Delaware Thoroughfare Plan

Appendix 11

Traffic System Management Guidelines (Transportation Demand Management "Toolbox")

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Transportation System Management "Tool Box"

The Transportation Demand Management (TDM) strategy information contained in this Transportation System Management (TSM) tool box was provided by the TDM Encyclopedia published by the Victoria Transport Policy Institute and available on their website at www.vtpi.org/tdm . Information on the following strategies are contained in this appendix:

Parking Controls

- Park & Ride
- Parking Management ie: shared parking facilities, price parking, & overflow parking plans

Transit Incentives

- Guaranteed Ride Home
- Ride Sharing
- Public Transit Improvement – conventional transit bus
  - Express commuter bus
  - Mini bus
  - Shuttle service
  - Light Rail
  - Heavy Rail
  - Shared Taxi

Land Use Planning

- Transit Oriented Development
- Smart Growth
- New Urbanism

Other

- School Trip Management
- Street Reclaiming
- Alternative Work Schedules
- Tele-commuting
- Bicycle/Walking Encouragement
- Campus Trip Reduction
- Freight Management
- Vehicle Restrictions

Information regarding the formation and development of TSM programs is also contained in this appendix.

Parking Controls

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Parking Solutions

A Comprehensive Menu of Solutions to Parking Problems

TDM Encyclopedia
Victoria Transport Policy Institute

About This Encyclopedia

This chapter describes and evaluates various solutions to common parking problems.

Introduction

Vehicle parking is an integral component of the transportation system. Parking that is considered difficult to find, inadequate, expensive or inconvenient will frustrate users and cause additional problems, including traffic congestion, spillover parking into other areas, and competitive disadvantage to businesses. But increasing parking capacity imposes many costs, including direct costs to governments, businesses and consumers, environmental costs, and undesirable impacts on transportation and land use patterns.

This chapter describes various ways to solve parking problems, and discusses advantages and disadvantages of each approach. This can help planners expand the range of solutions they consider, and identify options that are best for a particular situation. Table 1 lists the parking solutions described in this chapter.

Table 1 **Parking Solutions Described in This Chapter**

Increase Parking Supply	Use Existing Parking Capacity More Efficiently	Respond to Variable Demand	Reduce Parking Demand	Respond to Spillover Impact	Facility Design Improvements
Raise Minimum Parking Requirements	Parking Information to Users	Parking Brokerage Services	Price Parking	Regulate, Price and Enforce	Accessible Design
Increase Curb Parking	Encourage Use of Fringe Parking	Overflow Parking Plans	Parking Taxes	Compensate For Spillover Impacts	Safety and Security
Subsidize Off-street Parking	Regulate Parking		Provide Commuter Benefits		Aesthetics
Add Remote Parking	Pedestrian Improvements		Improve Travel Alternatives		Stormwater Management and Heat Island Effect
Redesign Existing Facilities	Share Parking		Transportation Demand Management Programs		
	Use Public Parking Facilities		Reduce Parking Supply		
	Access Management				
	More Accurate Parking Requirements				

This table shows the parking solutions described in this chapter. Headings show general approaches, specific strategies are listed below.

Evaluation Criteria

Several factors are used to evaluate potential solutions. For more information see Parking Policy Evaluation.

Parking Congestion

This refers to how much a particular solution reduces parking congestion and related problems, including motorist delay and frustration, spillover parking problems, and competitive disadvantage to area businesses.

Costs

This refers to the costs of implementing a solution, including facilities, equipment and operating costs. (Parking *price* refers to monetary charges by motorists who use a parking facility. Parking *cost* refers to the resource cost of providing parking facilities or services.)

Transportation and Land Use

This refers to the impacts a parking solution may have on strategic transportation and land use objectives. These include:

- Impacts on travel activity, including the total amount of driving that occurs, and impacts on traffic congestion, crashes and pollution problems. Some solutions support Transportation Demand Management objectives.
- Impacts on Transportation Choice and community livability, including the quality of the pedestrian environment and the feasibility of using other alternative modes.
- Impacts on land use patterns, including impacts on density, urban redevelopment and sprawl. Some solutions tend to support Smart Growth objectives.

Consumer Impacts

This refers to direct impacts on consumer access, convenience, costs and security. The following are examples of parking factors that have negative impacts on consumers.

- Lack of information about parking availability and price, particularly if motorists expect abundant, free parking but find limited or expensive parking.
- Inconvenient payment options that require specific coins, cause excessive delay (waiting in line using a payment machine), or which force motorists to pay for time they don't use, because parking is sold in large time blocks or because they must prepay based on the maximum amount of time they might need to park.
- Unfairness when some motorists must pay for parking, while others park for free.
- Delay finding a parking space, and long walking distances from parking to destinations (particularly if walking conditions are poor).

Equity

This refers to impacts on subsidies (subsidies are considered undesirable), and on people who are economically, socially and physically disadvantaged (benefits to disadvantaged people are considered desirable).

Parking Solutions

This section describes general approaches to solving parking problems, and specific ways to implement these solutions.

Increase Parking Supply

Description: Have local governments or businesses supply additional parking capacity.

Advantages: This is an easy-to-understand solution supported by existing planning practices. It avoids transaction costs, making it convenient to users and businesses. Because free parking is usually income tax exempt, it is an attractive benefit to both employees and businesses (a typical employee would need to earn nearly $2,000 annually in pre-tax income to pay for a parking space that costs employers only $1,000). It tends to be politically popular. It is considered fair to most people, who pay approximately their share of parking facility costs through taxes and as a component of retail good prices.

Disadvantages: It imposes financial costs on governments and businesses, which are ultimately borne by by consumers. It represents a subsidy to driving that increases automobile use, and so tends to increase traffic congestion, crashes and environmental impacts. It is unfair to non-drivers, and a financial burden to some low-income households. It creates low-density, automobile-oriented land use patterns and discourages infill development. The table below illustrates examples of parking facility costs.

Table 2 **Typical Parking Facility Costs** (Parking Evaluation)

	Land Per Acre	Land Per Space	Constr-uction	Annual O&M	Total Annual Cost
Surface, Free Land	$0	$0	$1,600	$50	$200
Suburban, Surface	$100,000	$800	$1,600	$50	$256
Suburban, 3-Story Struct.	$100,000	$267	$10,000	$100	$981
Urban, Surface	$250,000	$2,000	$1,600	$50	$359
Urban, 5-Story Struct.	$250,000	$400	$10,000	$200	$1,092
Urban, Underground	$250,000	NA	$20,000	$400	$2,116

This table illustrates the financial costs of providing parking facilities under various conditions.

Below are some specific strategies for increasing parking supply.

Minimum Parking Requirements

Description: Establish minimum off-street parking requirements in zoning regulations and development policies (ULI, 2000), and raise these minimums as needed to meet growth in parking demand.

Advantages: This is a common way to increase parking supply. It is usually easy to implement since most jurisdictions have zoning codes and development policies that can be increased. Generous minimum parking requirements can be justified because it is usually cheaper to add parking capacity when a building is constructed than it would be later.

Disadvantages: It is slow to implement and cannot solve immediate parking problems. It is inflexible. Minimum parking requirements that are commonly used do not necessarily represent the parking demand at a particular site (Shoup, 1999a).

This approach assumes that motorists drive and park at each site. Yet, in practice, motorists often want to park once, and walk to nearby destinations. For example, a family may park at a food store, walk across the street for a snack, visit a bank, and look in the windows of stores along the way. This type of travel behavior is desirable from a community's perspective, because it reduces vehicle trips and total parking requirements.

It places the full cost of solving parking problems on new development, even if much of the problem is created by a shortage of parking at existing developments. For example, older apartments may have one parking space per unit, but increased automobile ownership may result in spillover parking problems (i.e., residents using on-street parking spaces). It also discourages new, infill development, which can contribute to urban blight, and reduces housing affordability (Location Efficient Development).

Increase Curb Parking

Description: Design streets with curb parking. Convert traffic lanes to parking lanes. Minimize no-parking zones. Convert to angled parking spaces to increase the number of spaces. Minimize the number of restricted parking spaces.

Advantages: Curb parking is convenient, visible and cost efficient (each space tends to get heavy use). If space is available it can be a quick and inexpensive way to increase parking supply.

Disadvantages: Only a limited amount of curb parking can be provided in an area. It often involves trade-offs with traffic lanes, bike lanes, sidewalk space, or other uses of street space.

Subsidize Off-street Parking

Description: Use public resources to build parking facilities. This can include government-funded construction of parking, providing free or discounted public land to developers for building parking facilities, tax exemptions and other favorable tax policies for parking facilities, and incorporating public parking facilities in government buildings or public-private-partnership projects.

Advantages: It creates additional parking. Planners can control when and where parking supply is added.

Disadvantages: It tends to be expensive, and represents a public subsidy for driving. It often involves hidden costs, such as rent- and tax-free use of public land. It typically takes a year or more to plan and construct a new parking facility. It tends to be inflexible, resulting in expensive structures that have few alternative uses if expected demand does not occur.

Add Remote Parking Spaces

Description: Develop additional parking where land is relatively inexpensive and available. Provide information and support for accessing it, including signs, brochures, pedestrian improvements and shuttle services (regular transit service can be free within a downtown area). Use marketing and price incentives to encourage its use, particularly for long-term users (commuters and residents).

Advantages: Is less expensive than building more central parking facilities. May allow use of otherwise unused land, such as land temporarily held for future development, or contaminated land. Allows density in commercial centers.

Disadvantages: Is less convenient than adjacent parking. May not be used. May require additional costs, such as subsidized shuttle service. May involve paving greenspace.

Redesign Existing Parking Facilities

Description: Increase the number of spaces in existing parking facilities by using currently wasted areas (corners, edges, undeveloped land, etc.) and designing some "Compact Car" size spaces (in typical communities up to 25% of spaces can be sized for compact cars, which can result in a 4% overall net increase in parking capacity compared with all spaces being full size.

Advantages: Can be an inexpensive way to increase capacity. May be particularly appropriate for adding motorcycle and small car parking.

Disadvantages: Potential is usually limited. Current trends are toward *larger* parking spaces, due to increasing average vehicle size and increased handicapped parking requirements. May reduce convenience or involve paving greenspace. It usually involves additional paving or repainting.

Use Existing Parking Capacity More Efficiently

Description: This involves strategies that result in more efficient use of existing parking facilities, meaning that each parking space receives greater use. This can be called an increased *load factor* or *occupancy rate*.

These strategies can be implemented by creating a Transportation Management Program (if implemented within a single organization), or Transportation Management Association (if implemented by a group of organizations). This provides an institutional framework to manage planning, administration and marketing activities.

Advantages: This can be a quick, cost effective and flexible way to solve parking problems. It can support Smart Growth objectives by supporting increased density and infill development.

Disadvantages: It may require new planning and administrative structures. It does not reduce vehicle traffic.

Below are specific strategies to encourage more efficient use of existing parking capacity.

Provide Parking Information to Users

Description: Provide information on parking facility availability, including signs, brochures and maps, Internet data, and parking information incorporated into general marketing materials. Provide real-time information on the location of available parking spaces.

Advantages: Can be a cost effective way to encourage more efficient use of existing parking and address specific problems. It tends to reduce motorist delay and frustration, and allows consumers to make trade-offs between convenience and price (for example, motorists value knowing how much they must pay for a parking space adjacent to their destination, and how far they would need to walk for a cheaper alternative.)

Disadvantages: Benefits may be limited. Real time information may be difficult and expensive to provide.

Encourage Use of Fringe Parking Facilities

Description: This involves encouraging more motorists to use parking capacity that is available at the fringe of a commercial center or urban area. Provide information and support for accessing it, including signs, brochures, pedestrian improvements and shuttle services (regular transit service can be free within a downtown area). Use marketing and price incentives to encourage its use, particularly for long-term users (commuters and residents).

Advantages: May be a quick and inexpensive way to solve city center parking problems.

Disadvantages: Is inconvenient. May not be successful. May require additional costs, such as subsidized shuttle service.

Regulate Parking

Description: Public parking can be regulated to support parking and transportation objectives (Andrews, 2000; ITE, 2000; K.T. Analytics, 1995).

- Limit the maximum amount of time that a vehicle can be parked in more convenient spaces, to encourage turnover and make them available for short-term customer and client use (rather than long-term use by commuters and residents).

- Limit the types of vehicles that may use certain parking spaces, including delivery vehicles, rideshare vehicles, and residents' vehicles.
- Limit on-street parking of large vehicles or recreation vehicles, to ease traffic flow and discourage people from using public parking resources for long-term storage.
- Prohibit curb parking on certain routes at certain times (such as on arterials during rush hour), to increase traffic lanes.

Advantages: Allocates the most desirable parking spaces to preferred users. Imposes minimal direct costs on governments. Is widely used and understood, and so is easy to implement. Is sometimes considered more equitable than alternatives (i.e., they do not impose an unfair financial burden on lower-income motorists).

Disadvantages: Imposes costs for planning, signs and enforcement. Imposes costs on businesses and consumers. Because the costs are not explicit, they tend to receive little scrutiny, and so are more likely to be applied inefficiently. They are often applied inflexibly, and fail to reflect the parking demand at a particular location. Parking regulation enforcement often leads to various complaints from motorists when they are ticketed for violations (regulations are unclear or unfair, a ticket was issued inaccurately, motorist had an excuse for violating regulation, fines are excessive, enforcement officers were rude, etc.), and difficulties collecting fines. They may be considered inequitable, because they benefit some motorists at the expense of others.

Improve Pedestrian Access

Description: Pedestrian Improvements to increase the acceptable distance between destinations and parking facilities. This can be done by paving and improving sidewalks and paths, creating more direct access and shortcuts, providing covers and shade, improving roadway crossing, and improving pedestrian security. New Urbanist design principles can help create more pedestrian-friendly streetscapes and neighborhoods.

Advantages: This increases the number of parking spaces available from a destination, allows more efficient use of parking facilities, and creates a more pleasant experience for parkers. Pedestrian improvements can provide other benefits (besides just access to parking), including increased transportation choice and helping to create livable communities.

Disadvantages: Pedestrian improvements require financial and land resources, including future maintenance. Implementation may require new planning and funding structures (particularly for improvements on private property, and for creating new shortcuts.

Share Parking

Description: Share off-street parking facilities among various users to take advantage of different peak periods. Parking can be shared at various scales, including among motorists at a particular site, and between sites. These are described below.

Zoned Rather Than Assigned Spaces (Shared Parking #1)

Description: Parking facilities for residents and employees can be used more efficiently if spaces are shared among a group rather than assigning to individuals. It is usually possible to for 100 employees or residents to share 60-80 parking spaces without problem, particularly if implemented in conjunction with other Commute Trip Reduction and Location Efficient Development strategies.

This approach can be implemented as a consumer option. For example, motorists could be offered an assigned space for $100 per month, or space in a zone for $60 per month. Commuters could be offered a free parking

space in a zone, or an assigned space for an additional monthly charge. This allows individuals to decide whether they are willing to pay extra for an assigned space, or capture the savings that result from shared parking.

Share Parking Between Sites (Shared Parking #2)

Description: Share the use of off-street parking facilities among different buildings in an area (typically within 300-500 feet) to take advantage of different peak periods (see Table 3). For example, an office complex can efficiently share parking facilities with a restaurant or theaters, since offices require maximum parking during weekdays, while restaurants and theaters require maximum parking during evenings and weekends. As a result, the total amount of parking can be reduced if different types of land uses arrange to share parking. Barton-Aschman Associates (1982) and ITE (1995) provide specific recommendations for shared parking implementation.

Table 3 **Peak Parking Demand**

Weekday Peaks	Evening Peaks	Weekend Peaks
Banks	Auditoriums	Religious institutions
Schools	Bars and dance halls	Parks
Distribution facilities	Meeting halls	Shops and malls
Factories	Restaurants	
Medical clinics	Theaters	
Offices		
Professional services		

This table indicates when different types of activities have peak parking demand. Parking facilities can be shared efficiently by facilities with different peaks.

Advantages: Sharing parking is a quick, flexible and inexpensive way to use parking facilities more efficiently.

Disadvantages: It may require additional administration and enforcement activities. Users accustomed to assigned spaces may object. There may be occasional problems during unusual peak demand periods.

Use Public Parking Facilities

Description: Off-street parking requirements can be reduced or eliminated for buildings located close to public parking facilities, typically within 500 feet of a public parking garage or abundant on-street parking. Developers can be required to pay an in-lieu fee, or building owners may be required to pay a monthly fee to help fund public parking facilities, equivalent to the off-street parking facilities they would need to build in other situations (Shoup, 1999b). Because different activities have different peaks, total parking requirements can be reduced by 40-60% compared with each building having its own off-street parking (Smith, 1983).

Advantages: Sharing parking is a quick, flexible and inexpensive way to use parking facilities more efficiently.

Disadvantages: It may require additional administration and enforcement activities. Users accustomed to assigned spaces may object. It may be less convenient to users than a separate parking facility at each site. There may be occasional problems during unusual peak demand periods.

Access Management

Description: Access Management is a term used by transportation professionals for improved coordination between roadway design and land use to achieve transportation objectives. It converts automobile-oriented strip development into more clustered development with fewer driveways and improved pedestrian connections between sites. This allows parking facilities to be shared, and improves travel choices.

Advantages: It can result in more efficient use of parking facilities and provide other benefits, including reduced congestion and crashes, improved transportation choice, more efficient land use, and improved streetscape aesthetics.

Disadvantages: It may require additional administration and enforcement activities, and it may impose costs on government and businesses.

More Accurate and Flexible Parking Requirements

Description: Change minimum parking requirements to reflect the specific geographic, demographic and management conditions of each site (Smith, 1983; ULI, 2000). For example, establish higher minimum parking rates for development in automobile-oriented areas, and lower rates in more accessible areas or if the development includes Transportation Demand Management programs and strategies. The Land Use Impacts on Transportation chapter describes methods used to predict how various land use factors, such as density, mix and proximity to transit service, tend to reduce vehicle trips to a site.

Flexible parking requirements are sometimes criticized as arbitrary or unfair because individual developers may use them reduce their costs for off-street parking, causing spillover parking problems. Special efforts may be required to make variable parking requirements more politically and administratively acceptable.

- Consult stakeholders to identify specific concerns related to the application of variable parking requirements.
- Perform objective and defensible research to develop standard methods for determining the minimum parking requirements at a particular site.
- Establish Transportation Management Associations and parking brokerages so that facilities with excess parking capacity can sell, lease or trade it to others that need it. This allows all building owners to benefit from flexible parking requirements, not just developers of new facilities.
- Develop ways to evaluate results and correct problems if needed. For example, if parking requirements are reduced at a development because a TDM strategy (such as a Commute Trip Reduction program) is expected to reduce demand, there should a mechanism to insure that the program is actually implemented and demand is actually reduced, to monitor spillover problems, and to mitigate problems that develop.

Advantages: Flexible standards that more accurately reflect demand at a particular site are more efficient and fair than inflexible parking requirements.

Disadvantages: May require new planning and administrative responsibilities. May be abused if applied inconsistently.

Respond to Variable Demand

Description: Develop ways to accommodate changes in parking demand, including possible future increases and temporary peaks. This includes most strategies just described under "Use Existing Parking Capacity More Efficiently", supported by special activities described below.

Advantages: Can provide efficient, quick and flexible responses to parking problems. May avoid more expensive solutions, such as increasing parking supply.

Disadvantages: Requires new planning and administrative institutions.

Below are specific strategies for responding to changing parking demand.

Develop Parking Brokerage Services

Description: Develop a service that helps businesses to share, lease or sell parking, so that any available parking can be available for use by those that need it. This can be performed by a Transportation Management Association, a business organization, or a local government agency. This service is particularly important for businesses that implement Commute Trip Reduction programs that result in excess parking capacity.

Advantages: Can be a quick and cost effective solution to occasional parking problems.

Disadvantages: Requires an appropriate administrative structure. May have limited impacts if few businesses have extra parking.

Develop Overflow Parking Plans

Description: Develop a plan to deal with occasional periods of high demand (such as busy shopping days in a retail area, special events, emergencies, etc.). This plan may include policies that prioritize use of parking (for example, making the most convenient spaces available to customers and rideshare vehicles, and directing employees to use less convenient spaces), information for motorists on where to find additional parking, shuttle buses or free transit services, and efforts to promote use of alternatives, such as employee ridesharing.

Advantages: Can be a quick and cost effective solution to occasional parking problems.

Disadvantages: Requires planning and administration, and may involve various costs (such as shuttle bus service). May cause spillover parking problems (i.e., the areas used for overflow parking may experience problems).

Reduce Parking Demand

Description: This includes strategies that give people an incentive to shift their automobile travel to other modes or destinations. This solution can be implemented by creating a Transportation Management Program (if implemented within a single organization), or Transportation Management Association (if implemented by a group of organizations).

Advantages: To the degree that these strategies reduce total automobile use and encourage shifts to other modes these strategies can help achieve a variety of transportation and land use objectives, including parking and roadway facility cost savings, reduced congestion, crashes, pollution and sprawl. Many TDM strategies increase consumer choice and financial savings. These strategies are flexible and some can be implemented quickly.

Disadvantages: These strategies tend to require changes in current practices, and some increase transaction costs. Motorists may consider them inconvenient and unfair. To the degree that these strategies shift automobile travel to other locations, they may cause spillover problems or competitive disadvantage.

Below are specific strategies for reducing parking demand.

Price Parking

Description: Convert free parking to paid parking, or raise rates on paid parking. Motor vehicle travel and parking demand tend to be quite sensitive to parking fees, so even a relatively small fee can help

solve parking congestion problems and support TDM objectives (see Transportation Elasticities). For information on parking pricing methods, rate structures and revenue see Parking Evaluation chapter.

Governments can implement pricing directly on curb parking, off-street parking at government facilities (offices, schools, parks, etc.), and off-street municipal parking facilities. This often represents a significant portion of total parking, particularly in urban areas with parking problems. Shoup (1995) proposes creating Parking Benefit Districts in residential areas that experience parking problems, which involves charging non-residents for parking on local streets, and returning a portion of the revenue to neighbourhood residents. Solomon (1995) proposes leasing or selling curb parking spaces.

Public policies can encourage pricing of privately-owned parking. For example, governments can reduce the supply and increase the price of public parking, reduce parking requirements in zoning codes, and avoid tax policies that favour free parking. It can encourage developers to reduce parking supply and price parking.

Businesses often "bundle" parking, meaning that parking is provided free as part of a commercial transaction. For example, parking is often included at no extra charge with housing, shopping and employment. Such parking can be unbundled, so consumers can choose how much parking they wish to pay for, and receive the saving or other benefit if they reduce their vehicle ownership and use.

For example, under current practices an apartment might rent for $1,200 per month, with two parking spaces. Unbundling could mean that the apartment alone costs $1,000 per month, plus $100 for each parking space. This allows residents to pay for just the number of parking spaces they use, so non-drivers are not forced to pay for parking they don't need. This can significantly reduce parking demand.

Parking prices can be designed to achieve particular objectives. For example, convenient parking that is designated for short-term users (customers and clients) can be priced by the hour, with "First Hour Free" discounts, and maximum time periods, such as one or two hours. More distant parking designated for long-term parkers (commuters and residents) can have discounted monthly rates.

Below are specific parking pricing strategies (Parking Pricing, VTPI, 2000):

- Charge for on-street parking, and for parking at public facilities, such as government offices, schools and campuses, parks, etc. Develop Parking Benefit Districts, which provides a portion of on-street parking revenues to neighborhood projects (Shoup, 1995).
- Increase prices at publicly-owned parking facilities to reflect full costs and market rates (i.e., comparable to rates at privately-owned, for-profit parking facilities).
- Parking spaces most suitable for customers, clients and delivery vehicles should have short-term (minute or hourly) rates, and may even have "first-hour free" discounts, while parking that is most suitable for employees or residents can have monthly rate discounts.
- Encourage developers to unbundle parking from housing, so apartment and condominium residents pay only for the parking spaces they need, particularly with Location Efficient Development.
- Provide discounted or free parking for rideshare (car and van pool) vehicles.
- Where appropriate, auction on-street parking spaces so residents and businesses can control the parking spaces in front of their buildings.

Advantages: Pricing is an efficient way to reduce parking demand, solve parking congestion problems and support TDM objectives. Pricing parking can be considered more equitable than subsidizing parking, particularly if lower-income households receive a share of savings or revenues.

Disadvantages: Charging for parking incurs transaction costs, including equipment and administrative costs of collecting fees, and inconvenience to motorists. In areas with low demand, revenue may not even cover transaction costs.

Parking prices often seems confusing and arbitrary. Pricing systems may be difficult to understand, inconvenient to use, and prices often seem excessive. It is considered unfair that some motorists must pay for parking if others are able to park for free. Although customers ultimately pay for free parking in the price of goods they purchase, it may seem fairer that they only pay if they make a purchase, shifting the risk from the consumer to the merchant.

In areas were free parking is common, it is difficult for an individual property owner to price parking, since motorists will park at the unpriced parking facilities, causing spillover problems and competitive disadvantage.

Commuter Benefits

Description: This means that commuters are offered an alternative to parking subsidies (Commuter Financial Incentives, VTPI, 2000; USEPA, 2000). Below are specific types.

- *Parking Cash Out* means that commuters who are offered subsidized parking are also offered the cash equivalent if they use alternative travel modes.
- *Travel allowances* are a financial payment to employees to cover commuting costs. Employers do not provide free parking. Commuters can use this money to pay for a parking space or for another travel mode.
- *Transit and rideshare benefits* are free or discounted transit fares provided by employers. Convenient transit fare vouchers are available in many regions.

Advantages: They do not cause opposition from motorists and businesses that parking pricing may cause, yet they have a similar effect. These strategies reduce parking demand and vehicle use, are valued by some commuters, and are considered more equitable than only providing parking benefits. They can be implemented quickly and are flexible (for example, these benefits can be increased as needed to further reduce automobile commuting).

Disadvantages: These strategies require new administrative responsibilities and may add costs. Some businesses may perceive little or no financial savings from reduced parking demand (i.e., they own a sufficient amount of parking and have no alternative use for the parking facility or land).

Parking Taxes

Description: Special parking taxes can be used to reduce the total supply of parking, create a disincentive to drive, and to raise revenue. These can include:

- Special property tax on parking facilities.
- Special sales tax on commercial parking transactions.
- Special taxes on employee parking subsidies.

Advantages: They provide government revenue, which may be particularly appropriate for funding local transportation programs (since charges are related to vehicle use). They can be effective as part of an overall strategy to reduce total parking supply and discourage automobile use.

Parking taxes can offset current policies that undertax parking. Because parking benefits are usually exempt from income tax, a typical employee would need to earn nearly $2,000 annually in additional pre-tax income to pay for a parking space that costs their employer only about $1,000. This makes free

parking a popular employee benefit.

Disadvantages: Parking taxes tend to be opposed by motorists and businesses. They can be perceived as arbitrary and unfair, and cause competitive disadvantage to businesses, particularly if they only apply to some geographic areas. They only affect travel behaviour if the fees are paid by motorists, or if they result in reduced parking supply.

Improve Transportation Alternatives

Description: This includes a wide range of specific strategies that improve walking, cycling, ridesharing, public transit and telecommuting in order to reduce automobile travel.

Advantages: These strategies reduce parking demand and vehicle use, are valued by some people. They increase travel choice and can support equity objectives.

Disadvantages: These strategies may be expensive and ineffective at reducing parking problems, depending on the situation. They may require new planning, financing and administrative systems.

Implement Transportation Demand Management Programs

Description: This includes a corporate, local, municipal or regional program to encourage more efficient travel patterns (TDM Programs, VTPI, 2000).

Advantages: A program provides an institutional framework for implementing specific TDM strategies. Such a program can help achieve a variety of parking, transportation, safety and environmental objectives. It can increase travel choice and support equity objectives.

Disadvantages: A TDM program may be expensive and ineffective at reducing parking problems, depending on the situation. They may require new planning, financing and administrative systems.

Reduce Parking Supply

Description: Reducing parking supply tends to increase parking prices, and support strategic transportation and land use objectives, particularly if implemented as part of a comprehensive TDM and Smart Growth program that improves travel choices, encourages use alternative modes, and creates more efficient land use. The following are specific strategies for reducing parking supply:

- Reduced their minimum parking requirements in zoning codes and development policies.
- Reduce minimum parking requirements for developments in more accessible locations (i.e., near transit stations, in areas with good walking facilities, etc.)
- Reduce minimum parking requirements if developers implement TDM programs.
- Use in lieu fees to fund shared parking instead of each building having its own off-street parking.
- Limit the maximum amount of parking that can be built, either for individual sites or a cap on total parking in an area.
- Restrict parking facilities, such as temporary parking lots.

Advantages: Reduces costs and subsidies to driving. Helps achieve strategic transportation and land use objectives.

Disadvantages: May increase parking congestion and resulting spillover and competitive disadvantage problems. May require new planning, financing and administrative systems. May be ineffective at achieving objectives unless implemented in conjunction with other TDM strategies.

Respond to Spillover Impacts

Description: Parking supply reductions, restrictions and pricing can result in parking problems in nearby areas as motorists seek additional or cheaper parking. For example, residents may complain about spillover parking from a nearby business area. There are various ways to address these problems as part of an area parking management program.

Advantages: Addressing spillover problems directly can reduce these problems and avoid public resistance to parking management programs.

Disadvantages: These strategies require new administrative responsibilities and may add costs.

Increase Parking Regulation, Pricing and Enforcement

Increase parking regulations, pricing and enforcement in areas that experience spillover parking problems. For example, if a commercial area has parking congestion problems that spill over into nearby residential areas, local officials can establish regulations that limit parking on those streets to residents, and increase enforcement so regulations are effective. If priced parking causes spillover problems into other areas, pricing can also be implemented in those areas.

Advantages: This can be an effective, inexpensive, quick and flexible response to parking spillover problems.

Disadvantages: This may require new administrative and enforcement responsibilities. Motorists may complain.

Compensate Neighbors For Spillover Parking Impacts

Description: Provide a benefit to residents who experience parking problems. For example, if parking spillover problems occur on nearby streets during high school football games, the school can send complementary tickets to impacted residents. Shoup (1995) suggests that residents receive a portion of the revenues from curb parking on their street in Parking Benefit Districts.

Advantages: Can be an effective, inexpensive, quick and flexible response to spillover parking problems.

Disadvantages: May require new administrative and enforcement responsibilities.

Facility Design Improvements

Description: Parking facility design can affect both users and non-users. Design features can affect user convenience, comfort and security. Design standards can address various problems and help achieve transportation and land use objectives. Below are some specific parking facility design improvements.

Advantages: Design improvements can provide a variety of benefits to users and non-users. They can address a variety of problems and costs associated with parking facilities.

Disadvantages: Most design improvements increase costs of providing parking facilities.

Accessible Design

Description: Incorporate up-to-date standards for special handicapped parking spaces and walkways that accommodate people with disabilities. For information see the Access Board website (www.access-

board.gov), which provides information on accessible design standards.

Parking Location

Description: Locating off-street parking facilities behind buildings tends to create a more attractive and pedestrian-friendly streetscape (see New Urbanist design principles). This can be required in zoning codes and development practices, and encouraged by making minimum parking requirements more flexible.

Safety and Security

Description: Design facilities to minimize crash risk to vehicles and pedestrians (Hamilton, 1998), and to provide personal security with appropriate visibility, lighting, patrols and alarms (see discussion of Crime Prevention Through Environmental Design in Litman, et al, 2000).

Aesthetics

Description: Parking facilities can be designed to be attractive, with appropriate landscaping, and detailing (Smith, 1988) Large parking facilities with unadorned cement structures and blank walls are generally considered unattractive. Favor parking management practices that minimize the amount of land devoted to parking facilities and driveways, and that distribute parking in numerous smaller facilities.

Stormwater Management and Heat Island Effect

Description: Stormwater management costs and solar heat gain (*Heat Island Effect*) can be reduced by minimizing the total amount of land paved for parking, maximizing landscaping (particularly shade trees), using pervious pavements (such as pavement blocks with drainage gaps), incorporating on-site stormwater percolation, and using light-colored surfaces (cement rather than asphalt). For more information see NEMO Project website (www.canr.uconn.edu/ces/nemo) and Litman, 1998.

Summary

The table below rates parking solutions according to various objectives, including their ability to address parking congestion problems, minimize costs, support TDM and land use objectives, provide consumer benefits and achieve equity objectives.

Table 4 **Comparing Solutions**

Solution	Parking Congestion	Costs	TDM & Land Use	Consumer Benefits	Equity	*Totals*
Increase Parking Supply						
Increase Minimum Parking Requirements	3	-3	-3	2	-3	*-4*
Increase Curb Parking	3	-3	-3	2	-3	*-4*
Subsidize Off-street Parking	3	-3	-3	2	-3	*-4*
Redesign Existing Facilities	2	-1	0	1	0	*1*
Add Remote Parking	2	-2	-2	1	0	*-1*
Use Existing Parking Capacity More Efficiently						
Provide Parking Information	2	-1	0	3	0	*4*
Encourage Fringe Parking Use	2	-1	-1	1	0	*1*

Regulate Parking	2	-1	1	1	0	*3*
Pedestrian Improvements	2	-1	3	3	3	*10*
Share Parking	2	-1	2	-1	0	*2*
Use Public Parking Facilities	2	-2	2	-1	0	*1*
More Accurate Requirements	0	1	2	2	2	*7*
Respond to Variable Demand						
Parking Brokerage Services	2	-1	2	2	1	*6*
Overflow Parking Plans	2	-1	2	2	0	*5*
Reduce Parking Demand						
Price Parking	3	3	3	-3	2	*8*
Parking Taxes	2	3	3	-3	2	*7*
Commuter Benefits	3	-3	3	3	3	*9*
Improve Travel Alternatives	2	-3	3	3	2	*7*
TDM Programs	3	-2	3	2	2	*8*
Reduce Parking Supply	-3	3	3	-3	1	*1*
Respond to Spillover Impact						
Regulate, Price and Enforce	3	0	3	-3	1	*4*
Compensate Spillover Impacts	0	-2	0	0	3	*1*
Facility Design Improvements	0	-2	3	3	3	*7*

Rating from 3 (very beneficial) to –3 (very costly or harmful). A 0 indicates no impact or mixed impacts.

Of course, this analysis is affected by the weights and ratings assigned to each strategy. Other researchers may assign somewhat different values. However, one important conclusion of this analysis is unlikely to change under most reasonable assumptions: solutions that encourage more efficient use of existing parking supply can provide greater overall benefits to a community than strategies that rely on subsidies to increase parking supply. This suggests that capacity-expansion options should only be implemented if efficiency-improving options are ineffective and inadequate.

Best Practices

- Communities with parking problems should develop a comprehensive parking plan that is regularly updated.
- A community parking plan should summarize available information on parking supply, demand, costs and prices, and identify how this information should be maintained in the future (for example, planning departments may keep parking data in a GIS database).
- A parking plan should identify and defined parking problems, including when and where problems occur.
- A wide range of possible solutions should be identified and evaluated.
- Criteria for evaluating parking problems and solutions. These should generally reflect the community's transportation, land use, economic, consumer, environmental and equity objectives.
- Rather than identifying a single solution to parking problems, a parking plan should usually identify under which circumstances different solutions should be implemented. For example, it may identify certain

solutions that will be implemented first, and other solutions that should be implemented if those are found inadequate for solving problems.

- In most cases, cost-effective solutions that encourage more efficient use of existing parking should be implemented before capacity expansion solutions. Efficiency-based solutions include providing user information on parking availability and price, shared parking strategies, regulations that make the most convenient parking spaces available to priority uses, and pedestrian improvements.
- Pricing strategies are often justified on efficiency and equity grounds, but face a number of barriers, including current planning practices that result in excessive parking supply (excessive supply tends to reduce the feasibility of pricing), consumer resistance and transaction costs. However, these barriers can be reduced if pricing is implemented in a planned and coordinated manner, using new pricing methods that minimize user inconvenience and transaction costs.
- Parking management strategies should be integrated with TDM and Smart Growth planning.
- Transportation Demand Management programs, Transportation Management Associations and parking brokerage services are organizational structures for implementing parking management strategies.
- Special programs can address occasional overflow and spillover parking problems.
- A number of design strategies can make parking facilities safer and more convenient to users, and more attractive and less environmentally harmful to a community.

Case Studies and Examples

Regional Park

A regional park currently has 50 parking spaces. This is inadequate during peak periods (summer weekends). Planners estimate that 100 parking spaces are needed. Adding 50 parking spaces will cost $100,000, plus $5,000 per year for maintenance, a total annualized cost of $10,000. It also requires paving ½-acre of parkland.

Conventional Solution: Build 50 additional parking spaces. Charge a year-round, $1 daily parking fee to fund additional parking.

Alternative Solution: Charge a $2 daily parking fee during the summer to fund a transportation program expenses and discourage automobile use. Use revenue to:

- Produce a brochure describing transportation and parking options at the park, with information on recommended overflow parking options ("If the main parking lot is full you may want to park ¼-mile south on the shoulder of Bulger Road").
- Subsidize special shuttle bus service from downtown to the park during the summer, with several stops along the way. With this subsidy the fare is only $1 per rider. Encourage park staff to use this bus service for commuting.

Evaluation: Both solutions address the parking problem. However, the alternative solution preserves parkland, reduces traffic congestion on the roadway to the park, and improves travel options for non-drivers.

Commercial Development

A barber is developing a new, 5-chair shop in a suburban community. She knows that convenient parking will be important for customers and employees. During peak periods, a 5-chair barbershop requires 14-16 parking spaces (5 barbers, 1 receptionist, 5 customers being served, 2-4 customers

waiting their turn).

Conventional Solution: Develop a parcel of land with driveway access to a major arterial, construct a building with 16 parking spaces.

Alternative Solution: Develop a cluster of buildings that include the barbershop, an auto parts shop, a restaurant, and professional offices, which share 30 parking spaces. Because these businesses have different peak periods, they can efficiently share parking, resulting in a much smaller number of total parking spaces than would otherwise be required.

If 30 parking spaces prove to be insufficient at certain times, offer employees a financial benefit if they use alternative travel modes (walking, cycling, ridesharing or transit). If that is insufficient, rent or purchase a nearby parcel for employee parking.

Evaluation: Both solutions provide adequate parking, but the Alternative Solution is more cost effective, supports access management objectives (fewer driveways on arterials reduce traffic congestion and crashes), and provides more convenience (employees and customers can walk to the restaurant for a meal, rather than having to drive).

Downtown Parking Congestion

The downtown area of a small city (50,000 population) city is experiencing increased business activity and residential development that results in parking congestion, particularly during business hours. Downtown businesses are concerned that this will give them a competitive disadvantage compared with suburban malls. Downtown on-street parking is regulated (2-hour maximum) but free. Some off-street parking is priced.

Conventional Solution: Raise parking requirements for new development. Charge for on-street parking and use revenue to finance construction of additional municipal parking facilities.

Alternative Solution: Develop a downtown transportation management plan. The plan includes the following:

- Identifies which parking facilities should be used by residents and employees, and which should be reserved for customers and clients.
- Implements pricing of all municipal on- and off-street parking in the core area, with hourly rates that are higher during peak periods and lower rates during off-peak periods. Offer discounted monthly rates only for parking at the urban fringe.
- Use parking revenues to finance a downtown Transportation Management Association. It provides information on parking and transportation options in the downtown area (signs, brochures, website, etc.), promotes shared parking arrangements and provides brokerage services to match businesses that have excess parking with those that need extra parking, encourages employees to use parking at the downtown fringe designated for their use, and promotes use of alternative transportation modes.
- Establish flexible parking requirements that allow developers to pay an in lieu fee for public parking rather than building their own additional off-street parking, and reduced parking requirements for development that includes TDM components which reduce parking demand (such as density, mixed use, priced parking, transit access, lower-income housing, etc.).
- Improve pedestrian access between downtown and fringe parking facilities, including better pedestrian facilities, improved street crossing, shortcuts, and improved security.
- Establishes Access Management policies that encourage clustered development and improved pedestrian connections between sites.

- Establishes standard policies for dealing with spillover parking problems (such as complaints by residents of excessive parking on their streets), and arrangements to provide overflow parking for special events.
- Identifies additional options if parking congestion problems increase, including increased parking prices, additional parking supply, shuttle services, and TDM programs.

Evaluation: Both solutions address parking congestion problems. The Alternative Solution tends to have lower costs and support TDM and Smart Growth objectives, including reducing the amount of land paved for parking facilities, increased land use density and mix, and increased transportation choice.

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#72

Parking Management

Strategies for More Efficient Use of Parking Resources

TDM Encyclopedia
Victoria Transport Policy Institute

About This Encyclopedia

Category

Incentive to Reduce Driving and *Land Use Management*

Description

Parking Management includes a variety of strategies to encourage more efficient use of parking resources, reduce environmental impacts of parking facilities, and support transportation demand reduction objectives. Specific Parking Management strategies are described below (also see Parking Solutions).

Share Parking Facilities (Barton-Aschman Associates, 1982)

Sharing parking spaces typically allows 15-30% more users than if each motorist is assigned an individual space. For example, 100 employees may share 70-80 parking spaces. Even greater reductions are possible with mixed land uses, since different activities have different peak demand times. For example, a restaurant can share parking efficiently with an office complex, since restaurant parking demand peaks in the evening while office parking demand peaks during the middle of the day.

More Accurate Parking Requirements

Current parking requirements tend to be arbitrary and excessive (Shoup, 1999; CTR, 1999; Litman, 1999). Parking requirements are based on parking generation studies that are typically performed at new, suburban sites with unpriced parking. These standards tend to be unnecessarily high for urban areas with good access, where parking is priced. Parking requirements can be reduced by using standards that more accurately reflect each site's needs.

Allow Reduced Parking Requirements In Exchange for TDM Programs

Parking requirements can be reduced at sites that implement TDM programs. For example, a developer's parking requirements could be reduced 20% if they implement a Commute Trip Reduction program or Location Efficient Development.

Price Parking

Charge users directly for parking tends to significantly reduce parking demand, typically by 10-30%, depending on circumstances. Daily parking fees of $1.50 to $3.00 typically reduces solo commuting by 20-40%. Since consumers pay for free parking facilities indirectly (through higher taxes and retail prices, or employee benefits), this need not increase users' overall costs if they receive a portion of the savings that result.

Cash Out Free Parking

Cashing Out parking means that commuters who are offered subsidized parking are also offered the cash equivalent if they use alternative travel modes. This tends to reduce automobile commuting by 15-25%, and is more equitable than providing free parking with no comparable benefit for non-drivers.

Unbundle Parking

Parking facilities are often "bundled" with building costs, which means that a certain number of spaces are included with building purchases or leases. This assumes that all building users (residents, businesses, employees, etc.) have equal and unchangeable parking requirements. It is more fair and efficient to sell or rent parking separately, so building occupants pay for just the number of spaces that they require, and can adjust their parking supply as their needs change.

Favor Short-Term Parking Pricing

When parking is not free, it is often rented by the month, with significant discounts over short-term pricing. It is more efficient to rent parking on a daily basis, or to prorate monthly leases by days not driven. For example, if full-time parking costs $50 per month, commuters should be able to pay $30 if they only drive 3 days per week. This gives commuters a financial incentive to use alternative modes when possible.

Address Spillover Problems

Spillover parking problems can be addressed with pricing and enforcement strategies. Residential neighborhoods could create a "Parking Benefit District," where on-street parking is charged (at least for non-residents) with revenues used for neighborhood enhancement or to reduce property taxes (Shoup, 1994 and 1995). Resident's vehicles can be exempted from these charges.

Location Efficient Mortgages (LEMs)

LEM means that lenders consider potential transportation cost savings to households located in accessible neighborhood (where services and public transit are convenient) in mortgage analysis (Hoeveler, 1997). Housing in such locations has lower parking requirements because residents tend to own fewer cars. This encourages households to choose housing in more multi-modal neighborhoods.

Develop Overflow Parking Plans

Excessive parking is sometimes required to meet infrequent demand peaks that occur during special events. Parking requirements can be reduced if facility managers develop overflow Parking Management plans that make use of off-site parking with shuttle service, or other special-use parking facilities.

Regulate Use of Parking Facilities

Parking facilities can be regulated in several ways:

- Prohibit on-street parking on certain routes at certain times (such as on arterials during rush hour), to increase the number of traffic lanes.
- Place time limits on on-street parking (maximum amount of time that a vehicle can be left in one space), to encourage turnover and discourage owners from using on-street parking for long-term vehicle storage.
- Limit use of on-street parking to area residents (Andrews, 2000).
- Limit on-street parking of large vehicles (e.g., vehicles over 22 feet long or trailers) to ease traffic flow and discourage people from using on-street parking spaces to store large vehicles.

Parking Maximums

Some urban areas impose limit on the maximum amount of parking capacity allowed for various types of buildings or within a particular area as part of their TDM programs. For example, the City of Seattle allows a maximum of one parking space per 1,000 sq. ft. of downtown office space and the City of San Francisco limits parking to 7% of a downtown building's floor area (K.T. Analytics, 1995).

Allow In Lieu Fees As An Alternative To On-Site Parking

In lieu fees allow developers to fund off-site municipal parking facilities instead of providing on-site parking (Shoup, 1999a). This allows parking facilities to be located where they most optimal for the sake of urban design, and results in more efficient shared parking facilities.

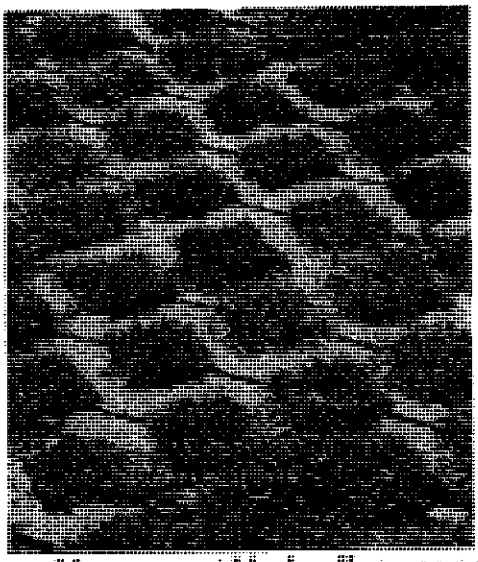
Tax Parking Facilities or Their Use

Some communities impose a special tax on parking facilities. This can be an effective TDM strategy provided that the tax is borne directly by users rather than being paid by businesses. It tends to be a revenue generation strategy.

Parking Facility Design

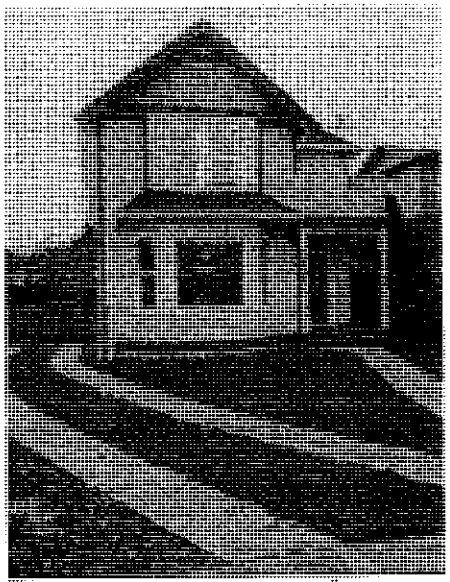
Improved parking facility design can increase safety (G.D. Hamilton Associates, 1998), improve aesthetics (Smith, 1988), and reduce stormwater impacts. Stormwater impacts can be reduced by minimizing paved area, using permeable pavement blocks, Hollywood driveways, and using on-site stormwater retention.

Figure 1 **Permeable Pavement Blocks**



Permeable pavement blocks allow grass to grow and water to drain into the ground.

Figure 2 **Hollywood Driveway**



"Hollywood" driveways only pave two strips.

These strategies are in contrast to current practices that are intended primarily to insure an abundant supply of convenient parking. Current parking requirements tend to be inflexible (the same standard is often applied equally in both urban and suburban areas, although vehicle ownership and use may vary significantly) and generous, resulting in more parking spaces than are needed at many sites.

From some perspectives this makes sense. Abundant parking capacity makes vehicle travel convenient, which is valued by drivers and by businesses that want to attract customers. Paying directly for parking is inconvenient, at least with traditional parking meters. But parking facilities have costs, some obvious and some less obvious (Shoup, 1999b; Litman, 2000). Abundant, free parking tends to increase total parking costs and automobile use. For more discussion of the merits of conventional and innovative Parking Management strategies see Parking Solutions and Evaluation of Parking Policy chapters.

Travel Impacts

Abundant, free parking encourages driving and helps create dispersed, automobile-dependent land use patterns. Parking Management can significantly reduce automobile travel, particularly if implemented as part of a comprehensive TDM program.

Automobile travel tends to be quite sensitive to parking fees. The price elasticity of parking is –0.1 to –

0.3, meaning that a 10% increase in parking charges reduces driving by 1-3% (Analytics, 1995; Shaw, 1997; Pratt, 1999). Shifting from free to market-price parking (i.e., prices that represent the cost of providing parking facilities) typically reduces drive alone commuting by 10-30%, particularly if implemented with improved travel choices and other TDM strategies. See Transport Elasticities and Land Use Impacts on Transport for additional information on how parking policies can affect travel decisions.

Parking Management can help shift automobile travel to alternative modes and improves access by increasing prices and reducing the amount of land that must be devoted to parking facilities, creating more pedestrian friendly land use patterns (which supports transit use). As the number of parking spaces per employee in a commercial center increases, the portion of automobile commuters also tends to increase (Morrall and Bolger, 1996; Mildner, Strathman and Bianco, 1997).

Table 1 **Travel Impact Summary**

Travel Impact	Rating	Comments
Reduces total traffic.	3	Reduces total driving.
Reduces peak period traffic.	3	
Shifts peak to off-peak periods.	1	If prices are higher during peak-periods.
Shifts automobile travel to alternative modes.	3	
Improves access, reduces the need for travel.	3	Allows higher-density, mixed land use.
Increased ridesharing.	3	
Increased public transit.	3	
Increased cycling.	3	
Increased walking.	3	
Increased Telework.	3	
Reduced freight traffic.	1	

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Benefits And Costs

Parking Management can provide several types of benefits. The Parking Policy Evaluation chapter has more information on benefits and costs of Parking Pricing.

Efficiency and Savings

Parking Management can reduce parking requirements, providing substantial savings in facility costs. The table below illustrates typical financial costs of parking facilities under various conditions. Even a modest reduction in parking requirements can provide thousands of dollars in avoided annual costs. The increased development that is made possible can increase local tax revenues.

Table 2 **Typical Parking Facility Costs** (Litman, 1999)

	Land Per Acre	Land Per Space	Constr-uction	Annual O&M	Annual Cost	Monthly Cost	Daily Cost
Suburban, Surface	$100,000	$800	$1,600	$20	$226	$19	$0.63
Suburban, 3-Story Struct.	$100,000	$267	$10,000	$50	$931	$78	$2.59
Suburban, Underground	NA*	$0	$20,000	$100	$1,816	$151	$5.05
Urban, Surface	$250,000	$2,000	$1,600	$20	$329	$27	$0.91
Urban, 5-Story Struct.	$250,000	$400	$10,000	$50	$942	$79	$2.62
Urban, Underground	NA*	$0	$20,000	$100	$1,816	$151	$5.05

* Underground spaces are assumed to have no incremental land cost. Assuming 125 spaces per acre, 25 year loans at 7% interest.

Reduced Environmental Impacts

Pavement imposes environmental impacts including reduced groundwater recharge, increased stormwater management requirements, reduced greenspace and wildlife habitat, and heat island effects (NEMO Project). Parking consumes a significant portion of urban land, particularly in commercial and high-density residential areas. Parking Management can reduce urban sprawl and the environmental impacts that result (Willson, 1995).

Reduced Automobile Use

As previously described, Parking Management is one of the most effective ways to reduce motor vehicle traffic and achieve TDM objectives. Parking management can reduce automobile trips by 10-30%, or even more if implemented as part of a comprehensive TDM program.

More Flexible Design

Parking Management allows greater flexibility in facility location and site design. For example, it can facilitate the preservation of historic buildings and districts, and allows designers to position buildings to meet access, aesthetic and environmental objectives in ways that are impossible with standard parking requirements.

Higher Density, Transit And Pedestrian Friendly Development

Parking Management allows higher density development, which is necessary to preserve and create transit and pedestrian friendly conditions, such as urban villages and Central Business District (Voith, 1998).

Revenues From Pricing

When parking is priced, it creates revenues (an economic transfer that is offset by user costs).

Parking Management *costs* include:

Administrative Expenses

Parking Management programs often involve additional activities, tasks and equipment.

Financial Costs to Motorists

When parking is priced, it imposes costs on motorists, an economic transfer that is offset by revenues to facility owners or managers. Consumer impacts depend on how revenues are used.

Transaction Costs to Users and Facility Owners

Paying for parking tends to be inconvenient to motorists, who are often required to prepay using specific coins or denominations, although newer parking payment technologies tend to be more convenient. Facility owners must pay fee collection and enforcement costs.

Spillover Impacts in Other Areas

Parking charges and restrictions in one area may cause motorists to park in other areas where they create congestion problems. This may increase management and enforcement costs, and create conflicts between neighbors.

Table 3 Benefit Summary

Objective	Rating	Comments
Congestion Reduction	3	Reduces vehicle travel.
Road & Parking Savings	3	Reduces vehicle travel and parking requirements.
Consumer Savings	0	Mixed, depending on strategy. Reduces driving affordability but reduces indirect parking costs through taxes and rents.
Transport Choice	0	Mixed, depending on strategy. Reduces driving affordability and convenience but improves other modes.
Road Safety	3	Reduces vehicle travel.

Environmental Protection	3	Reduces vehicle travel and the amount of land paved for parking.
Efficient Land Use	3	Reduces vehicle travel and allows higher-density development.
Community Livability	3	Reduces vehicle travel and the amount of land paved for parking.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Equity Impacts

The equity impacts of Parking Management vary depending on the type of strategies used, where and how they are applied. Many tend to affect some groups more than others, depending on where they live and work, and how they travel.

Management strategies that reduce subsidies and charge motorists directly for the parking costs they impose tend to increase fairness (horizontal equity). Similarly, restrictions on parking may increase equity if they reduce current subsidies or favor disadvantaged groups.

Some Parking Management strategies, such as parking Cash Out and Location Efficient Development can provide significant benefits to lower income and transportation-disadvantaged people. Most Parking Management strategies benefit people who are transportation disadvantaged by helping to create more multi-modal, transportation and land use patterns, and reducing the subsidies they currently pay toward parking facilities that they do not use.

The table below summarizes the major equity impacts of various Parking Management strategies. Most increase overall equity. The most significant inequitable impact identified is the regressive nature of parking pricing and taxes, but the overall equity impact depends on how revenues are used and the quality of travel choices. If revenues are used to benefit lower-income households and there are good travel alternatives to driving, pricing and taxes can be progressive overall.

Table 4 **Equity Analysis of Parking Management Strategies**

	Treats everybody equally	Individuals bear the costs they impose	Progressive with respect to income	Benefits transport disadvantaged	Improves basic mobility
More flexible requirements	1	3	3	3	0
Shared parking	0	0	0	Yes	0
Priced parking	2	3	-2*	2	2
Cash Out free parking	3	0	3	3	0
Unbundled parking	3	3	3	3	0
Favor short-term parking	0	0	0	0	0
Address spillover problems	3	3	1	3	0
LEM	3	3	3	3	3
Restrict parking	2	2	1	3	1
Taxing Parking	1*	1*	1*	1*	0

* Depends on who bears the cost, how revenues are used, and the quality of travel choices.

Applications

Parking Management can be applied in many situations (Evaluating Parking Policy). It is particularly appropriate where:

- A particular parking problem exists.
- Land values and parking facility costs are high.
- Dense development is desired.
- Traffic congestion or vehicle pollution are significant problems.
- Excessive pavement is undesirable.

Table 5 **Application Summary**

Geographic	Rating	Organization	Rating
Large urban region.	3	Federal government.	1
High-density, urban..	3	State/provincial government.	2
Medium-density, urban/suburban.	3	Regional government.	3
Town.	2	Municipal/local government.	3
Low-density, rural.	1	Business Associations/TMA.	3
Commercial center.	3	Individual business.	3
Residential neighborhood.	3	Developer.	3
Resort/recreation area.	3	Neighborhood association.	3
		Campus	3

Ratings range from 0 (not appropriate) to 3 (very appropriate).

Relationships With Other TDM Strategies

Parking Management supports and is supported by nearly every other TDM strategy. Parking Management includes many Parking Solutions. It is often implemented as part of TDM, Commute Trip Reduction, Transportation Management Associations and Campus Trip Reduction programs. It supports and is supported by Pedestrian and Cycling Improvements, Transit Improvements, Smart Growth, New Urbanism and Transportation Pricing Reforms. It is important for Location Efficient Development.

Stakeholders

Parking Management programs are primarily implemented by local government policies and agencies, and by individual businesses. Implementation often involves changing current planning, enforcement and design practices, sometimes with the support of professional organizations. Transportation Management Associations can provide Parking Management and parking facility brokerage services (for example, maintaining a system to match businesses that have excess parking capacity with those that need additional spaces and arranging for parking facilities to be shared when appropriate).

Barriers To Implementation

Public officials, planners and business leaders must become familiar with the many Parking Management strategies and their potential benefits. Parking Management requires changing current development, zoning and design practices. It requires an efficient institutional framework (such as TMAs and TDM Programs) and addressing concerns over spillover impacts.

Best Practices

Best practices for Parking Management are described in reports listed below. For more information see Evaluating Parking Policy.

- Parking facilities should be managed as an asset for efficiency. User information services, shared parking, pricing strategies and overflow parking plans allow more efficient use of existing capacity and avoid the need for excessive requirements.
- Prices for the most convenient parking spaces should be higher for peak-period parkers and lower for off-peak parkers, but there should be little or no discounts for long-term leases, to insure that the most desirable spaces are available for shoppers and customers, rather than commuters and residents.
- The standard of service for parking should be comparable to that of other services. Parking managers should use signs and brochures to provide accurate information to users, maintain attractive and safe facilities, and anticipate problems.
- Parking facilities should be integrated into overall facility and district design.

- Parking Management policies and programs should be coordinated through a district or region, rather than just in a few areas, such as a central business district.

- Stakeholders should be consulted and involved in planning parking policies and programs.
- New technologies should be used to improve information provided to users, make pricing convenient, and control revenue.
- Parking services should not be one-size-fits-all. A parking facility may provide a variety of services tailored to different users, including valet services for premium users, convenient short-term parking for shoppers and delivery vehicles, longer-term parking for commuters and residents, and special arrangements when appropriate for commercial users.
- Programs should anticipate potential spillover problems, and respond with appropriate regulations and enforcement.
- Enforcement should be adequate to maintain a high level of compliance. Since motorists are accustomed to abundant, free parking there may be considerable resistance to parking regulations fees. It is important that enforcement be predicable and as courteous as possible.

Examples and Case Studies

UK Maximum Parking Standards (www.planning.detr.gov.uk/consult/ppg13/07.htm)

Maximum numbers of parking spaces for different types of building uses have been drafted as part of UK planning policy guides, published by the *Department of the Environment, Transport and the Regions* in October 99. The parking maximums are designed to help reduce the car dependency of development and promote sustainable transport choices, whilst at the same time presenting a realistic proposition. For example, the proposed maximum parking standard for office buildings is 1 parking space per 35 square metres of gross floor space, for buildings above 2,500 square metres gross floor space. The proposed standards are already in use by some local authorities around the UK. These standards have been derived from analysis of existing levels of parking, consideration of the potential for changing travel patterns and consideration of potential effects on investment.

Time-Based Pricing (K.T. Analytics, 1995)

The City of Chicago raised rates at municipal parking lots by 30-120%, bringing prices in line with commercial operators. Parking demand declined 35%, and parking duration also decreased. Parking at nearby commercial lots did not change significantly. Local planners concluded that this reduction represented a shift from driving to transit or ridesharing, or shorter duration parking. The City of Eugene raised monthly parking rates at two municipal garages from $16 to $30 per month, and at several surface lots from $6 to $16 per month. Monthly parking sales declined from 560 to 360 parkers. About half shifted to ridesharing or riding transit, the other half apparently changed parking locations.

Parking Taxes (K.T. Analytics, 1995)

Commercial parking is taxed as a percent of revenue in many cities, including Baltimore, New York, Pittsburgh, San Francisco, and Washington DC. Washington State allows local governments to tax commercial and employee parking.

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"Efficiency - Equity - Clarity"

#28

Park & Ride

Convenient Parking For Transit Users

TDM Encyclopedia
Victoria Transport Policy Institute

About This Encyclopedia

Category

Improved Transport Choice

Description

Park & Ride consists of parking facilities at transit stations, bus stops and highway onramps to encourage public transit use and ridesharing. Security patrols and lighting are often provided. Some include parking for bicycles as well as cars. Parking is free or significantly less expensive than at the city center.

How it is Implemented

Park & Ride facilities are usually implemented by regional transportation or transit agencies. In some cases, existing, underutilized parking (such as a mall parking lot) is used for Park & Ride.

Travel Impacts

Park & Ride facilities can increase transit and rideshare travel. Morrall and Bolger (1996a & b) find that the supply of Park & Ride facilities can have a major influence on the portion of downtown commute trips made by transit. Parkhurst (2000) finds that while Park & Ride facilities reduce urban traffic, they may increase urban fringe vehicle traffic as motorists detour to reach facilities or make additional trips. Actual impacts depend on the quality of Transit and Rideshare services, the existence HOV Priority and Commuter Financial Incentives, and geographic factors such as the distribution of jobs and employment.

Table 1 **Travel Impact Summary**

Objective	Rating	Comments
Reduces total traffic.	1	Reduces a portion of car trips.
Reduces peak period traffic.	2	Tends to reduce trips during peak periods.
Shifts peak to off-peak periods.	0	
Shifts automobile travel to alternative modes.	3	Supports transit and ridesharing.
Improves access, reduces the need for travel.	0	
Increased ridesharing.	3	Supports ridesharing.
Increased public transit.	3	Supports transit use.
Increased cycling.	1	Supports cycling when bike parking is provided.
Increased walking.	0	
Increased Telework.	0	
Reduced freight traffic.	0	

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Benefits And Costs

By encouraging shifts to transit and ridesharing, Park & Ride facilities reduce urban highway traffic congestion and worksite parking demand. These benefits can be significant since Park & Ride tends to be most effective where traffic congestion and parking problems are worst. However, automobile Park & Ride for cars provides only modest reductions in local road traffic, pollution, energy use or consumer costs, since a local automobile trip is still made. Bicycle Park & Ride provides much greater economic and environmental benefits.

Costs are primarily associated with facility construction and operations. Construction costs typically average several thousand dollars per space, which is usually lower than the costs of providing parking at city centers. In some circumstances, Park & Ride facilities may encourage urban sprawl by reducing the cost of long distance commutes.

Table 2 **Benefit Summary**

Objective	Auto	Bike	Comments
Congestion Reduction	3	3	Reduced peak-period vehicle travel.
Road & Parking Savings	1	3	Reduces road and parking costs in urban centers.
Consumer Savings	1	3	Reduces travel expenses.
Transport Choice	1	2	Improves transit as a travel choice.
Road Safety	1	2	Reduces automobile travel.
Environmental Protection	1	3	Reduces automobile travel.
Efficient Land Use	-1	2	May encourage urban expansion.
Community Livability	1	3	Reduces automobile travel.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Equity Impacts

Only a portion of travelers can use Park & Ride facilities, although all road users can benefit from reduced traffic congestion, crash risk and pollution. Park & Ride facilities tend to require government subsidies, but these often replace worksite parking subsidies. Park & Ride is likely to be progressive with respect to income, since lower-income commuters tend to rely on public transit and ridesharing more than those with higher incomes. Non-drivers benefit from increased ridesharing, and from bike Park & Ride facilities. Supports basic mobility by increasing public transit and ridesharing.

Table 3 **Equity Summary**

Criteria	Rating	Comments
Treats everybody equally.	1	Only directly benefits users, but other road users benefit indirectly.
Individuals bear the costs they impose.	0	Requires subsidy, but these tend to be smaller than other parking subsidies.
Progressive with respect to income.	2	Lower-income people tend to use transit and rideshare.
Benefits transportation disadvantaged.	1	Can support cycling and increased ridesharing.
Improves basic mobility.	1	Increases transit and ridesharing.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Applications

Park & Ride is most appropriate at the fringe of large urban areas. It tends to be most effective as part of a comprehensive effort to encourage transit and rideshare commuting.

High-density, urban.	3	State/provincial government.	3
Medium-density, urban/suburban.	3	Regional government.	3
Town.	2	Municipal/local government.	2
Low-density, rural.	2	Business Associations/TMA.	2
Commercial center.	2	Individual business.	0
Residential neighborhood.	2	Developer.	1
Resort/recreation area.	2	Neighborhood association.	1
		Campus.	2

Ratings range from 0 (not appropriate) to 3 (very appropriate).

Relationships With Other TDM Strategies

Park & Ride supports and is supported by Public Transit Improvements, Ridesharing, HOV Facilities, Commute Trip Reduction, Cycling Improvements, and Parking Management.

Stakeholders

Park & Ride facilities are usually provided by transportation or transit agencies. Their use may be promoted as part of TDM and Commute Trip Reduction programs.

Barriers To Implementation

Park & Ride facilities require funding, adequate transit service and rideshare programs, and suitable incentives.

Best Practices

- Park & Ride facilities should be developed as part of an overall transit and rideshare improvement program.
- Park & Ride facilities should be located within view of businesses or homes, for the sake of security.
- Park & Ride facilities should include bike storage lockers, or other secure bike storage if demand exists.
- Facilities should have adequate lighting, landscaping, and other amenities (bus shelters, garbage cans, etc.).
- It is usually best to have several smaller Park & Ride facilities in different locations, rather than one large one.

Examples and Case Studies

SCAT Park-and-Ride (www.ridescat.com/commuterassistance/index.html)

The Space Coast Area Transit agency in Southern Florida promotes Park & Ride as part of its Commuter Assistance program. It identifies the following benefits to employers of using Park & Ride:
1.Reduced on-site parking
2.Employer/Employee tax credits
3.Improved Employee Recruitment and Retention
4.Improved Customer Service and Employee Morale
5.Improved Corporate Image
6.Bottom-Line, Profitability Goes Up!

Peripheral Parking With Shuttles (K.T. Analytics, 1995)

Hospitals in San Francisco, Portland, Syracuse and San Jose provide shuttle buses to remote parking areas. The University of Maryland has operated 25 shuttle buses serving parking areas, residential areas, campus and regional public transit stations. Hartford, CT has a policy allowing parking requirements for new development to be reduced up to 30% if shuttle service is provided from off-site parking. City planners had hoped developers would provide peripheral parking and shuttles, but instead several developers lease nearby surface parking where

available and provide it to tenants. In Orlando, FL developers can reduce parking requirements up to 20% in exchange for contributing toward a transportation management fund. The city has constructed 8,000 spaces at the periphery of downtown.

Washington DC Area Park & Ride Program (http://www.mwcog.org/)

The Metropolitan Washington Council of Governments Commuter Connection Program website a table listing the nearest town, the location and the number of spaces for dozens of Park & Ride lots in the region.

King County Park-and-Ride Information (http://transit.metrokc.gov/parknride/parknride.html)

King County, Washington, has dozens of Park-and-Ride lots. The County website provides information on their locations, closure alerts, and regulations.

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#27

Parking Pricing

Direct Charges for Using Parking Facilities

TDM Encyclopedia
Victoria Transport Policy Institute

About This Encyclopedia

Category

Incentive to Reduce Driving

Description

Motorists receive free or discounted parking for most trips. Of the 95% of commuters who drive, only 5% pay full parking costs and 9% pay a subsidized rate, while free parking is provided for more than 99% of non-commute trips (NPTS, 1992). Pricing parking is one of the most effective ways to change travel behavior and is an important component of many TDM programs. Below are some specific Parking Pricing strategies (also see Parking Solutions):

- Reduce or eliminate employee parking subsidies, so employees who commute by car pay some or all of their parking costs. (Rideshare vehicles are often exempt.)
- Cash Out free parking, so commuters who use other modes receive comparable benefits.
- Encourage businesses and public facilities to charge market rates for parking. Charge for parking at retail, entertainment, recreation andcampus facilities, to the maximum degree feasible.
- Charge for on-street parking, using meters or permits, and set fees to reflect market costs (i.e., comparable to rates for private, off-street parking).
- Increase prices at publicly-owned parking facilities to reflect full costs and market rates (i.e., comparable to rates at privately-owned, for-profit parking facilities).
- Rent parking spaces by the hour or day, rather than the week or month, and reduce or eliminate discounts for longer-term leases.
- Price the most convenient parking to favor customers rather than employees.
- Unbundle parking from housing, so apartment and condominium residents pay only for the parking spaces they need, particularly withLocation Efficient Development.
- Charge for parking on residential streets, with meters or permits, and use the revenue to benefit neighborhood residents (Shoup, 1995).
- Tax parking spaces, and encourage or require that the costs be passed on to users.
- Lease on-street and municipally-owned off-street parking spaces. For example, allow people and firms to lease spaces on the street in front of their homes or business, for their own use, for use by customers, or even to install their own parking meter.
- Use Parking Managementto reduce the supply of parking and address spillover problems. Encourage businesses to lease or rent any excess parking (for example, making parking spaces available for a fee during non-business hours).
- Use TDM Marketing and other information resources to provide accurate information on parking prices and availability, and information on more efficient alternative travel options.

Parking costs not paid directly by users are ultimately borne throughout the economy, as higher taxes, increased costs for retail goods, housing costs, or as a substitute for other employee benefits. Charging users directly rather than indirectly for parking can increase economic efficiency and equity (see Market Principles chapter), and reduce demand for parking facilities, providing a number of additional potential benefits (Litman, 2000).

Optimal parking prices reflect the full costs of providing parking facilities, including land (the equivalent of rent and property taxes, even on publicly-owned facilities), construction, financing and operations. Table 1 indicates typical costs of providing parking facilities. Additional costs include administration, enforcement, insurance, taxes and financing, which can add hundreds of dollars a year. Dorsett (1998) estimates that parking typically requires monthly revenue ranging from $42 to $196 per space to break even. Cost-recovery parking prices therefore range from about $1 to more than $10 per day.

Table 1 **Typical Parking Facility Costs**

	Land Per Acre	Land Per Space	Constr-uction	Annual O&M	Annual Cost	Monthly Cost	Daily Cost
Suburban, Surface	$100,000	$800	$1,600	$50	$256	$21	$0.71
Suburban, 3-Story Struct.	$100,000	$267	$10,000	$100	$981	$82	$2.72
Suburban, Underground	$100,000	NA	$20,000	$200	$1,916	$160	$5.32
Urban, Surface	$250,000	$2,000	$1,600	$50	$359	$30	$1.00
Urban, 5-Story Struct.	$250,000	$400	$10,000	$200	$1,092	$91	$3.03
Urban, Underground	$250,000	NA	$20,000	$400	$2,116	$176	$5.88

(Assumes 125 spaces per acre, 7% interest over 25 years. Underground spaces are assumed to have no incremental land cost. U.S. dollars.)

This table illustrates the financial costs of providing parking facilities under various conditions.

Total parking costs not paid directly by motorists are estimated to average $1,000 to $2,000 per motor vehicle year, or 8¢ to 16¢ per motor vehicle mile (Delucchi, 1998). This is more than what motorists pay for fuel, indicating that charging motorists directly for parking would more than double their perceived cost per trip.

A variety of conceptual and institutional changes are needed to implement Parking Pricing. Most current parking policies are primarily intended to force somebody other than motorists to provide generous amounts of parking. Free or subsidized parking is provided by local governments and businesses, and bundled with housing costs.

Motorists are accustomed to receiving subsidized parking, and so often resent and oppose Parking Pricing efforts. Retail businesses often use free parking to attract customers. Commercial centers often use free or discounted parking to compete with other commercial centers for customers. Tax policies favor parking subsidies over wages. A typical employee would need to earn about $2,000 in additional pre-tax annual income to pay for a parking space that costs an employer about $1,000 a year. In other words, a dollar of free parking is worth about $2 in wages to automobile commuters.

Zoning codes and development practices often encourage abundant parking that reduces parking prices, and causes businesses to consider parking facilities a "sunk" cost with little marginal value. Unless a business can sell or lease excess parking capacity, they may perceive little financial benefit from encouraging their employees and customers to reduce their parking demand. As a result, businesses, employees and consumers all find it beneficial for parking to be free rather than priced.

Yet, Parking Pricing is not necessarily a barrier to economic development, if they have other attractive

attributes. The real estate industry currently finds that major urban centers tend to have the most profitable development, despite limited and priced parking, while traditional suburban areas, which tend to have abundant and free parking are less economically competitive until they begin to urbanize (LLREI, 2000).

Pricing parking can have various transportation and land use impacts. Motorists may drive further to find cheaper parking (although the opposite effect may also occur: charging for parking tends to increase turnover, reducing the need for motorists to cruise for a parking space). Charging for parking may cause spillover impacts onto other streets, or onto other off-street parking facilities where parking is free or enforcement is lax. If parking is only priced in certain areas, some motorists may shift destinations, particularly for discretionary trips (e.g., shopping or dining at a mall rather than downtown, to avoid paying for parking). This may encourage shifts of business activity and development away from cities to urban fringe locations where most parking is free.

In the past, charging for parking had relatively high transaction costs. Parking facility owners either needed to hire staff to collect fees, or use mechanical meters that require motorists to have specific coins and predict how long they will be parked. Electronic parking meters (Luk, 1995; K.T. Analytics, 1995), and new management practices (Litman, 1999; Shoup, 1999a) make charging for parking more convenient and cost-effective. For information on fee collection techniques see the International Parking Institute website at http://www.parking.org/.

How It Is Implemented

Parking price changes are usually implemented by local governments or individual businesses, either as part of a TDM program or to achieve other objectives, such as revenue generation. Parking fees collection is often handled by private companies that specialize in parking facility management. Effective Parking Pricing requires appropriate planning and management to develop the price structure and enforcement regulations. It is important to anticipate and prevent spillover parking problems. Parking Pricing can sometimes be implemented indirectly by reducing parking supply (for example, by reducing minimum parking requirements for new development).

Travel Impacts

Automobile travel tends to be quite sensitive to per-trip parking charges. Even modest parking fees can reduce a significant number of car trips to an area. However, if parking is charged in one area but free elsewhere, automobile trips may simply shift from one location to another, without an overall reduction in vehicle travel.

The price elasticity of parking ranges from –0.1 to –0.3 (a 10% increase in parking charges reduces vehicle trips by 1-3%), depending on demographic, geographic, travel choice and trip characteristics (Comsis Corp., 1993; Analytics, 1995; Shaw, 1997; Pratt, 1999). Shifting from free to cost-recovery parking (prices that reflect the full cost of providing parking facilities) typically reduces automobile commuting by 10-30%, particularly if implemented with improved travel choices and other TDM strategies. The Transport Elasticities chapter provides additional information on the travel impacts of parking price changes.

Table 2 **Changes in Workplace Travel Due to Parking Pricing**

	Canadian Study			Los Angeles Study		
	Before	**After**	**Change**	**Before**	**After**	**Change**
Drive Alone	35%	28%	*-20%*	55%	30%	*-27%*
Carpool	11%	10%	*+9%*	13%	45%	*+246%*
Transit	42%	49%	*+17%*	29%	22%	*-24%*

Other	12%	13%	-8%	3%	3%	0%

(Feeney, 1989, cited in Pratt, 1999)

A study by ICF (1997) indicates that a $1.37 to $2.73 increase in parking fees reduces auto commuting 12-39%, and if matched with transit and rideshare subsidies, reduces total auto trips by 19-31%. A survey of automobile commuters found that nearly 35% would consider shifting to another mode if they were required to pay for parking, with fees of $1-3 per day in suburban locations and $3-8 per day in urban locations (Kuppam, Pendyala and Gollakoti, 1998). The table below shows the typical reduction in automobile commute trips that result from Parking Pricing. See Trip Reduction Tables for more information on the travel reductions that are predicted to result from parking fees and other commuter financial incentives.

Table 3 **Percent Vehicle Trips Reduced by Daily Parking Fees**

Worksite Setting	$1	$2	$3	$4
Low density suburb	6.5%	15.1%	25.3%	36.1%
Activity center	12.3%	25.1%	37.0%	46.8%
Regional CBD/Corridor	17.5%	31.8%	42.6%	50.0%

From Comsis Corporation, 1993. Fees in 1993 U.S. dollars.

One study estimates that Parking Pricing for work trips can reduce up to 4.0% of VMT and up to 4.0% of vehicle trips in a region (Apogee, 1994), and that Parking Pricing for non-work trips could reduce total regional VMT by up to 4.2% (Apogee, 1994). Deakin and Harvey (1997) model the effect of minimum employee parking charges applied to commuters who drive alone on transportation impacts in four major urban regions in California. Table 4 summarizes their results for the year 2010. It indicates, for example, that in the South Coast (Los Angeles) region, a $3 per day parking fee would reduce total vehicle trips by about 2.8%, but congestion delay would decline by a much larger amount (8.5%).

Table 4 **Impacts of Employee Parking Fees in Year 2010** (Harvey and Deakin, 1997, Table B.7)

Region	Price	VMT	Trips	Delay	Fuel	ROG	Revenue
Bay Area	$1.00	-0.8%	-0.9%	-2.7%	-1.0%	-0.8%	$473
	$3.00	-2.1%	-2.4%	-7.0%	-2.4%	-2.3%	$1,399
Sacramento	$1.00	-1.0%	-1.1%	-2.5%	-1.1%	-1.1%	$142
	$3.00	-2.6%	-2.8%	-6.5%	-2.7%	-2.8%	$419
San Diego	$1.00	-0.9%	-1.0%	-2.5%	-1.0%	-0.9%	$271
	$3.00	-2.4%	-2.6%	-7.0%	-2.5%	-2.5%	$800
South Coast	$1.00	-0.9%	-1.1%	-2.9%	-1.1%	-1.0%	$1,408
	$3.00	-2.5%	-2.8%	-8.5%	-2.7%	-2.6%	$4,151

Price = minimum daily parking fee for SOV commuters. VMT = change in total vehicle mileage. Trips = change in total vehicle trips. Delay = change in congestion delay. Fuel = change in fuel consumption. ROG = a criteria air pollutant. Revenue = annual revenue in millions of 1996 dollars. See original report for additional notes.

Travel behavior can also be influenced by how parking prices are structured. Significant discounts for long-term parkers (e.g., lower-priced monthly leases) encourage use by commuters, while parking prices and management strategies that discount short-term parking (e.g., "First-Hour-Free" rates) favor shoppers and business trips. Rate increases of $1-2 per day directed at commuters are found to reduce long-term parking demand by 20-50%, although this may result partly from shifts to other parking locations rather than alternative modes (Pratt, 1999).

In addition to direct impacts, pricing and Parking Management practices that reduce the amount of land devoted to parking facilities can create more accessible land use patterns and improve transportation choice (devoting large amounts of land to parking leads to more dispersed development and degrades

the pedestrian environment), as discussed in the chapter on Land Use Impacts. As a result, Parking Pricing can contribute to additional reductions in automobile travel over the long-term if it helps create more efficient land use.

Table 5 **Travel Impact Summary**

Travel Impact	Rating	Comments
Reduces total traffic.	3	Reduces automobile travel.
Reduces peak period traffic.	3	
Shifts peak to off-peak periods.	0	
Shifts automobile travel to alternative modes.	3	
Improves access, reduces the need for travel.	2	Allows higher-density development.
Increased ridesharing.	3	
Increased public transit.	3	
Increased cycling.	3	
Increased walking.	3	
Increased Telework.	3	
Reduced freight traffic.	2	

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Benefits And Costs

Charging motorists directly for parking can significantly reduce total vehicle travel, reducing traffic congestion, roadway costs, crashes and environmental impacts. It also reduces parking demand, providing parking facility cost savings, and reducing the amount of land that must be paved for parking facilities.

The Evaluation of Parking Pricing depends on what is assumed to be the Base Case (see Evaluating [illegible]). For example, if parking were not priced, would the same amount of parking be supplied for free, or would there be less parking available? If motorists do not pay for parking directly, would they pay indirectly through higher taxes, higher costs for retail products, or a reduction in other employee compensation? Parking fees are economic transfers. They are a cost to motorists who pay, and a benefit to the organizations or people who receive the revenue. Only when these issues are considered can the full costs and benefits of Parking Pricing be determined.

Costs include the transaction costs to motorists and parking facility managers associated with collecting fees and enforcing charges, possible spillover effects when parking charges encourage motorists to park elsewhere, and potential impacts on particular businesses if parking is priced in one area but not others. The Parking Policy Evaluation chapter has more information on benefits and costs of Parking Pricing.

Table 6 **Benefit Summary**

Objective	Rating	Comments
Congestion Reduction	2	Reduces vehicle travel.
Road & Parking Savings	3	Reduces vehicle travel and parking requirements.
Consumer Savings	-1	Increases direct costs, but reduces indirect costs. Overall impacts depend on how revenues are used.
Transport Choice	0	Mixed. Reduces driving affordability, encourages alternative modes.
Road Safety	2	Reduces vehicle travel.
Environmental Protection	2	Reduces vehicle travel.
Efficient Land Use	2	Reduces vehicle travel.
Community Livability	2	Reduces vehicle travel and can reduce the amount of land

		devoted to parking facilities.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Equity Impacts

Parking Pricing has mixed equity impacts. It is sometimes applied selectively, imposing costs on lower-status employees working in commercial centers, but not on higher-status employees or those at suburban worksites.

Charging motorists directly for the parking they use is fairer (greater horizontal equity) than indirect payment that overcharges people who own fewer cars and drive less, while undercharging those who impose higher than average parking costs. Parking charges are regressive (they represent a greater share of income for less-wealthy motorists), but not necessarily more regressive than alternative sources of paying for parking facilities, such as general taxes. Using parking revenue to reduce general taxes or improve travel alternatives can benefit lower-income people overall. Unbundling parking from housing can increase housing affordability by allowing lower-income households that own zero or one vehicle to rent or purchase housing without paying for parking facilities they do not need (SPUR, 1998; Litman, 1998). As mentioned earlier, the equity implications of Parking Pricing depend on what is assumed to be the Base Case.

Parking Pricing encourages the use of alternative modes and can crate more accessible and pedestrian-friendly land use, which increases transportation choices. It can also improve basic access by guaranteeing that more parking spaces are available for high-value trips, when users are willing to pay.

Table 7 Equity Summary

Criteria	Rating	Comments
Treats everybody equally.	-2	Parking Pricing is often applied selectively.
Individuals bear the costs they impose.	3	Reduces subsidies to driving.
Progressive with respect to income.	-1	Charges are regressive, but not necessarily more regressive than other funding sources.
Benefits transportation disadvantaged.	3	Reduces parking costs borne by non-drivers. Encourages development of alternative modes and more efficient land use.
Improves basic mobility.	2	Makes parking spaces available for higher-value trips.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Applications

Parking Pricing is most common in major commercial and recreational centers, and large cities. It is particularly appropriate where:

- Land values and parking facility costs are high.
- Parking supply is insufficient to meet demand.
- Traffic congestion or vehicle pollution are significant problems.
- Excessive pavement is undesirable.
- Administrative and enforcement resources exist.

Table 8 Application Summary

Geographic	Rating	Organization	Rating
Large urban region.	2	Federal government.	1
High-density, urban.	3	State/provincial government.	2
Medium-density, urban/suburban.	2	Regional government.	3
Town.	2	Municipal/local government.	3
Low-density, rural.	1	Business Associations/TMA.	3

Commercial center.	3	Individual business.	3
Residential neighborhood.	2	Developer.	3
Resort/recreation area.	3	Neighborhood association.	2
		Campus.	3

Ratings range from 0 (not appropriate) to 3 (very appropriate).

Relationships With Other TDM Strategies

Paid parking supports and is supported by most other TDM strategies. It is one of many Parking [illegible]. It is an important component of Commute Trip Reduction and Campus Trip Reduction programs, Smart Growth and New Urbanism. It is more feasible with Parking Management, and when travelers have good travel choices (Nonmotorized Transport, Ridesharing and Transit), and so can reduce their parking requirements. It is an important component of Location Efficient Development. Parking prices cause the greatest reduction in automobile travel if there are good travel alternatives and other TDM incentives.

Stakeholders

Parking Pricing is usually implemented by local governments or developers and businesses that own and manage parking facilities. Implementation may require support and coordination of local governments, business associations, individual businesses, neighborhood associations and individual residents. Local police may be involved in parking enforcement. Private companies often supply parking management equipment and services.

Barriers To Implementation

Major barriers include resistance by transportation professionals, motorists and businesses accustomed to subsidized parking; labor organizations that value free parking as a worker benefit; and nearby residents concerned with spillover impacts. Zoning laws, development practices and tax policies that favor abundant, free parking discourage Parking Pricing.

Best Practices

KT Analytics (1995), Shaw (1997), (Pratt, 1999) and Litman (1999) provide suggestions for Parking Pricing. Also see Parking Policy Evaluation. These recommendations include:

- Parking prices should be well publicized and predicable.
- Payment systems should be convenient. They should accept coins, bills and credit cards, and allow motorists to pay for just the amount of parking they will use (rather than requiring prepayment based on expected parking duration).
- Parking fees should be applied throughout a district or region, rather than just in a few areas, such as a central business district, although the magnitude of parking fees may vary.
- Management programs should anticipate potential spillover problems, and respond with appropriate regulations and enforcement.
- Enforcement should be adequate to maintain a high level of compliance. Since motorists are accustomed to abundant, free parking there may be considerable resistance to parking regulations fees.
- Parking violation enforcement should be predicable and courteous.
- Rates should be higher during peak periods and lower during offpeak periods. Parking should be rented by the hour or day, with no or minimal discounts for longterm leases.

Examples and Case Studies

Comsis (1993), ICF (1997), and K.T. Analytics (1995) describe various Parking Pricing programs implemented as part of TDM programs.

Dutch National Car Park Policy

The Dutch Coordinated National Car Parking Policy (C.R.O.W. 11 1994) has been successful in reducing automobile parking subsidies by encouraging more accessible development and reducing the tendency of businesses and local governments to provide free parking.

Examples Cited by K.T. Analytics (1995)

- CH2M Hill began charging employees who drive alone $49 per month to park, while carpoolers parked for free and each employee received a $40 monthly travel allowance. Solo driving declined from 89% to 64%.
- Pacific Northwest Bell charged employees who drive alone $60 per month to park, while offering discounts for carpools. This resulted in only 25% of employees driving alone to work, compared with 80% for other employers in the area.
- The City of Madison imposed a surcharge of $1 per day at four parking facilities combined with new shuttle services. Five to eight percent of commuters switched to transit as a result.
- The City of Chicago raised fees at municipal lots 30120%, bringing them to levels at nearby commercial lots. The number of cars parked declined 35%, with no significant increase in parking at nearby lots.
- The City of Eugene approximately doubled monthly rates at municipal parking lots from a minimum of $6 to $16 for surface lots and from $16 to $30 for garages. Parking demand declined 35%, about half changing parking locations and the other half switching to public transit or other alternative modes.

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Guaranteed Ride Home

TDM Encyclopedia
Victoria Transport Policy Institute

About This Encyclopedia

Category

Improved Transport Choice

Description

Commuters are often discouraged from using alternative modes (such as ridesharing, transit and cycling) because they want to be able to make occasional unscheduled trips, such as an emergency errand or an unexpected need to working late. Guaranteed Ride Home (GRH) programs give commuters who use alternative modes a few subsidized rides each year to accommodate such situations. It may use:

- Taxi rides reimbursed by employers.
- Company vehicles.
- Car rentals contracted by employers.
- Transit passes.

GRH may be free or it may require a modest co-payment (such as $1 per trip). The cost of offering this service tends to be low because it is seldom actually used. GRH programs are a common component of Commute Trip Reduction programs. Although it is sometimes called "Emergency Ride Home," it is most effective if requirements are not restricted to "emergency" trips. For example, a commuter may need a ride to participate in an unplanned social event that is not an emergency, but can still affect their decision whether or not to drive.

How It Is Implemented

Guaranteed Ride Home is typically a Commute Trip Reduction (CTR) service managed by a CTR administrator or Transportation Management Association (TMAs). A GRH policy should specify the following:

- Who is eligible. The program could cover all employees, or only those who use alternative modes for a specified portion of commuting.
- What trips are eligible. The program could cover any trip, or it could be limited to unexpected business appointments, employee or family member sickness.
- Maximum number of uses allowed during a certain period, maximum miles within a period, or maximum cost per trip.
- Which staff or department is responsible for implementation.
- Procedures for using the GRH service.
- Appropriate forms (e.g. registration and reimbursement vouchers).

Travel Impacts

GRH programs can significantly increase use of alternative commute modes. One study found that the existence of a GRH program is among the most important factors determining the effectiveness of a

Commute Trip Reduction program (Comsis, 1994). One survey of commuters found that 59% of rideshare and transit patrons consider GRH important in their decision to use alternative modes (K.T. Analytics, 1992). Another survey found that the availability of GRH has a value roughly equivalent to subsidized transit fares at a fraction of the cost (Hunt and McMillan, 1998).

Table 1 **Travel Impact Summary**

Travel Impact	Rating	Comments
Reduces total traffic.	3	Supports Commute Trip Reduction programs.
Reduces peak period traffic.	3	
Shifts peak to off-peak periods.	0	
Shifts automobile travel to alternative modes.	3	
Improves access, reduces the need for travel.	0	
Increased ridesharing.	3	
Increased public transit.	3	
Increased cycling.	2	
Increased walking.	2	
Increased Telework.	0	
Reduced freight traffic.	0	

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Benefits And Costs

Benefits include increased commuters security, flexibility (employees who use alternative modes can stay late when they are needed at work, which addresses a common employer concern), and participation in Commute Trip Reduction programs. By supporting use of alternative modes, GRH helps achieve all TDM objectives.

Costs include program administration and the costs of subsidizing trips. Comsis (1993) estimates that Guaranteed Ride Home programs typically cost $30 per trip for a taxi or rental car, and less than 10% of eligible employees take advantage of the service in any one year, so costs typically average less than $5 per employee year (1993 U.S. dollars). Other reports find even lower costs per employee. The Warner Center TMA in Los Angeles found about 1% of the 6,000 eligible rideshare patrons used the service (Park, 1991). A survey of eleven GRH programs nationwide found average use is about 13 rides per 100 eligible employees per year. However, higher usage rates are found among programs serving commuters working late or overtime versus programs offering emergency service only during the workday (K.T. Analytics, 1992).

Commuter Transportation Services in Los Angeles suggests for planning purposes one should estimate between 0.5 and 20 percent of current rideshare patrons will use the service. The high end of the range applies to companies allowing rides for overtime, errands or business trips, while the low end applies to companies allowing emergency use only. Given average suburban distance taxi rates, this indicates typical costs of $2-3 annually per rideshare patron.

Table 2 **Benefit Summary**

Objective	Rating	Comments
Congestion Reduction	2	Helps reduce automobile commuting.
Road & Parking Savings	2	Helps reduce automobile travel and trips.
Consumer Savings	3	Provides savings to users.
Transport Choice	3	Increases travel choice.

Road Safety	2	Helps reduce automobile travel.
Environmental Protection	2	Helps reduce automobile travel.
Efficient Land Use	2	Helps reduce automobile travel.
Community Livability	2	Helps reduce automobile travel.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Equity Impacts

Guaranteed Ride Home programs require subsidies, although these are usually small overall, far smaller than typical parking subsidies. It tends to increase equity by making alternative modes more feasible, by providing benefits to non-drivers, and by accommodating high-value trips, such as domestic emergencies. Lower-income employees are likely to place a high value on this benefit, because it helps them save money and avoid unexpected expenses.

Table 3 Equity Summary

Criteria	Rating	Comments
Treats everybody equally.	2	Generally, all employees at a worksite who use alternative modes are offered this benefit.
Individuals bear the costs they impose.	0	Involves subsidies, although these are usually small.
Progressive with respect to income.	3	Benefits lower-income commuters.
Benefits transportation disadvantaged.	3	Benefits non-drivers.
Improves basic mobility.	3	Supports access to employment.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Applications

GRH is an appropriate as part of a Commute Trip Reduction program in virtually any geographic condition. It is implemented by individual employees, often as part of a TDM Program sponsored by local or regional transportation agencies.

Table 4 Application Summary

Geographic	Rating	Organization	Rating
Large urban region.	3	Federal government.	1
High-density, urban.	3	State/provincial government.	1
Medium-density, urban/suburban.	3	Regional government.	2
Town.	3	Municipal/local government.	2
Low-density, rural.	3	Business Associations/TMA.	3
Commercial center.	3	Individual business.	3
Residential neighborhood.	3	Developer.	0
Resort/recreation area.	3	Neighborhood association.	1
		Campus.	3

Ratings range from 0 (not appropriate) to 3 (very appropriate).

Relationships With Other TDM Strategies

GRH is an important component of Commute Trip Reduction programs. It supports most other TDM strategies.

Stakeholders

Employers, TMAs or transit agencies must develop and administrate GRH programs. Employees should be involved in planning the program. Taxi companies or Carshare organizations may be contracted to provide the service.

Barriers To Implementation

The main barrier is simply establishing an appropriate Commute Trip Reduction program that can provide services such as GRH. Some employers may hesitate to provide GRH due to the possibility of high costs or liability exposure, but experience indicates that costs are usually low, and that GRH programs are a very cost effective way to encourage reductions in automobile commuting.

Best Practices

- A written policy should identify GRH eligibility and procedures.
- Maximum number of trips, mileage and costs should be specified.
- Requirements should not be overly restrictive (non-emergency trips should qualify).
- Users should be involved in planning the program.

Case Studies and Examples

Ride-On TMA Offers Guaranteed Ride Home (http://www.rideshare.org/)

Ride-On, the Transportation Management Association for San Luis Obispo County in Central California, offers door-to-door Guaranteed Ride Home service anywhere in the area on weekdays between 8 am and 7 pm. Employers can set up a GRH program to fit their needs. In the event of an emergency, authorized staff call Ride-On to request a Guaranteed Ride Home. The TMA will send a vehicle within 15 minutes. This program is insurance against ever being at work without a car, to help increase rideshare commuting. The cost of the rides home range from $5 to $20 depending on the distance traveled. Some businesses pay the fare for the actual ride or let the employee pay the fare. The GRH Program has proven to be a significant benefit for employees.

City of Albuquerque GRH Program (http://www.cabq.gov/transit/ridegu.html)

The Guaranteed Ride Home (GRH) Program is the Transit Department's insurance offering for those in the Bernalillo County area that regularly use alternate modes of transportation. If you are using any form of alternate transportation at least three times a week, you are eligible for this service. The registration is free and easy, but you must be registered to use this service. Starting in February 2000, when you buy a monthly bus pass, you will automatically be registered for GRH. If you use a different form of alternate transportation, you can register at the Sun Tran Customer Service office or on-line at http://www.cabq.gov/transit/grhfrm.html. This service can be used up to five times a year for true emergencies such as personal illness, family illness, unscheduled overtime or any other emergency that requires you to leave work or school. Once you have registered, you will receive a packet in the mail outlining proper usage of the GRH program. For more information regarding the GRH program, call 243-RIDE (V/TTY).

The Pennsylvania State University TDM Program (www.psu.edu/ufs/feb1agn.html)

All participants in the Pennsylvania State University Rideshare Program are automatically enrolled in the Guaranteed Ride Home (GRH) Program. In case of an emergency (medical, disaster, or work related emergencies) for a rider or driver, GRH provides free transportation home via a rental car or taxi.

TDM Status Report (www.fta.dot.gov/library/planning/tdmstatus/FTAGUAR2.HTM)

A 1992 study identified the following GRH programs:

- Hughes Aircraft Back-Up Vanpool Program, Tucson, Arizona: provides an emergency van only for vanpoolers during the day and after work. For after work service, employees must call the Hughes rideshare office before 4 p.m.
- Golden Gate Bridge District Flex-Pool Program, San Francisco, California: provides vanpool services for all commuters using District transit, vanpools, carpools or club buses in downtown San Francisco. Vans are owned by the District and driven by volunteer commuters in exchange for unlimited use of the van. Reservations must be made by 3:30 p.m.
- Montgomery County Government Subsidized Taxi Program, Montgomery County, Maryland: provides

county employees who use transit and carpool with reimbursement for taxi or transit use in emergencies.

- Denver Regional Council of Governments, Denver, Colorado: 16,500 registered car-poolers who rideshare at least twice per week are eligible for two free taxi rides for emergencies over a 6-month test period.
- Xerox Company Fleet Car Program, Palo Alto, California: rideshare patrons may use company cars in emergencies. Use is limited to two hours, though cars can be brought home and returned the next day.
- City of Bellevue Subsidized Taxi Service, Bellevue, Washington: carpool, vanpool and transit patrons are eligible for the program. Applicants are given taxi vouchers good for limited mileage for one year. Users must pay for the cab themselves, then send in the voucher to the regional transit agency (Metro) and request reimbursement. Metro refunds the taxi fare less a $1.00 co-payment.

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This Encyclopedia is produced by the Victoria Transport Policy Institute to help improve understanding of Transportation Demand Management. It is an ongoing project. Please send us your comments and suggestions for improvement.

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#18

Ridesharing

Car and Van Pooling

TDM Encyclopedia
Victoria Transport Policy Institute

About This Encyclopedia

Category

Improved Transport Choice

Description

Ridesharing refers to carpooling and vanpooling (the term is sometimes also applied to public transit, particularly commuter express bus). *Carpooling* use participants' own automobile. *Vanpooling* uses a van that is usually owned by an organization (such as a business, non-profit, or government agency) and made available specifically for commuting.

Ridesharing is one of the most common alternative modes, particularly in areas that are not well served by public transit. Ridematching is a common component of Commute Trip Reduction programs intended to reduce urban traffic problems. Ridesharing is also an important mobility option for non-drivers, particularly in small towns and rural areas, where notices are often posted on bulletin boards and travel needs are shared through informal networks. Some Community Transportation organizations provide some form of ridematching.

Carpooling tends to be most appropriate for short and medium distance commutes, while vanpooling is most suitable for longer commutes (10 miles or more each way). Many commuters rideshare part-time, for example, certain days of each week. In a few situations, "casual" carpooling has developed, in which motorists pick up riders at established stops in order to take advantage of HOV lanes (Beroldo, 1990). "Dynamic ridesharing" means that an independent organization matches passengers with drivers for individual trips (as opposed to regularly scheduled trips), using telephone and computer technologies (Behnke, 1996; SST, 1997).

Rideshare programs typically provide carpool matching, vanpool sponsorship, marketing programs, and incentives to reduce driving. Rideshare incentives may include HOV Priority (e.g., HOV highway lanes), preferential parking spaces, and awards. Some employers offer Commute Financial Incentives such as a cash payment to employees who carpool, or a voucher that covers vanpool fees, provided as an alternative to a free parking space. Because they have significant economies of scale (the more people who register, the more effective they are at successfully matching riders), it is helpful if one well-publicized ridematching program serves an entire geographic region.

Some vanpools are operated by employers, others by transit or TDM organizations, and others by participants themselves. Most vanpools are self-supporting; operating costs are divided among members, except van driver who are often allowed to commute for free. Some vanpool programs allow the driver to use the vehicle for personal use. Sometimes, employers or transportation agencies will provide an "empty seat subsidy," during periods when the van has less than its full potential paid passengers.

How It Is Implemented

Rideshare programs can be implemented by an individual employer as part of a Commute Trip Reduction program, by a Transportation Management Association or a Campus Trip Management program, a transit agency, or by a regional transportation agency. Marketing can inform potential ridesharers about the service. Vanpooling requires more organizational structure to address vehicle ownership, expense recovery and liability issues.

Commuter programs are used to match potential rideshare partners by larger ridematching programs. These can take into account each commuters' origin, destination, schedule, and special needs. Smaller programs use simpler techniques, such as maps.

Travel Impacts

If Rideshare programs include incentives such as HOV Priority and Parking Cash Out often reduce commute trips by 10-30% (Winters and Rudge, 1995). If implemented without such incentives travel impacts are often smaller. Similarly, Ewing (1993) concludes that ridesharing programs can reduce daily vehicle commute trips to specific worksites by 5-15%, and up to 20% or more if implemented with substantial parking charges. Pratt (1999) describes several worksites where 5-20% of employees commute by vanpool. The most effective programs tend to have paid parking, subsidies for alternative modes, and other incentives to encourage reduced automobile commuting.

Because rideshare passengers tend to have relatively long commutes, mileage reductions can be relatively large. For example, if ridesharing reduces 5% of commute trips it may reduce 7% of vehicle miles because the trips that are reduced are longer than average commutes. Rideshare programs can typically reduce up to 8.3% of commute VMT, up to 3.6% of total regional VMT, and up to 1.8% of regional vehicle trips (Apogee, 1994; TDM Resource Center, 1996). See Trip Reduction Tables for more technical information on the travel reductions that are predicted to occur from financial incentives for ridesharing under various circumstances.

Table 1 **Travel Impact Summary**

Travel Impact	Rating	Comments
Reduces total traffic.	2	Reduces vehicle travel.
Reduces peak period traffic.	3	Effective at reducing commute auto trips.
Shifts peak to off-peak periods.	0	
Shifts automobile travel to alternative modes.	3	
Improves access, reduces the need for travel.	-1	May encourage sprawl.
Increased ridesharing.	3	
Increased public transit.	0	
Increased cycling.	0	
Increased walking.	0	
Increased Telework.	0	
Reduced freight traffic.	0	

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Benefits And Costs

Ridesharing can reduce peak-period vehicle trips and increase commuters travel choices. It reduces congestion, road and parking facility costs, crash risk and pollution emissions. Ridesharing, particularly vanpools, tend to have the lowest cost per passenger-mile of any motorized mode of transportation. Ridesharing provides consumer financial savings (as estimated in the table below), and time savings if there are HOV Priority facilities. Crash risk declines due to fewer vehicles on the road, although this is

partly offset by the larger number of passengers who may be injured when a crash does occur. Rideshare programs are particularly helpful to commuters who cannot drive or lack a reliable automobile.

Table 2 **Estimated Monthly Commuting Costs**

Round Trip Miles	Drive Alone	3-Rider Car Pool	10-Rider Van Pool
30	$193	$64	$31
40	$257	$86	$37
50	$321	$107	$43
60	$386	$129	$50
70	$450	$150	$56
80	$514	$171	$63

Costs include programs administration expenses. One ridematch system pilot project was estimated to incur $150,000 in setup and marketing expenses, and an average about $3 per user (i.e., per phone call received) in operating costs (Guiliano, Hall and Golob, 1995, U.S. dollars). Costs to participants may include additional travel and time needed to meet rideshare partners, schedule constraints needed to match commuting times, loss of privacy, and restrictions on stops for errands.

Ridesharing may encourage urban sprawl by making longer-distance commutes more affordable. Transit agencies sometimes consider rideshare as competition that reduces transit ridership. For this reason it is important to track the travel alternative that rideshare passengers would otherwise use.

Table 3 **Benefit Summary**

Objective	Rating	Comments
Congestion Reduction	3	Reduces peak-period automobile travel.
Road & Parking Savings	3	Reduces peak-period automobile travel.
Consumer Savings	3	Provides consumer savings.
Transport Choice	3	Increases travel choice.
Road Safety	2	Reduces vehicle mileage, but increases vehicle occupancy, so crashes that do occur may have more casualties.
Environmental Protection	2	Reduces automobile travel.
Efficient Land Use	-1	May encourage longer-distance commutes and urban sprawl.
Community Livability	2	Reduces automobile trips.

Rating from 3 (very beneficial) to–3 (very harmful). A 0 indicates no impact or mixed impacts.

Equity Impacts

Rideshare matching services are usually open to anyone in a particular geographic area. Most ridesharing services are self-supporting. Most rideshare matching services are subsidized but the costs are usually modest, much smaller than the social cost of accommodating automobile travel. For example, if a ridematching service is effective at reducing just a few percent of automobile trips, its expenses can be paid through reduced road and parking facility costs. Rideshare programs generally increase vertical equity by improving travel options for non-drivers and making commuting more affordable.

Table 4 **Equity Summary**

Criteria	Rating	Comments
Treats everybody equally.	3	Rideshare services are generally available to anybody.
Individuals bear the costs they impose.	2	Most rideshare travel is self-supporting. Although ridematching services require subsides, these are usually less than the social costs of automobile travel.
Progressive with respect to income.	3	Improves travel options for lower-income people.
Benefits transportation disadvantaged.	3	Improves travel options for non-drivers.

Improves basic mobility.	2	Improves access to education and employment.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Applications

Rideshare programs can be appropriate in most geographic areas. They can be implemented by businesses, Transportation Management Associations and other business organizations, local and regional governments. In lower-density areas, ridematching services can provide efficient mobility for non-drivers. Regional programs are best, because they create a larger pool of potential users than ridematching at a local or worksite level.

Table 5 **Application Summary**

Geographic	Rating	Organization	Rating
Large urban region.	3	Federal government.	1
High-density, urban.	3	State/provincial government.	2
Medium-density, urban/suburban.	3	Regional government.	3
Town.	3	Municipal/local government.	3
Low-density, rural.	3	Business Associations/TMA.	3
Commercial center.	3	Individual business.	2
Residential neighborhood.	2	Developer.	1
Resort/recreation area.	3	Neighborhood association.	1
		Campus.	3

Ratings range from 0 (not appropriate) to 3 (very appropriate).

Relationships With Other TDM Strategies

Ridesharing supports and is supported by many other TDM programs, including HOV Priority, Commute Trip Reduction, Parking Management, Commute Financial Incentives, Flextime (which makes it easier for employees to match schedules), Guaranteed Ride Home services, and Pedestrian Improvements at worksites. In some cases ridesharing competes with transit or non-motorized commute modes.

Stakeholders

Rideshare programs require support by transportation and sometimes transit agencies, by Transportation Management Associations, or by individual employers. It may involve adoptions of special policies by employees and labor organizations to accommodate and support ridesharing and flextime.

Barriers To Implementation

Rideshare programs require sufficient funding to provide efficient matching services. Effectiveness depends on appropriate incentives: HOV facilities, financial subsidies, parking management, and marketing. Marketing efforts may be needed to inform potential ridesharers about this option.

Best Practices

Organizations such as the Association for Commuter Transportation and Commuter Connections can provide advice and resources for developing an effective ridesharing program. York and Fabricatore (1999) identify several ways of improving and increasing vanpooling in the Puget Sound region, which already has some of the most successful programs in North America. Some best practices include:

- Ridesharing should be implemented as part of a comprehensive TDM Program
- Ridesharing programs should include ridematching services, HOV priority, and other Commute Trip

Reduction strategies, such as Commute Financial Incentives.

- Ridematching services should cover a large geographic area (such as an entire region) in order to create the largest possible pool of users.
- Transportation agencies, businesses and employees should all be involved in planning Rideshare Programs.
- Provide incentives to attract and retain rideshare users, such as mileage-points and Vehicle Insurance Discounts.

Case Studies and Examples

Commute Trip Reduction Rideshare Programs

Comsis (1993) and Pratt (1999) describe several successful rideshare programs, including the Commuter Transportation Services, which provides ridematching services in Southern California, an employment center ridematching service supported by businesses, a residential ridematching service provided to residents of a suburban community funded by a developer, and various vanpool programs.

Dynamic Ridesharing in Seattle (http://sst.its.washington.edu/sst)

Seattle Smart Traveler (SST) was an experimental dynamic ridematching program that operated 1995 through 1997. Using an Internet website it allowed University of Washington students and staff to quickly and easily learn of others who shared their transportation needs for any specific trip or set of trips that they wished to make. In addition, it allowed users to send an email message to any or all of these individuals directly from the SST application. (D. J. Dailey, et al., 1997).

Metro Vanpooling Program (http://transit.metrokc.gov/)

Seattle's Metro transportation agency provides ridematching services throughout the region and operates dozens of self-financing vanpools. It is one of the most successful programs in North America, serving 2% of commute trips and 7% of 20-mile-plus commute trips in the region (York and Fabricatore, 1999).Below are their instructions for organizing one:

- You need four other people, in addition to yourself --or as many as 14 --to organize a vanpool. The more people, the lower your fare.
- Once your pool is together, you need to decide on a route, pickup points and schedule.
- Choose a primary driver and at least one back-up.
- Primary drivers, who meet Metro requirements, ride free and may receive 40 free personal miles each month. Additional miles are available to drivers for a low mileage fee.

Redmond Ride Sharing (http://www.ridequest.com/)

The Ridequest program in Redmond, Washington is a computerized system for registering for ridesharing supported by the Greater Redmond Transportation Management Association and the City of Redmond. The program also has various promotional campaigns to encourage alternative transportation.

Los Angles SmartTraveler (www.path.berkeley.edu/~leap/TTM/Ride_Matching)

This test was a public/private partnership between the California Department of Transportation, the Los Angeles County Metropolitan Transportation Authority, the State of California Health and Welfare Data Center, Commuter Transportation Services, Inc., Pacific Bell and Pacific Bell Information Services, IBM Corporation, and North Communications.

The ridesharing service allows users to obtain lists of potential ride matches, via touchtone telephone. Users must pre-register, which entails giving some personal information, including their usual commute times and preferred pick-up and drop-off locations. Upon request, the system can call the people in the list and deliver a userecorded message. The ridesharing materials were distributed to 68,000 people.

Users of the Los Angeles SmartTraveler ridesharing service tended to have longer trips to work than the average Los Angeles County commuter, and were less likely to drive alone. Of all users, 18% used alternative modes to

get to work about once or twice a week. Users stated that circumstances for which their regular commuting mode was not available are rare, suggesting that demand for occasional carpooling is likely to be low. Other factors that may lower the demand for carpooling are that half of those surveyed said they sometimes work a schedule different from their regular one, and that sometimes their work takes them to places other than their office. About half of all users felt they have access to good transit service. Most felt they needed transit and carpool information, yet at the same time most refused to ride with strangers.

Minerva Dynamic Ridesharing Service (Behnke, 1996)

The Minerva System uses cellular phones, palmtop computers, and wireless data communications to provide low cost, door-to-door transportation in low-density areas and low travel corridors. The service can be integrated with conventional transit, paratransit and ridesharing services, plus consumer services such as home shopping, telebanking and e-mail, to help reduce the need for some trips altogether. The Oregon State legislature has committed $1.5 million to this project, with additional commitments of $3 million in matching funds from local pilot sites, and $1 million in in-kind support from private management consulting outfits.

Fred Meyer Vanpools: One-Stop Commuting

When the I-5 bridge over the Columbia River closed for repair in 1997, the Fred Meyers corporation established a vanpool program to help their employees get to work in Portland. The company leases 15-person vans, and pays all expenses (fuel, parking, etc.). Employees organize their own routes, schedules and drivers. There are currently 11 vanpools with 10 riders. The vans pick up riders at a central meeting spot, usually a Park & Ride. Drivers may use the vans for personal errands after work, and vans are available during working hours for business meetings. The program coordinator reports "Vanpoolers have told me they love the program! It relieves their stress. They learn more about the company by riding with people in their departments. They relax before they get home." It reduced their [vehicle] insurance rates and cut their commute time in half.

San Francisco, CA

Approximately 8,000 to 10,000 people, or nine percent of total carpoolers, participate in casual carpooling in the San Francisco area. During the morning commute periods, pickup points are in Oakland near Bay Area Rapid Transit (BART) stations and in Alameda-Contra County near Costa Transit bus stops. These sites serve as loading zones, provide users with a back-up choice if a ride is unavailable, and guarantee users a ride home in the evening. Drop-off points usually are near the Transbay bus terminal in downtown San Francisco, although other destinations are also common. These sites are centrally located and provide passengers with other means to continue their trip if needed. Carpoolers gain the benefit of a 10 to 20 minute timesavings while avoiding a $1.00 toll by using the HOV toll bypass lane; passengers save money. Until recently, there was no market for evening casual carpooling since there were no HOV lanes heading out of San Francisco. In 1999, a 20-mile HOV lane was constructed and, with support from Environmental Defense organizing and securing destination signs in downtown San Francisco, limited evening casual carpooling has begun.

Washington, DC

Casual carpooling in the Washington, DC area is well organized with approximately 3000 people, or 11% of carpoolers, doing it. Northern Virginia commuters, who want a ride to the Pentagon or Washington DC, stand at specific suburban locations, usually near parking lots or bus stops. Drivers wanting to legally use the HOV lane system pick them up. Destinations are usually announced, except in certain places where drivers stand in queues according to which bridge they want to cross. A similar arrangement is used for the return trip from DC, but rides are harder to find causing some passengers to take transit home in the evenings. Drivers save up to an hour or more on their commute time and commute times may be more reliable; passengers find that casual carpooling is normally faster and more flexible than bus or subway service because of the ease and speed in which a ride is obtained and cheaper because they are not paying fares.

Carpoolworld.com (http://www.carpoolworld.com/)

Carpoolworld.com is a free, world-wide, self-service commuter carpooling system that uses latitude and longitude coordinates for precise automatic carpool matching. Their automated, online trip matcher calculates and ranks proximities to a precision of inches
for maximum ride sharing efficiency and ultimate convenience.

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Richard H. Pratt, *Traveler Response to Transportation System Changes, Interim Handbook*, TCRP Web Document 12 (www4.nationalacademies.org/trb/crp.nsf/all+projects/tcrp+bl2), DOT-FH-11-9579, 1999.

The *Rideshare Company* (www.rideshare.com) is a full-service, non-profit, comprehensive rideshare brokerage serving Eastern Connecticut. Its Easy Street® Vanpool Service sponsors more than 200 vanpools.

Ride Together, Toronto Environmental Alliance, (http://www.torontoenvironment.org/). Works with major employers to encourage carpooling.

Sacramento Council of Governments (www.sacog.org/sacogweb/ride/costcalc.htm) provides information on ridesharing in the Sacramento area, and a cost calculator.

SST (Seattle Smart Traveler; www.its.washington.edu/sst) was an dynamic ridematching test program that operated in Seattle, Washington, from 1995 through 1997. Although no longer functioning, the website describes the program.

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This Encyclopedia is produced by the Victoria Transport Policy Institute to help improve understanding of Transportation Demand Management. It is an ongoing project. Please send us your comments and suggestions for improvement.

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#34

Shuttle Services

Shuttle Buses, Jitneys and Free Transit Zones

TDM Encyclopedia
Victoria Transport Policy Institute

About This Encyclopedia

Category

Improved Transport Choice

Description

Shuttles include a variety of transportation services that use small buses or vans to provide public mobility:

- Circulating Shuttles carry passengers for short trips along busy corridors, including business districts, employment and education campuses, and parks or recreation areas. They may connect major activity centers, such as a transit station and a commercial center. Shuttle Services may be provided during periods of unusually high demand, such as fairs and sporting evens. Some Shuttles are free while others require a fare.
- Demand-response paratransit includes various types of flexible route transit service using small buses, vans or shared taxis. These are more appropriate than fixed transit service for some applications, such as off-peak service, or service in lower-density areas.
- *Jitney* services use vans or small buses to provide self-financing, privately operated transit service. Jitneys ply busier corridors. Riders are charged a modest fare. In developing countries these are often a primary type of public transit. In North America they often augment conventional public transit.
- *Mobility-to-Work* programs often involving special reverse-commute Shuttle Services between low-income neighborhoods and suburban employment centers. These services may be operated by transit agencies, social service agencies, or private contractors funded through government grants.
- Some major commercial centers have a zone where transit service is free in order to maintain convenient mobility. This helps reduce car trips in the area.
- Some colleges offer special late night Shuttle Services after regular transit service ends.
- Businesses, such as hotels, offer Shuttle Services for customers who arrive without a car.

How it is Implemented

Shuttle Services are usually implemented by a transit agency, downtown business association, developer, campus administration, or businesses. There are many possible funding sources, including transit budgets, local improvement districts, grants and revenues. Regulatory Reforms may be needed to eliminate restrictions private jitney service and other types of innovative Shuttle Services that could be provided by private companies.

Travel Impacts

Travel impacts vary depending on circumstances. Shuttles can substitute for part or all of a vehicle trip, and can support many other TDM strategies. For example, circulation Shuttles in commercial centers or resort areas may allow more people to use alternative transportation rather than a car or taxi. Shuttle

buses often increase use of public transit, ridesharing and non-motorized transport.

Table 1 **Travel Impact Summary**

Travel Impact	Rating	Comments
Reduces total traffic.	2	Helps reduce automobile travel.
Reduces peak period traffic.	2	
Shifts peak to off-peak periods.	0	
Shifts automobile travel to alternative modes.	3	
Improves access, reduces the need for travel.	0	
Increased ridesharing.	2	Includes some types of vanpooling.
Increased public transit.	3	Is a form of public transit.
Increased cycling.	0	
Increased walking.	1	Support pedestrian-oriented land use.
Increased Telework.	0	
Reduced freight traffic.	0	

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Benefits And Costs

Shuttle service benefits depend on circumstances (see Social Benefits of Public Transit). Shuttle Services can provide mobility for non-drivers and people who use alternative modes, substitute for automobile trips, support other TDM strategies, and allow the use of off-site parking spaces. Since Shuttles are most often provided at times and in places where demand is high, they can provide significant congestion reduction benefits. They can reduce parking demand when they substitute for entire car trips, or they can shift parking to less expensive locations. They usually provide consumer savings and increase transport choice. They provide safety and environmental benefits to the degree that they reduce total motor vehicle travel. Some Shuttles, such as paratransit service for people with disabilities, cause little or no reduction in automobile travel, their benefits consist primarily of improved mobility for people who are transportation disadvantaged.

Costs are primarily the expenses of operating the Shuttle Services. Since Shuttle vehicles themselves impose externalities (roadway costs, accident risk, pollution, etc.) they may provide little benefit if they fail to attract riders and do not reduce overall motor vehicle use.

Table 2 **Benefit Summary**

Objective	Rating	Comments
Congestion Reduction	3	Reduces car travel and supports other TDM.
Road & Parking Savings	2	Reduces car travel and supports other TDM.
Consumer Savings	2	Reduces users' car and parking expenses.
Transport Choice	3	Increases transport choice.
Road Safety	2	Reduces car travel and supports other TDM.
Environmental Protection	2	Reduces car travel and supports other TDM.
Efficient Land Use	2	Reduces car travel and supports other TDM.
Community Livability	3	Reduces car traffic and supports other TDM.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Equity Impacts

Equity impacts vary depending on the type of service. Most Shuttles serve the general public (i.e., anybody can use them), although they usually benefit some groups more than others. Shuttle Services often require subsidies, although some are self-financing. Some Shuttles provide affordable mobility to

lower-income and transportation disadvantaged people. Many improve basic mobility by providing transport to education, employment and medical services.

Table 3 **Equity Summary**

Criteria	Rating	Comments
Treats everybody equally.	1	Usually benefits most groups.
Individuals bear the costs they impose.	-1	Often requires subsidies.
Progressive with respect to income.	3	Increase mobility options for lower income people.
Benefits transportation disadvantaged.	3	Increase mobility options for nondrivers.
Improves basic mobility.	3	Increases basic mobility options.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Applications

Circulation Shuttles are most appropriate in activity centers during periods of heavy demand, particularly if there are significant traffic or parking problems, including large commercial and employment centers, college campuses, and resort communities. Paratransit services are appropriate in almost any community.

Table 4 **Application Summary**

Geographic	Rating	Organization	Rating
Large urban region.	2	Federal government.	2
High-density, urban.	3	State/provincial government.	2
Medium-density, urban/suburban.	3	Regional government.	3
Town.	2	Municipal/local government.	3
Low-density, rural.	2	Business Associations/TMA.	3
Commercial center.	3	Individual business.	1
Residential neighborhood.	2	Developer.	1
Resort/recreation area.	3	Neighborhood association.	1
		School/college/university.	3

Ratings range from 0 (not appropriate) to 3 (very appropriate).

Relationships With Other TDM Strategies

Shuttle Services can be an important part of Transportation Demand Management program, and Parking Management efforts. They can support various other TDM strategies, including Commute Trip Reduction, Campus Trip Management, Transit Service Improvements, HOV Priority, and Special Event Transportation Management. Regulatory Reforms may be needed for some Shuttle Services.

Stakeholders

Shuttle Services require support of a lead organization, such as a transit agency or downtown association, and a funding source. Merchant groups, employers, and user groups may be involved in planning and supporting the service.

Barriers To Implementation

Shuttle Services require support and funding. There is sometimes opposition from transit drivers' organizations who oppose the use of lower-wage drivers. Motor carrier regulations limit development of Shuttle Services in many jurisdictions.

Best Practices

- Shuttles should be implemented as part of an overall TDM programs that may include pedestrian and transit service improvements, marketing, parking management and pricing, and other appropriate strategies.
- Shuttle Services should be considered when planning events or centers that will generate heavy traffic, and as a way to deal with transportation problems during special times or events.
- Motor Vehicle Carrier regulations should be reformed to allow private companies to provide jitney service, particularly where such service does not complete directly for curbspace with existing scheduled transit services.

Examples and Case Studies

Urban Jitney Services

Private companies provide "jitney" Shuttle van services in several major U.S. cities, including New York, Miami and Pittsburgh (Poole and Griffin, 1994; Klein, Moore, Reja, 1996). Some jitney services are approved by regulators, others are technically illegal but ignored by local officials because they provide useful services.

Mobility to Work Shuttle Services (http://www.ctaa.org/)

Several federal and state programs provide special Shuttle Services between lower-income neighborhoods and employment centers. The U.S. federal government offers grants to help establish and support such services.

Shuttles to Suburban Centers

Comsis (1993) describes examples of successful Shuttle Service provided by suburban developers between Metrorail stations and nearby suburban retail/office/residential centers (Tyson's II and Fair Lakes). Twenty-five passenger buses carry residents to the station, and employees from the station to the malls. One system charged a 50¢ per trip fare that covered about 40% of total operating costs. Another Shuttle Service is free.

Hop and Skip Shuttles (http://go.boulder.co.us/pubs/hopskip_menu.html)

Shuttle bus service is provided in Boulder, Colorado to facilitate downtown shopping and non-automobile commuting. The "Hop" bus is a circulator Shuttle that makes a loop through central Boulder. The "Skip" bus makes regular runs on a major north/south arterial.

Atlantic City Jitney

The 190 members of the Atlantic City Jitney Association (ACJA) each owns and operates a 13-seat van that provides public transit service for $1.50 per trip along a 3-1/2 mile route through Atlantic City, New Jersey. Buying into the ACJA costs $180,000, which includes the price of a bus and a share of the franchise. The ACJA jitneys provide 8.5 million trips per year. The ACJA is the last continuously-operating jitney service in the U.S., out of 435 that existed in the 1920s.

Shared Taxi Services

Trudel (1999) describes how shared and subsidized taxi services provide affordable mobility in rural areas. Freund (2000) describes a demand-response service that provides mobility for elderly residents.

Pedestrian-Extending Transit (PEX)

Pedestrian-Extending Transit is a Shuttle bus service designed to extend "pedestrian access distance - the distance a pedestrian is able and willing to move in a downtown commercial setting." A PEX system called SMRTram 7, designed by Village Technology, supports five "convenience characteristics" essential for high ridership: Short, consistent headways (period between trams) similar to elevators; sidewalk orientation immediately adjacent to and level with the sidewalk; quick and easy boarding, just as in an elevator; standing-passenger design (because of relatively short trips; and easy-to-visualize route. PEX systems are explained at www.villagetechnology.com.

Peripheral Parking With Shuttles (K.T. Analytics, 1995)

Hospitals in San Francisco, Portland, Syracuse and San Jose provide Shuttle buses to remote parking areas. The

University of Maryland has operated 25 Shuttle buses serving parking areas, residential areas, campus and regional public transit stations. Hartford, CT has a policy allowing parking requirements for new development to be reduced up to 30% if Shuttle Service is provided from off-site parking. City planners had hoped developers would provide peripheral parking and Shuttles, but instead several developers lease nearby surface parking where available and provide it to tenants. In Orlando, FL developers can reduce parking requirements up to 20% in exchange for contributing toward a transportation management fund. The city has constructed 8,000 spaces at the periphery of downtown.

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This Encyclopedia is produced by the Victoria Transport Policy Institute to help improve understanding of Transportation Demand Management. It is an ongoing project. Please send us your comments and suggestions for improvement.

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"Efficiency - Equity - Clarity"

#39

Public Transit Improvements

TDM Encyclopedia
Victoria Transport Policy Institute

About This Encyclopedia

Category

Improved Transport Choice

Description

Public Transit includes various types of services and vehicles that provide mobility to the public. These include:

- Conventional, full-size, fixed route transit bus.
- Express commuter bus.
- Mini bus.
- Paratransit and Shuttle Service.
- Light rail (relatively small, lower-speed trams, in urban areas, with frequent stops).
- Heavy rail (relatively large, higher-speed trains, in suburban areas, with infrequent stops).
- Personal rapid transit (small, automated vehicles).
- Shared taxi.

There are many ways to improve and promote public transit. These include:

- Additional routes, expanded coverage, increased service frequency and hours of operation.
- Reduced and more convenient fares (such as discounts for frequent users).
- HOV Priority (bus or HOV lanes, queue-jumper lanes, bus-priority traffic signals, and other measures that reduce delay to transit vehicles).
- Comfort improvements, including bus shelters and better seats.
- Improved Security for transit users and pedestrians.
- Improved rider information and marketing programs.
- Services targeting particular travel needs, such as express commuter buses, special event service, and paratransit for people with disabilities.
- Various types of Shuttle Service.
- Park-and-Ride facilities.

Transit Oriented Development, Location Efficient Development, Access Management, Pedestrian and Cycling Improvements and Bike and Transit Integration (bike racks on buses, bike routes and bike parking near stations) support transit by improving access to transit, and mobility for transit users at their destinations.

How it is Implemented

Transit service improvements are usually implemented by transit agencies, often with support from other government agencies and businesses. Major transit investments sometimes require voter approval. Some improvements, such as HOV lanes and Park-and-Ride facilities, are provided by roadway agencies. Transit Oriented Development and Pedestrian and Bicycle Improvements to support transit are usually implemented by local governments. Shuttle Services are often managed by local non-profit organizations. Transit benefits are often provided as part of Commute Trip Reduction, Campus Trip

Management and Tourist Transport Management programs. Regulatory Reforms may be needed to allow some types of innovative transit services and encourage competition. Least Cost Planning allows transit to compete for funding with highway investments.

Travel Impacts

The travel impacts of various types of transit improvements are discussed below. See Kittleson & Associates (1999) for additional information on evaluating transit service quality. See Transportation Elasticities for information on how prices and other factors can affect transit use.

Service Improvements

Pratt (1999) concludes that the elasticity of transit use with respect to transit service frequency averages 0.5, meaning that each 1% increase in service (measured by transit vehicle mileage or operating hours) increases average ridership by 0.5%. There is a wide variation in this factor, depending on the type of service, demographic and geographic factors. Service elasticities of 1.0 have occurred where transit service has been carefully expanded into suitable areas.

Pratt also finds that the elasticity of transit use to service expansion (e.g. routes into new parts of a community already served by transit) is typically in the range of 0.6 to 1.0, meaning that each 1% of additional service increases ridership by 0.6-1.0%. New bus service in a community typically achieves 3 to 5 annual rides per capita, with 0.8 to 1.2 passengers per bus-mile. Higher first-year ridership may occur in some circumstances, such as university towns or suburbs with rail transit stations to feed.

Improved schedule information, easy-to-remember departure times (for example, every hour or half-hour), and more convenient transfers appear to increase transit use, particularly in areas where service is less frequent.

Fare Changes

The overall average price elasticity of bus ridership is -0.4 (Pham and Linsalata, 1991; Pratt, 1999). Large cities (more than 1 million population) tend to have a lower elasticity (-0.36) than small cities (-0.43), and peak hour travel is less elastic (-0.23) than off-peak (-0.42). Discounted senior citizen fares tend to have an elasticity of –0.21. Rapid transit fare elasticities tend to be significantly lower, typically in the –0.17 to –0.18 range, probably because rail passengers tend to be higher-income commuters and so are less price sensitive than bus passengers (Pratt, 1999). Somewhat higher elasticities are found in European countries (Nijkamp and Pepping, 1998). The table below summarizes transit elasticity estimates.

Table 1 **Factors Affecting Transit Ridership** (Kain and Liu, 1999)

Factor	Elasticity
Regional employment	0.25
Central city population	0.61
Service (transit vehicle mileage)	0.71
Fare price	-0.32

This table shows the elasticity of transit use with respect to various factors. For example, a 1% increase in regional employment is likely to increase transit ridership by 0.25%, while a 1% increase in fare prices will reduce ridership by 0.32%, all else being equal.

Commuter Financial Incentives, in which employers subsidize transit passes, can be effective at increasing ridership (*Commuter Check*, http://www.commutercheck.com/). Deep Discount transit passes can encourage occasional riders to use transit more frequently (Oram and Stark, 1996), and if implemented when fares are increasing, can avoid ridership losses.

Hensher and King calculate elasticities and cross-elasticities for various forms of transit fares and automobile travel (Hensher and King, 1998). Clements (1997) finds that the demand curve for transit has a "kink," since riders who are transit dependent have a lower elasticity than discretionary riders (those who have the option of driving). The table below summarizes various transit elasticity values estimated in one model.

Table 2 **Factors Affecting Transit** (JHK, 1995)

Factor	Elasticity
With respect to wait time.	-0.30
With respect to travel time.	-0.60
With respect to service.	0.68
With respect to headway.	-0.20
With respect to cost, non-commuters.	-0.51
With respect to cost, commuters.	-0.20

There is debate among planners as to what transit improvements are most cost effective at reducing automobile travel and achieving TDM objectives such as congestion and air pollution reductions. Rail transit tends to attract more discretionary riders (travelers who would otherwise drive) than buses because rail vehicles are usually more comfortable and faster, since they operate on separated right-of-way. However, some planners argue that buses designed with comparable comfort features (e.g., padded seats and generous legroom) and HOV Priority features to reduce congestion delays, could also attract discretionary riders at less cost, particularly because buses can provide more comprehensive coverage through a region (i.e., bus routes can reach more destinations). For a given level of funding, buses may provide more TDM benefits. (However, middle-class voters seem more willing to support special bonds for rail transit improvements than for bus service improvements, so rail projects may be a more politically feasible option for improving transit service.)

Some planners argue that rail transit has greater impacts on land use (rail stations provide a catalyst for higher-density, mixed use development, but bus transit does not seem to have the same effect) that can cause a greater overall reduction in automobile travel over the long run (see Land Use Impacts and Transit Oriented Development chapters for more discussion).

Complementary Strategies

A combination of transit improvements (fare reductions, service improvements, service expansion, marketing), and complementary TDM strategies can be particularly effective at increasing transit ridership. Commute Trip Reduction programs, Parking Pricing and Commuter Financial Incentives encourage transit commuting (Peng, Dueker, and Strathman, 1996). Campus Transport Management that includes improved transit service and discounted passes have tripled transit ridership in some college communities. The Trip Reduction Tables indicate the reduction in commute trips that can be expected from various combinations of financial incentives for transit and ridesharing. The Transport Elasticities chapter provides additional information on the travel impacts of various price changes.

Not all increased transit travel represents a reduction in automobile travel. A portion represents shifts from walking, cycling and ridesharing, or absolute increases in personal travel. On the other hand, some types of transit improvements lead to more accessible land use, which reduces automobile dependency and per capita motor vehicle travel. Newman and Kenworthy (1999, pp. 87) estimate that rail transit "leverage" total automobile travel reductions 4-7 times greater than the direct reductions in vehicle travel, due to land use impacts. As a result, residents of Transit Oriented Development tend to drive about 20% less than they would if they lived in conventional neighborhoods. Of course, many factors influence how much a particular transit project affects land use and travel behavior. The Land Use

Impacts chapter provides additional information on the travel impacts of various land use changes.

Table 3 **Travel Impact Summary**

Travel Impact	Rating	Explanation
Reduces total traffic.	3	Can reduce automobile use.
Reduces peak period traffic.	3	Tends to be attractive for commute trips.
Shifts peak to off-peak periods.	1	Off-peak fare discounts induce some shifts.
Shifts automobile travel to alternative modes.	3	
Improves access, reduces the need for travel.	2	Can encourage higher-density, clustered land use.
Increased ridesharing.	0	
Increased public transit.	3	
Increased cycling.	1	Can support cycling.
Increased walking.	2	Supports pedestrian travel.
Increased Telework.	0	
Reduced freight traffic.	0	

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Benefits And Costs

Transit improvements provide a variety of benefits that fall into two major categories: *mobility benefits* result from increased travel by people who are otherwise transportation disadvantaged, and *efficiency benefits* result when transit substitutes for a less economically efficient travel mode, for example, by reducing traffic congestion and parking costs. The table below summarizes specific benefit categories. For more discussion see Social Benefits of Public Transit chapter.

Table 4 **Transit Benefits Summary** (Litman, 1999)

	Description
Mobility Benefits	*Benefits from travel by transit that would not otherwise occur.*
1. Economic.	Economic benefits of increased productivity and employment.
2. Personal.	Benefits to users from increased employment, education, recreation and social activities.
3. Equity.	Benefits of providing mobility to people who are also economically, socially or physically disadvantaged.
4. Option Value.	Maintaining transportation options in case of changes in individual or social needs.
Efficiency Benefits	*Benefits resulting from reduced motor vehicle traffic.*
5. User Cost Savings.	Users' vehicle and time savings.
6. Economic Development.	Increased regional economic activity due to the larger portion of local inputs in transit expenditures compared with automobile expenditures.
7. Congestion Reduction.	Reduced traffic congestion resulting from reduced vehicle traffic.
8. Parking Cost Savings.	Reduced parking problems and parking facility cost savings from reduced automobile use.
9. Safety Benefits.	Relative safety of bus travel compared with automobile travel.
10. Reduced	

Roadway Facility and Service Costs.	Reduced costs for roadway construction, maintenance, traffic police, and related services.
11. Reduced Roadway Land Requirements.	Reduced need to use land for roads. Increased tax revenue.
12. Land Use Impacts.	Reduced urban sprawl, loss of greenspace and negative aesthetic impacts of roads.
13. Air Pollution Reductions.	Reduced vehicle air pollution.
14. Noise Impacts.	Changes in vehicle noise emissions.
15. Water Pollution.	Reduced vehicle water pollution due to reduced automobile use.
16. Resource Conservation.	Reduced use of energy and other natural resources.
17. Reduced Barrier Effect.	Improved mobility for pedestrians and bicyclists due to reduced vehicle traffic.

This table summarizes the potential benefits of transit use.

Although transit provides a relatively small portion of total travel, it tends to be concentrated in dense urban areas where motor vehicle external costs are high. As a result, it can provide significant benefits from congestion reductions, road and parking facility cost savings, user cost savings, efficient land use, and environmental benefits.

Transit service costs include financial subsidies, land used for special transit facilities (such as rail transit right-of-way), and any external impacts of transit vehicles (pollution, noise, accidents, etc.).

Table 5 **1996 Public Transit Costs** (FTA, *National Transit Database*; APTA)

	Bus	Trolley Bus	Light Rail	Heavy Rail	Commuter Rail
Operating Expenses (m)	$8,995	$135	$440	$3,402	$2,294
Capital Funding (m)	$1,920	$19.1	$847	$2,228	$1,690
Total Expenses (m)	*$10,915*	*$154*	*$1,287*	*$5,630*	*$3,984*
Passenger Fare Revenue (m)	$3,446	$55	$144	$2,322	$1,145
Subsidy (m)	$7,469	$99	$1,143	$3,308	$2,839
Vehicle Revenue Miles (m)	1,577	13.1	36.7	527	221
Total Expenses Per Revenue Mile	$6.92	$11.75	$34.78	$10.68	$18.03
Annual Passenger Miles (m)	16,802	184	955	11,530	8,350
Average Vehicle Occupancy	10.7	14.0	26.0	21.9	37.7
Total Expenses Per Passenger Mile	$0.65	$0.84	$1.35	$0.49	$0.48
Revenue Per Passenger Mile	$0.21	$0.30	$0.15	$0.20	$0.14
Subsidy Per Passenger Mile	$0.44	$0.54	$1.20	$0.29	$0.34

m=million

Table 5 summarizes public transit expenses. Of course, there are large variations within each category, depending on the route, conditions and perspective. For example, some new rail transit systems have extremely high costs per trip, because they require major new investments in rails and vehicles, and ridership tends to be low during the first few years of operation. Subsidies for a new urban rail transit system can exceed $20 per trip, a relatively large subsidy, although comparable in road and parking facility costs to accommodating an additional peak-period automobile trip in dense urban areas. On the other hand, the marginal (incremental) cost of an additional transit trip that uses an otherwise empty transit seat is extremely small (a slight increase in vehicle operating costs and boarding times), so TDM

strategies that make use of existing transit capacity, and transit improvements that increase average load factors, can be very cost effective.

Table 6 **Benefit Summary**

Objective	Rating	Comments
Congestion Reduction	3	Reduces automobile use on congested corridors.
Road & Parking Savings	2	Reduces road space and parking requirements. Buses may increase road wear costs.
Consumer Savings	3	Provides affordable mobility.
Transport Choice	3	Increases transport choice for non-drivers.
Road Safety	2	Tends to be safer than driving overall.
Environmental Protection	2	Tends to reduce air pollution.
Efficient Land Use	3	Tends to discourage sprawl.
Community Livability	3	Contributes to neighborhood livability.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Equity Impacts

Transit service is an important strategy for improving mobility choices (see Evaluation Transportation ...). Public transit can be used by anyone who pays the fare, although any particular transit service benefits some people more than others. For example, commuter rail improvements tend to benefit suburban residents, local bus service improvements tend to benefit urban residents, and special mobility services tend to benefit people with special transportation needs.

Transit improvements (especially local bus service) tend to provide affordable mobility to low-income and transportation disadvantaged populations. Transit services in smaller communities and during off-peak periods are justified primarily to achieve these objectives.

Transit improvements may require public subsidies, but these are often comparable or smaller than subsidies for an automobile trip when all costs are considered (including roadway and parking facility costs, and uncompensated crash and environmental costs). Transit subsidies tend to be relatively high per passenger-mile, but relatively low per passenger-year, because transit users tend to travel fewer miles per year than car drivers. As a result, on a per capita basis transit dependent people tend to receive less public subsidy than motorists.

Table 7 **Equity Summary**

Criteria	Rating	Comments
Treats everybody equally.	1	Provides benefits that are valued by most groups.
Individuals bear the costs they impose.	0	Requires subsidies, but often less than for driving.
Progressive with respect to income.	3	Provides affordable mobility for lower-income people.
Benefits transportation disadvantaged.	3	Provides mobility for non-drivers.
Improves basic mobility.	3	Provides basic mobility.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Applications

Transit service improvements may be appropriate in a wide range of situations, although the type of service can vary depending on conditions. For example, rural areas may rely on subsidized taxi and demand-response transit, while urban areas will rely more on fixed route bus and rail. Transit improvements are usually planned by regional and local government agencies, often with federal and state/provincial support. State/provincial governments can implement Regulatory Reforms that encourage innovative transit services. Businesses can provide various incentives for transit use through Commute Trip Reduction programs, and developers can implement Transit Oriented Development.

Private companies provide some transit services, such as jitney and some express commuter service.

Table 8 **Application Summary**

Geographic	Rating	Organization	Rating
Large urban region.	3	Federal government.	3
High-density, urban.	3	State/provincial government.	3
Medium-density, urban/suburban.	2	Regional government.	3
Town.	2	Municipal/local government.	3
Low-density, rural.	2	Business Associations/TMA.	1
Commercial center.	3	Individual business.	1
Residential neighborhood.	1	Developer.	1
Resort/recreation area.	3	Neighborhood association.	1
		Campus	3

Ratings range from 0 (not appropriate) to 3 (very appropriate).

Relationships With Other TDM Strategies

Transit service improvements support and are supported by most other TDM strategies, particularly [illegible] programs, Transit Oriented Development, Smart Growth, Nonmotorized [illegible], and New Urbanism. Shuttle Services are a category of public transit. Transit service improvements are usually more cost effective when matched with incentives for motorists to reduce their driving, such as Commute Financial Incentives, Distance-Based Fees, Parking Pricing and [illegible]. Transit sometimes competes with other alternative modes, particularly Ridesharing.

Stakeholders

Transit improvements depend on the support various government agencies. They sometimes require public support for additional funding. Some types of transit improvements require the support of businesses or local residents. Patrons and labor organizations are also affected by transit decisions.

Barriers To Implementation

Major barriers to improved public transit service include limited funds, automobile oriented land use, policies that underprice automobile travel (which makes transit relatively less competitive), and stigma that is sometimes associated with transit use.

Best Practices

Government agencies (such as the Federal Transit Administration) and professional organizations (such as the American Transit Association) provide a variety of resources concerning best practices in transit planning and operations. These include:

- Transit planning should be integrated with land use planning, pedestrian and cycling improvements (for access to transit stops) and TDM programs that provide incentives to use public transit.
- Transit agencies should consider themselves "mobility service providers", not just bus operators. They should search for innovative ways to improve mobility and access, such as rideshare matching, Transit Oriented Development and vanpools.
- Transport planning should reflect the multiple objectives that can be addressed by public transit, including mobility (improved travel choices for transportation disadvantaged people) and efficiency (reduced traffic congestion, road and parking facility cost savings, consumer savings, crash reductions, environmental protection and more efficient land use).
- Motor carrier regulations should be changed to encourage competition and innovation in transit services.

- Transit agencies should consider alternative services, such as paratransit and subsidized taxies, to provide mobility services in lower-density areas and during off-peak times.

Case Studies and Examples

Comsis (1993) and Pratt (1999) provide dozens of examples of successful transit improvements implemented and their effects on travel behavior. These examples include:

- Fare reductions.
- New fare options, particularly discounted tickets and passes.
- Free transit areas.
- New and expanded transit systems.
- More convenient routing (e.g., eliminating the need for transfers).
- Shuttle service, distributor routes, feeder routes.
- More frequent service.
- Increased speed and reliability (including HOV facilities).
- Longer service hours.
- Regularized schedules (such as having a bus every hour and half-hour).
- Special route to serve particular travel requirements, such as access to employment centers.

Internet Journey Planner (www.gmpte.gov.uk/travelin/bannerfr.htm)

The Greater Manchester Journey Planner is an automated website that provides comprehensive regional transport information. Users input their origin, destination, travel time and preferred mode, and immediately receive a recommended itinerary, complete with transit schedule.

"Rolling on: System Lets Traffic Lights Wave Buses Through"

(The New York Times, September 14, 2000, By Eric Taub)
Thanks to new technology plus common sense, 70,000 commuters a day can now often outpace the drivers on nearby clogged freeways by traveling on two routes served by red Metro Rapid buses, powered by natural gas. Los Angeles County transportation officials have managed to shave as much as 25 percent off the travel time of a local bus trip by adopting technology that, among things, can keep green lights on just a little longer as the bus approaches – as long as doing that does not cause another set of traffic problems.

The regional authority decided to take action because a survey showed that speed was the biggest complaint of bus passengers. In just a few years, average bus speeds had declined 17 percent, to just 10 miles per hour from a torrid 12. The Metropolitan Transportation Authority learned through its surveys that buses spent half their time standing still, either at red lights or at bus stops, waiting for passengers to get on and off. Officials had tried to speed things up a decade earlier by equipping buses with special transmitters that would hold traffic lights on green until buses passed through. But that just backed up the traffic on cross-streets, so the initiative was abandoned.

In 1997, traffic officials heard about a similar effort in Curitaba, Brazil, that was successful because the system was smarter in several ways. For one thing, it held the lights for buses only when that did not cause other traffic snarls. Still, there was no guarantee that the system would work in Los Angeles. Curitaba was built to handle public transportation, while public transit in Los Angeles often appears to be an afterthought. Even though one million people ride buses each day in the county, the bus is the transportation mode of last resort for most Angelinos.

On June 24, the transit authority began a system that gives express special buses priority at traffic signals. It first had to embed 210 antenna loops in the pavement at various spots along the route. As a bus passes over one of the loops, a $75 transmitter mounted on its front sends an identifying signal to an equipment box that controls the traffic light at the next intersection. The signal is also sent to a central control center downtown, so the bus can be tracked in the computer system.

But the $10 million project needed to find a way to ease the way for buses to clear intersections without tying up traffic on cross-streets. So the Los Angeles Department of Transportation wrote software that lets a green light be extended – held on green longer or switched to green earlier– for no more than 10 seconds. If several buses approach an intersection as the light is about the change, they can still get only 10 more seconds of green. Buses arriving later than that have to wait. And at important intersections, the green light can be extended in only every other cycle.

To prevent bus drivers from speeding up to make the system extend green lights, there are no visual indicators in the buses to tell drivers when some extra speed would accomplish that. The movement of each express bus is tracked in the authority's bus control center downtown, both on a computer screen (using the transmitter signals) and through information from video cameras placed at strategic intersections throughout the region.

As a bus passes over a pair of electronic loops embedded in the street, its speed is calculated. Then its arrival time is transmitted via a cell phone link to an electronic display at the next bus stop. Buses are dispatched every 3 to 10 minutes. And if a Metro Rapid bus finishes its route quicker than scheduled, that's fine. That just makes for a more contented rider. To prevent Metro Rapid buses from bunching up into packs, the central dispatcher radios the driver to slow down or speed up (without breaking the speed limit) to keep from getting too close to another bus.

The project has been successful so far. On the 16-mile Ventura Boulevard route, from Warner Center to Universal City, the average travel time has decreased by 25 percent, to 45 minutes from 1 hour. On the 26-mile route from Santa Monica through Beverly Hills to Montebello on the east side of the city, travel times have also dropped by 25 percent, to 1 1/2 hours from 2 hours. Arrival times for Metro Rapid buses are coordinated with the area's new Red Line subway extension so that even during rush hour, Mr. Gephart said, a trip across the San Fernando Valley into Union Station can now be done in about one hour, often faster than a car journey.

Will the improvements brought about by this new technology be enough to persuade the middle classes, and not just people without cars, to use public transportation? "That's what we're hoping for," Mr. Gephart said. The authority hopes to add 15 to 20 new express lines, he said, and transit systems around the country are calling him to find out how they can adapt the Los Angeles system to speed up their bus services.

Boulder Vote Would Connect Transit Passes To Property Taxes
(http://www.denverpost.com/news/election/pol0815.htm)

Residents in eight Boulder neighborhoods could be the first in the nation to tax themselves to get a seat on every commuter bus and train in a metro area. About 3,500 households may vote this fall on a proposal to pay more in property taxes in exchange for EcoPasses that would allow free rides on Regional Transportation District buses and light-rail lines in Denver and Boulder. The idea is to make mass transit as much of a neighborhood fixture as a school or sewer system, say EcoPass backers.

Denver's New Light Rail Succeeds at Attracting Riders

About 32 percent more riders are boarding Denver, Colorado's new southwest light-rail line than the transit agency projected would use the new line during its first year. "The trains are so packed by the time they reach the northern stations you have to wait 20 minutes or more to catch the next train," says one rider. Light rail's popularity since the line opened July 14, 2000 has forced into service every car the transit agency has, including the four cars reserved for emergencies, maintenance rotations, and breakdowns. "They're standing on top of each other," says a 35-year-old rider. "They're standing in the doorways. They'll do anything to squeeze onto the train."

Light Rail Land Use Benefits (http://wwwistp.murdoch.edu.au/lightrail/istp.htm)

The report *Can Rail Pay* describes several case studies in which light rail systems provide significant increases in property values and other positive land use benefits.

Suburban Luxury Bus Express

Cleveland's RTA provides express bus service between downtown and suburban park-and-ride lots. Special buses are used that have upholstered high-back seats that recline, individual reading lights and overhead storage racks

on new city buses. The vehicles mark a considerable change from the plastic vandalism-resistant seats currently on many urban buses. These luxury features cost the agency an extra $100,000 per bus.

Tax Exempt Transit Benefits (http://www.commutercheck.com/)

Commuter Check is a transit fare savings program that operates through employers. Commuter Checks are purchased by employers as either a company-paid benefit or by using pre-tax employee paid contributions. The Bay Area Commuter Check program began in 1991. The program was expanding by approximately 35% a year, and since the pre-tax employee-paid option became available in June 1998, the rate of growth has exceeded 100%. More than 2000 employers had participated by August 1999. In 1999, it is projected that over $15 million in Bay Area Commuter Checks will be sold, with over 35,000 employees now participating. Surveys indicate significant user appreciation of this service, and that it increases transit use.

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#47



Land Use Planning

MS CONSULTANTS, INC.

Transit Oriented Development

Creating Accessible and Multi-Modal Neighborhoods

TDM Encyclopedia
Victoria Transport Policy Institute

About This Encyclopedia

Categories

Land Use Management and *Improved Transport Choice*

Description

Transit Oriented Development (TOD) refers to residential and commercial areas designed to maximize Access by transit and nonmotorized transportation. A TOD neighborhood has a center with a rail or bus station, surrounded by relatively high-density development, with progressively lower-density spreading outwards. For example, the neighborhood center may have a transit stations and a few multi-story commercial and residential buildings, surrounded by several blocks of townhouses and small-lot single-family residential, and larger-lot single-family housing farther away. TOD neighborhoods typically have a diameter of ¼ to ½ mile (stations spaced ½ to 1 mile apart), which represents pedestrian scale distances. It includes these design features (Morris, 1996):

- The neighborhood is designed for Cycling and Walking, with adequate facilities and attractive street conditions.
- Streets have Traffic Calming features to control vehicle traffic speeds.
- Mixed-use development that includes shops, schools and other public services, and a variety of housing types and prices, within each neighborhood.
- Parking Management to reduce the amount of land devoted to parking compared with conventional development, and to take advantage of the parking cost savings associated with reduced automobile use.

Transit Oriented Development is a particular category of Smart Growth, New Urbanism and Location Efficient Development. It is intended to do more than simply shifting some car trips to transit; it is also increases accessibility and travel choice through land use clustering and mix, and nonmotorized transportation improvements. TOD makes it possible to walk and bicycle for errands, reduces the distance required for car trips, and allows some households to reduce their car ownership. This reduces total transportation costs, and helps create a more livable community, in addition to supporting TDM objectives.

High-quality transit supports the development of high-density urban centers, which can provide accessibility and agglomeration benefits (efficiencies that result when many activities are physically close together), while automobile-oriented transportation conflicts with urban density because it is space intensive, requiring large amounts of land for roads and parking facilities (Voith, 1998). Large scale Park & Ride facilities can conflict with Transit Oriented Development. A rail station that is surrounded by large parking lots and arterials with heavy traffic is unlikely to provide the best environment for residential development. It is therefore important that such facilities be properly located, designed and managed to minimize such conflicts.

Transit Oriented Development can often increase property values in an area, (Lewis and Fred Laurence

Williams, 1999; Kockelman, 1997). As a result, such projects can often be funded through "value capture" strategies, in which the costs of improvements are paid through the additional tax revenue or a special Local Improvement District (LID) tax assessment in the affected area.

How It Is Implemented

Transit Oriented Development can consist of new suburban neighborhoods designed around public transit stations, or incremental changes to existing urban neighborhoods that have public transit. Bernick and Cervero (1997) and PBQD (1996) describe Transit Oriented Development planning practices. Morris (1996) describes specific changes to zoning laws and policies to encourage TOD.

Travel Impacts

Successful Transit Oriented Development can significantly reduce per capita motor vehicle travel, as discussed in the chapter on Land Use Impacts. Also see Kittleson & Associates (1999) and Rood (1999) for additional information on transit service quality factors. One major study predicted that Transit Oriented Development would reduce single-occupant vehicle commuting by 22.5%, increase transit and nonmotorized travel by 27%, and reduce congestion 18% compared with increasing highway capacity (1000 Friends, 1997). Another study predicts that TOD reduces automobile travel by 20-25% compared with conventional development (Cambridge Systematics, 1992). The table below indicates how land use design features typically reduce per capita vehicle trips in an area.

Table 1 **Travel Impacts of Land Use Design Features** (Dagang, 1995)

Design Feature	Reduced Vehicle Travel
Residential development around transit centers.	10%
Commercial development around transit centers.	15%
Residential development along transit corridor.	5%
Commercial development along transit corridor.	7%
Residential mixed-use development around transit centers.	15%
Commercial mixed-use development around transit centers.	20%
Residential mixed-use development along transit corridors.	7%
Commercial mixed-use development along transit corridors.	10%
Residential mixed-use development.	5%
Commercial mixed-use development.	7%

Land use patterns at both origins and destinations affect travel behavior. Employees who work in areas with high employment densities, good pedestrian conditions and attractive urban environments with shops and restaurants nearby are more likely to commute by transit and rideshare use (Davidson, 1994; Evaluating Nonmotorized Transport).

Table 2 ***Travel Impact Summary***

Travel Impact	Rating	Comments
Reduces total traffic.	3	Reduces per capita vehicle travel.
Reduces peak period traffic.	2	"
Shifts peak to off-peak periods.	0	
Shifts automobile travel to alternative modes.	3	Encourages transit and nonmotorized travel.
Improves access, reduces the need for travel.	3	Increases density and land use mix.
Increased ridesharing.	0	
Increased public transit.	3	
Increased cycling.	2	
Increased walking.	3	

Increased Telework.	0	
Reduced freight traffic.	0	

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Benefits and Costs

Transit Oriented Development reduces transportation costs and externalities, increased travel choice, and reduced land paved per capita (see Social Benefits of Public Transit). It can help achieve virtually all TDM objectives. TOD can increase transit service the efficiency, resulting in improved performance and cost effectiveness. It can help create more livable communities, meaning that neighborhoods are physically and socially more desirable places to live. These benefits are reflected in higher property values and increased commercial activity in well-designed TODs, which can result in increased tax revenue.

Transit Oriented Development can provide efficiencies of accessibility and agglomeration, which reduces transportation costs and increases productivity (Voith, 1998). McCann (2000) finds that per-household transportation expenditures vary significantly from one metropolitan region to another, due to land use and transportation factors. She found that households in automobile-dependent regions devote more than 20% of household expenditures to surface transportation (more than $8,500 annually), while those in communities with more efficient land use and better transit service spend less than 17% (less than $5,500 annually), representing savings of hundreds of dollars a year. Similar differences are likely to exist between different neighborhoods within a metropolitan region, indicating that a household which chooses a more accessible location can save thousands of dollars annually on transportation costs. McCann also found that consumer expenditures on motor vehicles provide little economic return: a $10,000 spent on motor vehicles provides just $910 in equity, compared with $4,730 for the same investment in housing. This suggests that there are significant potential consumer savings from Transit Oriented Development.

Costs include any incremental transportation expenditures (pedestrian and cycling facility improvements, additional public transit services), and disamenities associated with higher density development, including increased local traffic congestion and noise exposure (as discussed in the Smart Growth chapter, and Litman, 2000).

Table 3 **Benefit Summary**

Objective	Rating	Comments
Congestion Reduction	2	Reduces total automobile trips, although congestion may increase within the TOD due to high densities.
Road & Parking Savings	2	Reduces automobile use.
Consumer Savings	2	Provides affordable mobility.
Transport Choice	3	Increases access and transport choices.
Road Safety	2	Reduces automobile use. Also provides health benefits.
Environmental Protection	2	Reduces automobile use.
Efficient Land Use	3	Reduces automobile use. Encourages higher-density development.
Community Livability	3	Reduces automobile use and increases local access.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Equity Impacts

Transit Oriented Developments can benefit virtually all groups of people, although some may benefit more than others. It may require additional public expenditures for nonmotorized transportation facilities and public transit, but these are often comparable to current public expenditures on automobile (roads, parking, traffic management, etc.). TODs can significantly benefit lower income people and non-drivers by improving travel choices and providing savings, although some TODs are relatively expensive, and

some transit oriented urban renewal projects may displace some low-income residents. By improving travel choice and access it improves basic mobility.

Table 4 **Equity Summary**

Criteria	Rating	Comments
Treats everybody equally.	2	Generally benefits all groups.
Individuals bear the costs they impose.	0	May involve public costs, but these are not necessarily greater than current public costs for automobile travel.
Progressive with respect to income.	3	Increases affordable transportation, provides savings.
Benefits transportation disadvantaged.	3	Increases transport choices for non-drivers.
Improves basic mobility.	3	Increases basic transport choices.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Applications

Transit Oriented Development can be implemented in urban and suburban areas where there is adequate public transit service. It is implemented by regional and local governments in conjunction with private developers and businesses.

Table 5 **Application Summary**

Geographic	Rating	Organization	Rating
Large urban region.	3	Federal government.	1
High-density, urban.	3	State/provincial government.	2
Medium-density, urban/suburban.	3	Regional government.	3
Town.	3	Municipal/local government.	3
Low-density, rural.	1	Business Associations/TMA.	3
Commercial center.	3	Individual business.	3
Residential neighborhood.	3	Developer.	3
Resort/recreation area.	3	Neighborhood association.	3
		Campus.	3

Ratings range from 0 (not appropriate) to 3 (very appropriate).

Relationships With Other TDM Strategies

Transit Oriented Development is a particular category of New Urbanism and Smart Growth, Location Efficient Development and Access Management. TOD supports and is supported by most other TDM strategies, such as Commute Trip Reduction, Public Transit Improvements Nonmotorized Transportation, Location Efficient Development, Parking Management, Parking Solutions, Parking Pricing, Traffic Calming, School Trip Management and Campus Trip Reduction, and Carsharing.

Role Of Stakeholders In Implementing This Strategy

Transit Oriented Development usually requires the coordinated support of local governments, private developers and transit agencies. Some measures, such as increased development density, may be opposed by some residents.

Barriers That Need To Be Overcome For Full Implementation

Transit Oriented Development may require changes in zoning codes and development practices to allow and encourage higher density development and lower parking requirements around transit stations. It may also require additional funding for pedestrian and bicycle facility improvements.

Best Practices

Best practices include:

- Integrate transit and land use planning.
- Provide high quality pedestrian and cycling facilities around transit stations.
- Manage Parking to minimize the amount of land devoted to car parks around stations.
- Encourage Carsharing to reduce the need to own automobiles.
- Create complete communities, with shops, schools and other services within convenient walking distances within the TOD neighborhoods.

Examples and Case Studies

Sunnyside Transit Village

The Sunnyside Village Transit Plaza is a Transit Oriented development located about 10 miles from downtown Portland, built with $2 million in combined federal, state and local funds. Apartments, townhouses, smallot single-family residences, and professional offices surround a core of retail and public services, including a library, community center and daycare, around a transit plaza, all in a dense and walkable setting. The goal is to allow Sunnyside residents to satisfy more of their needs without adding to regional highway traffic congestion.

Philadelphia Region Maps Child Care-Rich Transit Stations

The Delaware Valley Child Care Council and the Southeastern Pennsylvania Transportation Authority (SEPTA) recently developed a map showing where more than 1,600 licensed childcare centers are in relation to bus, train, subway and trolley routes in the Philadelphia metropolitan area.The Kids' Care Connections map, a colorful, two-sided spread, is expected to be particularly useful to parents starting new jobs and to businesses seeking workers in a competitive labor market. The map helps identify where child care services may be inadequate, noting that there are few accredited child care facilities in some of the outer counties despite a high concentration of jobs and children in these areas.

King County TOD Program (http://www.metrokc.gov/kcdot/alts/tod/todindex.htn)

King County, Washington, has been working on busrelated TOD joint-development projects since 1998. King County projects are under way in the cities of Redmond, Renton, Seattle and Shoreline. These projects include transit centers, park-and-ride lots, off-street bus-layover facilities, and residential, institutional, retail, office, hotel and entertainment uses. Project concepts range from 300 apartments above a parkand-ride lot in Redmond (near Microsoft world headquarters) to four skyscrapers above an underground buslayover facility in downtown Seattle near the state Convention &Trade Center.

Vancouver, BC Transit Oriented Development

PBQD (1996) describes how SkyTrain transit stations have been a catalyst for regional town centers in Vancouver, British Columbia. Each center is intended to serve 100,000 to 200,000 people living and working in the area. Development within each center is controlled by local governments. There is a strong emphasis on pedestrian orientation with the centers, resulting in buildings with limited or no setbacks and minimal surface parking. Governments encourage commercial, employment and residential development within the centers by leasing office space, and by addressing developers needs, such as building parks. The result has been hundreds of millions of dollars in development and hundreds of thousands of square feet of new office and residential buildings, high population densities, and high levels of transit use.

"Economy Booms Along Light-rail Path" Home News Tribune, *24 April 2000*

Jersey City– There are no locomotives powering trains on NJ Transit's HudsonBergen light-rail system. There's a different kind of engine at work: an economic one. Development is sprouting alongside the first segment of the Hudson-Bergen light rail, through Jersey City and Bayonne, which opened April 15, 2000. Hundreds of town houses and apartments are being built on Essex Street in Jersey City. Scrapyards and old warehouses are being cleared for office buildings and Jersey City Medical Center's new complex. Union County officials hope economic growth for major cities, such as Plainfield and Elizabeth, will follow the tracks of the county's proposed

light-rail system.

Their line is being developed by the county and Raytheon Infrastructure, which is a partner with NJ Transit in the Hudson-Bergen line. "When the light rail is complete, you'll see Union County totally changed," said Union County Freeholder Lewis Mingo Jr. "It will make our major cities more valuable to the state." More than 50 years ago, light-rail systems were electrically powered trolley cars, which ran on streets and private rights of way. The first 5.8-mile section of Union County's light rail would connect Elizabeth's train station, on the Northeast Corridor line, with stops at Elizabethport, the former Singer plant, a ferry to New York, Jersey Gardens Mall, IKEA and Newark Airport.

"This is a good plan, because if they never built another inch of track, it would be successful, would drive development and have good ridership," said Bill Wright, secretary of the New Jersey Association of Railroad Passengers, about the first phase. A draft environmental impact study of that line has been completed. Two other sections of the proposed light-rail system are still being debated and only exist on paper. One, an 11-mile section could operate on unused Central Railroad of New Jersey tracks from Elizabeth to Cranford. The other, paralleling the Raritan Valley Line to Plainfield, is possible if diesel-powered rail cars are used. Extending the line between Elizabeth and Plainfield could cost an estimated $228 million, according to a Raytheon study. Developers already have invested in light rail by donating land for the first phase of the Union County system, said Jeff Warsh, NJ Transit executive director. "It will save the project enormous amounts of time and money," Warsh said. "Hudson-Bergen was built without a single penny of contribution from businesses and developers along the right of way."

Developers along the Hudson-Bergen system will reap profits from having a rapid transit system. Some land owners along the line report property values already have increased because of light rail, Warsh said. "The landowners are donating land for the right of way because it increases the opportunity for development," said Michael Lapolla, Union County manager. "We view this as an economic development tool," Lapolla said. "For every piece of land, five-six developers are looking to build on it.

We foresee the same kind of development at each stop." About 700,000 square feet of office space is being proposed in Elizabeth, Lapolla said. Developers are considering Elizabethport for hotels and conference centers, he said. Estimated cost of the first segment is $230 million to $250 million, Lapolla said. Newark Airport is the key to immediate success of the first segment. The airport could generate 12,000 light-rail trips per day from airport employees, Warsh said. Now, workers have to park off airport grounds to provide room for passenger parking, which is also in demand.

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Transit Focused Development Website (www.peak.org/~jbs) provides detailed information resources related to Transit-Oriented Development.

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#45

Smart Growth

More Efficient Land Use Management

TDM Encyclopedia
Victoria Transport Policy Institute

About This Encyclopedia

Category

Land Use Management

Description

Smart Growth is a general term for land use practices intended to create more resource efficient and livable communities. These practices help create more accessible land use patterns that reduce the amount of mobility required reach goods and services. Smart Growth is an alternative to conventional "sprawl" development. Major differences between these two land use patterns are compared in Table 1.

Table 1 Comparing Smart Growth and Sprawl

Smart Growth	Sprawl
• Higher-density, cluster development.	• Low-density development.
• Infill (brownfield) development.	• Urban periphery (greenfield) development.
• Mixed land use.	• Large areas of homogeneous land use.
• Multi-modal transportation and land use patterns that support walking, cycling and public transit.	• Automobile-oriented transportation and land use patterns, poorly suited for walking, cycling and transit.
• Streets designed to accommodate a variety of activities. Traffic calming.	• Streets designed to maximize traffic volume and speed.
• Planned and coordinated between jurisdictions and stakeholders.	• Unplanned, with little coordination between stakeholders.

Smart Growth usually reflects regional policies and planning, while New Urbanism, Transit Oriented Development, Location Efficient Development and Access Management reflect similar design principles at the local and site level. Many individual Smart Growth measures are implemented at a local level, but an effective Smart Growth program requires coordination among jurisdictions in a region so that local efforts are complementary.

Smart Growth includes a number of individual policies and practices, such as those listed below. Which are implemented and how they are applied depends on the specific situation. Objectives and strategies tend to differ depending on whether an area is urban, suburban and exurban (JHK Associates, 1995). Smart Growth is a relatively recent concept (although many of its practices are old), and so is developing and evolving as practitioners gain experience.

Smart Growth Practices (Ewing, 1996; Bochner, 2000)

- *Strategic planning.* Establish a comprehensive community "vision" which individual land use and

transportation decisions should support.

- *Create more self-contained communities.* Reduce average trip distances, and encourage walking, cycling and transit travel, by locating a variety of compatible land uses within proximity of each other. For example, develop schools, shops and recreation facilities in or adjacent to residential areas. Mix land uses at the finest grain feasible.
- *Encourage quality, higher density development.* Eliminate unnecessary restrictions on density. Demand high quality designs that addresses problems associated with higher density.
- *Encourage cluster development.* Keep clusters small and well defined, such as "urban villages" with distinct names and characters. Coordinate development to facilitate accessibility. For example, encourage employment centers near commercial centers, so employees can walk to perform errands during their breaks.
- *Encourage infill development.* Reduce average trip distances, and encourage walking, cycling and transit travel, by locating new development in already developed areas, so that activities are close together. Review public costs to insure that public expenditures do not favor new, greenfield development over existing residents or infill development. Use impact fees and utility pricing that reflects the costs of providing public services to different sites. Encourage redevelopment of older facilities and brownfields.
- *Concentrate activities.* Encourage pedestrian and transit travel by creating "nodes" of high-density, mixed development that are linked by convenient transit service. Concentrate commercial activities in these areas. Retain strong downtowns and central business districts. Use access management to discourage arterial strip commercial development.
- *Encourage Transit Oriented Development.* Increase development density within walking distance (0.25 to 0.50 miles) of high capacity transit stations and corridors, and provide high quality pedestrian and cycling facilities in those areas.
- *Manage parking for efficiency.* Encourage shared parking, and other parking management strategies. Reserve the most convenient parking for rideshare vehicles.
- *Avoid overly-restrictive zoning.* Reduce excessive and inflexible parking and road capacity requirements. Limit undesirable impacts (noise, smells and traffic) rather than broad categories of activities. For example, allow shops and services to locate in neighborhoods provided that they are sized and managed to avoid annoying residents.
- *Create a network of interconnected streets.* Keep streets as narrow as possible, particularly in residential areas and commercial centers. Use traffic management and traffic calming to control vehicle impacts rather than dead ends and cul de sacs.
- *Site design and building orientation.* Encourage buildings to be oriented toward city streets, rather than set back behind large parking lots. Avoid large areas of parking or other unattractive land uses in commercial areas.
- *Improve nonmotorized travel conditions.* Encourage walking and cycling by improving sidewalks, paths, crosswalks, protection from fast vehicular traffic, and providing street amenities (trees, awnings, benches, pedestrian-oriented lighting, etc.). Improve connections for nonmotorized travel, such as trails that link dead-end streets.
- *Implement TDM.* Use transportation demand management to reduce total vehicle traffic and encourage the use of efficient modes. This includes parking and road pricing, commute trip reduction programs, policies that favor high-occupancy vehicles, and other strategies.
- *Preserve greenspace.* Preserve open space, particularly areas with high ecological and recreational value. Channel development into areas that are already disturbed.
- *Encourage a mix of housing types and prices.* Develop affordable housing near employment, commercial and transport centers. Develop second suites, apartments over shops, lofts, location-efficient mortgages and other innovations that help create more affordable housing.
- *Utility Management.* Use on-site stormwater drainage systems. Encourage water conservation.

Smart Growth does not eliminate urban expansion or suburban development. Rather, it changes the nature of such development to help achieve resource efficiency and community livability goals. Smart Growth incorporates many efficiency and amenity features private developers apply to "master planned" communities, such as incremental expansion of development to minimize infrastructure costs, and coordination between land uses to maximize access. It allows such features be implemented in existing communities and in new communities with multiple developers.

There is considerable debate concerning the desirability of Smart Growth (Gordon and Richardson, 1997, and counterpoint by Ewing; Burchell, et al., 1998; Moretti, 1999; Mills 1999; Litman, 2001). Critics argue that Smart Growth provides little real benefits, increases congestion, makes residents worse off, and is unpopular with consumers. Proponents counter that the total economic, social and environmental benefits are substantial, and point to the popularity of New Urbanism developments and to surveys indicating that consumers prefer communities with coordinated planning and Smart Growth design features. They argue that critics focus on individual factors without considering the overall effects of a coordinated Smart Growth program. For example, critics often highlight negative impacts associated with density, such as increased congestion, without considering how Smart Growth can offset such problems by improving access and travel choice. Sustainable development principles tend to justify more implementation of Smart Growth (Sustainable Transportation and TDM).

How It Is Implemented

Smart Growth is usually implemented as a set of policies and programs by state/provincial, regional or local governments. To be effective it requires multi-jurisdictional coordination. Some professional and non-profit organizations support Smart Growth (including the American Planning Association, the National Governor's Association, and citizen's groups such as 1000 Friends of Oregon). The Table below indicates the level of government action that can implement specific Smart Growth measures.

Table 2 **Smart Growth Implementation**

Smart Growth Measure	Implementation Mechanism
Increased Density and Infill Development	State growth controls. State development incentives. Local growth controls. Local incentives.
Transit Oriented Development	State development incentives. Local growth controls. Local incentives.
Jobs/Housing Balance	State growth controls. State development incentives. Local growth controls. Local incentives.
Land Use Mixing	Local growth controls. Local design controls. Local incentives.
Neotraditional Design	Local growth controls. Local design controls. Local incentives.
Site Design and Parking Management	Local zoning codes. Local design controls.

Travel Impacts

Smart Growth can significantly reduce per capita automobile travel, as discussed in the chapters on Land Use Impacts and Transportation Price Elasticities. Smart Growth tends to reduce automobile travel

through specific mechanisms described below.

- Clustering of population and employment, which increases access (e.g., proximity to employment, shops and schools), and travel choice (better transit, ridesharing, and better pedestrian facilities).
- Land use mix, such as commercial and public services located within or adjacent to residential areas, which increases access and travel choice.
- Parking Management and Parking Pricing can reduce automobile travel, encourage use of alternative modes, and reduce the amount of land paved for parking facilities, creating accessible and pedestrian-friendly landscape (see Evaluating Nonmotorized Transport).
- Traffic Calming and other measures that reduce automobile traffic speeds, which reduces driving and improves conditions for walking, cycling and transit use.
- A more connected street network improves access.
- More attractive, safer streets, and pedestrian-oriented land use, encourages nonmotorized travel.
- An effective transit system tends to reduce per capita automobile travel, particularly when integrated with supportive land use (high-density development with good pedestrian access within ½-kilometer of transit stations).
- Other TDM strategies can be incorporated into Smart Growth, including Commute Trip Reduction, School and Campus Trip Reduction, Carsharing and Road Pricing, to further reduce per capita vehicle travel.

One study predicts that households make 20-25% fewer automobile trips if located in a higher density, transit-oriented suburb than in a conventional, low density, auto-oriented suburb (Cambridge Systematics, 1992). The table below summarizes the effects that some design features can have on trip generation to a particular site.

Table 3 **Travel Impacts of Land Use Design Features** (Dagang, 1995)

Design Feature	Reduced Vehicle Travel
Residential development around transit centers.	10%
Commercial development around transit centers.	15%
Residential development along transit corridor.	5%
Commercial development along transit corridor.	7%
Residential mixed-use development around transit centers.	15%
Commercial mixed-use development around transit centers.	20%
Residential mixed-use development along transit corridors.	7%
Commercial mixed-use development along transit corridors.	10%
Residential mixed-use development.	5%
Commercial mixed-use development.	7%

Although individual strategies may have modest travel effects, typically reducing total vehicle traffic by just a few percentage points, their impacts are cumulative and synergetic. A comprehensive Smart Growth program using cost-effective strategies (i.e., strategies that are fully justified for their direct economic and consumer benefits) can reduce total per capita automobile travel by 20-40% compared with conventional, automobile-dependent land use patterns and transportation policies.

The table below summarizes estimated travel impacts that can typically be achieved by Smart Growth. Of course, these impacts can vary significantly depending on specific policies, geography, demographics, and time frame.

Table 4 **Travel Impact Summary**

Travel Impact	Rating	Comments
Reduces total traffic.	3	Results in more efficient land use and

		improved travel alternatives.
Reduces peak period traffic.	2	Reduces automobile commuting.
Shifts peak to off-peak periods.	0	
Shifts automobile travel to alternative modes.	3	
Improves access, reduces the need for travel.	3	Results in more efficient land use.
Increased ridesharing.	1	Clustered employment supports ridesharing.
Increased public transit.	3	Supports public transit.
Increased cycling.	3	Supports bicycle transportation.
Increased walking.	3	Supports walking for transportation.
Increased Telework.	0	
Reduced freight traffic.	1	May include some freight management.

Ratings range from 1 (minimal impact) to 3 (significantly contributes to this impact).

Benefits And Costs

Smart Growth can provide a variety of economic, social and environmental benefits, as summarized in Table 5. The actual benefits of a particular Smart Growth program depend on the components of the program and the conditions in which it is implemented.

Table 5 **Potential Smart Growth Benefits** (Burchell, et al, 1998; Litman, 1999)

Economic	Social	Environmental
Reduced development and public service costs. Consumer transportation cost savings. Economies of agglomeration. More efficient transportation.	Improved transportation choice, particularly for nondrivers. Improved housing choices. Community cohesion.	Greenspace and wildlife habitat preservation. Reduced air pollution. Reduce resource consumption. Reduced water pollution. Reduced "heat island" effect.

A number of studies indicate that Smart Growth can reduce costs for public services, such as water and sewage, roads and schools (Burchell, et al, 1998). The table below summarizes public costs for three possible development patterns in Toronto region, showing significant potential savings from the higher density, less automobile oriented options. Other studies show similar potential savings in public costs from more efficient land use.

Table 6 **Estimated 25 Year Public Costs for Three Development Options** (Blais, 1995)

	Spread	Nodal	Central
Residents per Ha	66	98	152
Capital Costs (billion C$ 1995)	54.8	45.1	39.1
O&M Costs (billion C$ 1995)	14.3	11.8	10.1
Total Costs	69.1	56.9	49.2
Percent Savings over "Spread" option	n/a	17%	29%

This table shows substantial public savings for higher density land use patterns associated with Smart Growth development.

Smart Growth can provide substantial consumer savings. McCann (2000) finds that per-household transportation expenditures vary significantly from one metropolitan region to another, due to land use and transportation factors. She found that households in sprawl regions devote more than 20% of household expenditures to surface transportation (more than $8,500 annually), while those in communities with more efficient land use spend less than 17% (less than $5,500 annually), representing

savings of hundreds of dollars a year. Similar differences are likely to exist between different neighborhoods within a metropolitan region, indicating that a household which chooses a more accessible location can save thousands of dollars annually on transportation costs. This suggests that there are significant potential consumer savings from Smart Growth land use practices.

Smart Growth can increase traffic safety, security and health by reducing total per capita vehicle travel, encouraging shifts to safer modes, and reducing traffic speeds (see Safety Impacts of TDM).

Some studies indicate that more pedestrian-oriented communities increase community cohesion, reduce crime and increased employment opportunities for disadvantaged populations. Untermann and Vernez Moudon (1989) studied traffic impacts on neighborhoods and conclude,

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

Smart Growth costs can include additional planning, construction and operating costs needed to develop higher density facilities and increase travel choices. Higher-density, infill development may increase local traffic congestion and exposure to noise and air pollution, although regional traffic and pollution tends to decline if residents drive less, as discussed in the chapter on Land Use Impacts (also see discussion in Litman, 2001). Increased density can reduce the amount of greenspace within an urbanized area, although it can increase total regional greenspace by reducing per capita area of land development. These negative impacts can be reduced with appropriate design features (such as noise insulation and carefully located parks), but these mitigation activities may also involve additional costs.

Many higher-density urban neighborhoods have higher rates of social problems (crime and poverty) than lower-density suburban neighborhoods. Although studies find an association between crowding (density measured in residents per residential room, an indication of poverty) and social problems, there is no such association with density measured in residents per acre (1000 Friends of Oregon, 1999). This suggests that the association between density and social problems reflects the tendency of distressed households to concentrate in higher-density, urban neighborhoods, not that higher-density development to cause social problems. This indicates that increasing middle-class housing density does not increase social problems, and urban infill could reduce such problems as distressed households become less segregated.

Table 7 **Smart Growth Housing Affordability Impacts** (Litman, 2000)

Reduces Housing Affordability	Increases Housing Affordability
• Urban growth boundaries (reduce developable land supply). • Increased building design requirements (curbs, sidewalks, sound barriers, etc.).	• More accessible housing reduces total transportation costs (leaves more money for housing expenses). • Reduced parking and setback requirements (reduces land requirements per housing unit). • Higher density development and (reduces land requirements, increases land supply for housing.) • More diverse, affordable housing options (secondary suites, apartments over shops, loft apartments). • Reduced property taxes and utility fees for clustered and infill housing.

Many Smart Growth can increase housing affordability.

Another objection to some Smart Growth measures, such as urban growth boundaries, is that they increase housing costs by reducing the supply of land available for residential development (see discussion in Litman, 2000). However, other Smart Growth strategies increase housing affordability by allowing more diverse housing types (such as multi-family and secondary suites) and by reducing development costs (Jia and Wachs, 1998; Litman, 1998). Smart Growth can also reduce households' transportation costs, which can offset increased housing costs (see Location-Efficient Mortgages). More Smart Growth reduce rather than increase household costs, as illustrated in Table 7. This suggests that Smart Growth can increase overall housing affordability, or at least cannot be blamed for reduced housing affordability (Nelson, 2000).

Table 8 **Benefit Summary**

Objective	Rating	Comments
Congestion Reduction	2	Higher density may increase local congestion, other Smart Growth features tend to reduce congestion.
Road & Parking Savings	2	Reduces automobile trips and travel, although it may increase some costs (such as more structured parking).
Consumer Savings	2	Reduces household transportation costs, and some infrastructure costs.
Transport Choice	3	Increases alternative travel choices.
Road Safety	2	Reduces automobile traffic speeds and volumes.
Environmental Protection	3	Reduces automobile travel and land devoted to roads and parking.
Efficient Land Use	3	Reduces automobile travel and land devoted to roads and parking.
Community Livability	3	Creates more livable communities.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Equity Impacts

Smart Growth includes many specific components that have various equity impacts. Some impacts may affect certain groups more than others, such as the effects of infill on existing neighborhoods. Smart Growth includes some measures, such as variable development fees that reflect the costs of a particular location, which internalize economic and environmental costs associated with development. This reduces horizontal inequity by reducing cross-subsidies (for example, by reducing subsidies from residents for existing urban housing to residents of new suburban housing to finance the higher public service costs of such development).

Smart Growth increases access and affordable travel choices, which benefits lower income households and non-drivers. Research by McCann (2000) indicates that sprawl increases the minimum transportation costs. In an automobile-dependent community, households have no alternative to owning an automobile. For middle- and upper-class households this is not a major burden, many spend much more than they need for extra automobile comfort and prestige features. But for lower-income families the costs of automobile dependency can be high, reducing consumer choice and household wealth. The increased transportation affordability of Smart Growth can provide significant vertical equity benefits by improving transportation choice and opportunities to save money for lower-income households.

Smart Growth can significantly benefit people who are transportation disadvantaged by improving land use access (proximity between common destinations), travel choice and basic mobility options. Some Smart Growth measures (particularly urban growth boundaries) can increase housing costs, but others increase housing affordability, as discussed above. When transportation and housing costs are considered together, Smart Growth tends to benefit lower-income residents overall (Location-Efficient Mortgages).

Table 9 **Equity Summary**

Criteria	Rating	Comments

Treats everybody equally.	0	Mixed. Uneven distribution of impacts is often a major concern of Smart Growth programs.
Individuals bear the costs they impose.	2	Tends to reduce externalities associated with automobile use and lower density development.
Progressive with respect to income.	2	Increases affordable transport options. Mixed impacts on housing affordability.
Benefits transportation disadvantaged.	3	Increases access and travel choices for non-drivers.
Improves basic mobility.	3	Increases access and travel choices for non-drivers.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Applications

Smart Growth is appropriate in most geographic areas, particularly those that experience strong growth. Smart Growth strategies are primarily implemented by regional and local governments, although some require state/provincial support. Developers can implement some Smart Growth design features.

Table 10 **Application Summary**

Geographic	Rating	Organization	Rating
Large urban region.	3	Federal government.	1
High-density, urban.	3	State/provincial government.	2
Medium-density, urban/suburban.	3	Regional government.	3
Town.	2	Municipal/local government.	3
Low-density, rural.	2	Business Associations/TMA.	2
Commercial center.	3	Individual business.	1
Residential neighborhood.	2	Developer.	2
Resort/recreation area.	3	Neighborhood association.	3
		Campus.	2

Ratings range from 0 (not appropriate) to 3 (very appropriate).

Relationships With Other TDM Strategies

Smart Growth supports and is supported by nearly all other TDM strategies. It includes Pedestrian and Cycling Improvements, Traffic Calming, Public Transit Improvements, and any incentive to reduce automobile use. Smart Growth particularly supports and is supported by Parking Management, Parking Pricing, Commute Trip Reduction, School Trip Management and Campus Trip Reduction, and Carsharing. New Urbanism, Transit Oriented Development and Location Efficient Development are specific components of Smart Growth.

Stakeholders

Smart Growth involves many stakeholders. Most Smart Growth efforts are implemented by regional and local governments, often as result of the community's strategic plan. Neighborhood associations, business associations and developers are also important stakeholders with regard to many specific Smart Growth policies and projects.

Barriers To Implementation

Smart Growth often requires changing land use policies and development practices, including zoning codes, road design standards, and the location of public services (such as schools). Professionals and agencies often resist these new approaches. Transportation funding may favor highway widening over other transportation investments. Residents often oppose infill development and may demand mitigation measures.

Infill development is often discouraged by environmental contamination or the fear of such contamination (called "brownfields"), and by the unique location and shape of such sites. As a result, infill development often requires special government policies to support environmental clean up and encourage development, and special efforts by developers to create profitable projects.

Individual Smart Growth projects are often opposed by residents who dislike higher density, mixed-use development. Much of this opposition reflects residents concerns about increased vehicle traffic and parking problems. If infill development can be implemented with measures that reduce per capita vehicle use, and with amenities that benefit existing residents, such opposition may be reduced.

Best Practices

Ewing (1996), JHK Associates (1995) and (Hirschhorn, 2000) provide the following recommended Smart Growth practices:

- Develop comprehensive strategic community development plans.
- Take advantage of existing community assets.
- Mix land uses.
- Create a range of housing opportunities and choices.
- Foster "walkable" close-knit neighborhoods.
- Promote distinctive, attractive communities with a strong sense of place, including the rehabilitation and use of historic buildings.
- Preserve open space, farmland, natural beauty, and critical environmental areas.
- Strengthen and encourage growth in existing communities.
- Provide a variety of transportation choices.
- Make development decisions predictable, fair and cost effective.
- Encourage citizens and stakeholder participation in development decisions.
- Implement a comprehensive Smart Growth program, rather than just one of two measures.
- Insure that transportation and land use policies are coordinated.
- Coordinate Smart Growth efforts between jurisdictions within a region.
- Encourage cooperation between public and private decision makers to facilitate Smart Growth development.

Examples and Case Studies

Portland Region (http://www.friends.org)/; http://www.trans.ci.portland.or.us/)

The Portland, Oregon region is implementing number of Smart Growth measures, including urban growth boundaries, multi-modal transportation, and incentives for higher-density, infill development. The Region has shifted transportation investment funds away from highway capacity expansion into rail development, with supportive land use policies to create transit-oriented development. It has made a major commitment to improve walking and cycling conditions and to implement TDM measures.

Washington State Growth Management (www.ocd.wa.gov/info/lgd/growth/vision.html)

The Washington State Growth Management Act (GMA), passed in 1990, provides coordination among state and local governments to encourage more resource efficient development. Most communities are using their GMA plans and development regulations to make and stick to decisions about growth and development, while continuing to monitor, update and improve their growth management work. State grant and loan resources are increasingly given to jurisdictions having GMA plans and the projects beimg funded are consistent with those plans.

Maryland Smart Growth (www.op.state.md.us/smartgrowth)

In 1997 the State of Maryland passed "Priority Funding Areas" legislation that limits most State infrastructure funding and economic development, housing and other program monies to Smart Growth Areas which local governments designate for growth. This package is intended to facilitate the reuse of brownfields and provide tax

credits to businesses creating jobs in a Priority Funding Area. A new Live Near Your Work pilot program supports this effort by providing cash contributions to workers buying homes in certain older neighborhoods. And, to spur more preservation of undeveloped land, the new Rural Legacy Program provides financial resources for the protection of farm and forest lands and the conservation of these essential rural resources from development. This package is intended to:

- Save natural resources
- Support existing communities and neighborhoods
- Save state expenses.

Smart Growth Network (www.smartgrowth.org/casestudies/casestudy_index.html)

The Smart Growth Network has information on more than a dozen Smart Growth development projects. Below are examples:

Austin, Texas Smart Growth Matrix (www.ci.austin.tx.us/smartgrowth)

The *Smart Growth Matrix* is a tool to assist the Austin City Council in analyzing development proposals within the Desired Development Zone. It is designed to measure how well a development project meets the City's Smart Growth goals such as: 1) the location of development; 2) proximity to mass transit; 3) urban design characteristics; 4) compliance with nearby neighborhood plans; 5) increases in tax base, and other policy priorities.

If a development project, as measured by the matrix, significantly advances the City's goals, financial incentives may be available to help offset the high cost of developing in urban areas. These incentives may include waiver of development fees and public investment in new or improved infrastructure such as water and sewer lines, streets or streetscape improvements, or similar facilities. These incentives require City Council review and approval.

Maryland Department of Transportation (Halligan, 2000)

In 1997 the state of Maryland established policies to encourage more efficient development practices. As part of this effort, the Maryland Department of Transportation initiated a "smart transportation" program that focuses major capital resources on projects within designated growth areas, encourages the development of more diversified transportation systems, improves planning coordination with local governments, encourages Transit Oriented Development.

Atlantic Steel Development

Jacoby Development is developing a mixed-use (residential, retail, office, and entertainment) transit-oriented development on a 138-acre brownfield site in midtown Atlanta, formerly the home of Atlantic Steel. To provide adequate auto and transit access, the site plan requires construction of a bridge to connect the site to the local fixed rail transit system and highway ramps to improve highway access. Because Atlanta is in a conformity lapse under the Clean Air Act, the bridge and ramps would be prohibited under standard interpretation of EPA regulations.

Applying Decision Support Tools For Eco-Industrial Park Planning

Burlington, Vermont proposed to develop an eco-industrial park (EIP) on a 10 acre site, adjacent to which are already located a wood-burning co-generation power plant, a waste-wood depot, a community garden, and a compost facility. This brochure describes application of a suite of tools (Designing Industrial Ecosystems Tool, Facility Synergy Tool, and Reality Check) in a case study of Burlington. The case study illustrates how the screening models allow stakeholders to explore decisions, issues and tradeoffs in an interactive and flexible analytical framework. In addition to the information the tools provide (i.e., potential linkages, rough estimates of benefits, regulatory constraints), much of their value comes from the collaborative decision-making process they help to facilitate. As part of this incremental and collaborative process, in later stages of EIP planning, more detailed issues lying outside the three screening tools must be addressed, e.g., covenants, working relationships, engineering design specifications.

"Deconstruction - Building Disassembly and Material Salvage: The Riverdale Case Study." Demolition firms,

contractors specializing in building salvage, and private/public property owners each have questions about how and under what conditions building disassembly and salvage can be cost competitive with standard demolition. This paper presents the key results from a case study done on a 2000 square foot, 4 unit, residential building in an urban area in Baltimore County, Maryland. The study addresses some of the issues involved in a comparison between deconstruction and straight demolition and proposes some recommendations for the deconstruction industry.

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Organizations

American Planning Association (Chicago; http://www.planning.org/) has extensive resources for community and transportation planning, including a book ordering service.

Center for Excellence in Sustainable Development (http://www.sustainable.doe.gov/transprt/trintro.htm) information on sustainable community transportation planning.

Center for Livable Communities (http://www.lgc.org/clc/) helps local government and community leaders be proactive in their land use and transportation planning.

Center for Watershed Protection (http://www.cwp.org/) provides analysis and resources for minimizing hydrologic impacts and pollution.

Congress for New Urbanism (http://www.cnu.org/) is a movement centered on intelligent neighborhood planning, and human scale urban communities.

Conservation Law Foundation (http://www.clf.org/) provides environmental protection information.

Ecology Center's Ecosystem Defense Library (http://outerlimits.wildrockies.org/) provides information on the effects of development and road building on wildlife habitat.

The *International Council for Local Environmental Initiatives* (http://www.iclei.org/) is the "international environmental agency for local governments."

International Society for Ecological Economics (http://kabir.umd.edu/ISEE/ISEEhome.html) is a professional organization of people interested in valuing ecological resources.

National Trust for Historic Preservation (http://www.nationaltrust.org/) focuses on preserving downtown areas and historic buildings.

NEMO Project (www.canr.uconn.edu/ces/nemo) provides resources for communities that want to reduce their amount of impervious surfaces.

Planners Web (http://www.plannersweb.com/), maintained by the Planning Commissioners Journal, includes a sprawl resources guide, a primer for citizen planners, and other resources.

San Francisco Planning and Urban Research Association (SPUR) (http://www.spur.org/) is a leading organization doing research to develop more livable urban areas.

Sprawl Watch Clearinghouse (http://www.sprawlwatch.org/) provides information, advice & referrals on sprawl & smart growth.

Smart Growth Network (http://www.smartgrowth.org/) provides information and support.

Sustainable Communities Network (http://www.sustainable.org/) provides tools to help citizens work together to define a community's course and make it more sustainable.

TransAct (http://www.transact.org/) is a collection of information and resources about making communities more livable through innovative transportation projects and initiatives.

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

U.S. EPA (http://www.epa.gov/tp/) supports strategies to reduce environmental impacts of transport.

Wildland CPR (http://www.wildrockies.org/) works to protect wilderness areas from roads.

World Health Organization Healthy Cities Project (www.who.dk/london99) provides information on international efforts to create healthy cities.

This Encyclopedia is produced by the Victoria Transport Policy Institute to help improve understanding of Transportation Demand Management. It is an ongoing project. Please send us your comments and suggestions for improvement.

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"Efficiency - Equity - Clarity"

#38

New Urbanism

Clustered, Mixed-Use, Multi-Modal Neighborhood Design

TDM Encyclopedia
Victoria Transport Policy Institute

About This Encyclopedia

Category

Land Use Management

Description

New Urbanism (also called *Neotraditional Design, Traditional Neighborhood Development, Location Efficient Development* and *Transit Oriented Development*) consists of neighborhoods and commercial districts that reflect traditional urban design principles that existed prior to the dominance of automobiles. They tend to be medium-density, mixed-use, pedestrian-friendly, multi-modal, with special efforts to enhance the public realm. Specific design features are listed below. Of course, not all of these features are included in all New Urban developments.

New Urbanism Neighborhood Design Features (Peter Swift)

1. The community has a discernible center. This is often a plaza, square or green, and sometimes a busy or memorable intersection. A transit stop should be located at this center.
2. Buildings at the center are placed close to the sidewalk and to each other, creating an urban sense of spatial definition. Buildings towards the edges are placed further away and further apart from each other, creating a more rural environment.
3. Most dwellings are within a five-minute walk (a quarter mile) from the center. Streets are designed for walking and cycling, with sidewalks on both sides, bike lanes where needed, good crossings, traffic calming features used to control motor vehicle traffic speeds, and other features to `encourage non-motorized travel.
4. There are a variety of dwelling types. These take the form of houses, row houses, and apartments, such that younger and older, singles and families, the poorer and the wealthier can find places to live. Density averages 6-7 units per acre or greater.
5. There are places to work within and adjacent to the neighborhood, including shops, office buildings, and live-work units.
6. There are shops sufficiently varied to meet common household needs, such as convenience stores, a post office, a bank machine, and a gym.
7. A small ancillary building should be permitted within the backyard of houses. It may be used as a rental apartment, or as a place to work.
8. There should be an elementary school close enough so that most children can walk from their dwelling. This distance should not be more than one mile.
9. There are parks, trails and playgrounds near every dwelling. This distance should not be more than one-eighth of a mile.
10. Thoroughfares within the neighborhood form a continuous network, providing a variety of itineraries and dispersing traffic. The neighborhood has multiple access routes connect to adjacent neighborhoods. These access points may be highlighted with a gateway or signs.

11. Thoroughfares are relatively narrow and shaded by rows of trees that slow traffic and create an appropriate environment for pedestrian and bicyclist.
12. Parking lots and garage doors rarely end of front the thoroughfares. Parking is relegated to the rear of the buildings and usually accessed by alleys or lanes.
13. Certain prominent sites are reserved for public buildings. A building must be provided at the center for neighborhood meetings.
14. The neighborhood should be self governing, deciding on matters of maintenance, security, and physical evolution.

New Urbanism and Transit Oriented Development reflect neighborhood and local level planning, while Smart Growth reflects similar principles at the regional level. New Urbanism has gained increasing attention among development professionals and the general public, particularly in regions experiencing growth-related conflicts. Many see the New Urbanism as a way to accommodate growth while enhancing community and environmental objectives. Some developers find that New Urbanist design features increase the value and marketability of their buildings.

Although many of the best-known New Urbanist projects are "master planned communities," meaning major new urban fringe developments design as a unit, these concepts can also be incorporated into existing urban communities. Existing residential and commercial areas are incorporating New Urbanist design features as part of redevelopment efforts. For example, older neighborhoods can implement Traffic Calming and Pedestrian Improvements, use Parking Management, encourage Location Efficient Development, and work to create a design identity.

Despite potential benefits and positive feedback from homebuyers, few New Urbanist developments have been constructed, although some New Urban design features are increasingly incorporated into conventional development. One reason for this is that many current planning regulations and development practices in North America conflict with New Urbanist principles. For example, zoning codes often require more parking and wider streets than considered appropriate by New Urbanists. Zoning codes also discourage commercial activities and secondary living units in residential areas, and require large setbacks for homes and businesses that reduce densities and land use mix.

Another barrier to New Urbanism is that the real estate industry is highly segmented by land use category (such as single-family housing, multi-family housing, retail, office and warehouse). Each category has its own practices, markets, trade associations, and financing sources. New Urbanists requires a more integrated approach to development that requires changing these practices and coordinating stakeholders.

How it is Implemented

New Urbanist features can be designed into new development or implemented incrementally in existing neighborhoods. It usually requires changes to street design standards, and to zoning laws to allow higher densities and mixed land use. Urban renovation projects can incorporate New Urbanism features, including commercial infill and pedestrianization.

Travel Impacts

New Urbanism improves access, improves travel choices, and reduces traffic speeds, which tend to reduce per capita automobile ownership and use, as discussed in the chapter on Land Use Impacts. Although most individual design features have modest impacts on total travel, their effects are cumulative and synergistic, resulting in significant total reductions in vehicle use. Residents in such

neighborhoods tend to drive 20-35% less than residents in automobile dependent areas, and even greater vehicle travel reductions may be possible if New Urbanism is well coordinated with other TDM strategies, such as Carsharing, Road Pricing and Parking Pricing, Transit Improvements, Pedestrian Improvements and Commute Trip Reduction programs. See PBQD (2000) and Evaluating Nonmotorized Transport for information on modeling travel impacts of New Urban design features.

Table 1 **Travel Impact Summary**

Objectives	Rating	Comments
Reduces total traffic.	3	Reduces per capita vehicle travel.
Reduces peak period traffic.	2	"
Shifts peak to off-peak periods.	0	
Shifts automobile travel to alternative modes.	3	Improves travel alternatives.
Improves access, reduces the need for travel.	3	Increases land use access.
Increased ridesharing.	1	Can increase ridesharing to worksites.
Increased public transit.	3	Accommodates public transit.
Increased cycling.	3	Improves cycling conditions and access.
Increased walking.	3	Improves pedestrian conditions and access.
Increased Telework.	0	
Reduced freight traffic.	0	Mixed impacts.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Benefits And Cost

New Urbanism can provide a variety of economic, social and environmental benefits. These can include:

- More housing and commercial options for consumers.
- Improved transport and access for non-drivers.
- More affordable housing (Location Efficient Development).
- It can reduce automobile dependency and use, providing consumer cost savings and reductions in automobile travel that provide social benefits (such as reduced traffic congestion, parking costs, accident risk, pollution and urban sprawl).
- Increased community interaction and cohesion.

McCann (2000) finds that per-household transportation expenditures vary significantly from one metropolitan region to another, due to land use and transportation factors. She found that households in more automobile-dependent communities devote more than 20% of household expenditures to surface transportation (more than $8,500 annually), while those in communities with more diverse transportation transportation systems spend less than 17%, representing savings of hundreds of dollars a year. Similar differences are likely to exist between different neighborhoods within a metropolitan region, indicating that a household in New Urbanist communities can save thousands of dollars annually on transportation costs.

Table 2 summarizes these impacts as identified in one major study. The actual benefits depend on conditions and design factors.

Table 2 **Potential Smart Growth Benefits** (Burchell, et al, 1998)

Economic	Social	Environmental
Consumer transportation cost savings. Economies of agglomeration (density). More efficient transportation. Increased property values.	More attractive communities. Improved transportation choice, particularly for nondrivers. Improved housing choices. Community cohesion and interaction.	Greenspace and wildlife habitat preservation. Reduced air pollution. Reduce resource consumption. Reduced water pollution. Reduced "heat island" effect.

Costs include the additional expenses associated with more detailed planning, design and amenities (sidewalks, transit, public spaces), and extra development costs associated with construction within existing urban areas. Some critics argue that New Urbanism and Smart Growth reduce housing affordability, but while some features do increase housing costs (such as urban growth boundaries), others reduce these costs (such as reduced parking and setback requirements, and secondary suites), allowing housing to be more affordable overall (see discussion in Litman, 2000).

Higher-density, infill development may increase local traffic congestion and exposure to noise and air pollution, although regional traffic and pollution tends to decline if residents drive less (see discussion in Land Use Impacts chapter, and in Litman, 2000). Increased density often reduces the amount of greenspace within an urbanized area, although it can increase total regional greenspace by reducing per capita area of land development.

Table 3 **Benefit Summary**

Objective	Rating	Comments
Congestion Reduction	2	Fewer trips per capita and better access, offset at the local level by increased population density.
Road & Parking Savings	1	Reduces road and parking capacity requirements, but may increase costs for traffic calming, cycling and pedestrian facilities.
Consumer Savings	2	Can reduce vehicle and development costs, although housing costs may increase.
Transport Choice	3	Increases travel choices and access.
Road Safety	2	Reduces vehicle traffic volumes and speeds.
Environmental Protection	3	Reduces vehicle use and pavement.
Efficient Land Use	3	Encourages higher-density, infill development.
Community Livability	3	Reduces vehicle traffic volumes and speeds.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Equity Impacts

New Urbanism design features have a variety of equity impacts. Some impacts may affect certain groups more than others, such as the effects of infill on existing neighborhoods. It can reduce subsidies associated with lower-density, sprawl development and automobile dependency. It can increase consumer housing and transportation choices, providing benefits to lower-income households and non-drivers. As described above, some New Urban developments are relatively expensive, but many New Urban design features (such as small lots, cluster locations and reduced parking and road requirements) can reduce housing costs. Increased access and travel choice, and transportation cost savings tend to significantly benefit lower-income households and non-drivers. New Urban designs can reduce some externalities associated with lower-density, automobile-oriented development.

Table 4 **Equity Summary**

Criteria	Rating	Comments
Treats everybody equally.	0	Can benefit most groups.
Individuals bear the costs they impose.	1	Reduces some external costs associated with dispersed land development and automobile dependency.
Progressive with respect to income.	2	Can make transportation and housing more affordable.
Benefits transportation disadvantaged.	3	Can improve access and travel choices for non-drivers.
Improves basic mobility.	3	Can improve basic mobility and access.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Applications

New Urbanism design features are appropriate in any urban or suburban area, particularly those

experiencing high levels of growth and problems associated with housing inaffordability and sprawl. They are implemented primarily by regional and local governments, and developers.

Table 5 **Application Summary**

Geographic	Rating	Organization	Rating
Large urban region.	3	Federal government.	1
High-density, urban.	3	State/provincial government.	2
Medium-density, urban/suburban.	3	Regional government.	3
Town.	3	Municipal/local government.	3
Low-density, rural.	2	Business Associations/TMA.	3
Commercial center.	3	Individual business.	2
Residential neighborhood.	3	Developer.	3
Resort/recreation area.	3	Neighborhood association.	3
		Campus.	3

Ratings range from 0 (not appropriate) to 3 (very appropriate).

Relationships With Other TDM Strategies

New Urbanism is similar to Smart Growth, Transit-Oriented Development, and Location-Efficient Development. It supports and is supported by most other TDM strategies, particularly Traffic Calming, Pedestrian and Bicycle Improvements, Carsharing, Road Pricing, Parking Pricing, Parking Management, Transit Improvements, and Commute Trip Reduction programs.

Stakeholders

New Urbanism is generally implemented by local governments and developers. Neighborhood associations, business associations and developers are also important stakeholders with regard to many specific New Urbanist policies and projects.

Barriers To Implementation

Existing zoning laws and development policies often discourage or prohibit New Urbanism designs. There is sometimes local resistance to higher density, infill development.

Best Practices

The Congress for the New Urbanism and Ewing (1996) provide guidelines for New Urban best practices. The National Governor's Association provides recommendations for more efficient development (Hirschhorn, 2000). Homburger (1989) and Burden (1998) describe recommended street design features. Recommendations include:

- Educate planners and developers about New Urbanist strategies.
- Implement comprehensive New Urbanist policies, rather than just one of two strategies.
- Encourage cooperation between public and private decision makers to facilitate New Urbanism.
- Promote distinctive, attractive communities with a strong sense of place, including the rehabilitation and use of historic buildings.
- Strengthen and encourage growth in existing communities.
- Mix land uses.
- Create a range of housing opportunities and choices.
- Provide a variety of transportation choices.

- Foster "walkable" close-knit neighborhoods.

Examples and Case Studies

NCDOT New Subdivision Guidelines (www.dot.state.nc.us/news/TNDsubdivguidelines00-08.html)

The N.C. Board of Transportation today approved Traditional Neighborhood Development (TND) Street Design Guidelines that will improve safety by promoting low speeds and cautious driving while fully accommodating the needs of pedestrians and bicyclists.

"By approving these guidelines, our Board of Transportation is to be commended for making smart transportation planning a priority," said Gov. Hunt. "These guidelines will improve the quality of life for all North Carolinians by helping us build strong communities across the state."

The alternative guidelines were developed in response to increased interest in balancing growth and quality of life initiatives and to promote neighborhood development. They were created in consultation with citizens, developers, builders, architects, engineers, planners, local government officials, state agencies and environmental organizations.

The following criteria are established in the new guidelines for TND developments:

- Streets will be designed to be only as wide as needed for low-speed traffic.
- Narrow streets are part of a dense transportation network that also includes sidewalks, walking paths and bike lanes.
- Sidewalks will line both sides of most neighborhood streets to encourage walking.
- On lower traffic volume streets, bicyclists should be considered a normal part of traffic. On higher volume streets, bicyclists should be accommodated with six-feet-wide bike lanes, but separate routes for less experienced bicyclists may be considered as well.
- On-street parking along major streets should have signs, markings or otherwise clearly be designated.
- Planting strips, located between the curb and sidewalk, help create shaded streets, promote walking and slow traffic.
- As a general rule, more and shorter street lights are preferred.

Seaside (http://www.seasidefl.com/)

Seaside, Florida was the first New Urbanist community, which has been a model and inspiration to most New Urbanist developments created since. "The little beach town that changed the world, by remembering how nice the world can be."

Seaside is an 80-acre town developed in the early 1980's by Robert and Daryl Davis based on concepts by Miami architects Andres Duany and Elizabeth Plater-Zyberk. Their inspiration was an image by urban designer Leon Krier, "...A sensibly laid out town or city would, in fact, have all of the necessities and pleasures of daily existence within walking distance of one's residence. You might have to use mechanical transportation to go to the opera, but you should not need to use a car to get a quart of milk, nor should you have to be a chauffeur for your children..."

Initial sales in 1982 were encouraging. Sales were also helped by early recognition, in both the architectural and popular press, that the Seaside idea was quite appealing and might be a model for changing the patterns of urban and suburban growth. The master plan and the Seaside Urban Code were drafted in the summer of 1982. While they continue to this day to evolve and to change, these documents still incorporate the original simple and cogent ideas. The Code is designed to work with the master plan to produce streets which are comfortable for pedestrians.

There are now more than 300 cottages in Seaside. The streets are designed to accommodate cars and parking but to make walking more convenient and pleasant than driving. From inception, downtown Seaside has been an important part of the plan. Seaside visitors and residents are able to walk to Central Square which contains a

variety of public and commercial buildings. The quaint and cozy streets of Seaside received additional visibility in 1999 as the location for the movie *The Truman Show*. In 1982, Davis established The Seaside Institute (http://www.theseasideinstitute.org/), which provides information about Seaside and New Urbanism.

NorthWest Landing (http://www.nwlanding.com/)

Northwest Landing is a 3,000-acre mixed-use planned community developed by the Land Management Division of Weyerhaeuser Real Estate Company, located in the city of DuPont, Washington, midway between Tacoma and Olympia, about 50 miles south of Seattle. Land uses include industrial, office and commercial development, homes, schools, parks, places of worship, open space and trails. As of December 31, 1999, Northwest Landing had over 1400 residents living in approximately 680 single family, condominium and apartment homes. On completion, Northwest Landing will include homes for approximately 10,000 people and jobs for 8,600 people.

Celebration (http://celebration.nm1.net/)

Celebration, Florida is a 4,900-acre masterplan development built just a few miles from Walt Disney World by the Disney Corporation. As the Corporation describes it,

> "Celebration takes the best of what made small towns great in our past and adds a vision of the future. All the conveniences and technology of modern life will be hidden in timeless architecture. There will also be a sense of community. Hence the lakeside town center, complete with town hall, post office, library, deli, restaurants, bookstore-cafe, grocery store, dry cleaner, and movie theater. It is meant to be a sociable place, with people living above the shops and streets designed for pedestrians. In addition, the town will have a Health Campus with a fitness center and "healthcare edutainment"

Celebration first opened in 1996. It currently has 700+ residences with a population of 2,000+, with plans to expand to about 8,000 residential units and 20,000 people. It includes a downtown, health center, school, post office, town hall, golf course, single family homes, townhouses and apartments. The town has restrictive covenants that limit what property owners can and cannot do, including strict building design standards.

A survey of Celebration residents shows that 43 percent said they drive significantly less, while the rest said they use their cars somewhat less. Ninety percent fell that the physical characteristics of New Urbanist planning contribute to and improve the quality of their lives, and 98 percent said the feeling of community in Celebration has met their expectations. With the central village containing essentially all community activities, including schools, one respondent reported that his two-and-a-half-year-old car only had 13,000 miles on it, and another said his son was disturbed that he hadn't been in a car in over a month.

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Dan Burden and Peter Lagerway, *Road Diets Free Millions for New Investment*, Walkable Communities (http://www.walkable.org/), 1999.

Stephen Burrington & Veronika Thiebach, *Take Back Your Streets; How to Protect Communities from Asphalt and Traffic*, Conservation Law Foundation (Boston; http://www.clf.org/), 1995.

Center for Livable Communities (http://www.lgc.org/clc/) helps local governments and community leaders be proactive in their land use and transportation planning.

Center for Urban Transportation Research, USF (Tampa; http://cutr.eng.usf.edu/) provides TDM materials and classes, and publishes *TMA Clearinghouse Quarterly*.

Center for Watershed Protection (http://www.cwp.org/) provides analysis and resources for minimizing hydrologic impacts and pollution.

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

Congress for the New Urbanism (http://www.cnu.org/), provides a variety of information on innovative urban design. The CNU *Narrow Streets Database* (www.sonic.net/abcaia/narrow.htm) describes more flexible zoning codes being implemented in various communities.

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Todd Litman, *Evaluating Smart Growth and TDM; Social Welfare and Equity Impacts of Efforts to Reduce Sprawl and Automobile Dependency*, VTPI (http://www.vtpi.org/), 2000.

Barbara McCann, *Driven to Spend; The Impact of Sprawl on Household Transportation Expenses*, STPP (http://www.transact.org/), 2000.

PBQD, *Data Collection and Modeling Requirements for Assessing Transportation Impacts of Micro-Scale Design*, Transportation Model Improvement Program, USDOT (www.bts.gov/tmip), 2000.

The *San Francisco Planning and Urban Research Association* (http://www.spur.org/) is an organization working to improve urban planning practices in the San Francisco region.

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

This Encyclopedia is produced by the Victoria Transport Policy Institute to help improve understanding of Transportation Demand Management. It is an ongoing project. Please send us your comments and suggestions for improvement.

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#24

Other Management Strategies

School Trip Management

Encouraging Alternatives to Driving to School

TDM Encyclopedia
Victoria Transport Policy Institute

About This Encyclopedia

Category

TDM Program

Description

School Trip Management programs encourage parents, students and staff to reduce automobile trips and use alternative modes for travel to and from schools. These programs improve travel options and provide encouragement to reduce driving. They typically include:

- Surveying students and parents to determine travel patterns, reasons for travel choices, barriers and potential opportunities for change (see Data Collection and Surveys).
- Promotion campaigns, special events, and contests to encourage parents and students to reduce automobile travel to schools (see Marketing TDM).
- Assessment of pedestrian and cycling conditions around the school (i.e., pedestrian and cycling audits, mapping safe routes; see Evaluating Nonmotorized Transport) and correction of problems and barriers (see Improving Cycling and Walking Conditions).
- Bicycle parking.
- Pedestrian and bicycle safety education (see Nonmotorized Encouragement).
- Supporting "Walking School Bus" development, in which a parent walks a group of students to and from school.
- Promotion of Ridesharing, so parents share the responsibility of driving a group of students to school.
- Encouraging parents and students to use public transit to school.
- Parking Management.
- Encouraging parents who drive to park away from the school and walk with their children the last few blocks (this reduces congestion and parking problems at the school, and provides some exercise).
- Traffic Calming and neighborhood traffic management around schools.
- Organizing field trips and off-campus activities in ways that minimize driving (e.g., ridesharing, chartering buses, etc.)
- Locating schools to maximize Access. For example, preserve older schools and develop new schools within residential neighborhoods, where they can be reached by walking and cycling, rather than at urban fringe locations. (See Smart Growth)

Thirty years ago approximately 80% of grade school students walked or bicycled to school. Now only about 20% walk or bicycle to school in typical North American communities. Travel to school represents 10-15% of peak period motor vehicle trips in many urban areas. Chauffeuring children to school often results in two vehicle trips, one to the school and one returning home, or four additional

trips per day.

Children are far less physically active than in previous generations, resulting in unfitness and health risks. A few decades ago children typically spent about three hours a *day* in outside play activity such as walking, running and games, but now children average only about three hours a *week*. School trip management programs that emphasize "active transportation" (walking and cycling) are often promoted as a way to help children become more physically active and make exercise become a regular habit. One report concludes, "*Regular walking and cycling are the only realistic way that the population as a whole can get the daily half hour of moderate exercise which is the minimum level needed to keep reasonably fit.*" (Physical Activity Task Force, 1995). Research by the U.S. Center for Disease Control indicate that increased physical activity during childhood is an important strategy for lifelong health, and that school and community programs play an important role in promoting physical activity (CDC, 2000).

Walking and bicycling to school are also opportunities for children to explore their community, develop social skills, and experience increasing independence and responsibility as they become older (Hillman, 1993; Adams and Hillman, 1995). Children often prefer to walk to school. A survey of 769 children aged between 7 and 11 commissioned by the UK Department of Environment, Transport and Region's "Are You Doing Your Bit?" campaign office found that:

- 38% of children who are driven to school would rather walk or cycle.
- 31 % who are driven live within a 15 minute walk from school.

The worst things about going to school by car, according to the children, are:

- Getting stuck in traffic (27%)
- Cars causing pollution (24%)
- Lack of exercise (23%)
- Not meeting classmates (17%)
- It's boring (16%).

The best things about walking to school include:

- Meeting and talking to friends (53%)
- Getting some fresh air (23%)
- Getting some exercise (21%)
- Going to the sweet shop (21%)
- Spending time with mum, dad or gran (16%).

School Trip Management programs can be cheaper than increasing parking capacity, dealing with local traffic congestion, and providing school busing services. Students, staff and parents often value having improved travel choices, particularly those with lower incomes.

School Trip Management programs must address a number of barriers that discourage children for walking and cycling, including fears of "stranger danger" and the risk of motor vehicle crashes. Education can help address both concerns, and both risks tend to decline as more parents and students walk and cycle rather than drive. Programs to Address Security Concerns can be an important component of School Trip Management.

School location and design can have a major impact on vehicle trips. One study found that the portion of students walking to school in South Carolina is far higher in older (pre-1970) schools than in schools that were built recently because the newer schools tend to be located at the urban fringe (SCCCL, 1999). School siting can affect both the travel mode and the distances that are driven for children to get to school. Some current public policies result in less accessible schools, including policies that favor new school construction over renovation of existing schools, excessive minimum acreage requirements for

new schools (resulting in new schools being constructed outside of residential neighborhoods), and inflexible building codes and design standards (Beaumont and Pianca, 2000). School Trip Management may include changing such policies to help preserve existing schools and favor development of new schools in residential neighborhoods.

How it is Implemented

School Trip Management programs are usually initiated by school authorities, parent organizations, or students, often as a response to traffic and parking problems. They can be implemented as part of a neighborhood traffic management program. Multi-modal transportation can also be considered more when schools are sited and designed. State and provincial education agencies can create policies and programs that support alternative transport to schools.

Travel Impacts

Travel to school represents 10-15% of peak period motor vehicle trips in typical North American communities, although a smaller portion of total mileage since these trips tend to be shorter than other trip categories. There are currently few detailed studies of the effectiveness of School Trip Management programs, but anecdotal evidence indicates that total reductions in automobile trips of 10-20% or more are possible at a particular school, and much greater reductions are possible when schools are sited and designed for good accessibility. Neighborhood schools often have 70% or more students walk or cycle, while at urban fringe schools the majority of students arrive by car.

Table 1 **Travel Impact Summary**

Travel Impact	Rating	Comments
Reduces total traffic.	2	School trips are numerous, but relatively short.
Reduces peak period traffic.	3	Reduces peak-period vehicle trips.
Shifts peak to off-peak periods.	0	
Shifts automobile travel to alternative modes.	3	Encourages use of alternative modes.
Improves access, reduces the need for travel.	0	
Increased ridesharing.	2	
Increased public transit.	1	
Increased cycling.	3	
Increased walking.	3	
Increased Telework.	0	
Reduced freight traffic.	0	

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Benefits And Costs

School Trip Management program benefits include:

- Avoided parking and congestion problems, and over the long run reducing road and parking facility costs.
- Increased travel choice and financial savings to students and families.
- Safer and calmer streets and nearby neighborhoods.
- Increased physical activity, and encouragement of healthier lifestyle habits.
- Opportunities for children to explore the world and experience increasing independence and responsibility.
- Opportunities for positive interactions between school and community members.

Costs include program costs, and any additional delays or problems for motorists from parking

management and traffic calming.

Table 2 **Benefit Summary**

Objective	Rating	Comments
Congestion Reduction	2	Reduces peak-period vehicle trips, although largely on local roads.
Road & Parking Savings	3	Reduces total automobile travel and school parking costs.
Consumer Savings	3	Reduces vehicle costs.
Transport Choice	3	Increases travel options.
Road Safety	3	Reduces vehicle travel, and traffic around schools, and often includes road safety improvements.
Environmental Protection	3	Reduces vehicle travel, and nonmotorized travel habits.
Efficient Land Use	3	Reduces vehicle traffic. Can encourage more neighborhood schools.
Community Livability	3	Reduces vehicle traffic. Can encourage more neighborhood schools.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Equity Impacts

School Trip Management programs offer services and encouragement to all students, although not all can use each service. School Trip Management programs tend to increase equity by devoting resources for alternative modes that are comparable to those devoted to providing road and parking capacity for motorists, by reducing external costs (congestion, crash risk, facility costs and environmental impacts) caused by automobile trips, and by increasing travel choices for lower-income and transportation disadvantaged students and parents. It can also reduce the stigma that may be associated with non-automotive travel for some students.

Table 3 **Equity Summary**

Criteria	Rating	Comments
Treats everybody equally.	2	Provides resources for alternative modes comparable to those for road and parking capacity for motorists.
Individuals bear the costs they impose.	2	May require subsidies but reduces external costs associated with driving.
Progressive with respect to income.	3	Increases affordable travel options.
Benefits transportation disadvantaged.	3	Increases travel choices for non-drivers.
Improves basic mobility.	2	Increases access to education.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Applications

School Trip Management programs are appropriate in most any geographic condition (in urban areas and towns more travel will shift to nonmotorized modes, in suburban and rural areas there may be more carpooling). It is implemented primarily by regional and local governments, often with state/provincial funding.

Table 4 **Application Summary**

Geographic	Rating	Organization	Rating
Large urban region.	3	Federal government.	1
High-density, urban.	3	State/provincial government.	2
Medium-density, urban/suburban.	3	Regional government.	3
Town.	2	Municipal/local government.	3
Low-density, rural.	2	Business Associations/TMA.	1
Commercial center.	1	Individual business.	0
Residential neighborhood.	3	Developer.	0
Resort/recreation area.	2	Neighborhood association.	2
		Campus.	3

Ratings range from 0 (not appropriate) to 3 (very appropriate).

Relationships With Other TDM Strategies

School Trip Management programs may include the following TDM strategies:

- Marketing and Promotion.
- Pedestrian and Bicycle Improvements.
- Traffic Calming.
- Ridesharing Programs and Transit Improvements.
- Parking Management.
- New Urbanism and Smart Growth.
- Address Security Concerns

Funding for School Trip Management may increase as a result of Least-Cost Planning and Institutional Reforms, which allow alternative programs to compete for money that is currently devoted to capacity expansion. It is similar to Campus Transportation Management.

Stakeholders

School Trip Management programs are usually implemented by school officials or parent groups, often with the encouragement and support of local transportation agencies. Transit agencies may provide discounted fares and improved services. Planning agencies and developers may be involved in siting schools and street design that affects nonmotorized access. Municipal engineers can provide detailed maps for developing safe routes and technical support. School liaison officers can provide pedestrian and bicycle safety training.

Barriers To Implementation

Such programs often require coordinating efforts by a variety of organizations, including school administrators, parents, and student groups. Some school officials may see little benefit unless they perceive an immediate parking or traffic congestion problem. Program funding is often a limiting factor. Parental fears of traffic and strangers often encourage driving.

Best Practices

Documents and guidebooks listed below provide recommendations for best practices. These include:

- Involve school officials, parents, students and local transportation officials.
- Tailor programs to meet the needs of each specific school.
- Survey students and parents to identify barriers to walking, cycling and transit.
- Integrate programs into school curriculum if possible.
- Implement traffic safety improvements, pedestrian and bicycle safety audits, traffic calming and safety education.
- Address security concerns.
- Include both fun and educational components.
- Implement policies that favor more accessible, pedestrian friendly school design and location, and encourage the preservation of older schools.

Case Studies and Examples

Way To Go (http://www.waytogo.icbc.bc.ca/)

The *Way to Go* program in British Columbia is a provincial program sponsored by the Insurance Corporation of British Columbia and its brokers, that provides a variety of resources to help schools reduce automobile trips, and

create safer pedestrian and bicycling environments around their schools. *Way to Go!* resources and support are available free to all BC schools. More than 550 schools across the province have requested the *Way to Go!* Resource Kit.

Safe Routes to School (www.transalt.org/campaigns/school/index.html)

The Bronx Safe Routes to School is a program managed by Transportation Alternatives and sponsored by school officials, local governments and the state Traffic Safety Committee. It coordinates efforts of parents, teachers and principals and traffic engineers to identify and fix street conditions dangerous to children walking and cycling to school. Since October 1997 the program has helped create safe walking corridors at 31 elementary schools. Safe Routes to School is so popular that schools are vying to participate. To be selected for the program, parents and principals must be actively concerned about dangerous walking conditions and a high number of pedestrian injuries must be documented. Several hundred of travel surveys are collected at the participating schools. Geographic Information System mapping are used to identify problems areas and develop safe walking routes. The State DOT installed speed humps, elevated crosswalks, sidewalk extensions and other measures where needed.

Christchurch, New Zealand Walk A Child To School Day

Forty-four primary schools took part in Christchurch City Council's annual "Walk a Child to School Day" (WCSD) on 1 March 2000. The program was a success with many schools reporting over three-quarters of their children walking to school on the day. Arising from concerns over child health in general and child road safety in particular, WCSD was held to encourage safe and healthy travel to school, as well as the added benefit of of saving transport energy. Most schools noted quieter streets, happy children, and seeing many parents.

The numbers of children walking to school increased from 35% beforehand to 73% on WCSD - exactly the same as 1999. The numbers of children coming to school by motor vehicle decreased from 55% before to 22% on WCSD. One school had virtually the whole school turned out to walk to school in four walking school buses that were organized. Another had a breakfast at school for parents and children. A group of parents at one school have organized an ongoing Walking School Bus as a result of the event.

Sports people from the Canterbury Crusaders, the Canterbury Rams basketball team, New Zealand women's cricketer Cathy Campbell walked with the children. Christchurch Mayor Garry Moore and Green MP Rod Donald acted as guest 'drivers' for walking school buses. To follow up WCSD, a Walking School Bus kit has been developed for schools. The kit includes hats, drink bottles, fridge magnets, contact cards, certificates, stickers and travel cards.

State Funding For Traffic Safety Near Schools (www.wsdot.wa.gov/ta/homepage/hlphp.html)

The Washington Transportation Commission approved grant funding packages for five new programs created by the Legislature, including a Traffic SafetyNear Schools Program. The purpose of this program is to fund capital projects for traffic and pedestrian safety improvements near schools. Eligible projects include sidewalks and walkways, school signing and signals, improved pedestrian crossings, turning lanes, school bus pullouts, and roadway channelization and signalization.

Students Walked 7423 km to School (http://www.greenestcity.org/)

Students and staff of Maurice Cody Public School in Toronto, Canada have walked 7,423 kilometres since October 6, 1999, by walking to school. Their Cross Canada Challenge took them from St. John's, Newfoundland, to Vancouver, British Columbia. This challenge is a continuation of the school's four year association with Greenest City's Active and Safe Routes to School program and was inspired by Greenest City's Walk to School Day event, which takes place every year on the first Wednesday of October. Schools are then encouraged to make the first Wednesday of every month Walk to School Day.

Every Wednesday is "Walking Wednesday." The idea is to promote walking to school as a safe, healthy alternative to driving. The traffic congestion around the school at drop off and pick up time each day creates unsafe conditions for all students and jeopardizes air quality in the school area. This has led the school to take a closer look at ways to promote walking to school. A successful Walking School Bus program was launched in 1997 on Balliol Street, five blocks from the school, but it was difficult to convince folks on other streets to follow

suit. The Walking Wednesday program has led to greater awareness of the issues around school transportation and increased the number of families walking regularly. Carol Anne Coulter, one of the organizing parents at Maurice Cody, says: "Cody students who choose active ways to get to school are learning to make healthy lifestyle choices for themselves and for the environment".

Maurice Cody School Principal, Ron Markwell comments, "my participation in Walking Wednesdays has helped me to reconnect with my immediate environment as I experienced the change of seasons walking to school through the Don Valley each Wednesday morning." Principal Markwell's personal walk to school record for this year is one hundred and eighty one kilometres! The school's Vice-Principal, Wendy Keene, cycled to school on Walking Wednesdays for a total of two hundred and seventy two kilometres travelled.

The Pembina Institute has calculated if all the families that live within a 30-minute walk of Maurice Cody Public School were to switch from driving to walking, they could prevent more than 26,500 kg of GHG emissions from entering the atmosphere each year! The school's Cross Canada Challenge has avoided the release of 2041 kg of carbon dioxide. (www.climatechangesolutions.com/english/individuals/stories/transport/school.htm).

Walking to school may not seem unusual, but the Canadian Institute of Child Health reports that "in Canada, neighbourhood schools report more than 50% of the student body are frequently chauffeured to school by parents." Approximately two-thirds of today's children are not physically active enough to lay a solid foundation for future good health and childhood obesity is on the rise across Canada. The walk to and from school would provide the minimum daily requirement for children of 30 minutes of moderate to vigorous physical activity.

Greenest City's Active and Safe Routes to School Program has been in place since 1996 and has spread from Toronto to other parts of the Province. Greenest City's resources and support are available free to schools and communities across Ontario. More than 100 schools have implemented some portion of the program, and 250 schools participated in last year's Walk to School Day. Greenest City works with groups in other countries to promote International Walk to School Day each October. Canada, the United States, the United Kingdom, Ireland and South Africa have participated. Check out the IWSD Web site for further information at http://www.iwalktoschool.org/.

We Walk to School Because . . .
"We can stop and say hello to a kitty or a pup and sing along with the birds." JK, student, Maurice Cody.

Preserving Older, Accessible Schools

Beaumont and Pianca (2000) describes several examples of public policy reforms to favor more accessible schools, and case studies of communities that have preserved older, more accessible schools rather than building less accessible new schools at the urban fringe:

- In Durham, N.C., when state standards threatened a historic elementary school, neighborhood residents mounted a campaign that resulted in the school being saved and renovated. The campaign included the production of a detailed study to refute assertions that renovating the school would be infeasible.
- In Rice Lake, WI, a "Save Our Schools" committee has worked to preserve three historic elementary schools. They point out that if the schools are closed, children who currently walk to school would need to be bused.
- In Sharlevoix, MI, residents sued the school district over plans to build a new high school on 74 acres of prime farmland three miles out of town. They are encouraging the district to renovate an in-town school instead.
- The state of Maryland has eliminated minimum acreage requirements for new schools, leaving site decisions to local communities. The state now gives preference to reinvestment in existing schools over new school construction that may stimulate sprawl.
- In the state of Maine, the state planning office and the board of education have published a joint brochure urging school districts to avoid sprawl, renovate existing, more accessible schools, and promote walking to school.
- The state of New Jersey has adopted a special Rehabilitation Code that makes it easier and less expensive to

rehabilitate historic buildings, such as neighborhood schools.

Trail Blazers (http://www.pedestrians.org.uk/)

The Pedestrians Association has compiled information on walking school bus and school trip management programs in communities throughout UK in their publication, *Trail Blazers!* They cite successful programs in Buckinghamshire, Kent, Knowsley, Leeds, Maidenhead, Poole, Southend, Staffordshire, Stoke on Trent, Swale, Swansea, and Vale of Glamorgan. For each of these communities they describe how the program was established, how it operates, costs (for staff time, vests and trolleys for carrying bags), evaluation, plans for expansion, and contact information.

References And Resources For More Information

John Adams and Mayer Hillman, "Children's Freedom and Safety," *Beyond the Car: Essays in Auto Culture*, Steel Rail Publishing (Toronto), 1995, pp. 141-151.

"Active and Safe Routes to School" (Ottawa; 888-UB-ACTIV; 613-562-531; http://www.goforgreen.ca/) is a Canada-wide program to encourage the use of active modes of transportation to and from school.

CDC, *Promoting Better Health for Young People Through Physical Activity and Sports*, Center for Disease Control (http://www.cdc.gov/), 2000.

Constance Beaumont and Elizabeth Pianca, *Historic Neighborhood Schools in the Age of Sprawl- Why Johnny Can't Walk to School*, National Trust for Historic Preservation (http://www.nationaltrust.org/), November 2000.

CDC, *Kids Walk-to-School*, Centers for Disease Control and Prevention (www.cdc.gov/nccdphp/dnpa/kidswalk.htm), 2000. This guide promotes physical activity, creating safe and walkable routes to school, crime prevention, and generally healthy environments.

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International Walk To School Day (http://www.iwalktoschool.org/) promotes walking to school. Canada, the United States, the United Kingdom, Ireland and South Africa have schools registered for this event.

Anne Fritzel, *Smart Moves for Washington Schools: Transportation and the Environment Activities for Grades K-12*, Climate Solutions (Olympia, WA; http://www.climatesolutions.org/smartmoves.html), 1999.

Ministry of Transportation and Highways, *Safe Crossings: Guidelines for School Crossing Programs*, Road Safety Program, ICBC (Vancouver; 604-661-6643; http://www.icbc.com)/), 1998.

The *Pedestrians Association* (http://www.pedestrians.org.uk/) campaigns on all aspects of pedestrian welfare. It has produced an interactive CD-Rom based on their successful Walk to School pack that is particularly suitable for junior age children. It features games, puzzles and fun-based learning about school transport. Background information for teachers and parents is also included. The price is £5.

Physical Activity Task Force, *More People, More Active, More Often*, UK Department of Health (London), 1995.

Francoise Poinsatte and Will Toor, *Finding A New Way: Campus Transportation for the Twenty-First Century*, University of Colorado Environmental Center and Colorado Office of Energy Conservation (Boulder; 303-492-8308; ecology@stripe.colorado.edu), 1999.

Joseph P. Savage, et al., *A Guidebook for Student Pedestrian Safety*, Washington State Department of Transportation (Olympia; www.wsdot.wa.gov/ta/t2/t2pubs.htm) 1996.

School Travel, School Travel Advisory Group, (http://www.localtransport.detr.gov.uk/schooltravel), 1999.

SUSTRANS Safe Routes to School Project (http://www.sustrans.co.uk/srts/) is a demonstration project in the United Kingdom to show how children can be encouraged to cycle and walk to school.

Way To Go! School Program, "small steps towards a big difference," (Vancouver; 1-877-325-3636; http://www.waytogo.icbc.bc.ca/) provides resources and support for school traffic reduction programs, including a variety of safety education strategies and materials.

SCCCL, *Waiting for the Bus: How Lowcountry School Site Selection and Design Deter Walking to School*,

Southern Carolina Coastal Conservation League (Charleston), 1999.

The Bronx Safe Routes to School (www.transalt.org/campaigns/school/index.html) is an example of a successful regional school trip safety program.

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This Encyclopedia is produced by the Victoria Transport Policy Institute to help improve understanding of Transportation Demand Management. It is an ongoing project. Please send us your comments and suggestions for improvement.

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#36

Street Reclaiming

TDM Encyclopedia
Victoria Transport Policy Institute

About This Encyclopedia

Category

Incentive to Reduce Driving

Description

Street Reclaiming is a process for increasing the social, cultural, recreational and economic activity in neighborhood streets. It is intended to change way that people think about and use public streets to encourage interaction and increase residents' involvement in their community. It involves reducing vehicle traffic volumes and speeds, and creating more attractive street environments. This concept is described in Engwicht (1999), and reflects the recommendations of other urban planners for creating more pedestrian-friendly, socially active streets (Jacobs, 1961; Appleyard, 1989; Lennard and Lennard, 1995). It incorporates aspects of Traffic Calming, New Urbanism and Smart Growth, with emphasis on community-based decision-making by residents, rather than conventional "top-down" planning organized by professionals and government agencies.

Street Reclaiming is based on the assumption that each community resident must take responsibility for their contribution toward traffic problems by reducing car use and speeds in their own and other neighborhoods. Street Reclaiming activities include:

- Holding meetings and a party for street residents.
- A commitment by residents to reduce their car use and speeds.
- Promoting specific techniques that residents can use to reduce their car use.
- Psychologically reclaim streetspace, by engaging in social and recreational activities along and within streets, to encourage residents and visitors to consider it an outdoor living space. This includes painting the road surface, banners overhead, landscaping and banners on the side of the road, seating, etc.
- Traffic Reduction and exchange of treaties – setting up sister-relationships with other streets in the city with exchange of agreements to put less traffic in each other's neighbourhood.
- Physically reclaim streetspace by changing materials (e.g., from asphalt to brick), creating gateways, installing street furniture (benches, planters, picnic tables, etc.), installing artworks, holding markets and fairs, and implementing traffic calming design features.
- Improving neighborhood services and alternative travel options.

How It Is Implemented

Street Reclaiming is usually initiated by local residents or a neighborhood association. Some physical changes are implemented by local governments.

Travel Impacts

A major objective of Street Reclaiming is to reduce total automobile use. Engwicht suggests that

personal travel reductions of 30-50% are possible among residents committed to Street Reclaiming principles. Because the concept of Street Reclaiming is new, there is little empirical experience to determine whether such travel impacts are feasible and durable, and what factors determine effectiveness.

Table 1 **Travel Impact Summary**

Travel Impact	Rating	Comments
Reduces total traffic.	2	Can reduce per capita vehicle travel.
Reduces peak period traffic.	1	
Shifts peak to off-peak periods.	0	
Shifts automobile travel to alternative modes.	2	Encourages residents to use alternative modes.
Improves access, reduces the need for travel.	1	Supports higher-density land use.
Increased ridesharing.	1	Encourages use of alternative modes.
Increased public transit.	1	Encourages use of alternative modes.
Increased cycling.	2	Encourages alternative modes and improves cycling environments.
Increased walking.	2	Encourages alternative modes and improves walking environments.
Increased Telework.	1	Encourages use of alternative modes.
Reduced freight traffic.	0	

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Benefits and Costs

Street Reclaiming helps achieve virtually all TDM objectives. It reduces motor vehicle traffic volumes and speeds, and therefore reduces road and parking facility requirements, provides consumer savings, and increases roadway safety. It can increase travel choice (especially nonmotorized transport), and encourages local services within neighborhoods. It supports urban infill and therefore more efficient land use. These can increase environmental protection and make neighborhoods more livable by reducing traffic, improving street environments and encouraging community interaction.

It is uncertain how durable these TDM benefits are over the long run (for example, whether Street Reclaiming programs continue after organizers leave a neighborhood), and to what degree they spill over to other geographic areas (for example, whether residents will reduce their driving and speeds on streets outside of their neighborhood).

Engwicht emphasizes the psychological, social and cultural benefits of creating more pedestrian-oriented street environments that encourage cooperation and interaction among residents, and give vulnerable people (children, elderly, handicapped, low income) greater mobility and opportunity. He argues that this can result in more creativity, enjoyment, health, and economic security within a community.

Street Reclaiming programs rely primarily on residents' efforts and behavior changes. Costs include planning and construction for changes in street design, and reduced mobility for motorists (although this is voluntary, so the cost may be minimal).

Table 2 **Benefit Summary**

Objective	Rating	Comments
Congestion Reduction	1	Reduces automobile use.
Road & Parking Savings	1	Reduces traffic. May require street improvements.
Consumer Savings	2	Reduces automobile use and increases travel alternatives.

Transport Choice	3	Increases travel choice, especially nonmotorized modes.
Road Safety	3	Reduces traffic volumes and speeds.
Environmental Protection	2	Reduces vehicle travel and improves urban environments.
Efficient Land Use	2	Reduces automobile use, improves urban neighborhoods.
Community Livability	3	Reduces traffic, and encourages community development and interaction.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Equity Impacts

Street Reclaiming has a variety of equity impacts. Generally, street residents and people who value nonmotorized transport benefit most, while people who want to drive fast through a neighborhood are worst off. It tends to reduce the external costs of motor vehicle traffic such as congestion, accident risk, noise and air pollution. It is likely to be progressive with respect to income, since lower-income households tend to rely more on nonmotorized transport and drive less than average, although this can vary depending on circumstances. It tends to benefit transportation disadvantaged people, who are particularly vulnerable to traffic impacts, and it can improve basic mobility.

Table 3 Equity Summary

Criteria	Rating	Comments
Treats everybody equally.	0	Mixed impacts. Is largely voluntary.
Individuals bear the costs they impose.	3	Reduces automobile externalities.
Progressive with respect to income.	2	Generally, benefits alternative travel.
Benefits transportation disadvantaged.	2	Benefits non-drivers.
Improves basic mobility.	1	Reduces lower-value vehicle trips.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Applications

Street Reclaiming is most appropriate in neighborhoods where residents and businesses want to change their streetscape and their travel habits. It is implemented primarily by neighborhood associations, but may also involve local planners and businesses.

Table 4 Application Summary

Geographic	Rating	Organization	Rating
Large urban region.	1	Federal government.	0
High-density, urban.	2	State/provincial government.	0
Medium-density, urban/suburban.	2	Regional government.	1
Town.	2	Municipal/local government.	2
Low-density, rural.	1	Business Associations/TMA.	2
Commercial center.	2	Individual business.	1
Residential neighborhood.	3	Developer.	0
Resort/recreation area.	3	Neighborhood association.	3
		Campus.	2

Ratings range from 0 (not appropriate) to 3 (very appropriate).

Relationships With Other TDM Strategies

Street Reclaiming includes aspects of Traffic Calming, Pedestrian and Cycling Improvements, New Urbanism, Smart Growth and Parking Management. It supports and is supported by most other TDM strategies.

Stakeholders

Street Reclaiming requires the support and initiative of residents on a street, and some activities require support from local officials.

Barriers To Implementation

Barriers include rigid zoning and traffic regulations, resistance from some residents, and lack of funding.

Best Practices

Engwicht (1999) describes Street Reclaiming activities. He recommends:

- Residents should lead the planning process.
- The planning process should encourage community interaction and creativity.
- All aspects of street uses (transportation, aesthetics, social interactions) should be considered in street design and management.
- Street design and management should encourage community interaction.
- Street reclaiming should encourage people to take more responsibility and control of their streets.

Examples and Case Studies

European Pedestrianized Streets (Beatley, 2000)

Many European cities have become increasingly pedestrianized, woonerf residential streets (in Dutch, *woon* means "residential" and *erf* means "yard) where vehicles traffic is slowed to walking speeds. In the United Kingdom they are called "Home Zones." There are now an estimated 6,000 woonerf in the Netherlands and an increasing number of British residential areas are implementing Home Zone programs, including traffic calming, low vehicle speeds, and pedestrian improvements.

References And Resources For More Information

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Stephen Burrington & Veronika Thiebach, *Take Back Your Streets; How to Protect Communities from Asphalt and Traffic*, Conservation Law Foundation (Boston; http://www.clf.org/), 1995. Guide provides justifications and information on implementing traffic calming.

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Reid Ewing, *Traffic Calming; State of the Practice*, FHWA and ITE (available free at www.ite.org/traffic/tcstate.htm#tcsop), 1999.

Jane Jacobs, *The Death and Life of the Great American Cities*, Random House (New York), 1961.

Suzanne Crowhurst Lennard and Henry Lennard, *Livable Cities Observed*, Gondolier (Carmel) 1995.

Todd Litman, *Traffic Calming Costs, Benefits and Equity Impacts*, VTPI (http://www.islandnet.com/~litman), 1999. Report details various costs and benefits of traffic calming.

City of Portland (http://www.trans.ci.portland.or.us/Traffic_Management/trafficcalming/) provides excellent

information and materials on traffic calming and pedestrian planning.

PTI, *Slow Down You're Going Too Fast,* Public Technology Incorporated (http://pti.nw.dc.us/task_forces/transportation/docs/trafcalm). Good introduction to traffic calming available on-line.

Seattle, *Making Streets that Work*, City of Seattle (www.ci.seattle.wa.us/npo/tblis.htm), 1996. Handbook for residents describes how to request various street improvements, including traffic calming.

Walkable Communities (http://www.walkable.org/) helps create people-oriented environments.

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#30

Alternative Work Schedules

Flextime, Staggered Shifts, Compressed Work Week

TDM Encyclopedia
Victoria Transport Policy Institute

About This Encyclopedia

Category

Improves Transport Choice

Description

Alternative work schedules include:

- *Flextime.* This means that employees are allowed some flexibility in their daily work schedules. For example, rather than all employees working 8:00 to 4:30, some might work 7:30 to 4:00, and others 9:00 to 5:30.
- *Staggered Shifts.* This means that shifts are staggered to reduce the number of employees arriving and leaving a worksite at one time. For example, some shifts may be 8:00 to 4:30, others 8:30 to 5:00, and others 9:00 to 5:30. This has a similar effect on traffic as flextime, but does not give individual employees as much control over their schedules.
- *Compressed Workweek (CWW).* This means that employees work fewer but longer days, such as four 10-hour days each week (4/40), or 9-hour days with one day off every two weeks (9/80).

Flextime and CWW are usually implemented as an employee and manager option (both employees and their managers must agree). They may vary from day-to-day or week-to-week, depending on circumstances. Of course, not all jobs are suitable for alternative schedules. Positions that require employees to provide service at a particular time and place require a rigid schedule. Not all workers can take advantage of flextime offered by employers due to other scheduling constraints, such as the need to coordinate activities with other family members. Two-thirds of employees surveyed by Picado (2000) have some flexibility in their work schedule, yet less than twenty percent of them actually shift their commute times to avoid congestion.

How it is Implemented

Alternative Work Schedule is typically implemented as part of a Commute Trip Reduction program. Employers may work with managers, employees and labor organizations to develop suitable policies. It may begin with a pilot project to test the concept, although informal alternative work schedules may already be common, so a program may simply formalize and support existing practices.

Such policies usually specify which job categories are suitable for alternative work schedules, what is required of employees to qualify for this option, and what criteria are to be used to evaluate the performance of employees on alternative schedules. It may involve a written agreement between employees and their managers that specifies employees' schedules, what is required to change schedules, and periodic reviews of the arrangement.

Alternative Work Schedule may require changes in management practices that reduce the need to have employees physically together at one time, including more outcome-oriented management practices (evaluating employees based on their performance rather than simply being at a desk), and increased use

of electronic communication.

Travel Impacts

Flextime reduces peak period congestion directly, and can make ridesharing and transit use more feasible (Freas and Anderson, 1991). Picado (2000) finds that employees with more flexible schedules tend have shorter commute trips (averaging 7-minutes per day time savings). Staggered shifts can reduce peak-period trips, particularly around large employment centers. Ewing (1993) estimates that flextime and Telework together can reduce peak-hour vehicle commute trips by 20-50%. Modarres (1993) found that flextime is a significant factor in Commute Trip Reduction program effectiveness in reducing peak-period traffic.

Compressed Work Weeks reduce total vehicle travel. One survey of commuters found that it could reduce automobile commutes by 7-10%, making it among the most effective commute trip reduction strategies considered (CUTR, 1998). Another analysis estimates that CWW can reduce up to 0.6% of VMT and up to 0.5% of vehicle trips in a region (Apogee, 1994). However, other research indicates that compressed work schedules may cause modest overall reductions in vehicle travel, in part because participants make additional trips during their non-work days (Ho and Stewart, 1992; Giuliano, 1995). Compressed Work Weeks may also encourage some employees to move further from worksites, or to drive rather than rideshare.

Table 1 **Travel Impact Summary**

Objective	Flextime	CWW	Comments
Reduces total traffic.	1	2	Flextime supports ridesharing
Reduces peak period traffic.	3	2	
Shifts peak to off-peak periods.	3	3	
Shifts automobile travel to alternative modes.	1	-1	CWW may reduce ridesharing.
Improves access, reduces the need for travel.	0	-1	CWW may encourage longer commutes and sprawl.
Increased ridesharing.	1	-1	CWW may reduce ridesharing.
Increased public transit.	1	0	CWW may reduce transit use.
Increased cycling.	0	0	
Increased walking.	0	0	
Increased Telework.	0	0	
Reduced freight traffic.	0	0	

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Benefits And Costs

Flextime benefits include reduced traffic congestion, support ridesharing and public transit use, and benefits to employees. Compressed Work Week reduces commute travel, although there may be little or no reductions in total vehicle travel if employees take additional car trips during non-work days, or move further from worksites. As a result, congestion reduction benefits tend to be larger than safety or environmental benefits. (Shefer and P. Rietvald, 1997; Zhou and Virginia Sisiopiku, 1997). See Safety Impacts of TDM for more discussion.

Schedule flexibility is highly valued by many employees and can increase their productivity and job satisfaction. Flextime and CWW help employees match family and education schedules, reduce commuting time and stress, reduce fears about being tardy, match rideshare and transit schedules, and work when they are most productive (some employees are morning people, others are not). One survey found that 68% of employees would like to have flexible work hours, and 53% would participate in a

compressed workweek (CTS, 1994). Since Flextime and CWW are usually implemented as an employee option, those who participate are almost always better off (or they would not choose the option).

Costs are primarily associated with increased administrative and management responsibilities. In some cases it may reduce productivity. Compressed Work Weeks may lead to more dispersed land use patterns.

Table 2 **Benefit Summary**

Objective	Flextime	CWW	Comments
Congestion Reduction	3	3	Both reduce peak-period driving.
Road & Parking Savings	1	2	Flextime reduces peak-period trips. CWW reduces total trips and parking requirements.
Consumer Savings	1	2	Reduces commuter stress. CWW reduces travel costs.
Transport Choice	3	3	Increases commuter choice. Flextime supports ridesharing and transit use.
Road Safety	0	1	CWW reduces commuting but may increase other trips.
Environmental Protection	0	1	CWW reduces commuting but may increase other trips.
Efficient Land Use	0	-1	CWW may encourage longer-distance commuting.
Community Livability	1	1	Rednces congestion.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Equity Impacts

Alternative Work Schedules can increase equity by better accommodating individual employees' needs, including the ability to rideshare or use public transit. Many economically and physically disadvantaged workers (e.g., single mothers, transit-dependent non-drivers, people with physical disabilities) place a particularly high value on these options. However, disadvantaged workers often jobs with inflexible schedules (factory staff, receptionists, service workers, etc.) and so may feel excluded and disadvantaged compared with employees who can use Alternative Work Schedules.

Table 3 **Equity Summary**

Criteria	Rating	Explanation
Treats everybody equally.	-1	Only appropriate for some jobs. Employees who cannot participate may feel excluded.
Individuals bear the costs they impose.	0	No impact.
Progressive with respect to income.	1	Benefits many low-income employees, but some are excluded.
Benefits transportation disadvantaged.	3	Improves commute choice and the convenience and feasibility of transit and ridesharing.
Improves basic mobility.	3	Can improve commute choice.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Applications

Alternative Work Hours are generally implemented by businesses, often as part of a Commute Trip Reduction or regional TDM Program. It is most appropriate for jobs that do not require rigid employee schedules, and in organizations that have effective methods to measure employee performance. It is particularly suitable in urban areas with serious traffic congestion problems.

Table 4 **Application Summary**

Geographic	Rating	Organization	Rating
Large urban region.	3	Federal government.	1

High-density, urban.	3	State/provincial government.	2
Medium-density, urban/suburban.	3	Regional government.	3
Town.	2	Municipal/local government.	3
Low-density, rural.	2	Business Associations/TMA.	3
Commercial center.	3	Individual business.	3
Residential neighborhood.	2	Developer.	1
Resort/recreation area.	2	Neighborhood association.	1
		Campus.	3

Ratings range from 0 (not appropriate) to 3 (very appropriate).

Relationships With Other TDM Strategies

Alternative work schedule is usually implemented as part of a Commute Trip Reduction program. It is often implemented along with Telework programs. It supports Ridesharing and Public Transit use by giving employers greater travel scheduling flexibility. Congestion Pricing can provide an additional incentive for employees to request and use Alternative Work Schedules.

Stakeholders

Alternative work schedules are primarily implemented by employers. Labor organizations can be involved in developing rules. Governments can encourage alternative work schedules as part of Commute Trip Reduction or regional TDM Program, and allow it for their own employees.

Barriers To Implementation

Alternative work schedules require changing institutional barriers and management practices that do not require constant oversight of employees.

Best Practices

Several organizations and publications listed below provide guidelines for flextime and Compressed Work Week. These include:

- Implement Alternative Work Schedule in conjunction with other TDM strategies, such as Congestion Pricing and Telework.
- Develop a formal policy and contract between employees and managers for alternative work schedules. This should identify job categories suitable for alternative work schedules, and what employees must do to qualify for alternative schedules.
- Develop appropriate performance measures for employees working alternative work schedules.
- Allow flextime to help commuters match transit and ridesharing schedules.

Case Studies and Examples

Flexible Work Hours As An Emission Reduction Strategy
(www.tc.gc.ca/envaffairs/subgroups1/passenger_urban/study1/FinalAppendices/appendix_e.htm)

Alternative work arrangements such as compressed workweeks and flexible work schedules are becoming more common. According to the Canadian Labour Market and Productivity Centre (analyzing data from the 1995 Statistics Canada *Survey of Work Arrangements*), approximately 10 percent of the workforce follows a compressed work week schedule and 25 percent have flexible work schedules.

There are many examples of these alternative work arrangements in public and private-sector employment. In Edmonton, Alberta, for example, a compressed workweek is one of several options available to City employees to reduce VKT. The city offers a 10 percent discount when employees purchase transit passes, and offers secure

bicycle parking facilities in City buildings, a compressed workweek for City employees, and modified parking allotments. The City of Winnipeg has implemented flexible work arrangements. The Royal Bank and the Toronto Star are examples of companies that have also implemented flexible work arrangements and modified workweeks.

Flexible Work Options (http://www.hr.upenn.edu/quality/flexoptions/default.htm)

The University of Pennsylvania has developed a Flexible Work Options Program as part of the university's Work Life Balance for employees. This program includes a detailed guide for managers and staff which includes model guidelines and agreement documents. Below is the guidebook's introduction.

> Flexible work options offer alternative approaches to getting work done through non-traditional work hours, locations, and/or job structures. They offer creative approaches for completing work while promoting balance between work and personal commitments. They do not reduce work hours or output. They cannot overcome an unmanageable assignment or difficult work relationship.
>
> Typical flexible work options are flextime (flexible start, stop and lunch times), flexplace (work away from the office, typically at home), compressed work schedules (compressing standard work week hours into fewer days), and part-time and job sharing assignments (less than full-time work, either for a reduced assignment, or a shared one).

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#15

Tele-Access

Telecommunications To Substitute for Physical Travel

TDM Encyclopedia
Victoria Transport Policy Institute

About This Encyclopedia

Category

Increases transport choice.

Description

Tele-Access refers to various ways that telecommunications (telephone, fax, email, websites, video connections, etc.) can substitute for physical travel. This includes:

Telework

This includes telecommuting, employees with mobile work (e.g., sales staff or field workers who rely heavily on telecommunications), and people who are self-employed and able to work from a home office due to efficient communications.

Telecommuting

This refers to salaried employees who are allowed to work from home or another location (such as a neighborhood telework office) in order to reduce commute travel. Telecommuting is often preformed on a part-time basis. For example, employees may telecommute a few days a week, while working on a particular project (such as a major report), or when they are ill.

Distance-Learning

This refers to use of telecommunications to allow teachers and students to minimize the need for physical meetings. Some colleges and universities offer distance-learning classes and degrees. Others use distance-learning for special projects.

Tele-Shopping (Internet Shopping)

This refers to use of telecommunications to facilitate retail purchases without a physical visit to a store.

Tele-Banking (Internet Banking)

This refers to use of telecommunications to perform banking and bill payment transactions.

Electronic Government

This refers to use of telecommunications by government agencies to provide services that would otherwise require visiting a government office.

Internet Business-to-Business (B2B) Transactions

This refers to Internet transactions used to replace common interactions between businesses, such as bidding, sales and planning. These are primarily for competitive and efficiency purposes (e.g., to identify the lowest bid for a good or service), but it can also reduce the need for physical meetings between staff.

How it is Implemented

Telecommuting is usually implemented by employers who establish policies that determine when

employees may telework and what practices they must observe when they do so. Employers may also provide equipment, such as portable computers and telephone lines. These policies are often established at the request of employees, who want to telework, or to give employees more flexibility in their jobs. Telecommuting is often part of Commute Trip Reduction programs.

Distance-Learning, Tele-Shopping, Tele-Banking, B2B Internet transactions, electronic government, and other applications of telecommunication are implemented by businesses and government agencies to improve services, reduce costs and address particular problems.

Travel Impacts

How much employees can Telework, and how much Telework reduces motor vehicle travel varies depending on several factors. Some estimates indicate that up to 50% of all jobs are suitable for Teleworking (Nilles, 1996), but the actual portion of employees who can telecommute appears to be much lower. Many jobs require access to special materials and equipment, or frequent face-to-face meetings. Not all employees want to telework or have suitable home conditions.

Teleworking can significantly reduce a participating employee's commute travel. For example, a twice-a-week Teleworker reduces commute trips by 40%. One study of neighborhood telework centers found that they reduce commute VMT by about 50%, although less effect on emissions, since they still require cold start automobile trips (Henderson and Mokhtarian, 1996). Teleworking appears to be particularly attractive to employees with longer-distance commutes, so that the reduction in VMT can be larger than the reduction in trips.

However, individuals tend to devote a relatively constant amount of time to travel (averaging about 75 minutes a daily) regardless of transport conditions (Levinson and Kumar, 1995). Although it may not be true in all cases, this suggests that a significant portion of travel time savings may be reinvested in additional travel (called a "takeback" effect). As a result, total travel impacts may be significantly lower than the short-term reduction in commute trips because:

- Employees may use teleworking to move further from their worksite, for example, choosing a home of job in a rural area or another city because they know that they only need to commute two or three days a week. In some cases this may encourage more urban sprawl.
- Teleworkers often make additional vehicle trips to run errands that would otherwise have been made during a commute.
- Vehicles not used for commuting may be driven by other household members.

A survey of 400 U.S. Teleworkers indicates that Telework provides net reductions in vehicle travel averaging 30 miles per telecommute day, and found no evidence of increased sprawl (Nilles, 1996). This study estimates that if 10% of the workforce Telecommutes on any given day, total vehicle travel would decline by 4%. Mokhtarian (1997) concludes that a more realistic estimate is that 1-2% of vehicle travel could be reduced by telework, and long-term impacts may be even smaller if it encourages more urban dispersion.

Mokhtarian (2000) estimates that 6.1% of the California workforce may currently Telecommute, 1.2 days a week on average, with the result that 1.5% of the workforce may be telecommuting on any given day. The vehicle-miles eliminated by this level of Telecommuting constitute at most 1.1% of total household vehicle travel. Taking into account takeback effects (additional non-commute travel and longer commute distances), it is estimated that the net reduction is 0.6% or less of household travel. Reductions in the future could be smaller as commute distances of Telecommuters fall closer to the average and as the stimulation effect grows.

The travel impacts of other types of tele-access are equally difficult to predict. Tele-shopping and Electronic Government transactions may increase the number of commercial and government transactions that occur, without necessarily reducing the number of physical trips to stores and government agencies. B2B transactions may reduce some business trips, but may encourage businesses to use more distant suppliers, resulting in longer travel distances for freight delivery, or when meetings between staff are needed.

Some studies suggest that telecommunications and transportation are complementary: telecommunications improvements tend to stimulate travel by reducing costs and increasing opportunities (Plaut, 1997). It is therefore inappropriate to assume that electronic communications always substitutes for, and reduces, physical travel. Telecommunications can have complex and difficult to predict impacts on overall vehicle travel. Significant reductions in vehicle travel require that other TDM strategies be implemented which provide an incentive to reduce driving.

Table 1 **Travel Impact Summary**

Objective	Rating	Comments
Reduces total traffic.	2	Reduces commute trips, but may increase other vehicle travel.
Reduces peak period traffic.	3	Reduces commute trips.
Shifts peak to off-peak periods.	1	May increase non-commute trips.
Shifts automobile travel to alternative modes.	0	
Improves access, reduces the need for travel.	0	
Increased ridesharing.	0	
Increased public transit.	0	
Increased cycling.	0	
Increased walking.	0	
Increased Telework.	3	
Reduced freight traffic.	0	

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Benefits And Costs

Since Teleworking reduces commute trips it can significantly reduce congestion and parking costs. Telecommuting and other forms of Tele-Access increase consumer choice, convenience and financial savings. Pratt (1999) describes a variety of benefits from telework, particularly related to employee satisfaction and productivity.

Because a portion of travel reductions are often offset by increases in other types of vehicle travel and more dispersed land use, road safety and environmental benefits may be small, and sprawl may actually increase, unless telework is matched with incentives to reduce vehicle travel. Telework may increase community livability by reducing vehicle traffic and allowing more people to work and shop from particularly in physically-isolated communities, or people who have mobility constraints.

Costs include increased expenses for computers and telecommunications, although these costs are declining, and many employees already have home offices for personal use. Increased sprawl is another possible cost of Tele-Access.

Table 2 **Benefit Summary**

Objective	Rating	Comments

Congestion Reduction	3	Reduces commute trips.
Road & Parking Savings	2	Reduces vehicle travel and trips.
Consumer Savings	2	Reduces vehicle travel.
Transport Choice	3	Increases transport choice and convenience.
Road Safety	1	Reduces vehicle travel.
Environmental Protection	1	Reduces vehicle travel.
Efficient Land Use	-2	Can encourage more dispersed land use.
Community Livability	2	Reduces vehicle travel.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Equity Impacts

Not everybody benefits equally from Tele-Access. Telework is only suitable for jobs, and so not all employees benefit from it, so some employees may feel left out, although they are not actually made worse off. Teleworking can improve employment opportunities for some lower income and transportation disadvantaged groups (for example, by allowing people in economically disadvantaged, isolated communities to have jobs that would otherwise require too long a commute), but labor organizations are concerned that it could lead to abuse of vulnerable employees (such as "electronic sweatshops" for keypunch operators). Lower-income households that cannot afford Internet access may be unable to use telecommunications services, and may be disadvantaged if physical services (such as local banks and printed documents) become less available.

Table 3 Equity Summary

Criteria	Rating	Comments
Treats everybody equally.	-1	Some employee categories may be excluded.
Individuals bear the costs they impose.	0	No significant impact.
Progressive with respect to income.	0	Mixed. Increases transport choices, but some concerns exist about labor abuse.
Benefits transportation disadvantaged.	3	Increases employment choices for non-drivers.
Improves basic mobility.	3	Can improve access to education and employment.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Applications

Tele-Access is appropriate for appropriate in just about any geographic area. In urban and suburban areas it helps reduce congestion. In rural areas it allows residents better access to employment and services. Telework can be encouraged by federal, state and regional governments through TDM Programs, but is actually implemented by individual businesses.

Table 4 Application Summary

Geographic	Rating	Organization	Rating
Large urban region.	3	Federal government.	1
High-density, urban.	3	State/provincial government.	2
Medium-density, urban/suburban.	3	Regional government.	2
Town.	3	Municipal/local government.	2
Low-density, rural.	3	Business Associations/TMA.	2
Commercial center.	3	Individual business.	3
Residential neighborhood.	3	Developer.	0
Resort/recreation area.	3	Neighborhood association.	1
		Campus.	3

Ratings range from 0 (not appropriate) to 3 (very appropriate).

Relationships With Other TDM Strategies

Telework is often promoted as part of TDM Programs, Commute Trip Reduction, and Transportation Management Associations. It is most effective at achieving TDM objectives if matched with disincentives to drive, including and supported by Commute Financial Incentives, Road Pricing, Parking Pricing, Parking Management, Distance-Based Fees, and Fuel Tax Increases.

Stakeholders

Tele-Access can involve governments, businesses, employers, employees and labor organizations.

Barriers To Implementation

Tele-Access can face institutional and technical barriers. Telework often involves changing organizational and management practices. It may require additional funding or consideration when equipment is selected (for example, purchasing portable computers rather than desktop models). There is sometimes opposition to telework programs from labor organizations concerned about negative impacts on vulnerable employees. Many residential communities forbid working at home, which may make telecommuting technically illegal, but such regulations do not seem to be enforced.

Best Practices

Organizations such as the International Telework Association, and various publications provide guidance on developing telecommuting programs. Best practices include:

- Include Telework as one component of a comprehensive Commute Trip Reduction program.
- Develop a formal policy and contract between employees and managers for Telework. This should identify which job categories are suitable for telework, and what employees must do to maintain this.
- Develop appropriate performance measures for employees who telework.

Examples and Case Studies

Puget Sound Telecommuting Demonstration Project

The Puget Sound Telecommuting Demonstration Project was initiated in 1990 by the Washington State Energy Office (WSEO). It included 25 public agencies and private firms in the Seattle area. A conference held in 1989 was used to recruit participant employers. These groups signed a memorandum of understanding that outlined the projects polices and procedures. WSEO staff provided assistance to employers in establishing telecommuting programs. After two years the project found these results:

- Most participants telecommute an average of one day a week.
- Benefits by teleworkers included increased job satisfaction, enhanced performance, and greater flexibility. Some concerns were raised over job security.
- Reasons given by participants who discontinued telecommuting included not liking it, concerns about being less visible in the office, problems in the office and lack of adequate equipment.
- Supervisors generally rated telecommuters' performance the same or better as days spent in the office. A few cases of declining performance were noted.
- An average of 26 fewer annual commute trips were recorded. Approximately 61% of participants drove to work, 18% carpooled, and 17 rode transit. The results indicate that each teleworker reduced an average of 1,900 annual kilometers of vehicle travel.

First Interstate Bank

First Interstate Bank employs approximately 3,500 people in the Los Angeles area. It established a telecommuting

program in 1991. The objectives of the program include increased productivity and flexibility for employees.

Participants must have worked for the bank at least one year. An employee submits a formal request to telecommute, which includes an equipment checklist. A signed agreement is used to ensure that all parties understand the policies, procedures and expectations. Most telecommuters work from home, but a few work at telework centers. Some equipment is provided by the bank, and business-related telephone calls are reimbursed.

Response to the program has been positive for managers and telecommuters. Benefits noted by supervisors include increased productivity and less time off. Telecommuters report fewer distractions and greater flexibility in balancing home and family responsibilities.

TRW

TRW uses telecommuting throughout its offices and plants, including more than 1,000 employees in Orange County, California. The telecommuting program is governed by guidelines that identify the responsibilities of all groups and establishes ground rules for participating in the program. One issue for TRW, which does defense and aerospace work, is information access and security for telecommuters. To address these concerns the company developed enhanced local area network connections for telecommuters' homes. The program has been well received by staff and management. Benefits include reduced stress, increased productivity and reduced vehicle travel.

State of Arizona Telecommuting Program (USDOT, 1997)

Arizona state agencies have allowed telecommuting since a pilot project was established in 1989. The program includes policies and information materials to promote telecommuting within all state agencies. The program has expanded, and has a goal that 15% of state agency personnel participate in some type of telecommuting. An evaluation performed in 1996 found:

- Senior managers tend to be positive toward telecommuting, due to their perception of increased work efficiency and productivity.
- Supervisors were also supportive of telecommuting, due to the perception that telecommuters have fewer disruptions and are better able to work during their peak performance times. Improved staff morale among telecommuters was also noted.
- Both telecommuters and non-telecommuting state employees indicated support for the program, due to increased productivity, job satisfaction and flexibility.
- A public opinion survey indicated general support toward telecommuting.

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#43

Nonmotorized Transportation

Bicycle and Pedestrian Improvements

TDM Encyclopedia
Victoria Transport Policy Institute

About This Encyclopedia

Category

Improves Transport Choice

Description

Nonmotorized transportation includes walking, cycling, skating, scootering and wheelchair travel (most planning focuses on walking and cycling, but many concepts also apply to other nonmotorized modes). These modes provide both recreation (they are an end in themselves) and transportation (they provide access to goods and activities), although users may consider a particular trip to serve both (users choose a nonmotorized mode, although it takes longer, because they enjoy the activity).

There are many specific ways to improve nonmotorized transportation (ADONIS, 1998; Litman, et al., 2000). Major categories include:

- Better sidewalks, crosswalks, paths and bikelanes.
- Reduce barriers and special hazards to nonmotorized transport.
- Develop pedestrian oriented land use and building design (see New Urbanism).
- Street furniture (e.g., benches) and design features (e.g., smaller scale lighting design).
- Better road maintenance to accommodate cycling.
- Traffic Calming, speed reductions and Vehicle Restrictions.
- Safety education and law enforcement.
- Integration with transit (Bike/Transit Integration and Transit Oriented Development).
- Improved bike parking.
- Address Security Concerns of pedestrians and cyclists.

How it is Implemented

Pedestrian and cycling improvements are usually implemented by local governments, sometimes with funding and technical support of regional or state/provincial transportation agencies. It usually begins with a pedestrian and bicycle plan to identify problems and prioritize projects (Litman, et al., 2000). Implementation may require special funds, either shifting funds within existing transportation, a new budget allocation, or grants.

Travel Impacts

In recent years several evaluation tools have been developed to predict demand for nonmotorized travel, evaluate walking and cycling conditions and predict the effects of pedestrian and cycling improvements. (see Evaluating Nonmotorized Transport).

Nonmotorized improvements can substitute directly for automobile trips. Walking and cycling improvements can also help increase use of public transit and ridesharing. A relatively short nonmotorized trip often substitutes for a longer car trip. For example, a shopper might choose between

walking to a small local store, or driving a longer distance to shop at a supermarket. Pedestrian and bicycle improvements are critical to Smart Growth, New Urbanism, and Transit Oriented Development, which can result in significant reductions in per-capita motor vehicle trips, as discussed in the Land Use Impacts chapter.

Communities that improve nonmotorized travel conditions often experience significant increases in nonmotorized travel and related reductions in vehicle travel (PBQD, 2000). One study found that residents in a pedestrian friendly community walked, bicycled, or rode transit for 49% of work trips and 15% of their non-work trips, 18- and 11-percentage points more than residents of a comparable automobile oriented community (Cervero and Radisch, 1995). Another study found that walking is three times more common in a community with pedestrian friendly streets than in otherwise comparable communities that are less conducive to foot travel (Moudon, *et al*, 1996).

Each mile of bikeway per 100,000 residents increases bicycle commuting 0.075 percent, all else being equal (Nelson and Allen, 1997). Although only about 1% of total U.S. trips are made by bicycle, several North American communities (Palo Alto, Madison, Boulder, Eugene) have cycling rates five to ten times higher (Comsis, 1993). International studies also find significant differences in non-motorized travel patterns, as illustrated in the table below. High levels of non-motorized travel in such geographically diverse communities, and lower levels in otherwise similar areas, indicate that transport policies and community attitudes are more important than geography or climate in determining bicycle use.

Table 1 **Mode Split in Urban Areas** (Pucher and Lefevre, 1996)

	Car	Transit	Cycling	Walking	Other
Austria	39%	13%	9%	31%	8%
Canada	74%	14%	1%	10%	1%
Denmark	42%	14%	20%	21%	3%
France	54%	12%	4%	30%	0%
Germany	52%	11%	10%	27%	0%
Netherlands	44%	8%	27%	19%	1%
Sweden	36%	11%	10%	39%	4%
Switzerland	38%	20%	10%	29%	3%
UK	62%	14%	8%	12%	4%
USA	84%	3%	1%	9%	2%

The majority of vehicle trip reductions associated with higher-density land use patterns result from shifts to nonmotorized travel. This suggests that pedestrian access (i.e., the ability to access destinations such as schools and shopping by walking) may be more important than the quality of transit service in reducing total vehicle trips. However, a commitment to transit appears to "leverage" higher-density, more pedestrian-oriented land use and travel habits, so transit investments are often key to improving nonmotorized travel.

Many communities have significant latent demand for nonmotorized travel. That is, people would walk and bicycle more frequently if they had suitable facilities and resources (Komanoff and Roelofs, 1993). A U.S. survey found that 17% of adults claim they would sometimes bicycle commute if secure storage and changing facilities were available, 18% would if employers offered financial incentives, and 20% would if they had safer cycling facilities ("A Trend On the Move: Commuting by Bicycle," 1991). The table below summarizes a Canadian public survey indicating high levels of interest in cycling and walking.

Table 2 **Active Transportation Survey Findings** (Environics, 1998)

	Cycle	Walk
Currently use this mode for leisure and recreation.	48%	85%
Currently use this mode for transportation.	24%	58%
Would like to use this mode more frequently.	66%	80%
Would cycle to work if there "were a dedicated bike lane which would take me to my workplace in less than 30 minutes at a comfortable pace."	70%	NA
Support for additional government spending on bicycling facilities.	82%	NA

Some TDM studies conclude that walking and cycling improvements have little impact on overall vehicle travel (Comsis, 1993; Apogee, 1994), because they only consider current commute trips that can shift directly to nonmotorized modes with no changes in destinations or land use. Potential travel impacts are much greater if walking and cycling are integrated with public transit, and with Smart Growth development practices that reduce travel requirements, for example, by locating schools and shops within residential neighborhoods. Pedestrian improvements around worksites can increase transit and rideshare use, because without these employees may feel the need to have a car to run errands during breaks.

Travel surveys and traffic counts usually under-record nonmotorized trips, because they ignore or undercount short trips, non-work travel, travel by children, recreational travel, and nonmotorized links (BTS, 2000). For example, trips that are classified as "auto" or "transit" trips are often actually "walk-auto-walk," or "walk-bus-walk" trips, yet the walking component is not usually counted, even if it takes place on a roadway. One study found that the actual number of nonmotorized trips is six times greater than what conventional surveys indicate (Rietveld, 2000). In 2000, the Southern California Metropolitan Transportation Authority increased the portion of nonmotorized travel in their models from about 2% of regional trips (based on conventional travel surveys) up to about 10% (based on more comprehensive travel data from the 1995 National Personal Transportation Survey).

Table 3 **Travel Impact Summary**

Objective	Rating	Comments
Reduces total traffic.	2	
Reduces peak period traffic.	2	
Shifts peak to off-peak periods.	0	
Shifts automobile travel to alternative modes.	3	
Improves access, reduces the need for travel.	1	Supports higher-density, mixed land use.
Increased ridesharing.	0	
Increased public transit.	2	Pedestrian access affects public transit use.
Increased cycling.	3	
Increased walking.	3	
Increased Telework.	0	
Reduced freight traffic.	0	

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Benefits And Costs

Nonmotorized transportation provides a number of benefits and costs.

Mobility Benefits (See Evaluating Transportation Choice)

Improved nonmotorized transport conditions increase travel choice and mobility, which particularly benefits non-drivers. People who are transportation disadvantaged often rely heavily on nonmotorized transportation, for trips made entirely by walking or cycling, and to access transit. Nonmotorized transportation provides basic mobility.

TDM Benefits

Shifts from driving to nonmotorized modes can congestion reduction, road and parking facility savings, consumer savings, environmental protection and increase community livability (Litman, 1999; Buis, 2000). Nonmotorized transportation supports other alternative modes (public transit and ridesharing), and Smart Growth land use objectives, including higher density, mixed-use development to increase access, and reduce per capita pavement.

Safety and Health Impacts (See Safety Impacts of TDM)

Nonmotorized modes have relatively high crash injury and fatality rates per mile of travel, but this is offset by reduced risk to other road users, and by the fact that pedestrians and cyclists tend to travel less overall than motorists. International research suggests that shifts to nonmotorized transport result in overall increases in road safety. For example, the Netherlands has a high level of nonmotorized transport, yet the overall traffic death rate per capita, and the death rate of cyclists per million km ridden, is much lower than in automobile dependent countries (Pucher and Dijkstra, 2000). Pedestrian fatalities per billion km walked are less than a tenth as high, and bicyclist fatalities are only a quarter as high, as in the United States.

Walking and cycling provides significant aerobic fitness health benefits, which more than offsets the increased crash risk (Roberts, et al., 1996). According to one major study, "Regular walking and cycling are the only realistic way that the population as a whole can get the daily half hour of moderate exercise which is the minimum level needed to keep reasonably fit." (Physical Activity Task Force, 1995). Danish bicycle commuters have a 40% reduction in mortality compared with people who do not cycle to work, which suggests that the incremental risks of bicycle transportation are far outweighed by health benefits, at least for experienced adult cyclists riding in a bicycle-friendly community (Andersen, et al, 2000).

Recreation Benefits

Nonmotorized transport provides recreational benefit. Many people enjoy walking and cycling and the healthy exercise they provides. They are among the most common forms of physical recreation. Some people argue that transportation funding should not be spent on recreational activities, such as walking and cycling facilities, yet a significant portion of motor vehicle travel is for recreation. It makes no sense to refuse funding for a path or bikelane, yet fund roadway capacity so motorists can drive to a healthclub where they walk a treadmill or pedal a stationary bike. This suggests that both transportation and recreational funding can be devoted to nonmotorized improvements.

Costs

Costs are generally associated with program expenses and facility improvements. A typical bike lane costs $52,000 per mile, or 30¢ per 2.1 mile trip bicycle trip if used by 80 cyclists a day, while a typical new sidewalk is estimated to cost 12¢ per trip (Comsis, 1993). High-quality bike racks and lockers typically cost $100-500 per bike. Some nonmotorized transportation improvements, such as traffic calming, may reduce motor vehicle traffic speeds.

Table 4 **Benefit Summary**

Objective	Rating	Comments
Congestion Reduction	2	Reduces automobile use.
Road & Parking Savings	3	Reduces automobile use.
Consumer Savings	3	Provides affordable mobility.
Transport Choice	3	Increases travel choices.
Road Safety	3	Reduces automobile use. Also provides health benefits.
Environmental Impacts	3	Reduces automobile use, particularly high-polluting short trips.
Land Use Impacts	3	Reduces automobile use. Encourages higher-density development.
Community Livability	3	Reduces automobile use and increases local access.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Equity Impacts

Since nearly everybody walks, and many people cycle, nonmotorized transportation improvements can

benefit nearly everybody, although some people benefit more than others from a particular policy or project. Although nonmotorized improvements may require public resources (money and land devoted to roads and sidewalks), the cost per trip is usually less than the social costs of automobile travel (money and land devoted to roads and parking facilities).

Litman (1998) describes how people who drive less than average overpay their share of local transportation expenditures, since their local taxes fund roadway expenses that are primarily needed for the sake of automobile traffic, so increased funding for nonmotorized transportation is often justified for the sake of horizontal equity. Lower-income and transportation disadvantaged people often rely heavily on nonmotorized transportation, and so benefit significantly by nonmotorized improvements. Nonmotorized transportation is often critical for providing basic mobility.

Table 5 **Equity Summary**

Criteria	Rating	Comments
Treats everybody equally.	2	Almost everybody uses nonmotorized transport.
Individuals bear the costs they impose.	2	Requires public resources, but usually less than costs for automobile trips.
Progressive with respect to income.	3	Lower income people rely on nonmotorized transport.
Benefits transportation disadvantaged.	3	Transport disadvantaged rely on nonmotorized transport.
Improves basic mobility.	3	Nonmotorized transport provides basic mobility.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Applications

Nonmotorized transportation improvements are particularly important in areas with high levels of walking and cycling, higher-density commercial and residential areas, and resort areas. They are provided primarily by regional and local governments, sometimes with federal and state/provincial support. Businesses can provide sidewalks, bicycle parking, and shower facilities.

Table 6 **Application Summary**

Geographic	Rating	Organization	Rating
Large urban region.	3	Federal government.	1
High-density, urban.	3	State/provincial government.	2
Medium-density, urban/suburban.	3	Regional government.	2
Town.	3	Municipal/local government.	3
Low-density, rural.	2	Business Associations/TMA.	3
Commercial center.	3	Individual business.	2
Residential neighborhood.	3	Developer.	3
Resort/recreation area.	3	Neighborhood association.	3
		Campus.	3

Ratings range from 0 (not appropriate) to 3 (very appropriate).

Relationships With Other TDM Strategies

Nonmotorized transportation supports most other TDM strategies, particularly Transit and Ridesharing, and Smart Growth. It is supported by Commute Trip Reduction programs, Parking Management, Traffic Calming, New Urbanism, and Transit Oriented Development. Least Cost Planning and Institutional Reforms can help increase public support for non-motorized transport improvements. Address Security Concerns can be an important part of improving pedestrian and cycling conditions.

Stakeholders

Nonmotorized transportation improvements are usually implemented by local or regional governments,

sometimes with state or provincial transportation agency support. Some measures, such as sidewalks, paths and bicycle parking facilities, are implemented by businesses and developers.

Barriers To Implementation

Nonmotorized transportation programs are often disadvantaged by professional practices and funding that favors motorized modes, and development practices that result in lower-density, single-use land use patterns.

Best Practices

A number of guides and resources including ADONIS (1998) and Litman, et al. (2000) provide information on best practices for improving nonmotorized travel conditions and encouraging nonmotorized transport. These include:

- Integrate nonmotorized planning into all transport and land use planning activities.
- Educate all transportation professionals in nonmotorized transportation planning principles.
- Fund nonmotorized planning at a comparable rate as other travel modes.
- Insure that all roads are suitable for walking and cycling unless these modes are specifically prohibited and suitable alternatives are available.
- Use current planning practices and design standards.
- Include nonmotorized travel in transportation surveys and models.
- Create pedestrian-oriented centers and neighborhoods.
- Perform user surveys to identify problems and barriers to nonmotorized travel.
- Use traffic calming and other traffic control measures to make street environments safer and more pleasant for nonmotorized transport.

Examples and Case Studies

Bicycling

Santa Barbara (www.ci.santa-barbara.ca.us/pworks/transp/bike_plan/bmp_toc.html.)

A comprehensive plan for integrating bicycling infrastructure into the city's street network, including on- and off-road facilities, and ancillary facilities such as bicycle parking, signing and other amenities.

Portland, OR (www.trans.ci.portland.or.us/traffic_management/bicycle_program/BikeMasterPlan/Default.htm)

During the 1990's the City of Portland has developed an extensive bicycling infrastructure including on- and off-street routes, bicycle parking, and other facilities.

Philadelphia, Pa (www.phila.gov/departments/street/html/the_bicycle_network.html)

The City was awarded more than $3 million of Congestion Mitigation and Air Quality program funds to plan and implement a city-wide bicycle network featuring bike lanes, trails, and bicycle parking facilities.

Tucson, AZ (www.ci.tucson.az.us/transport/planning/overview.html)

With a network of more than 240 miles of bikeway already on the ground, the Tucson Bikeway Improvement Plan identifies more than 50 additional miles of striped bike lanes that will be added to the system by 2001.

New York City, NY (www.ci.nyc.ny.us/html/dcp/html/bndprods.html#b)

This award-winning plan identifies more than 900 miles of on- and off-street facilities and recommends a series of policies and programs which would promote bicycle use, encourage integration with transit, and link to the City's greenway system. The activist group, *Transportation Alternatives*, has published their own *Bicycle Blueprint* for the city (http://www.transalt.org/blueprint/chapter16/chapter16e.html)

Wisconsin Department of Transportation (www.dot.state.wi.us/dtim/bop/finalbike.html)

Adopted in December, 1998, the Wisconsin Bicycle Transportation Plan 2020 provides a blueprint for more and safer bicycle trips with recommendations and roles for a variety of government agencies and groups.

Pedestrians

City of Portland, OR (www.trans.ci.portland.or.us/Sidewalks_and_Pedestrians.html)

The City has adopted a two-part plan: Part One outlines the policies and plans for improving conditions for walking and Part Two is a detailed design manual for pedestrian facilities. The *Portland Pedestrian Design Guide* and *Pedestrian Master Plan* (http://www.trans.ci.portland.or.us/Traffic_Management/Trafficcalming) are outstanding pedestrian planning resources. It developed an excellent process for prioritizing pedestrian improvements, taking into account demand and current conditions.

City of Madison, WI (www.ci.madison.wi.us/reports/execsum2.pdf)

Adopted in September 1997, Madison's visionary plan for walking incorporates planning, design, maintenance, and long-term goals and objectives. Madison was one of the first communities to adopt a separate plan for walking.

Arlington County, VA (www.co.arlington.va.us/dpw/planning/ped/ped.htm)

Arlington County is one of the nation's densest urban areas and has developed a pedestrian plan that builds on the accessibility of two major transit corridors in the County. An extensive sidewalk building program is complemented by a neighborhood traffic calming program, all directed by citizen task forces.

Washington State DOT (www.wsdot.wa.gov/hlrd/sub-defaults/pedestrian-default.htm)

Washington State Department of Transportation adopted a Pedestrian Policy Plan in 1993 that focused on local and regional planning for pedestrians, necessary pedestrian facility types and locations, and who should pay for them.

ODOT (www.odot.state.or.us/techserv/bikewalk)

The Oregon Department of Transportation has established a comprehensive pedestrian (and bicycle) planning and design document.

European Pedestrianization (Beatley, 2000)

Many European cities have become increasingly pedestrianized, including car-free commercial districts in older downtowns, and woonerf residential streets (in Dutch, *woon* means "residential" and *erf* means "yard) where vehicles traffic is slowed to walking speeds. In the United Kingdom they are called "Home Zones." There are now an estimated 6,000 woonerf in the Netherlands.

Nonmotorized Transport Safety Programs

European Pedestrian and Bicyclist Safety (Pucher and Dijkstra, 2000)

In the United States, pedestrian fatalities are 36 times higher, and bicycling fatalities are 11 times higher, than car occupant fatalities per km traveled. Walking and bicycling can be made quite safe, however, as shown by much lower fatality rates in The Netherlands and Germany. Pedestrian fatalities per billion km walked are less than a tenth as high, and bicyclist fatalities are only a quarter as high, as in the United States. The Netherlands and Germany have long recognized the importance of pedestrian and bicyclist safety. Over the past two decades these countries have undertaken a wide range of measures to improve safety: better facilities for walking and bicycling; urban design sensitive to the needs of non-motorists; traffic calming of residential neighborhoods; restrictions on motor vehicle use in cities; rigorous traffic education of both motorists and non-motorists; and strict enforcement of traffic regulations protecting pedestrians and bicyclists. The United States could adopt many of the same measures to improve pedestrian and bicycling safety here. The necessary technology and methods are already available, with decades of successful experience in Europe.

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"Efficiency - Equity - Clarity"

#25

Bicycle and Walking Encouragement

TDM Encyclopedia
Victoria Transport Policy Institute

About This Encyclopedia

Category

Incentive to Use Alternative Modes

Description

The following programs and strategies can encourage walking and cycling for transportation:

- Bicycle commuting campaigns and contests. These often involve individuals and teams that compete to see which can commute most by bicycle or other alternative modes.
- Bicycle storage (secure racks or lockers), and showers and changing areas at employment and other activity centers.
- Education programs that teach basic riding skills.
- Cycling maps, showing recommended cycling routes and facilities, roadway conditions (shoulders, traffic volumes, special barriers to cycling, etc.) hills, recreational facilities, and other information helpful to cyclists.
- Bicycles provided by employers and community organizations to rent, loan or borrow.
- Reimbursement of employee cycling expenses, as with automobile mileage.
- Cycling and walking events and activities, particularly on trails and cycling routes.
- Programs to encourage use of bicycles for deliveries and other commercial uses.
- Tourist promotion materials highlighting cycling and walking.

How It Is Implemented

Bicycle and walking encouragement programs are usually implemented by community groups, including including cycling organizations, local transportation agencies, employers, Transportation Management Associations, chambers of commerce and tourist promotion organizations, and individual businesses.

Travel Impacts

These programs can help increase nonmotorized transportation. Impacts can be particularly significant during a particular campaign and contest. Although the largest effect may be temporary, the experience can lead participants to long-term changes in travel behavior. See Evaluating Nonmotorized Transport chapter for more discussion of travel impacts.

Table 1 **Travel Impact Summary**

Objective	Rating	Comments
Reduces total traffic.	2	
Reduces peak period traffic.	2	
Shifts peak to off-peak periods.	0	
Shifts automobile travel to alternative	2	Encourages nonmotorized transportation.

modes.		
Improves access, reduces the need for travel.	0	
Increased ridesharing.	0	
Increased public transit.	0	
Increased cycling.	3	Encourages cycling.
Increased walking.	3	Encourages walking.
Increased Telework.	0	
Reduced freight traffic.	0	

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Benefits and Costs

Shifts from driving to cycling or walking can provide traffic congestion reduction, road and parking facility cost savings, environmental improvement, increased safety, increased community livability and improved public health (Roberts, et al, 1996; Litman, 1999; Buis, 2000). Safety benefits vary depending on circumstances and perspective; although nonmotorized modes tend to have higher casualty rates per unit of travel, this is offset by reduced risk to other road users and reduced total mileage, particularly if TDM programs include safety education and marketing (see Safety Impacts of TDM) Cycling encouragement programs increase transport choice by providing support and increasing public acceptance of nonmotorized travel.

Costs include program expenses and any increase in crash risk to cyclists and pedestrian. This additional risk is offset by reductions in risk to other road users, and improved health due to increased aerobic exercise. One major study found that Danish workers who regularly commute by bicycle have a 40% reduction in mortality compared with people who do not cycle to work (Andersen, et al, 2000), which suggests that the incremental risks of bicycle transportation are far outweighed by health benefits, at least for inexperienced adult cyclists riding in a bicycle-friendly community. Pucher and Dijkstra (2000) discuss these risks and describe ways to minimize crash risk to pedestrians and cyclists.

Table 2 **Benefit Summary**

Objective	Rating	Comments
Congestion Reduction	1	Reduces automobile travel.
Road & Parking Savings	2	Reduces automobile travel.
Consumer Savings	2	Reduces automobile travel.
Transport Choice	1	Increases choice for people who can walk or cycle.
Road Safety	2	Mixed crash impacts. Overall beneficial to public health.
Environmental Protection	3	Reduces automobile travel.
Efficient Land Use	2	Reduces automobile travel. Encourages higher-density.
Community Livability	3	Reduces automobile travel, improves street environment.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Equity Impacts

Most people can walk or cycle, although some may have few opportunities to use nonmotorized modes as a substitute for driving because they live in automobile-dependent areas. Programs that promote cycling and walking for transportation can benefit lower-income and transportation disadvantaged people by increasing public support and acceptance of nonmotorized travel. These programs may require subsidies, although these are often less than subsidies for automobile travel.

Table 3 **Equity Summary**

Criteria	Rating	Comments
Treats everybody equally.	0	Some people who cannot cycle may feel excluded.

Individuals bear the costs they impose.	0	May require subsidies, but often less than for a car trip.
Progressive with respect to income.	1	Many lower-income people cycle for transport.
Benefits transportation disadvantaged.	1	Many non-drivers cycle for transport.
Improves basic mobility.	1	Yes

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Applications

Walking and cycling promotion is most appropriate and effective in geographic areas and among demographic groups that are suitable for nonmotorized transport. Such programs can be sponsored by local governments, business associations, neighborhood associations or educational organizations.

Table 4 **Application Summary**

Geographic	Rating	Organization	Rating
Large urban region.	2	Federal government.	1
High-density, urban.	2	State/provincial government.	2
Medium-density, urban/suburban.	2	Regional government.	2
Town.	2	Municipal/local government.	3
Low-density, rural.	1	Business Associations/TMA.	3
Commercial center.	2	Individual business.	2
Residential neighborhood.	2	Developer.	0
Resort/recreation area.	2	Neighborhood association.	3
College/university communities.	3	Campus.	3

Ratings range from 0 (not appropriate) to 3 (very appropriate).

Relationships With Other TDM Strategies

This strategy is closely related to Nonmotorized Transportation Improvements and Bike/Transit integration. It supports and is supported by Commute Trip Reduction, School Trip Management, Campus Transportation Management, and other strategies that provide incentives to reduce automobile travel.

Stakeholders

A public agency or non-profit organization usually organizes these programs. They are often supported as part of Commute Trip Reduction and Transportation Demand Management programs. Some national organizations such as the League of American Bicyclists (which sponsors *National Bike to Work Month*), and Climate Solutions provide planning and marketing resources. Media and corporate support can be important.

Barriers To Implementation

These programs require organizational leadership and funding. There is seldom opposition to such programs, but some people may be skeptical of their benefits.

Best Practices

Organizations listed below have experience operating various types of cycling and walking campaigns, and provide resources for developing local programs. Cleary and McClintock (2000) provide recommendations for employee cycling program development. Best practices include:

- Create a clear, consistent and positive message about the benefits of nonmotorized travel.
- Help identify and overcome barriers to nonmotorized transport, including bottlenecks in the street system, lack of education resources, lack of bicycle parking, and inadequate support from employers. Use

promotional campaigns as part of an overall program to improve walking and cycling conditions.

- Find opportunities for cooperation with other organizations, including recreation, public health, community development, schools, tourist promotion and neighborhood organizations.
- Work with local planners, employers and employees who cycle to design and improve cycling facilities and services. Include people who current do not cycle in program development to help identify and overcome the barriers they perceive to cycle transportation.
- Use cycling, walking and recreational organizations to enlist volunteers.

Examples and Case Studies

National Bike to Work Month (http://www.bikeleague.org/advocacy/advbki.html)

The League of American Bicyclists has declared May to be National Bike Month since 1956. The League also promotes Bike to Work Week and Bike-to-Work Day. They invite communities, corporations, clubs, and individuals to join in sponsoring bicycling activities during the month of May in order to increase awareness and acceptance of bicycling. The League produces a *National Bike Month Event Organizer's Kit*, to help individuals and organizations that promote these events.

Eugene Encourages Bicycle Transportation (www.ci.eugene.or.us/PW/bike)

Eugene, Oregon has a well-planned and well used cycling network that includes 28 miles of off-street paths, 78 miles of on-street bicycle lanes, and 4 bicycle/pedestrian bridges spanning the Willamette River. This results in 8% of commute trips to be by bicycle.

Bicycle Commuting Contest (http://www.climatesolutions.org/)

The Thurston County, Washington Bicycle Commuter Contest encourages individuals to bicycle to work, school, and to run errands throughout the month of May. The contest has been a participatory event for Thurston County residents and employees since 1988. The goal of the Bicycle Commuter Contest is to promote cycling as an efficient, non-polluting method of travel. Participants keep track of how often and how far they commute by bicycle, and win prizes in a variety of categories. In 1999 574 participants rode a total of nearly 15,000 miles. Individuals and teams compete to see who can:

- Ride the most miles.
- Ride the most number of days in their age category.
- Tally more total miles than any other team.
- Ride the most days per team-member (advantage to smaller teams).
- Compile the most days ridden by all members (advantage to larger teams).
- Compile the most days ridden by first-time participants (advantage to teams that recruit first-time riders).

Bike To Work Week Campaign http://www.biketoworkvictoria.bc.ca/

A *Bike-to-Work-Week* campaign is held annually in the Victoria region. In 2000 it included:

- A bicycle commuting contest with more than 200 teams at different worksites competing in various classes to see which can achieve the most bicycle commuters. All participants are eligible for prizes and drawings.
- A friendly contest between drivers and cyclists determines who gets the first cup of hot coffee at a downtown coffee shop without violating traffic rules.
- Free, bicycle skills training workshops for employees who want to learn more about bicycle commuting.
- An elementary school literary competition between bikes and cars. Cycling and driving parents leave the school at a specified time, travel to the downtown public library, check out a book and return to the school while following all the rules of the road. Students that estimate the closest time differences between the two modes are eligible to win great bike prizes.
- A Bike-to-Work-Week non-profit organization that plans and coordinates activities.

Go For Green (http://www.goforgreen.ca/)

Go For Green, The Active Living & Environment Program, promotes nonmotorized transportation. It provides resources and program coordination.

Cycle-Friendly Employers' Project (Cleary and McClintock, 2000)

A regional program in Nottingham, UK implemented in 1996, called "Cycle-Friendly Employers" included a number of improvements and incentives to encourage bicycle commuting, including workplace shower and changing facilities, workplace bicycle storage, cycle mileage allowances for short journeys (15 pence per mile), company pool bikes, public information, promotion (e.g., special events for cycle commuters), and a Bicycle Users Group to provide feedback from participants. Employers reported an increase in cycle commuting, and that most provisions for cycling are well used. More employees cycle more often. This resulting increase in cycle commuting stimulated additional bicycle facility improvements by local governments. The program is credited with increasing cycle commuting in the region by 19.5%, during which areas without such programs had a small decrease in bicycle travel.

Bethlehem, PA Bicycle Commuter Facility (http://www.car-free.org/)

The Bethlehem Bicycle Commuter Facility affords its members access to bicycle tools, a shower facility, work sink, bathroom, washer/dryer unit, secure bicycle parking and a bike wash. There is a $400 annual fee for membership, half of which is payable by 20 hours of community service. There is a $100 security deposit for the keys.

Public Bike Rentals (Beatley, 2000)

Public bike programs exist in Scandinavia, Germany, the UK, the Netherlands and France. Typically, the bikes are withdrawn from municipally furnished racks by depositing a token costing about $3.50, and then replaced in similar racks (with token returned) at the end of the trip.

Loaner Bicycles (TA, 1998)

The Downtown Management Commission of Boulder, CO, has made available 100 bicycles and 50 helmets for residents and tourists; all that's required is a credit card as a deposit. Champlain College in Burlington, VT, gives bikes to students who agree not to keep a car on campus.

Employer-Funded Commuter Bikes (TA, 1998)

The Nabisco bakery in Buena Park, CA, gives new bicycles to employees who commute to work three out of five days for a six-month period. Those who commute on their own bikes are given $300, the cost of a moderately priced new bike. Ten percent of the plant's 480 workers now commute regularly by bicycle, helping Nabisco satisfy the Los Angeles area's anti-pollution rules. "These commuters have become biking enthusiasts," reports Nabisco transportation coordinator Byron Kemp. "For them, biking is now an important social activity, and they regularly participate in fun rides on weekends."

Apple Computer provides free use of mountain bikes for employees at its Cupertino, CA, facility, as part of a Commuter Alternatives program. The chemical company Ciba-Geigy was able to avoid building a new garage at a facility in Switzerland by encouraging its employees to ride to work. Any worker willing to give up his or her parking space was given a new bicycle, an option 230 employees chose.

Cross-Continent Run Teaches Exercise and Education (Audrey Van Eerden, Victoria)

Each September I presented the idea of a cross-continent run to my elementary students. They were given a few days to think about it and then they voted on paper. The concept is simple. Each day an average size class of 25-30 students walks, jogs or runs one kilometre every school day. The class records the cumulative distance and marks the location on a map of Canada. A "thousand" party celebrates each 1000 kilometres with a film or stories and pictures about where we are at that point in the run. The proudest celebration is when we symbolically dip our toes in ocean water to signify crossing 4500km from ocean to ocean.

The activity provides many benefits. The children gain confidence in their ability to achieve a set goal and that

confidence transfers to other areas of achievement. The students and teacher are energized by the physical activity at the start of the day. An honour system allows students to contribute additional kilometres that they run outside of school. Math skills were used to calculate the growing results and students enjoyed learning about places in Canada as we run by. We used variety to make our run interesting. Some days we included various guests. We tried racewalking and skipping and pursuit (a game when runners stay in single file and the last runner sprints to the lead and then slows to a jog, and then the next runner sprints to the lead, and so on.) Most importantly we actively contributed to our health and we felt good when we returned to our classroom.

A New Approach to Improving Cycling; Bicycle Diversion Training Programs

by Eleanor Lippman
California Association of Bicycling Organizations Newsletter, CommuniCABO, Fall 2000

We all know that bicyclists are expected to operate their bicycles by the same rules of the road as do motorists. Both bicyclists and motorists have equal responsibility to follow all laws and regulations in the vehicle code.

However, the question of what to do about bicycle scofflaws often comes up. Should police actively enforce the laws and ticket bicyclists for infractions of the vehicle code?

Several cities have looked at the statistics pertaining to bicycle collisions and have concluded that deaths and injuries to cyclists can be significantly reduced by education and training bicyclists as compared to merely recommending the use of a bicycle helmet.

Since studies clearly show that bicyclists are solely at fault in about half of the reported crashes resulting in injury or death, some police departments are addressing the issue directly using a refreshingly new concept called Bicycle Diversion Training programs.

Rather than police issuing tickets to bicyclists leaving riders no option but to pay hefty fines (and possibly have the infraction appear on their driving records), some cities are using the Bicycle Diversion Training Program to change the behavior of bicyclists.

How does Bicycle Diversion Training Program work? Police (ideally police who are trained cyclists and understand how the vehicle code applies to bicycles) issue tickets to bicyclists who break traffic laws. Instead of paying a fine (running a red light results in a fine of $271) or making a court appearance, the cyclist is offered the opportunity to attend a safety training workshop. Training is designed for the age level of the bicyclist; it includes rules of the road, common traffic events and proper response, equipment and clothing that contributes to bicycle safety. In some cases, training includes videos and practical exercises including the use of mock cities or actual trips on city streets. Training ends with a test to emphasize important teaching points and participants who complete the program are given a gift that relates to safety (such as a helmet or headlight). The goal is to provide training to change behavior rather than to be punitive.

Bicycle Diversion Training Programs are established and effective. Tempe, Arizona, University of California at Davis through their Transportation and Parking Services, Huntington Beach, California, as well as Walnut Creek and Brentwood in Contra Costa County California, have adopted Bicycle Diversion Training Programs. The advocates among us would do well to spread the word to public officials to encourage all local jurisdictions to develop their own programs.

We can make a difference by contacting local officials and encouraging them to establish:

- An education program for bicyclists.
- A program that in lieu of paying a traffic fine or going to court, bicyclists can attend an education program and finally.
- An end to police turning a blind eye to illegal and unsafe bicycling practices.

Thanks to Robert Raburn of the East Bay Bicycle Coalition for providing information for this article.

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#3

Campus Trip Reduction

Trip Reduction Programs on College, University and Research Campuses

TDM Encyclopedia
Victoria Transport Policy Institute

About This Encyclopedia

Category

TDM Program

Description

Campus Trip Management programs are coordinated efforts to improve transportation choice and reduce trips at colleges, universities and other campus facilities. TDM tends to be particularly effective and appropriate in such settings. It is often more cost effective than other solutions to local traffic and parking problems. Many students and employees value having improved transportation choices.

Campus TDM programs can include:

- Transit Service Improvements and Fare Discounts.
- Ridesharing.
- Pedestrian and Bicycle Improvements.
- Shuttle Services.
- Marketing and Promotional Campaigns.
- Parking Pricing, Parking Management, and other disincentives to driving.
- Flextime, Compressed Work Week, Telework, Guaranteed Ride Home.
- Recreation activity transportation.
- Developing on-campus housing and services to reduce the need for travel.

An increasing number of colleges and universities offer free or significantly discounted transit passes to all students and sometimes staff (called a "UPASS"). The table below summarizes the costs and travel impacts of several UPASS programs. Students voted overwhelmingly (most referenda received 75% or more approval) to support many of these programs, even though it increases their fees.

Table 1 **UPASS Program Summary** (Brown, Hess and Shoup, 1998)

University	Year Began	Who May Ride Free	Eligible Riders	Annual Program Cost	Annual Rides	Cost Per Eligible Person	Rides Per Eligible Person	Average Cost per Ride	Ridership Increase
			(1)	*(2)*	*(3)*	*(4)=(2)/(1)*	*(5)=(3)/(1)*	*(6)=(2)/(3)*	*(7)*
niversity of alifornia, San Diego	1969	Students, faculty, staff, emeritus	35,200	$177,700	296,600	$5	8	$0.60	
niversity of Georgia : Athens	1977	Students	30,000	$275,000	600,000	$9	20	$0.46	
al Poly State niversity, San Luis bispo	1985	Students, faculty, staff, emeritus	17,500	$169,000	531,700	$10	30	$0.32	
ppalachian State niversity, NC	1980	Students, faculty, staff	13,200	$251,000	361,800	$19	27	$0.69	
niversity of ittsburgh, PA	1995	Students, faculty, staff	31,200	$650,000	1,536,900	$21	49	$0.42	60%
niversity of alifornia, Santa arbara	1986	Students	17,400	$400,200	584,800	$23	34	$0.68	6%

anta Barbara City ollege, CA	1995	Students	12,000	$277,000	525,500	$23	44	$0.53	36%
niversity of assachusetts at mherst	1969	Students, faculty, staff	39,000	$972,300	807,500	$25	21	$1.20	
hio State University	1997	Students	48,300	$1,400,000		$29			300%
niversity of /isconsin at adison	1996	Students	39,000	$1,200,000	1,600,000	$31	41	$0.75	
irginia Polytechnic stitute and State niversity	1983	Students, faculty, staff	32,000	$1,100,000	1,400,000	$34	44	$0.79	
uraria Higher ducation Center JC Denver)	1994	Students	31,500	$1,204,000	1,965,000	$38	62	$0.61	
niversity of alifornia, Davis	1990	Students	18,500	$719,000	1,800,000	$39	97	$0.40	255%
an Jose State niversity, CA	1993	Students	27,000	$1,060,000		$39			
niversity of olorado at Boulder	1991	Students, faculty, staff	24,500	$1,000,000	1,500,000	$41	61	$0.67	400%
arquette University, /I	1995	Students	6,700	$400,000		$60			
niversity of Illinois : Urbana-hampaign	1989	Students	36,000	$2,200,000	5,800,000	$61	161	$0.38	370%
niversity of /isconsin at ilwaukee	1994	Students	20,200	$1,247,400	2,300,000	$62	114	$0.54	27%
niversity of alifornia, Santa ruz	1972	Students, faculty, staff	12,220	$1,203,800	1,253,047	$99	103	$0.96	
VERAGES						**$32**	**56**	**$0.57**	

Some campuses use Vehicle Restrictions and regulations to limit automobile use. For example, some colleges do not provide parking permits to freshmen who live on campus. This encourages students to become more involved in campus activities, and discourages them from taking jobs to finance a car.

How It Is Implemented

Campus TDM programs are often implemented by facility managers and administrators to address a particular problem, such as parking shortages or traffic congestion on nearby streets. Some are initiated by student groups, to improve their travel options and achieve environmental or community goals. UPASS programs often require students to approve a special levy to fund universal transit passes. Student and employee organizations are often involved in program planning and management.

Travel Impacts

Campus TDM programs often reduce automobile trips by 10-30% (Brown, Hess and Shoup, 1998). A program at the University of Wisconsin-Milwaukee reduced student driving by 26% (Meyer and Beimborn, 1996). A University of Washington program reduced total vehicle trips to campus by 16% during its first year of operation, and by 1998 the number of vehicles coming to campus during the morning peak period decreased 19 percent over 1990 levels, despite growth in the campus population (Williams and Petrait, 1993).

Table 2 **Travel Impact Summary**

Objectives	Rating	Comments
Reduces total traffic.	2	Reduces automobile commutes.
Reduces peak period traffic.	3	Reduces automobile commutes.
Shifts peak to off-peak periods.	1	May include some peak shifting measures.

Shifts automobile travel to alternative modes.	3	Encourages use of alternative modes.
Improves access, reduces the need for travel.	1	May include some measures to increase the amount of housing and services on campus.
Increased ridesharing.	3	Encourages use of alternative modes.
Increased public transit.	3	Encourages use of alternative modes.
Increased cycling.	3	Encourages use of alternative modes.
Increased walking.	3	Encourages use of alternative modes.
Increased Telework.	1	May include telework promotion.
Reduced freight traffic.	1	May include freight trip management.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Benefits And Costs

Campus Trip Management programs can provide many benefits:

- Reduced parking and congestion problems around campuses, and avoided costs for additional road and parking capacity.
- Safer and calmer campus and nearby streets, and therefore fewer conflicts with residents of nearby neighborhoods.
- Increased travel choice and financial savings to students and staff.
- Increased personal security on campuses (programs often in efforts to Address Security Concerns).

Costs include administrative expenses, transit subsidies, and any inconvenience to motorists. Of 19 UPASS programs surveyed by Brown, Hess and Shoup (1998), costs averaged $32 per student or about 60¢ per transit trip.

Table 3 **Benefit Summary**

Objectives	Rating	Comments
Congestion Reduction	3	Reduces peak-period trips.
Road & Parking Savings	3	Reduces automobile trips.
Consumer Savings	3	Reduces travel expenses.
Transport Choice	3	Increases travel choice.
Road Safety	3	Reduces automobile travel.
Environmental Protection	3	Reduces automobile travel.
Efficient Land Use	3	Reduces automobile travel.
Community Livability	3	Reduces automobile traffic.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Equity Impacts

Most campus transport management services are available to all students, and sometimes employees. Not all students use all of these services, and some may consider it unfair that they must pay for services they don't use (although this is also true of other campus services, such as recreation, medical services and counseling). Some campus transportation management programs are funded through increased parking fees, which can be considered unfair, although historically campus parking fees were set below the cost of providing parking facilities (particularly when the value of land used for parking is considered), and motorists benefit from reduced traffic and parking congestion. Regulations and restrictions (such as prohibitions on freshmen parking) may be considered unfair by some students.

Campus transportation management programs tend to increase vertical equity by increasing travel choices and service quality, and by providing financial savings for non-drivers (pedestrians, cyclists, carpoolers and transit riders), who tend to be disadvantaged populations.

Table 4 **Equity Summary**

Criteria	Rating	Comments
Treats everybody equally.	0	Some groups may benefit more than others.
Individuals bear the costs they impose.	0	Often requires subsidies, but these tend to be comparable to subsidies for driving.
Progressive with respect to income.	3	Benefits non-drivers, who tend to be lower-income.
Benefits transportation disadvantaged.	3	Benefits non-drivers.
Improves basic mobility.	3	Improves access to education and employment

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Applications

Campus transportation management can be implemented in most geographic conditions, although it tends to be most appropriate for campuses with significant traffic or parking problems, and large numbers of lower-income students and staff. It is usually implemented by campus administrators, often in cooperation with local and regional agencies.

Table 5 **Application Summary**

Geographic	Rating	Organization	Rating
Large urban region.	3	Federal government.	1
High-density, urban.	3	State/provincial government.	2
Medium-density, urban/suburban.	3	Regional government.	3
Town.	2	Municipal/local government.	3
Low-density, rural.	2	Business Associations/TMA.	2
Commercial center.	2	Individual business.	1
Residential neighborhood.	2	Developer.	1
Resort/recreation area.	2	Neighborhood association.	2
College/university community	3	Campus.	3

Ratings range from 0 (not appropriate) to 3 (very appropriate).

Relationships With Other TDM Strategies

Campus trip management programs are similar to School Trip Management and Commute Trip Reduction programs. They may include the following TDM strategies:

- Parking Pricing
- Parking Management
- Marketing and Promotion.
- Employee Financial Incentives.
- Transit Service Improvements.
- Ridesharing Programs.
- Pedestrian and Bicycle Improvements.
- Telework.
- Flextime.
- Vehicle Use Restriction
- Shuttle Services.
- Guaranteed Ride Home.

Stakeholders

Campus trip management programs are usually implemented by campus authorities, often with the encouragement and support of local government transportation agencies. Transit agencies often provide discounted fares and improved services. Student, employee and neighborhood organizations are often involved in program planning.

Barriers To Implementation

Such programs often require coordinating efforts by a variety of organizations, including campus planners and administrators, local government, transit agencies, and user groups. Some campus planners may see little reason to implement TDM programs unless they perceive an immediate parking or traffic congestion problem. Programs that include parking price increases often face resistance from user groups, including student and employee organizations. Funding is often a limiting factor.

Best Practices

Best practices for Campus TDM programs include:

- Provide a variety of improvements and services, including specialty services such as support for recreational trips.
- Improve pedestrian and bicycle conditions on campus and in surrounding areas.
- Involve administrators, managers, students and staff in planning and implementing the program.
- Emphasize the benefits to students and staff from improved transportation services, including financial savings, improved choice, improved exercise (for cycling and walking) and environmental benefits.

Case Studies and Examples

Finding a New Way

Poinsatte and Toor (1999) describe several successful Campus Trip Management programs:

- Transit pass discounts at the University of Colorado, Colorado State University, the University of Wisconsin, and the University of Washington in Seattle.
- Bicycle improvements at the University of California at Davis and University of Oregon at Eugene.
- Pedestrian improvements at the University of Iowa and the University of California at Berkeley.
- Carpooling and campus shuttle systems at the University of Utah, a commuter campus with 25,000 students and 9,000 faculty and staff.
- Faculty trip management at Cornell University in Ithaca, New York.

University of Colorado Ski Bus (Poinsatte and Toor, 1999)

The University of Colorado ski bus program provides students and staff with access to downhill ski areas, including Copper Mountain, Winter Park and Vail resorts. It was established in 1996 and is jointly funded by the ski resorts, ticket sales and student bus pass fees. Students pay $5 and faculty-staff $10 for a round-trip ticket. The program has proven quite popular: during its first two years all buses were sold out. Some students report that it allows them to live on campus without a car.

University of Victoria and Camosun College (http://www.uvic.ca/)

In 1999 students at the University of Victoria and Camosun College in Victoria both voted to establish Upass programs, which provide all students with unlimited public transit (student body cards become transit passes) at a cost of about $15 per month per student.

Stanford University (http://www.stanford.edu/)

Stanford University in Palo Alto, California plans to expand by 25%, adding more than 2.3 million square feet of research and teaching buildings, public facilities and housing without increasing peak period vehicle traffic. The program has allowed 1.7 million square feet of new buildings, while automobile commute trips are down by about 500 per day. To accomplish this the campus transportation management plan includes:

- A 1.5 mile transit mall.
- Free transit system with timed transfers to regional rail.

- Bicycle network.
- Staff parking "cash-out".
- Ridesharing program.
- Other transportation demand management elements.

By using this approach the campus was able to add $500 million in new projects with few additional rounds of local review and no Environmental Impact Review (EIR) for individual projects. The campus also avoided significant parking and roadway costs. Planners calculate that the University saves nearly $2,000 annually for every commuter shifted out of a car and into another mode. This also reduced regional agency traffic planning costs.

Public benefits included decreased congestion and improved safety on surrounding roadways and the regional traffic system, reduced air, noise and water pollution, and improved local transit options. All of Stanford's transportation services are available to the general public, as well as its students and employees.

University of Washington (www.washington.edu/upass)

The University of Washington in Seattle has an extensive campus transportation management program that includes discounted transit fares ($31 a quarter for students and $42 per quarter for faculty and staff), rideshare matching, vanpools, a Night Ride shuttle, bicycle and pedestrian facility improvements, increased parking fees, and promotional efforts that include merchant discounts.

Uni-Link (www.soton.ac.uk/~unilink)

Uni-Link is a transport service developed by the University of Southampton in partnership with First Bus Southampton to link the various University sites, the University and the city centre, major transport hubs (rail, coach, and air) and recreational and entertainment venues frequented by students and staff. Buses will run at regular intervals from early in the morning well into the evening thus making it easy for students and staff to travel between the University campuses in Southampton throughout the day. On four evenings a week (during term time), Wednesdays, Thursdays, Fridays and Saturdays late night services (The Club Zone) operates between the University and the major entertainment and recreational venues in Southampton. It is a registered public services available for general use. A discounted Uni-Link pass is available only to staff and students and their immediate family. Others are welcome to travel on pay-as-you-go basis or with bus passes. There are a variety of passes available to suit different needs.

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#5

Freight Management

Reducing Commercial Vehicle Traffic

TDM Encyclopedia
Victoria Transport Policy Institute

About This Encyclopedia

Category

TDM Program and *Improved Transport Choice*

Description

There are many ways to improve the efficiency of freight and commercial transport. The technical term for this is "logistics," although it usually refers to minimizing shipper cost rather than social costs such as congestion or environmental impacts. Below are some examples of freight and commercial demand management strategies:

- Encouraging shippers to use the most cost-effective mode (taking into account total social costs) for each trip, such as rail and water transport rather than truck for longer-distance shipping.
- Using existing freight capacity more efficiently by increasing load factors (e.g., avoiding empty backhauls).
- Organizing regional delivery systems so fewer vehicle trips are needed to distribute goods (e.g., using common carriers that consolidate loads, rather than company fleets).
- Reducing total freight transport by reducing product volumes and unnecessary packaging, and by relying on more local products.
- Use smaller vehicles and human powered transport, particularly for urban deliveries and routes (such as meter readers).
- Implement fleet management programs that reduce vehicle mileage, use optimal sized vehicles for each trip, and insure that fleet vehicles are maintained and operated in ways that reduce external costs (congestion, pollution, crash risk, etc.)
- Changing freight delivery times to reduce congestion.

Heavy trucks represent about 10% of total vehicle mileage, and smaller commercial vehicles represent another 5-10% of total vehicle traffic. Because of their size, freight trucks impose relatively high congestion, road wear, accident risk, air pollution and noise costs, so travel reductions can provide significant benefits. Heavy truck traffic is particularly concentrated on certain corridors, such as major highways and around ports, rail terminals and industrial areas.

How it is Implemented

There are many ways to encourage more efficient freight delivery. Some strategies involve public planning and investments. For example, transportation and port authorities can improve intermodal transfer facilities, making it easier to shift loads from trucks to rail and water transport. Governments can also subsidize rail and marine transport industries (Casavant and Lenzi, 1989). Local governments can encourage more efficient delivery services (Takada and Kobayakawa, 1998). Governments can institute Pricing Reforms such as Weight-Distance Charges that encourage more efficient freight transport.

Private companies can improve their logistics. Firms can increase the efficiency of their own distribution networks, rely more on rail or marine transport for medium- and long-distance shipping, develop and use more local suppliers, find ways to reduce freight volumes, and use smaller vehicles or bicycles when appropriate for urban transport. Businesses can create cooperative distribution networks that consolidate loads, and develop services such as electric vehicle or bicycle delivery networks.

Travel Impacts

The potential for reducing freight traffic varies depending on location and what strategies are used.

The price elasticity of freight *transport* (measured in ton-miles) in Denmark is calculated to be –0.47, while the elasticity of freight *traffic* (measured in truck-kilometers) is –0.81 (Bjørner, 1999). This means that a 10% increase in shipping costs reduces truck traffic by 8%, but total shipping volume by only 5%, because some freight is shifted to rail, while others are shipped using existing truck capacity more efficiently. Other researchers find somewhat higher road freight elasticities (Button, 1992; Oum, Waters and Yong, 1992). Freight traffic is affected by the price difference between modes. One study estimates that in Australia the elasticity of road freight travel with respect to the price ratio between truck and rail freight is –0.39 over the short term and –0.8 over the long term (Luk and Hepburn, 1993).

Table 1 **Travel Impact Summary**

Objective	Rating	Comments
Reduces total traffic.	2	Reduces a small portion of vehicles, but they tend to have relatively large impacts.
Reduces peak period traffic.	1	Usually reduces a small portion of vehicles on congested roads.
Shifts peak to off-peak periods.	1	Some freight management involves shifting peak-period trips to off-peak.
Shifts automobile travel to alternative modes.	1	Some freight management involves shifting deliveries to bicycle.
Improves access, reduces the need for travel.	0	
Increased ridesharing.	0	
Increased public transit.	0	
Increased cycling.	1	
Increased walking.	0	
Increased Telework.	0	
Reduced freight traffic.	3	

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Benefits And Costs

Although freight vehicles represent only 10-20% of total vehicle mileage, they tend to impose large impacts. Reductions in freight traffic can provide the following benefits. See the Appendix in Litman, 2000 for information on freight cost studies.

Reduced Traffic Congestion.

Because of their large size and slower acceleration, heavy trucks impose more congestion per unit of travel than lighter vehicles. Freight vehicles are a small portion of urban-peak traffic (operators often schedule trips to avoid congestion), but trucks constitute a large portion of traffic on some corridors, such as highways to ports and major industrial areas.

Road Maintenance Cost Savings.

Freight trucks cause high levels of road wear (FHWA, 1997). A heavy truck can impose road wear costs hundreds of times greater than an automobile.

Energy Conservation and Pollution Reduction

Heavy diesel trucks consume about 22% of total roadway fuel. They produce high levels of particulate air pollutants, which are particularly harmful to human health. Heavy trucks are also much noisier than other vehicles.

Reduced Crash Risk.

Although crash rates for heavy trucks are relatively low, they can cause significant damage to other road users when a crash does occur, resulting in relatively high costs per vehicle-mile (Forkenbrock, 1999) (See Safety Impacts of TDM.)

Improved Pedestrian and Cycling Conditions.

Heavy vehicle traffic is a particular deterrent to pedestrian and bicycle travel. (See Evaluating Nonmotorized Transport.)

Financial Savings to Shippers

Logistical improvements that increase freight delivery efficiently can provide financial savings to shippers.

Freight management costs may include additional facility investments (such as improved rail and port terminals), subsidies and logistic management expenses. Disincentives (such as higher fuel taxes or fees) increase shipping costs, which will have a greater effect on industries and regions that are more dependent on transport. Price changes that are sudden and unpredictable impose transition costs that are economically harmful, because producers and consumers will not be able to take them into account when making long-term decisions, such as where to locate and what equipment to purchase.

Table 2 **Benefit Summary**

Objectives	Rating	Comments
Congestion Reduction	2	Modest overall reductions in peak-period travel.
Road & Parking Savings	3	Heavy trucks cause significant roadway costs.
Consumer Savings	0	No direct impact.
Transport Choice	0	No direct impact.
Road Safety	3	Reduces traffic risk caused by large trucks.
Environmental Protection	3	Reduces air pollution caused by large trucks.
Efficient Land Use	2	Tends to encourage more infill/cluster development.
Community Livability	2	Reduces traffic impacts and noise caused by large trucks.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Equity Impacts

Freight transport management has minimal equity impacts. Higher fees and taxes on heavy vehicles may disadvantage some groups (truckers and freight-intensive industries), particularly if they are sudden and unpredictable, but these usually represent an internalization of currently external costs (i.e., a reduction in current subsidies to heavy truck travel).

Table 3 **Equity Summary**

Criteria	Rating	Comments
Treats everybody equally.	-1	Impacts some groups more than others.
Individuals bear the costs they impose.	2	Reduces externalities.
Progressive with respect to income.	0	No significant impact.
Benefits transportation disadvantaged.	0	No significant impact.
Improves basic mobility.	0	No significant impact.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Applications

Demand management can be applied to just about any freight transport activity, and is particularly appropriate in large urban areas with heavy freight traffic. It can be implemented by most levels of government and businesses.

Table 4 **Application Summary**

Geographic	Rating	Organization	Rating
Large urban region.	3	Federal government.	3
High-density, urban.	3	State/provincial government.	3
Medium-density, urban/suburban.	3	Regional government.	3
Town.	2	Municipal/local government.	3
Low-density, rural.	2	Business Associations/TMA.	3
Commercial center.	3	Individual business.	3
Residential neighborhood.	2	Developer.	2
Resort/recreation area.	2	Neighborhood association.	2
Industrial centers and terminals	3	Campus.	2

Ratings range from 0 (not appropriate) to 3 (very appropriate).

Relationships With Other TDM Strategies

Logistics improvements may be included in comprehensive TDM Programs. Least-Cost Planning, Pricing Reforms and Smart Growth planning principles can support freight demand management. Congestion Pricing can improve truck traffic efficiency.

Stakeholders

Freight planning and TDM programs can be implemented by various government agencies, and by businesses that profit from increased freight efficiency. Government policies can affect prices that provide an incentive for more efficient freight travel. Transport-intensive industries (such as those that rely heavily on raw materials), shipping firms and operators (such as truck drivers), and fleet operators all have an interest in Freight Transport Management.

Barriers to Implementation

Different freight TDM strategies face different barriers. Underpricing of freight travel (particularly trucks) and dedicated highway funding are major barriers to improved logistics since they reduce the incentive for more efficient shipping.

Best Practices

Logistic planners have a variety of strategies for improving freight transport efficiency, however, there is little practical experience with freight TDM programs. Best practices depend on the type of freight to be managed.

Examples and Case Studies

Incorporating Environmental Objectives into Corporate Logistics (OECD, 2000)

The German retailer Otto received an EST! Best Practices award for developing a Green Supply Chair Management Program, which incorporates environmental objectives in organizing product shipping. The company developed new logistics chains (i.e., contracts with shipping and delivery agents) and analysis methods to determine which shipping option has the least environmental impacts. For example, when possible goods are

transported by ship and train rather than truck, or truck rather than air. This reduced costs and increased profits as well as providing environmental benefits. As a result, the company:

- Reduced CO2 emissions by more than 40%.
- Cut costs by more than 3 Million Euros.
- Developed new logistic chains like sea – train.
- Developed new partners, like forwarders, agents
- Is positioned to benefit from emission trading and other environmental instruments.

Freight Coordination

A New Zealand software company, 4Technology, has created a website which matches empty trucks with one-off shipments. The website, at http://www.4freight.net/, promotes transport efficiency by providing a way both shippers and carriers can match freighting needs with available services. It is aimed particularly at individuals and companies moving irregular large consignments. Carriers will be charged 5 per cent of freight won and carried through use of the service. A service fee will be charged to the shipper/ supplier.

City Logistics (http://www.wupperinst.org/)

City Logistics projects in 80 German cities allow shippers to consolidate deliveries, reducing total freight vehicle travel and costs.

Pedal Powered Deliveries

Pedal Express is a human-powered cargo delivery service in the San Francisco Bay area. It operates a fleet of cargo bicycles capable of carrying up to 700 pounds in watertight containers. Common deliveries include meals and baked goods, books packages and post office box mail.

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This Encyclopedia is produced by the Victoria Transport Policy Institute to help improve understanding of Transportation Demand Management. It is an ongoing project. Please send us your comments and suggestions for improvement.

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#16

Vehicle Restrictions

Limiting Automobile Travel At Certain Times and Places

TDM Encyclopedia
Victoria Transport Policy Institute

About This Encyclopedia

Category

Incentive to Reduce Driving

Description

A number of regulatory strategies can be used to control vehicle use.

- Some cities discourage or prohibit automobile traffic on certain roads at certain times to create pedestrian-oriented commercial area (see chapter on Car-Free Planning).
- Some cities have Auto-Restricted Zones that limit automobile access, for example, to residents and commercial vehicles. These often have features of Car-Free Planning, Location Efficient Development, Traffic Calming, and Transit Oriented Development.
- Some cities are divided into traffic cells that have direct walking, cycling and transit connections, but require a longer trip to travel between by private automobile.
- Driving can be restricted based on vehicle license plate numbers. For example, vehicles with license numbers ending in 0 or 1 are prohibited from driving on Mondays, and other numbers limit driving during other weekdays. This is typically implemented as a temporary measure during air pollution emergencies, or to reduce traffic congestion during major sport or cultural events.

Travel Impacts

Travel impacts depend on how restrictions are applied and the quality of transport alternative. See Land Use Impacts on Transportation for more discussion. Geographic restrictions on automobile travel, such as prohibitions on driving in a downtown area, may simply shift car trips to other parts of the urban region unless it is implemented with other disincentives to driving and improvements to walking, cycling and public transit. Similarly, restrictions based on license numbers have a number of problems (Goddard, 1997):

- Many trips are simply deferred, not eliminated. If a motorist planned to go shopping by car, they will simply put it off until the next day, resulting in no actual reduction in mileage or emissions.
- Many wealthier households purchase a second car with another license number, so they have one available every day. These tend to be cheap, older, high polluting vehicles. Mexico City recorded a jump in the number of vehicles owned due to this policy.
- A large portion of vehicles must be exempted, including any vehicle used for business (taxis, delivery vehicles, vehicles used for construction work, etc.), and many professionals (doctors, salespeople, consultants, etc.) demand exceptions based on their professional needs.

For these reasons, a program that prohibits each vehicle from driving 20% of days does not necessarily result in a 20% reduction in total vehicle travel. Actual travel reductions are likely to be half that amount or less.

Table 1 **Travel Impact Summary**

Travel Impact	Rating	Comments
Reduces total traffic.	1	Depends on measures implemented.
Reduces peak period traffic.	2	For time-based restrictions.
Shifts peak to off-peak periods.	2	"
Shifts automobile travel to alternative modes.	2	
Improves access, reduces the need for travel.	1	Reduced traffic can improve cycling and walking conditions.
Increased ridesharing.	1	
Increased public transit.	3	
Increased cycling.	3	
Increased walking.	3	
Increased Telework.	1	
Reduced freight traffic.	0	Freight vehicles are usually exempt from such restrictions.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

How it is Implemented

Most vehicle restrictions are implemented by local or regional governments, often as part of a downtown revitalization program or neighborhood traffic management plan, or during a period of exceptional traffic congestion or pollution.

Benefits And Costs

When they are effective, vehicle restrictions can reduce traffic congestion, road and parking facility cost savings, crash risk, pollution and local environmental impacts. Restricting urban vehicle traffic can have significant safety benefits (Cairns, 1999). Because such programs tend to be implemented in areas and at times when vehicle impacts are greatest, these benefits can be significant. The actual magnitude of benefits depends on circumstances. If a program is poorly designed or there are inadequate travel alternatives, benefits may be small or negative, because automobile use simply shifts to other routes and times. Comprehensive TDM programs that include vehicle use restrictions can reduce automobile use and improve mobility for alternative modes.

Costs include program and enforcement expenses, increased travel costs and reduced mobility for motorists, and possible spillover effects (such as increased driving at other times or in other areas). An ineffective vehicle restriction programs that reduces access in urban areas may increase sprawl by encouraging businesses and residents to choose suburban locations.

Table 2 **Benefit Summary**

Objective	Rating	Comments
Congestion Reduction	2	Can reduce automobile use.
Road & Parking Savings	2	"
Consumer Savings	0	Mixed. Increases motorists' costs, reduces costs for other modes.
Transport Choice	0	Limits driving, improves other modes.
Road Safety	2	Reduces traffic.
Environmental Protection	2	Reduces traffic.
Efficient Land Use	1	Can reduce sprawl if effective, can increase sprawl if ineffective.
Community Livability	3	Reduces local traffic impacts and increases local access.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Equity Impacts

Vehicle restrictions, such as no-drive days based on license numbers, are considered by some people to be more equitable than pricing to reduce automobile travel (since restrictions are intended to apply equally to everybody, and therefore force all residents to reduce travel, not just the poor), but in practice many higher-income motorists avoid travel reductions by purchasing a second car or hiring a taxi.

Area restrictions impact some groups more than others: Some businesses and residents may benefit, while others are made worse off, depending on how much they depend on automobile travel. Vehicle restrictions that are successful at reducing total vehicle traffic (rather than just shifting it to other times or routes) tend to reduce external costs of motor vehicle traffic. Vehicle restrictions that improve conditions for other modes (walking, cycling and public transit) are likely to increase vertical equity, because lower income and transportation disadvantaged people tend to rely heavily on alternative modes. If vehicle restrictions do not include appropriate exemptions for motorists with special needs, some transportation disadvantaged people (e.g., motorists with physical disabilities) may be made worse off. If vehicle restrictions include appropriate exemptions, they can increase basic access by favoring people with special needs and higher value trips.

Table 3 **Equity Summary**

Objective	Rating	Comments
Treats everybody equally.	-2	This is often a major issue.
Individuals bear the costs they impose.	2	Reduces external costs of driving.
Progressive with respect to income.	2	Can improve walking, cycling and transit.
Benefits transportation disadvantaged.	3	Can improve walking, cycling and transit.
Improves basic mobility.	2	Depends on program details.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Applications

Different types of vehicle restrictions have different applications. Most are most applicable by regional or municipal governments in urban areas and resort communities.

Table 4 **Application Summary**

Geographic	Rating	Organization	Rating
Large urban region.	2	Federal government.	1
High-density, urban.	3	State/provincial government.	1
Medium-density, urban/suburban.	2	Regional government.	2
Town.	2	Municipal/local government.	3
Low-density, rural.	1	Business Associations/TMA.	2
Commercial center.	3	Individual business.	1
Residential neighborhood.	2	Developer.	1
Resort/recreation area.	2	Neighborhood association.	2
		Campus.	2

Ratings range from 0 (not appropriate) to 3 (very appropriate).

Relationships With Other TDM Strategies

Many other TDM strategies are supported by vehicle travel restrictions, including Car-Free Planning, Nonmotorized Planning, Public Transit Improvements, Traffic Calming, Smart Growth, Location Efficient Planning and Commute Trip Reduction programs.

Stakeholders

Most vehicle restrictions are implemented by local or regional governments, with administrative

responsibilities given to transportation and law enforcement agencies. Business and residents in affected areas are often significantly impacted by restrictions. Neighborhood and business associations are often involved in traffic restriction planning.

Barriers To Implementation

Political acceptability is usually a major barrier to vehicle restrictions. Motorists and some businesses are likely to oppose vehicle restrictions. Ineffective planning, administration and enforcement can also present barriers.

Best Practices

- Vehicle restrictions should be implemented in conjunction with other TDM strategies, including improvements in alternative travel options and other disincentives to reduce driving.
- Restrictions based on license numbers or similar systems should only be implemented briefly, or motorists are likely to find ways to circumvent them, such as purchasing second cars.

Examples and Case Studies

Amsterdam Vehicle Reductions (Lemmers 1995)

The city of Amsterdam is reducing automobile traffic significantly using a combination of restrictions on parking and road access matched with improvements in pedestrian, cycling and public transit services.

Mexico City No Drive Days (Goddard, 1997)

Mexico City implemented no-drive days during periods of extreme air pollution. Under this rule, a car could only be used every other day, depending on whether the license plate had an odd or even number. When the duration of these restrictions increased, many wealthier households bought second cars to use those days. Most of these cars were cheap, older, high-polluting cars. The policy has since been dropped.

Bologna, Italy (Beatley, 2000)

Bologna residents voted overwhelmingly to designate its historic center a "car-restricted zone" (*zona a traffico limitato*). Between 7:00 a.m. to 8:00 p.m., only residents, business owners, taxis, delivery vehicles, and other vehicles with special access needs are permitted to enter the area. More than 82,000 vehicle permits have been issued. An automated vehicle licence plate identification system verifies compliance. As a result, the number of vehicles entering the core during the restricted period decline 62%, although traffic is a major problem during the late evening when automobiles are no longer restricted.

Bremen, Germany (Vuchic, 1999)

In the early 1960s, the city of Bremen was divided into four sectors, or "traffic cells." Automobiles are allowed to travel within each cell, but to travel between these cells they must use a circumferential ring road. Pedestrian, bicycle and transit vehicles can travel directly between these cells. As a result, vehicle traffic volumes are significantly reduced and travel by other modes is significantly improved.

Gothenburg, Sweden (Vuchic, 1999)

The city of Gothenburg is Sweden's second largest city, with almost half a million residents. In the late 1960s, the city's historic center was divided into five traffic cells. As in Bermen, automobiles can travel within each cell but not directly between cells, they must use a ring road. Pedestrian, bicycle and transit vehicles can travel directly between ecils. The result has been a 48% reduction in vehicle traffic despite increased vehicle ownership by residents, improved pedestrian and cycling conditions (and a 45% reduction in pedestrian accidents), and improved transit service.

Dutch National Environment Plan (NEPP 3; www.netherlands-embassy.org/c_envnmp.html)

The central goal of the Dutch National Environment Plan (NEPP) is to decouple economic growth from the

growth in fuel consumption and the use of non-renewable resources. In passenger transport the Dutch are successfully constraining the growth in car use and ensuring that an average of 28% of all passenger transport trips are made by bicycle with that increasing to 34% of trips by 2010. Without the NEPP it was expected that car kms would increase by 72% over the period 1986 to 2010. With the NEPP this increase will be lowered to 48%. As a result, greenhouse gas emissions from the car fleet are declining. The Netherlands has a newer, less polluting vehicle fleet, with 41% of passenger cars powered by LPG, which produces 14 % less GHG and significantly less air pollution.

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#33



TSM Programs

MS CONSULTANTS, INC.

Transportation Management Programs

An Institutional Framework for Implementing TDM

TDM Encyclopedia
Victoria Transport Policy Institute

About This Encyclopedia

Category

TDM Program

Description

A *TDM Program* is an institutional framework for implementing a set of TDM strategies. Such a program has stated goals, objectives, a budget, staff, and a clear relationship with stakeholders. It may be a division within a transportation or transit agency, an independent government agency, or a public/private partnership. Below are possible responsibilities of a TDM Program:

- Plans and coordinates implementation of TDM projects and activities.
- Marketing, Data Collection and Evaluation.
- Responds to problems and complaints.
- Provides Ridematching, Shuttle Services, Pedestrian and Cycle Promotion and Special Event Transportation Management services.
- Provides Parking Management, Parking Pricing and Regulatory Reform activities.
- Supports Pedestrian and Bicycle Improvements, Freight Transportation Management and Security Improvements that encourage use of alternative modes.
- Coordinates activities with other organizations, such as Transportation Management Associations and Commute Trip Reduction Programs
- Supports integrated transportation and land use planning to improve access and reduce vehicle travel (i.e., Access Management, Smart Growth and Location Efficient Planning).

TDM Programs insure that specific strategies are complementary and coordinated, for maximum effectiveness. For example, Transit Improvements, Pedestrian Improvements, and Parking Pricing can have far greater travel impacts and consumer benefits when implemented as a coordinated program, than if each were implemented individually. A general rule is that TDM Programs should include a balance of improved travel choice and incentives to reduce automobile travel.

How it is Implemented

TDM Programs are usually established and funded by local, regional or state/provincial governments, often within existing transportation agencies, or through grant programs.
It may be organized as a division within a transportation or transit agency, as an independent government agency, or as a partnership between government and other community organizations, such as a chamber of commerce (called a Transportation Management Association).

Travel Impacts

A well managed and properly supported TDM Program can affect a significant portion of total travel. Comprehensive TDM Programs can achieve cost-effective reductions of 20-40% in motor vehicle travel compared with no TDM efforts (Litman, 1999), although most programs have much smaller effects because they focus on particular types of trips (such as commuting), cover a limited geographic scope, or are limited to strategies that can be implemented by a particular government agency. Travel reductions of 10-30% are more realistic for TDM Programs implemented by local or regional governments.

Elasticities and Trip Reduction Tables show the travel impacts of various pricing strategies. Well-managed Commute Trip Reduction programs can reduce vehicle trips to a particular worksite by 15-30%, particularly if programs include suitable financial incentives (Comsis Corp., 1993). Commute trips represent only about 30% of total personal vehicle travel (50-80% of travel on congested urban highways). Other types of trips can also be reduced using appropriate TDM strategies. For example, School Transport Management can also achieve 15-30% trip reductions. Land use management strategies such as Access Management, Smart Growth and Location Efficient Planning can reduce per capita vehicle travel by 20-50% in a specific area.

Table 1 **Travel Impact Summary**

Travel Impact	Rating	Comments
Reduces total traffic.	2	Implements specific TDM strategies.
Reduces peak period traffic.	2	"
Shifts peak to off-peak periods.	2	"
Shifts automobile travel to alternative modes.	2	"
Improves access, reduces the need for travel.	2	"
Increased ridesharing.	2	"
Increased public transit.	2	"
Increased cycling.	2	"
Increased walking.	2	"
Increased Telework.	2	"
Reduced freight traffic.	2	"

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Benefits And Costs

TDM Programs can provide many benefits, including reduced traffic congestion, increased mobility, road and parking cost savings, consumer savings, increased transport choice, reduced traffic crashes, environmental protection, more efficient land use, more livable communities and increased equity. By providing coordination, TDM Programs can increase the effectiveness of individual TDM strategies.

Costs include program expenses and any negative impacts of disincentives to driving. Some TDM strategies, such as Parking Pricing and Road Pricing, involve increased user charges, but these are economic transfers, not true resource costs, so their overall cost to consumers depends on how revenues are used (see Evaluating TDM). For example, parking fees may simply substitute for taxes or other indirect consumer payments to fund parking facilities.

Table 2 **Benefit Summary**

Objective	Rating	Comments
Congestion Reduction	2	Reduces automobile travel.
Road & Parking Savings	2	Reduces automobile travel.

Consumer Savings	2	Improves automobile affordability.
Transport Choice	2	Increases transportation choices.
Road Safety	2	Reduces automobile travel.
Environmental Protection	2	Reduces automobile travel.
Efficient Land Use	2	Reduces automobile travel, benefits urban residents.
Community Livability	2	Reduces automobile travel.

Rating from 3 (very beneficial) to–3 (very harmful). A 0 indicates no impact or mixed impacts.

Equity Impacts

TDM Programs can have a wide range of equity impacts, depending on program design and the conditions in which it is implemented. Although TDM Programs usually require subsidies, these are often less than subsidies currently provided for automobile travel. For example, TDM Programs may simply substitute for current public expenditures on parking and roadway expansion.

TDM Programs can help achieve equity objectives. They can correct market distortions that currently favor driving over other travel modes. For example, they can reduce parking subsidies, or provide non-drivers with comparable benefits. Similarly, Road Pricing can charge motorists directly for road and congestion costs, as opposed to indirect funding that results in cross-subsidies from residents who drive less than average to those who drive more than average.

Most TDM Programs increase vertical equity by improving mobility options for non-drivers. Many also provide financial savings to non-drivers (such as Parking Cash Out and Transit Fare Discounts), which tend to benefit lower-income people most. TDM Programs can significantly improve basic mobility by improving and coordinating travel alternatives. Of course, these benefits vary depending on circumstances.

Table 3 Equity Summary

Criteria	Rating	Comments
Treats everybody equally.	0	Varied and mixed.
Individuals bear the costs they impose.	2	TDM Programs may require subsidies, but these are generally less than subsidies for driving. Many TDM strategies reduce transportation subsidies overall.
Progressive with respect to income.	2	TDM Programs tend to increase transport choice and potential savings to lower-income households.
Benefits transportation disadvantaged.	3	TDM strategies often increase transport choice and savings to non-drivers.
Improves basic mobility.	3	TDM strategies often improve basic transport options.

Rating from 3 (very beneficial) to–3 (very harmful). A 0 indicates no impact or mixed impacts.

Applications

TDM Programs are appropriate in almost any geographic area, although benefits tend to be greatest in large and growing urban areas where transportation problems are greatest. Comprehensive TDM Programs are appropriate for implementation at the local, regional and state/provincial level. Business organizations, individual businesses, developers and campus managers can also implement TDM Programs.

Table 4 Application Summary

Geographic	Rating	Organization	Rating
Large urban region.	3	Federal government.	2
High-density, urban.	3	State/provincial government.	3
Medium-density, urban/suburban.	3	Regional government.	3
Town.	3	Municipal/local government.	3

Low-density, rural.	3	Business Associations/TMA.	3
Commercial center.	3	Individual business.	2
Residential neighborhood.	3	Developer.	2
Resort/recreation area.	3	Neighborhood association.	2
		Campus.	2

Ratings range from 0 (not appropriate) to 3 (very appropriate).

Relationships With Other TDM Strategies

TDM Programs support virtually all other TDM strategies. Many TDM strategies cannot be implemented or will be ineffective if they are not part of a comprehensive TDM Program that provides coordination and support. Commute Trip Reduction, Transportation Management Associations, Tourist Transport Management and Campus Transport Management are specific types of TDM Program. Least Cost Planning, Institutional Reform and Regulatory Reform can be implemented in conjunction with TDM Programs. It is important to incorporate Evaluation into TDM Programs.

Stakeholders

TDM Programs depend on governments for implementation, funding and enforcement. Their effectiveness depends on support from local businesses and residents, and from other levels of government. Transportation professionals, motorists, environmentalists, taxpayer organizations, public safety officials, transit supporters, and neighborhood organizations all have reasons to support comprehensive TDM Programs.

Barriers To Implementation

Common barriers include existing planning and funding practices that favor capacity expansion over demand management (even when it is more cost effective and beneficial overall), institutional opposition to change, political opposition to change, and resistance from special interest groups that benefit from existing inefficiencies. Some anti-government groups oppose TDM Programs on the grounds that they represent government intrusion into private activities.

Best Practices

A number of organizations and publications listed below provide information on TDM Program planning and implementation. Best practices include:

- Make TDM Programs comprehensive, including as many transportation improvements and incentives as appropriate for a particular situation.
- Include both positive and negative incentives. TDM Programs tend to be most effective when they improve consumers' travel choices and provide incentives to use alternatives to driving when possible.
- Do not limit TDM Programs to commute trips, which represent only about one fifth of total vehicle travel.
- Integrate transportation and land use planning as part of a comprehensive TDM Programs.
- Involve stakeholders in TDM Program planning and implementation, including transportation and land use planning agencies, transit providers, businesses, residents and employees.
- Be sensitive to equity concerns, by applying incentives equally (for example, by applying Parking Pricing to administrators as well as staff), and by providing positive incentives that balance negative incentives.

Examples and Case Studies

Travel Smart (http://www.travelsmart.transport.wa.gov.au/)

Travel Smart is a community-based program in Western Australia that encourages people to use alternatives to traveling in their private car. It provides coordination and resources for local governments, employers, employees, businesses, schools, community organizations and individuals to help reduce automobile travel. The Transport Strategy for the Perth Metropolitan area has a target of reducing in car trips by one-third by 2029 (from 4.7 million to 3.1 million trips per day). Travel Smart includes a variety of community-based activities to encourage walking, cycling, ridesharing and public transit.

Space Coast Commuter Assistance (www.ridescat.com/commuterassistance/index.htm)

The Space Coast Area Transit agency in Southern Florida has programs encourage the use of a variety of alternative modes. It supports car/vanpool matching, fixed route bus service, employer parking incentive programs, developing Park-n-Ride locations, telecommuting options, the vanpool program, alternative work scheduling, bicycle commuting, pedestrian commuting, or combination of the above elements. The agency helps develop individualized Transportation Demand Management programs for individual business. It highlights the following benefits:

- Employer benefits: Reduced federal taxes, reduced parking demand, employee recruitment and retainment, positive public relations and increased employee productivity.
- Customer benefits: Reduced commuting costs, less wasted time and reduced stress.
- Community benefits: Improved air quality, reduced peak period traffic congestion, quality of life issues, reduced energy consumption and less land used for parking facilities.

Oxford, UK

Oxford was one of the first cities in the UK to adopt traffic restraint policies, and to abandon road building as a solution to its transport problems. This has proved very successful with traffic levels having remained stable for over 25 years. Bus patronage has experienced an 80% growth in passengers in the last 10 years and economic vitality has been preserved.

Oxford has a population of 130,000 (of which 20,000 are students) and serves as a regional centre for a scattered, largely rural population of about half a million people. The city has the largest Park and Ride system in the UK and extensive bus priority lanes and traffic signal systems. Deregulation of buses in 1986 resulted in real competition with two large bus companies operating extensive bus services.

Strategic land use policies, for the sub-region within which Oxford lies, take account of the critical landscape and environmental constraints and are complimentary to transport policies aimed at reducing car dependence and encouraging the use of alternative modes of travel.

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Apogee, *Costs and Cost Effectiveness of Transportation Control Measures; A Review and Analysis of the Literature*, National Association of Regional Councils (http://www.narc.org/), 1994.

Association for Commuter Transportation (Washington DC; 202-393-3497; http://tmi.cob.fsu.edu/act/act.htm) is a non-profit organization supporting TDM Programs.

BC Transit, *Travel Options Manual* (www.bctransit.com/traveloptions/introduction/introduction.htm), 2000.

The *California Air Resources Board* (www.arb.ca.gov/linkage/linkage.htm) provides a variety of information about more efficient transportation and land use.

City of Cambridge, *Parking And Transportation Demand Management Planning* (http://bpc.iserver.net/codes/cbridge).

Cambridge Systematics, *Effects of Land Use and Travel Demand Management Strategies on Commuting*

Behavior, USDOT (Washington DC), DOT-T-95-06, November 1994.

Center for Urban Transportation Research, USF (Tampa; http://cutr.eng.usf.edu/) provides TDM materials and classes and publishes *TMA Clearinghouse Quarterly.*

Commuter Choice Program (www.epa.gov/oms/traq) provides information, materials and incentives for developing employee commute trip reduction programs.

Commuter Check (http://www.commutercheck.com/) works with transit agencies to provide transit vouchers as tax-exempt employee benefit.

Comsis Corporation, *Implementing Effective Travel Demand Management Measures: Inventory of Measures and Synthesis of Experience*, USDOT and Institute of Transportation Engineers (http://www.ite.org), 1993.

Detour Publications (http://www.web.apc.org/~detour)) provides information related to urban ecology and transportation planning.

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

Environment Canada *Green Lane* program (www.ec.gc.ca/emission/51e.html) promotes TDM and other strategies for reducing transportation environmental impacts.

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

The *Institute of Transportation Engineers* (Washington DC; http://www.ite.org) has extensive technical resources on TDM, transportation planning and traffic calming.

Todd Litman, *Guide to Calculating TDM Benefits*, VTPI (http://www.vtpi.org/), 1998.

Todd Litman, *Socially-Optimal Transport Prices and Markets*, VTPI (http://www.vtpi.org), 1999.

Michael D. Meyer, "Demand Management as an Element of Transportation Policy: Using Carrots and Sticks to Influence Travel Behavior," *Transportation Research Record A*, Vol. 33, No. 7/8, Sept./Nov., 1999, pp. 575-599.

National Bicycle and Pedestrian Clearinghouse (Washington DC; www.bikefed.org/clear.htm) provides resources related to non-motorized transport planning and promotion.

National Transportation Library (http://www.bts.gov/NTS/) has resources, some of which are available to download, and others that can be ordered.

Pleasanton, TSM Program (http://www.sustainable.doe.gov/codes/pleasnt1.htm), 1997.

Road Traffic Reduction Act 1997, Her Majesty's Stationary Office (http://www.hmso.gov.uk/acts/acts1997/1997054.htm)).

Transportation Association of Canada (Ottawa; http://www.tac-atc.ca)/) provides a variety of resources related to transportation planning and TDM.

TDM Resource Center, *Transportation Demand Management; A Guide to Including TDM Strategies in Major Investment Studies and in Planning for Other Transportation Projects*, Office of Urban Mobility, WSDOT (http://www.wsdot.wa.gov/), 1996.

WSDOT TDM Resource Center (http://www.wsdot.wa.gov/) and *Northwest Technology Transfer Center* (www.wsdot.wa.gov/TA/T2/publications.html) offers TDM resources.

Victoria Transport Policy Institute (http://www.islandnet.com/~litman) provides resources for planning and evaluating TDM, bicycling and walking programs.

The *Washington State Department of Transportation* (WSDOT) website has information on Transportation

Demand Management at (http://www.wsdot.wa.gov/Mobility/TDMhome.html).

This Encyclopedia is produced by the Victoria Transport Policy Institute to help improve understanding of Transportation Demand Management. It is an ongoing project. Please send us your comments and suggestions for improvement.

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#42

Transportation Management Associations and Coordinators

TDM Encyclopedia
Victoria Transport Policy Institute

About This Encyclopedia

Category

TDM Program

Description

Transportation Management Associations (TMAs) are private, non-profit, member-controlled organizations that provide transportation services in a particular area, such as a business district, mall, medical center or industrial park. Transportation Management Coordinators (TMC) are professionals who work for TMAs or individual employers.

TMAs are a practical and effective way to deliver TDM services. They can usually provide more services at a lower cost than programs managed by individual businesses. TMAs allow small employers to provide Commute Trip Reduction services comparable to those offered by large companies. They avoid residence that may be associated with government-run TDM programs, since they are controlled by members.

TMAs can provide Parking Management and parking brokerage services. It can arrange for a business that has extra parking capacity at a particular time to make it available to other businesses through exchanges or leases. For example, a church may allow its parking spaces to be used by a nearby restaurant on Saturday nights in exchange for use of the restaurant's parking on Sunday mornings. This results in more efficient use of parking resources, and allows employers with successful Commute Trip Reduction programs to recoup their costs by leasing excess parking spaces.

Transportation Management Associations may provide the following services:

- Marketing and Promotion
- Commute Trip Reduction
- Commuter Financial Incentives
- Parking Management
- Transit Improvements
- Pedestrian and Bicycle Improvements
- Freight Transport Management
- Access Management
- Rideshare Matching and Vanpool Coordination.
- Shuttle Services
- Guaranteed Ride Home Services
- Flextime Support
- Telework Support

How it is Implemented

Regional or local governments, chambers of commerce or management of a major facility (such as a mall or hospital) can help create a TMA and provide seed funding. Developers or facility managers may

be required to establish a TMA to mitigate local congestion and parking problems. TMAs are typically funded through dues paid by member businesses and local government grants.

Travel Impacts

TMAs provide an institutional structure to deliver various TDM strategies. One study estimates that TMAs can reduce 6-7% of total commute trips if implemented alone, and significantly more if implemented with other TDM strategies (TDM Resource Center, 1996).

Table 1 **Travel Impact Summary**

Travel Impact	Rating	Comments
Reduces total traffic.	2	Implements Commute Trip Reduction
Reduces peak period traffic.	3	"
Shifts peak to off-peak periods.	3	"
Shifts automobile travel to alternative modes.	3	"
Improves access, reduces the need for travel.	1	May involve some land use management.
Increased ridesharing.	3	Implements Commute Trip Reduction
Increased public transit.	3	"
Increased cycling.	2	"
Increased walking.	2	"
Increased Telework.	3	"
Reduced freight traffic.	1	May involve some freight traffic management.

Rating from 3 (very beneficial) to–3 (very harmful). A 0 indicates no impact or mixed impacts.

Benefits And Costs

Transportation Management Associations can increase travel choice, provide financial savings to employees and consumers, reduce traffic problems, and result in more efficient use of parking facilities. These benefits can be large because traffic and parking costs tend to be particularly high in commercial and industrial areas where most TMAs develop. Parking and road facility savings often repay TMA operating costs.

Costs are primarily direct TMA program expenses, which typically average $5-10 annually per covered employee, although this can vary significantly depending on what services it provides (Ferguston, Ross and Meyer, 1992). Sometimes, TMAs increase consumer costs by implementing increased parking fees.

Table 2 **Benefit Summary**

Objective	Rating	Comments
Congestion Reduction	3	Helps reduce commute trips.
Road & Parking Savings	2	Helps reduce commute trips, more efficient use of parking facilities.
Consumer Savings	2	Helps reduce commute trips, increases commute choice.
Transport Choice	2	Helps increase commute choice.
Road Safety	2	Helps reduce vehicle trips.
Environmental Protection	2	Helps reduce vehicle trips.
Efficient Land Use	2	Helps reduce vehicle trips.
Community Livability	2	Helps reduce vehicle trips.

Rating from 3 (very beneficial) to–3 (very harmful). A 0 indicates no impact or mixed impacts.

Equity Impacts

Most services provided by TMAs are available to any employee at a worksite. TMAs typically require

subsidies, but these are often comparable to subsidies for parking and local road improvements. Some strategies (such as Parking Cash Out) are progressive with respect to income, while others (such as Parking Pricing) may be regressive unless offset by other compensation. TMA services often benefit lower-income and transportation disadvantaged people by improving transportation choices and savings. TMAs can improve basic mobility by providing better travel options to employment and essential services.

Table 3 **Equity Summary**

Criteria	Rating	Comments
Treats everybody equally.	2	Usually provide services and benefits to all employees.
Individuals bear the costs they impose.	2	May involve subsidies, but less than for driving.
Progressive with respect to income.	3	Tends to increase affordable transport choices.
Benefits transportation disadvantaged.	3	Tends to increase transport choices for non-drivers.
Improves basic mobility.	2	Tends to increase basic transportation options.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Applications

TMAs are appropriate for any geographic area where there are multiple employers. Regional and local governments, business associations and individual businesses can all help establish TMAs.

Table 4 **Application Summary**

Geographic	Rating	Organization	Rating
Large urban region.	3	Federal government.	1
High-density, urban.	3	State/provincial government.	2
Medium-density, urban/suburban.	3	Regional government.	3
Town.	2	Municipal/local government.	3
Low-density, rural.	2	Business Associations/TMA.	3
Commercial center.	3	Individual business.	3
Residential neighborhood.	2	Developer.	2
Resort/recreation area.	3	Neighborhood association.	1
		Campus.	3

Ratings range from 0 (not appropriate) to 3 (very appropriate).

Relationships With Other TDM Strategies

Transportation Management Associations are often created as part of local or regional government TDM policies and programs. TMAs typically support the following TDM strategies:

- Access Management
- Alternative Work Schedules.
- Commute Trip Reduction
- Commuter Financial Incentives
- Flextime Support
- Freight Transport Management.
- Guaranteed Ride Home.
- Parking Management.
- Pedestrian and Bicycle Improvements.
- Ridesharing
- Shuttle Services.
- TDM Marketing
- Telework.
- Transit Improvements.

Stakeholders

TMA stakeholders include regional and local government agencies, transit providers, chambers of commerce or other business organizations, businesses, facility managers (such as a mall or medical center), employees, nearby residents and customers.

Barriers To Implementation

The main barriers are a lack of knowledge among stakeholders, a lack of support structure to establish TMAs, and often the perception that short-term benefits are small if there is no immediate parking or traffic congestion problem.

Best Practices

- TMAs should support a variety of transportation services, travel options and incentives, including planning efforts to create more pedestrian-and transit-friendly land use, and parking brokerage services to help businesses share and trade their parking resources.
- TMAs should include both positive and negative incentives. TDM programs tend to be most effective when they improve consumers' travel choices and provide incentives to use alternatives to driving when possible.
- TMAs should work to develop and maintain cooperation between transportation agencies, transit service providers, businesses, employees and residents who are affected by their programs.

Examples and Case Studies:

Ride-on (www.sloner.org/vv/iprideon/about.htm)
Ride-On in San Luis Obispo County, California is a non-profit transportation cooperative established in 1993 with a mission to develop and implement creative solutions to transportation and mobility issues that concern employers, businesses, medical providers, visitors services providers, special events coordinators, government agencies and individuals. It owns 35 vans and buses. The TMA is guided by a steering committee with representation from non-profit organizations, businesses and local government. It provides:

- Shuttle bus services to regional transportation terminals.
- Shuttle services for children and patients.
- Special event transportation
- Lunchtime shuttle
- Employee Transportation Coordinator (ETC) contract services
- Transportation information and referral
- Commuter baseline survey
- Guaranteed/Emergency Ride Home

Transportation Management Association of San Francisco (http://www.tmasf.org/)
The TMASF is a privately funded association of building owners and managers that encourages the use of alternatives to single occupant commuting. The TMASF was established in 1989 as a cooperative effort between San Francisco city and county governments, and office building developers in the downtown area. It has more than 45 business members and 50,000 individual members who use the organizations services. These services include on-line ridematching, transit trip planning and referral, business resource library, comprehensive marketing, survey, public and community relations programs, interagency relations and event planning. The organization is run by an executive director who reports to a board of directors made up of member representatives.

Hope for Healthy Transport Website (www.hop.man.ac.uk/transport)

This website near Manchester, UK, provides comprehensive travel planning information to encourage employees and visitors to the Hope Hospital to use alternative forms of transportation.

Commuter Connections (http://www.commuterconnections.org/)

Commuter Connections is a network of Washington metropolitan commuter transportation organizations coordinated by the Metropolitan Washington Council of Governments (COG). Commuter. It is the main commuter information resource for Maryland, Virginia, and the District of Columbia. It helps businesses identify opportunities for voluntarily complying with the Clean Air Act guidelines to reduce vehicle emissions, and provides the following services:

- Promoting telework programs and other pollution reduction activities.
- Using Geographic Information System software to match commuters for ridesharing.
- Offers a regional Guaranteed Ride Home program.
- Operates a regional system of Traveler Information kiosks, InfoExpress.

BWI Business Partnership (http://www.bwipartner.org/)

The BWI Business Partnership is a non-profit, member-run organization established in 1985 to promote sound transportation policies and economic development in and around Baltimore/Washington International Airport. It promotes ridesharing, flextime, preferential parking, telecommuting, guaranteed ride home services, and other traffic management techniques.

References And Resources For More Information

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Tri-Met (Portland region) TMA website www.tri-met.org/tma.htm.

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