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"Efficiency - Equity - Clarity"

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 increasing consumer options and removing market distortions that cause excessive motor vehicle travel. They provide many economic, social and environmental benefits. If implemented to the degree that is economically justified, Win-Win Solutions could achieve the transportation component of Kyoto emission reduction targets while stimulating economic development and helping address problems such as traffic congestion, accidents and inadequate mobility for non-drivers. 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 that correct existing market distortions which cause inefficient travel patterns. These reforms 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 choice* (consumers have various options to choose from), *efficient pricing* (prices reflect production costs), and *neutrality* (public policies do not arbitrarily favor one good over others). Current transport markets often violate these principles in ways that lead to inefficient travel behavior and reduced consumer value.

For example, many commuters are offered subsidized parking but no comparable benefit for alternative modes such as walking, cycling, public transit, or telecommuting. When commuters can choose between subsidized parking or its cash equivalent (called *parking cash-out*) automobile commute trips typically decline 15-25%. Broader implementation of parking cash out could significantly reduce traffic congestion, accidents, energy consumption and pollution emissions by giving commuters more options, which corrects the current bias favoring automobile commuting over other modes.

Another example is that many vehicle fees (insurance, registration, taxes and leases) are *fixed*, they are not based directly on the vehicle's annual mileage, although the costs they represent – accidents, road wear and vehicle depreciation – increase with vehicle travel. This fee structure encourages motorists to maximize their vehicle mileage: after paying thousands of annual dollars in fixed fees they are not inclined to leave their vehicle at home and use alternative modes. Converting these to distance-based fees gives consumers a new opportunity to save money when they reduce their mileage, providing a significant incentive to reduce mileage.

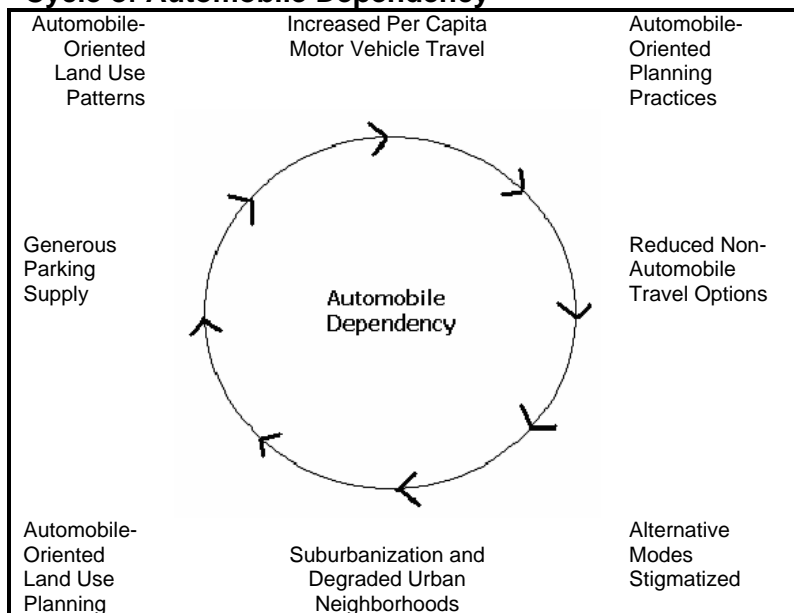
Described differently, current pricing fails to give motorists the savings that result when they drive less. For example, a motorist who reduces mileage helps reduce congestion, parking costs, accident risk and pollution emissions, but few of these savings are returned directly to that individual. As a result, consumers lack the incentive to shift mode or choose closer destinations when such alternatives are most cost-effective overall. This is not only inefficient, it is also unfair because people who drive less than average end up subsidizing the costs of others who drive more than average, and since lower-income people tend to drive less than average these market distortions tend to be regressive.

<p>Motorist Reduces Mileage (walks, bikes, rides transit, closer destination, etc.)</p> <p>↓</p> <p>Reduced Costs (road wear, parking, accidents, etc.)</p> <p>↓</p> <p>Savings Are Widely Distributed (reduced taxes, reduced business costs, etc.)</p>	<p>Motorist Reduces Mileage (walk, bike, transit, closer destination, etc.)</p> <p>↓</p> <p>Reduced Costs (road wear, parking, accidents, etc.)</p> <p>↓</p> <p>Savings Passed Back To The Individual That Reduced Mileage</p>
<p><i>In current markets, savings that result when motorists reduce mileage are widely distributed through the economy.</i></p>	<p><i>In efficient markets, savings that result when motorists reduce mileage are passed back to that individual.</i></p>

Other distortions involve planning biases. For example, many jurisdictions have funds dedicated to roads and parking facilities that cannot be used for other transport improvements even when they are more cost effective and beneficial overall. Current transport planning tends to focus on certain objectives, such as traffic congestion, while overlooking others, such as improved mobility for non-drivers and encouraging physical fitness and health. More objective and comprehensive planning tends to increase support for alternative modes and market reforms, resulting in a more diverse and efficient transportation system, which better meets consumers' needs.

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 1). 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 1 Cycle of Automobile Dependency



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

Many existing distortions reflect outdated goals and constraints. For example, in the past it may have made sense to encourage motor vehicle ownership and use in order to take advantage of economies of scale in vehicle and roadway production, but now that the vehicle industries and road systems are mature such policies are no longer justified. Similarly, until recently it was difficult to collect road tolls and parking fees, but new pricing systems make congestion charges more convenient and cost-effective.

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 over 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. It simply indicates that in a more optimal market consumers would choose to drive less than they do now, and be better off as a result. 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 excellent Win-Win strategies. For more information see Litman (2005) and related chapters in the Online TDM Encyclopedia (VTPI, 2005).

Planning Reforms

Conventional transportation planning and funding practices favor automobile travel and undervalue alternative modes in various, sometimes subtle ways (Sussman, 2001; Beimborn and Puentes, 2003). *Least-cost planning* is a term for more objective and comprehensive planning which:

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

Least-cost planning creates more efficient and equitable transportation systems, particularly over the long-run as more durable planning decisions are affected. When fully implemented it typically reduces automobile travel 10-20% compared with what occurs with conventional, automobile-oriented planning.

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. *Commute 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. 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 in a row, offset by increases in the basic deductible, reducing taxes on workers, particularly those with lower incomes.

Summary of Win-Win Solutions

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.

There are various Win-Win Solutions, which 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, 2006). 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.

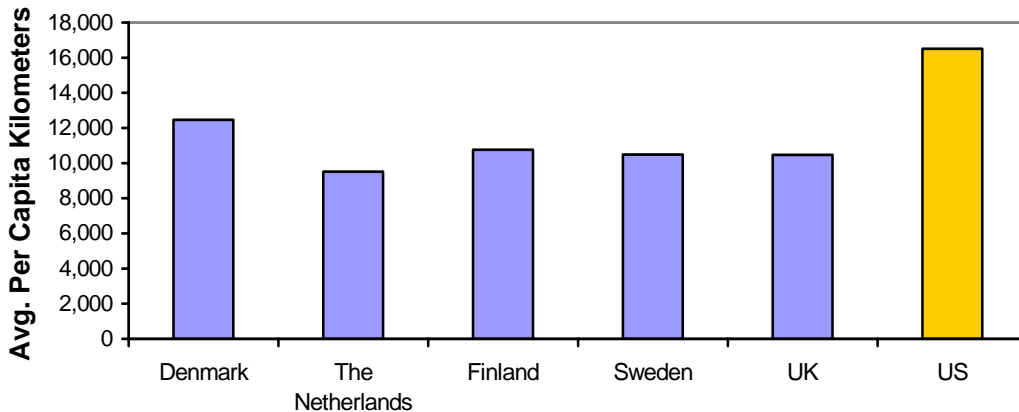
Table 3 Travel Impacts (Win-Win Evaluation Spreadsheet, www.vtpi.org/win-win.xls)

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 portion of roadway travel affected and the magnitude of reductions caused by Win-Win Solutions, assuming they are implemented to the degree economically justified.

This estimate can be validated by comparing annual vehicle mileage in the US with other wealthy countries that have different transport policies (Figure 2). Northern European countries with more diverse transportation systems and higher fuel taxes have 30-40% lower per capita vehicle mileage, although these countries have yet to widely implement some Win-Win strategies such as Pay-As-You-Drive fees and congestion pricing, indicating potential for additional, cost-effective vehicle travel reductions there.

Figure 2 Per Capita Vehicle Travel, 2000 (European Commission & USDOT 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, are particularly effective at reducing urban-peak driving and so provide particularly large benefits. 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 overall since they reduce vehicle travel. But Win-Win strategies improve travel options and provide efficient financial incentives, and so reduce motor vehicle travel in ways that make consumers better off overall. Higher value automobile trips continue. Travel foregone consists of lower-value automobile travel that consumers willingly give up in return for savings and benefits.

For example, many Win-Win strategies improve travel options and land use accessibility. Strategies such as Parking Cashing Out and Pay-As-You-Drive pricing return to individual motorists more of the savings that result when they drive less, giving motorists a new opportunity to save money not currently available. Motorists who continue driving are no worse off, and benefit from reduced congestion, accident risk and pollution.

Win-Win Solutions tend to increase equity. For example, with current “free” parking, everybody pays for parking indirectly, through higher taxes, rents and retail prices; but non-drivers benefit little and so overpay their fair share. With Parking Cash Out, non-drivers receive alternative benefits comparable in value to the parking subsidies given motorists. Flexible zoning requirements allow non-drivers to avoid paying for parking spaces they don’t need. 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), or indirectly, by stimulating demand for these modes, which tend to experience economies of scale.

At the margin, that is, compared with current levels of automobile travel, many motorists would prefer to drive less and rely on alternatives more, provided that they are convenient, comfortable, secure and affordable. Win-Win strategies provide such options, making people better off.

There are other examples of consumers’ willingly changing behavior, including recycling, smoking reductions and seat belt use. In each case, a combination of public education, improved options and suitable incentives caused consumer to modify their behavior, indicating that people welcome such changes if given suitable support.

Economic Impacts

People sometimes assume that since motor vehicle travel tends to increase with economic development, strategies 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 the environmental benefits from reduced traffic. But Win-Win Transportation Solutions actually support economic development overall by increasing transport system efficiency.

Win-Win Solutions reflect market principles. They help create a more efficient transport system that increases productivity and economic development by reducing costs such as congestion, road and parking facility expenses, accident damages, fuel consumption and environmental degradation. These savings and productivity gains make society wealthier and allow more investment in other sectors.

For example, economic productivity increases if businesses have access to a larger pool of employees (and conversely, if employees have access to more potential worksites). Although driving is sometimes the most cost-effective commute option, in many situations, transit, ridesharing, cycling, walking or telecommuting is more efficient overall. Win-Win strategies improve travel options and provide incentives for commuters to choose more resource effective options when possible, increasing efficiency.

Many claimed economic benefits associated with increased vehicle travel are economic transfers rather than true productivity gains. Although increased automobile and petroleum consumption benefits some economic sectors, it burdens others. Each dollar spent on motor vehicles means one less dollar to spend on other goods. Expenditures on automobiles, fuel and roadway facilities provide relatively little regional economic activity because they are capital intensive and largely imported for other areas. For example, a study in San Antonio, Texas found that each 1% of regional travel (53 million vehicle miles) shifted from automobile to transit increases regional income by \$2.9 million (about 5¢ per mile shifted), resulting in 226 additional regional jobs (Table 4).

Table 4 Economic Impacts of \$1 Million Expenditure (Miller, Robison & Lahr, 1999)

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

This table shows regional economic impacts of one million dollars spent in central Texas. Automobile expenditures provide relatively little economic benefit compared with a typical bundle of consumer goods, and far less than expenditures on public transit. Win-Win Solutions tend to shift expenditures in ways that increase regional employment and business activity.

Conclusions

There are many possible ways to conserve energy and reduce pollution emissions. Some provide more benefits than others. A gallon of fuel savings from reduced vehicle travel is worth far more than a gallon saved by increasing fuel efficiency, because decreased vehicle mileage provides other benefits such as reduced congestion, roadway and parking cost savings, road safety and improved public health. 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 supports economic development and other strategic planning objectives. Many transport problems are virtually unsolvable without such reforms.

Conventional transportation planning tends to treat mobility management strategies as measures of last resort, to address specific problems such as congestion and air pollution where other solutions are infeasible. Win-Win Solutions take the opposite approach – they apply market reforms whenever cost effective, taking into account all costs and benefits.

Most individual Win-Win strategies provide modest benefits, and so are not considered the best way to solve any particular problem. As a result, they are often undervalued in a conventional planning process that focuses on two or three objectives. However, their impacts are cumulative and synergistic. An integrated program of Win-Win strategies is often the most cost-effective way of addressing problems and improving transport overall.

If fully implemented to the degree that they are economically justified Win-Win Solutions can reduce motor vehicle emissions and other costs by 30-50%, although exact impacts are difficult to predict and vary depending on geographic, demographic and economic conditions. This approach could meet Kyoto emission reduction targets while *increasing* consumer benefits and economic development.

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