



Victoria Transport Policy Institute

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Win-Win Emission Reduction Strategies

Smart Transportation Strategies Can Achieve Emission Reduction Targets And Provide Other Important Economic, Social and Environmental Benefits

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The Earth's surface is covered by a thin atmosphere. Photo: NASA

Abstract

Win-Win Transportation Solutions are cost-effective, technically feasible market reforms that solve transportation problems by improving mobility options and removing market distortions that cause excessive motor vehicle travel. They provide many economic, social and environmental benefits. If implemented to the degree economically justified, Win-Win Solutions could achieve the transport component of Kyoto emission reduction targets while helping to address problems such as traffic congestion, accidents and inadequate mobility for non-drivers, and supporting economic development. This paper discusses the Win-Win concept and describes various Win-Win strategies.

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Introduction - How Win-Win Strategies Work

People often assume that environmental and economic goals conflict. For example, opponents of Kyoto emission reduction targets claim that energy conservation would harm the economy. They are wrong. Some emission reduction strategies also support economic development.

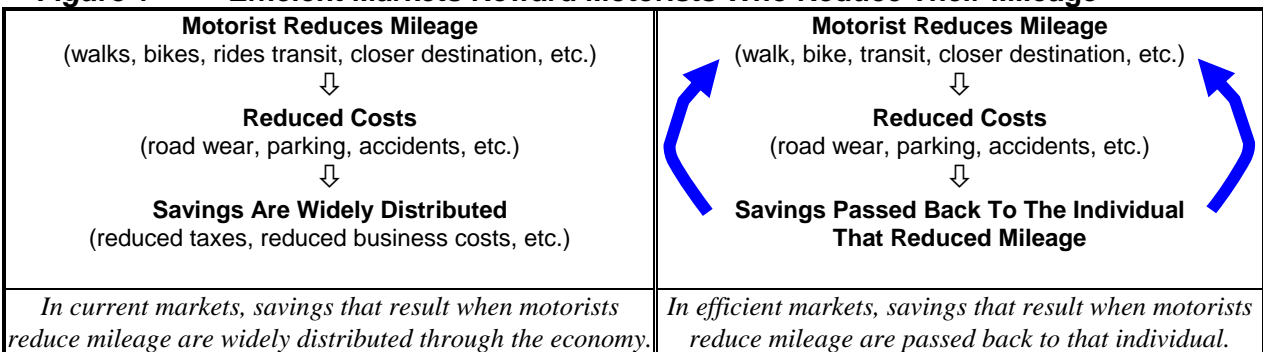
This paper identifies a dozen such strategies, called *Win-Win Transportation Solutions*. These are cost-effective, technically feasible policy reforms which correct existing market distortions that reduce transport system efficiency. They provide multiple benefits, including congestion reduction, road and parking cost savings, consumer savings, safety, improved mobility for nondrivers, plus energy conservation and emission reductions. They also tend to increase overall economic productivity, employment and wealth.

These are, admittedly, big claims. To understand why such large benefits are possible it is useful to consider some basic economic principles. Efficient markets have certain requirements, including *consumer options* (consumers have adequate options from which to choose), *efficient pricing* (prices reflect production costs), and *neutrality* (public policies do not arbitrarily favor one good or group over others). Current transport markets violate these principles in ways that reduce efficiency and exacerbate problems.

For example, many commuters are offered subsidized parking but no comparable benefit for alternative modes such as walking, cycling, ridesharing or public transit. This is a market distortion that favors automobile travel over other modes and reduces travel options. Offering commuters a choice between parking subsidies and their cash equivalent (called *parking cash-out*) typically reduces automobile commuting 15-25%.

Another example is that many vehicle fees (insurance, registration, taxes and leases) are *fixed*, not based on how much a vehicle is driven, although the costs they represent (accidents, road wear and vehicle depreciation) increase with vehicle travel. This price structure encourages motorists to use their vehicles. Converting these to distance-based fees gives consumers a new opportunity to save money when they reduce their vehicle mileage. Implementing these strategies can help reduce traffic problems and benefit consumers by offering them new opportunities to save money.

Figure 1 Efficient Markets Reward Motorists Who Reduce Their Mileage

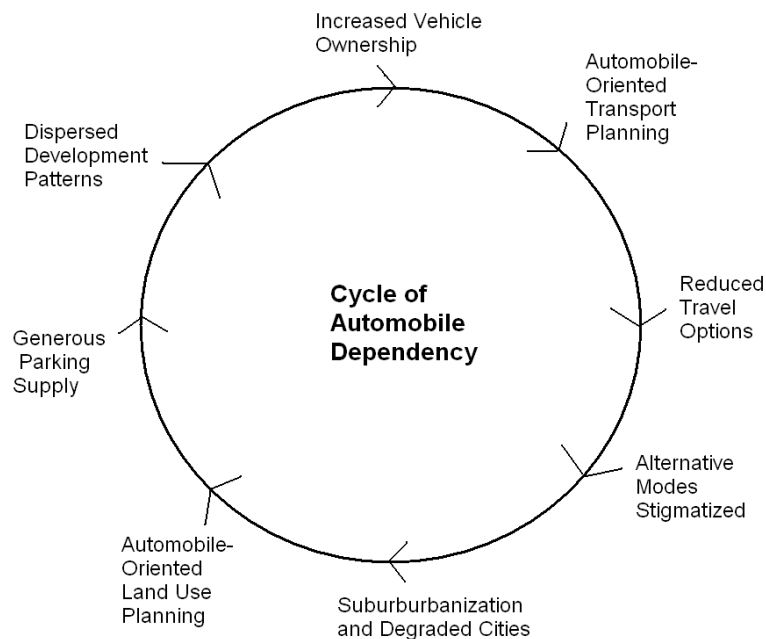


Described differently, current policies fail to give motorists the savings that result when they drive less. Reducing vehicle travel reduces congestion, parking costs, accidents and pollution emissions, but these savings are not returned directly to the individual motorists who reduce their mileage (Figure 1). This is both inefficient, because it stimulates economically excessive vehicle travel (travel in which user benefits are smaller than total costs to society) and unfair, because people who drive less than average subsidize others who drive more than average, and since lower-income people tend to drive less than average these market distortions tend to be regressive.

Other distortions involve planning bias. For example, current transport planning tends to focus on certain impacts, such as traffic congestion, while overlooking other social and environmental impacts. Many jurisdictions have funds dedicated to roads and parking facilities that cannot be used for other transport improvements, even if they are more cost effective and beneficial overall. More comprehensive and objective planning tends to increase support for alternative modes and mobility management strategies, resulting in a more diverse and efficient transport system.

Although individual distortions may seem modest and justified, their effects are cumulative and synergistic (total impacts are greater than the sum of individual impacts), significantly increasing problems and costs. They contribute to a cycle of automobile dependency (Figure 2). Many transport problems are virtually unsolvable without market reforms. For example, urban traffic congestion will never decline significantly without improved travel options and more efficient pricing.

Figure 2 Cycle of Automobile Dependency



Individual market distortions reinforce the cycle of automobile dependency, leading to economically-excessive automobile ownership and use.

Many of these distortions reflect outdated goals and constrains. For example, motor vehicle underpricing may have been justified in the past to take advantage of economies of scale in vehicle and roadway production, but not now that vehicle industries and road systems are mature. Similarly, until recently collecting road tolls and parking fees was costly and incontinent to users, but new pricing systems reduce these problems.

Win-Win solutions correct market distortions, as described in Table 1. This increases overall economic efficiency and equity. Win-Win strategies are a type of preventive medicine, equivalent to putting the transport system on a healthier diet. This can avert more difficult and expensive measures otherwise required to address these problems.

Table 1 Win-Win Solutions Support Market Principles (Litman, 2006)

Market Requirements	Current Market Distortions	Win-Win Solutions
<i>Options.</i> Consumers need viable transport and location options, and information about those options.	Consumers often lack viable alternatives to automobile transport, and living in automobile dependent communities.	Many Win-Win Solutions increase travel options directly, and all increase options indirectly by stimulating demand for alternatives.
<i>Cost-based pricing.</i> Prices for each good should reflect its production costs.	Motor vehicle travel is significantly underpriced: many costs are either fixed or external.	Many Win-Win Solutions result in more efficient pricing.
<i>Economic neutrality.</i> Public policies (laws, taxes, investments, etc.) should not arbitrarily favor one activity or group.	Many laws, tax, planning and funding practices favor automobile travel over alternatives.	Many Win-Win Solutions help correct biases that favor automobile transport over other modes and goods.
<i>Land Use.</i> Land use policies should not favor automobile oriented development.	Many current land use policies encourage lower-density, automobile-dependent land use patterns.	Some Win-Win Solutions correct land use biases that encourage sprawl and automobile dependency.

Win-Win Solutions correct market distortions, creating a more efficient and equitable transport system.

This is not to suggest that automobile travel provides no benefits and should be eliminated. It simply indicates that in a more optimal market consumers would choose to drive less and use alternatives more than they do now. As an analogy, food is essential for life and so 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. Given better options and more efficient pricing, many motorists would choose to drive less and be better off overall as a result.

A Dozen Excellent Win-Win Strategies

This section describes twelve Win-Win strategies. For more information see Litman (2007) and related chapters in the "Online TDM Encyclopedia" (VTPI, 2007).

Planning Reforms

Conventional transportation planning practices tend to favor mobility over accessibility and automobile travel over alternative modes, in various, often subtle ways (Beimborn and Puentes, 2003; Litman, 2006). *Least-cost planning* (VTPI, 2007) refers to more objective and comprehensive planning that:

- Considers all significant impacts (costs and benefits).
- Funds alternative modes and demand management strategies equally with roadway and parking facility expansion, based on cost-effectiveness.

Planning reforms create more efficient and equitable transportation systems, particularly over the long-run as more durable planning decisions are affected. When fully implemented such reforms typically reduces automobile travel 10-20% compared with what occurs with conventional, automobile-oriented planning (Litman, 2007b).

Pay-As-You-Drive (PAYD) Pricing

Pay-As-You-Drive (also called *Distance-Based* and *Mileage-Based*) pricing means that vehicle insurance, registration, taxes and leasing fees are based directly on the vehicle's annual mileage. The more you drive the more you pay and the less you drive the more you save. For example, a \$400 annual insurance premium becomes 3¢ per mile, and a \$1,200 annual premium becomes 10¢ per mile. A typical U.S. motorist would pay about 7¢ per mile for insurance, plus 3¢ for registration fees and taxes. This should reduce affected vehicles' annual mileage 10-15%, providing comparable reductions in congestion, facility costs, accidents, and pollution, plus consumer cost savings. This is more equitable and affordable. It is particularly beneficial to lower-income motorists, which drive significantly less on average and value opportunities to save money.

Pay-As-You-Drive pricing requires *odometer audits*, which means that somebody (a service station or insurance broker) checks the vehicle odometer and records its mileage. This typically requires 5 to 10 minutes, and less if performed with other vehicle servicing (tune ups, emission inspections, etc.), with incremental costs of \$5 to \$10. Once the system is established there is minimal incremental cost to pricing other fees by mileage.

Parking Cash-Out

Parking Cash Out means that commuters who are offered a subsidized parking space can instead choose the equivalent cash value or other benefits. For example, employees might be able to choose between a free parking space, a monthly transit pass, vanpool subsidies, or \$50 cash per month. This typically reduces automobile commuting by 10-30%, and is fairer, since it gives non-drivers benefits comparable to those offered motorists.

Parking Pricing

Parking pricing means that motorists pay directly rather than indirectly for using parking facilities. This is facilitated by using better pricing methods that accommodate various payment options and only charge motorists for the amount of time they are parked. Cost-based parking pricing typically reduces vehicle trips 10-30% compared with unpriced parking.

Road Pricing

Road Pricing means that motorists pay directly for driving on a particular roadway or in a particular area. *Congestion Pricing* (also called *Value Pricing*) refers to road pricing with higher fees during peak periods to reduce congestion. Economists have long advocated road pricing as an efficient and equitable way to fund transport facilities and services and reduce traffic problems. Efficient road pricing typically reduces affected vehicle traffic 10-20%, with larger reductions if implemented with improvements to alternative modes.

Transportation Demand Management Programs

Transportation Demand Management (TDM) programs include various services and incentives to encourage use of alternative modes. *Commuter Trip Reduction* programs target employee travel. *School and Campus Trip Management* programs target students and school staff. *Transportation Management Associations* are member-controlled organizations that provide transportation services in a particular area, such as a commercial district, industrial park or mall. TDM programs typically reduce affected automobile travel by 5-15% if they rely on information and encouragement, and 10-30% if they include financial incentives such as parking cash out.

Transit and Rideshare Improvements

There are many ways to improve public transit and rideshare services, including additional routes, increased service, HOV priority, comfort improvements, lower and more convenient fares, improved user information, marketing programs, transit oriented development, improved security, and special services such as commuter express buses and special event shuttles. Typically, 5-10% of urban automobile trips will shift to high quality transit, and quality transit can leverage additional travel reductions by stimulating more compact development. People who live in transit-oriented communities tend to drive 10-30% less than residents of automobile-oriented areas.

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. There are many ways to improve walking and cycling, including improved facilities (sidewalks, crosswalks, paths and bicycle parking), traffic calming, shortcuts, streetscaping, encouragement programs, and more mixed land use (so more activities are within walking distance). Walking and cycling improvements provide many unique benefits including improved mobility for non-drivers, improved public fitness and health, improved community livability, and tourism development. People typically drive 5-15% fewer vehicle miles in communities with good walking and cycling conditions than in more automobile-dependent areas.

Smart Growth

Current land use development practices tend to increase vehicle travel by dispersing destinations, separating activities and favoring automobile travel over alternative modes. *Smart Growth* refers to development practices that result in more compact, accessible, multi-modal communities where travel distances are shorter, people have more travel options, and it is possible to walk and bicycle to more destinations. Smart growth policies typically reduce per capita vehicle travel 10-30%. Although these land use changes take many years to be achieved, they provide diverse and durable benefits.

Freight Transport Management

Freight Transport Management includes various strategies to increase the efficiency of freight and commercial transport. This includes improving distribution practices to reduce vehicle trips, shifting freight to more resource efficient modes (such as from air and truck to rail and marine), improving efficient modes such as marine and rail, and better siting of industrial locations to improve distribution efficiency. Although less than 10% of total traffic consists of commercial vehicles, they tend to be heavy and so impose large impacts. Reductions of 5-20% of freight vehicle travel can be achieved.

Carsharing

Carsharing refers to automobile rental services intended to substitute for private vehicle ownership. It requires affordable, short-term (hourly and daily rate) vehicle rentals in residential areas. Carsharing has low fixed costs and high variable costs, which encourages users to minimize their driving and use alternatives when possible. Motorists who shift from car ownership to carsharing typically reduce their vehicle travel 30-60%.

Revenue-Neutral Tax Shifting

Many economists recommend shifting from current taxes on income and business activity to more taxes on vehicles, vehicle fuel and road use in order to stimulate economic development while recovering more roadway costs and petroleum externalities, and encouraging energy efficiency and technological innovation. For example, *carbon taxes* are taxes based on fossil fuel carbon content, and therefore a tax on carbon dioxide emissions (Litman, 2008b). Transition costs are minimal if implementation is predictable and gradual, and tax shifting can be progressive with respect to income if revenues are used in ways that benefit lower-income people. For example, fuel taxes can be increased 10% annually for several years, offset by tax reductions targeting lower-income households.

Win-Win Solutions Summary

Table 2 summarizes the Win-Win strategies described in this paper.

Table 2 Win-Win Transportation Solutions

Name	Description	Transport Impacts
Planning Reforms	More comprehensive and neutral planning and investment practices.	Increases support for alternative modes and mobility management, improving options.
Pay-As-You-Drive Pricing	Converts fixed vehicle charges into mileage-based fees.	Reduces vehicle mileage.
Parking Cash-Out	Offers commuters financial incentives for using alternative modes.	Encourages use of alternative commute 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.
Road Pricing	Charges users directly for road use, with rates that reflect costs imposed.	Reduces vehicle mileage, particularly under congested conditions.
Transportation Demand Management Programs	Local and regional programs that support and encourage use of alternative modes.	Increased use of alternative modes.
Transit and Rideshare Improvements	Improves transit and rideshare services.	Increases transit use, vanpooling and carpooling.
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.
Freight Transport Management	Encourage businesses to use more efficient transportation options.	Reduced truck transport.
Carsharing	Vehicle rental services that substitute for private automobile ownership.	Reduced automobile ownership and use.
Revenue-Neutral Tax Shifting	Increases fuel taxes and other vehicle taxes.	Reduces vehicle fuel consumption and mileage.

This table summarizes various Win-Win strategies that encourage more efficient transportation.

Table 3 indicates estimated vehicle travel reduction of these strategies. Each of these strategies has been successfully implemented, although no community has implemented all to the degree that is justified by economic principles. It is difficult to predict the total impacts of a comprehensive Win-Win program because their effects overlap and have synergistic effects. Despite these uncertainties, an integrated Win-Win program, with strategies implemented to the maximum degree economically justified, would probably reduce total vehicle travel 30-50% compared with current practices (Litman, 2007). This is the magnitude of reductions required to achieve the Kyoto targets, and would provide other economic, social and environmental benefits. Although some strategies take years to implement, their effects are durable and so ideal for solving long-term problems such as climate change.

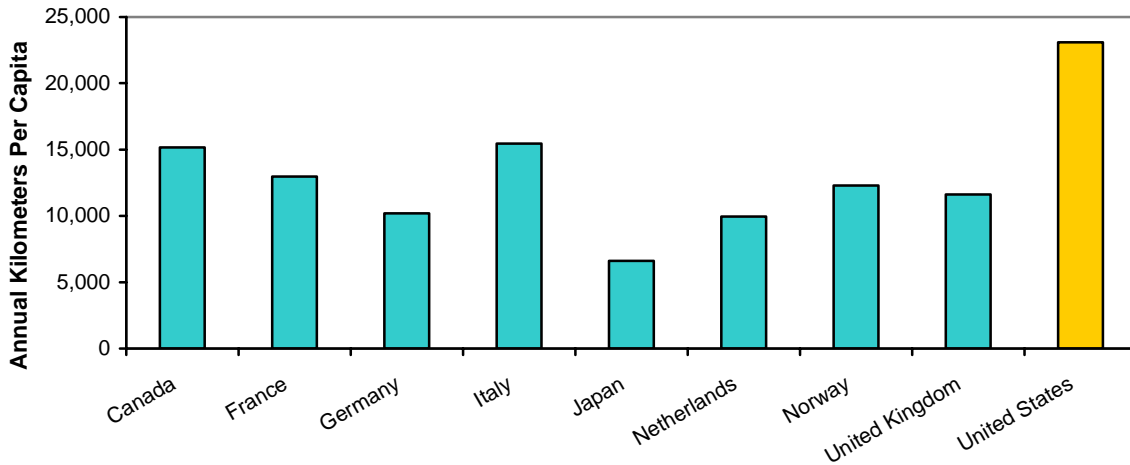
Table 3 Travel Impacts (Win-Win Evaluation Spreadsheet, www.vtpi.org/win-win.xls)

Name	Portion of Vehicle Travel Affected	Typical Reductions Of Affected Travel	Total Reductions
Planning Reforms	100%	10-20%	10-20%
Pay-As-You-Drive Pricing	80%. Private automobile travel.	10-12%	8-10%
Parking Cash-Out	20%. Commute travel.	10-30%	2-6%
Parking Pricing	40%. Mainly urban travel.	10-20%	4-8%
Road Pricing	30%. On new or congested roads.	10-20%	3-6%
TDM Programs	40%. Mainly urban travel.	10-20%	4-8%
Transit & Ridesharing	30%. Mainly urban travel.	10-30%	3-9%
Walking & Cycling	20%. Shorter-distance trips.	10-30%	2-6%
Smart Growth Reforms	40%. Mainly urban travel.	10-30%	4-12%
Freight Transport Man.	10%. Freight and commercial travel.	5-20%	0.5-2%
Carsharing	5%. Suitable households.	20-40%	1-2%
Tax Shifting	100%	5-15%	5-15%

This table indicates the magnitude of reductions that could be provided by various Win-Win strategies.

International comparisons support these estimates. Residents of wealthy countries with more diverse transport systems and higher vehicle fees drive 30-40% less than in the U.S. (Figure 3), although none have implemented all cost-effective Win-Win strategies. Analysis by Johnston (2006) and Banister (2007) also indicate that substantial vehicle travel reductions are feasible and can provide net economic benefits.

Figure 3 Per Capita Vehicle Travel, 2004 (OECD Data)



Per capita vehicle travel is 30-40% lower in wealthy countries that have Win-Win type policies.

Some Win-Win strategies, such as commute trip reduction programs and transit service improvements, provide particularly large benefits because they reduce urban-peak vehicle travel. For example, a 5% reduction in urban-peak driving might reduce congestion, parking cost, and emission costs by 10%. Similarly, reductions in heavy freight vehicle travel provide large congestion, road and accident cost reductions.

Consumer Impacts

Some people are skeptical that Win-Win strategies are beneficial since they reduce total mobility. But Win-Win strategies improve transport options and provide efficient incentives; mileage foregone consists of lower-value vehicle travel that consumers willingly forego in return for savings and benefits. Higher value travel continues, and benefits from reduced congestion, accident risk and pollution exposure.

Win-Win Solutions tend to increase equity. For example, Parking Cash Out gives non-drivers benefits comparable in value to parking subsidies given motorists. Pay-As-You-Drive insurance avoids cross-subsidies from low- to high-mileage motorists. Virtually all Win-Win Solutions increase travel options, either directly, by improving alternative modes (walking, cycling, ridesharing, public transit and carsharing), and indirectly, by stimulating demand for these modes, since they all tend to experience economies of scale.

Although few motorists want to give up driving altogether, at the margin, that is, compared with their current travel patterns, many people would prefer to drive less and rely more on alternatives, provided they are convenient, comfortable, safe and affordable. Win-Win strategies provide such options, making consumers better off overall. There are other examples of voluntary consumer behavior change, including reductions in smoking and increases in recycling and seat belt use. In each case, a combination of improved options, public education and incentives caused people to shift their behavior, indicating that many people want to change if given suitable support.

Economic Impacts

Many people assume that increased mobility increases economic development, and reforms that reduce vehicle travel are economically harmful. Transport planning decisions are sometimes portrayed as a tradeoff between the economic development benefits and environmental costs of increased vehicle traffic. But, Win-Win strategies support economic development by increasing transport system efficiency and providing economic savings (“Economic Development and TDM,” VTPI, 2007). Such strategies eliminate the conflict between economic and environmental objectives; they help achieve both.

Although a basic highway system is important for economic development, once the system matures and the most cost effective projects have been implemented, further expansion provides declining benefits. Win-Win strategies that result in more efficient use of existing transportation facilities, such as road and parking pricing, are overall better for the economy than further roadway expansion.

Vehicle and fuel expenditures provide relatively little regional economic activity because they are capital intensive and a significant portion of their value is imported. By reducing vehicle and fuel expenditures, Win-Win strategies leave consumers with more money to spend on other, more locally-produced goods. These benefits are likely to increase in the future as petroleum costs rise, increasing the economic burden on oil importers.

Current Analysis

Several recent reports have evaluated emission reduction strategies according to their cost effectiveness (McKinsey, 2007), and numerous emission reduction policies are being proposed, often involving cap-and-trade programs (RFF, 2007). Virtually all this analysis is biased against mobility management for the following reasons:

- Co-benefits are ignored. Current analysis gives virtually no consideration to benefits such as congestion reduction, road and parking facility cost savings, consumer savings, reduced traffic accidents, and improved mobility for non-drivers, although these benefits are often larger in total value than emission reduction benefits. When all impacts are considered, mobility management strategies are often among the most cost effective GHG emission reduction strategies because they are justified on economic grounds and so provide "free" environmental benefits.
- Current analysis generally ignores the additional external costs that result when increased vehicle fuel efficiency and subsidized alternative fuels stimulates additional vehicle travel, called a *rebound effect* (Litman, 2005).
- Mobility management emission reductions are considered difficult to predict. Although case studies and models are available for many of these strategies (CCAP, 2005) and the TRIMMS Model at www.nctr.usf.edu/abstracts/abs77704.htm this information is not widely applied to energy planning.
- Mobility management programs are considered difficult to implement. Such programs often involve multiple stakeholders, such as regional and local governments, employers and developers, and various special interest groups. As a result, they tend to seem difficult and risky compared with other emission reduction strategies that only require changes to utility operations, fuel production or vehicle designs.
- Analysis often assumes that vehicle travel reductions harm consumers and the economy. In fact, many mobility management strategies benefit consumers directly and increase economic productivity (Concas and Winters, 2007).

Described differently, there are two general ways to reduce transport emissions: reduce vehicle-kilometer emission rates or reduce total vehicle-travel. The first often seems easier but the second, if done correctly, provides far more benefits and so is usually best overall. Currently proposed emission reduction programs (particularly those involving emission trading) will not implement mobility management as much as optimal, and so will miss opportunities to also help address other planning objectives such as congestion reductions, crash reductions, consumer savings and improved mobility for non-drivers (Wright and Fulton, 2005). The following steps can help overcome these barriers:

- Educate decision-makers about these issues, and build partnerships with interest groups interested in other mobility management benefits, such as congestion reduction, consumer cost savings, traffic safety and improved mobility for non-drivers.
- Develop better models for predicting the travel impacts, emission reductions and total benefits of mobility management programs.
- Develop mobility management strategies and programs that are easy to implement, suitable for funding through emission trading programs.

Conclusions

There are many possible ways to conserve energy and reduce pollution emissions. Some provide more total benefits than others. Fuel saved by reducing vehicle travel is worth far more than fuel saved by increasing fuel efficiency, because vehicle mileage reductions also reduce congestion, roadway and parking costs, accidents and sprawl. This is not to suggest that other energy conservation strategies should be ignored, but the additional benefits of mileage-reduction strategies should be recognized when evaluating options.

Win-Win Transportation Solutions are market-based policy reforms that increase efficiency by removing distortions that limit consumer choice and stimulate motor vehicle travel. They help create a more equitable and efficient transport system that benefits consumers, supports economic development, and provides other benefits. Many transport problems are virtually unsolvable without such reforms.

To appreciate Win-Win solutions it is necessary to use more comprehensive analysis than typically applied. Many transportation improvement strategies help solve one or two problems but exacerbate others. For example, expanding highways reduces congestion but tends to increase total vehicle traffic, which increases parking, accident and pollution problems. Similarly, increasing vehicle fuel efficiency conserves energy but by reducing vehicle operating costs tends to increase total vehicle travel and therefore congestion, parking and accident problems. Ignoring these indirect impacts exaggerates highway expansion and fuel efficiency benefits, and undervalues Win-Win strategies. Table 5 illustrates this concept. When all impacts are considered, Win-Win strategies often turn out to be the most cost effective and beneficial solutions to transportation problems.

Table 5 Comparing Strategies (Litman, 2005 and 2007)

Planning Objective	Fuel Efficient Vehicles	Roadway Expansion	Win-Win Solutions
Congestion Reduction		✓	✓
Road and Parking Cost Savings			✓
Consumer Cost Savings			✓
Reduced Traffic Accidents			✓
Improved Mobility Options			✓
Energy Conservation	✓		✓
Pollution Reduction	✓		✓
Physical Fitness & Health			✓
Land Use Objectives			✓

Because Win-Win Solutions improve travel options, encourage use of alternative modes, and reduce total vehicle travel, they support many planning objectives. Increasing vehicle fuel efficiency and roadway expansion provide fewer benefits. Those strategies tend to increase total vehicle travel and so can exacerbate problems such as congestion, accidents and sprawl.

If fully implemented to the degree economically justified, Win-Win Solutions can reduce motor vehicle costs by 30-50%. They could meet Kyoto emission reduction targets while *increasing* consumer benefits and economic development.

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