

MOBILITY MANAGEMENT INNOVATIVE MANAGEMENT STRATEGIES TO TRANSPORT PROBLEMS

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ABSTRACT

Mobility Management (also called *Transportation Demand Management*) consists of policies and programs that result in more efficient travel behavior, including changes in trip mode, destination, route and time. Mobility management can provide multiple economic, social and environmental benefits. Many mobility management strategies reflect market principles; they correct existing market distortions that result in economically excessive automobile travel. Because they provide multiple benefits they offer opportunities for cooperation and coordination among various organizations and political interests. This paper describes mobility management strategies and how they can be incorporated into transport planning.

1. INTRODUCTION

This paper describes various *Mobility Management* (also called *Transportation Demand Management*) strategies, which are various policies and programs that encourage more efficient travel behavior, such as those listed in Table 1. These strategies can affect travel behavior in a variety of ways, including shifts in travel *mode* (from driving to walking, cycling, ridesharing, public transit, etc.), *destination* (choosing neighborhood services rather than driving to a more distant shops), *time* (from peak to off-peak), and *frequency* (consolidating trips, and substituting telework for physical travel). Some change land use patterns to increase accessibility, reducing the distance that people need to travel.

Table 1 Mobility Management Strategies (VTPI, 2004)

Improves Transport Options	Incentives	Land Use Management	Implementation Programs
Transit improvements	Congestion pricing	Smart growth	Commuter trip reduction programs
Walking & cycling improvements	Distance-based fees	New urbanism	School and campus transport management
Rideshare programs	Employee transportation benefits	Location-efficient development	Freight transport management
Flextime	Parking cash out	Parking management	Tourist transport management
Car sharing	Parking pricing	Transit oriented development	Transit marketing
Telework	Pay-as-you-drive vehicle insurance	Car free planning	Nonmotorized encouragement
Taxi improvements	Fuel tax increases	Traffic calming	
Bike/transit integration			
Guaranteed ride home			

This table lists various mobility management strategies.

Mobility management can provide multiple economic, social and environmental benefits. Table 2 lists various planning objectives and evaluates the effects of various transportation improvement strategies.

Table 2 Benefits Provided By Various Types of Travel Changes

Planning Objective	Reduced Veh. Ownership	Reduced Veh. Trips	Shift Mode	Shorter Trips	Shift Trip Time	Reduced Traffic Speeds
Congestion reduction	✓	✓	✓	✓	✓	
Roadway cost savings	✓	✓	✓	✓	✓	
Parking cost savings	✓	✓	✓			
Consumer cost savings	✓	✓	✓	✓		
Improved mobility options for non-drivers	✓	✓	✓		✓	
Improved traffic safety	✓	✓	✓	✓		✓
Reduced pollution	✓	✓	✓	✓	✓	✓
Energy conservation	✓	✓	✓	✓	✓	✓
Efficient land use	✓	✓	✓	✓		✓
Improved fitness & health	✓	✓	✓	✓		✓

✓ = helps achieve that objective.

Mobility management benefits vary depending on the specific circumstances. For example, strategies that reduce peak-period trips reduce traffic congestion, and strategies that reduce automobile trips reduce parking costs. Some incentives, such as increased road and parking user fees, increase user costs, but others, such as parking cash out and transit benefits, give consumers direct financial benefits. Some strategies increase walking and cycling activity, which tends to improve public physical fitness and health.

When all benefits and costs are considered, mobility management strategies are often the most cost effective way of improving transportation. But special care is needed when evaluating mobility management solutions and comparing them with other options. Conventional planning tends to be *reductionist*; individual problems are assigned to a specific agency or professional with narrowly-defined goals (Litman, 1999). For example, transport agencies are responsible for reducing traffic congestion, environmental agencies are responsible for emission reductions and social service agencies are responsible for improving opportunities for disadvantaged people. This can result in agencies selecting solutions to problems within their mandate that exacerbate other problems outside their mandate, and tends to undervalue strategies that provide multiple but modest benefits.

Table 3 compares the range of benefits provided by various types of transportation solutions. Most mobility management strategies provide a wide range of benefits. Expanding roadways tends to help achieve just one objective (congestion cost savings), but tends to exacerbate other problems by inducing additional vehicle travel (“Rebound Effects,” VTPI, 2005). Alternative fuel vehicles and fuel efficiency mandates tend to provide just two benefits (pollution emission reductions and energy savings). Conventional

planning, which considers a limited set of impacts, will often select solutions such as roadway widening and alternative fuels, while more comprehensive analysis, which considers a wider range of impacts, will tend to favor mobility management solutions (Sussman, 2001).

Table 3 Comparing Solutions (VTPI, 2004)

Planning Objectives	Transport Options	Incentives	Land Use Management	Expanded Roads	Alternative Fuels
Congestion reduction	✓	✓		✓	
Roadway cost savings	✓	✓		✗	
Parking cost savings	✓	✓	✓	✗	
Consumer cost savings	✓	✓/✗	✓		
Improved mobility options	✓	✓	✓		
Improved traffic safety	✓	✓	✓		
Reduced pollution emissions	✓	✓	✓	✗	✓
Energy conservation	✓	✓	✓	✗	✓
Efficient land use development	✓	✓	✓	✗	
Improved public fitness & health	✓	✓			

✓ = helps achieve that objective. ✗ = contradicts that objective.

Figure 1 illustrates the estimated magnitude of various transport costs. For example, in 2000 U.S. residents spent an average of about \$2,100 annually on fixed vehicle expenses, the equivalent of about \$1,750 in crash damages (including the value of uncompensated pain and disability), and about \$1,000 for parking subsidies (the value of unpriced parking provided by businesses and governments). Traffic congestion and environmental costs are moderate in magnitude, averaging about \$350 each per capita. It would not be cost effective to reduce one of these costs in a way that caused comparable-size increases in other costs. For example, it would not be cost effective to reduce traffic congestion or pollution emissions by 10% if doing so increased vehicle costs or accident risk by 10%. On the other hand, a congestion or emission reduction strategy becomes far more beneficial overall if it also reduces vehicle costs and accident risk, for example, by improving transportation options in ways that reduce total vehicle travel.

Many mobility management strategies are market reforms that support basic economic principles such as consumer options, efficient pricing and neutral public policies (“Market Principles,” VTPI, 2005). Current transport markets often violate these principles. For example, many jurisdictions have dedicated funds for roads and parking facilities that cannot be used for other types of transport improvements, and most jurisdictions have policies that encourage the provision of abundant, subsidized vehicle parking. Although individual market distortions may seem modest and justified, their effects are cumulative and synergistic (total impacts are greater than the sum of individual impacts), significantly increasing per capita vehicle ownership and use. For example, to individual businesses it makes sense to subsidize employee parking, since this is generally not taxed as income and so is worth more than an equal value given as wages. But when employees are able to choose between a parking subsidy and cash, automobile commuting typically declines about 20%, indicating that a significant portion of traffic problems result from this market distortion which favors driving over other commute options (“Commuter Financial Incentives,” VTPI, 2005).

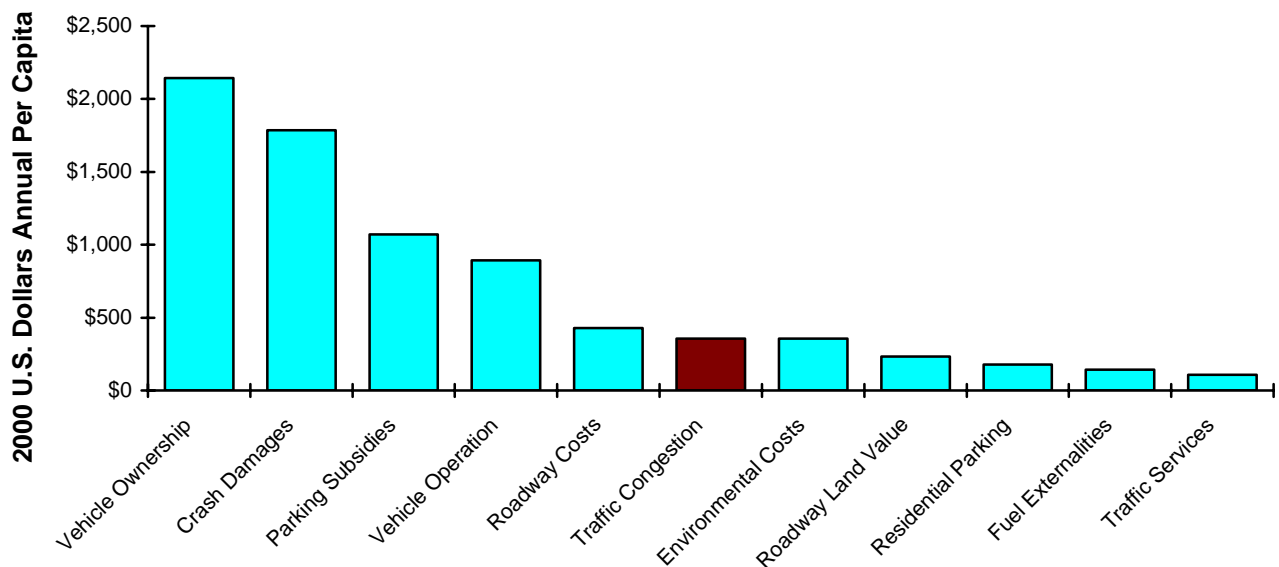


Figure 1. Costs Ranked by Magnitude (VTPI, 2005)

This figure shows Average Car costs per vehicle mile, ranked by magnitude.

This is not to suggest that driving should be prohibited or that it provides no benefits. It simply indicates that in a more optimal market consumers would choose to drive significantly less and be better off overall as a result (Litman, 2005). As an analogy, food is essential for life and therefore provides tremendous benefits. However, this does not mean that everybody should increase their food consumption or that society should subsidize all food. At the margin (relative to current consumption) many people are better off eating less. Food subsidies may be justified for undernourished people, but it would be economically and medically harmful to subsidize all food for everybody. Similarly, that mobility provides benefits does not prove that *more* driving is better, that current levels of driving are optimal, or that driving should be subsidized. At the margin, many motorists would prefer to drive less, provided that the alternatives are convenient, comfortable and affordable.

2. MOBILITY MANAGEMENT STRATEGIES

This section describes specific Mobility Management strategies. For more information see appropriate chapters in the “Online TDM Encyclopedia (VTPI, 2005) and other references.

2.1 Least Cost Transportation Planning

Conventional transport planning and funding practices tend to favor automobile travel and undervalue alternative modes in various, often subtle ways (Sussman, 2001; Beimborn and Puentes, 2003; Litman, 2005c; “Comprehensive Transport Planning,” VTPI, 2005). For example, conventional evaluation practices rely primarily on indicators of motor vehicle travel quality, such as roadway level-of-service, Volume/Capacity ratios and average traffic speed, which ignore impacts on other modes. There is often significant funding dedicated to roads and parking facilities that cannot be shifted to other modes, and funding dedicated to capital projects that cannot be used for management programs. This encourages decision-makers to expand roads and parking facilities even when alternative options are more cost effective overall.

Least-cost transportation planning is a term for more neutral and comprehensive planning that:

- Considers demand management equally with facility capacity solutions.
- Considers all significant impacts (costs and benefits), including indirect effects.
- Involves the public in developing and evaluating alternatives.

For example, Least Cost Planning means that funding available for roadway capacity expansion projects could be used for transit improvements or other mobility management programs if they are more cost effective at achieving transportation planning objectives, taking into account all economic, social and environmental impacts.

2.1.1 Implementation

Least-cost planning shifts planning and investment decisions to better support alternative modes and management programs. Although it does not affect travel directly, it can have a significant effect on travel behavior, particularly over the long term. It is generally implemented by transportation planning organizations, but can also be applied by businesses, for example, when evaluating solutions to parking problems.

2.1.2 Travel Impacts

Least-cost planning can affect virtually all types of travel. Impacts vary depending on circumstances, and often take many years to be fully realized, but often result in 10-20% reductions in automobile travel compared with what would otherwise occur.

2.2 Commute Trip Reduction Programs

Commuter Trip Reduction (CTR) (also called *Employee Trip Reduction* or *Vehicle Trip Reduction*) are employer programs to encourage reduced automobile commute trips. CTR programs typically include some of the following strategies:

- Rideshare matching.
- Alternative scheduling (flextime and compressed work weeks).
- Telework (allowing employees to work at home).
- Marketing and promotion activities.
- Guaranteed Ride Home.
- Walking and cycling improvements and encouragement.
- Commuter Financial Incentives (described below).

2.2.1 Implementation

Commuter Trip Reduction programs should be implemented to the degree justified by their cost effectiveness at achieving conventional planning objectives, such as traffic congestion reduction and parking cost savings, and often more for other, more difficult to quantify objectives such as improved mobility for non-drivers and pollution reduction. These programs are generally implemented by businesses and local governments.

2.2.2 Travel Impacts

Commuter Trip Reduction programs affects the 15-20% of travel that consists of urban and suburban commuting. CTR programs that do not include financial incentives (described next) typically reduce automobile commuting 5-15%.

2.3 Commuter Financial Incentives

Commuter Financial Incentives means that commuters are offered financial incentives to use alternative travel modes ("Commuter Financial Incentives," VTPI, 2005). *Parking Cash Out* means that commuters offered subsidized parking can instead choose the cash equivalent. *Transit Benefits* means that employers help fund their employees' transit and rideshare fares. For example, employees might be able to choose between a free parking space, a monthly transit pass, a vanpool subsidy, or \$50 cash per month.

2.3.1 Implementation

Commuter Financial Incentives are usually implemented at least to reflect modal neutrality, or based on their cost effectiveness at achieving conventional planning objectives (such as congestion reduction and parking cost savings), and often more to achieve other objectives such as reducing pollution. They are generally implemented by businesses, often with local government support.

2.3.2 Travel Impacts

Commuter Financial Incentives typically reduce automobile commuting 10-30% compared with what would otherwise occur.

2.4 Increased Fuel Taxes - Tax Shifting

Since governments must tax something to raise revenue, many economists recommend shifting taxing to activities that are harmful or risky, for example, reducing taxes on employment and commercial transactions, and increasing taxes on non-renewable resources, particularly vehicle fuel (Durning and Bauman, 1998). Current fuel taxes are relatively low, particularly in the U.S., Canada, and developing countries. Transition costs are minimal if implementation is predictable and gradual, and it can be progressive with respect to income if revenues are used in ways that benefit lower-income people.

2.4.1 Implementation

Optimal fuel taxes are at least high enough to cover all public costs for providing roadway and producing and importing petroleum, and could be higher to achieve other social objectives, such as reducing pollution emissions.

2.4.2 Travel Impacts

The elasticity of vehicle travel with respect to fuel price tends to be -0.1 to -0.3 , and the elasticity of fuel consumption with respect to fuel price is -0.3 to -0.7 . Gradually increasing fuel taxes so prices increase by 40-100% would reduce automobile travel 5-15% compared with what would otherwise occur, and reduce fuel consumption by 25-65%. It affects virtually all types of motor vehicle travel.

2.5 Pay-As-You-Drive Pricing

Pay-As-You-Drive (PAYD) pricing (also called *Distance-Based* and *Mileage-Based pricing*) means that vehicle insurance or other fees are based directly on how much it the vehicle is driven ("Pay-As-You-Drive Pricing," VTPI, 2005). This can be done by changing the pricing unit (i.e., how fees are calculated) from the vehicle-year to the vehicle-mile, vehicle-kilometer or vehicle-minute. Existing pricing factors are incorporated so higher-risk motorists pay more per unit than lower-risk drivers. For example, if a vehicle's annual insurance premiums are \$400 and its class averages 20,000 annual kilometers, the distance-based fee is 2¢ per km. Similarly, currently fixed vehicle taxes, registration, licensing and lease fees, and taxes can be converted to distance-based fees by dividing existing fees by average annual mileage for each vehicle class.

2.5.1 Implementation

PAYD insurance could be a consumer option, in which case only a small portion of total vehicle travel would be affected (10-30% depending on circumstances), or it could be mandatory, in which case it would affect virtually all private vehicles. PAYD insurance is implemented by insurance companies, which can be encouraged or mandated by public policies and incentives. PAYD registration is implemented by governments.

2.5.2 Travel Impacts

Pay-As-You-Drive pricing could apply to virtually all vehicles. PAYD pricing typically reduces affected vehicles' average annual mileage 10-15%, depending on price structure.

2.6 Road Pricing

Road Pricing means that motorists pay directly for driving on a particular roadway or in a particular area ("Road Pricing," VTPI, 2005). *Congestion Pricing* (also called *Value Pricing*) refers to road pricing with variable fees designed to reduce traffic congestion. Transportation economists have long advocated road pricing as a way to fund transportation improvements and to reduce congestion problems and to charge motorists directly for the costs of the facilities they use.

2.6.1 Implementation

Road pricing is generally implemented by changing uses for the costs of new highways, or for driving under urban-peak conditions with rates high enough to reduce traffic volumes to optimal levels. It is generally implemented by regional or state/provincial governments, sometimes through public-private partnerships.

2.6.2 Travel Impacts

Road pricing typically reduces 10-20% of affected vehicle travel. Although only a small portion of total vehicle travel occurs on new highways or under urban-peak conditions (the main candidates for road pricing), this travel imposes relatively high congestion and pollution costs, so total benefits are relatively large. For example, road pricing imposed on the 10% of vehicle travel that consists of urban-peak highway traffic might reduce total vehicle mileage by just 1-2%, but reduce parking and pollution costs by 5-10% and congestion costs by 10-30%.

2.7 Parking Management

Parking Management includes a variety of strategies that encourage more efficient use of existing parking facilities, including sharing, regulating, pricing and unbundling of parking facilities, use of offsite parking facilities, improved user information, and improved walking conditions between parking facilities and destinations (Litman, 2006). Parking Management can help address a wide range of problems, and can help achieve various economic, social and environmental objectives.

2.7.1 Implementation

Parking management is most often implemented in urban areas, where parking facility costs are high and opportunities for sharing and mode shifting is greatest, although it can be useful in a wide range of situations to achieve various objectives. It is generally implemented by property owners and local governments, often with local or regional government support and encouragement (such as more flexible parking requirements and incentives for developers and employers that implement parking management programs).

2.7.2 Travel Impacts

Parking management (excluding parking pricing described below) primarily affects travel in urban and suburban areas. Where applied it typically reduces automobile trips 5-10%, and much larger reductions in parking costs. Since parking management is usually implemented in urban areas, it also tends to provide relatively large congestion and pollution cost reductions.

2.8 Parking Pricing

Parking pricing means that motorists pay directly for using parking facilities. Parking pricing may be implemented as a parking management strategy (to reduce parking problems in a

particular location), as a mobility management strategy (to reduce vehicle traffic in an area), to recover parking facility costs, to generate revenue for other purposes (such as a local transportation program or downtown improvement district), or for a combination of these objectives (“Parking Pricing,” VTPI, 2005).

A related strategy is to *Unbundle Parking*, which means that parking is sold or rented separately from building space. For example, rather than renting an apartment for \$1,000 per month with two parking spaces at no extra cost, each apartment can be rented for \$850 per month, plus \$75 per month for each parking space. This is more efficient and fair, since occupants only pay for the amount of parking they need and want.

2.8.1 Implementation

Parking pricing is generally implemented by changing uses for parking facility costs, or as a way to reduce parking demand to optimal levels, particularly in urban areas or commercial centers with parking problems.

2.8.2 Travel Impacts

Cost-based parking pricing (i.e., prices set to recover the full cost of parking facilities) typically reduces parking demand 10-20% compared with unpriced parking. It is generally implemented by local governments and facility managers.

2.9 Public Transit and Rideshare Improvements

There are many ways to improve public transit and rideshare services, and encourage their use, including additional routes, increased service frequency and longer operation hours, rideshare matching and promotion programs, rider comfort improvements, reduced and more convenient fares, improved rider information and marketing programs, transit oriented development, pedestrian and cycling improvements around transit stops, improved security for transit users, and transit services targeting particular needs such as commuter express and special events (“Transit Improvements,” VTPI, 2005).

2.9.1 Implementation

Transit and rideshare improvements are generally implemented by local, regional and state/provincial governments, often with federal support.

2.9.2 Travel Impacts

Transit and ridesharing improvements have both direct and indirect travel impacts. Direct impacts reflect the passenger-miles shifted from driving to these modes. Indirect impacts reflect the effects that transit and rideshare improvements can have on per capita vehicle ownership and land use patterns (“Transit Evaluation,” VTPI, 2005). Residents of transit-oriented communities tend to drive 10-20% less than residents of automobile-oriented areas.

2.10 HOV Priority

HOV Priority refers to strategies that give *High Occupant Vehicles* (buses, vanpools and carpools) priority over general traffic (“HOV Priority,” VTPI, 2005). This can be justified as a more efficient and equitable allocation of road space (HOV passengers *impose* less congestion on other road users, are rewarded by *bearing* less congestion delay), an efficient use of road capacity (they can carry more people than a general use lane), and as an incentive to shift to more efficient modes. HOV Priority strategies include HOV highway and arterial lanes, busways (special lanes for transit buses with features to improve transit service quality), queue-jumping lanes and intersection controls, and preferred parking spaces or parking fee discounts provided to rideshare vehicles.

2.10.1 Implementation

HOV Priority can attract more peak-period travelers to transit and ridesharing. It is generally implemented by regional and state/provincial governments.

2.10.2 Travel Impacts

HOV priority primarily affects travel on major roadways under urban-peak conditions which represents a relatively small portion of total travel, but provides proportionally larger reductions in congestion and parking costs. An HOV priority program which provides substantial time savings to high occupant vehicles typically shifts 10-20% of targeted automobile trips to transit and ridesharing.

2.11 Walking and Cycling Improvements

Walking and cycling travel can substitute for some motor vehicle trips directly, and supports other alternative modes such as public transit and ridesharing. Residents of communities with good walking and cycling conditions drive less and use transit and rideshare more. There are many specific ways to improve nonmotorized transportation (Walking and Cycling Improvements," VTPI, 2004):

- Improve sidewalks, crosswalks, paths and bikelanes.
- Increase road and path connectivity, with special shortcuts for nonmotorized modes.
- Traffic calming, speed reductions and vehicle restrictions.
- Safety education, law enforcement and encouragement programs.
- Convenient and secure bicycle parking.

2.11.1 Implementation

Walking and cycling improvements are generally implemented by local and regional governments.

2.11.2 Travel Impacts

Walking and cycling improvements primarily affects short-distance trips, but can influence longer trips by supporting shifts to public transit. People who live in more walkable and bikeable communities typically drive 10-20% less than they would in more automobile-oriented communities.

2.12 Smart Growth Land Use Policies

Current zoning and development practices tend to increase vehicle travel by limiting density, separating activities, dispersing destinations and favoring automobile access over alternative modes. *Smart growth* development practices can provide many benefits, including more diverse and efficient transportation ("Smart Growth," VTPI, 2005; Frank, Kavage and Litman, 2006).

- Create more self-contained communities and neighborhoods. For example, develop schools, convenience shopping and recreation facilities in neighborhoods.
- Creating "urban villages" with distinct names and characters.
- Encourage infill development. Redevelop older neighborhoods and buildings.
- Concentrate commercial activities in compact centers or districts.
- Develop a network of relatively direct, interconnected street. Keep streets as narrow as possible, particularly in residential areas and commercial centers.
- Apply reduced and more flexible parking requirements.
- Design streets to accommodate walking and cycling. Create a maximum number of connections for non-motorized travel, such as trails that link dead-end streets.

2.12.1 Implementation

Smart growth policies can be justified based on their effectiveness at achieving various economic, social and environmental objectives, including infrastructure cost savings, transport cost savings, community livability, and environmental quality. They can be implemented in urban and suburban conditions. Smart growth policies are generally implemented by developers, and local and regional governments.

2.12.2 Travel Impacts

Comprehensive Smart Growth programs can result in significant (10-30%) reductions in per capita vehicle travel by affected residents and employees over the long term. Short term impacts depend on the speed of development and redevelopment occurring and the types of strategies implemented.

2.13 Location Efficient Development

Location Efficient Development includes incentives that concentrate residential and commercial development in areas with accessible land use and good transport options. These features reduce automobile ownership and use, and provide transportation cost savings to consumers.

2.13.1 Implementation

Location efficient development is generally implemented by developers, lenders, and local and regional governments.

2.13.2 Travel Impacts

Location efficient development tends to reduce residents' vehicle travel by 10-20%, and employees' automobile commute trips by 10-20%.

2.14 Mobility Management Marketing

Mobility Management Marketing involves various activities to improve consumers' knowledge and acceptance of alternative modes, and to provide products that better meet travelers' needs and preferences ("Mobility Management Marketing," VTPI, 2005).

2.14.1 Implementation

Mobility management marketing is generally implemented by local and regional governments, and by public transit agencies.

2.14.2 Travel Impacts

Mobility management marketing can significantly increase use of alternative modes, often reducing local automobile travel by 5-10% (Cairns, et al., 2004).

2.15 Freight Transport Management

Freight Transport Management includes various strategies of increasing the efficiency of freight and commercial transport ("Freight Transport Management, VTPI, 2005). This can include improving distribution practices, shifting freight to more resource efficient modes (such as truck to rail), improving efficient modes such as marine and rail services, siting industrial facilities to optimize distribution efficiency, and reducing total freight volumes. Because freight vehicles tend to be large, energy-intensive and high polluting, a relatively small improvement in freight efficiency can provide significant benefits.

2.15.1 Implementation

Freight transport management is generally implemented by businesses with support and encouragement of local and regional governments.

2.15.2 Travel Impacts

Reductions of 5-15% of freight vehicle travel can often be achieved.

2.16 School and Campus Trip Management

These programs help overcome barriers to the use of alternative modes, and provide positive incentives for reduced driving to schools and college or university campuses ("School Transport Management," VTPI, 2005). School trip management usually involves improving pedestrian and cycling access, promoting ridesharing, discounted transit fares, rideshare promotion, encouragement programs, and increased parking fees. These programs give students, parents and staff more travel choices, encourage exercise, and reduce parking and congestion problems.

2.16.1 Implementation

School and campus transport management is generally implemented by schools, campuses and local governments.

2.16.2 Travel Impacts

School and campus transport management affects 5-10% of trips involving travel to schools. Such programs typically reduce affected automobile travel by 5-15%.

2.17 Carsharing

Carsharing provides affordable, short-term (hourly and daily rate) motor vehicle rentals in residential areas as an alternative to private ownership ("Carsharing," VTPI, 2005). Because it has lower fixed costs and higher variable costs than private vehicle ownership, carsharing tends to significantly reduce annual vehicle mileage by participants.

2.17.1 Implementation

Carsharing is generally implemented by private companies or non-profit organizations, often with local or regional government support.

2.17.2 Travel Impacts

People who shift from owning a private vehicle to carsharing are typically lower-annual-mileage drivers who reduce their vehicle travel about 50% (i.e., they reduce their mileage from 6,000 to 3,000 annual miles).

2.18 Traffic Calming and Traffic Management

Traffic calming includes various strategies to reduce traffic speeds and volumes on specific roads ("Traffic Calming," VTPI, 2005). Typical strategies include traffic circles at intersections, sidewalk bulbs that reduce intersection crossing distances, raised crosswalks, and partial street closures to discourage short-cut traffic through residential neighborhoods. This increases road safety and community livability, creates a more pedestrian- and bicycle-friendly environment, and can reduce automobile use.

2.18.1 Implementation

Traffic calming can be justified based on its safety benefits, to improve mobility for non-drivers, and to increase community livability and property values. It is generally implemented by local governments.

2.18.2 Travel Impacts

Traffic calming primarily affects local street travel, and can provide modest reductions in affected travel by improving the relative convenience, speed and safety of walking and cycling. In a typical community perhaps 3-6% of total travel may take place on roads suitable for traffic calming, and perhaps 3-6% of mileage on those roads is reduced.

3. SUMMARY OF MOBILITY MANAGEMENT STRATEGIES

Table 4 summarizes these various Mobility Management Strategies.

Table 4 Mobility Management Strategies

Name	Description	Transport Impacts
Planning Reforms	More comprehensive and neutral planning and investment practices.	Increases support for alternative modes and mobility management.
Regulatory Reforms	Reduced barriers to transportation and land use innovations.	Tends to improve transport options.
Transportation Demand Management Programs	Local and regional programs that support and encourage use of alternative modes.	Increased use of alternative modes.
Commute Trip Reduction (CTR)	Programs by employers to encourage alternative commute options.	Reduces automobile commute travel.
Commuter Financial Incentives	Offers commuters financial incentives for using alternative modes.	Encourages use of alternative commute modes.
Fuel Taxes - Tax Shifting	Increases fuel taxes and other vehicle taxes.	Reduces vehicle fuel consumption and mileage.
Pay-As-You-Drive Pricing	Converts fixed vehicle charges into mileage-based fees.	Reduces vehicle mileage.
Road Pricing	Charges users directly for road use, with rates that reflect costs imposed.	Reduces vehicle mileage, particularly under congested conditions.
Parking Management	Various strategies that result in more efficient use of parking facilities.	Reduces parking demand and encourages use of alternative modes.
Parking Pricing	Charges users directly for parking facility use, often with variable rates.	Reduces parking demand and facility costs, and encourages use of alternative modes.
Transit and Rideshare Improvements	Improves transit and rideshare services.	Increases transit use, vanpooling and carpooling.
HOV Priority	Improves transit and rideshare speed and convenience.	Increases transit and rideshare use, particularly in congested conditions.
Walking and Cycling Improvements	Improves walking and cycling conditions.	Encourages use of nonmotorized modes, and supports transit and smart growth.
Smart Growth Policies	More accessible, multi-modal land use development patterns.	Reduces automobile use and trip distances, and increases use of alternative modes.
Location Efficient Housing and Mortgages	Encourage businesses and households to choose more accessible locations.	Reduces automobile use and trip distances, and increases use of alternative modes.
Mobility Management Marketing	Improved information and encouragement for transport options.	Encourages shifts to alternative modes.
Freight Transport Management	Encourage businesses to use more efficient freight transport options.	Reduced truck transport.
School and Campus Trip Management	Encourage parents and students to use alternative modes for school commutes.	Reduced driving and increased use of alternative modes by parents and children.
Carsharing	Vehicle rental services that substitute for private automobile ownership.	Reduced automobile ownership and use.
Traffic Calming and Traffic Management	Roadway designs that reduce vehicle traffic volumes and speeds.	Reduced driving, improved walking and cycling conditions.

This table summarizes the of the Mobility Management Strategies described in this paper.

Nearly all of these strategies have been successfully implemented somewhere (CCAP, 2005; ICLEI, 2005; "Success Stories," VTPI, 2005), although virtually no community has implemented all strategies to the degree that is cost effective and justified by economic principles. Table 5 shows their typical range of impacts.

Table 5 Mobility Management Travel Impacts

Name	Directly Affects Travel?	Portion of Vehicle Travel Affected	Typical Reductions By Affected Travel	Total Reductions
Planning Reforms	No	100%	10-20%	10-20%
Regulatory Reforms	No	20-40%	5-10%	1-4%
TDM Programs	No	30-50%. Mainly urban travel.	10-20%	4-8%
Commuter Trip Reduction (CTR)	Yes	15-20%. Urban commute travel.	5-15%	1-3%
Commuter Financial Incentives	Partly (includes parking pricing)	15-20%. Urban commute travel.	10-30%	1-6%
Fuel Taxes - Tax Shifting	Yes	100%	5-15%	5-15%
Pay-As-You-Drive Pricing	Yes	80-90%. Private automobile travel.	10-15%	7-13%
Road Pricing	Yes	5-15%. Driving on new or congested roadways.	10-20%	1-3%
Parking Management	Yes	40-50%.	5-10%	2-8%
Parking Pricing	Yes	40-50%.	10-20%	3-10%
Transit and Rideshare Improvements	Yes	20-40%. Mainly urban travel.	10-20%	2-12%
HOV Priority	Yes	5-10%. Congested roadways.	10-20%	1-2%
Walking and Cycling Improvements	Yes	10-20%. Shorter-distance trips.	10-20%	1-4%
Smart Growth Reforms	Yes	30-50%. Mainly urban travel.	10-30%	3-15%
Location Efficient Housing and Mortgages	No (Is a Smart Growth Reform)	10-20%. Travel by households that can change location.	10-20%	1-6%
Mobility Management Marketing	Yes	30-50%. Mainly urban travel.	5-10%	2-5%
Freight Transport Management	Yes	5-15%. Freight and commercial travel.	5-15%	0.3-2%
School and Campus Trip Management	Partly (is a type of CTR program)	5-10%. School and campus trips.	5-15%	0.3-1.5%
Carsharing	Yes	1-2%. Households that can choose this option.	20-30%	0.2-0.6%
Traffic Calming	Yes	3-6%. Local urban travel.	3-6%	0.1-0.4%

This table indicates the portion of vehicle travel affected and the magnitude of reductions caused by Mobility Management Strategies, assuming they are implemented to the degree economically justified. The “Directly Affects Travel” column indicates to whether a strategy affects travel itself or helps implement other Mobility Management strategies that do, and so whether or not it would be counted toward cumulative effects.

4. CONSUMER IMPACTS

Some people are skeptical that Mobility Management strategies are beneficial, since they cause consumers to reduce their vehicle travel. But if properly implemented these strategies benefit consumers overall. Many Mobility Management strategies improve travel options and provide positive incentives, so consumers only reduce their driving when they consider themselves better off. Motorists who continue driving are no worse off, and benefit from reduced congestion, accident risk and pollution.

For example, some strategies improve walking, cycling, rideshare, transit and telecommuting options, or help increase land use accessibility. Strategies such as Parking Cashing Out and Pay-As-You-Drive vehicle insurance return to individual motorists the savings that result when they drive less, offering motorists a new opportunity to save money that does not currently exist.

Some strategies apply negative incentives, such as parking pricing, road pricing and fuel taxes. But these increased fees are offset by reduced transport problems, reductions in other consumer costs and taxes that currently subsidize road and parking facilities, and petroleum production, and motorists benefit from reduced traffic congestion. Similarly, traffic calming reduces vehicle speeds, which is a cost to motorists, but a benefit to pedestrians and local residents, and reduces motorist crash risk.

5. ECONOMIC IMPACTS

Economic Development refers to progress toward a community’s economic goals, including increases in economic productivity, employment, business activity and investment. Many people assume that since motor vehicle ownership and use tend to increase with wealth, motor vehicle travel must support economic development and market reforms that reduce vehicle travel must be economically harmful. Transport planning decisions are sometimes portrayed as a tradeoff between the economic development benefits of increased mobility, and social and environmental benefits from reduced demand. But, Mobility Management strategies actually support economic development by increasing transport system efficiency (“Economic Development Impacts,” VTPI, 2005).

Some transportation activity provides large economic benefits. For example, one delivery truck may contain goods that contribute to millions of dollars in production. However, this does not justify underpricing. On the contrary, it justifies planning and pricing strategies that allow higher value trips to have priority over lower-value trips, and improvements to alternative modes that impose less traffic costs.

Many Mobility Management Strategies reflect efficient market principles. TDM can help create a more efficient transport system that increases productivity and economic development, and makes consumers better off overall. The total economic benefits can be large.

6. CONCLUSIONS

Mobility Management strategies are cost-effective, technically feasible policy reforms and programs that help solve transport problems by improving transport options and correcting market distortions that result in economically excessive vehicle travel. They help create a more equitable and efficient transportation system that benefits consumers overall, supports economic development and helps achieve other strategic planning objectives. Many transportation problems are virtually unsolvable without such reforms.

Conventional transport planning tends to treat these strategies as measures of last resort, to address specific problems such as congestion and air pollution where other solutions have failed. Mobility Management solutions takes the opposite approach – it applies market reforms whenever they are cost effective, taking into account all costs and benefits, and consider capacity expansion as a fallback if these reforms fail.

Most individual Mobility Management strategies provide modest benefits, and so are not considered the best way to solve any particular problem. As a result, they are often undervalued by conventional planning. However, their impacts are cumulative and synergistic. An integrated program of Mobility Management strategies is often the most cost-effective way of addressing problems and improving transportation overall.

Mobility Management solutions are the best way to increase transport system sustainability because they balance economic, social and environmental objectives. If fully implemented to the degree that is economically justified Mobility Management would reduce motor vehicle costs by 25-50%, although exact impacts are difficult to predict and vary depending on geographic, demographic and economic conditions. They could meet Kyoto emission reduction targets while increasing consumer benefits and economic development.

Because Mobility Management provides many different benefits, organizations and individuals representing a wide range of interests have reasons to support their implementation. This offers the opportunity for political coalitions to advocate for these reforms. Transportation professionals, local government and taxpayer groups, environmental organizations, economic development and business interests, social equity advocates, and even motorists all have reasons to support Mobility Management Solutions.

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