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"Efficiency - Equity - Clarity"

The Costs of Automobile Dependency
and the Benefits of Balanced Transportation

by

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2 August, 2002

Abstract
Automobile dependency is defined as high levels of per capita automobile travel, automobile oriented land use patterns, and reduced transport alternatives. Automobile dependency increases many costs: higher vehicle expenses, reduced travel choices, increased road and parking facility costs, congestion, accident damages, and a variety of environmental impacts. Beyond an optimal level, excessive automobile dependency may reduce economic productivity and development. A more balanced transportation system can provide many benefits to consumers and society.

Introduction

Automobile dependency is defined as high levels of per capita automobile travel, automobile oriented land use patterns, and reduced transport alternatives.[1] Its opposite is *balanced transportation*, meaning that consumers have viable transport choices and incentives to use each mode for what it does best.[2] This paper explores the costs to society of automobile dependency and benefits of more balanced transportation.

Automobile dependency is not a single thing. It includes various transport and land use factors, as described in Table 1. These tend to be mutually supporting so it is generally inappropriate to consider any one factor the "cause" of automobile dependency; they all both contribute to, and result from, automobile dependency. Automobile dependency is relative. A mixed transportation system is generally in the middle range of most factors, with nodes of low automobile dependency, where transit and non-motorized travel is favored, and other areas that are more automobile dependent.

Table 1 **Auto Dependency and Balanced Transportation Compared**

Factor	Automobile Dependency	Balanced Transportation
Motor vehicle ownership	High per capita motor vehicle ownership.	Medium per capita motor vehicle ownership.
Vehicle use	High per capita motor vehicle use.	Medium per capita motor vehicle use.
Land use density	Low.	Medium.
Land use mix	Single-use development patterns.	Mixed-use development patterns.
Land for transport	Large amount for roads and parking.	Medium amount devoted to roads and parking.
Road design	Road designs favoring automobile traffic.	Road designs balancing modes.
Street scale	Large scale streets and blocks.	Small to medium streets and blocks.
Traffic speeds	Maximum traffic speeds.	Lower traffic speeds.
Walking	Mainly in private malls.	On public streets.
Signage	Large scale, for high speed traffic.	Medium scale, for lower-speed traffic.
Parking	Generous, free, rigid requirements.	Modest, some priced, flexible requirements.
Site design	Parking paramount, in front of buildings.	Parking sometimes behind buildings.

Most North American communities are automobile dependent. Most households own automobiles and rely on them for most travel. Land use patterns are increasingly automobile oriented. Non-automobile travel options are inferior and declining in quality. Although consumers have many choices when choosing an automobile and vehicle services, they often have few viable alternatives to driving when choosing mobility.

This automobile dependency causes both benefits and costs. Most benefits are direct and internal to users while many costs are indirect, external (not borne directly by users), and cumulative. Just as individual consumers want to know the full costs of owning and operating a vehicle before purchasing it, a community needs information on all impacts that result from their transportation planning decisions, including indirect costs.

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[1] "Automobile" refers to cars, vans, light trucks and SUVs for personal use.

[2] Todd Litman, *You CAN Get There From Here: Evaluating Transportation Choice*, VTPI (www.vtpi.org), 2000; "Evaluating Transportation Options," *Online TDM Encyclopedia*, VTPI (www.vtpi.org), 2002.

Experiencing Automobile Dependency

If you are a typical motorist, try this experiment: Give up driving for two typical weeks. This period should require trips to work, shopping, socializing, family obligations, and all other normal travel. You'll discover that non-drivers face many obstacles, including limited choices, high financial and time costs, and poor service. As a result you may travel less, foregoing some trips and choosing more convenient destinations for others. You may experience embarrassment when asking for a ride or when you use stigmatized modes such as transit, bicycling and walking.

The problems you experience as a non-driver depend on where you live. If your community is highly automobile dependent you will experience significant difficulties. You may have trouble getting to a store or even crossing a busy street. If your community is multi-modal, with good transit service, bicycle and pedestrian facilities, you may experience fewer problems.

After two weeks you may be glad to drive again. You may also have experienced some benefits during the period of abstinence. You may discover unexpected joys from walking and bicycling, and meeting fellow passengers in a car pool or transit vehicle. You may have appreciated being more home-centered and community oriented. You may take pride in reducing pollution, and saving energy. There are benefits to both the user and society as a whole to reduced driving.

Several market distortions, some listed in Table 2, contribute to auto dependency.[3] This indicates that automobile dependency does not necessarily reflect consumer preferences or optimal social welfare, it results in part from distortions that reduce travel choices and encourage more driving than what consumers would choose in a more neutral market.

Table 2 **Market Distortions That Contribute to Auto Dependency**[4]

Market Requirements	Common Transport Market Violations
Choice. Consumers need viable choices, and information about those choices.	Consumers often have few viable alternatives to owning and driving an automobile, and living in automobile dependent communities.
Competition. Producers must face competition to encourage innovation and efficient pricing.	Most roads and public transit services are provided as public monopolies. There is often little competition or incentive for innovation.
Cost-based pricing. Consumers must bear the costs they impose. There should be no significant external costs unless specifically justified.	Automobiles use is underpriced: most costs are either fixed or external. Lower-density, automobile dependent land use patterns are also underpriced.
Economic neutrality. Public policies (laws, taxes, subsidies, and investment policies) must not favor one class of businesses or good over others, unless specifically justified.	Public policies that favor automobile dependency include dedicated road funding, road designs that maximize traffic speeds, zoning laws that provide generous free parking, and underpriced vehicle use.

[3] R. Kitamura, S. Nakayama and T. Yamatomo, "Self-Reinforcing Motorization: Can Travel Demand Management Take Us Out of the Social Trap?" *Transport Policy*, Vol. 6, No. 3, July 1999, pp. 135-145.

[4] Todd Litman, *Transportation Market Distortions; A Survey*, VTPI (www.vtpi.org), 1999.

Critiques of automobile dependency are sometimes accused of being "anti-automobile," which represents this as an ideological rather than an economic issue. Reducing excessive automobile dependency is no more anti-automobile than healthy diets are anti-food. This investigation does not mean that automobiles are "bad," or that governments should forbid driving. It simply suggests that communities could benefit from more balanced transportation systems and fewer market distortions that favor automobile travel.

Developing Objective Transportation Language[5]

Many transport planning terms are unintentionally biased toward motor vehicle travel. For example, increased road and parking capacity is often called an "improvement," although wider roads and larger parking facilities, and increased vehicle traffic volumes and speeds tends to reduce the mobility of pedestrians and cyclists and degrade the local environment. Calling such changes "improvements" indicates a bias in favor of one activity over others. Objective language uses neutral terms, such as "added capacity," "additional lanes," "modifications," or "changes."

The terms "traffic" and "trip" often refer only to motor vehicle travel. Short trips, non-motorized trips, travel by children, and non-commute trips are often undercounted or ignored in transport surveys, models, and analysis. Although automobile and transit trips often begin and end with a pedestrian or cycling link, they are usually classified simply as "auto" or "transit" trips.

The term "efficient" is frequently used to mean increased vehicle traffic speeds. This assumes that higher motor vehicles speeds increase overall efficiency. This assumption is debatable. High vehicle speeds can reduce total traffic capacity, increase resource consumption, increase costs, and increase automobile dependency, reducing overall economic efficiency.

Level of service (LOS) is used to describe conditions for a particular user group (motorists, pedestrians, etc.). Transportation professionals often focus on level of service for motor vehicles. It is important to indicate which users are considered when level of service values are reported.

Biased Terms	**Objective Terms**
Traffic	Motor vehicle traffic, pedestrian/bike traffic, etc.
Trips	Motor vehicle trips, person trips, etc.
Improve	Change, modify, expand, widen
Enhance	Change, increase traffic speeds
Deteriorate	Change, reduce traffic speeds
Upgrade	Change, expand, widen, replace
Efficient	Faster, increased vehicle capacity
Level of service	Level of service for…

Example:

Biased: *Level of service* at this intersection is rated "D." The proposed *improvement* will cost $100,000. This *upgrade* will make our transportation system more *efficient* by *enhancing* capacity, preventing *deterioration* of *traffic* conditions.

Objective: *Level of service* at this intersection is rated "D" *for motorists* and "E" *for pedestrians*. A *right turn channel* would cost $100,000. This *road widening project* will *increase motor vehicle traffic speeds and capacity* but may *reduce safety and convenience to pedestrian travel*.

[5] Based on Michael Wright, *Transportation Language Policy Memo*, City of West Palm Beach, 1996.

Automobile Dependency Costs

Specific costs associated with increased automobile dependency are summarized below.

1. Consumer Costs

Vehicle Expenses

Automobile dependency increases consumers' total transportation costs by increasing automobile ownership and use. As a result, transportation costs represent a larger portion of household expenditures in North America than in most other parts of the world, despite relatively low prices for individual components such as vehicles and fuel.[6]

Table 3 **Average Transportation Expenditures**[7]

	Total Vehicle Expenditures	Portion of Total Household Expenditures
Total vehicle expenses	$6,278	17.4%
Total public transportation	$390	1.1%
Total transportation expenses	*$6,669*	*18.5%*

The 1997 Consumer Expenditure Survey indicates that 18.5% of total household expenditures are devoted to transport, 94% of which was spent on automobiles, as shown in Table 3. Table 4 shows how vehicle ownership and transportation costs vary by region. Northeast Region households spend much less on transport than households in other regions despite higher average incomes, apparently because cities and towns in that region have more balanced transport systems that allow lower rates of automobile ownership. Residents of such communities avoid excessive automobile expenses, saving an average of $1,245 per household annually compared with the national average.[8]

Table 4 **Transportation Expenditures By U.S. Region**[9]

	All	Northeast	Midwest	South	West
Net (after tax) income	$36,684	$40,166	$35,904	$33,292	$39,839
Vehicles owned or leased	2	1.6	2.2	1.9	2.1
Owns or leases at least one vehicle	87	79	89	89	88
Transportation expenditures	$6,457	$5,830	$6,367	$6,473	$7,120
Transportation/ Net Income	17.6%	14.5%	17.7%	19.4%	17.9%

Transport costs are particularly burdensome for lower-income households, consuming more than 25% of income for those earning less than $20,000 annually, as illustrated in Figure 1.

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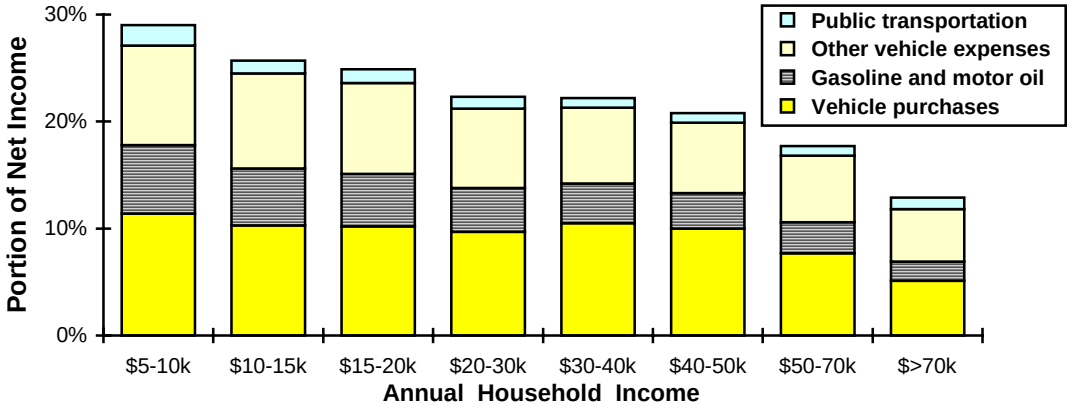
[6] Walter Hook, "Economic Importance of Non-Motorized Transportation," *Transportation Research Record 1487*, 1995, pp. 14-21.

[7] 1997 Consumer Expenditure Survey, BLS (ftp://ftp.bls.gov/pub/special.requests/ce).

[8] (17.6% - 14.5%) x $40,166 = $1,245

[9] 1997 Consumer Expenditure Survey, BLS (ftp://ftp.bls.gov/pub/special.requests/ce).

Figure 1 **Transportation Expenditures as Percentage of Household Income**[10]

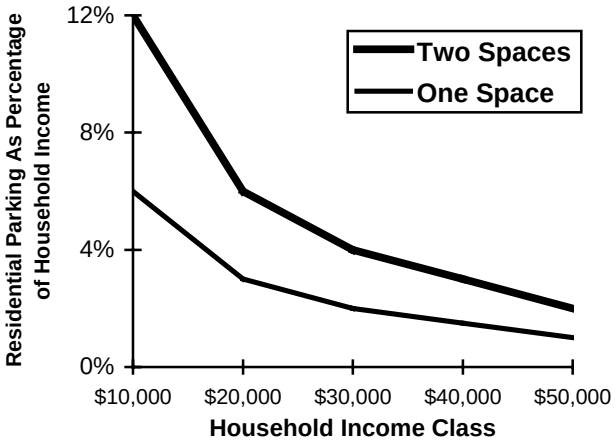


Transportation expenditures are highest as a portion of income for lower-income households, indicating that automobile dependency is a financial burden to the poor.

Residential Parking

Residential parking costs average about $600 annually per space or about $1,200 per housing unit.[11] This represents a particularly large portion of housing costs for low-income households, as indicated in Figure 2, which contributes to a lack of affordable housing and homelessness.[12]

Figure 2 **Residential Parking Costs as a Percentage of Household Income**[13]



Parking costs typically constitute a greater portion of poor household expenditures than for wealthier households, indicating that they are regressive.

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[10] 1997 Consumer Expenditure Survey, BLS (ftp://ftp.bls.gov/pub/special.requests/ce).

[11] Patrick H. Hare, *Making Housing Affordable by Reducing Second Car Ownership*, Patrick Hare Planning and Design (Washington DC), April, 1993.

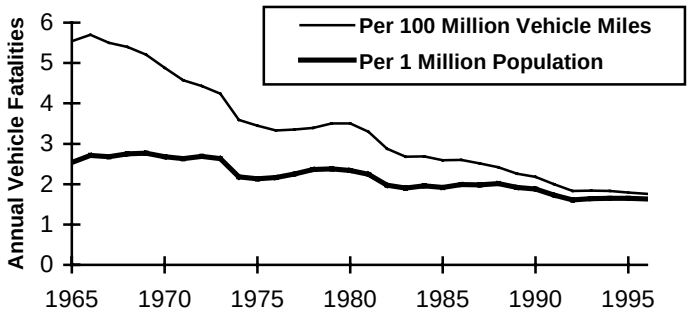
[12] Todd Litman, *Parking Requirement Impacts on Housing Affordability*, VTPI (www.vtpi.org), 1999.

[13] Based on $50 per month per parking space.

Accidents

Per-mile crash rates have declined over the last three decades due to improvements in vehicle and road design, traffic management, and medical services, but these are largely offset by increased mileage, resulting in little change in per-capita death rates, as illustrated in Figure 3.

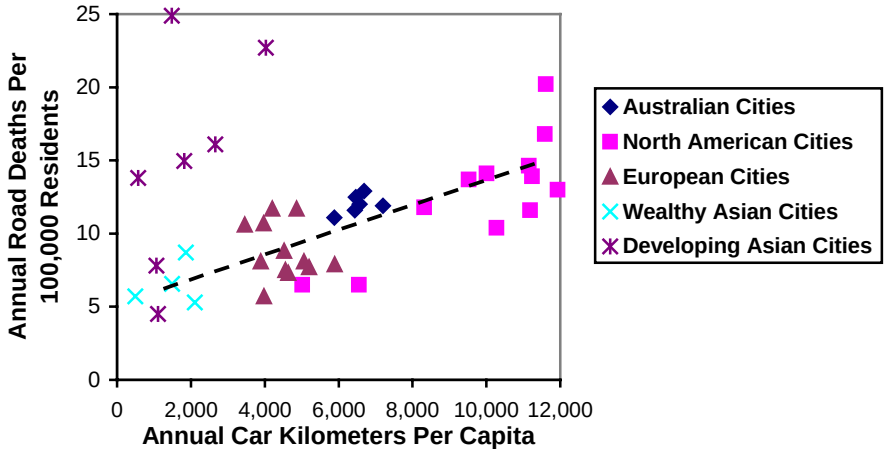
Figure 3 **U.S. Motor Vehicle Accident Rate**[14]



Accident rates have declined significantly per vehicle mile, but not much per capita.

Road deaths tend to increase with automobile use, as indicated in Figure 4. The exceptionally high crash rates of the Developing Asian Countries can be attributed to relatively poor roads, traffic management and medical standards. Among regions with similar standards, increased vehicle use increases road deaths.

Figure 4 **Annual Vehicle Travel and Road Deaths**[15]



Among developed countries, automobile deaths tend to increase with car use.

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[14] *Facts and Figures '95*, Motor Vehicle Manufactures Association (Detroit), 1995.

[15] Felix Laube, *Optimizing Urban Passenger Transport*, Ph.D. Dissertation, Sustainable Transport Research Group, Murdoch University (Perth; http://wwwistp.murdoch.edu.au), 1997.

These additional road deaths and injuries impose significant costs on society. Vehicle crashes are the leading cause of death among Americans 1- to 37-years old.[16] Motor vehicle crash costs are estimated to total $358 billion (1988 dollars) in the U.S, representing one of the largest transport costs.[17]

Automobile dependent, suburban communities tend to have significantly higher per capita traffic crash injuries and deaths because residents drive so much more each year than urban residents. One study found that this risk significantly offset the somewhat lower risk of crime injury and death to suburban residents.[18]

Automobile dependency may contribute to road risk by making it more difficult for communities to withdraw driving privileges from motorists with abysmal safety records because there are so few alternatives. One elderly driver explained, "*I will be 70 next month and would gladly quit driving if somebody would provide me with a chauffeured car every time I must go for groceries, a doctor's appointment or to church. My children have families and jobs and aren't able to drive me all the places I need to go. What am I supposed to do? Sit at home and dry up?*"[19] Judges are often persuaded by similar arguments from revoking the licenses of dangerous drivers.

Travel Time and Stress

Automobiles have higher average speeds than most other modes, and so offer the potential for travel time savings. Automobile dependency tends to increase public transit travel times, because it reduces the quality of public transit service and disperses land use patterns. As a result, in the U.S., transit commutes take about twice as long, on average, as driving.[20] This is one of the major incentives that encourage individuals to choose automobile travel over transit.

However, overall people tend to devote approximately the same amount of time to travel, no matter what their mode or average speed.[21] Commute times are remarkably consistent across all the different city types: Australian and North American cities average 26 minutes, European cities average 28 minutes, and Asian cities average 33 minutes.[22] Over the long run, automobile dependency increases the need to travel. Whitelegg writes,

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[16] Henri Richardson, *Motor Vehicle Traffic Crashes as a Leading Cause of Death in the U.S., 1992*, National Highway Traffic Safety Administration, USDOT (Washington DC; www.nhtsa.org), 1997.
[17] Ted Miller, *The Costs of Highway Crashes*, FHWA (Washington DC), pub. No. FHWA-RD-055, 1991.
[18] Alan Durning, *The Car and the City*, Northwest Environment Watch (www.northwestwatch.org), 1996.
[19] Boise, Idaho, "Ann Landers Personal Advice Column," *Times Colonist* (Victoria), June 28, 1995.
[20] *Summary of Travel Trends, 1995 NPTS*, (www-cta.ornl.gov/npts/1995).
[21] Gordon Stokes, "Travel Time Budgets and Their Relevance for Forecasting the Future Amount of Travel," Transport Planning Methods: PTRC European Transport Forum Proceedings, 1994, pp. 25-36.
[22] Jeff Kenworthy, et al., *Indicators of Transport Efficiency in 37 Global Cities*, ISTP, Murdoch University (http://wwwistp.murdoch.edu.au), for the World Bank, 1998.

> "Those who use technology to travel at greater speeds still have to make the same amount of contacts--still work, eat, sleep and play in the same proportions as always. They simply do these further apart from each other."[23]

That automobile's increased travel speeds fails to reduce travel time is an example of a "social trap." The first households to own a car in a community have a significant competitive advantage when buying a house (they can choose suburban and rural homes), when searching for jobs (they can consider jobs outside the transit service area), and for social status. But once other households achieve similar levels of automobile ownership much of this competitive advantage is lost.[24] Cars become a necessity rather than a luxury, and the amount of driving required to maintain parity with others continually increases until other costs (congestion, vehicle costs, travel time) become limiting factors. On the other hand, a more balanced transportation system can reduce total personal travel time by encouraging more efficient transportation and land use patterns.[25]

Travel time costs (the cost assigned to a given amount of time spend traveling) vary depending on various factors. Table 5 summarizes set of travel time values which indicates that travel time costs are lower for public transit users (assuming clean vehicles, a comfortable seat, convenient service) and rideshare passengers than for automobile drivers, particularly under congested traffic conditions. Passengers experience less stress and are able to use their travel time to rest, read or work. This implies that a more balanced transportation system can reduce travel time costs by allowing people to choose alternatives to driving when they consider it a better use of their time.

Table 5 **Recommended Travel Time Values**[26]

	Travel Time Values
Commercial vehicle driver	Wage rate plus fringe benefits
Personal vehicle driver	50% of current average wage
Adult car or bus passenger	35% of current average wage
Child passenger under 16 years	25% of current average wage

Congestion increases travel time costs for drivers by the following amounts according to Level of Service (LOS) ratings:

LOS D: multiply by 1.33 LOS E: multiply by 1.67 LOS F: multiply by 2.0

[23] John Whitelegg, "Time Pollution," *The Ecologist*, Vol. 23, No. 4, July/Aug. 1993, p. 131-134.
[24] See F. Hirsch, *Social Limits to Growth*, Routledge (London), 1976 for discussion of "positional goods."
[25] John Neff, "Travel Distance Substitution Rates Between Automobile Users and Transit Patrons," *Papers and Proceedings of the Applied Geography Conferences, Vol. 19*, 1996.
[26] William Waters, *The Value of Time Savings for The Economic Evaluation of Highway Investments in British Columbia*, BC Ministry of Transportation (Victoria; www.th.gov.bc.ca/bchighways), March 1992.

Automobile dependency increases personal stress by increasing the amount of driving under congested conditions.[27] One study found that aggressive driving deaths are much higher in places with automobile dependent transportation and land use systems, and that "Places with low aggressive driving death rates were more likely to have high transit use, many people who walked or biked to work, and fewer miles of highway per resident."[28]

Reduced Exercise and Enjoyment

Automobile dependency discourages non-motorized travel by dominating transport resources (money, land, roadway design), by creating low-density land use patterns with dispersed destinations, and because roads with heavy, high-speed traffic create barriers to walking and cycling.[29] At first glance this may seem to be a minor problem. After all, people *can* walk or cycle for exercise in automobile dependent communities, even if it requires driving to a suitable location. But it can be a major cost to both individuals and society because in practice, the total amount of active transport declines. Children, elderly and disabled people are particularly disadvantaged in this way.[30]

Given suitable conditions, people walk and bicycle more than occurs in automobile dependent communities.[31] Surveys, such as those summarized in Table 6, indicate that people want to walk and bicycle more, but feel limited by traffic and land use conditions.

Table 6 **Active Transportation Survey Findings**[32]

	Cycle	**Walk**
Currently use this mode for leisure and recreation (at least sometimes).	48%	85%
Currently use this mode for transportation (at least sometimes).	24%	58%
Would like to use this mode more frequently.	66%	80%
Would cycle to work if there "were a dedicated bike lane which would take me to my workplace in less than 30 minutes at a comfortable pace."	70%	
Portion of Canadian adults who could realistically increase their use of these modes for transportation.	29%	61%
Support for additional government spending on bicycling facilities.	82%	

Communities that accommodate walking and cycling have achieved significant increases in non-motorized travel. For example, the city of Eugene, Oregon has created a comprehensive cycling network, resulting in exceptionally high levels of non-motorized travel. Although Eugene has a large university, much of the increase in pedestrian and

[27] Raymond Novaco and Cheryl Collier, *Commuting Stress, Ridesharing, and Gender*, UCTC Working Paper No. 208 (Berkeley; www.its.berkeley.edu), 1994.

[28] *Aggressive Driving: Are You At Risk?* Surface Transportation Policy Project (Washington DC; www.transact.org), 1999.

[29] Donald Rintoul, *Social Cost of Transverse Barrier Effects*, Planning Services Branch, B.C. Ministry of Transportation and Highways (Victoria; www.th.gov.bc.ca/bchighways), 1995.

[30] Mayer Hillman, *Children, Transport and the Quality of Life*, Policy Studies Institute (London), 1993.

[31] Susan Handy, "Urban Form and Pedestrian Choices; Study of Austin Neighborhoods," *Transportation Research Record 1552*, 1997, pp. 135-144; Christopher Porter, John Suhrbier and William Schwartz, *Forecasting Bicycle and Pedestrian Travel*, TRB Annual Meeting (www.nas.edu/trb), 1999.

[32] Environics, *National Survey on Active Transportation*, Go for Green, (www.goforgreen.ca), 1998.

bicycle transportation occurred among the non-student population. Latent demand exists for non-motorized travel among virtually all demographic and income groups.[33]

Regular aerobic exercise is essential to good health. A sedentary lifestyle has the cardiovascular risk equal to smoking 20 cigarettes a day.[34] The most practical way to obtain this exercise is to encourage non-motorized transportation. According to a government report, "*Regular walking and cycling are the only realistic way that the population as a whole can get the daily half hour of moderate exercise which is the minimum level needed to keep reasonably fit*."[35] One study concludes that heart disease would decline 5-10% if one-third of short trips shifted from driving to bicycling.[36]

The enjoyment potential of non-motorized travel is also substantial. Pedestrian and bicycle friendly environments are among the most popular tourist destinations, from Venice, Italy to Disneyland's Main Street. San Antonio's Riverwalk is the most popular tourist attraction in Texas. Public trails are major tourist attractions in many areas.[37] The popularity of these destination walking and cycling attractions does not reduce the importance of providing adequate safe and enjoyable walking and cycling conditions in every community.

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[33] Arthur C. Nelson and David Allen, *If You Build Them, Commuters Will Use Them; Cross-Sectional Analysis of Commuters and Bicycle Facilities*, Transportation Research Board, #970132, 1997.

[34] Ian Roberts, et al., *Pedalling Health—Health Benefits of a Modal Transport Shift*, Bicycle Institute of South Australia (Sydney; www.science.adelaide.edu.au/slate/demos/cyhealth.pdf), 1996.

[35] Physical Activity Task Force, *More People, More Active, More Often*, UK Department of Health (London), 1995, cited in Judith Hanna, "Transport and Health: Fit to Get About" *Urban Transport International*, No. 4, March/April 1996, p. 11.

[36] *Bike For Your Life*, Bicycle Association & Cyclists' Public Affairs Group (London), 1995.

[37] Economics of Trails, American Trails (www.outdoorlink.com/amtrails/resources/index.html).

External Costs

Economists have long recognized that transportation imposes external costs (costs imposed on somebody other than the user). Several recent studies have examined and estimated these costs.[38] Some of these costs are discussed below.

Infrastructure Costs (Road and Parking Facilities)

Automobile dependency increases the amount of land devoted to roads and parking facilities.[39] U.S. and Canada studies find that households typically pay several hundred dollars annually in general taxes (not vehicle user fees) to fund local roads and traffic services.[40] Off-street parking costs are estimated to average more than $800 per motor vehicle year in the U.S.[41] Low density develop tends to have lower unit parking costs, since land costs are lower, but automobile dependency tends to increase total parking costs since parking demand increases and there is less shared parking facilities.

Automobile dependency tends to increase the portion of wealth devoted to roadway and transport expenditures, and reduce public transit system cost recovery, as indicated in Table 7 and figures 5 and 6.

Table 7 **Economic Data on Global Cities, 1990**[42]

	Australian Cities	US Cities	Metro Toronto	European Cities	Wealthy Asian Cities	Developing Asian Cities
Per capita GRP	$19,761	$26,822	$22,572	$31,721	$21,331	$2,642
Per capita car use (kms)	6,536	10,870	5,019	4,519	1,487	1,611
Per capita road expenditures	$264	$142	$150	$135	$88	$39
Road expenditure per $1,000 GRP	$7.19	$9.84	$6.65	$4.26	$4.13	$14.76
Transit operating cost recovery	40%	35%	61%	54%	119%	99%
Transport deaths per 100,000 pop.	12.0	14.6	6.5	8.8	6.6	13.7
Total car and transit operating expenditures as portion of GRP	13.2%	12.4%	7.4%	8.1%	4.8%	15.9%

(GRP = Gross Regional Product)

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[38] Mark Delucchi, et al., *Annualized Social Cost of Motor Vehicle Use in the United States, Based on 1990-1991 Data*, Institute of Transportation Studies (Davis; www.engr.ucdavis.edu/~its), UCD-ITS-RR-96-3, 1996-97; David Maddison, et al, *The True Costs of Road Transport*, Earthscan (London), Blueprint #5, 1996; Todd Litman, *Transportation Cost Analysis*, VTPI (www.vtpi.org), 1998.

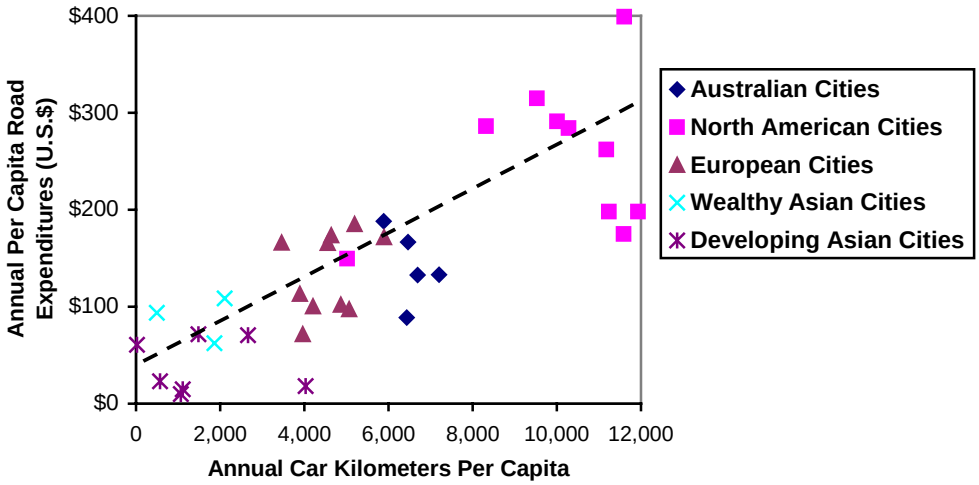
[39] Todd Litman, *Land Use Impact Costs of Transportation*, VTPI (www.vtpi.org), 1999.

[40] John DeCicco and Hugh Morris, *The Costs of Transportation in Southeastern Wisconsin*, American Council for an Energy-Efficient Economy (Washington DC; www.aceee.org), 1998; KPMG, *The Cost of Transporting People in the City of Edmonton*, Transportation Department (Edmonton), 1996.

[41] Mark Delucchi, *Annualized Social Cost of Motor-Vehicle Use in the U.S., 1990-1991*, Vol. 6, Institute of Transportation Studies (Davis), UCD-ITS-RR-96-3 (6), 1997.

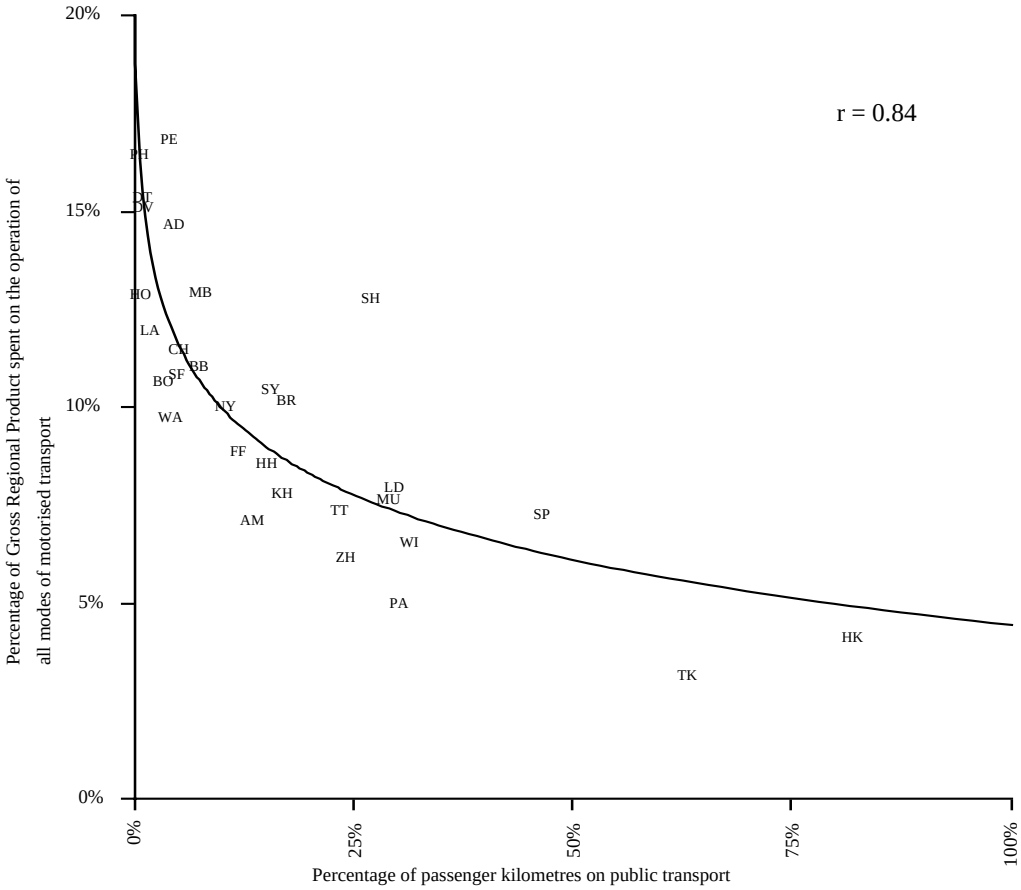
[42] Jeff Kenworthy, Felix Laube, Peter Newman and Paul Barter, *Indicators of Transport Efficiency in 37 Global Cities*, Sustainable Transport Research Group, Murdoch University (Perth; http://wwwistp.murdoch.edu.au), for the World Bank (Washington DC), February 1997; Peter Newman and Jeff Kenworthy, *Sustainability and Cities; Overcoming Automobile Dependency*, Island Press (Covelo; www.islandpress.org), 1998.

Figure 5 **Annual Vehicle Travel and Road Expenditures**[43]



Roadway expenditures tend to increase with car use.

Figure 6 **Total Transport Costs vs. Transit Use**[44]



Total transport costs decline with more balanced transportation systems.

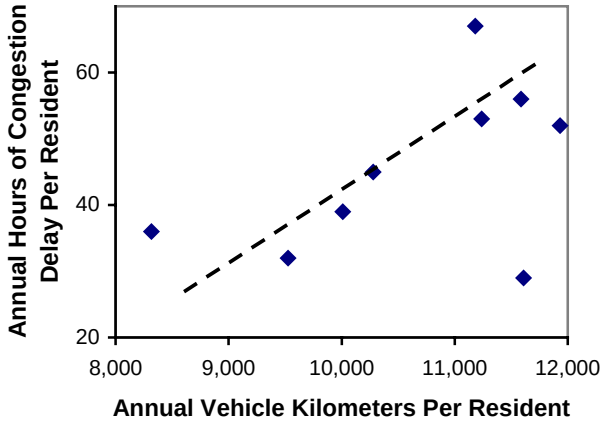
[43] Felix Laube, 1997.

[44] Jeff Kenworthy, et al., 1997.

Traffic Congestion

Automobile dependency tends to increase overall congestion costs. Although higher density, transit oriented areas tend to have more intense congestion, automobile dependent areas actually have greater total congestion. Automobile dependent cities such as Los Angeles and Houston have much higher per capita delays than cities with more balanced transportation, such as New York and Chicago, as illustrated in Figure 7. Increasing highway capacity does not reduce traffic congestion,[45] but grade separated transit can reduce congestion on adjacent highways by attracting travelers from their cars whenever congestion delays increase.[46]

Figure 7 **Annual Vehicle Travel and Congestion Delays**[47]



As vehicle travel increases, congestion delays also tend to increase.

One study argues that the 235% increased traffic congestion delays between 1982 and 1997 in major U.S. cities results primarily from more automobile dependent transportation and land use patterns.[48] The study points out that during this time population in those urban regions increased only 22% and per capita roadway capacity actually increased 10%, but these were offset by increased average trip length and reduced ridesharing, transit, cycling and walking, which are related to land use and transportation system choice.

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[45] *Analysis of the Relationship Between Highway Expansion and Congestion in Metropolitan Areas*, Surface Transportation Policy Project (Washington DC; www.transact.org/mean98), 1998.

[46] Daniel Brod and David Lewis, *The Congestion Management Role of Transit in Strategic Corridors*, Transportation Research Board Annual Meeting, Paper #971393, January 1997.

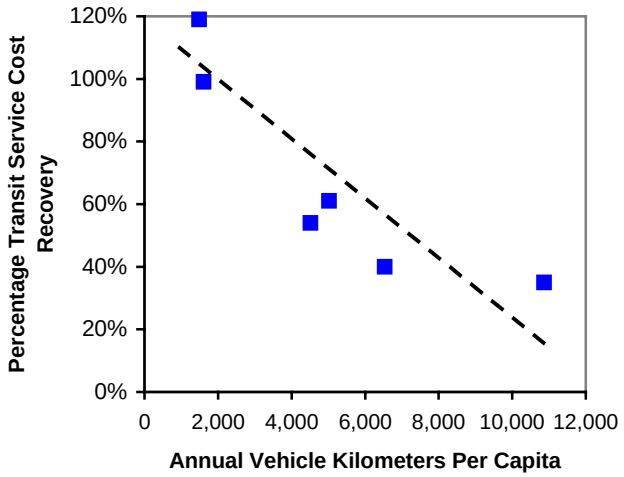
[47] *Mobility Study*, Texas Transportation Institute (College Station; http://mobility.tamu.edu), 1998, and Jeff Kenworthy, et al., 1997.

[48] *Why Are the Roads So Congested? An Analysis of the Texas Transportation Institute's Data On Metropolitan Congestion*, Surface Transportation Policy Project (www.transact.org), 1999.

Inefficient Travel Alternatives

There are significant economies of scale in transport facilities and services. As more people use a transport mode, unit costs decline resulting in better facilities, services and integration with other transport and land use activities. Figure 8 illustrates that cost recovery for transit services are much lower in automobile dependent regions. Similarly, as more people walk or bicycle, unit costs for facilities (sidewalks, trails, bike lanes, etc.) decline so communities can justify greater investments in them. Automobile dependency reduces consumers' transport choices and the efficiency of the service that is provided. Communities must either provide less service or more subsidies to maintain a given level of service. Increased efficiency of alternative modes is a benefit of a more balanced transportation system.

Figure 8 **Annual Vehicle Travel and Transit Cost Recovery**[49]



As vehicle travel increases, transit service cost recovery declines.

Pollution and Consumption of Non-renewable Resources

Automobiles are primary contributors to air, noise and water pollution, and major consumers of non-renewable resources.[50] Harmful air emissions include carbon monoxide, particulates, nitrogen oxides, volatile organic compound, sulfur oxides, carbon dioxide, methane, road dust, and toxic gases such as benzene.[51] According to an OECD report, "*Transport is by far the major source of noise, ahead of building or industry, with road traffic the chief offender*."[52] Motor vehicles, roads and parking facilities are also major sources of water pollution and hydrologic disruptions.[53]

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[49] Jeff Kenworthy, et al., 1997.

[50] *Transportation & Environmental Impacts*, Transportation Partners Program, USEPA (Washington DC; www.epa.gov/oppe/tp), 1997.

[51] *Indicators of the Environmental Impacts of Transportation*, Office of Policy and Planning, USEPA (Washington DC; www.epa.gov/tp), EPA 230-R-96-009, 1996, pp. 63-75.

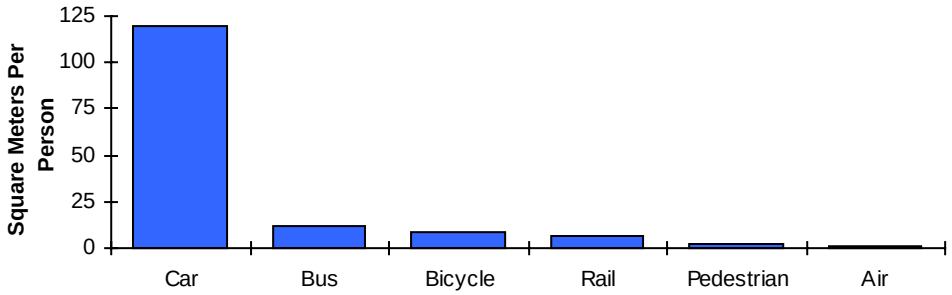
[52] *Environmental Policies for Cities in the 1990s*, OECD (www.oecd.org), 1990, cited in Poldy, p. 29.

[53] *Indicators of the Environmental Impacts of Transportation*, USEPA (Washington DC; www.epa.gov/tp), EPA 230-R-96-009, 1996, pp. 41-69; NEMO project (www.canr.uconn.edu/ces/nemo).

Land Use Impacts[54]

Automobile dependency has a number of negative land use impacts. It increases the amount of land paved for roads and parking which has economic, social and environmental costs.[55] Automobile oriented cities devote up to three times as much land to roads and parking as traditional, pedestrian-oriented cities.[56] Figure 9 shows per passenger road space requirements for various modes.

Figure 9 **Road Space By Mode**[57]



Automobiles require more road space per passenger than other travel modes.

Automobile dependency tends to result in lower density, urban periphery development (*sprawl*), which imposes a number of economic, social and environmental costs.[58] Sprawl increases the amount of land used per capita for roads, parking, and buildings and reduces the land left for agricultural and wildlife habitat.[59] Under most conditions it increases costs for public services, as illustrated in Figure 10.

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[54] Todd Litman, *Land Use Impact Costs of Transportation*, VTPI (www.vtpi.org), 1995

[55] Chester Arnold and James Gibbons, "Impervious Surface Coverage: The Emergence of a Key Environmental Indicator," *Am. Planning Association Journal*, Vol. 62, No. 2, Spring 1996, pp. 243-258.

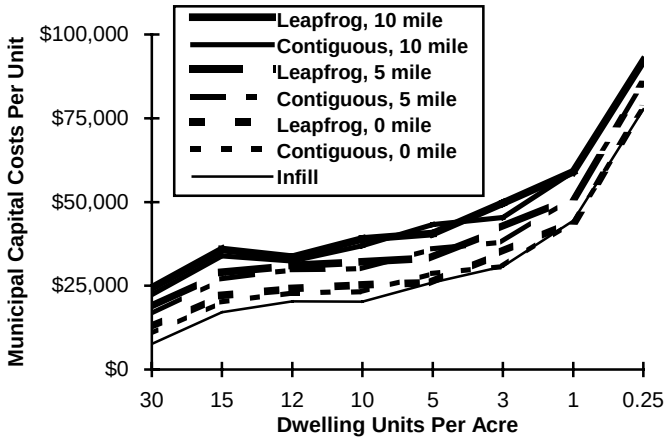
[56] Harry Dimitriou, *Urban Transport Planning*, Routledge, (NY), 1993, p. 136.

[57] D. Teufel, Die Zuykunft des Autoverkehrs (The Future of Motorized Transport), Umwelt- und Prognose Institut, Heidelberg, 1989, in *Transportation, The Environment and Sustainable Development*, p. 184.

[58] Robert Burchell, et al., *The Costs of Sprawl – Revisited*, TCRP Report 39, Transportation Research Board (www.nas.edu/trb), 1998.

[59] H. Ronald Pulliam, "Managing Landscapes for Sustainable Biodiversity," *Defining and Measuring Sustainability*, World Bank (Washington DC), 1995, pp. 89-102; Committee for a Study on Transportation and a Sustainable Environment, *Toward a Sustainable Future; Addressing the Long-Term Effects of Motor Vehicle Transportation on Climate Change*, Transportation Research Board (Washington DC; www.nas.edu/trb) Special Report 251, 1997, Chapter 4; *Indicators of the Environmental Impacts of Transportation*, Office of Policy and Planning, USEPA (Washington DC; www.epa.gov/tp), EPA 230-R-96-009, 1996, pp. 41-50.

Figure 10 **Residential Service Costs**[60]



This illustrates increased capital costs for lower density, non-contiguous development.

Community Impacts

Automobile dependency imposes a number of negative community impacts. Heavy vehicle traffic and roads designed for high-speed traffic tend to degrade the public realm (public spaces where people naturally interact) and in other ways reduce opportunities for social interaction, particularly spontaneous exchange between residents.[61] "*Automobile-based development has reduced opportunities for public life and magnified the polarization of our society by aggravating the geographical and time barriers between people with different incomes, and by making it more difficult for those who don't own cars to participate in life outside their communities.*"[62]

Donald Appleyard reported a negative correlation between vehicle traffic volumes and measures of neighborly interactions and activities, including number of friends and acquaintances residents had on their street, and the area they consider "home territory." He comments:

> "The activities in which people engage or desire to engage in may affect their vulnerability to traffic impact. So many of these activities have been suppressed that we sometimes forget they exist...Children wanting to play, and people talking, sitting, strolling, jogging, cycling, gardening, or working at home and on auto maintenance are all vulnerable to interruption [by traffic]...One of the most significant and discussed aspects of street life is the amount and quality of neighboring. Its interruption or 'severance' has been identified as one of the primary measures of transportation impact in Britain."[63]

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[60] James Frank, *The Costs of Alternative Development Patterns*, Urban Land Institute, 1989, from p. 40.

[61] David Engwicht, *Reclaiming our Cities and Towns*, New Society Publishers (Philadelphia), 1993, p. 45.

[62] Daniel Carlson, Lisa Wormser, and Cy Ulberg, *At Road's End; Transportation and Land Use Choices for Communities*, Island Press (Washington DC), 1995, p. 15.

[63] Donald Appleyard, *Livable Streets*, University of California Press, 1981.

An article by Consumers Union identifies residents' benefits of less automobile oriented communities.[64] Researchers describe traffic impacts,

> "A deeper issue than the functional problems caused by road widening and traffic buildup is the loss of sense of community in many districts. Sense of community traditionally evolves through easy foot access–people meet and talk on foot which helps them develop contacts, friendships, trust, and commitment to their community. When everyone is in cars there can be no social contact between neighbors, and social contact is essential to developing commitment to neighborhood."[65]

Automobile dependency encourages social and economic stratification, in which people spend an increasing portion of their lives in private and semi-private environments, surrounded by others with similar incomes and lifestyles. Although this may appear attractive, it contradicts the development of a true, diverse and complex community.

Aesthetic Degradation and Loss of Cultural Resources

Vehicle traffic, and large roadway and parking facilities tend to degrade landscape beauty,[66] and threaten cultural resources (historic structures and sites, traditional communities).[67] Landscape planners argue that an automobile oriented urban area is inherently ugly because retail businesses must "shout" at passing motorists with raucous signs, because so much of the land must be used for automobile parking, and because the settlement pattern has no clear form.[68] The value of attractive and healthy landscapes is indicated by their importance in attracting tourism and increasing adjacent property values.[69]

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[64] "Neighborhoods Reborn," *Consumer Reports*, May 1996, pp. 24-30.

[65] Richard Untermann and Anne Vernez Moudon, *Street Design; Reassessing the Safety, Sociability, and Economics of Streets*, University of Washington, Dept. of Urban Planning (Seattle), 1989, p. 3.

[66] John Edwards, "Environmental Considerations," *Transportation and Traffic Engineering Handbook*, Second Edition, Institute of Transportation Engineers (www.ite.org), 1982, p. 396; Works Consultancy, *Land Transport Externalities*, Transit New Zealand, 1993, p. 92; Harvey Flad, "Country Clutter; Visual Pollution and the Rural Landscape, *Annals*, AAPSS, 553, Sept. 1997, pp. 117-129; L. Huddart, "Evaluation of the Visual Impacts of Rural Roads and Traffic," TRRL, Report #355, 1978.

[67] S.L. Cullinane and K.P.B. Cullinane, "Increasing Car Ownership and Use in Egypt: The Straw that Breaks the Camel's Back?" *International Journal of Transport Economics*, Vol. 22, Feb. 1995, pp. 35-63.

[68] William Shore, "Recentralization; The Single Answer to More Than a Dozen United States Problems and A Major Answer to Poverty," *American Planning Assoc. Journal*, Vol. 61, No. 4, Summer 1995, 496-503.

[69] Charles Fausold and Robert Lileiholm, *The Economic Value of Open Space: A Review and Synthesis*, Lincoln Institute of Land Policy (Cambridge; www.lincolninst.edu), 1996.

Automobile Dependency and Health[70]

The World Health Organization (WHO) *Charter on Transport, Environment and Health* states that increased motor vehicle use has significant negative impacts on human health by producing pollution, accidents, and reducing exercise. The Charter recognizes:

1. Reliance on motorized transport, in particular road transport, continues to increase, resulting in adverse environmental and health effects. These effects may increase in the future if no effective preventive and structural actions are taken;
2. Increasing the safety of transport and reducing the health consequences of accidents need to be given high priority;
3. Policies on transport, environment and health need to be better coordinated, with a view to integrating them. The potential conflicts between transport and environment and health policies will increase at all levels unless effective action is taken now. There is a need to enhance cooperation and coordination between different sectors in central and local governments, as well as between governments, the public and the private sector;
4. Until now, the health effects of transport have been dealt with separately and without regard for their cumulative effect. Further coordination with and within the health sector is needed;
5. Consideration of the health impacts of policies has to be better integrated into approval procedures, impact assessments, and evaluations of the costs and benefits of transport plans, land use planning, and infrastructure programs and investments;
6. Motorized transport, and especially road and air transport users, usually do not face the full environmental and health-related costs, which can create adverse incentives and distortions in the transport market;
7. The public is generally not sufficiently informed of the adverse environmental and health effects from motorized transport and the importance of taking individual action to alleviate the problems.

The Charter proposes specific measures to encourage more balanced transportation, including increased use of environmentally sound and health-promoting modes, reducing the need for motor vehicle travel, and pricing reforms that relate the costs of transport more closely to mileage travelled and internalizing transport-related environmental and health costs and benefits.

[70] *Charter on Transport, Environment and Health*, World Health Organization (www.who.dk), 1999. Also see Carlos Dora, "A Different Route to Health: Implications of Transport Policy," *British Medical Journal*, Vol. 318, 19 June 1999, pp. 1686-1689.

Economic Development (Macroeconomic) Costs[71]

There is a common assumption that automobile use benefits the economy due to the importance of the automobile and petroleum industries. This may have been true during periods of initial industrial growth, due to economies of scale in vehicle and road production, but not now that these industries are mature.[72] Although highway investments showed high returns on investment (0.54) during the 1960s, this declined to a low level (0.09) by 1991, indicating that there are far more productive ways to spend the funds.[73] The automobile industry is now overcapitalized and not very profitable.[74] Public transit expenditures provide much greater economic returns than highway improvements.[75]

Automobile and petroleum expenditures provide relatively little employment or business activity, since they are highly capital intensive and rely on many imported inputs. One study found that each highway job costs approximately $1.5 million in government expenditures, compared with $5,000 to $30,000 for other programs.[76] A given expenditure on public transit provides almost five times as many jobs as the same expenditure on petroleum fuel in British Columbia.[77]

A World Bank study indicates that automobile dependency reduces regional economic development.[78] The researchers conclude that, "*there are no obvious gains in economic efficiency from developing car dependence in cities.*" This research indicates that beyond a certain point (about 7,500 kilometers of per capita annual automobile travel), increased driving, automobile dependent transport system and low-density land use patterns impose economic costs that outweigh marginal economic benefits.

Similarly, Walter Hook argues that automobile dependency gave the U.S. an economic *disadvantage* relative to Japan during its years of maximum economic growth.[79] He points out that transport accounts for only about half portion of GNP in Japan as in the U.S. This increased Japanese productivity and freed funds for capital investment.

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[71] Todd Litman and Felix Laube, *Automobile Dependency and Economic Development*, VTPI (www.vtpi.org) 1998; Hank Dittmar, "Highway Capacity and Economic Productivity, *STPP Progress* (www.transact.org/febr99/hcep.htm), Feb. 1999.

[72] Marlon Boarnet, "New Highways & Economic Productivity: Interpreting Recent Evidence," *Journal of Planning Literature*, Vol. 11, No. 4, May 1997, pp. 476-486.

[73] *Economic Effects of Federal Spending on Infrastructure and Other Investments*, Congressional Budget Office (www.cbo.gov), June 1998.

[74] "The Coming Car Crash: Global Pile-up," *The Economist*, 10 May 1997, pp. 21-23.

[75] David Aschauer, *Transportation Spending and Economic Growth*, American Public Transit Association (Washington DC), 1991.

[76] Cited in Hank Dittmar, Feb. 1999.

[77] B.C. Treasury Board Input/Output Table (Victoria), 1996.

[78] Jeff Kenworthy, et al., *Indicators of Transport Efficiency in 37 Global Cities*, Sustainable Transport Research Group, Murdoch University (Perth), for the World Bank (Washington DC), February 1997.

[79] Walter Hook, "Economic Importance of Nonmotorized Transportation," *Transportation Research Record*, #1487, 1995, pp. 14-21.

Automobile expenditures (petroleum in particular) provide relatively little regional economic activity because they are mostly imported from other regions and are capital intensive, while transit services are largely locally produced and labor intensive. A 1999 Texas case study found that a 1% shift in regional travel (53 million vehicle miles) from automobile to public transit causes a $2.9 million in regional income (about 5¢ per mile shifted), resulting in 226 additional regional jobs.[80] Table 8 summarizes the estimated regional economic impacts of consumer expenditures.

Table 8 **Regional Economic Impacts of Alternative Consumer Expenditures**

Expenditure Category	Regional Income	Regional Jobs
Automobile Expenditures	$307,000	8.4
Transit Expenditures	$1,200,000	62.2
Non-automotive Consumer Expenditures	$526,000	17.0

Automobile expenditures tend to provide less regional economic activity and employment than alternative expenditures, particularly public transit expenditures

[80] Jon Miller, Henry Robison & Michael Lahr, *Estimating Important Transportation-Related Regional Economic Relationships in Bexar County, Texas*, VIA Metropolitan Transit (San Antonio), 1999.

Equity Impacts[81]

Automobile dependency has significant equity impacts.

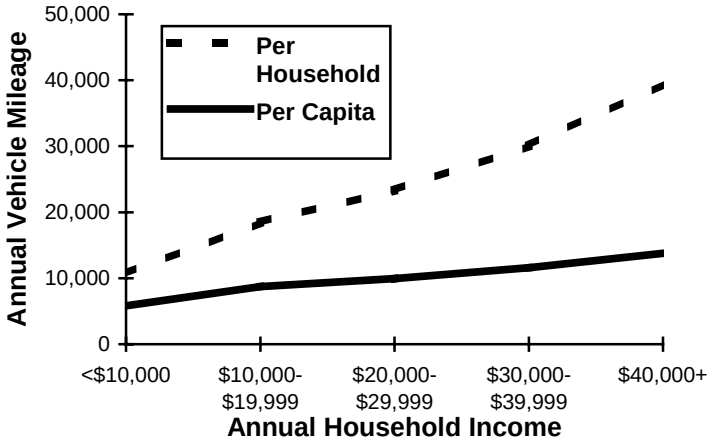
Horizontal equity

Horizontal equity requires that people with comparable abilities and resources be treated alike. Automobile dependency violates this principal by increasing external costs, including financial subsides (such as free parking and road services not covered by user charges), and non-market externalities (such as air pollution, noise and accident risk). Non-drivers and people who drive less than average therefore subsidize people who drive more than average.

Vertical Equity with Respect to Income

This definition assumes that public policy should be progressive with respect to income (provide greater benefits to lower income than to higher income households). Policies and programs that benefit the poor are considered equitable by this criterion. Automobile dependency violates this goal, since lower income households drive less than wealthier families, as illustrated in Figure 11, and bear costs, such as tax expenses for local roads, subsidies for parking, reduced mobility for non-drivers, and health risk from accidents and pollution. Automobile dependency is therefore inequitable with respect to income.

Figure 11 **Annual Vehicle Travel By Income**[82]



Higher income households and individuals drive more than those with lower incomes, and thus enjoy a greater share of benefits and user subsidies. This implies that automobile dependency is inequitable with respect to income.

This is not to say that poor people don't benefit from inexpensive driving (low priced fuel, subsidized parking, untolled roads). In the short term such underpricing can be progressive with respect to income. For example, free parking is a greater financial benefit to poor than wealthy motorists as a portion of income. Subsidies to driving may

[81] Todd Litman, *Evaluating Transportation Equity*, VTPI (www.vtpi.org), 1998.

[82] Patricia Hu, Jennifer Young, *1990 NPTS Databook, Vol.1*, FHWA (Washington DC), Nov. 1993.

therefore be justified for vertical equity. But such practices are less equitable than more flexible subsidies, since lower-income households tend to drive less than those with higher incomes. While a parking subsidy may benefit poor drivers, a transport subsidy that can be used for any mode is more progressive because it benefits non-drivers too.[83]

Over the long term, automobile dependency imposes significant costs on the poor by reducing non-automotive travel options and increasing the amount of travel necessary to access destinations. Automobile dependency imposes a major cost burden on low-income households by increasing their need to own and operate motor vehicles.

Vertical Equity with Respect to Need or Ability

This definition of equity is similar to vertical equity with respect to income, except that whether a person is "advantaged" or "disadvantaged" is determined by factors other than income, such as whether they have a disability, and whether they can drive an automobile. Automobile dependency doesn't entirely immobilize non-drivers, since given enough time and money they can reach most destinations, but it makes them disadvantaged relative to drivers. This gives motorists a competitive advantage over non-drivers in housing, schooling, employment and access to recreational activities. This is unfair by any criteria, and especially unfair because many non-drivers are also economically, physically or socially disadvantaged.

As described earlier, automobile dependency reduces the efficiency of travel alternatives. It is virtually impossible for an automobile dependent community to offer high-quality mobility to non-drivers, since taxpayers are unwilling to subsidize transit services and facilities for non-motorized transport facilities that are lightly used, and because of the barriers created by automobile oriented land use patterns and heavy vehicle traffic. As a result, automobile dependency is inherently harmful to anybody who cannot drive or afford a personal automobile. One recent article describes the impacts of automobile dependent land use patterns on the poor:

> "Land use patterns that put a premium on mobility actually disadvantage some segments of the population. Furthermore, a major cause of this poverty, in the opinion of many scholars and policymakers, is the gap between where these poor people live in central cities and where job growth is taking place in the suburbs. This transportation gap can be all but unbridgeable for low-wage workers who do not own cars, especially when public transit, where it exists, usually focuses on downtown and is often useless for conveying people to widely dispersed, suburban employment sites."[84]

[83] Commuter Choice Program (www.epa.gov/orcdizux/transp/comchoic/f98029.htm).

[84] "Restructuring our Car-Crazy Society," *Land Lines* 6/2, Lincoln Institute, March 1994, p. 2.

Putting Automobile Dependency Costs in Perspective

This section compares automobile dependency costs with alternatives.

The average private automobile costs $3,140 annually in direct expenses,[85] plus $400 to $800 for residential parking. In addition to these internal costs (costs borne directly by users), automobile use requires facilities funded by businesses and governments. Parking for employees and customers is estimated to cost businesses $260 to $875 per vehicle-year.[86] Various studies indicate that governments spend $250 to $500 annually per vehicle in general taxes on roads and traffic services.[87]

Facility costs tend to be particularly high in urban areas. The cost of increasing urban roadway capacity at a rate that just maintains current congestion levels is estimated to cost an average of $564 per vehicle-year in U.S. urban areas.[88] In the Vancouver region, the cost of adding roadway capacity to accommodate an additional vehicle is estimated to cost $75,000 U.S. ($106,000 Canadian), representing an annual cost of about $4,000, not including expenses for road maintenance or traffic services.[89] Urban parking costs $10,000 to $20,000 per space to construct, plus operating and maintenance expenses, or $1,200 to $2,000 per vehicle-year, assuming that each urban vehicle requires two non-residential parking spaces.[90]

This indicates that the average motorist spends about $4,000 directly on each automobile, and that businesses and governments must spend a comparable amount on facilities and traffic services, or a total of about $8,000 per vehicle. Note that these estimates do not include non-market external costs of motor vehicle use, such as uncompensated accident and environmental damages, or the opportunity cost of land used for public roads.

These cost estimates may seem high because these costs are widely dispersed, borne as business expenses and higher taxes, and not directly connected to vehicle use. In addition, the cost of accommodating additional vehicle travel is often borne as increased traffic congestion rather than as an expenditure on additional roadway capacity.

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[85] 1997 Consumer Expenditure Survey, BLS (ftp://ftp.bls.gov/pub/special.requests/ce).

[86] Mark Delucchi, *Annualized Social Cost of Motor-Vehicle Use in the U.S., 1990-1991*, Vol. 6, Institute of Transportation Studies (www.engr.ucdavis.edu/~its), 1996, UCD-ITS-RR-96-3 (6), 1997.

[87] Todd Litman, *Whose Roads?*, VTPI (www.vtpi.org), 1999.

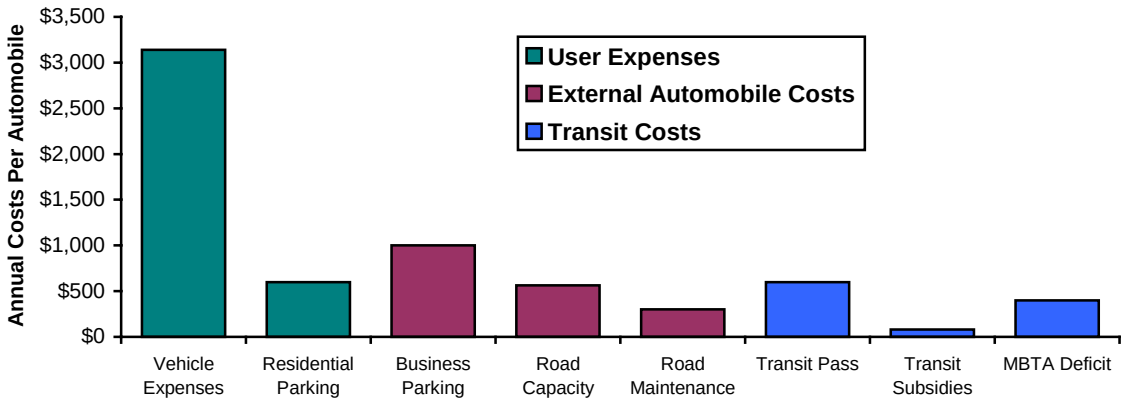
[88] *An Analysis of the Relationship Between Highway Expansion and Congestion in Metropolitan Areas*, STPP (Washington DC; www.transact.org), 1998. Cost values in the table in Appendix B were calculated to average $1,128 per household or $627 per vehicle, assuming 2 vehicles per household.

[89] Gordon Price, *A Local Politician's Guide to Urban Transportation*, VTPI (www.vtpi.org), 1999.

[90] Donald Shoup, "The High Cost of Free Parking," *Journal of Planning Education and Research*, Vol. 17, No. 1, September 1997.

Compare these costs of automobile dependency with alternatives. A public transit pass typically costs users about $600 per year. Public transit subsidies total about $15 billion annually in the U.S., or about $81 per vehicle-year.[91] A regional transit agency deficit averaging about $400 annually per automobile is considered a severe financial crisis.[92] These *are* significant costs, and would represent severe waste if they provide little benefit, but they pale in comparison to the incremental costs of automobile dependency.

Figure 10 **Typical Transportation Costs in Urban Regions**



This table compares various transportation costs that are typical for urban regions.

Figure 10 illustrates the magnitude of these costs. Transit fares and subsidies are not insignificant, but are much smaller than automobile costs. This indicates that a fairly large increase in public transit expenditures could be justified if it provides even a small reduction in total automobile costs. For example, transit subsidies could double from $81 to $162 per vehicle year if doing so reduced total automobile costs by just 1%. Similarly, large increases in expenditures on walking, cycling and telecommuting facilities could be justified if doing so reduces a small portion of automobile costs.

The example in Table 9 illustrates these potential savings. It compares a household's transportation costs in an automobile dependent community and in a community with more balanced transportation. Table 10 shows total costs. This indicates that a household that shifts from automobile dependency to more balanced transportation can save $4,500 per year directly, and reduces its external costs by $3,300. In addition to these direct economic benefits, more balanced transportation can increase equity by improving non-drivers' mobility, increase consumer choice, and provide community benefits.

[91] *1996 National Transit Summaries and Trends* and *1998 APTA Transit Fact Book*, American Public Transit Association (Washington DC; www.apta.com), 1998.

[92] Jose Gomez-Ibanez, "Big-City Transit Ridership, Deficits, and Politics; Avoiding Reality in Boston," *APA Journal*, Vol. 62, No. 1, Winter 1996, pp. 30-50.

Table 9 **Automobile Dependent and Multi-Modal Community Annual Costs**[93]

Cost	Rate	Auto Dependent	Multi-Modal	Difference
Automobiles per Household		2	1	1
Annual Mileage per Household		25,000	15,000	10,000
Automobile Ownership Costs	$3,000/auto	$6,000	$3,000	$3,000
Automobile Operating Costs	10¢/mile	$2,500	$1,500	$1,000
Transit Fares	$50/month	$0	$600	-$600
Internal Accident Costs	5¢/mile	$1,250	$750	$500
External Accident Costs	3.5¢/mile	$875	$525	$350
Residential Parking Costs	$600/space	$1,200	$600	$600
External Parking Costs	4.8¢/mile	$1,200	$720	$480
Congestion	4.2¢/mile	$1,050	$630	$420
Roads, Road Land, and Services	4.7¢/mile	$1,175	$705	$470
Air Pollution	4.8¢/mile	$1,200	$720	$480
Noise	0.8¢/mile	$200	$120	$80
Energy Externalities	2.4¢/mile	$600	$360	$240
Barrier Effect	0.9¢/mile	$225	$135	$90
Land Use Impacts (Sprawl)	5.6¢/mile	$1,400	$840	$560
Water Pollution/Hydrologic Impacts	1.3¢/mile	$325	$195	$130
Totals		*$19,200*	*$11,400*	*$7,800*

This table compares cost per household in auto dependent and multi-modal communities.

Table 10 **Cost Summary**

	Auto Dependent	Multi-Modal	Difference
Internal Costs	$10,950	$6,450	$4,500
External Costs	$8,250	$4,950	$3,300
Total Costs	*$19,200*	*$11,400*	*$7,800*

Some households may consider such savings not worth the lifestyle changes and mobility foregone, but there is evidence that at least some households would prefer to drive less if given better choices and fewer market distortions that favor automobile dependency. This is indicated, for example, by the popularity of neotraditional communities, indicating latent demand for less automobile dependent lifestyles, and the effectiveness of strategies such as parking cash out, which simply offer more neutral commute options.[94] A variety of transportation market reforms may be justified for the sake of economic, social and environmental benefits.[95]

[93] Cost estimates from Todd Litman, *Transportation Cost Analysis*, VTPI (Victoria; www.vtpi.org), 1999. These represent a weighted mix of urban and rural travel.

[94] Commuter Choice Program, Transportation Air Quality Center, USEPA (www.epa.gov/oms/traq).

[95] Todd Litman, *Win-Win Transportation Solutions*, VTPI (www.vtpi.org), 1999.

Justifications for Automobile Dependency?

Several organizations have published documents defending public policies that support automobile dependency.[96] *Some of their arguments are discussed below.*

Argument: Failing to accommodate growing travel demand constrains economic development. Highway investments stimulate economic growth. The automobile/highway industries are an important sector of the economy.

Counter-argument: Although a highway improvement may stimulate economic development in a particular location, much of that represents a transfer from other locations. Greater economic benefits appear to result from transit improvements and TDM measures that encourage more efficient transport. Research described earlier indicates that automobile dependency is overall harmful to the economy. Automobile expenditures provide less economic benefits than other consumer expenditures, because much of the inputs (vehicles, parts and fuel) are imported.

Argument: Automobile dependency represents consumer needs and demands. High levels of automobile use and suburban living represent consumer preferences for convenience, comfort, and privacy. Constraints on vehicle ownership and driving, including failure to invest in roadway capacity needed to meet demand, would reduce consumer welfare.

Counter-argument: Only if consumers have efficient markets can society ensure that increased consumption actually provides net benefits. Current market distortions reduce consumer choices and encourage automobile use beyond what is optimal. Most proposed constraints on automobile use, such as least-cost planning and full cost recovery for facilities, simply represent standard business practices as they would apply to most other goods. The lack of viable transportation alternatives is a strong argument in support of *reducing*, not supporting, automobile dependency.

Argument: Demand management is inequitable. It is unfair to use revenue from motor vehicle taxes and fees for anything other than road building. Automobile user fees are regressive and prevent lower-income households from enjoying the benefits of driving.

Counter-argument: Motor vehicle user fees are inadequate to cover roadway facility costs, much less the total external costs of motor vehicle use, so there is no reason to consider "diversions" of motor vehicle taxes to other travel modes unfair (horizontally inequitable). User fees need not be regressive with respect to income if the revenue is used to replace other regressive fees, or is used in ways that benefit disadvantaged populations, such as improving transit services and facilities for non-motorized travel. Many TDM strategies, such as cashing out free parking and location-efficient housing, greatly benefit lower-income households.

Argument: Transportation costing and TDM programs are "anti-automobile," "social engineering," and out of touch with American ideals of consumer sovereignty.

Counter-argument: Transportation costing and TDM programs are no more "anti-automobile" than a healthy diet is "anti-food." Most TDM measures are no more intrusive than current transport policies (such as zoning code parking requirements). There is considerable evidence that consumers want better transportation and land use choices, including improved walking and cycling conditions, improved transit, and alternatives to sprawled development.

[96] Todd Litman, *Reply to Critics of Transportation Costing*, VTPI (www.vtpi.org), 1998.

Conclusions, Implications and Alternatives

Automobile dependency provides direct benefits to motorists. There is little evidence that it provides significant *external* marginal benefits (i.e., you benefit if your neighbors drive more). On the other hand, automobile dependency imposes a variety of economic, social and environmental costs. Increased driving is not necessarily beneficial to society when all incremental benefits and costs are considered.

Automobile dependency is inequitable. Because automobile use imposes external costs, people who drive less than average bear more than their share of costs, while those who drive more than average receive a subsidy. Disadvantaged people (low income, disabled, children and seniors) bear a large share of such costs. People who for any reason cannot own or drive a motor vehicle are worse off.

Automobile dependency does not reflect true consumer choice due to market distortions that encourage excessive motor vehicle use. Only if such distortions are eliminated can society be sure that automobile use actually provides net benefits. Table 11 summarizes current policies that increase automobile dependency, and alternatives that encourage more balanced transportation. These reforms would cause consumers to choose to drive less, and they would be better off as a result overall.

Table 11 **Policies Options**

	Current Policies that Encourage Automobile Dependency	**Policies That Encourage Balanced Transportation**[97]
Measuring Transportation	Assumes vehicle travel is an end in itself.	Focus on *access* to goods, services and destinations.
Automobile Pricing	Most costs of vehicle use are either fixed or external and therefore do not affect individual trip decisions.	1. Internalize external costs. 2. Shift fixed costs to variable costs. 3. Implement revenue-neutral tax shifts.
Transportation Planning	Favors roadway investments. Overlook the full benefits of alternatives. Dedicated road funding encourages communities to choose roadway solutions to transport problems.	"Lease cost" transportation planning that allows all transportation improvement options to compete equally for investment and implementation.
Land Use Planning	Single purpose, low density zoning with generous parking requirements creates automobile dependent land use patterns.	Encourage higher density, mixed use development patterns that accommodate alternative modes.
Roadways	Design roads to maximize automobile traffic volumes and speeds.	Accommodate all modes. Use traffic calming where appropriate.
Mode Choice	Minimal travel alternatives to driving.	Encourage development of additional travel modes and options. Give priority to non-automobile modes when possible.

[97] Todd Litman, *Potential TDM Strategies*, VTPI (www.vtpi.org), 1999.

Resources

Carfree Times (www.carfree.com/cft/i007_qx.htm) is an international journal dedicated to promoting reduced automobile dependency.

Center for Livable Communities (www.lgc.org/clc) helps local governments and community leaders develop more balanced transportation systems.

Centre for Sustainable Transportation (Ottawa, www.web.net/~cstctd) is a research institute dedicated to encouraging more sustainable transportation policy.

U.K. **Dept. of Environment, Transport and Regions**, (www.roads.detr.gov.uk/roadnetwork) has extensive resources on transportation and land use planning and travel demand management.

Reid Ewing, *Transportation and Land Use Innovations; When You Can't Build Your Way Out of Congestion*, Planners Press (Chicago; www.planning.com), 1997.

Phil Goodwin, *Solving Congestion*, Centre for Transport Studies (London; www.ucl.ac.uk/transport-studies/tsuhome.htm), 1997.

The **International Council for Local Environmental Initiatives** (www.iclei.org) provides tool to help communities become healthier and more environmentally responsible.

Institute for Science and Technology Policy (Murdoch University; http://wwwistp.murdoch.edu.au) has resources for evaluating automobile dependency.

Todd Litman, Charles Komanoff and Douglas Howell, *Road Relief; Tax and Pricing Shifts for a Fairer, Cleaner, and Less Congested Transportation System in Washington State*, Climate Solutions (www.climatesolutions.org), 1998.

Terry Moore and Paul Throsnes, *The Transportation/Land Use Connection*, American Planning Association, Report 448/449 (Chicago; www.planning.org), 1994.

Peter Newman and Jeff Kenworthy, *Cities and Automobile Dependency*, Gower, 1989.

Peter Newman and Jeff Kenworthy, *Sustainability and Cities: Overcoming Automobile Dependence*, Island Press (www.islandpress.org), 1999.

The OECD **Environmentally Sustainable Transport** (www.oecd.org/env/trans) studies strategies to achieve more sustainable transport.

The **Smart Growth Network** (www.smartgrowth.org) includes planners, govt. officials, lenders, community developers, architects, environmentalists and activists.

The **Sprawl Watch Clearinghouse** (www.sprawlwatch.org) provides information, advice, and referrals on issues related to sprawl and smart growth.

TransAct (www.transact.org) sponsored by the Surface Transportation Policy Project is a collection of resources for making communities more livable through innovative transportation projects and initiatives.

Transportation for Livable Communities (www.tlcnetwork.org) is a resource for people working to create more livable communities by improving transportation.

Here are related reports available from VTPI:

Automobile Dependency and Economic Development

Reinventing Transportation; Exploring the Paradigm Shift Needed to Reconcile Transportation and Sustainability Objectives

Potential TDM Strategies

Socially Optimal Transport Prices and Markets

Transportation Cost Analysis for Sustainability

Transportation Cost Analysis; Techniques, Estimates and Implications

Transportation Market Distortions - A Survey

Win-Win Transportation Solutions

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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