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Transportation Planning
Principles, Distortions and Reforms

Guidance for Reducing Automobile Dependency and Sprawl

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Abstract

Automobile dependency and sprawl create communities where it is easy to drive but difficult to get around by other modes. This is unfair to non-drivers and increases various costs. This study investigates the roots of these problems: planning distortions that favor driving over other modes and dispersion over compact development. To be fair and efficient, planning must reflect certain principles including consumer sovereignty (it responds to consumer demands), fair share investments (each group or individual receives a comparable share of public resources), efficient pricing (travellers pay for the infrastructure they use unless subsidies are justified), comprehensive analysis (all significant goals and impacts are considered), and accessibility-based analysis (it maximizes access not mobility). This report identifies common planning practices that violate these principles, evaluates their impacts, and recommends reforms. This analysis indicates that given more efficient and equitable planning travellers would drive less, rely more on non-auto modes, save money, and be better off overall as a result.

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Key Findings

- To be efficient and fair transportation planning must reflect certain principles including *consumer sovereignty* (it responds to consumer demands), *fair share investments* (each group or individual receives a comparable portion of public resources), *efficient pricing* (travellers pay for the infrastructure they use), *comprehensive analysis* (it considers all significant goals and impacts), and *accessibility-based analysis* (it maximizes access rather than mobility).
- Current planning violates these principles in ways that favor automobile travel over other modes, and sprawl over compact development. This report identifies twelve transportation planning distortions, evaluates their impacts, and describes reforms for more efficient and equitable planning.
- These distortions minimize vehicle expenses but increase other costs. About half of roadway expenses and the majority of parking facility expenses are funded indirectly, and motorists do not pay for the congestion, risk and pollution costs they impose on other people. This is unfair and inefficient. Planning that makes driving cheap makes other goods are more expensive: taxes are higher to pay for roads, housing and retail goods are more expensive to pay for off-street parking, reduced safety and health increase medical and disability costs, and a degraded natural environment makes clean air and water more costly.
- These distortions reduce non-auto travel options and increase the distances people must travel to reach services and activities. These impacts are unfair to people who cannot, should not or prefer not to drive, and increase many costs to individuals and communities including the time and money people spend travelling, infrastructure costs, crashes, chauffeuring burdens, and environmental damages.
- Analysis in this report suggests that correcting these distortions would significantly reduce automobile travel and increase non-auto travel. These reforms benefits motorists by reducing their traffic and parking congestion, increasing safety, and reducing chauffeuring burdens. Many transport problems are virtually unsolvable without these reforms.
- With more comprehensive and multimodal planning people would choose to drive less, rely more on walking, bicycling and public transit, spend less time and money on driving, and be better off overall as a result.

Introduction

Imagine how you would feel if you were consistently served smaller and less tasty and healthy food than your peers. That is comparable to how current planning treats non-drives.

Automobile dependency and sprawl create communities where it is difficult to get around by non-auto modes and destinations are dispersed. This is unfair to non-drivers, and increases costs many, as summarized below. It also harms motorists by increasing their vehicle, congestion, crash risk and chauffeuring costs. There is growing interest in understanding the causes and potential solutions to these problems.

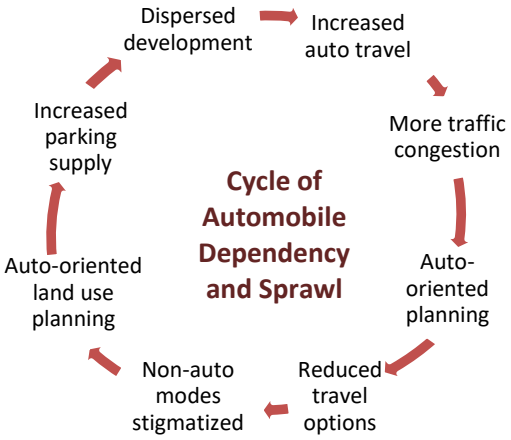
Table 1 **Automobile Dependency and Sprawl Costs**

Economic	Social	Environmental
• Higher household transport costs. • Increased road and parking facility costs. • Increased traffic congestion. • Increased crashes.	• Less independent mobility for non-drivers, reducing their economic opportunities. • Reduced public fitness and health.	• Increased pollution emissions. • More impervious surface, heat island effects, and habitat loss. • Hydrologic disruptions and stormwater management costs

Automobile dependency and sprawl increase many economic, social and environmental costs. Conventional planning overlooks and undervalues many of these impacts, resulting in underinvestment in non-auto modes.

This report explores these issues. It identifies the roots of automobile dependency and sprawl: planning distortions that favor driving over other modes and dispersion over compact development, and it identifies reforms to create better transportation systems.

To be efficient and fair planning must reflect the principles of consumer sovereignty, fair resource allocation, efficient pricing, comprehensive analysis, and accessibility-based analysis. Many common planning practices violate these principles. These distortions undervalue and underinvest in non-auto modes, underprice driving, and prevent development of compact multimodal communities. These distortions are numerous and well-established, and so common that they are usually ignored. For example, incomplete sidewalk networks are considered normal and acceptable, not deserving additional investments. Few North American cities invest sufficiently in non-auto modes to make them convenient and attractive. Parking minimums in zoning codes are a huge but generally ignored subsidy to motorists. These distortions contribute to the self-reinforcing cycle of automobile dependency and sprawl, illustrated to the right.



This is a timely issue. There is growing criticism of auto-oriented planning, but most critiques consider just a few distortions. This report is more comprehensive and systematic. It describes principles for equitable and efficient planning, identifies common practices that violate these principles, evaluates their impacts, and recommends reforms. This should be of interest to policy makers, planners, advocates for multimodal planning, and anybody who wants a more diverse, equitable and efficient transportation system.

How Distortions Affect Our Lives and Communities

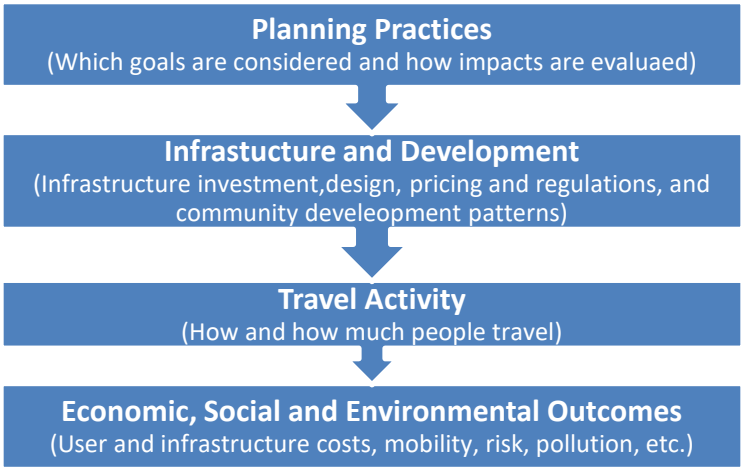
Transportation planning decisions affect our lives and communities in many ways, as summarized in the box below. Transportation is co-produced by governments, which develop and manage infrastructure, and individuals who decide how and how much to travel. Transportation planning decisions therefore affect how we spend our time and money, our opportunities, safety and health, plus our local and global environment.

How Transportation Affects Our Lives and Communities

- 60-90 daily minutes per day. Travelling can be a high- or low-point in our day.
- 15-25% of household budgets, including many indirect costs such as residential parking.
- A major cause of death, injury and health problems.
- Affects our economic and social opportunities, and therefore our success and happiness.
- Transportation infrastructure is a major government expense and use of urban land.
- Affects community design and the urban realm, and therefore how people interact.
- A major consumer of non-renewable resources and source of noise, air and water pollution.

There are often several steps between a planning decision and its ultimate impacts. For example, which goals are considered and how impacts are evaluated affect infrastructure investment, design and management decisions. This affects how and how much people travel, which in turn affects outcomes such as individual and community costs and opportunities, health and safety impacts, and environmental quality, as illustrated below.

Figure 1 **Steps in Planning Impacts**



Planning practices affect infrastructure and development decisions, which in turn affect how and how much people travel, and various economic, social and environmental outcomes.

Planning distortions that overvalue automobile travel and underinvest in non-auto modes create automobile-dependent communities where it is difficult to get around without driving. This is unfair to non-drivers and increases many costs.

If a community values affordability, inclusivity, health and environmental quality it should invest sufficiently in non-auto modes and favor compact development. Planning that overlooks or undervalues these goals bias decisions in ways that create automobile-dependent transportation systems and communities where it is difficult to access services and activities without driving (Butner and Noll 2020; Shill 2019). Correcting such distortions ensures that planning decisions accurately reflect community values (ITF 2023).

Principles for Efficient and Equitable Planning

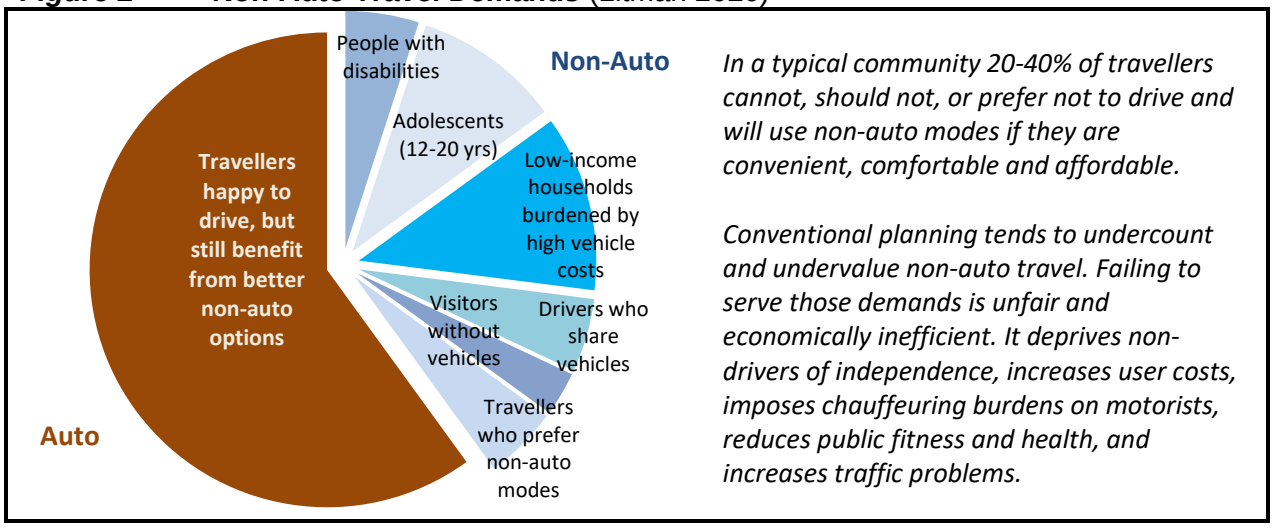
To be efficient and equitable planning must reflect the following principles. Violating these principles distorts decision-making away from optimal outcomes.

1. Consumer Sovereignty

Consumer sovereignty means that, as much as possible, planning should respond to consumer demands, including *latent demands* (options that consumers would choose if available). This means, for example, that if some travellers want to walk or bicycle, planning should invest in sidewalks, crosswalks and paths to the degree they are cost effective. As a result, equitable and efficient planning requires comprehensive information on travel demands, plus planning and funding that responds to those needs and preferences.

In a typical community, 20% to 40% of people cannot, should not, or prefer not to drive, for reasons described below. Current planning undercounts and undervalues these demands. For example, commonly-cited travel data, such as *journey to work* statistics, ignore non-commute trips, school trips, recreational travel, and walk/bike links of journeys that include motorized modes. Non-auto modes serve only 8% of U.S. *commute trips*, but about 16% of *total trips*. This indicates that people actually use these modes about twice as much as often-cited statistics indicate, and their potential mode shares are much greater, if given more support.

Figure 2 **Non-Auto Travel Demands** (Litman 2020)



2. Fair Share Investments

Fair share planning means that each individual or group receives comparable portions of public resources, such as funding and road space, unless there are specific reasons to do otherwise. It implies that planning should invest in non-auto modes at least as much as their potential shares of trip or users, and often more to help achieve strategic goals and to make up for decades of underinvestment. Most North American communities currently underinvest in non-auto modes compared with their portions of trips, potential trips and users, as described later in this report.

3. Efficient Pricing

Efficient and equitable pricing means that consumers should "get what they pay for and pay for what they get" unless there are specific reasons to subside a particular good or group. For example, if a vehicle trip imposes $5 worth of costs, motorists should pay fees of that amount. This prevents society from spending $5 worth of resources to serve trips that users value less than that amount. Efficient pricing can also manage demands to reduce external costs; urban traffic and parking problems are virtually unsolvable without efficient pricing.

Of course, motorists prefer "free" roads and parking, but those facilities are never really free; the choice is between financing them directly through user fees, or indirectly through higher taxes (for government parking), higher rents (for residential parking), lower wages (for employee parking) and higher prices for other goods (for parking at commercial destinations). Paying indirectly is inefficient and unfair because it increases traffic problems, and forces people who drive less than average to subsidize parking facilities for people who drive more than average. Since vehicle travel increases with incomes, this tends to be regressive.

Efficient and equitable transportation fees should recover all infrastructure and external costs, with higher rates for congested conditions, higher risk and more polluting vehicles. Such fees would typically add 5-15¢ per vehicle-mile to recover roadway costs, which would reduce vehicle travel 5-10%; $1.00-5.00 per trip to recover parking costs, which would reduce driving 10-30%; 50¢ per gallon of gasoline as a carbon tax, which would reduce driving about 5%; plus distance-based vehicle insurance and registration fees, which would reduce vehicle travel about 10% (CAPCOA 2021; Butner and Noll 2020; Litman 2014). Together they would significantly reduce driving, particularly under urban-peak conditions, providing large road and parking cost savings, and justifying much more non-auto infrastructure investments.

Planning that assumes driving will be underpriced creates a self-fulfilling prophecy by increasing predicted traffic, which is used to justify roadway expansions, which induces more driving and degrades non-auto travel conditions, causing the predicted traffic to occur. Planners should instead describe future traffic growth as variable, depending on prices and investments. For example, a traffic engineer could say, "This highway will require 10 traffic lanes if they are unpriced, 8 lanes if they have $1.00 per trip tolls, or 6 lanes if they have $2.00 peak-period tolls with revenues used to improve non-auto modes." Similarly, a planner could say, "This building will require 100 parking spaces if they are unpriced and assigned to individual occupants, 80 if assigned individually with cost-recovery prices, 60 if priced and shared, and only 40 if priced, shared and implemented with a parking management program."

4. Comprehensive Analysis

Efficient and equitable planning should consider all significant impacts and goals. Conventional planning evaluates transportation system performance based primarily on driving convenience and speed using indicators such as roadway level-of-service (LOS) and hours of congestion delay, plus distance-based crash and emission rates such as traffic deaths per 100 million vehicle-miles. Conventional planning tends to overlook or undervalue other goals and impacts such as affordability, independent mobility for non-drivers, public fitness and health, plus induced vehicle travel impacts and sprawl-related costs. These omissions tend to overvalue automobile improvements and undervalue improvements to non-auto modes and TDM programs (Volker, Lee and Handy 2020; Metz 2021).

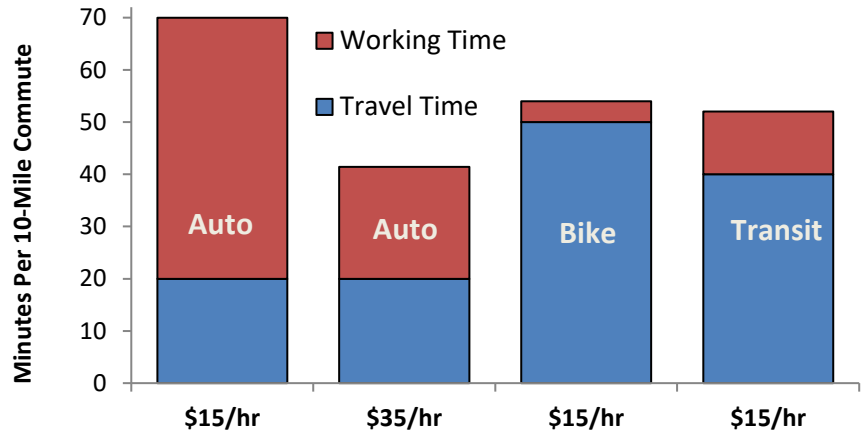
5. Accessibility-based planning

The ultimate goal of most transportation (except travel with no destination) is to access services and activities such as work, education, shopping and recreation. Many factors affect accessibility including *mobility* (physical travel), *proximity* (the distances between destinations, and therefore development density and mix), and *affordability* (travel costs relative to income).

Planning decisions often involve trade-offs between different accessibility factors. For example, wider roads and increased traffic speeds tend to increase automobile accessibility but degrade walking and bicycling conditions. Since most public transit trips include walking and bicycling links, this reduces transit accessibility, reducing overall non-auto access. Similarly, increasing parking mandates makes driving more convenient but encourages auto-dependent sprawl.

Planning decisions also involve trade-offs between mobility and affordability. Conventional planning evaluates mobility based on *nominal speeds* (distance divided by time spent travelling, such as miles per hour), which favors faster but expensive modes. *Effective speed* measures distance divided by time spent travelling plus time spent earning money to pay travel expenses. Measured this way, slower but inexpensive modes, such as walking, bicycling and public transit, are often faster than driving (Litman 2022; Tranter and Tolley 2021). Planning that only considers nominal speed overinvests in automobile travel and underinvests in affordable modes.

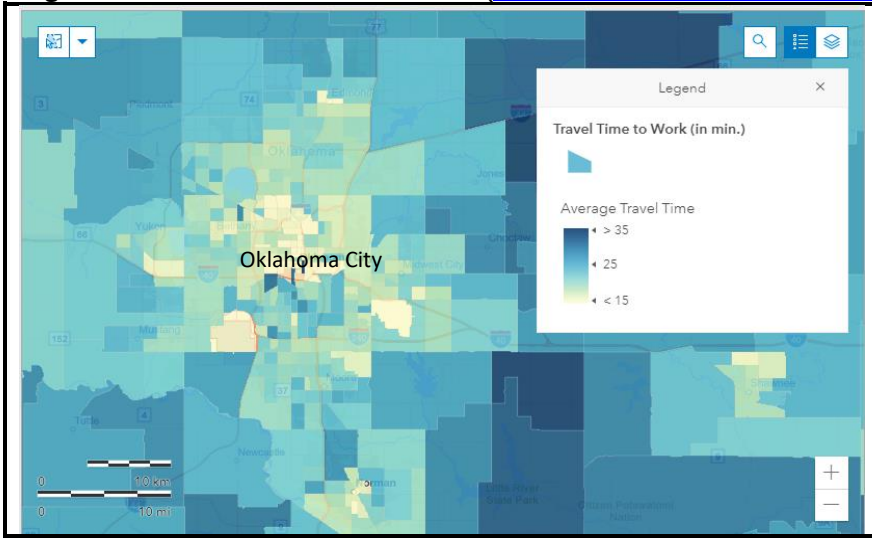
Figure 3 **Effective Speed by Income and Mode** (Litman 2022)



Measured by effective speed (time spent travelling and earning money to pay travel expenses), bicycling and transit are often faster than driving, particularly for lower-wage workers. (Assumes bicycling 12 mph, 10¢/mile; Public Transit 15 mph, 30¢/mile; Auto 25 mph, $5,000 and 4,000 annual miles for $15/hr. motorists and $7,000 and 12,000 annual miles for $35/hr. motorists.)

In a typical community, a percentage increase in density provides more accessibility than the same increase in speed (Levine, et al. 2012). This is demonstrated by the fact that residents of compact urban neighborhoods have shorter duration commutes than in sprawled areas, as illustrated below. Multimodal accessibility maps, which measure the number of jobs and services reachable in a given time period, such as the *Urban Accessibility Explorer* (http://urbanaccessibility.com), often show that non-drivers living in central neighborhoods have better access to goods and services than motorists in sprawled locations. Since non-auto modes are much cheaper, their effective speeds are much lower. A major study "Urban Access Across the Globe: An International Comparison of Different Transport Modes," (Wu, et al. 2021) found that automobile-dependent cities have only moderate automobile access and far lower non-auto access than more compact, multimodal cities.

Figure 4 **Commute Duration** (Mineta Institute Commute Duration Mapping System)



The Mineta Institute's Commute Duration heatmaps show the number of minutes workers spend commuting in U.S. communities. Commute duration is generally much higher in sprawled, urban fringe areas than in central neighborhoods, indicating that proximity affects accessibility more than travel speed. This figure illustrates this in Oklahoma City. Similar patterns are seen in most cities.

Conventional, mobility-based planning tends to favor automobile transportation. Accessibility-based planning tends to support Smart Growth development policies, invests more in slower, affordable modes, and supports TDM incentives to increase proximity and effective speeds.

Summary of Principles

The table below summarizes these five planning principles. Violating them tends to reduce transportation system efficiency and equity.

Table 2 **Transportation Planning Principles**

Principle	Description	Reforms Needed	Travel Impacts
Consumer sovereignty	Planning responds to consumer demands.	Consider non-auto demands, including latent demands.	Significantly increases non-auto travel and reduces auto travel.
Fair share planning	All travellers receive comparable shares of public resources.	More multimodal planning and investments.	Significantly increases non-auto travel and reduces auto travel.
Efficient pricing	Prices reflect marginal costs and recover infrastructure costs.	Efficient fuel taxes, road tolls, parking and emission fees.	Would significantly reduce vehicle travel, particularly under urban-peak conditions.
Comprehensive planning	Individual, short-term decisions should support strategic, long-term goals.	More comprehensive analysis of impacts, including currently overlooked planning goals.	Would increase investments in affordable, healthy and resource-efficient modes.
Accessibility-based analysis	Evaluate transport system performance based on accessibility not mobility.	Shift from mobility-based to accessibility-based analysis and performance indicators.	Supports investments in slower modes, and more compact development.

These five principles can help guide transportation planning. Applying these principles tends to support more multimodal planning, Smart Growth development policies, efficient pricing, and TDM programs.

Common Transportation Planning Distortions

This section describes practices that violate economic principles, their impacts and potential reforms.

1. Elite Bias

Elite bias refers to decision-makers perspectives and experience which favor faster, more expensive modes, such as driving, over slower but more inclusive and affordable modes that better serve people with disabilities and low-incomes.

Current Practices. Most transportation decision-makers are busy professionals who drive high annual miles and seldom depend on non-auto modes. As a result they tend to be familiar with the problems experienced by motorists but less familiar with non-drivers' problems, sometimes described as a "windshield" world view or "motornormativity" (Goddard 2024; Walker, Tapp and Davis 2023). As a result, practitioners tend to favor auto-oriented planning, hesitate to implement vehicle travel reduction policies, and undervalue non-auto improvements. This tends to undervalue and underinvest in non-auto modes. Because they lack personal experience with non-auto travel they tend to overlook and undervalue qualitative factors such as convenient connections between modes, increasing comfort, and providing user information.

Impacts. Elite bias contributes to planning practices that favor automobile travel over more affordable, inclusive modes and sprawl over compact, multimodal development. For example, transportation system performance is generally evaluated based on automobile travel conditions using indicators such as roadway level-of-service, congestion delay hours and parking availability. Although multimodal level-of-service indicators are available, few transportation agencies apply them. This is not to suggest that decision-makers completely ignore non-auto demands but they tend to give vehicle traffic conditions more consideration, resulting in more investment in automobile infrastructure than non-auto modes. It also explains why non-auto improvements are sometimes poorly designed and integrated, such as sidewalks and bikeways with critical gaps, and transit stations with poor pedestrian access and wayfinding.

Reforms. Elite bias can be reduced by improving representation of disadvantaged groups, their needs and goals in the planning process. This can include improving data on the current and latent travel demands for people with disabilities and low incomes, plus children and seniors, the transportation problems they face, and improving public engagement and professional development programs that support more diverse perspectives.

2. Industry Influence

Current practices. The automobile and petroleum industries wield significant political influence, which favors automobile-oriented solutions, and discourages investments in non-auto modes and implementation of TDM solutions. This can include formal lobbying, plus general support by business and labor organizations for policies that favor automobile travel.

Impacts. Industry influence contributes to many of the planning distortions described below. It justifies automobile-oriented planning practices, automobile underpricing, and reluctance to implement TDM incentives even when they are cost effective and beneficial overall.

Reforms. Reforms can include limits on industry's political influence, and public education concerning the benefits of multimodal transportation planning.

3. Transportation Agency Goals and Practices

Current practices. Most transportation agencies prioritize speed over other goals and driving over other modes in their planning and investment practices (Cleveland 2023; Grabar 2021; Litman 2022) Vickerman (2024) points out that current planning tends to favor infrastructure investments over demand management solutions such as efficient pricing. This reflects their organizational roots: they were established as highway agencies and although most are officially multimodal "transportation agencies," their goals and practices have not fully evolved. Described differently, planning agencies strive for mobility rather than accessibility and so undervalue slower modes and compact development (Litman, Shebeeb and Milam 2024).

Transportation agencies often give little priority to emerging goals such as affordability, equity and inclusivity, public health, and community livability. They often evaluate risk and environmental impacts based on distance-based crash and emission rates (per mile or kilometer) which overlooks the additional damages caused by planning decisions that induce additional vehicle travel and the benefits of TDM. Most continue to evaluate transportation system performance based primarily on vehicle travel conditions using indicators such as roadway level-of-service, traffic speed and delay, and distance-based crash and emission rates. They collect little data on non-auto travel activity, demands, conditions or problems.

For example, transportation agencies often expanded urban highways in order to improve access for suburban motorists, although by dividing urban neighborhood this reduced non-auto accessibility (SGA 2023). This occurred because transportation agencies recognized the benefits to motorists but generally ignored disbenefits to non-drivers.

State and provincial transportation agencies justify their emphasis on automobile travel by arguing that they are responsible for intercity travel, while non-auto modes serve local trips and are therefore local government's responsibility. However, this is a façade. A major portion of traffic on state and provincial highways consists of local trips, so these agencies benefit from improving non-auto travel conditions and implementing TDM incentives that reduce highway traffic problems. Transportation agencies seldom support these solutions to the degree that is cost effective and optimal overall, considering all benefits and costs.

Impacts. Agencies that evaluate transportation system performance based on traffic speed, ignoring other goals and modes, overinvest money and road space in highways, underinvest in other non-auto modes and TDM programs, and design roadways for higher traffic speeds than is optimal, considering all modes, users and goals. These practices, in turn, encourage sprawl which further increases automobile travel and reduces non-auto accessibility.

Reforms. A variety of institutional reforms are needed to implement equitable and efficient multimodal planning. These include:

- A shift from mobility-based to accessibility-based planning.
- More multimodal transportation data collection.
- Comprehensive goals and impact analysis.
- Apply least-cost planning, to implement non-auto modes and TDM programs whenever they are most cost effective and beneficial, considering all goals and impacts.

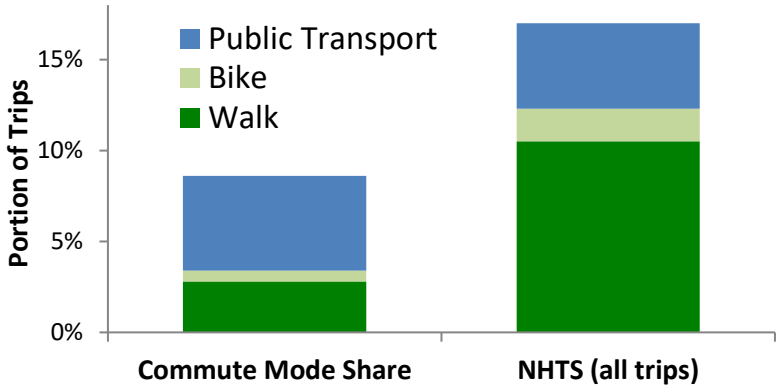
4. Inadequate Non-Auto Data

How travel data are collected and analyzed can affect planning decisions. Incomplete and biased non-auto data can undercount and undervalue these modes.

Current practices. To justify automobile-oriented planning, advocates often cite statistics such as that 92% of households own vehicles and 86% of workers commute by automobile, which implies that non-auto travel is insignificant and everybody benefits from pro-auto policies.

Those statistics are incomplete and biased. Most travel surveys undercount shorter (within *traffic analysis zones*), off-peak, non-commute, youth, and recreational travel (ABW 2018). Many surveys ignore active links of journeys that include motorized travel; for example, a *bike-transit-walk* trip is often classified simply as a transit trip, and trips between parked vehicles and destinations are ignored even if they involve walking many blocks on public streets. Non-auto travel is about twice as common than commonly-cited statistics indicate, as illustrated below.

Figure 5 **Non-Auto Mode Shares** (U.S. Census, 2017 NHTS)



Commonly-cited statistics, such as census commute mode share data, tend to undercount non-auto modes, particularly walking and bicycling trips. More comprehensive sources, such as the National Household Travel Survey (NHTS) indicate that walking and bicycling trips are two to six times more common than indicated by commute mode share data.

The study, *The Multimodal Majority?* found that during a typical week about 7% of Americans rely entirely on non-auto modes, about half take at least three non-auto trips, and 25% take at least seven non-auto trips (Buehler and Hamre 2015). Blumenberg, Brown and Schouten (2020) found that about 20% of U.S. households are car-deficit, meaning they have more drivers than vehicles. Consumer surveys find that many residents of auto-dependent areas want to live in more walkable neighborhoods but cannot due to inadequate supply (NAR 2023). Non-auto travel tends to increase significantly after those modes are improved, reflecting latent demands. This indicates that non-auto modes are more important than commonly-cited statistics indicate, and improving those modes can provide larger impacts and benefits than commonly assumed.

Impacts. Incomplete data on non-auto modes tends to undervalue non-auto travel, leading to underinvestment in these modes, and hinders efforts to improve non-auto travel.

Reforms. Travel surveys should collect detailed information on non-auto trips, users, demands, latent demands, conditions and obstacles. Practitioners can correct for biased data. For example, if surveys indicate that 8% of *commute trips* are by non-auto mode, this probably means that they serve about twice that number of *total trips*, and improving these modes could increase their share to 20-30% of trips, and more in denser and lower-income areas.

5. Mobility-Based Performance Indicators

How impacts are measured can significantly affect planning decisions. Planning relies on performance indicators to identify problems, define targets and evaluate progress.

Current practices. Conventional planning evaluates transportation system performance using indicators of vehicle mobility, such as roadway level-of-service (LOS) and congestion delay, with no comparable indicators for other modes or other goals (Lee and Handy 2018; Metz 2024). These indicators value non-auto modes to the degree that they reduce roadway congestion; they recognize no direct benefit to improving non-auto travel convenience and comfort. Few transportation agencies collect detailed information on non-auto travel conditions, such as the convenience and comfort of walking, bicycling and public transit travel. Few agencies model multimodal accessibility in order to evaluate how transportation system changes will affect non-drivers or the potential benefits of non-auto improvements or TDM incentives.

Impacts. Mobility-based performance indicators favor faster modes over slower modes, higher speed roadways over complete streets, and sprawl over compact development. They recognize few of the benefits provided by non-auto mode improvements (DeRobertis, et al. 2014).

Reforms. For more equitable and efficient planning, transportation agencies should evaluate the convenience and comfort of non-auto travel, using multimodal LOS indicators. They should shift from mobility-based to accessibility-based planning that accounts for the time and money costs of accessing services and activities by various modes and system users.

6. Biased Travel Models

Current practices. Models used to evaluate transportation system changes are biased in ways that tend to exaggerate highway expansion benefits and undervalue improvements to other modes and TDM programs (Currans and Stahl 2023; Litman 2024; Millard-Ball 2015; Ross and Cortright 2024). They:

- Exaggerate future traffic growth rates.
- Recognize automobile travel demands but underestimate non-auto demands.
- Use low price elasticities which underestimate TDM impacts and benefits.
- Overlook and underestimate induced travel effects (the additional vehicle travel that results when roadways are expanded, that would not otherwise occur).
- Use far higher values of travel time than most travellers are actually willing to pay.
- Fail to account for many vehicle traffic external costs and non-auto improvement benefits.

Impacts. Modelling biases tend to overvalue the benefits and underestimate the costs of roadway expansion, and undervalue improvements to non-auto modes and TDM programs.

Reforms. Transportation organizations can improve their models to better reflect non-motorized modes, to account for latent demands for non-auto travel, to account for induced travel and associated costs, and to evaluate TDM incentives (F&P 2020).

7. Incomplete Impact Analysis.

Current practices. Conventional planning tends to consider some impacts and overlook others, as summarized below.

Table 3 **Often-Overlooked Impacts**

Usually Considered	Often Undervalued or Overlooked	
• Roadway costs.	• User costs and affordability.	• Traveller convenience and comfort.
• Traffic speed.	• Mobility for non-drivers.	• Barrier effect (pedestrian delays).
• Congestion delay.	• Public fitness and health.	• Parking costs and potential savings.
• Per mile crash rates.	• Impervious surface impacts.	• Induced travel and sprawl costs.
• Per mile emission rates.	• Roadway aesthetics.	• Community livability.

Conventional planning tends to consider some impacts but undervalues or overlooks others. These omissions tend to favor automobile infrastructure improvements and undervalue other modes and TDM incentives.

For example, when evaluating potential congestion reduction strategies conventional planning gives little consideration to affordability, vehicle ownership costs, parking costs, health impacts, the values of improving non-drivers independent mobility, the barrier effect (pedestrian delay), the benefits of pedestrian short-cuts, or the value to passengers of more comfortable transit vehicles and waiting areas. It generally ignores the additional downstream congestion, crashes and pollution caused by induced travel and sprawl-related costs.

Impacts. Incomplete impact analysis tends to overvalue roadway expansions, and undervalue improvements to non-auto modes and TDM programs.

Reforms. Transportation agencies can apply more comprehensive analysis (CAPCOA 2021; DeRobertis, et al. 2014; ITF 2022). The table below illustrates this type of analysis; it indicates how various types of transportation improvements support or contradict planning objectives.

Table 4 **Comparing Impacts**

Planning Objectives	Roadway Expansions	Efficient and Alt. Fuel Vehicles	TDM and Smart Growth
Vehicle Travel Impacts	*Increased*	*Increased*	*Reduced*
Congestion reduction	✓	×	✓
Roadway cost savings	×	×	✓
Parking cost savings	×	×	✓
Consumer savings and affordability	×	Mixed	✓
Traffic safety	×	×	✓
Independent mobility for non-drivers	×	×	✓
Fossil fuel conservation	×	✓	✓
Pollution reduction	×	✓	✓
Physical fitness and health	×	×	✓
Efficient development (reduced sprawl)	×	×	✓

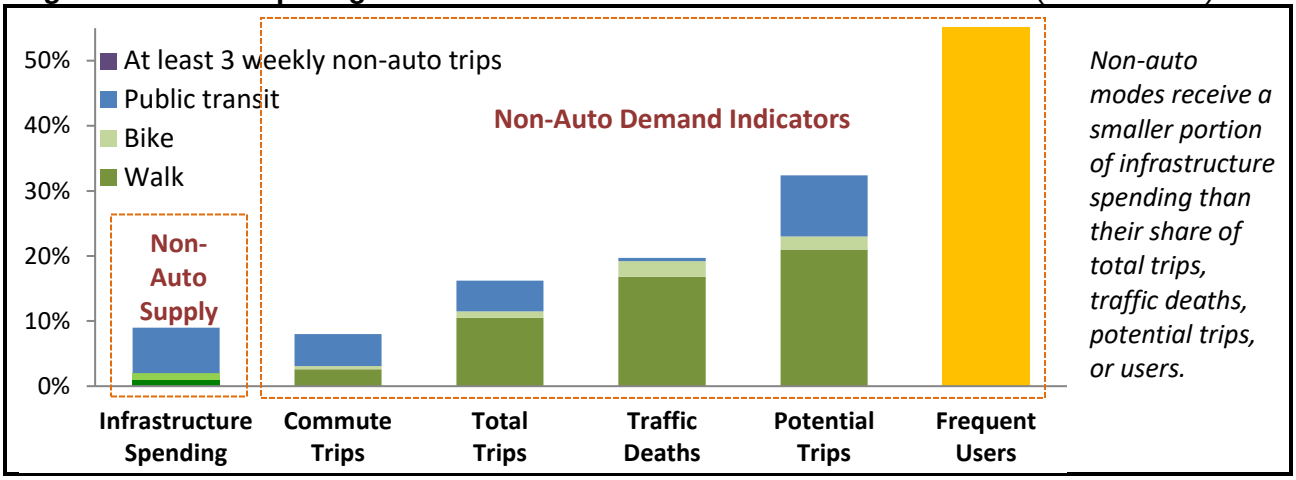
(✓= Achieve objectives. ×= Contradicts objective.) Roadway expansions can reduce congestion, and clean vehicles can conserve fossil fuel and reduce pollution, but by inducing more vehicle travel they contradict other objectives. TDM and Smart Growth strategies help achieve all objectives.

8. Non-auto Underinvestment

Current practices. Most communities invest less money and road space in non-auto infrastructure than justified based on their demands indicated by their shares of current and potential trips, traffic deaths, current and potential users (travellers who would choose non-auto modes if they are convenient, comfortable and affordable).

North American communities typically spend about $50 annually per capita on sidewalks and paths, about $180 on transit subsidies, about $1,000 on roads and traffic services, and more than $2,000 annually per capita on government-mandated parking facilities. Overall, non-auto modes receive about 10% of surface transportation infrastructure investments, which is about equal to their commute mode share, but much less than their shares of total trips, traffic deaths, potential trips or frequent users (more than 3 non-auto trips per week), as illustrated below.

Figure 6 **Comparing Non-Auto Investments with Demand Indicators** (Litman 2023)



This indicates that conventional planning underinvests in non-auto travel compared with demands. This is particularly inequitable because many physically, economically and socially disadvantaged travellers rely on non-auto modes, or would if they were improved. As a result, underinvestments in non-auto modes is regressive (it harms disadvantaged groups), and it reduces economic opportunity and productivity.

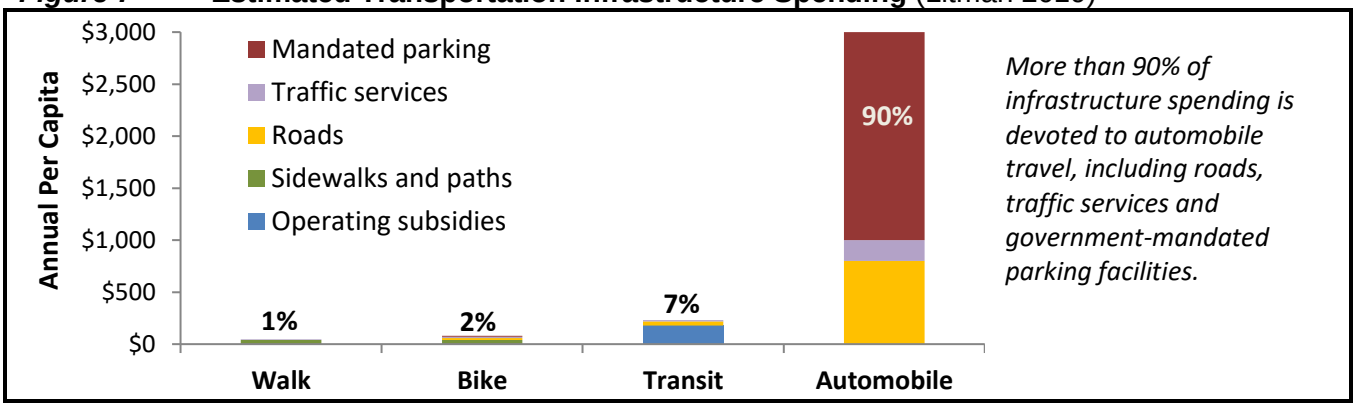
Impacts. Underinvestment in walking, bicycling and public transit reduces use of these modes and creates automobile dependent communities where it is difficult to get around without driving. This is unfair to non-drivers, increases motorists' chauffeuring burdens, and increases traffic problems.

Reforms. Implement multimodal planning that recognizes the unique and important roles that walking, bicycling and public transit play in an efficient and equitable transportation system. Invest in non-auto modes at least as much as their shares of trips or users, and more to account for latent demands, strategic goals (equity, public health, emission reductions, compact development), and to make up for decades of underinvestment.

9. Dedicated Road and Parking Facility Funding

Current practices. In most jurisdictions, the largest sources of transportation funds are dedicated to roads and parking facilities. This funding is relatively abundant and predictable, and requires little public review or approval. In contrast, non-auto infrastructure, such as sidewalks, bikeways, multimodal paths and public transit investments, and TDM programs, usually require general budget allocations and so face more competition and approval requirements.

Figure 7 **Estimated Transportation Infrastructure Spending** (Litman 2019)



A portion of dedicated roadway funding is spent on walking and bicycling facilities, such as sidewalks and paths within highway rights-of-way, and some federal funds can be "flexed" from highways to public transit projects that reduce traffic congestion and pollution emissions, but in most jurisdictions only small amounts are shifted.

Impacts. Dedicated funding encourages transportation agencies to expand roads and parking facilities instead of other types of transportation improvements.

Reforms. Apply least-cost funding, which means that transportation funding is allocated to the projects that provide the greatest total benefits, taking into account all impacts, including improvements to non-auto modes and TDM programs.

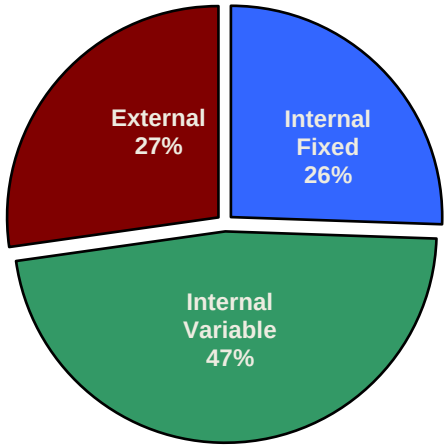
10. Automobile Underpricing

As previously described, economic efficiency requires that prices reflect the marginal cost of producing that good unless subsidies are specifically justified. This allocates resources efficiently, prioritizes higher value trips over lower-value trips, and reduces subsidies from households that drive less than average to those that drive more than average.

Efficient pricing would charge motorists directly for costs to provide roads, traffic services and parking facilities, with higher prices under congested periods, and higher fees for larger, heavier, more dangerous and more polluting vehicles. Parking would be *unbundled* (parking rented separately from building space) and *cashed out* (non-drivers receive cash benefits equivalent in value to any parking subsidies provided to motorists), and priced by the minute, hour or day, so motorists can save money when they reduce parking duration. It would also convert current fixed vehicle insurance and registration fees into distance-based fees, and correct any tax policies that favor employee vehicle or parking benefits.

Current practices. Automobile travel is significantly underpriced. Motorists only pay directly for about half of roadway costs, a small portion of non-residential parking costs, and impose significant delay, risk, noise and pollution on other people (ICF 2021; Litman 2019). In addition, many user charges, such as vehicle insurance, taxes and registration fees, are fixed, unrelated to the amount a vehicle is driven, although the costs they represent increase with annual mileage, so motorists who drive less than average cross-subsidize those who drive more than average. Overall, about a quarter of vehicle costs are external and about a quarter are internal-fixed, as illustrated below. This price structure is inefficient and inequitable; it increases vehicle travel and traffic problems, and imposes unfair costs on people who drive less than average.

Figure 8 **Vehicle Costs** (Litman 2019)



About a quarter of vehicle costs are external (road and parking costs not currently paid by user fees, plus congestion, risk and pollution costs imposed on other people), and about a quarter are internal-fixed (vehicle financing, insurance, taxes and registration fees). This price structure is inefficient and unfair; it forces people who drive less than average to subsidize others who drive more than average.

More efficient pricing would reduce automobile travel by 30-50%, consisting of lower-value trips that users value less than the total costs they impose.

Because automobile travel imposes many costs including road and parking infrastructure, traffic services, congestion, crash risk, noise and pollution emissions, and sprawl-related costs it requires a variety of prices to internalize them, as summarized in the following table.

Table 5 **Optimal Transportation Pricing**

Type of Pricing	Optimal Prices
Fuel taxes	Fuel taxes recover roadway costs and emission damages.
Road tolls	Road user fees recover roadway costs and congestion impacts.
Efficient parking fees	Fees recover parking facility costs, with higher rates during peaks.
Distance-dased fees	Fixed vehicle fees, taxes and insurance premiums prorated by mileage
Transit subsidies	Transit fares are reduced as a second-best solution.

Because automobile travel imposes many costs, optimal pricing requires a variety of fees.

If optimal pricing is infeasible, subsidies for resource-efficient modes such as public transit can be justified on second-best grounds, to encourage shifts from driving in order to reduce congestion, crash and emission problems, and because non-auto modes tend to experience economies of scale, so as more people use them their unit costs decline.

Impacts. Underpricing increases automobile travel and suppresses non-auto travel. Planning based on underpriced driving increases automobile dependency and sprawl. For example, unpriced parking typically increases vehicle travel 10-30% and cuts non-auto mode shares in

half. A typical 100 employee office building would generate 80 vehicle trips if parking is unpriced, but only 60 vehicle trips if parking is efficiently priced. Planning that assume that parking will be unpriced requires more and higher traffic impact fees, which discourages infill development. Alternatively, planners could tell the developers, "You need 80 parking spaces if unpriced or 60 spaces if priced or cashed out, and that will also reduce your development impact fees by 20%."

The various types of automobile underpricing have cumulative and synergistic effects, together significantly increasing automobile dependency and sprawl. Current roadway underpricing (about 5¢ per vehicle-mile) increases automobile travel 5-10%. Current parking underpricing increases automobile travel 10-30%. Vehicle insurance and registration fee underpricing increases vehicle travel 10-15%. Considering all types of vehicle underpricing, efficient pricing could reduce vehicle travel 30-50%, consisting of economically-inefficient vehicle-miles that motorists value less than the total costs they impose.

Automobile underpricing also reduces walking, bicycling, ridesharing and public transit demands, and since those modes experience strong economies of scale, it reduces their efficiency. If roads and parking facilities are efficiently priced a community could justify more sidewalk and bikeway investments, and more transit services, and have more successful ridesharing services. The same pattern occurs with other types of pricing: current underpricing of roads, vehicle insurance and registration fees increases automobile dependency and sprawl compared with what would occur with efficient pricing.

Reforms. Several types of pricing reforms can help create to more equitable and efficient transportation systems including fuel tax increases to recover roadway costs and internalize pollution costs, variable road tolls to recover roadway and congestion costs, efficient parking pricing, plus distance-based vehicle insurance to more accurately internalize risk.

Transportation planning and modelling can recognize the effects of underpricing on travel demands. For example, rather than saying that, "Due to current demographic and economic trends, during the next decade automobile travel is predicted to increase by 30%," a planner could say, "Due to current demographic and economic trends, during the next decade automobile travel is predicted to increase by 10% with current pricing, 0% if road use is more efficiently priced, decline 10% if vehicle insurance is distance-based, and decline 30% if, in addition parking is efficiently priced."

11. Parking Minimums

Parking minimums in zoning codes require owners to provide a certain number of off-street parking spaces on their properties. Considering land, construction and operating expenses a typical parking space costs from about $500 annually for a basic surface space on low-value land, to more than $3,000 annually for high amenity structured parking. A typical community has three to six government-mandated parking spaces per vehicle, representing a large subsidy for motorists (Litman 2019; Grabar 2023).

Current practices. Most local jurisdictions require property owners to provide off-street parking facilities. These typically include one to two parking spaces per residential unit, and two to six parking spaces per 1,000 square feet of commercial space.

Impacts. These regulations increase parking supply, reduce parking prices (usually to zero), which increases automobile ownership and use, and associated traffic problems. By increasing the land required for a given amount of development they also increase sprawl. They eliminate property owners' incentive to support non-auto modes or TDM programs since those would result in costly parking facilities sitting unoccupied.

Reforms. Local governments can eliminate parking minimums or provide adjustment factors that significantly reduce them to reflect demands and encourage transportation demand management strategies and Smart Growth incentives (Gies, Hertel and Tully 2021).

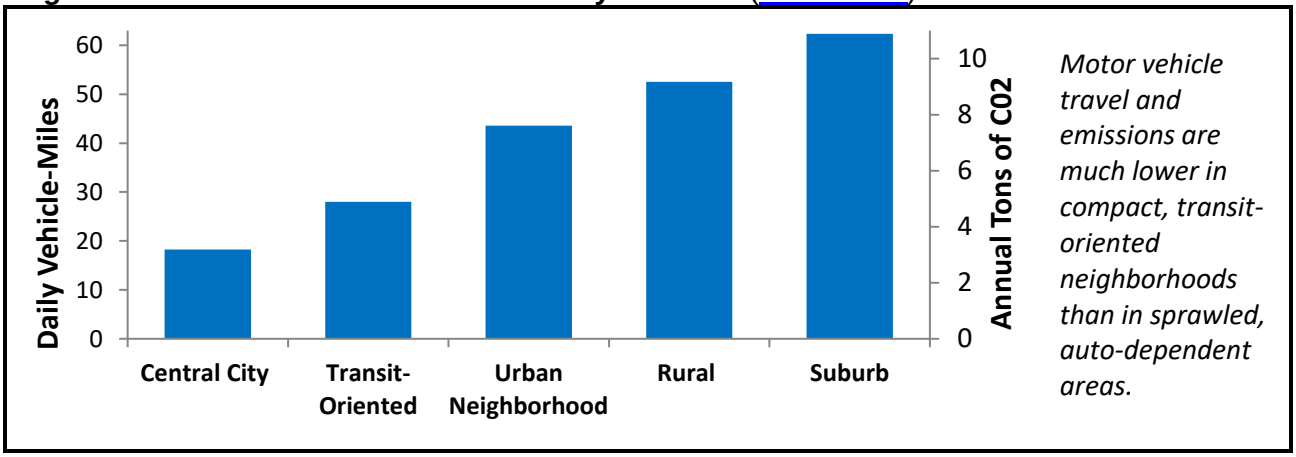
12. Sprawl-oriented Development Policies

Land use development patterns significantly affect how and how much people travel. Dispersed, segregated, sprawled development significantly increases automobile travel, and reduces non-auto accessibility and use compared with more compact, mixed development.

Current Practices. Most jurisdictions have policies that favor sprawl over compact infill (Litman 2014; Zuegel 2017). These include limits on development density and mix, restrictions on multifamily housing, setback requirements, plus development regulations and fees that are higher for infill than sprawled locations (Blais 2010). In most North American communities, the majority of residential land only allows low-density housing and prohibits commercial buildings. Parking mandates discourage infill development in areas with high land values. These policies discourage the type of compact, mixed development that allows residents to reduce their vehicle ownership and use, despite strong demand (NAR 2023). As a result, many households are forced to live in more automobile-dependent communities than they prefer.

Impacts. Residents of sprawled locations typically drive 20-60% more, and use non-auto modes much less than demographically equal people living in compact, multimodal neighborhoods. This increases transportation and sprawl-related costs.

Figure 9 **Household Vehicle Travel by Location** (Salon 2014)



Reforms. Smart Growth policies include upzoning, eliminating parking minimums, plus development fees that are lower for compact infill, reflecting their lower public costs.

Summary

The table below summarizes the twelve distortions identified in this study.

Table 6 **Twelve Common Transportation Planning Distortions**

Type of Distortion	Effects	Reforms
Elite bias. Policy makers and planners favor automobile travel and undervalue other modes.	Prioritizes automobile travel over other modes in policy, planning and investments.	Better analysis, guidance and tolls for multimodal planning. Include non-drivers in planning.
Industry influence. The substantial cultural and political influence by automobile and petroleum industries.	Increases popular and political support for policies that increase automobile ownership and use.	Analysis and control of excessive industry influence.
Transportation organization goals and practices. Agencies prioritize automobile travel and give little consideration to other modes.	Favors roadway expansions over improvement to other modes, and provides minimal support for transportation demand management.	Reform transportation organizations to be more comprehensive and multimodal, and to support TDM programs.
Inadequate non-auto data. Survey and travel data undercount non-auto travel and demands.	Underinvests in non-auto modes relative to their demands (including latent demands) and potential benefits.	More comprehensive travel data, including latent demands. Recognize data biases.
Mobility-based performance indicators (e.g., roadway level-of-service and travel time index).	Favors faster modes, higher roadway design speeds, and sprawl over compact development.	Consider other planning goals beside speed. Apply accessibility-based planning.
Biased travel models. Underestimate elasticities and induced vehicle travel.	Overinvests in roadway expansions and underinvests in alternatives.	Account for induced vehicle traffic in planning analysis.
Incomplete impact analysis. Overvalues speed and undervalues other community goals.	Favors faster modes and higher road design speeds over slower but more affordable and efficient options.	More comprehensive analysis, additional performance targets and more multimodal planning.
Dedicated funds for road and parking facilities, but not for other modes.	Favors automobile infrastructure over investments in other modes.	Least-cost transportation planning. Multimodal planning.
Non-auto underinvestment. Walking, bicycling and transit receive less than their share of funds and road space.	Makes walking, bicycling and public transit inconvenient, unsafe and expensive, reducing their use.	Multimodal planning. Targets for improving non-auto modes and increasing their use.
Automobile underpricing (unpriced roads, parking, risk, pollution, etc.)	Increases automobile travel and reduces non-auto travel demands.	More efficient pricing and more investments in non-auto modes.
Parking minimums. Local parking mandates increase off-street parking supply.	Increases automobile ownership and use, degrades walking conditions, and encourages sprawled development.	Reduce or eliminate parking mandates. More efficient parking management.
Sprawl-oriented development policies. Density restrictions and parking minimums.	Creates dispersed communities that increase travel distances and provide poor non-auto access.	Smart Growth policies that create more compact, multimodal communities.

Many common transportation planning distortions favor automobile travel and sprawl over more affordable, inclusive and efficient modes, and sprawl over compact, multimodal development.

Many of these categories overlap. For example, elite bias and industry influence encourage transportation agencies to prioritize automobile travel over other modes, use mobility-based analysis, dedicate funding to roads and parking facilities, underprice driving, and mandated parking. Their impacts tend to be synergistic. Similarly, parking minimums increases parking supply, which leads to underpricing, increases automobile travel, degrades non-auto access, and encourages sprawl, which in turn justifies more automobile-oriented planning.

These distortions contribute to the self-reinforcing cycle of automobile-dependency and sprawl described in the Introduction. The results are often self-fulfilling: automobile-oriented planning creates automobile-dependent, sprawled communities where residents must drive more to access services and activities. Conversely, multimodal planning creates more accessible communities where residents drive less and rely more on affordable, resource-efficient modes.

Consider how these distortions affect a common transportation activity, children's travel to school, as summarized in the table below. Together these distortions increase automobile dependency and sprawl, causing walking and bicycling to be less convenient and safe, and automobile travel to be more common, than parents and students prefer.

Table 7 **School Transportation Planning Distortions**

Type of Distortion	Effects
Elite bias	Favors automobile-oriented school transport planning.
Industry influence	Favors automobile-oriented school transport planning.
Transportation agency goals and practices	Favors driving over walking and bicycling to school.
Inadequate non-auto data	Undervalues walking and bicycling improvements.
Mobility-based performance indicators	Favors driving over other modes, and traffic speed over other goals.
Biased travel models	Favors automobile-oriented school transport planning.
Incomplete impact analysis	Favors traffic speed increases over other planning goals.
Dedicated road and parking facility funds	Favors road and parking expansion over other travel improvements.
Non-auto underinvestment	Underinvests in walking, bicycling and public transit.
Automobile underpricing	Increases automobile travel demands, justifying roadway expansions.
Parking minimums	Encourages auto travel, and by increasing school land requirements, encourages sprawl.
Sprawl-oriented policies	Increases distances between homes and schools, reducing walkability.

These planning distortions favor driving over other forms of school transportation, and sprawl over compact, development. Together they make non-auto travel difficult and dangerous, and increase driving.

These distortions are unfair to travellers who cannot, should not or prefer not to drive, and are costly to motorists who must spend more time and money chauffeuring non-drivers. Reforms that result in more comprehensive and multimodal planning, which invests in non-motorized to the degree justified for fairness and efficiency, can provide large savings and benefits.

Planning Trends and Critiques

This section provides a timeline of automobile planning trends and critiques.

1910-1960s – Automobile-Oriented Planning Practices

During this period, highway planning and construction methods, highway agencies, roadway funding and parking minimums developed to efficiently deliver automobile infrastructure (Brown, Morris and Taylor 2009). Governments also developed public transit agencies but gave them minimal resources. Since vehicle travel and suburban development increased steadily during this period, it made sense to expand roadways to serve growing demands, and it seemed sensible to overbuild in anticipation of future needs. For example, if during this period traffic volumes warranted one traffic lane, a highway engineer could justify building two in anticipation of future growth. There was little concern that these practices would create a self-reinforcing cycle of automobile dependency and sprawl that results in excessive vehicle travel.

Some highway projects faced opposition, called "freeway revolts" (Brinkman and Lin 2019). The Transportation Research Board responded with a report, *Beneficial Effects Associated with Freeway Construction* (Gamble and Davinroy 1978) which claimed that freeways improve safety, environmental quality, productivity and aesthetics. In response to criticism, governments started to require environmental impact statements to identify mitigation strategies, but these seldom involved halting highways and applying TDM solutions.

1960-2000 – General criticism of automobile-oriented planning

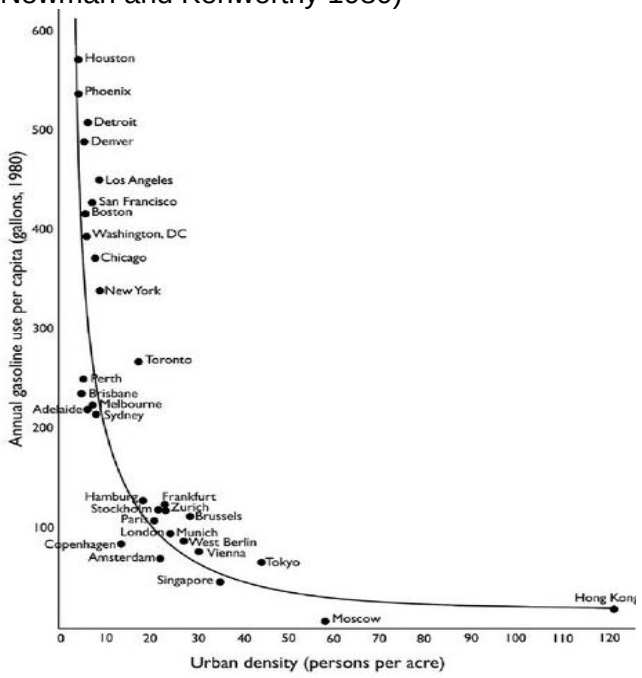
During this period, popular books criticized automobile-oriented planning practices (Holtzclaw Kay 1997; Mumford 1963). A few studies estimated the costs of automobile transportation and sprawl (Burchell, et al. 1998; Delucchi 1996).

1989-2020 – Detailed criticisms

In 1989 researchers Peter Newman and Jeffrey Kenworthy published their seminal book, "*Cities and Automobile Dependence: An International Sourcebook*, which provided results from a major study of the relationships between transportation planning, vehicle travel, and outcomes such as per capita energy consumption and crash rates (Newman and Kenworthy 1989 and 2021). Their database has been updated (UITP 2000).

Subsequent studies examined the factors that contribute to automobile dependency and the problems that result (Goodwin 1995; Handy 2020; Mattioli, et al. 2020). The report, *Raising Automobile Dependency: How to Break the Trend?* (Kodukula 2011) examines impacts in developing countries. The International Transport Forum study, *Reversing Car Dependency* (ITF 2021), described policies for more multimodal transportation. Some studies quantify

Figure 10 **Gasoline Use Versus Density**
(Newman and Kenworthy 1989)



"Cities and Automobile Dependency" analyzed relationships between density, vehicle travel, energy consumption and emissions. Its results are widely cited.

various costs of automobile dependency and sprawl (Ewing and Hamidi 2014; Litman 2014), and some agencies developed standard cost values for transportation planning (ATAP 2017; Caltrans 2020; DfT 2020; EVIDENCE 2014; Waka Kotahi 2021).

These studies indicate that compared with compact, multimodal communities, automobile-dependent, sprawled area residents (Ewing and Hamidi 2014; Litman 2019; Ricardo-AEA 2014):

- Drive two to four times as many annual vehicle-miles.
- Spend about twice as much of their household budgets on transportation.
- Have higher housing foreclosure rates.
- Have access to fewer jobs, longer duration commutes, and spend more time travelling.
- Have larger disparities in access and opportunity between drivers and non-drivers.
- Are less economically productive.
- Spend more time and money chauffeuring non-drivers.
- Require more costly public infrastructure and services (roads, utility lines, emergency services, etc.).
- Have much higher traffic death rates.
- Are more likely to be sedentary, overweight, have associated health problems and shorter lifespans.
- Consume more energy and produce more pollution emissions.
- Consume more land for housing, roads and parking facilities, and displace more openspace.

Some recent publications examine specific planning biases that increase automobile dependency and sprawl (Butner and Noll 2020). For example, Professor Gregory Shill (2019) has published critiques of legal practices, and analyst David Zipper (www.davidzipper.com) has published articles critiquing policy biases that contribute to automobile dependency and sprawl. Cleveland (2023) identified how "institutional intercurrence" (contradictions within planning objectives) contributes to automobile dependency.

2010-Present – Vehicle travel reduction targets

Starting late in the Twentieth Century some transportation agencies started to implement TDM programs to reduce urban traffic volumes (WSDOT 2022). U.S. federal transportation funding laws, from ISTEA in 1991 to the FAST Act in 2015, increasingly allowed some federal funds to be shifted from highways to non-auto modes if justified to reduce congestion and pollution. However, most of these efforts focused on specific urban corridors, and highways and parking facilities continue to receive the majority of investments.

Recently, some jurisdictions have established general vehicle travel reduction targets, which explicitly recognize that current levels of vehicle travel are excessive and should be reduced (Caltrans 2020; WSL 2008). The European Union requires all cities to establish Sustainable Urban Mobility Plans (SUMPs) to reduce excessive vehicle travel and increase use of resource-efficient modes (Eltis 2012). These policies are a catalyst for more multimodal planning and TDM incentives in order to achieve diverse goals including affordability, social equity, public fitness and health, traffic safety, community livability, reducing sprawl costs, and responding to growing consumer demands for non-auto travel.

Evaluating Planning Distorition Justifications

This section critically evaluates arguments used to justify current planning distortions.

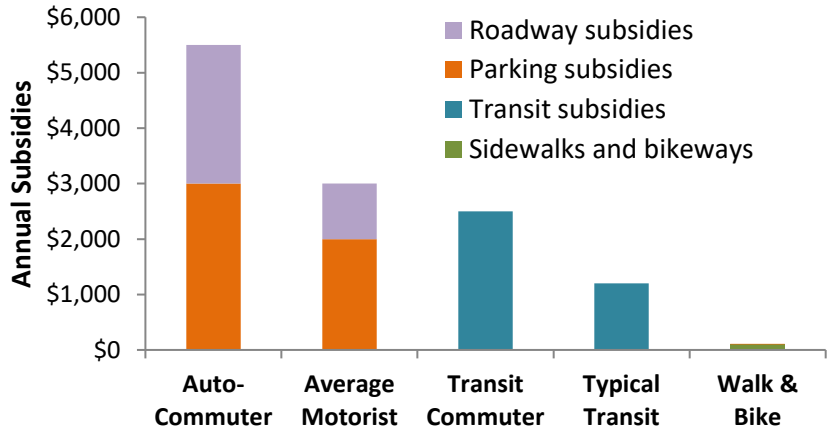
Auto-Oriented Planning Reflects Consumer Preferences

Some people argue that automobile-oriented planning responds to consumer preferences for driving over other travel options. Certainly, consumer sovereignty is an important planning principle, but their true preferences can only be determined if consumers have diverse travel options and efficient pricing that tests their willingness to pay the higher costs of automobile transportation. There is abundant evidence of significant latent demand for non-auto travel, and experience shows that travellers often shift from driving to non-auto modes when they are convenient, comfortable and affordable (Litman and Pan 2023).

Equal Distortions Favor Non-Auto Modes

Automobile advocates sometimes argue that planning distortions favoring driving are offset by equal distortions favoring non-auto modes. As examples, they describe public transit subsidies, plus bikeway investments. However, these are small compared with automobile subsidies. Most commuting occurs in large cities where expanding roads and parking facilities is particularly costly. Although transit subsidies are relatively large when measured per passenger-mile, motorists travel more annual miles and so usually receive larger annual subsidies, as illustrated below. A typical non-driver who relies on a combination of non-auto modes requires far lower annual subsidies than a typical motorist.

Figure 11 **Annual Subsidies by Mode** (Litman 2019)



Commuters who drive daily on urban highways require thousands of dollars in annual roadway and parking subsidies. Average motorists who seldom drive under urban-peak conditions impose lower infrastructure costs. Daily transit commuters also require significant subsidies, but typical transit users who often travel off-peak impose lower costs. Walking and bicycling require minimal subsidies.

Equity Goals

Advocates sometimes claim that automobile-oriented planning supports social equity goals by making driving more affordable. However, distortions that increase automobile dependency and sprawl tend to harm disadvantaged groups overall by reducing affordable and inclusive travel option, and forcing people who drive less than average to subsidize higher mileage motorists. Improving affordable modes, more affordable housing in walkable neighborhoods, and targeted discounts and subsidies to lower-income travellers are more effective at achieving equity goals.

Table 8 **Automobile Dependency Equity Impacts**

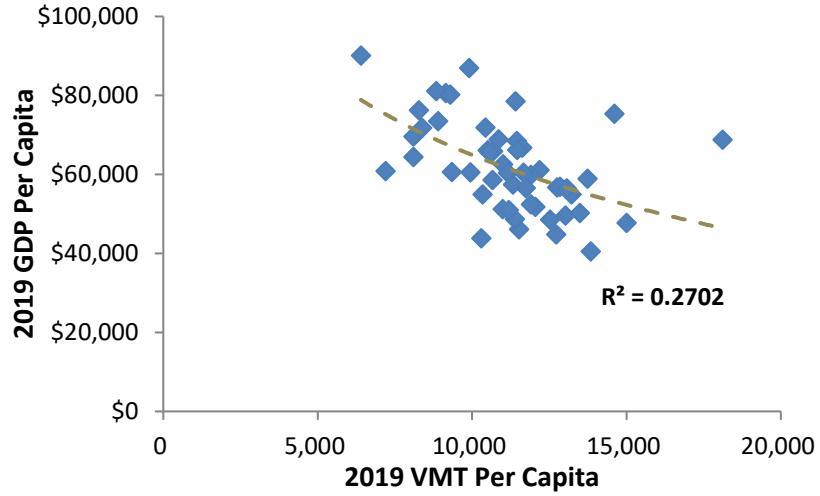
Benefits	Harms
	• Residents who bear higher costs for sprawl infrastructure. • Urban residents who bear traffic risk, noise and pollution. • Travellers who value non-auto mode health benefits. • Children, youths and seniors. • Motorists burdened by chauffeuring responsibilities.
• Contented lower-income motorists. • Contented motorists with disabilities	• Lower-income motorists who prefer affordable modes. • Motorists with disabilities who prefer affordable modes.

Automobile dependency and sprawl benefit people who are contented to lead automobile-dependent lives but are burdensome and unfair to non-drivers, motorists who want to reduce their vehicle expenses and chauffeuring burdens, and urban residents who bear external traffic costs.

Economic Development Benefits

Advocates often claim that automobile improvements, such as highway expansions and parking subsidies, support economic development. Certainly, the first paved highways that serve an area tend to increase economic productivity and development, but once a basic road network exists expanding its capacity provides diminishing benefits. Automobile dependency and sprawl tend to reduce productivity by increasing costs and reducing agglomeration efficiencies (Litman 2014; Melo, Graham and Noland 2009). Among U.S. urban regions there is a negative relationship between per capita vehicle travel and economic productivity, as illustrated below, indicating that the high rates of vehicle travel that occur in North America are economically harmful.

Figure 12 **Per Capita GDP and VMT for U.S. States (FHWA 2019)**



Per capita economic productivity tends to increase as vehicle travel declines. (Each dot is a U.S. state.)

This suggests that more compact and multimodal urban regions tend to be more economically productive than sprawled, automobile dependent regions.

Conclusions

Transportation planning decisions impact our lives and communities in many ways. They affect how we spend our time and experience the world, our economic and social opportunities, our household budgets, and the costs we impose on other people. Transportation planning should optimize for all of these factors.

To be efficient and equitable, transportation planning should reflect the principles of consumer sovereignty, fair resource allocation, efficient pricing, comprehensive analysis, and accessibility-based planning. Common planning practices violate these principles. These distortions cause a disconnect between the transportation system that users want and what transportation agencies deliver. These distortions tend to overvalue and overinvest in automobile infrastructure, undervalue and underinvest in other modes, and disperse development. These reduces non-auto travel options and increases the distances that people must travel to reach services and activities, which in turn increases vehicle travel and reduces non-auto travel compared with what would occur with more comprehensive and neutral planning.

Table 9 **Transportation Planning Principles**

Principle	Description	Common Distortions	Reforms Needed
Consumer sovereignty	Planning responds to consumer demands.	Planning favors automobile travel over other modes.	Consider non-auto demands, including latent demands.
Fair share planning	All travellers receive comparable shares of public resources.	Transportation funding favors roads and parking facilities over non-auto infrastructure.	More multimodal planning and investments.
Efficient pricing	Prices reflect marginal costs and recover infrastructure costs.	Roads, parking and vehicle insurance are underpriced, and fail to reflect external costs.	Efficient fuel taxes, road tolls, parking and emission fees.
Comprehensive planning	Individual, short-term decisions should support strategic, long-term goals.	Planning decisions are often fail to reflect total impacts and strategic goals.	More comprehensive analysis of impacts, including currently overlooked planning goals.
Accessibility-based analysis	Evaluate transport system performance based on accessibility not mobility.	Current performance indicators and targets reflect mobility rather than accessibility.	Shift from mobility-based to accessibility-based analysis and performance indicators.

To be efficient and fair transportation planning should reflect these five principles. Several distortions are common and should be reformed to better achieve community goals.

Planning distortions are inefficient, they increase many costs to individuals and communities including the time and money people spend travelling, public infrastructure costs, crashes, chauffeuring burdens, and environmental damages. They are also unfair, particularly to people who cannot, should not or prefer not to drive. Automobile dependency and sprawl ratchet up the costs of living, causing many responsible, hard-working families to experience financial stress. These distortions tend to be regressive, they harm disadvantaged people by reducing the quality of affordable and inclusive modes, and the availability of affordable housing in multimodal neighborhoods.

Although individually these distortions may seem modest and justified, their impacts are cumulative and synergistic, resulting in far less transportation diversity, and far higher costs than what travellers and communities prefer. For example, underpriced parking not only increases parking costs, by increasing total vehicle ownership and use it also increases traffic congestion, accidents, pollution emissions and sprawl compared with what would occur with efficient pricing, while underpricing road use, by increasing vehicle trips, increases parking costs. Market distortions favoring automobile travel and sprawl tend to reduce travel options and land use accessibility, which harms non-drivers and reduces transport system efficiency. Underpricing encourages driving for trips when alternatives are more efficient overall.

Optimal travel activity is what people would choose if planning reflected these principles. Analysis in this report suggests that correcting these distortions would reduce automobile travel by 30-50%, and significantly increase non-auto travel. Motorists also benefit from reduced traffic and parking congestion, increased safety and reduced chauffeuring burdens. Many transport problems are virtually unsolvable without the planning reforms recommended here.

This analysis is not anti-car; driving has important roles to play in an efficient and equitable transportation system. However, current vehicle travel is excessive, including many trips that would shift to more affordable and efficient modes, given better options and incentives. With more comprehensive and multimodal planning people would choose to drive less, rely more on walking, bicycling and public transit, spend less time and money on driving, and be better off overall as a result.

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