.</td>
</tr>
<tr>
<td>Sustainable mobility apps</td>
<td>Mobile apps provide user information, payments and rewards for reduced driving.</td>
<td>73% of app users reduce their vehicle travel.</td>
</tr>
</tbody>
</table>

There are many ways to reduce driving and increase non-auto travel. Impacts vary depending on design and conditions. They tend to have synergistic effects: they become more effective if implemented as integrated programs that include non-auto improvements, TDM incentives and Smart Growth development policies.
Potential Savings and Benefits

This section describes vehicle travel reduction benefits.

Because motor vehicles are large, heavy and fast they are more expensive to use, require more costly infrastructure (roads, parking facilities, and traffic services), and impose more external costs (congestion, risk and pollution) than non-auto modes when measured per mile of travel, and since motorists tend to travel far more annual miles than non-drivers, motorists tend to have much higher annual costs (Litman 2019). Similarly, sprawled development consumes more land and requires more costly infrastructure per capita, and by increasing motor vehicle travel, increases transportation costs.

Vehicle travel reduction strategies and Smart Growth development can reduce these costs, providing various benefits (Ahlfeldt and Pietrostefani 2017; Ewing and Hamidi 2014). They can also impose various costs. The table below summarizes these impacts, categorized according to how they affect travel.

Table 7  Multimodal Planning Benefits and Costs

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Improve Non-Auto Travel</th>
<th>Increase Non-Auto Travel</th>
<th>Reduce Automobile Travel</th>
<th>More Compact Communities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Costs</td>
<td>Facility costs.</td>
<td>Equipment costs and transit subsidies.</td>
<td>Slower travel.</td>
<td>Increases some development costs.</td>
</tr>
<tr>
<td></td>
<td>Lower traffic speeds.</td>
<td>User crash risks.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Improving non-auto modes has various benefits and costs.

These impacts vary. Not every vehicle travel reduction program achieves all benefits, but most provide many. Many help achieve social equity goals: they improve travel options used by physically and economically disadvantaged groups, ensure that non-drivers receive their fair share of transportation infrastructure investments, increase affordability, and reduce external costs (congestion, risk and pollution) that motor vehicles impose on other people.
Examples

Below are examples of successful vehicle travel reduction programs. For more information see “TDM Success Stories” (www.vtpi.org/tdmss.pdf) and Tools of Change (www.toolsofchange.com).

Active Transportation Improvements

Many studies find that walking and bicycling improvements can significantly increase use of these modes (CPSTF 2017). For example, after the Federal Highway Administration’s four-year Nonmotorized Transportation Pilot Program invested about $100 per capita in pedestrian and bicycling improvements in four typical communities (Columbia, MO; Marin County, CA; Minneapolis area, MN; and Sheboygan County, WI), walking trips increased 23%, bicycling trips increased 48%, and automobile travel declined 3% (FHWA 2014).

A recent U.S. study found that a 10% increase in per capita bikeway-miles increases bicycle commute mode shares 2.5%, and a 10% increase in protected bicycle lanes increases bicycle mode shares 4% (Yang, et al. 2021). Cities with extensive active mode networks, such as Davis, California; Eugene, Oregon; and Boulder, Colorado have more than 15% active commute mode shares, five times the national average, plus under 20 daily vehicle miles travelled per capita, 20% less than the national average (Buehler 2016).

TDM Program Effectiveness

The article, Don’t Underestimate Your Property: Forecasting Trips and Managing Density over the Long Term (Galdes and Schor 2022) summarizes experience with TDM programs in suburban Fairfax County, particularly Tyson’s Corner. It found that residential and commercial developments that had comprehensive but cost-effective TDM programs actually generate 49% fewer trips than predicted by ITE trip generation models. This reduces parking and roadway costs, and allows more development to occur on available land. As one traffic engineer explained,

“Underestimating trip generation can have deleterious effects on a neighborhood because trip generation is so closely linked to the amount of square footage that a property is allowed. More than any other feature of a development, vehicle trip generation estimates determine density limits and impacts.” (Mike Workosky, traffic engineer and President of Wells + Associates)

Similarly, a detailed study, Travel Demand Management: An Analysis of the Effectiveness of TDM Plans in Reducing Traffic and Parking (Spack and Finkelstein 2014) measured trip generation at various office buildings in the Minneapolis-St. Paul metropolitan region. It found that, compared with Institute of Transportation Engineers’ average trip generation rates, office buildings that implemented TDM Plans generate, on average, 34% to 37% less traffic and need 17% to 24% fewer on-site parking spaces.

Regional Vehicle Travel Reduction Programs

Some North American urban regions have implemented integrated vehicle travel reduction programs that significantly reduce per capita vehicle travel. For example, during the last two decades the city of Portland shifted highway expansion funding to improve regional bus and rail transit services, implemented TDM programs, reformed its parking policies, and implemented Smart Growth policies that encourage more compact development. As a result, per capita vehicle travel declined in that region while it increased nationally, resulting in average per capita vehicle travel nearly 30% lower than the U.S. average, as illustrated in the following graph.
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Victoria Transport Policy Institute

**Figure 8**  Portland, Oregon Travel Trends *(Metro 2021)*

Portland, Oregon’s integrated TDM and Smart Growth policies reduced average vehicle travel in both the city and its urban region (which includes the Vancouver, Washington suburb), while driving increased elsewhere in the U.S.

Similarly, after Boulder, Colorado increased non-auto mode investments to about $100 annually per capita, use of those modes increased, and automobile mode share declined from 62% to 52%, as illustrated below.

**Figure 9**  Non-Auto Funding and Mode Share, Boulder *(Henao, et al. 2015)*

After Boulder increased non-auto investments to about $100 annual per capita (left) their mode shares increased to about a third of all trips and single occupant vehicle (SOV) shares declined about 17%.

**California SB 743**
California has targets and plans to achieve carbon neutrality by 2045, in part by reducing per capita light-duty vehicle travel 25% by 2030 and 30% by 2045. To achieve these targets California law requires that transportation projects be evaluated based on their vehicle travel impacts *(Lee and Handy 2018)*. The California State Transportation Agency *(CalSTA 2021)* and the California Air Pollution Control Association *(CAPCOA 2021)* developed guidelines for applying these policies to planning decisions.
Campus Transportation Management Programs
Many colleges and universities are implementing transportation demand management programs in order to reduce traffic and parking problems, increase affordability and better serve students, staff and visitors. These usually include a combination of active and public transit service improvements, u-pass (the campus purchases highly-discounted transit service for all students), efficient parking pricing, bike- and car-sharing, and more accessible campus design. These typically reduce automobile trips to campus by 20-50%.

For example, Stanford University implemented its comprehensive TDM program in an agreement with the local government to eliminate the requirement for traffic impact studies and mitigation for campus development (more classrooms, laboratories, research institutes and housing) provided there is no net increase in total vehicle trips. As a result drive alone rates declined from 72% to 46% for staff, and just 39% for total commuters, including students, drive. This allowed construction of millions of square feet of additional building space that accommodate more students and staff without expanding roads and parking facilities.

Scottish Planning Rules (BBC 2023)
Scotland established new planning rules intended to support “transformational reduction in private car use” by creating “20-minute neighbourhoods” where all services are within walking or bicycling distance, improving public transit services, and reducing out-of-town shopping malls and drive-throughs. This will help achieve national targets to reduce car trips 20% by 2023.

Rural Community Multimodal Planning (Lynott 2014)
Some rural communities are implementing multimodal planning to improve affordable and healthy travel options and help reduce vehicle-travel. For example, Washington State’s Rural Mobility Grant Program and a Travel Washington Intercity Bus Program supports public transit services in rural counties. As a result, it is possible to travel around the Olympic Peninsula using the Olympic Transit Loop, which consists of six coordinated local public transit agencies.

European Sustainable Urban Mobility Plans (Eltis 2021 and EU 2021)
The European Union’s new Urban Mobility Framework requires municipal governments to develop Sustainable Urban Mobility Plans (SUMPs) by 2025 (EU 2021). This is intended to help solve air pollution, congestion, accessibility, traffic safety, growth of e-commerce, and other urban mobility challenges. SUMPs are multifaceted and tailored to each region’s unique needs and abilities. They typically include a combination of active and public transport improvements, roadway and parking design changes, efficient road and parking pricing, development policy reforms, regulatory reforms, improved data collection and program evaluation, and targeted mobility management programs to improve both personal and freight transport efficiency.

To support these plans the European Union sponsors the Urban Mobility Observatory, managed by Eltis, a network of research organizations that provides extensive, practical guidance on SUMP development (Eltis 2021). These resources include the Planner’s Guide to Sustainable Urban Mobility Management (SUMP) a Toolbox for Mobility Management, and the Eltis Case Study Database which describes in detail numerous, diverse examples from the European Local Transport Information Service. Eltis also provides tailored training on all aspects of the SUMP process and its implementation, improved data collection and evaluation tools, and financial support for implementing and testing innovation.
Evaluating Criticisms
This section evaluates various criticisms of vehicle travel reduction targets and programs.

Reduces Transportation System Efficiency
Critics argue that, because automobiles are faster than other modes, auto-oriented planning benefits everybody, including non-drivers who travel as automobile passengers and use goods delivered by motor vehicles. They cite examples of trips that would require much more time and effort by non-auto modes. However, the fact that automobiles are most efficient for some trips does not mean that they are best for all trips, or that vehicle travel cannot be efficiently reduced.

Compact, multimodal community residents spend less total time and money on transportation than in automobile-dependent, sprawled areas, as illustrated below. Much of the time savings provided by automobile travel is offset by the additional working hours required to own and operate a vehicle. When measured as effective speed (defined as travel distance divided by time spent travelling plus time spent earning money to pay travel expenses), non-auto travel is often faster than driving, particularly for lower-income workers (Tranter 2010). The study, “Urban Access Across the Globe: An International Comparison” (Wu, et al. 2021) found that U.S. urban regions have less access than in other countries due to automobile dependency and sprawl.

Figure 10 Commute Duration (Mineta Institute Commute Duration Mapping System)

Average commute duration (minutes per commute) are generally much lower in compact, multimodal neighborhoods than in automobile-dependent, sprawled areas, due to better accessibility.

This figure shows Nashville, Tennessee, using US Census Data. Similar patterns are seen in most cities.

Motorists can benefit directly from vehicle travel reduction strategies that reduce their traffic and parking congestion, and reduce chauffeuring burdens. In automobile-dependent area about 15% of trips are made to chauffeur a non-driver, and these are particularly inefficient because they often involve an empty backhaul, so a five mile trip generates ten vehicle-miles and requires twenty minutes of driving.
Harms Disadvantaged Groups
Critics argue that because some people with disabilities and low incomes use motor vehicles, they are harmed by vehicle travel reduction policies. This is generally untrue. Most vehicle travel reduction strategies benefit disadvantaged groups, and vehicle travel programs can be designed to support equity goals. The table below summarizes these effects.

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Non-drivers</th>
<th>Low-Income Drivers</th>
<th>High-Income Drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active and micro mode improvements</td>
<td>Smart Growth (affordable infill)</td>
<td>Flextime and telework</td>
<td>Flextime and telework</td>
</tr>
<tr>
<td>Transit and ridesharing improvements</td>
<td>Flextime and telework</td>
<td>Carsharing</td>
<td>Parking management</td>
</tr>
<tr>
<td>Flextime and telework</td>
<td>Distance-based fees</td>
<td>Parking cash out</td>
<td>Parking fees</td>
</tr>
<tr>
<td>Smart Growth (affordable infill)</td>
<td>Parking cash out</td>
<td>Parking cash out</td>
<td>Road tolls &amp; congestion pricing</td>
</tr>
<tr>
<td>Parking unbundling &amp; cash out</td>
<td>Reduced travel as a vehicle passenger.</td>
<td>Road space reallocation</td>
<td>Road space reallocation</td>
</tr>
<tr>
<td>Road tolls and fuel taxes</td>
<td>Fuel or carbon tax increases*</td>
<td>Reduced travel as a vehicle passenger.</td>
<td>Reduced travel as a vehicle passenger.</td>
</tr>
<tr>
<td></td>
<td>Parking fees*</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Road tolls *</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Road space reallocation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Most vehicle travel reduction strategies directly benefit non-drivers by improving non-auto modes, creating more accessible communities, and reducing subsidy costs. Higher prices (indicated by *) burden low income drivers, but their overall impacts depend on how revenues are used and the quality of alternatives available. Higher income drivers benefit from tolls and fees that reduce congestion.

Disadvantaged groups tend to benefit from strategies that improve non-auto modes, improve affordable housing in multimodal neighborhoods, or reduce the external costs that motorists impose on other people. Parking cash out (non-drivers receive the cash equivalent of parking subsidies provided to motorists) and parking unbundling (parking is rented separately from housing) are particularly progressive since they can provide hundreds of dollars per month in financial benefits to non-drivers. Increasing fuel taxes, parking fees and road tolls can harm motorists directly but their overall impacts depend on how revenues are used; if invested in affordable modes or used to reduce regressive taxes, low-income household can benefit overall.

Critics claim that disadvantaged workers earn more if they have an automobile (Pisarski 2009), but on average their additional income is insufficient to pay the higher costs of automobile travel, making them financially worse off overall. For example, Smart and Klein (2015) found that formerly carless households that obtain a car typical earn about $2,300 more annually, but must spend an additional $4,100 on their vehicles, so they are financially worse off overall. In addition, automobile travel increases crash risk and reduces physical fitness, and imposes external costs on disadvantaged communities (Lens 2021). As a result, low-income workers tend to benefit more from non-auto improvements than from vehicle subsidies (CTS 2010; Gao and Johnston 2009). Even congestion pricing often benefits disadvantaged groups overall since few drive under congested conditions and they bear external costs (Manville and Goldman 2018).

This indicates that most disadvantaged people benefit overall from vehicle travel reduction strategies that improve affordable modes, provide financial savings to non-drivers, create more compact, multimodal communities and reduce external costs (Alexander, Alfonzo and Lee 2021).
Harms the Economy
Critics sometimes argue that because most economic activities involve motor vehicle travel, vehicle travel reductions reduce economic productivity (Pozdena 2009). That is not necessarily true. Although vehicle travel supports many economic activities it also imposes large economic costs. Vehicle travel reduction strategies that increase transportation system efficiency provide economic benefits. For example, TDM incentives that reduce congestion delays and favor commercial and public transit vehicles tend to increase productivity. Efficient management can reduce the parking supply required in an area, increasing development productivity. Walking, bicycling and public transit improvements can access to jobs and services at lower cost than automobile access (Wu, et al. 2021). Businesses tend to be more productive if located in compact, multimodal areas due to agglomeration efficiencies (Melo, Graham and Noland 2009).

Recent studies find that increases from very low to moderate levels of mobility tend to increase economic productivity but marginal impacts decline and eventually become negative at high levels (DOE 2021; Ecola and Wach 2012; Kooshian and Winkelman 2011; McMullen and Eckstein 2011; Ecola and Wachs 2012). This makes sense since marginal benefits tend to decline while economic costs tend to increase at high levels of mobility, as described in Figure 5. Within developed countries there tends to be a negative relationship between vehicle travel and economic productivity (Zheng, et al. 2011), as illustrated below.

**Figure 11** Per Capita GDP and VMT for U.S. States *(FHWA 2019)*

This indicates that vehicle travel reduction strategies that improve resource efficient modes, apply efficient pricing, or create more compact, multimodal communities are likely to increase productivity, employment, property values and tax revenues.
Cost Efficiency
Critics argue that vehicle travel reduction programs are less efficient at achieving specific goals, such as reducing congestion or pollution, than engineering solutions such as road expansions and electric vehicles (Poole 2009). This might be true if goals are considered individually, but when all impacts are considered, vehicle travel reductions are often very cost effective (Alarfaj, Griffin and Samaras 2021). Engineering solutions tend to be costly and increase total vehicle travel which exacerbates other problems. For example, although roadway expansions may reduce traffic congestion in the short-run, they induce additional vehicle travel which increases crashes and pollution emissions. Similarly, because they cost less to operate, electric vehicles induce more vehicle travel, which increases traffic congestion (Moshiri and Aliyev 2017). Recent studies conclude that vehicle travel reductions are needed to achieve emission reduction targets (Manjoo 2021; McCahill 2021).

Some studies compare the cost-efficiency of various emission reduction strategies, including Environmental Defense’s Marginal Abatement Cost Curves for U.S. Net-Zero Energy Systems (Farbes, Haley and Jones 2021) and The Economics of Climate Change: A Primer (Hatzius, et al. 2020). They generally find that, considering all benefits and costs, clean vehicle emission reductions are relatively expensive, usually costing more than $50 per tonne and often much more (NCE 2015). In contrast, vehicle travel reduction strategies often have negative costs; their total benefits are greater than their total costs. The figure below shows results from one study.

Figure 12 Emission Abatement Cost Curve (Liimatainen, Pöllänen and Viri 2018)
This study concluded that vehicle travel reduction strategies, such as car- and ride-sharing incentives and more compact urban form, have negative costs (they provide net savings) due to their large co-benefits, while alternative fuels and alternative energy and more energy efficient cars tend to have relatively high costs, over 100€ per tonne.

Road User Fee “Diversions” Are Unfair to Motorists
Critics argue that it is unfair to use road user fees, such as fuel taxes and road tolls, to finance non-auto modes, which they call these diversions (Feigenbaum and Hillman 2020). However, user fees only cover about half of roadway costs and a smaller portion of government-mandated parking facilities; the rest is financed in ways that residents pay regardless of how they travel. If it is unfair for motorists to fund non-auto infrastructure it is more unfair for non-drivers to fund automobile infrastructure, and since automobile travel increases with income, this tends to be regressive (Litman 2022). The OECD report, Distributional Effects of Urban Transport Policies to Discourage Car Use (Lindsey, Tikoudis and Hassett 2023) investigates the social equity impacts of vehicle travel reduction policies such as cordon tolls, distance-based charges, fuel taxes, parking measures and public transport subsidies. It evaluates their distributional effects and discusses ways to design such policies to support more equitable outcomes.
All Travel Imposes External Costs and is Subsidized
Critics argue that all travel imposes external costs, and public transit requires larger subsidies, so it is unfair to focus automobile external costs (O’Toole 2019), but their analysis is faulty (Walker 2016). Critics only consider a limited set of costs, and measure them per mile which ignores the high costs caused by motorists’ higher annual mileage. Walking and bicycling have low infrastructure and external costs. Transit has higher costs but operates in dense urban areas where automobile costs are particularly high, and is generally less costly than providing taxi service for non-drivers. In most situations, automobile costs are higher than other modes per mile, and since motorists travel more annual miles their per capita costs are generally much higher than non-drivers (Gössling, et al. 2018; Litman 2019; Schröder, et al. 2022).

Reduces Freedom
Critics argue that vehicle travel reduction policies are “social engineering” and a “war on cars” that deprives motorists of freedom (Fix 2017; Greenhut 2019). This ignores current planning practices that favor automobile travel over other modes, and sprawl over compact development, which reduce freedom, particularly for non-drivers. As Professor Mark Hallenbeck explains, “All transportation planning is social engineering. We’ve spent 100 years making it easy to drive. We’ve spent 100 years making it really hard to walk, bicycle or take a bus. So people drive, because it makes sense.”

Automobiles can increase some freedoms, allowing motorists to travel to any destination at any time, but by reducing non-auto travel options, and increasing traffic problems and sprawl, automobile-oriented planning reduces many freedoms, particularly for non-drivers.

<table>
<thead>
<tr>
<th>Freedoms Increased</th>
<th>Freedoms Reduced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motorists’ freedom of movement.</td>
<td>• Independent travel by non-drivers.</td>
</tr>
<tr>
<td></td>
<td>• Drivers’ freedom from chauffeuring burdens</td>
</tr>
<tr>
<td></td>
<td>• Motorists’ financial freedom.</td>
</tr>
<tr>
<td></td>
<td>• Non-drivers’ financial freedom.</td>
</tr>
</tbody>
</table>

Automobile travel increases motorists’ freedom of movement, and reduces other types of freedom.

Responding to Criticisms
A poorly designed vehicle travel reduction programs could be inefficient and unfair. To maximizing their effectiveness and benefits, including social equity goals, vehicle travel reductions programs should involve an integrated set of policies that reflect basic economic principles: consumer sovereignty, efficient pricing and comprehensive analysis, as described earlier in this report. Such programs reduce economically inefficient vehicle travel, in which total costs exceed benefits, by responding to latent consumer demands for non-auto travel, and investing public resources to maximize cost efficiency and fairness.
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Conclusions
Many current planning practices favor automobile travel over other modes and sprawl over compact development. This is unfair to people who cannot, should not or prefer not to drive, and increases total transportation costs. New planning practices are intended to increase transportation system efficiency, accessibility can be achieved with less mobility. The table below summarizes four principles that can help determine optimal levels of vehicle travel. Many current policies violate these principles, resulting in economically-inefficient vehicle travel; travellers would forego those vehicle-miles if they had better mobility and accessibility options, and efficient prices.

**Table 10** Principles for Optimizing Vehicle Travel

<table>
<thead>
<tr>
<th>Principle</th>
<th>Description</th>
<th>Travel Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fair share planning</td>
<td>Each traveller should receive comparable shares of public resources.</td>
<td>Would significantly improve and increase non-auto travel, and reduce auto travel.</td>
</tr>
<tr>
<td>Consumer sovereignty</td>
<td>Planning responds to latent and changing consumer demands.</td>
<td>Would significantly improve and increase non-auto travel, and reduce auto travel.</td>
</tr>
<tr>
<td>Efficient pricing</td>
<td>Users pay directly for facilities and external impacts such as congestion, crash and pollution damages.</td>
<td>Would increase the price of driving, reducing vehicle travel, particularly under urban-peak conditions.</td>
</tr>
<tr>
<td>Comprehensive planning</td>
<td>Individual, short-term decisions should support strategic, long-term goals.</td>
<td>Would increase support for affordable, healthy and resource-efficient modes.</td>
</tr>
</tbody>
</table>

*These four principles can help determine optimal vehicle travel. They tend to justify more multimodal planning, more efficient transportation pricing, and Smart Growth development policies.*

Analysis in this report indicates that applying these principles significantly increases fairness, reduces vehicle travel, increases non-auto travel, reduces costs, and makes most people better off overall. It suggests that vehicle travel reduction targets of 20-40% are achievable and cost effective. Many jurisdictions have contradictory policies: they invest in non-auto modes but continue expand roadways and impose parking mandates that increase automobile travel and sprawl. Vehicle travel reduction targets can justify reforms so individual, short-term decisions support strategic goals.

Although individual strategies are not necessarily the most cost effective way to achieve any single objective, for example, a single bicycle or transit improvement will not eliminate congestion, crashes or emissions, their impacts are cumulative and synergistic; an integrated vehicle travel reduction program can provide many benefits are be very cost effective overall.

Critics argue that vehicle travel reduction targets are inefficient and unfair, sometimes described as a “war on cars,” but their arguments cannot stand scrutiny. This research indicates that vehicle travel can be reduced in ways that support social equity, benefit most travellers, are cost effective, increase economic productivity, and enhance freedom overall.
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