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"Efficiency - Equity - Clarity"

Transportation Cost Analysis for Sustainability

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Abstract
Transportation decisions are affected by the distribution of costs. Consumers are most influenced by internal, variable costs. Transportation planners and policy makers are most influenced by direct market costs because they are easiest to measure. Fixed, non-market and indirect costs tend to be undervalued, which can lead to economic inefficiency and inequity. This article summarizes current research on total North American roadway transportation costs, including non-market environmental and social costs. The results indicate that automobile use is significantly underpriced, resulting in overconsumption and inefficient use of resources. The implications on sustainability criteria (economic efficiency, equity, environmental impacts, and land use patterns) are discussed. Recommendations are provided for incorporating total costs analysis in transport planning and policy analysis for better decision making.

Introduction

A sustainable economy emphasizes efficient use of natural resources, sensitivity to environmental and social constraints, and fairness, including to people living in distant places and times.[1] Unlike neoclassic economics, sustainable economics does not strive for ever increasing consumption, but rather for *sufficiency*. Sustainable economics is concerned with market failures that create wasteful consumption practices and fail to account for long-term impacts. This has significant implications for transportation decision making since transport activities tend to be highly consumptive of resources, seldom meet all criteria required for an efficient market (prices reflecting full marginal costs, competition among suppliers, consumer choice, equal treatment of all participants), and frequently distribute benefits and costs inequitably.

Conventional transport planning emphasizes increasing traffic capacity and speeds. This results, in part, from dedicated funding and institutional incentives for road improvements based on engineering criteria, rather than comprehensive economic analysis (transport engineers are seldom rewarded for proving that a highway project or a new bridge is *not* justified). Sustainable transport planning incorporates a broader range of goals, including long-term economic efficiency, equity, and environmental and social enhancement.[2]

Transport sustainability can be evaluated with respect to "automobile dependency," which is defined as transport and land use patterns that increase automobile ownership and use, reduce travel choices, and disadvantage non-drivers relative to drivers.[3] Many communities are increasingly automobile dependent, and marginal benefits from increased automobile use are diminishing. Transportation decisions should be assessed based on their overall impacts on transport system and land use patterns.

Economic analysis has much to contribute to sustainable transport planning. It can help define issues, assess benefits and costs, and identify policies that achieve sustainability goals. Several recent studies have estimated the magnitude and distribution of total transport costs.[4] We incorporate these estimates into a framework suitable for policy analysis and planning. The results demonstrate that total cost analysis can be applied to a broad range of transport decisions, including those related to sustainability goals.

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[1] Timothy Beatley, "The Many Meanings of Sustainability," *Journal of Planning Literature*, Vol. 9, No. 4, May, 1995, pp. 339-342; Herman Daly and John Cobb, *For the Common Good*, Beacon (Boston) 1989.

[2] *Towards Sustainable Transportation*, proceedings of OECD conference held March 1996 in Vancouver, BC; *Sustainable Transport; Priorities for Policy Reform*, World Bank (Washington DC), 1996; *Toward a Sustainable Future*, the Transportation Research Board (Washington DC), Special Report 251, 1997; Reid Ewing, "Measuring Transportation Performance," *Transp. Qrly*, Vol. 49, No. 1, 1995, pp. 91-104.

[3] Peter Newman and Jeffrey Kenworthy, *Cities and Automobile Dependency*, Gower Press, 1989.

[4] Examples of recent transportation cost studies include Todd Litman, *Transportation Cost Analysis; Techniques, Estimates and Implications*, Victoria Transport Policy Institute (Victoria), 1996; MacKenzie, et al. *The Going Rate*, World Resources Institute (Washington DC), 1992; Mark Delucchi, *Annualized Social Cost of Motor Vehicle Use in the United States, Based on 1990-1991 Data*, Institute of Transportation Studies (Davis), 1996-97.

Costs Categories

Since this article explores costs and costing, it is important to define these terms. In formal economics *cost* is defined as "benefits foregone." *Cost* refers to tradeoffs that individuals and society must make between use of resources. This can involve money, time and other resources, or the loss of any potential benefit. For example, time spent traveling is a cost in terms of the opportunity to use that same time in other activities. This same concept applies to tradeoffs between transport investments and other possible expenditures, between roads and other land uses, and between transportation activities and environmental protection. What non-economists call "problems" economists describe as "costs." For example, if a community experiences growing parking, traffic accident and air pollution problems due to increased driving, economists could state that "Driving imposes marginal parking, accident and air pollution costs."

To apply costs theory to specific applications it is necessary to quantify all costs using a common metric. Economists find that using monetary units for all costs and benefits is best because such universal units are easy to transfer from one application to another. In recent years methods have been developed for monetizing (measuring in monetary units) non-market costs such as travel time,[5] accident risk,[6] and environmental impacts.[7] Although there are still theoretical and methodological challenges, a growing body of research is now available to draw on for preliminary estimates of some non-market costs.

The magnitude, distribution and perception of costs are all important for economic evaluation. Important distinctions include:

1. *Internal and External Costs*

   Costs can be divided between *internal* (also called *user*) and *external* (also called *social*) costs. Internal costs are borne directly by the good's consumer. External costs are borne by others. Some costs such as traffic congestion and accident risk are external to individual users but largely borne by the sector (group) as a whole. Whether such costs are considered "internal" depends on perspective. If the only concern is group-level equity, as is common in political conflicts ("Our group shouldn't be forced to subsidize another group."), then costs need only be internalized at the sector level. If the concern is a more rigorous definition of equity ("One individual shouldn't be forced to subsidize another individual"), or economic efficiency ("People tend to squander resources that they get for free."), then costs must be internalized at the individual level. Since economic efficiency is usually a consideration in transportation decision making, externalities should usually be defined at the individual level.

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[5] *The Value of Travel Time in British Columbia*, British Columbia Ministry of Transportation and Highways (Victoria, B.C.), November 1994.

[6] Frank Haight, "Problems in Estimating Comparative Costs of Safety and Mobility," *Journal of Transport Economics and Policy*, January 1994, p. 14-17.

[7] Ismail Seregeldin and Andrew Steers, *Valuing the Environment*, World Bank (Washington DC), 1994; Nick Hanley and Clive Spash, *Cost-Benefit Analysis and the Environment*, Edward Elgar (Brookfield), 1993; David James, *The Application of Economic Techniques in Environmental Impact Assessment*, Kluwer, Boston. (1994).

External costs can be internalized if users adequately compensate those on whom the cost is imposed, or pay a tax of equivalent value. Road user fees (fuel taxes, vehicle registration fees and tolls) internalize some costs, but are much less than total external costs.[8] The automobile industry has published reports claiming that motorists pay more than their share of costs.[9] However, these studies violate standard cost allocation principles by including all taxes paid by motorists (rather than just special user charges),[10] and consider only highway construction costs, ignoring local roadway costs and all other external costs associated with motor vehicle use. Virtually all studies that use appropriate economic analysis procedures conclude that motorists significantly underpay the costs they impose on society.

2. *Variable and Fixed Costs*
Variable costs, such as fuel, travel time and accident risk, are proportional to vehicle use. Fixed costs such as depreciation, insurance, and registration do not vary with use. The distinction between fixed and variable often depends on the perspective and time horizon. For example, depreciation is often considered a fixed cost because car owners make the same payments no matter how many miles a year they drive; but a car's operating life and resale value are affected by how much it is driven, so depreciation is partly variable.

3. *Perceived and Actual Costs*
There is often a difference between perceived and actual automobile costs. Users tend to be most aware of immediate costs such as travel time, stress, parking fees, fuel, and transit fares, while costs that are only paid occasionally, such as insurance, registration, and maintenance are often underestimated.[11] Some costs tend to be ignored by users altogether, such as parking subsidies and external environmental impacts.

4. *Market and Non-Market Costs*
Costs can also be divided between *market* and *non-market*. Market costs involve goods that are regularly traded in a competitive market, such as land, cars, and gasoline. Non-market costs involve goods that are not regularly traded in markets such as clean air, accident risk, and quiet. Although many non-market goods have significant value, they are often ignored or underestimated compared with market costs.

5. *Direct and Indirect Costs*
A fifth consideration is the degree to which costs are *direct* or *indirect*. Quantifying indirect costs and benefits requires an understanding of the various steps connecting an activity with its ultimate impacts. Whether an activity imposes an indirect cost can be determined using a "*with and without*" test.[12] The difference in impacts with and without a project or policy are considered a result of that project or policy.

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[8] *1997 Federal Highway Cost Allocation Study*, USDOT (www.ota.fhwa.dot.gov/hcas/final).
[9] For example, Royola Dougher, *Estimates of the Annual U.S. Road User Payments Versus Annual Road Expenditures*, American Petroleum Institute (Washington DC), 1995; Z. A. Spindler, *Automobiles in Canada; A Reality Check*, Canadian Automobile Association. (Ottawa), 1997.
[10] Urban Institute, *Rationalization of Procedures for Highway Cost Allocation*, Trucking Research Institute (Washington DC), 1990.
[11] Cy Ulberg, *Psychological Aspects of Mode Choice*, Washington State Department of Transportation, (Olympia), 1989, p. 20.
[12] van Kooten, *Land Resource Economics and Sustainable Development*, UBC Press (Vancouver) 1993, p. 86.

Table 1 **Transportation Cost Categories**

Cost	Definition	Internal/ External	Fixed/ Variable	Market/ Non-Market
1. Vehicle Ownership	Vehicle expenses that are not proportional to the amount that the vehicle is driven.	Internal	Fixed	Market
2. Vehicle Operation	User expenses that are proportional to vehicle use.	Internal	Variable	Market
3. Operating Subsidies	Vehicle expenses not paid by the user.	External	Fixed	Market
4. User Travel Time	Time spent traveling.	Internal	Variable	Non-Mkt
5. Internal Accident	Vehicle accident costs borne by users.	Internal	Variable	Non-Mkt
6. External Accident	Vehicle accident costs not borne by users.	External	Variable	Non-Mkt
7. Internal Parking	Parking costs borne by users.	Internal	Fixed	Market
8. External Parking	Parking costs not borne by users.	External	Fixed	Market
9. Congestion	Increased delay, vehicle costs and stress an additional vehicle imposes on other road users.	External	Variable	Non-Mkt
10. Road Facilities	Road construction, maintenance and operating expenses not borne by road users.	External	Variable	Market
11. Roadway Land Value	Opportunity cost of land used for roads.	External	Variable	Non-Mkt
12. Municipal Services	Public services devoted to vehicle traffic.	External	Variable	Market
13. Equity & Option Value	Reduced travel choices, especially for disadvantaged people.	External	Variable	Non-Mkt
14. Air Pollution	Costs of motor vehicle emissions.	External	Variable	Non-Mkt
15. Noise	Costs of motor vehicle noise.	External	Variable	Non-Mkt
16. Resource Consumption	External costs resulting from the consumption of petroleum and other natural resources.	External	Variable	Non-Mkt
17. Barrier Effect	The disamenity motor traffic imposes on pedestrian and bicycle mobility. Also called “severance.”	External	Variable	Non-Mkt
18. Land Use Impacts	Economic, environmental and social costs resulting from low density, automobile oriented land use.	External	Variable	Non-Mkt
19. Water Pollution	Water pollution and hydrologic impacts from motor vehicles and roads.	External	Variable	Non-Mkt
20. Waste Disposal	External costs from motor vehicle waste disposal.	External	Variable	Non-Mkt

This table summarizes the definitions and distribution of transportation costs that have been identified in our research.

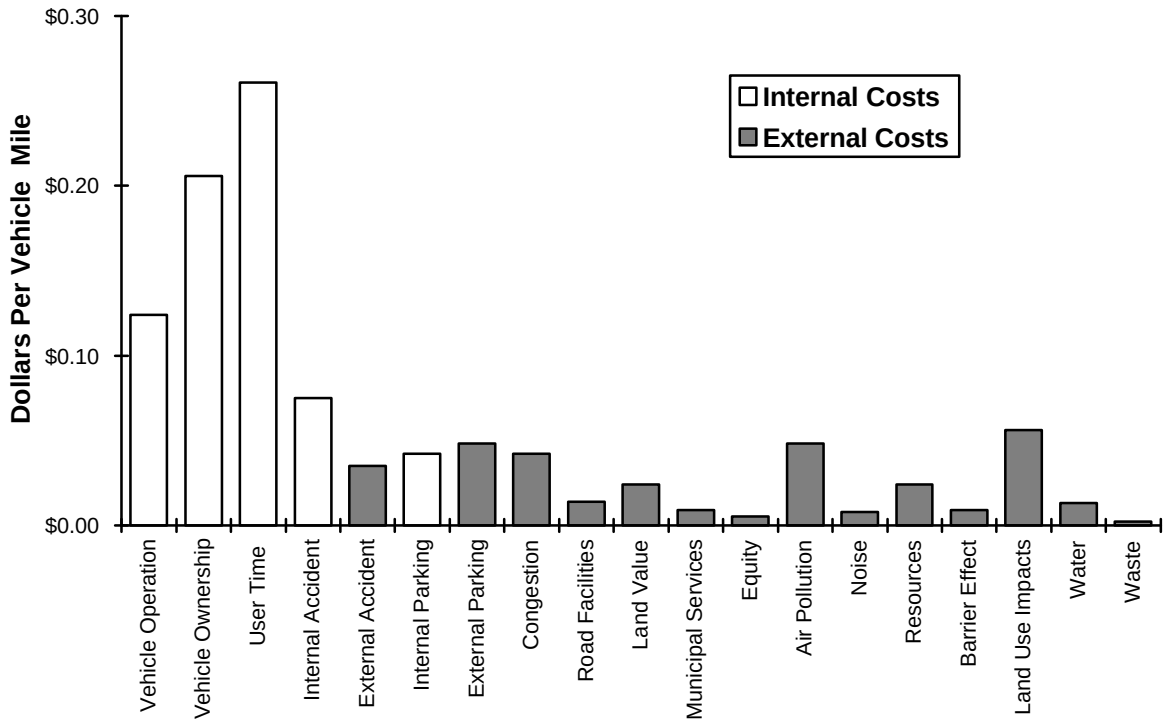
Our research identified twenty categories of transport costs, as summarized in Table 1. How a cost is distributed and perceived determines how it affects private and public decisions. Consumers are most affected by costs that are internal, variable, direct and short-term. Public agencies tend to focus on direct market costs since they are easiest to measure. External, fixed, long term, non-market and indirect costs tend to be undervalued. Many costs of driving have these features, which skews users and society’s transportation decisions, resulting in economic inefficiency, inequity, and unsustainability.

Cost Estimates

Our research involves summarizing existing estimates for each of the twenty costs defined above for eleven modes under three travel conditions to provide average estimated costs per unit of passenger travel in North America. Some of these costs, such as vehicle ownership and operating expenses, are widely recognized and estimates are readily available. Other costs are less obvious and fewer existing estimates are available. For example, the Barrier Effect refers to the disamenity motor vehicle traffic imposes on the mobility of pedestrians and bicyclists. Although it is easy to demonstrate that this cost exists, it has seldom been quantified.

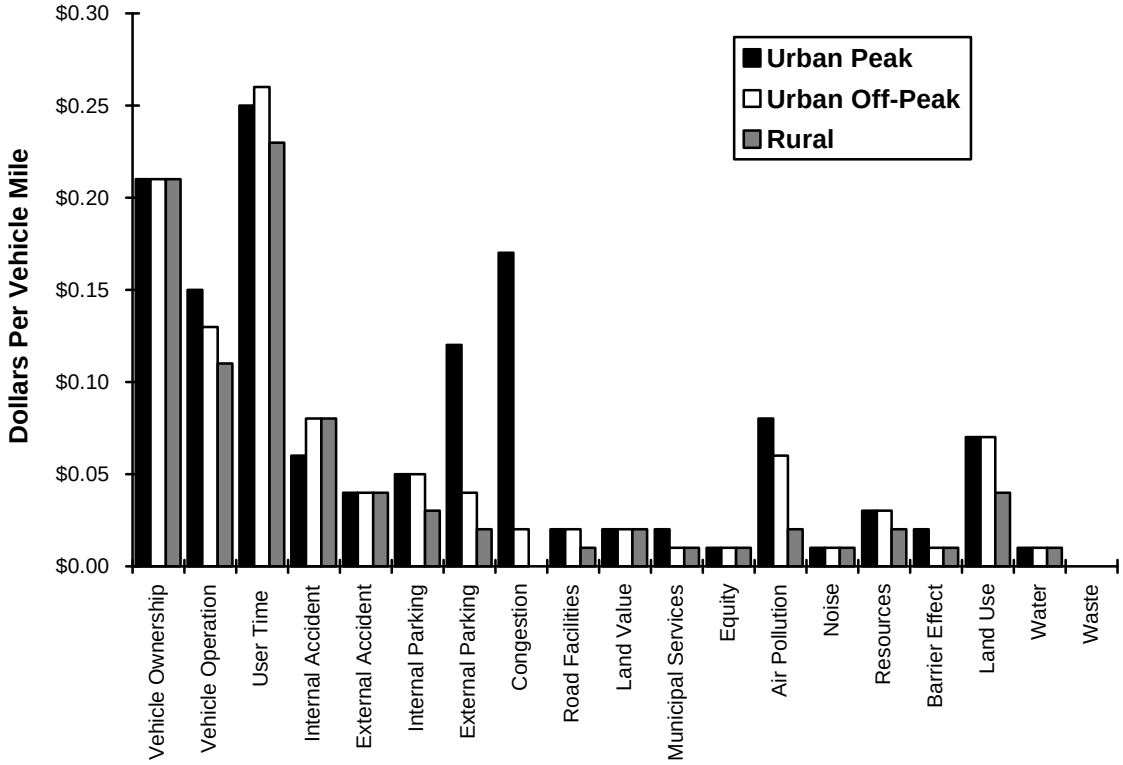
Developing estimates of these costs for use in our framework required using information from other disciplines, including environmental studies and urban economics. In some cases we found existing estimates that could be converted for our use. In a few cases we were forced to develop our own estimate based on indirect data. This is particularly true of the categories "Equity and Option Value" and "Land Use Impacts" for which there is little quantifiable research specific to transportation, despite considerable qualitative evidence that society recognizes these to be significant "problems" (i.e. costs). Our "Best Guess" estimates for typical U.S. travel conditions are illustrated in figures 1-3.

Figure 1 **Costs Per Vehicle Mile for Average Automobile**



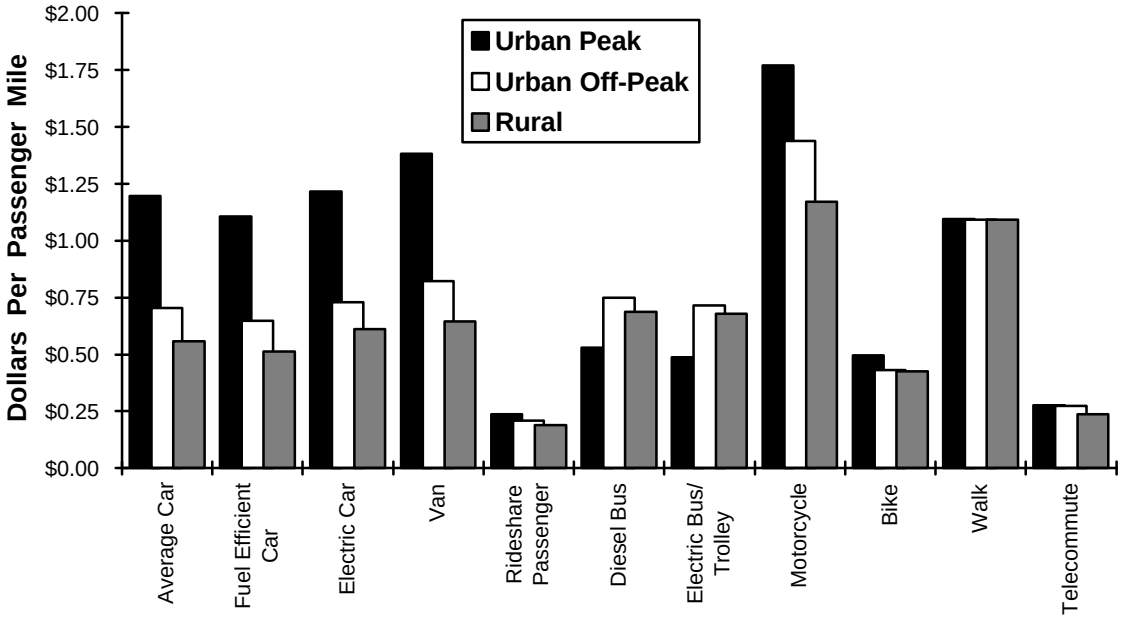
This shows average costs per mile and indicates which costs are primarily external.

Figure 2 **Automobile Costs Under Three Travel Conditions**



Some costs vary between urban peak, urban off-peak and rural travel conditions.

Figure 3 **Total Costs Per Passenger Mile for Eleven Modes**



This graph compares total costs of each travel mode under the three travel conditions.

Implications of Transportation Underpricing

There is a vivid vocabulary to describe overpricing. A person who charges too much is said to "gouge," "gyp," or "fleece." It is easy to demonstrate that overpricing reduces economic efficiency, and tends to be inequitable, so criticizing overpricing is a favorite issue for economists and policy analysts. Countless political campaigns, policy debates, and programs focus on eliminating overpricing. Underpricing causes similar problems. It leads to economic inefficiency and inequity. But we are unlikely to hear a popular cry, *"Raise my prices, please."* Underpricing may be acknowledged as a problem in theory, but because impacts are indirect and dispersed they are often unrecognized and ignored. Specific impacts of transport underpricing are discussed below.

Economic Efficiency

A basic tenet of market theory is that economic efficiency is maximized when prices (defined as *perceived, internal, variable costs*) reflect total marginal costs. The estimates cited above indicate that motor vehicle use is significantly underpriced compared with total costs imposed on society. About 1/3 of total transport costs are external (Table 2). In other words, user costs would need to increase 50% to internalize all costs.

Table 2 **Average Automobile Costs as a Percent of Total Costs**

	Total Costs	Internal Costs		External Costs	
Units	**per mile**	**per mile**	**% of Total**	**per mile**	**% of Total**
Urban Peak	$1.32	$0.71	54%	$0.61	46%
Urban Off-Peak	$1.05	$0.71	68%	$0.34	32%
Rural	$0.84	$0.64	76%	$0.20	24%
Weighted Average	*$0.99*	*$0.67*	*68%*	*$0.32*	*32%*

On average, about one-third of the costs of driving are external.

Externalized costs are not the only cause of underpricing. Many vehicle costs are fixed, which further reduces the ratio between prices and total costs. Due to these fixed costs, average vehicle costs per mile decline with increased use, so vehicle owners have an incentive to maximize driving "to get their money's worth." Only about 35% of vehicle expenses (i.e., market costs) are variable, representing only about 13% of total driving costs (i.e. including both market and nonmarket costs). Each dollar spent on vehicle operating costs imposes on average $2.60 worth of external costs. Vehicle owners pay fixed and external costs no matter how much or little they drive, which reduces the incentive to limit driving to high value trips.

To put this another way, automobile owners receive only a small portion of the total savings they produce by reducing their driving. For example, under urban peak period travel conditions, automobile driving imposes external costs averaging $0.55 per mile, while bus riders external costs average only $0.18 per mile,[13] resulting in external cost

[13] Todd Litman, *Guide to Quantifying Transportation Demand Management Benefits*, Victoria Transport Policy Institute (Victoria), 1995.

savings of $7.40 for a typical 20 mile round trip commute day shifted from driving to public transit. But these savings are not returned to the consumer. Driving often costs a car owner less than bus fare, despite the higher total cost of automobile use, due to the large portion of fixed and external costs. This underpricing reduces the incentive for individuals to use the cheapest overall travel option for any particular trip.

Although underpricing of such a common consumer good may appear beneficial from a narrow perspective (and indeed benefits many individuals in the short term), mispricing reduces overall economic efficiency. External costs are not eliminated, they show up elsewhere, as higher prices for commercial goods (for parking subsidies), increased local taxes (to pay for road services), increased injury and illness (from pollution and accidents), and lower residential property values (from urban traffic). Underpricing creates automobile dependency which reduces the efficiency of other travel modes.

This is not to say that driving would cease if costs were internalized and marginalized. Automobile users would be willing to pay a higher price for some trips. However, a significant portion of driving has relatively low value to the user, either because the trip itself provides little net benefit or because alternative modes exist. Increasing prices to reflect a greater portion of total costs would reduce low value driving, improving overall transport system efficiency.

A number of transportation price reforms could reduce current distortions that encourage excessive automobile travel.[14] For example, making automobile insurance a variable cost could reduce driving by about 10%.[15] Offering employees cash payments as an alternative to free parking typically reduces automobile commuting by 20-40%.[16] A comprehensive package of state level tax and price shifts is predicted to reduce total driving by 35%.[17]

How does underpricing affect economic development? Low transport *costs* increase economic efficiency and productivity, leading to economic development, but transport *underpricing* has the opposite effect, since it increases total transportation costs. Most claimed benefits of underpricing are really economic transfers, in which one group benefits at another's expense.[18] There is no evidence that automobile expenditures provide greater economic benefit than other consumer purchases.[19]

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[14] *Win-Win Transportation Management Strategies*, Victoria Transport Policy Institute (Victoria), 1998.
[15] Todd Litman, "Distance-based Vehicle Insurance as a TDM Strategy," *Transportation Quarterly*, Vol. 51, No. 3, Summer 1997, pp. 119-138.
[16] *Local Government Guide to Parking Cash Out*, International Council for Local Environmental Initiatives, (www.iclei.org/us), 1998; Donald Shoup, "Cashing Out Employer-Paid Parking," *Journal of the American Planning Association*, Vol. 61, No. 1, Jan. 1995, pp. 14-28.
[17] *Road Relief; Tax and Pricing Shifts for a Fairer, Cleaner, and Less Congested Transportation System in Washington State*, Energy Outreach Center (Olympia; www.eoc.org), 1998.
[18] W. Rothengatter, W. "Do External Benefits Compensate for External Costs of Transport?" *Transportation Research*, Vol. 28A, 1991, pp. 321-328.
[19] Todd Litman and Felix Laube, *Automobile Dependency and Economic Development*, Victoria Transport Policy Institute (Victoria; www.vtpi.org), 1999.

Equity

An argument often used to justify underpricing is that increasing the price of driving is inequitable. This is only true from a narrow perspective. Although underpricing benefits low-income drivers directly in the short term, over the long term it increases automobile dependency. Land use patterns become more dispersed so individuals must travel farther to access the same activities.[20] This increases total user transportation costs, which is especially disadvantageous to the poor.[21] Non-drivers suffer immensely from underpriced driving since they incur external costs, have fewer transport choices, and are increasingly disadvantaged relative to drivers. Some external costs are particularly inequitable. Residential parking requirements as they exist in most North American communities are highly regressive because they reduce affordable housing availability and force poor households to subsidize the vehicle ownership of wealthier neighbors.[22]

The equity impact of any increase in automobile user charges depends on how revenues are spent. Due to external costs, equity increases if revenues are *not* dedicated to roadway improvements, but instead compensate for harm caused by automobile use or replace more regressive taxes. Cameron found that implementing a flat mileage charge could provide overall benefits to poor as well as rich households, provided that revenues are returned proportionally to each income class.[23]

Environmental Impacts

By increasing total motor vehicle ownership and use, underpricing significantly increases motor vehicle environmental impacts. Efficient pricing is essential for sustainable transport. Even the best new technologies that reduce environmental and social costs will not be implemented unless consumers perceive economic incentives to adopt them. Non-pricing strategies for achieving individual environmental goals, such as vehicle fuel efficiency mandates, can *increase* other external costs by further reducing the ratio between users' variable costs and total costs (increasing fuel efficiency makes automobile operating cheaper, leading to more driving, accidents, air pollution, sprawl, etc.).[24]

Land Use Impacts

Underpriced driving and the automobile dependency that results have tremendous impacts on land use patterns. Automobiles require more road and parking space than other modes and encourage more travel, increasing the portion of land dedicated to transport facilities.

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[20] Elliot Sclar, E. and K.H. Schaeffer, *Access for All*, Columbia University Press (NY), 1980.
[21] Elmer Johnson, *Avoiding the Collision of Cities and Cars*, National Academy of Arts and Sciences (Chicago), 1993.
[22] Todd Litman, *Parking Requirement Impacts on Housing Affordability*, Victoria Transport Policy Institute (Victoria), 1995.
[23] Michael Cameron, *Efficiency and Fairness on the Road*, Environmental Defense Fund (Oakland), 1994.
[24] Pietro Nivola, and Robert Crandall, *The Extra Mile: Rethinking Energy Policy for Automotive Transportation*, Brookings Institute (Washington DC), 1995.

Automobile oriented cities devote 25%-30% of land to streets and parking compared with less than 10% in traditional walking cities.[25] This increase in total pavement imposes economic, environmental, social and aesthetic costs on society.[26]

In addition to these direct land use impacts, automobile use encourages sprawl by degrading the urban environment and accommodating low-density development at the urban periphery. This creates a self-reinforcing cycle of increased automobile use, reduced travel options, urban blight, low density land development and automobile dependency.[27] Urban sprawl provides benefits, which are mostly internal, and imposes a variety of external costs, including habitat losses, reduced greenspace and water quality, and increased per capita public service costs.[28]

Generated Traffic

One result of underpriced driving is that congestion becomes a constraint on further increases in motor vehicle use and urban sprawl. It is virtually impossible to eliminate congestion by increasing roadway capacity under such conditions because induced travel fills any added space.[29] This increases total automobile travel, urban sprawl and automobile dependency.[30] Transportation planning often ignores the full impacts of generated traffic, causing roadway capacity enhancement benefits to be overestimated and total costs to be underestimated.[31] This skews transport investments toward motor vehicle traffic improvements and away from more efficient, equitable, and sustainable options.

Assessing Current Transportation Priorities

Conventional planning priorities tend to assume that traffic congestion is the greatest transport problem facing society. However, according to our estimates, traffic congestion is actually only a middle-range cost, as illustrated in Figure 4.

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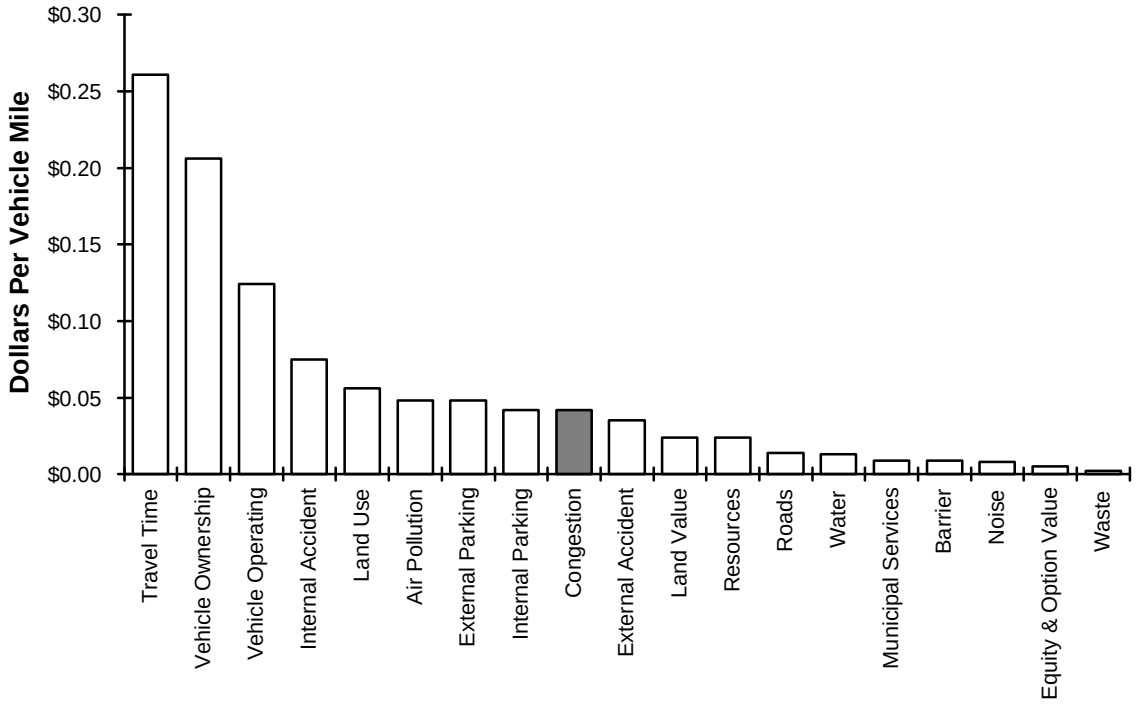
[25] Harry Dimitriou, *Urban Transport Planning*, Routledge (NY), 1992, p. 136.
[26] Todd Litman, "Land Use Impact Costs of Transportation," *World Transport Policy and Practice*, Vol. 1, No. 4, 1995, pp. 9-17.
[27] Terry Moore and Paul Thorsnes, *The Transportation/Land Use Connection: A Framework for Practical Policy*, American Planning Association (Chicago), Report # 448/449, 1993.
[28] Frank James, *The Costs of Alternative Development Patterns*, Urban Land Institute, (Washington DC) 1989.
[29] Standing Advisory Committee on Trunk Road Assessment. *Trunk Roads and the Generation of Traffic*, HMSO (London), 1994.
[30] Hansen, et al., *The Air Quality Impacts of Urban Highway Capacity Expansion: Traffic Generation and Land Use Change*, Institute of Transportation Studies (Berkeley), 1993.
[31] Todd Litman, *Generated Traffic; Implications for Transport Planning*, Victoria Transport Policy Institute (Victoria), 1997.

Figure 4 **Automobile Costs Ranked by Magnitude**



Traffic congestion is a moderate cost overall, yet it dominates transport planning.

Traffic congestion is a relatively small cost compared with total costs. Of 16 transport costs, only two (congestion and travel time) can be reduced by expanding roadway capacity, while 14 tend to increase, as shown in Table 3.

Table 3 **Transportation Costs Affected by Increased Roadway Capacity**

Costs Typically Reduced by Increased Road Capacity	Costs Typically Increased by Increased Road Capacity	
Congestion User Travel Time	Vehicle Costs Road Facilities Municipal Services Air Pollution Waste generation Land Use Impacts Resource consumption	Parking Accidents Equity & Option Barrier Effect Noise Water Pollution Roadway Land Use

Increasing roadway capacity tends to reduce two costs and increase 14. This indicates that other strategies for improving access should be employed before roads are widened, especially when driving is significantly underpriced.

As discussed earlier, most roadway improvement analyses overstate traffic congestion reduction benefits and understate costs by ignoring the impacts of generated traffic. External costs of generated traffic (increased parking demand, congestion on other roads,

air pollution, energy consumption, urban sprawl, etc.) should be considered a cost of congestion reduction projects.

If you ask people, *"Do you think that traffic congestion is a major problem?"* most would probably answer yes. If you ask them, *"Would you rather expand our road system or use pricing to solve congestion problems?"* a majority might choose the road improvement option. This is how transportation planning choices are typically defined. But if you present a more realistic choice by asking, *"Would you rather spend a lot of money widening highways to provide only moderate, short term congestion reductions, but which over the long term will increase personal, municipal, social and environmental costs, cause urban sprawl, and leave a legacy of automobile dependency, or would you rather start to create a more diverse transportation system?"* the preference for roadway investments is likely to disappear.

As part of our research we asked such a question in a survey distributed randomly to households across North America (Table 4) which indicated a popular preference for increased travel choices and environmental protection over increased roadway capacity.

Table 4 **Survey Ranking of Transportation Goals**[32]
"Please indicate how important you consider the following transportation goals."

Rank	Question	Average	Variance
1	Develop more diverse transportation system.	1.26	0.20
2	Provide better transport to poor, handicapped, and elderly.	1.58	0.44
3	Reduce environmental impacts.	1.74	0.81
4	Reduce urban impacts.	1.77	0.39
5	Reduce/avoid urban sprawl	2.21	0.92
6	Accommodate increased driving	2.34	0.81

Survey respondents indicated a preference for increased transportation choices and reduced environmental impacts. Increasing roadway capacity ranked last.

[32] Todd Litman, *Transportation Cost Analysis*, Victoria Transport Policy Institute, (Victoria), 1996, Chapter 4.

Ten Steps Towards More Sustainable and People-Centred Transport

Based on document posted by Sustainable Transport Action Network for Asia & the Pacific. (website: www.geocities.com/RainForest/Canopy/2853)

Accessibility for all

The purpose of transport policy is to provide access to the contacts, services and goods that we all need in an equitable, low-cost and low-impact way. Transport policy should not simply promote more and more movement at higher and higher speeds.

Social equity

Almost everywhere, transport priorities serve the poor badly and devote most investment to the mobility of affluent vehicle owners. Social equity demands that highest priority go to public transport, walking and non-motorised vehicles that are accessible to almost everyone.

Ecological sustainability

Both global sustainability and local environments are threatened by overuse of private motor vehicles. Places whose transport systems contribute least to environmental damage are those with the lowest car and motorcycle use and the highest use of public transport, cycling and walking.

Health and safety

Transport has a major impact on health and safety. In most developing countries, more than 60% of the victims are pedestrians and other vulnerable road users. Travel is safest in places that provide plentiful public transport and facilities for cyclists and pedestrians.

Public participation and transparency

Transport planning is always the better for involving the communities who are being planned for. Transparency and open information also help to prevent corrupt practices that hurt society.

Economy and low-cost

Too many transport plans are dominated by expensive mega-projects. The most sustainable, people-centred and equitable approaches to transport tend to be low-cost approaches which include restraint of the highest-cost mode of transport - namely the private car.

Information and analysis

To take action, communities need to understand the forces that are pushing transport priorities in the wrong directions. Destructive proposals do not stand up to critical scrutiny. We can all learn from the successes and failures of other campaigns.

Advocacy

Unless voices are raised from local communities (especially poor communities), pedestrians, bus riders, and NMV users in transport planning, only the voices of motorists, truckers and big business will be heard by the decision-makers.

Capacity building

There is an urgent need to build capacity and commitment among transport decision-makers to adapt to the new paradigms that are replacing car-oriented mobility planning.

Networking

Networking involves actively making contacts and encouraging information exchange and collaboration while always respecting the independence of diverse participants.

Policy Recommendations

A number of changes are needed to make transport prices more closely reflect total marginal costs. A relatively easy strategy is to convert fixed costs into variable costs, such as charging insurance and vehicle registration tax proportionally to vehicle mileage.

A common suggestion for internalizing costs is to increase fuel taxes. This, however, is not an optimal charge since fuel prices do not affect when or where driving takes place, or provide incentives to buy a low polluting car. Over the long run drivers would buy more fuel efficient cars, which does not reduce congestion, accidents, parking costs, noise, sprawl, or even many air pollutants. Recently there has been growing interest in congestion pricing. This could internalize congestion costs but not other externalities such as pollution, accidents, and parking subsidies.

User charges should be applied as closely as possible to the source of an externality to optimize economic efficiency. No single mechanism can capture all external costs due to their diverse nature. Komanoff identifies several price changes needed for optimal efficiency: weight-distance charges, fuel taxes, congestion pricing, smog fees, parking fees, marginalized insurance, and higher fines for violators.[33] He estimates that no charge should raise more than 1/3 of total user revenue. The U.S. Congress Office of Technology Assessment reaches a similar conclusion.[34] Tax and price increases should be gradual and predictable to allow individuals and firms to adjust when making long term decisions.

Changes in urban development policy are needed to reduce automobile dependency by locating activity centers (employment centers, schools, shops, play areas) where they are most accessible, and setting development and utility prices to reflect the higher costs associated with low density, sprawled locations. Lending institutions should consider the higher transport costs of suburban and exurban residences in mortgage assessments (multiple automobile ownership is usually considered an asset rather than a liability).[35]

Transportation planning and investment decisions should consider all impacts, including long term and indirect costs, and the implications of generated traffic. The value of having travel choices must be recognized, which means developing transportation systems that provide non-drivers with a high level of mobility. Transportation planners and engineers who are normally car dependent should make a habit of living at least a few weeks each year without use of a private automobile in order to experience the problems and pleasures of being dependent on other modes.

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[33] Charles Komanoff, "Pollution Taxes for Roadway Transportation," *Pace Environmental Law Review*, 1995.

[34] Office of Technology Assessment. *Saving Energy in U.S. Transportation*, U.S. Congress (Washington DC), July 1994.

[35] Patrick Hare, *Planning, Transportation, and the Home Economics of Reduced Car Ownership*, Hare Planning (Washington DC), 1995.

Summary

Motor vehicle use is significantly underpriced in North America. Driving imposes external economic, environmental, and social costs, and many of the internal costs of driving are fixed. Average vehicle costs per mile decline with increased use, so vehicle owners have an incentive to maximize driving "to get their money's worth," and those who drive less than average subsidize those who drive more. Drivers have no incentive to limit their driving to trips in which total benefits exceed total costs.

Transportation in an absolute sense ("access") provides significant benefits. But access itself is seldom a problem in developed countries with extensive road networks. Most transport improvements simply increase travel speeds and capacity, marginally reducing costs. The existence of significant externalities implies that a major portion of transport activities result in net losses, just as businesses lose money if they sell products below their total costs. Current growth in personal and freight travel may result more from perverse pricing incentives than from net benefits. A bottle of Italian mineral water is the same price in British Columbia stores as comparable domestic water despite imposing external transport costs (congestion, subsidized facility costs, accident risk, pollution) many times greater, and virtually identical production costs.

Underpriced transport increases:

- *Overall transportation costs*. Underpricing encourages individuals to spend a greater portion of their budget on driving and to incur greater external costs.
- *Automobile dependency*. Land use patterns develop that are suitable for driving and unsuitable for other travel modes. Walking, bicycling, public transit and rail service receive less investment and support.
- *Environmental impacts.* Air and noise pollution, urban blight, energy consumption, habitat loss, water pollution and hydrological problems increase with more driving.

At one time, underpricing may have provided significant external benefits due to economies of scale by reducing average roadway and industrial development costs, but there is no evidence that current driving provides external marginal benefits.

Underpricing is inequitable. Wealthy households drive significantly more than poor households, thereby capturing greater benefits and imposing greater external costs. The short-term impacts of underpricing on lower income households are mixed; the benefits of cheap automobile use are balanced by higher costs for other goods and reduced travel options. The most vulnerable populations (the very poor, disabled, seniors and children) are greatly disadvantaged by underpricing and the automobile dependency that results. The equity and economic efficiency effects of increased transport prices depend on how new prices are structured, how quickly and predictably changes occur, whether travel options improve, and how revenues are distributed.

Here are related reports available from VTPI:

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The Costs of Automobile Dependency

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Transportation Cost Analysis; Techniques, Estimates and Implications

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Feedback

The Victoria Transport Policy Institute appreciates feedback, particularly suggestions for improving our products. After you have finished reading this report please let us know of any:

- Typographical errors or confusing wording.
- Concepts that were not well explained.
- Analysis that is inappropriate or incorrect.
- Additional information, ideas or references that could be added to improve the report.

Thank you very much for your help.

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