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The Role Of Demand-Side Strategies"

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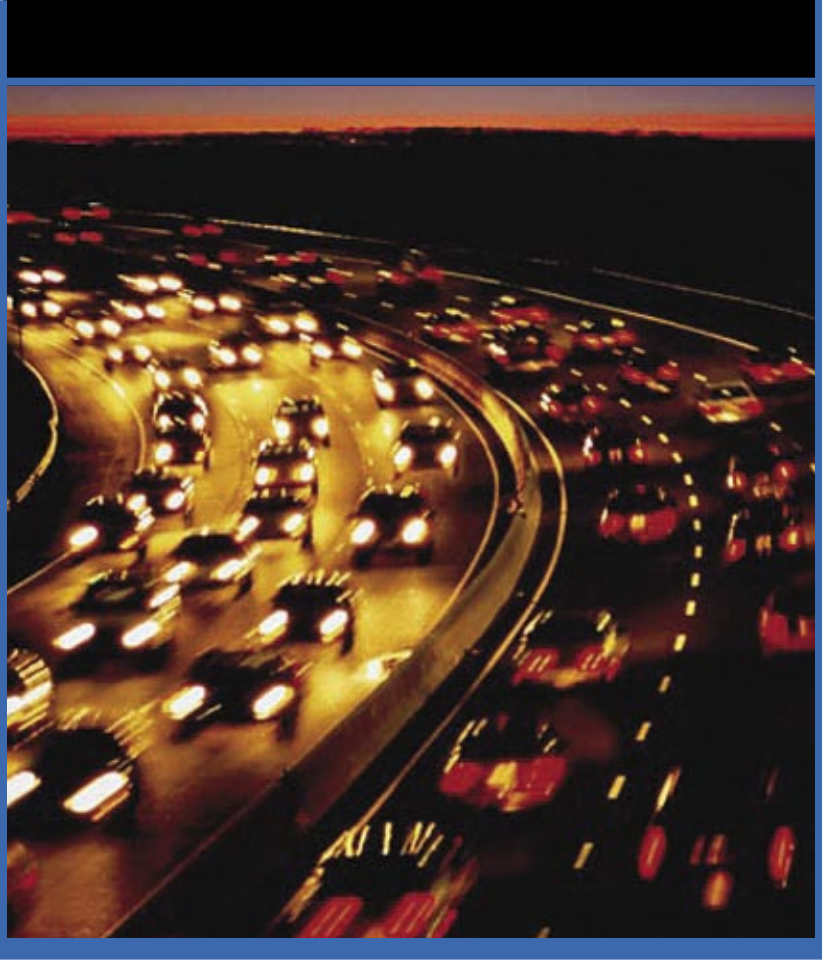
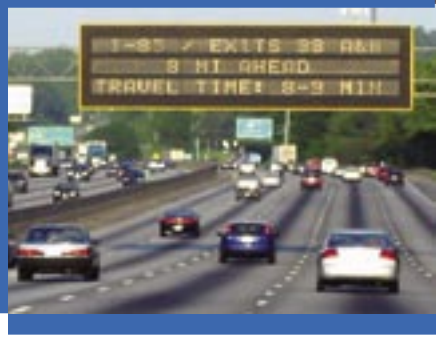
Introduction to the Study Guide

This Study Guide consists of pages 1-57 of the Federal Highway Administration document, "Mitigating Traffic Congestion, The Role of Demand-Side Strategies" written by The Association for Commuter Transportation, et al, in partnership with the FHWA, October, 2004.

The Study Guide does not contain the Case Studies present in the original FHWA document. Interested readers can view the Case Studies by downloading the original document from this link. The present course is based solely on the Study Guide.





MITIGATING **TRAFFIC CONGESTION**

THE ROLE OF DEMAND-SIDE STRATEGIES

U.S. Department of Transportation
Federal Highway Administration

MITIGATING **TRAFFIC CONGESTION**

THE ROLE OF DEMAND-SIDE STRATEGIES

BY

The Association for Commuter Transportation

WITH

URBANTRANS CONSULTANTS

AND

PB PARSONS BRINCKERHOFF

ESTC

IN PARTNERSHIP WITH:

U.S. Department of Transportation
Federal Highway Administration

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Note From the Director
Office of Transportation Management, Office of Operations
Federal Highway Administration

As we advance further into the 21st Century, strategies to manage demand will be more critical to better transportation operations and system performance than strategies to increase capacity (supply) of facilities. The inability to easily and quickly add new infrastructure, coupled with the growth in passenger and freight travel, have led to the need for transportation system managers and operators to pay more attention to managing demand.

The original concepts of demand management took root in the 1970s and 1980s from legitimate desires to provide alternatives to single occupancy commuter travel – to save energy, improve air quality, and reduce peak-period congestion. Today, the need to manage travel demand has broadened to encompass the desire to optimize transportation system performance for both commute and non-commute types of trips, and during both recurring as well as non-recurring events.

Growth in population, number of vehicles and the number of travelers, freight, and development has affected travel demand and re-shaped travel patterns. Managing travel demand now occurs at shopping malls, tourist sites, employment areas, or special events, such as the Olympics. The need to manage demand can occur in the middle of the day, during weekends, or evenings. Demand–side approaches are needed to help address transportation issues created by growth and the variability in demand for use of the system.

In this light, the Federal Highway Administration's Office of Transportation Management is pleased to present this new report on demand-side strategies and the important role that it plays in 21st Century transportation operations. This report builds upon previous work done on travel demand management in the early 1990's to present a newer, more contemporary, perspective on what managing demand in the 21st Century really means.

Given the greater need to manage demand under a broader set of situations and conditions, as well as the influence of information and the technologies to deliver it, the concept of demand management in the 21st Century takes on a broader and more relevant meaning. Managing demand in the 21st Century goes beyond just encouraging travelers to change their travel mode from driving alone to a carpool, vanpool, public transit vehicle, or other alternative. Managing travel demand today is about providing travelers, regardless of whether they drive alone or not, with informed choices of travel route, time, and location – not just travel mode.

Information and the technology to deliver it to travelers are beginning to have a significant impact on managing demand for both commute and non-commute situations. Real-time information systems can now let travelers make better decisions about how they travel (mode), when they travel (time), which route they travel (route), and whether they travel at

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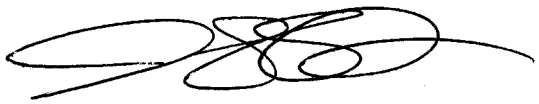
all. Real-time traveler information systems are also critical to managing significant shifts in demand that occur as a result of special events, tourist activity, incidents and emergencies, schools, shopping centers, recreation areas, medical facilities, weather problems, and reconstruction projects. In the 21st Century, the need to deliver information to help manage transportation demand will grow and be further supported by intelligent transportation systems (ITS) technologies.

The FHWA Office of Operations has a two-pronged action agenda of awareness and guidance to evolve the thinking of managing demand to a more 21st Century perspective. This report is a significant step in that direction.

To learn more, visit our website at: www.ops.fhwa.dot.gov

We look forward to working with organizations, public agencies, and interest groups to advance the ideas presented in this publication.



Jeffrey Lindley
Director
Office of Transportation Management, FHWA

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INTRODUCTION

Traffic congestion is slowing America down. In cities large and small, from the east coast to the west coast, traffic congestion is steadily getting worse each year. A larger percentage of the nation's roadway network is congested, more severely and for longer portions of each day, than ever before. In 1982, the average person living in one of the country's 75 largest cities faced seven hours of travel delay per year. By 2001, that figure had shot to 26 hours of delay per year, and the most severely congested periods of the day – once known as the "rush hour" – stretched to cover nearly six hours of each day. By 2001, the severity of peak-period congestion also intensified, with the average "rush hour" trip taking nearly 40% longer than the same trip at other times of the day (TTI, 2003).

The impacts of traffic congestion are far-reaching – impacting individuals, families, businesses and communities. The Texas Transportation Institute (TTI), at Texas A&M University, calculates that the country's "congestion invoice" amounted to nearly $70 billion in 2001 – the byproduct of 3.5 billion hours of delay and 5.7 billion gallons of excess fuel consumed in congestion-related delays. These costs directly affect individuals and families, as people spend more time and money stuck in traffic. For most American households, transportation costs now account for 18% of total household expenditures. Only shelter represents a larger portion of expenditures, at 19%. The impacts on lower-income families are even more severe. For households earning between $12,000 and $23,000 per year, transportation expenses consume one in every four dollars spent (STPP, 2000).

Recognizing the growing burden of traffic congestion and the importance of efficient access and mobility, community leaders and transportation planners are actively working on transportation improvements to alleviate traffic congestion. Much needed roadway, bridge, and transit infrastructure projects – considered transportation "supply" or "capacity" enhancements – are underway across the country to mitigate travel delays and accommodate future growth needs.

As urban areas mature, however, opportunities for further investments in transportation infrastructure are often limited. Urban transportation corridors increasingly lack the physical space to accommodate more lanes. In some areas, communities voice concerns that impacts to private rights-of-way or sensitive environments outweigh the potential benefits of expanding facilities. Many areas simply lack the funds needed to pay for major roadway or transit projects. Competition for limited federal and state funds is intense, and even where needed infrastructure projects are in the planning or construction stages, project completion can still be years away.

Effectively tackling traffic congestion increasingly means employing all available strategies. New infrastructure projects – from roads to bridges to transit facilities – remain a core element of comprehensive transportation improvement programs.

Supplementing these "supply-side" investments are a broad array of "demand-side" strategies intended to make existing transportation facilities work better. Demand-side strategies are designed to better balance people's need to travel a particular route at a particular time with the capacity of available facilities to efficiently handle this demand. Many people have attended a sporting event or a concert where everyone tries to leave the same place at the same time. While in the extreme, this is a perfect example of where travel demand exceeds available supply – and severe traffic congestion often results. The focus of demand-side strategies is to provide people with enhanced travel choices – from choices in travel mode (such as driving, using transit or bicycling), to choices in travel route and trip departure-time – and to provide incentives and information for people to make informed travel choices. For example, many sports and concert venues provide incentives for people to arrive a little early or stay a little late, essentially spreading the "peak" of the demand to travel to/from the building, reducing traffic congestion, and improving the visitor's overall experience.

This contemporary understanding of demand-side strategies is broader in scope than prior, more traditional views of transportation demand management – or TDM. To some, the realm of demand management applications is limited primarily to encouraging alternatives to single-occupant vehicle travel for the commute to work. In practice, however, this narrow view is no longer consistent with the broad applications of demand-side strategies currently underway across the country. Today's applications are not only limited to facilitating shifts in travel mode – they also address shifts in travel routes and travel departure-times (for all travelers, including single-occupant vehicle drivers). Today's applications also extend beyond a focus on commute trips. At national parks, sports stadiums, university campuses, and other diverse destinations, transportation and facility managers are implementing demand-side strategies as part of coordinated efforts to reduce congestion. On bridges, and along corridors undergoing roadway reconstruction programs, demand-side strategies are helping travelers avoid congestion by utilizing alternative travel routes, travel times and/or travel modes – or by reducing the need for some trips altogether by facilitating work from home options a few days a month.

LAKE TAHOE, CALIFORNIA/NEVADA

Mitigating Traffic Congestion: The Role of Demand-Side Strategies articulates a framework for understanding contemporary efforts to manage demand and improve the performance and efficiency of transportation systems. The document provides extensive examples of programs already underway in a variety of application settings, including over 25 in-depth case studies from across the country.

The in-depth case studies illustrate a handful of the many applications of demand-side strategies in place today. The case studies attempt to highlight the diversity of programs, with an effort to find examples that also provided one or more measures of program effectiveness. A few highlights from the case studies include:

- **SBC Park** (formerly Pac Bell Park) in San Francisco – a 41,000 seat baseball stadium – forged an access plan that integrated excellent access to existing transportation facilities (roadways, bus and rail transit, ferry services, and an extensive sidewalk network) and a comprehensive transportation management plan. With only 5,000 dedicated parking spaces available, demand-side strategies to promote a variety of mode and route travel options, along with advanced transit ticket sales and an aggressive marketing program, were key to the stadium's success. The year the park opened, approximately 50% of baseball fans arrived in non-auto modes, over 100,000 advance-purchase transit tickets were sold, and the limited number of parking spaces were rarely full.

SBC PARK, SAN FRANCISCO

- **CH2M Hill** in Denver implemented a transportation program to improve the commute and enhance their employee recruitment and retention abilities. They designed an aggressive telework program with full-time and part-time telework options, and instituted a flextime program to better support a variety of commute options. CH2M Hill also designed the "Look Before You Leave" program, which encouraged all employees to check traffic conditions on a company intranet that centralized a variety of resources for current traffic conditions, roadway construction updates, etc. This resource encouraged employees to avoid the most congested travel routes and travel times whenever feasible. At this suburban work location, 17% of CH2M Hill employees use transit, carpool, bicycle, or telework. In 2002, the program reduced the number of miles driven by employees by over 115,000, and saved nearly 3,700 staff hours.

- **Lee County Bridges** crossing the Caloosahatchee River in southwest Florida are a major source of congestion and travel delay for the region. In 1997, County leaders implemented a variable pricing system for the bridge tolls which incorporated a discount for travelers crossing the bridges just before and just after the peak-periods (when using the electronic toll collection system). A 1999 survey found that this demand-side pricing system encouraged 7% of users to shift their travel patterns to cross the bridges during the discounted, non-peak hours of the day.

LEE COUNTY TOLL BRIDGES, FLORIDA

A full understanding of demand-side strategies must recognize the reasonable limits of these applications. Demand-side strategies should not be considered total solutions to regional traffic congestion problems. Rather, they should more often be implemented as part of an integrated set of solutions that balance supply-side infrastructure investments and demand-side strategies. Demand-side strategies can be relatively easy to implement in a shorter timeframe, within a more constrained budget, than capital improvements. As such, supply-side and demand-side approaches can prove complementary – with demand-side efforts taking on an asset management role by maximizing the performance and extending the life of existing roadways. Successful demand management programs often leverage the synergistic results of many demand-side strategies working together – essentially producing the cumulative results of a number of small percentage improvements.

Demand-side strategies are ultimately about choice and balance. Expanding the array of mode, route and departure-time choices available – supported by robust real-time traveler information, incentives, and other resources – allows each person to choose the options that work best for them regarding when they travel, the mode and route they use to get there, or whether they travel at all.

What's Inside?

Mitigating Traffic Congestion outlines a framework for understanding the full scope of demand-side strategies, and provides a wealth of case studies, both brief and in-depth, that illustrate where and how these strategies are already underway. The document is organized around these primary five sections:

The Demand-Side Framework – The broad framework for understanding demand-side strategies, their impact on traveler choices, and the varied settings where they are applied.

Summary of Case Study Experience – A review of the case studies collected and key lessons learned from the case study exploration.

Conclusions & Future Developments – A summary of concluding thoughts from the publication as a whole and highlights of important future developments.

Additional Resources & References – A collection of organizations, publications and internet resources, along with citations from this publication.

The Case Studies – In-depth case studies of over 25 examples of demand-side programs underway across the country.

THE DEMAND-SIDE FRAMEWORK

this section outlines a framework for understanding demand-side strategies, their impact on traveler choices, and the varied settings where they are applied

In order to better understand the scope of demand-side strategies, the following section presents a framework outlining three primary areas for discussion of demand-side strategies: the variety of available action strategies, the realm of targeted traveler choices, and the variety of program applications.

The basic framework for how these concepts work together is presented in Figure 1. Essentially, in considering demand management programs:

> *A variety of **demand-side strategies** are implemented in order to impact the **travel choices** of individuals and organizations, in the context of a wide array of **application settings**.*

Further detail on each of these three areas is provided below, and illustrated in Figure 2 on the following page.

Demand-Side Strategies. These are the actual strategies designed and implemented by organizations with a role to play in mitigating traffic congestion, including state/regional/local governments, employers, special event managers, and many others. Organizations frequently tailor packages of both general strategies and targeted strategies to facilitate the most appropriate blend of efficient traveler choices.

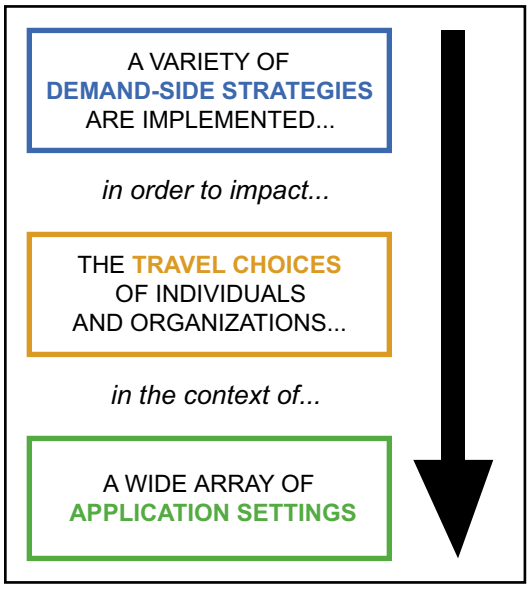


FIGURE 1: THE THREE CORE ELEMENTS OF DEMAND-SIDE STRATEGIES

Traveler Choices. These are the key travel choices made by individuals and organizations that collectively impact the efficiency and performance of the transportation system. Elements include both day-to-day choices about travel mode, departure-time, and travel route, as well trip reduction choices (i.e., telework) and more fundamental residential and business location choices.

Application Settings. Demand-side strategies impacting traveler choices are tailored for a wide range of different application settings, each addressing different trip types or travel market segments. Examples are shown in Figure 2, along with some of the case studies included in this document.

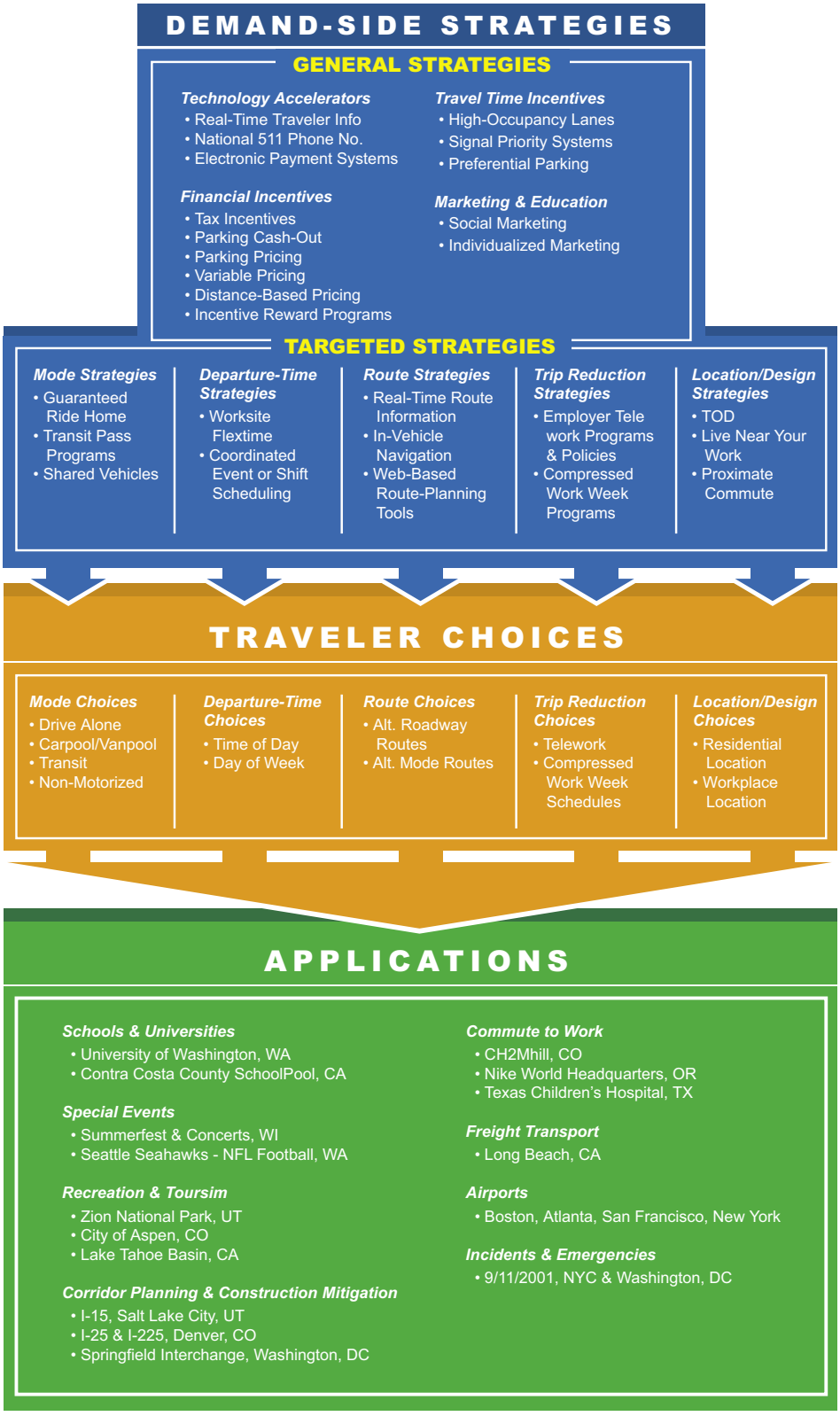


FIGURE 2: THE THREE CORE ELEMENTS OF DEMAND-SIDE STRATEGIES

DEMAND-SIDE STRATEGIES

this section describes the scope of programs and policies implemented by organizations to impact the demand for travel

These are the on-the-ground strategies designed and implemented by organizations with a role to play in mitigating traffic congestion, including state/regional/local governments, transportation management associations, non-profit transportation services providers, transit agencies, employers, special event managers, property managers, and many others. Action strategies can include "general" strategies that have a broad impact on a variety of travel choices. For example, financial incentives can be used to impact travel choices in a variety of ways. In addition to the general strategies available, there are also many "targeted" strategies that focus on a specific travel choice. For example, implementation of workplace "flextime" policies is a demand-side strategy specifically targeting travel departure-time choices. Organizations designing and implementing demand-side strategies frequently tailor appropriate packages of both general and targeted action strategies to facilitate the most appropriate blend of traveler choices.

General Strategies

"General" demand-side strategies impact the full range of traveler choices – from mode choices to departure-time choices and route choices. Ranging from infrastructure investments like high-occupancy vehicle lanes and preferential parking spaces, to more programmatic investments like tax-based incentives, these broad-based, general strategies often work in conjunction with the targeted strategies described below. The full range of general demand-side strategies are described in greater detail in the sections below, and are organized in four primary categories:

- **Technology Accelerators**
- **Travel Time Incentives**
- **Financial Incentives**
- **Marketing & Education**

Targeted Strategies

Often complementing the more broad-based, general demand-side strategies, an array of demand-side strategies are targeted to specific traveler choices – such as choices regarding travel mode or trip departure time. These targeted strategies are described in detail in the sections below, and are organized around the five primary categories of choices that affect overall transportation demand:

- **Mode Strategies**
- **Departure-Time Strategies**
- **Location/Design Strategies**
- **Route Strategies**
- **Trip Reduction Strategies**

General Strategies

General demand-side strategies impact the full range of traveler choices – from mode choices to departure-time choices and route choices.

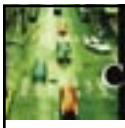
Technology Accelerators

Advances in technology are quickly accelerating the ability of transportation organizations to implement effective demand-side strategies. Significant investments in intelligent transportation system (ITS) infrastructure throughout the country are yielding increasingly precise, real-time information about transportation conditions (i.e., current traffic congestion, transit vehicle locations and wait times, etc.), and increasingly user-friendly and robust pre-trip travel planning tools – all of which are making it easier for travelers to make smart transportation mode, route, and departure-time choices. Additionally, rapid advancements in broadband and wireless internet connectivity are making trip reduction strategies, like telework and e-commerce, viable for larger segments of society. While ITS hardware and software technologies will continue to improve – demand-side strategies play a critical role ensuring that advances in transportation information technology translate into more efficient mode, route, and departure-time choices by the users of the transportation system. By developing partnerships with employers, property developers and managers, residential districts, transportation providers and others, organizations that design demand-side programs can ensure full integration of technology accelerators and other complementary demand-side strategies (i.e., financial incentives, travel-time incentives, etc.). Specific technology applications accelerating the scope of demand-side strategies include:

- **Real-Time Traveler Information**
  The expanded deployment of intelligent transportation system infrastructure and networks, such as road sensors and video cameras, means that accurate, real-time information about traffic congestion, parking availability, transit arrival times, and more are now available to more and more travelers around the country. Real-time traveler information can be provided through a wide variety of communications mediums, including: (1) websites, (2) telephone systems, (3) wireless devices (cell phones, pagers, PDAs, etc.), (4) information kiosks, (5) variable message signs on roadways, at transit stops, and in parking lots, and (6) in-vehicle navigation systems. In order to reach more people before they make travel decisions, transportation organizations are working with a variety of partners to integrate such real-time traveler information resources into corporate intranets at the workplace, building lobbies and elevators, and residential developments through "internet communities."

By providing better information about current travel conditions, transportation agencies and their partners allow people to make travel mode, route and time choices that best match their individual travel needs. Real-time travel information evaluations show that – armed with real-time travel information – a significant number of travelers alter their original route, departure-time, and even mode choices, reducing the demand for already congested facilities and maximizing the use of underutilized alternatives.

FAST FACTS: According to a 2001-2002 survey of real-time travel information users, 68% of users in Pittsburgh and 86% of users in Philadelphia changed their original travel route, while 47% of users in Pittsburgh and 66% of users in Philadelphia changed their original time of travel as a result of the traffic information. The effect on mode choice was less noticeable, 6% in Pittsburgh and 2% in Philadelphia changed their mode of transportation based on the information provided. (Fekpe, 2003)



Case Study Examples

REAL-TIME TRANSIT INFORMATION – REHOBOTH BEACH, DE. Summertime parking and traffic problems in the beach town area around Rehoboth Beach, Delaware, are addressed with seasonal bus services including a park-and-ride Beach Bus. Electronic signs placed at the Rehoboth Park-n-Ride, the Rehoboth Boardwalk, and Dewey Beach's Ruddertown complex, provide both scrolling text messages and AVL-based bus arrival time predictions (NextBus, 2002). In the season following installation, "ridership increased over 13 percent from the year before. No additional service hours or miles were operated…" (Hickox, 2002). This notable response pertains to a recreation and tourist oriented rider clientele, and the electronic sign placement may have had an advertising as well as informational effect. (TCRP, 2003)

REAL-TIME TRANSIT & PARKING INFORMATION – ACADIA NATIONAL PARK, ME. The Acadia National Park, in Maine, is visited by an increasing number of people each year, exceeding 2.5 million annually in 2002. In 2001-2002, a partnership between the U.S. Departments of Transportation and Interior, Acadia National Park, and the State of Maine, implemented several real-time traveler information systems to provide more timely and accurate information to visitors regarding the Acadia's Island Explorer free shuttle bus service and on-site parking availability. Components included (1) real-time bus departure electronic message signs, (2) automated on-board "next-stop" announcements on each Island Explorer bus, and (3) real-time parking information made available by website, telephone, and parking status signs.

A visitor survey, conducted near the end of 2002, revealed the following shifts in transportation choices and preferences among park visitors:

- Real-time parking information impacted decisions visitors made about travel in the park. Of visitors using the parking information, 43% changed the time they visited a destination and 38% changed destinations based on the information.
- Visitors strongly believed in the benefits of the Island Explorer's real-time bus departure signs and the on-board bus announcements. Over 80% found that these technologies made it easier to get around and 69-80% visitors believed they helped to save time.
- Visitors using the electronic bus departure signs and on-board announcements reported that the technologies helped them decide to use the Island Explorer bus (80% and 67%, respectively). 44% of the users of the real time parking information said it helped them decide to use the Island Explorer bus.

(Battelle, 2003)

- **National 511 Phone Number**
  During the 1990s, a variety of organizations established hundreds of travel information telephone numbers across the country to provide real-time and other transportation information. In 1999, the U.S. Department of Transportation petitioned the Federal Communications Commission for a three-digit dialing code to make it easier for consumers to access these travel information services – using the same, simple phone number nationwide. The FCC assigned the "511" number on July 21, 2000. In early 2004, 511 was available in over 20 states/regions, providing users access to advanced traveler information services.

DID YOU KNOW? By January 2004, the 511 system was available to almost 57 million Americans (19.4%), in over 20 states/regions. In January 2004, 1.8 million calls were placed to the 511 system, with an average length of 1 minute and 46 seconds (for a total of over 3.2 million minutes of call time in the month). (Resource511, 2004)

- **Integrated Electronic Payment Systems**
  Electronic Payment Systems (EPS) allow travelers to pay for transportation services electronically. The advancement of EPS technologies is allowing more widespread – and more integrated – application of electronic payment options for transit, parking, roadway tolls, and other fee-based transportation services. Integrated EPS technologies – from the "smart card" fare payment systems with imbedded microprocessors in each card to the Radio Frequency Identification (RFID) systems at many toll plazas – are quickly reducing many of the barriers to seamless transportation across travel modes and between different transportation providers. EPS technology can allow for seamless payment, with a single fare payment media, across a variety of modes (bus, rail, ferry, etc.), and on a variety of transportation service providers within the same region. Transit agencies and other providers are also exploring adding retail purchase options to fare payment smart cards, allowing transit users convenient purchase of retail goods and services in and around transit stations and stops. In each case, technological advances are enabling more efficient and convenient travel choices.

INTEGRATED ELECTRONIC FARE PAYMENT – WASHINGTON, DC. The Washington Metropolitan Transportation Authority's (WMATA) SmarTrip program was the first public transportation system in the U.S. to adopt smart cards, launching a pilot program in 1999. In June, 2002, WMATA sold its 250,000th SmarTrip permanent rechargeable plastic smart card which holds up to $200.00 in fare value. One third of WMATA Metrorail riders use SmarTrip cards regularly. SmarTrip will be expanded to parking, bus transit, and other regional rail service over a total of 17 transit systems. (APTA, 2003)

DID YOU KNOW? Smart card electronic fare payment systems are now in use by transit agencies in over ten regions of the U.S., including Washington, DC; Atlanta, GA Los Angeles, CA; San Francisco, CA; Orlando, FL; Minneapolis, MN; and others. (APTA).

Financial Measures

Transportation expenses are a major factor in the travel choices people make everyday. In fact, for the average American household, transportation costs represent 18 percent of total household expenditures (STPP, 2000). As such, a wide range of demand-side strategies are oriented around using financial incentives and targeted pricing systems to encourage efficient travel choices.

- **Tax Incentives**
  The Federal tax code allows employers to provide tax-free transit, vanpool, and parking benefits to their employees. The employer and employee save on taxes, since neither pays federal income or payroll taxes on these benefits. Called "qualified transportation fringe" benefits in the Internal Revenue Code, Section 132(f), these tax incentives are often referred to as "Commuter Choice tax benefits" or simply "commuter benefits." For tax year 2004, transit and vanpool expenses up to $100 per month ($1,200 per year) and qualified parking expenses up to $195 per month ($2,340 per year) are tax-free. The monthly tax-free limits are subject to annual adjustments, indexed to inflation (see www.commuterchoice.com for continually up-to-date information). Providing commuter tax benefits to employees can save payroll taxes for employers. Because the value of the benefit paid to employees is considered a tax-free transportation fringe benefit and not wage or salary compensation, the cost of the benefit is eligible as a business expense and payroll taxes do not apply. There are three primary ways employers can structure the benefit:

  Employer-Paid Transportation Benefits. Employers can pay for their employees to commute by transit or vanpool, up to a limit of $100/month (subject to annual change). With this arrangement, employees get up to $100 in a tax-free transportation benefit. Employers get a tax deduction for the expense and enjoy savings on payroll-related taxes. Employers have found that providing transportation benefits offers significant savings over offering the equivalent dollar value to employees in the form of a salary increase. Employers can also pay for the cost of parking for employees, up to a limit of $195/month (this limit is subject to annual change).

  Employee-Paid, Pre-Tax Transportation Benefits. Employers can allow employees to set aside up to $100/month of pre-tax income to pay for transit or vanpooling (subject to annual change). Employers save money overall since the amount set aside is not subject to payroll taxes. Employees save money, too, since the amount of an employee's salary set aside for transportation benefits is not subject to income or payroll taxes, up to the specified monthly limits.

  Shared-Cost Transportation Benefits. Employers can share the cost of transit or vanpool costs with employees—and everyone can receive valuable tax savings. With this approach, employers can provide a portion of the cost of taking transit or vanpooling as a tax-free benefit and allow the employee to set aside pre-tax income to pay for the remaining amount of the benefit (up to the specified limits).

Q. Are additional tax incentive programs available to employers at the state level?

A. Yes, several states have tax incentive programs to encourage employer participation in providing commuter benefits to their employees. For example, the Maryland Commuter Tax credit provides a 50 percent tax credit, up to $30 per employee per month, for provision of transit passes, vanpool benefits, and reimbursement for carpooling expenses. Other states offering tax incentives to employers include: Georgia, Minnesota, Delaware, Connecticut, Oregon, New Jersey. See the following U.S. EPA document for more information: www.bwc.gov/pdf/fedtax.pdf

FAST FACTS: Although 86 percent of American workers feel that commuter assistance benefits — such as discount transit passes, ride sharing boards, or parking benefits — are beneficial and useful, only 17 percent have access to such assistance through their employers. Eighty-six percent of employees who do not have commuter assistance typically drive alone to work, compared with only 71 percent who do have access to commuter assistance. Surveyed employees who have commuter assistance are almost eight times more likely to use public transportation such as the train, subway or bus than those employees who do not have assistance (15 percent versus 2 percent). (Xylo, 2001)

- **Parking Cash-Out**
  Employers can offer their employees the option to "cash out" of their existing parking space. For example, if Company A subsidizes parking for their employees at $60/month, a parking cash-out program would allow employees to choose from the following options: (1) keep the parking space worth $60/month, (2) give up the parking space and receive $60 extra each month in taxable salary, or (3) receive $60/month in tax-free transportation benefits to pay for transit or vanpooling. Cash-out programs often work best for employers that pay separately for parking and for organizations with parking shortages or demands to expand parking facilities.

FAST FACTS: A 1997 study of eight parking cash out programs in California found that total vehicle trips declined by 17% after a parking cash out option was introduced at various urban and suburban worksites, as shown in Figure 3 below. (Shoup, 1997)

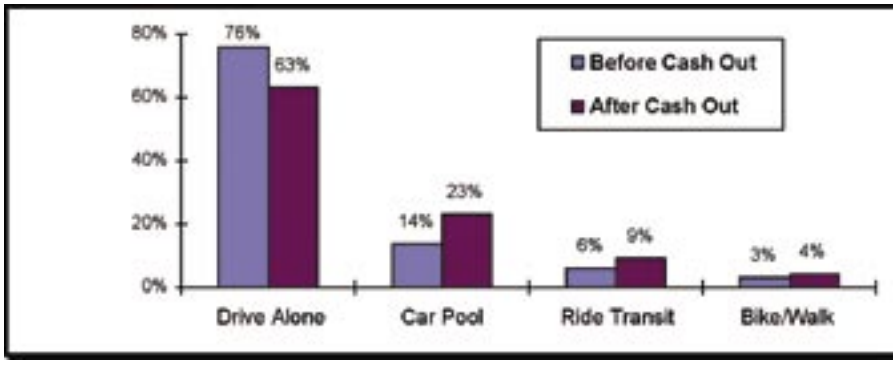
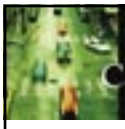


FIGURE 3: CASHING OUT IMPACTS ON COMMUTE MODE (SHOUP, 1997)

- **Parking Pricing**
  Parking pricing entails charging vehicles directly for use of a parking space, and is among the most powerful demand-side strategies. There is a cost (whether in land value, construction cost, maintenance cost, etc.) for all parking spaces. The question is whether these costs are subsidized by developers, property owners, property managers, or others – or whether, and how, these costs are charged directly, in full or in part, to those using the spaces. Well-crafted parking pricing strategies can impact the use of alternative travel modes, in particular where high-quality transit services are available. Variable parking pricing programs (see below for more detail on variable pricing), where parking prices are higher during more congested hours of the day or along more congested routes, assist in managing demand and encouraged the use of less-congested travel times and travel routes. Within particular parking lots, parking managers can discount certain parking spaces (preferably in priority locations, such as next to a building entrance) for use by those arriving in multi-occupant vehicles.

  FAST FACTS: Over 95 percent of commuters park for free at work in the US, and almost all of them drive alone (91 percent of total commuters). For 2002, this yielded an estimated commuter parking subsidy for off-street parking paid by the employer and/or developer of $36 billion. (Shoup, 2003)

- **Variable Pricing**
  Variable pricing changes the price structure of toll roads, bridges, parking lots, and other congested transportation facilities in order to provide incentives for using the facilities in uncongested times or by different modes. On variable priced toll roads, toll rates are structured such that higher prices are assessed based upon time of day concurrent with typical or even actual periods of congestion. Despite the nature of the program, tollway users will experience higher charges during the peak periods and lesser charges during off-peak or shoulder periods. The effect of variable pricing on toll facilities is to: 1) help divert some traffic from the peak period to the shoulders of the peak period, and, 2) provide a cost-based encouragement for the use of transportation options (such as transit and ridesharing). Shifts to either off-peak periods or other transportation options will likely reduce the overall congestion on the facility, and, reduce the need for additional capacity on the toll facilities.



Case Study Examples

VARIABLE-PRICED TOLLS – LEE COUNTY, FL. Lee County is using variable-priced tolls to mitigate congestion on two county bridges by spreading traffic away from the peak period "rush hour." In the "shoulders of the peak period" (6:30 – 7:00 am, 9:00 – 11:00 am, 2:00 – 4:00 pm, and 6:30 – 7:00 pm), patrons received a 50% discount on the bridge toll if they utilize the bridge's electronic toll collection system. According to a 1999 telephone survey, half of respondents indicated they always or sometimes considered the toll discounts prior to making a trip across the bridges. As a result of the program, use of the bridges increased in the off-peak times and decreased during the peak periods. Analysis indicated that the travelers who modified their travel plans were more likely to be retired or working part-time. The survey results indicated that commuters were less likely to modify their schedules as a result of variable pricing, and that the program appears to have a greater impact on shopping trips. (Burris, 2000)

FAST FACTS: Over forty-five projects in fifteen states have investigated and, in some cases, begun implementation of pricing programs. In Hudson County, NY, variable pricing on existing toll bridges increased transit usage and reduced peak-period traffic by 7 percent. On the New Jersey Turnpike, up to 15 percent of peak-period traffic was reduced by variable pricing. Variable tolls on the State Route 91 facility has increased three-or-more person carpools. (FHWA, 2004)

- **Distance-Based Pricing**
  Distance-based pricing involves shifting automobile expenses that are often fixed monthly or annual costs, such as automobile insurance or vehicle registration, to expenses that vary according to how much the vehicle is driven. Distance-based pricing strategies are designed to directly tie more types of automobile expenses (i.e., in addition to fuel expenses) to the number of miles driven. Distance-based pricing programs may include (1) pay-as-you-drive automobile insurance, (2) mileage-based vehicle registration fees, and (3) mileage-based vehicle purchase taxes.

DID YOU KNOW? Progressive Insurance became the first insurance company in the United States to offer mileage-based vehicle insurance when it initiated service in Texas in 1999. Not only does Progressive charge per mile, but the company also uses a Global Positioning Satellite (GPS) system to charge motorists more when they drive under higher risk conditions. In 2004, GMAC Insurance and OnStar teamed up to offer mileage-based insurance discounts to OnStar subscribers in four states. Under the new program, vehicle owners with active OnStar accounts may be able to save from 5 to 40 percent on their car insurance, depending upon where they fall within seven mileage categories. (OnStar, 2004)

- **Incentive Rewards Programs**
  Reward-based incentive programs use financial and recognition rewards to encourage travelers to try and to maintain efficient transportation choices. There are a wide variety of ways incentive reward programs are structured: (1) direct cash or gift certificate rewards offered to travelers for efficient travel choices, either on a regular basis or through periodic prize giveaways, (2) points-based systems for use of efficient travel choices, much like airline frequent flier programs, (3) extra time off of work, or similar workplace-based rewards, and (4) recognition of travelers or sponsoring organizations in newspaper ads, award ceremonies, etc. Reward-based incentive programs are sponsored by organizations at many different levels, from single-site employers to federal agencies. For example, the Best Workplaces for Commuters[SM] program, established by the U.S. Environ-

INCENTIVE PROGRAMS – NIKE. Nike, a footwear manufacturer headquartered in suburban Portland, has an extensive commuting program that includes two types of carpooling incentives. First, carpools have reserved parking areas until 10 AM. Second, carpoolers are eligible, along with all other non-single occupant vehicle commuters, for monthly and quarterly prize drawings. Prizes range from gift certificates in increments of $25, $50, of $100 for company store or local retailers to $400 for mountain bike purchase or "getaway" weekends. Nike's SOV rate in 1992 was 98%. Since moving WHQ and implementing the Nike Buck and TRAC programs, Nike's SOV rate has reduced to 78%. 10% of employees carpool, 2% bike, 5% use bus and rail and 5% use flextime.

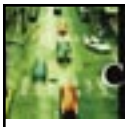
mental Protection Agency (EPA) and the U.S. Department of Transportation (DOT), publicly recognizes employers whose commuter benefits reach a National Standard of Excellence. EPA and DOT also recognize entities other than employers, such as business parks, downtown districts, or shopping malls, which provide and administer to each of the district's employees a commuter benefits program that meets the National Standard of Excellence. For more information, visit: www.bwc.gov.

Travel Time Incentives

Increases in congestion levels around the country are creating longer and longer travel times. The average driver in the country's 75 largest cities experienced about 26 hours of travel delay due to congested driving conditions in 2001. In addition to an overall increase in average travel times, travel time "reliability" has also decreased, with crashes, vehicle breakdowns, weather, special events, construction and maintenance accounting for about 50 percent of all delay on the roads in 2001 (TTI, 2003). As such, a variety of demand-side strategies are oriented around providing travel time incentives to encourage efficient travel choices. These demand-side travel time incentives address both overall travel time savings and improved travel time reliability.

- **High-Occupancy Vehicle (HOV) Lanes**
  HOV lanes are exclusive roadways or lanes designated for high-occupancy vehicles, such as buses, vanpools, and carpools. The facilities may operate as HOV lanes full time or only during the peak periods. HOV lanes typically require minimum vehicle occupancy of two or more persons. However, in some locations, occupancy requirements have been increased to prevent congestion on the HOV lane. Support facilities, such as park and ride lots and transit centers with direct access to the HOV lane, are important system elements to increase facility use. HOV lanes may also be used to provide bypass lanes on entrance ramps with ramp meter signals. Keys to the success of lanes include location (areas of high congestion do better); enforcement; interagency coordination; synergy with parking policy, trip reduction ordinances, and transit and ridesharing programs; public and policy-maker support; and education and marketing. A related concept, high-occupancy toll lanes, or HOT lanes, allow single-occupant vehicles to utilize HOV lanes for a fee. HOT lanes can expand the range of travel choices available to all users and even help articulate the perceived "value" of HOV lanes to transit, vanpool, or carpool travelers able to use the same lanes at free or reduced rates. Revenues generated through fees paid by single-occupant vehicles on HOT lanes can also bolster ongoing funding for transit and ridesharing services along a HOT/HOV route.

FAST FACTS: There are more than 2,500 lane-miles of HOV facilities in the U.S. and Canada. This is expected to double within the next 25 years. One of the first HOV lanes, the I-10 HOV lane in southern California, known as the "El Monte Busway", was opened in 1973 as a dedicated busway and later opened to carpools of three or more people. In 2002, the single El Monte HOV lane carried more people than three regular general purpose lanes during peak periods, and, saved users an average of 20 minutes over the eleven mile distance. On average in southern California, HOV lane users saved more than half a minute per mile compared to the general purpose lanes. (CA DOT - District 7, 2003)



BUS SIGNAL PRIORITY SYSTEMS – INTERNATIONAL EXPERIENCE. "Transit signal priority (TSP) installations in England and France have shown a 6 to 42% reduction in transit travel time, with only 0.3 to 2.5% increases in auto travel time. In North America, Toronto, Edmonton, Charlotte, Portland, Chicago, and Los Angeles, among others, have installations in place. In Toronto, for example, average transit signal delay reductions of between 15 and 49% using TSP has justified expansion to over 300 signalized intersections (15% of total) along four bus and five streetcar routes, all in mixed traffic. Other TSP deployments include a 2-mile stretch in Cicero, IL on Cermak Road that is the site of an Illinois Department of Transportation demonstration using wire loops at 10 signalized intersections. Chicago Transit Authority and suburban PACE buses, using transponders and absolute TSP, realized an 8-minute trip time versus 12 minutes before TSP (a 33% reduction). In Los Angeles, two projects demonstrated application of TSP in conjunction with service restructuring (Metro Rapid) at approximately 100 signals along of each corridor (14-16 miles). Results indicated an average 8% decrease in overall bus running time, and a 35% reduction in bus delay at signalized intersections." (ITS America, 2002)

- **Transit / HOV Signal Priority Systems & Queue Jumps**
  Queues at either arterial intersections and/or ramp meters (signals that manage access to freeways from arterials) can significantly lengthen travel times for all travelers. When compounded with the need to make stops, signal delays often result in unacceptably long travel times for potential bus riders, carpools, and vanpools. Many metropolitan areas have implemented signal priority systems and queue jumps as one means of addressing signal delay for multi-occupancy vehicles, providing a significant improvement to travel time and/or travel time reliability for transit users, vanpoolers, or carpoolers. These demand-side strategies provide a travel time incentive for the use of high-occupancy travel modes – or the use of underutilized travel routes/times.

  FAST FACTS: The Minnesota Department of Transportation conducted a study to evaluate the effectiveness of its extensive ramp metering system, including shutting the system down. The study showed that ramp metering decreased total travel time by 24% in heavy congestion and 46% in typical traffic. Without HOV bypass lanes, ramp metering imposes a delay on buses and carpools. With HOV bypass lanes, overall travel time delay can be reduced by up to 62% in heavy congestion due to 1) reduction of freeway traffic due to ramp metering, and, 2) no travel time delay on the ramps. (MN DOT, 2002)

- **Preferential Parking**
  This strategy reserves priority parking spaces within a parking lot for those arriving by carpool or vanpool, or even those arriving during less-congested times of the day. "Preferred" parking could include (1) covered parking that protects people and cars from the weather, (2) an assigned parking space near the building entrance, (3) a level-one spot in a multistory parking garage, or (4) priority position on a parking space waiting list. Although designating preferred parking areas is most effective where parking demand meets or exceeds supply, many travelers with abundant parking still enjoy parking closer to the building or in a designated parking space.

FAST FACTS: The City of Aspen, Colorado, provides a variety of demand-side transportation strategies to preserve the physical environment and to control future traffic impacts on the community. In order to encourage carpooling, vehicles with more than three people entering the downtown area can stop at a kiosk and receive a Carpool Parking Permit that allows that vehicle to park in a designated area free of charge all day. In 2001, approximately 16,000 daily permits were issued. Coupled with the high-occupancy vehicle lanes, the distribution of these permits is one of the most successful incentives to rideshare.

Marketing & Education

A critical element of successful demand-side strategies is often a well-designed and executed marketing and education program. Even in communities where high-quality transportation mode, route and time choices are currently available, travelers who remain unaware that these choices exist, or unconvinced that these choices are viable and/or reliable, even modest shifts in travel behavior and transportation efficiency are unlikely. Transportation marketing programs, at their most basic level, are designed to do one of three things: (1) increase awareness of available transportation choices, (2) encourage travelers to try new, more efficient travel choices for the first time, or (3) increase or maintain the frequency that people utilize more efficient travel modes, routes or times. Educational programs are designed to make travelers more aware of available transportation choices, and more aware of the specific facts related to travel choices – such as travel costs for different travel modes, travel times at different departure times, etc. Several specific strategies are emerging at the forefront of demand-side marketing and education strategies:

- **Social Marketing**
  Social marketing campaigns are increasingly being used by organizations around the country to encourage voluntary, socially-beneficial behavior change. "Social marketing is the use of marketing principles and techniques to influence a target audience to voluntarily accept, reject, modify, or abandon a behavior for the benefit of individuals, groups, or society as a whole" (Kotler, 2002). Using techniques similar to marketing commercial goods and services, various organizations have used social marketing techniques to encourage environmentally-friendly landscaping techniques, increase the use of seat belts and child safety seats, promote safe bicycling and the use of bike helmets, and champion enhanced exercise and physical activity. Similar approaches are increasingly being used to encourage voluntary changes in travel behavior, from reducing the number of trips made by single-occupant automobile to encouraging travel at off-peak travel times.

FAST FACTS: In 1993, North Carolina launched the "Click It or Ticket" campaign to increase seat belt use throughout the state. A social marketing campaign touted the benefits of seat belt use in conjunction with communicating a $25 fine for violations (fine revenues went to local schools). Before the campaign, only 65% of North Carolinians used seat belts. By 2000, seat belt use had jumped to 84%, among the highest rates in the nation. Highway fatalities and injuries were cut by 14%, and statewide, auto insurance rates fell. The U.S. Department of Transportation called the campaign a "model for the nation," and it has since been replicated by states across the country. (Kotler, 2002)

- **Individualized Marketing**
  Individualized marketing – sometimes referred to as dialogue marketing – focuses marketing efforts and financial resources on a targeted group of individuals or households, working on a one-to-one level to provide tailored information about available transportation choices and small incentives to encourage individuals to try new options. In April 2004, the Federal Transit Administration (FTA) selected four communities for a pilot individualized transit marketing project: Bellingham, WA; Cleveland, OH; Sacramento, CA; Triangle Park, NC. "The FTA's pilot project is based on personalized, individual marketing of potential commuters who might consider using public transit, but need more information. Transit agencies in the pilot communities first identify a neighborhood (approximately 600 households) with existing transit service and those residents are contacted in writing to determine if they are interested in learning more about travel options. Interested residents are then contacted by phone to determine if they would like information on transit, bicycling or walking. The outreach continues until residents have enough information to ensure their comfort level with trying different modes of transportation. In a few cases, bus operators make 'home visits' to personally discuss public transportation routes and options with residents." (FTA, 2004)

FAST FACTS: A UITP (International Public Transportation Association) project conducted in Europe, as well as larger scale individualized marketing programs in Australia, resulted in significant increases in transit ridership. The pilot project in Europe resulted in a 10 percent reduction in car usage in the targeted area, while the large-scale individualized marketing efforts in Australia yielded up to 14 percent reductions. The first U.S. pilot project in Portland, Oregon, reduced car travel by 8 percent in the first area selected for the pilot, and resulted in a 27 percent increase in travel by carpool, vanpool, transit, bicycling and walking in that same area. (FTA, 2004; Australian TravelSmart, www.dpi.wa.gov.au/travelsmart/)

Targeted Strategies

Often complementing the more broad-based, general demand-side strategies, an array of demand-side strategies are targeted to specific traveler choices – such as choices regarding travel mode or trip departure time. These targeted strategies are described in detail in the section below, and are organized around the five primary categories of choices that affect overall transportation demand.

- **Mode Strategies**
- **Departure-Time Strategies**
- **Location / Design Strategies**
- **Route Strategies**
- **Trip-Reduction Strategies**

Mode Strategies

The following demand-side strategies specifically target the choices of travel mode, from driving alone to bicycling to using transit:

- **Guaranteed Ride Home**
  Guaranteed Ride Home (GRH) programs, sometimes called emergency ride home programs, provide those who do not drive into work, or other supported destination, with

a free ride home in cases of emergencies, unplanned overtime, or other unexpected issues. Rides are often provided by taxi, but GRH can also be supported through rental cars, company fleet vehicles, or other alternatives. Often sponsored by local/regional governments, or by employers, GRH programs provide a back-up travel option to prevent travelers using alternative travel modes from being stranded at their destination.

FAST FACTS: In a 2003, survey the Artery Business Committee Transportation Management Association in Boston found that seven percent of commuters who used to drive alone switched to transit once they found out that there was a GRH service available. Metropolitan Washington's Council of Governments (MWCOG) GRH program is listed as a transportation control measure in the area's state implementation plan (SIP). MWCOG estimates that by 2005, its GRH program will eliminate 0.76 tons per day of NOX, at a cost of $8,800 per ton of NOX reduced. (Todreas, 2004)

- **Transit Pass Programs**
  Transit pass programs provide subsidized or free passes to travelers for the use on community transit and/or regional rail, bus, ferry or shuttle transit services. Free transit passes provide an incentive for "first time" users to try using transit and simplify the fare payment process..

FAST FACTS: When employees in downtown Ann Arbor, Michigan were provided a discounted or free transit pass (depending on the level of employer involvement), the estimated effect was a 9.2% increase in daily bus trips and a 3.5% daily decrease in the number of private vehicles coming into downtown between 2000 and 2001. (White, 2002)

- **Shared Vehicles**
  Shared vehicles provide a flexible option to travelers who rely primarily on non-motorized and public transit travel, yet at times require a vehicle for special trips, such as grocery shopping or trips to rural areas, or to get from the transit station to their final destination. Shared vehicle concepts include:

  - Car Sharing: Member based programs offer 24 hour access to a fleet of vehicles (cars, vans, trucks) within a city or neighborhood. Vehicles are reserved and used for just a few hours or up to a week. Most programs offer vehicles at an hourly and mileage based rate, with prices including gas, insurance, parking and maintenance. Several vehicles are generally located at convenient locations throughout the city
  - Station Cars: Similar to the car sharing concept; small, low emission vehicles are available at transit stations, helping people get from the train to their final destination, used daily for the commute or on an as needed basis.

FAST FACTS: According to researchers at the University of California at Berkeley tracking City CarShare, a San Francisco Bay area car-sharing organization, 30 percent of users have sold one or more of their privately owned vehicles and City CarShare is saving 13,000 miles of vehicle travel, 720 gallons of gasoline, and 20,000 pounds of carbon dioxide emissions in the Bay area. (City CarShare, 2004)

Departure-Time Strategies

The following demand-side strategies specifically target trip departure-time choices:

- **Worksite Flextime**
  Worksite flextime allows employees to set their own arrival and departure time to/from work – within established time boundaries agreed to by their employer. This strategy can influence travel in several ways. In congested areas, it may encourage employees to avoid the most congested travel times, reducing the demand on roadway and/or transit systems during peak-demand periods. Furthermore, flextime programs often provide employees with the schedule flexibility sometimes needed to coordinate carpools and vanpools.

  FAST FACTS: From a Federal Transit Administration report on the potential impacts of flextime programs on peak-period traffic demand: "At Bishop Ranch in California, flextime policies [were] successful in shifting employee arrival times to earlier periods. A survey of 14,800 employees between 1988 and 1990 showed the percent of employees starting work before 7:00 a.m. increased from eight to 17 percent, and the percent starting work after 9:00 a.m. increased from one to 9 percent. Departure peaking also has been reduced. The percentage of workers leaving before 4:00 p.m. increased from 12 to 17 percent. The employer flextime programs were instituted as part of a broad demand management program for the area, as well as a local trip reduction ordinance encouraging reduction of peak hour vehicle trips." (FTA, 1992)

- **Coordinated Event or Shift Scheduling**
  Scheduling the coordination and staggering of traffic to reduce the number of vehicles arriving and leaving a site at one time. This can apply to event venues, specific worksites or office parks with severe traffic congestion.

  FAST FACTS: Near downtown Milwaukee, Summerfest, an annual, eleven-day outdoor music festival, attracts approximately 100,000 patrons per day and over 1 million annually. Since parking on-site is limited near the venue, alternative means of providing transportation and informing festival visitors with traffic, alternative route and parking information were essential. Local ridership data for Year 2000 showed that approximately 25% of the total attendance used bus transportation.

Route Strategies

Travelers making day-to-day decisions regarding available travel routes generally use a combination of information resources to determine the quickest, or most reliable, route option. Many commuters listen to television and radio reports of traffic conditions. Others explore real-time, web-based travel-speed maps. Some simply pursue alternate routes when their normal route is unusually congested. The role of demand-side route strategies is to get the most accurate, timely information on travel conditions to people before they end up on congested facilities – allowing them to select less-congested routes and avoid "adding to the problem" by using already congested routes. Demand-side route strategies can apply to roadway, transit and other travel route alternatives.

- **Real-Time Travel Route Information**
  More and more areas around the country are launching real-time travel route information resources for area travelers. Using web-based maps, en route variable message signs, wireless updates to mobile devices, and other communications mediums – travelers are better able to make the most efficient route choice, and better able to make that choice before they end on a congested roadway or transit facility. Real-time, web-based traffic maps, like the Georgia Navigator system shown in Figure 4, often use a color-coded system to display travel speeds, warning indicators to show current incident locations, and hotlinks to connect users to live camera images of existing traffic conditions (where available). Organizations implementing comprehensive demand-side strategies are working with employers, property developers and managers, and others to integrate these real-time tools into corporate intranets, lobby kiosks, and others medium – in order to ensure that people can access this information conveniently.

FIGURE 4: GEORGIA NAVIGATOR REAL-TIME TRAFFIC MAP. www.georgia-navigator.com

DID YOU KNOW? The Utah Department of Transportation's CommuterLink, a real-time, web-based traveler information system that was operational for the 2002 Salt Lake Winter Olympics, is based on the Georgia Department of Transportation's Navigator system – which was used during the 1996 Summer Olympic Games.

- **In-Vehicle Navigation Systems**
  In-vehicle navigation systems are currently available in a variety of automobiles currently on the market for sale, lease and rent. These systems generally provide drivers with route guidance, vehicle position, and regional points of interest information. Historically, in-vehicle systems have relied on static data about travel times for each road segment to calculate the shortest travel time from where the vehicle is located to a point the driver inputs as the destination. As the collection and dissemination of real-time travel information – and the availability and affordability of regional broadband wireless networks – both improve, in-vehicle navigation systems will be able to provide drivers of private automobiles and transit vehicles real-time route guidance. Such guidance will encourage travelers to take advantage of underutilized travel routes and avoid non-recurring congestion caused by incidents and other emergencies.

FAST FACTS: Telecommunications companies are launching region-wide, broadband wireless services in cities around the country. The expansion of region-wide broadband wireless will expand the capacity to deliver real-time traffic data and other information to vehicles moving throughout a region. Telecommunications companies initiated service in Washington, DC, and San Diego, CA, in 2003. Service will expand to other major metropolitan areas throughout 2004 and 2005. (Baig, 2004)

- **Web-Based Route-Planning Tools**
  A variety of companies provide web-based travel route planning tools for roadway trips, and an increasing number of transit agencies are offering similar services for transit riders. These tools allow users to enter trip start and end locations (along with desired departure times or en route services, in some instances), and process recommended travel routes and forecast travel times. As these tools evolve, multi-modal travel route planning and the capacity for using real-time travel information to suggest less-congested alternate routes or modes is likely to emerge.

Trip Reduction Strategies

The following demand-side strategies are designed to reduce the need for some trips altogether:

- **Employer Telework Programs & Policies**

Employers establish telework programs and policies at the worksite in a wide variety of ways – from structured, formally-implemented telework programs and policies to more informal telework arrangements established between individual employees and their direct supervisors. In many areas, transportation organizations – from metropolitan planning organizations to transportation management associations – have well-established telework support programs to assist employers in setting up appropriate telework systems and policies.

FAST FACTS: In a 2001-2002 employee survey, AT&T found that "AT&T teleworkers again reported that they gain about an extra hour of productive time each day at home, adding up to at least an estimated $65M in business benefit each year... Teleworkers appear to get more accomplished not only because of time saved by not commuting - that is, increased productivity on a per teleworker or per workday basis - but also because of increased productivity per unit hour. The ability to focus and manage time is critical for knowledge workers, and little distractions in the office add up to big costs in productive time." (Roitz, 2002)

- **Employer Compressed Work Week Programs & Policies**
  Employers in a variety of setting establish compressed work week programs, offering employees the option to work the same number of work hours in fewer days per week, or per pay period. Development of compressed work week programs and policies involves a variety of partners, including company management and human resources staff, employee labor unions, and regional transportation organizations.

FAST FACTS: A 1991 study of compressed work week programs in Ventura County, CA, reports that the program was associated with a decline in single-occupant vehicle trips to work, from 82 percent to 77 percent. (Freas, 1991)

Location / Design Strategies

The location of land uses in a community – from homes, to businesses, to retail establishments –directly impacts transportation demand. Over time, as cities evolve, changes in land use development patterns lead to changes in trip-making patterns. In some areas, urban growth has led to increases in trip lengths and growth in the average number of vehicle trips per day. In other areas, a variety of land use location and design strategies have led to reductions in trip lengths and vehicle trip generation – contributing to congestion mitigation advances (R.H. Pratt Consultant, 2003). Communities, businesses, and individuals make land use location and design decisions based on a wide range of economic, social, environmental, and other factors. Transportation accessibility is also a factor in many of these decisions, and a variety of location/design demand-side strategies are available. Several specific programs are described below. A more extensive discussion of the impacts of land use and site design strategies on travel patterns is available from the Transportation Research Board: Traveler Response to Transportation System Changes: Chapter 15 Land Use and Site Design (R.H. Pratt Consultant, 2003).

- **Live Near Transit Mortgage Incentives**
  Live near transit programs offer mortgage incentives to encourage residential location near transit facilities. The programs recognize that household transportation expenses can be lower for residences well served by public transportation, and allow homebuyers to use these transportation savings as additional borrower income in qualifying for a home mortgage. For example, Fannie Mae sponsors the Smart Commute InitiativeTM in pilot cities across the country. In several of the pilot cities, the Smart Commute Initiative involves partnerships with regional planning organizations, transit agencies, and private companies to provide complementary services supporting the use of public transportation (i.e., discounted transit passes, shared-car membership programs, etc.). Fannie Mae also supports the Location Efficient Mortgage® program in four pilot cities nationally.

Case Study Examples

WASHINGTON REGIONAL SMART COMMUTE INITIATIVE. In Washington, DC, the Smart Commute Initiative offers mortgage incentives to households locating within one-quarter mile of a public bus stop or one-half mile of a public rail station. Through the program, participating lenders will add a portion of the potential transportation savings to borrowers' qualifying income - an addition of $200 per month for one wage-earner households and $250 per month for two wage-earner households (a potential increase in home-buying power for a typical purchaser of a median-priced home of approximately $10,000). Participants also receive discounts on transit passes and lifetime membership in the Flexcar shared-car program. (www.mwcog.org/planning/smart_commute/index.html)

- **Live Near Work Incentive Programs**
  Live near work programs provide incentives for employees to live near their place of employment. Examples include down payment assistance, location efficient mortgages and rent subsidies. By providing housing close to employment, this program can lower the costs of commuting, lessen the pressure on infrastructure, and generate more pedestrian traffic in business districts.

DID YOU KNOW? In 1997 Maryland's General Assembly adopted a series of growth management programs, one of which was the Live Near Your Work Program. The City of Baltimore pioneered the program and continues to partner with area "Live Near Your Work Employers" to provide $2,000 cash grants to home buyers for down payment and/or settlement expenses. (www.livebaltimore.com/homebuy/lnyw.html)

- **Proximate Commute**
  This program involves voluntary, coordinated relocation of eligible employees who work for multi-site employers to the work branch locations closest to their home, reducing commute distances. Rather than having employees commute to distant locations, their employers help them arrange job swaps and transfers to company sites closer to home. In the mid-1990s, the Washington State Department of Transportation worked with Key Bank on a proximate commute demonstration project. A total of 500 Key Bank employees – from 30 individual branches in three counties – were found to be eligible for the program. An initial review found that 83% of the employees lived closer to an average of 10 different branches than the branch where they were presently employed. 85 of the 500 employees enrolled in the program. The result was a 65% reduction in miles traveled. (Giery, 2003)

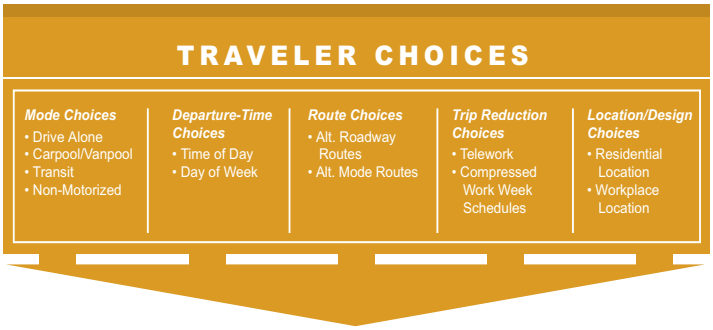
FAST FACTS: In 2002, Boeing undertook a pilot project to itemize the jobs and home addresses of 10,000 of its non-union workers to determine if some could transfer to a plant closer to home. Preliminary research showed that 53 percent, or 42,475, of its workers share a job description with a plant that is closer to their residence. Boeing found that if those employees could be moved, it would reduce commute-related travel by 168 million miles annually, equating to 8 million gallons of gas and 5,000 tons of emissions each year. (Seattle Post-Intelligencer, 2002)

- **Transit-Oriented & Pedestrian-Oriented Design, Mixed-Use**
  A wide range of urban form and design strategies can enhance opportunities for the use of public transit, ridesharing, bicycling, and walking. Focusing a mix of land uses – such as employment, housing, restaurants, services (banking, day care, etc.), retail, and more – in well-designed, pedestrian-friendly developments and/or near transit connections can reduce the demand for vehicle travel and reduce trip distances. A 2002 study in California demonstrated that transit-oriented developments (TODs) can yield 20 to 40 percent higher ridership at an individual transit station for both work and non-work trips, and can increase overall regional transit ridership by up to 5 percent. (Parsons Brinckerhoff).

FAST FACTS: An assessment of the impact of different degrees of land use mix on travel patterns in 57 suburban activity centers found that centers with some on-site housing had 3 to 5% more transit, bike and walk commute trips. Additionally, for each additional 10% of commercial/retail floor space in the activity center, transit and ridesharing increased by 3%.

TRAVELER CHOICES

an outline of the range of traveler choices impacted by demand-side strategies



Traveler Choices

Strategies implemented as part of a demand-side program are designed to facilitate efficient traveler choices.

Individual travelers, families, and businesses all make important decisions that collectively impact traffic congestion. These decisions include day-to-day travel choices, such as travel mode, departure-time, and travel route. They also include decisions to eliminate some travel altogether – for example, by working from home a few days a month or by using internet-based technologies to preclude the need to physically travel to a store, library, or other destination. Finally, individuals and organizations make important decisions about the location of their residence or business – often factoring in transportation-related considerations such as commute to work travel times or ease of access to public transportation services.

This section provides additional detail on five primary traveler choices:

1. **Mode Choices**
2. **Departure-Time Choices**
3. **Route Choices**
4. **Trip Reduction Choices**
5. **Origin / Destination Location Choices**

Mode Choices… "What travel mode will I use for my trip?"

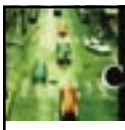
Demand-side strategies target improvements to the availability and viability of real transportation mode alternatives for a full range of travelers, from school-age children through seniors, and for a full range of trip types, from the trip to work to the trip to the corner store. By enhancing the availability of a range of travel mode choices, travelers can select the most appropriate or efficient option for each trip. In many situations, the flexibility and convenience of the single-occupant automobile is the best option. However, for many trips, other mode choices can prove less expensive, less stressful or more predictable.

The Range of Mode Choices:

- **Single-Occupant Vehicle (SOV)**
  A single individual driving an automobile or motorized cycle with no other passengers.

FAST FACTS: The country's share of commuters driving alone increased by just over 3% from 1990 to 2000 (from 73.19% to 76.31%). From the 2000 U.S. Census, the District of Columbia (40%), New York (56%), Hawaii (67%), and Alaska (69%) remain the four jurisdictions with the lowest drive alone rates. Alabama (85%), Michigan (84%), and Ohio (84%) have the highest drive alone rates. (2000 U.S. Census)

- **Carpool**
  Two or more people sharing a ride in a private vehicle. Carpooling is the most common and flexible way for travelers to share a ride, and often occurs between family members, friends, or co-workers. More informal than a vanpool and more flexible than public transit, carpools generally have two or more passengers who live in the same neighborhood, or along the same route, using a private vehicle to travel to common or nearby destinations. Carpooling often appeals most to people traveling at least ten miles or whose trip takes over 20-30 minutes.



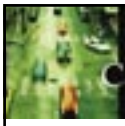
Case Study Examples

VANPOOLING - PUGET SOUND, WA. Six large, medium and small transit agencies in the Puget Sound region include vanpool service as an integral part of their total service package. In January 2004, King County Metro operated 663 vanpool and 60 vanshare vans, Community Transit ran 210 , Pierce Transit ran 228 , Kitsap Transit ran 89, Intercity Transit ran 77, and Island Transit ran 43. In the Puget Sound area, vanpooling has achieved a 2% market share of the overall commuter market. Among commuters who travel 20+ miles each way, vanpooling has reached a 7% market share. King County Metro's VanShare program provides service to bridge the gap between the commuter and a public transportation hub or terminal (rail station, Park & Ride lot and ferry dock). The agencies specifically look to vanpooling to meet demand in hard-to-serve suburban markets. For more information on vanpooling in the Puget Sound region, contact Syd Pawlowski at King County Metro, 206-684-1535, syd.pawlowski@metrokc.gov.

- **Vanpool**
  A group of seven or more people sharing a ride in a prearranged vehicle. With one or two vanpool participants typically serving as regular drivers, vanpools provide non-stop, point-to-point service. The van's ownership and operating costs are usually paid for by the van riders on a monthly basis. Vanpools typically serve trips of 15 miles or more. Many transportation agencies complement fixed-route bus and rail transit with vanpool services to provide attractive door-to-door travel options for otherwise difficult to serve trips (i.e., suburb-to-suburb trips, trips to low-density office markets, and trips to/from smaller towns or outlying communities).

FAST FACTS: While the average fare paid by bus passengers in 2001 was $0.74 per unlinked trip, vanpool passengers paid an average of $2.06. As a result, transit operators in the Puget Sound region achieve an 85% farebox recovery of capital and operating costs for their vanpool programs. In 39 cities reporting data on more than one mode to the National Transit Database (NTD) in 2001, vanpools had the lowest cost-per-passenger and cost-per-revenue-mile expense to transportation agencies. (APTA, NTD)

- **Public Transportation**
  Rail, bus, shuttle or ferry transportation services provided to the general public, utilizing a paid driver and administered by public transportation agencies or private-sector companies. Services may operate along a fixed-route on a set schedule, or may utilize more flexible routing and scheduling options. Public transportation services provide critical, high-capacity access to dense-urban areas (allowing for intensified land use development without increased congestion), offer needed transportation services to those without access or unable to drive (including child and the elderly populations), and are increasingly vital to the success of special events (from major events like the Olympic Games, to recurring events like baseball games or concerts). In an effort to preserve high-value environments and enhance visitors experience, public transportation is now a key element of overall mobility and access planning at many of the nation's parks, including Acadia and Zion National Parks.



Case Study Examples

CHICAGO, IL. The City of Chicago has joined forces with the Chicagoland Bicycle Federation to teach motorists and bicyclists to better share city streets. Along with an ad campaign to show motorists how to share the road, they'll send bicycling ambassadors out to the streets to speak face-to-face with members of the public.
www.biketraffic.org/

USA. In 2003, 500,000 students, parents and community leaders in cities across America joined millions of walkers worldwide to participate in International Walk to School Day.
www.iwalktoschool.org/

FAST FACTS: Public transportation ridership has increased over 21 percent in the last six years (1998-2003), faster than highway or air travel. Every $1 invested in public transportation projects generates $6 in local economic activity, and supports approximately 47,500 jobs. Public transportation is a $32 billion industry that employs more than 350,000 people. (APTA, 2004)

- **Non-Motorized (Walk, Bike, Skate)**
  Includes walking, bicycling, skating or any other mode of non-motorized travel. Often complements other modes of travel. For example, most public transportation trips begin or end with a walking trip, and many users bicycle to/from transit stops. A safe and convenient environment for pedestrians can dramatically increase the number of people walking to offices, stores, or schools during the day. Walking then enables sharing a ride or taking the bus as a realistic travel alternatives.

DID YOU KNOW? In 2000, the bicycle industry generated $5.89 billion in sales. Each year, nearly one billion trips are made by bicycle, and over 40 million American adults ride a bike at least once a month. Bicycling and walking represent 7% of all trips made nationally, yet accounts for 13% of all traffic-related fatalities in the country. (America Bikes, 2003). More than half of the American public (55%) says it would like to walk more throughout the day either for exercise or to get to specific places. When thinking about deciding where to live, having sidewalks and places to take walks for exercise or fun is important to nearly eight in ten Americans (79%), and "very" important to four in ten (44%). Having areas to walk in the neighborhood rates third on a list of seven items asked in the survey, behind feeling safe from crime and the quality of the public schools. (STPP, 2001)

Departure-Time Choices… "What time-of-day or day-of-week will I depart for my trip?"

Beyond day-to-day choices about travel mode, travelers also make regular decisions about the time of day, or even day of week, to depart on their trip. Travelers often adjust their travel schedules to avoid rush-hour traffic congestion, to work around childcare or school schedules, or to take advantage of reduced roadway, bridge or transit off-peak pricing discounts. Demand-side strategies use a variety of approaches to facilitate utilization of less-congested travel times, mitigating the length and duration of congested peak periods ("spreading the peak"). The enhanced use of real-time travel information increasingly allows travelers to avoid non-recurring traffic incidents by shifting trips to an earlier or later time.

The Range of Departure-Time Choices:

- **Time of Day**
  Shifting trip departure-times away from congested times of day, to avoid non-recurring traffic congestion resulting from a traffic incident, to avoid traffic congestion caused by weather, or for individual scheduling needs.

  FAST FACTS: The extra time needed for rush hour travel has tripled over two decades. According to the Texas Transportation Institute's (TTI) 2003 Urban Mobility Report, the national average Travel Time Index for 2001 was 1.39 (meaning a rush hour trip took 39 percent longer than a non-rush hour trip). The national average in 1982 was only 1.13, a 26% increase in travel time for a rush hour trip versus a non-rush hour trip. This increasing "rush hour penalty" creates a growing incentive for travelers to take advantage of less congested travel times. (TTI, 2003)

- **Day of Week**
  Shifting trips to less-congested days of the week. In addition to more common "rush hour" times of the day in many urban areas, congested travel conditions in some communities are more frequently linked to certain days of the week. For example, travel to recreation or tourism destinations can be plagued with peak-direction congestion on Friday afternoons and Saturday mornings, followed by congestion in the reverse direction on Sunday afternoons. US 50 over the Chesapeake Bay Bridge, Highway 99 to the Whistler Blackcomb ski area, Route 6 to the Cape Cod National Seashore, and I-70 to Colorado's many ski areas all exhibit this day-of-week congestion.

Q. Do demand-side operations programs require people to change their travel patterns?

A. Absolutely not. These programs simply aim to provide travelers with the broadest range of efficient travel choices, the best information on the choices available and how to use them, and balanced financial incentives for the most efficient alternatives.

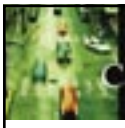
Route Choices… "Which route will I use for the trip?"

Many travelers have several routes available to travel between Point A and Point B. Travelers wisely choose routes that get them where they need to go (including en route stops) based on experience over time that informs them of the most efficient route choices. Some travelers choose the fastest routes, while others choose routes with less-hectic or safer travel conditions. Other travelers alter travel routes from day-to-day as the result of changing travel needs (i.e., trip chaining) or as the result of non-recurring travel delays caused by traffic incidents, roadway construction, or even weather. The collective route choices made by travelers in a region affect the performance of the transportation network ("too many people using the same route at the same time"). Demand-side programs provide travelers with advanced, real-time transportation information in a variety of formats, facilitating traveler utilization of excess roadway capacity on less-congested travel routes, and limiting the magnitude and duration of both recurring and non-recurring travel delays. These strategies can also focus on shifting travel away from residential or other sensitive routes, and can shift demand away from routes with construction related delays.

The Range of Route Choices:

- **Alternative Roadway Routes**
  Shifting the roadway route utilized to travel between destinations, in order to avoid congested facilities and travel on routes with available capacity. Travelers may utilize a variety of traveler information tools – such as real-time traffic information available on websites or en route variable message signs – to determine the best available routes.

- **Alternative Mode Routes**
  Shifting the transit routes utilized in order to avoid system delays or other issues, or shifting the travel mode used (into transit, bike, walk, etc.) in response to delays on roadway systems.



Case Study Examples

ROUTE CHOICES – CAPE COD NATIONAL SEASHORE. Of the five million annual visitors to the Cape Cod National Seashore today, one-half arrive during a ten-week period in the months of June-August. The type and duration of tourist visits has changed over the past forty years. The two-week to a full month stay that was usual in the 1960s and 1970s has been replaced by shorter trips, usually a two to three day weekend. In order to address the long-range transportation needs of the area, planners developed the Long-Range 25-Year Plan for Alternative Transportation Systems – including transit enhancements and development of intelligent transportation systems to provide both pre-trip and en route travel information services. From the plan: "Pre-trip information can assist a driver map a route, gather information on current roadway conditions, and identify detours around planned construction. Transit users can identify transit routes, schedules, fares, and connections… En-Route Driver Information systems provide real-time information to travelers who have commenced a trip. Information on delays, accidents, weather conditions, and emergency situations can be communicated to the traveling public. Route guidance systems can identify alternative routes that are available to by-pass delays." (Volpe, 2003)

Trip Reduction Choices… "What are my options to reduce the need for some trips?"

The demand for travel is based on the need of customers to move between two points for some purpose, whether to get to work or to the store. "Trip reduction" choices explore alternative ways to "connect" origins and destinations, using technology and other advancements to eliminate the original need for some trips altogether. As an example, "teleworking" connects people to their jobs through the information superhighway, rather than the local interstate highway.

The Range of Trip Reduction Choices:

- **Telework**
  Simply defined, teleworking is working at home or another off-site location, full- or part-time. While employees may be hooked up to the main office via a sophisticated computer network, it's possible to telework with as little as a pen, paper and phone. Jobs are more portable than they once were. Teleworking is increasingly used by employers to reduce the demand for office space and parking space. Additionally, teleworking is often used as a recruiting and retention tool. Across the country, part-time teleworking is on the rise, while trends suggest a gradual decline in the number of people working full-time from home. A 2003 survey by The Dieringer Research Group reported that 23.5 million Americans telework at least one day per month, a growth of 40 percent since 2001. The report found that 42 percent of these employee teleworkers work from home at least one day per week, and 22 percent of the employees work at home daily or nearly every day. (Dieringer, 2003)

  FAST FACTS: 21% of working Americans teleworked in 2001. 58.8% of teleworkers say they work longer hours because they work at home. (ITAC, 2001)

- **Compressed Work-Week Schedules**
  In a compressed work week, employees complete their required number of work hours in fewer-than-normal days per week (or per pay period). This arrangement allows employees to have one day off each week or one day off every other week, depending upon which type of compressed work week program preferred. The two most popular compressed work week schedules are the 4/40 and 9/80 programs, although other variations also exist. These options are described below:

  - 4/40 Program. Employees work four 10-hour days each week, with the fifth day off. To ensure five-day coverage, some employers have half the company take Mondays off and half take Fridays off.
  - 9/80 Program. Employees work 80 hours in nine days, with the 10th day off. This schedule usually translates to eight 9-hour days and one 8-hour day (this shorter day is often the Friday that the employee works). In a company with two major work groups, each group might take off alternating Fridays.

FAST FACTS: A 1995 study of 2,600 Southern California employees, conducted for the California Air Resources Board, found that "employees on compressed work week reduced their net number of trips by an average of 0.5 per week… The respondents using a 9/80 schedule drove an average of 13 fewer miles per week; those using a 4/40 schedule drove an average of 20 fewer miles per week." (Holmes, 1995)

Origin / Destination Location Choices… "How do residential, business, shopping and other location choices impact my travel choices?"

While travel choices cover the range of alternatives about how and when to travel between an origin and destination (decisions that people make every day), individuals and businesses also make more fundamental choices about the actual location of these origins and destinations - and these "location choices" have a significant impact on the demand for transportation. People looking for a new home often consider the length and difficulty of their commute to work in their residential location choice. Companies often consider maximizing access to employee labor markets, or to central freight shipment locations, when making business location choices. Retail establishments often assess area consumer markets and ease of access to their retail location. Additionally, community land use design decisions can integrate a mix of land uses in one area, making it easier for people to access multiple destinations (work, shopping, day care, etc.) in a centralized area. All of these locations choices can have a significant impact on the number of trips people make, the length of these trips, and the viability of making these trips by a variety of travel modes (driving, transit, walking, etc.).

Q. Do these travel choices, such as using transit or adjusting travel times, really work for everyone?

A. No, but even shifting 5-10% of travelers to a different mode or time can have a significant impact on peak period congestion in certain locations. Many travelers in urban areas note that congestion is less severe when area schools are not in session – a prime example of how small shifts in travel patterns can affect overall congestion levels and delay.

The Range of Origin / Destination Location Choices:

- **Residential Location**
  Decisions about residential location, with consideration given to ease of access to adjacent transportation facilities (roadways, transit stations/stops, bike paths, etc.) or to travel distances to key destinations (work, shopping, schools, etc.).

- **Business Location**
  Decisions about business location, with consideration given to ease of access to adjacent transportation facilities, proximity of employee residential locations and commute distances, ease and manner of access to potential customer markets, etc.

FAST FACTS: Quantitative assessments of jobs/housing balance at the sub-regional level have shown that a good balance of jobs and housing can be associated with average commuter trip lengths lower by seven to almost 30 percent, compared to where jobs and housing are out of balance (R.H. Pratt Consultant, 2003).

APPLICATIONS

the application settings for demand-side strategies

Demand-side strategies facilitating efficient traveler choices are tailored for a wide range of different program applications, each addressing different trip types of travel market segments.

1. **Schools & Universities**
2. **Special Events**
3. **Recreation & Tourism Destinations**
4. **Transportation Corridor Planning & Construction Mitigation**
5. **Employer-Based Commute Programs**
6. **Airports**
7. **Incidents & Emergencies**
8. **Freight Transportation**

Schools & Universities

Throughout the United States, driving children to school is as routine as the commute to work. While school bus systems exist for many school districts (particularly rural), they do not always fit student schedules (due to after school activities, etc.) or they are not even offered in some urban districts. Neighbors may form carpools for their children, however, without outside support or guidance, the reach of these carpools may be limited to groups of friends or neighbors that already know each other and that have children in the same school. "School Pool" programs are administered in many communities to share information with parents and assist in the connection of interested parties for sharing a ride. Not only do school pools reduce overall vehicle miles traveled, they also decrease congestion around the schools, which enhances safety and fosters an improved environment for children walking or bicycling to school. Often referred to "safe

routes to school," these programs are underway across the country, in cities of all sizes. The California Safe Routes to School Clearinghouse offers a range of resources and contacts for these efforts: www.4saferoutes.org.

CONTRA COSTA COUNTY, CA. The county-wide SchoolPool program has providing rideshare assistance and bus passes on local transit for five years.

UNIVERSITY OF WASHINGTON. The University created the "Universal Pass" which provides transportation options for a quarterly fee to faculty/staff.

In university or college settings, the physical space for parking and transportation infrastructure is often limited. By making transportation opportunities abundant and flexible in nature, students, faculty, and staff are encouraged to try and eventually rely on alternatives to single occupancy vehicles. Other programs may integrate on-campus housing as part of an integrated transportation and land use strategy designed to reduce travel distances or eliminate the need for some trips altogether. Disincentives, such as an aggressive parking fee structure, often play an integral role in encouraging more efficient travel choices.

Special Events

Many communities recognize sizeable special events produce significant impacts to the transportation system. In order to curtail traffic disruptions and congestion related to events – whether they are summer festivals, sporting events or conventions – agency collaborations on traffic management plans are using available assets, including local transit and ITS infrastructure, to better manage demand. FHWA has developed a technical reference entitled *Managing Travel for Planned Special Events.* The reference is intended to serve as a stand-alone tool for transportation practitioners and includes successful case studies for a range of special event types.

SUMMERFEST, WI. The Wisconsin Department of Transportation demonstrated the effectiveness of "pre-planning" for large events, such as the Summerfest concert festival, attended by over one million people annually.

SEATTLE SEAHAWKS, WA. As a condition of project approval, the transportation management plan for Seahawks Stadium established goals to reduce personal vehicle trips. Based on 2002 results, mode split goals set forth in the plan have been surpassed.

King County, in Seattle, developed an internet-based resource for offering ridematching and other services for regional events. The website provides an updated list of upcoming special events, and facilitates ridesharing to the event locations. More information is available: www.rideshareonline.com/eventmatching/logonframepubevent.asp

ZION NATIONAL PARK, UT. In order to preserve the unique resources and recreational opportunities of Zion Canyon, the Park instituted a mandatory shuttle system during peak visitation. 75% of Zion's annual visitors utilize the shuttle system.

ASPEN, CO. In this city, the revenue generated from the paid parking program is directly reinvested into demand-side programs and allocated for future transit investments.

Recreation & Tourism

Unique circumstances can lead to successful implementation of demand-side strategies at recreation and tourism destinations. Typical of the resort areas researched for this guide, maintaining environmental, natural, and aesthetic features of

the community are of necessary importance for the economic vitality of the area. As part of this guide, information has been collected on strategies to manage traffic that have been implemented in recreational and destination communities. Demand-side strategies typically focus on targeted travelers (i.e. employees, visitors, etc.) to reduce trips during congested travel times. Often demand-side programs are geared towards home-based work trips. However in an area where tourism and seasonal services occur, demand-side strategies might be particularly effective if targeted towards seasonal employees often priced out of living close to their employment center or visitors who are accustomed to paying for services and already expect a unique experience from visiting the area. The case studies highlighted in this guide describe a collection of programs undertaken by various sponsors (i.e. local jurisdictions, transit authority, non-profit organizations) as part of a collective effort for their community.

Transportation Corridor Planning & Construction Mitigation

Planning and preliminary engineering of major corridor investment projects presents significant opportunities for the coordinated integration of demand-side programs. In more and more projects around the country, these programs are being developed as an integrated component of each "build" alternative assessed in the corridor planning process. There are three prime opportunities for integration of demand-side programs into the corridor planning and construction process:

1. **Project Phasing.** In corridors where major capital investments are selected as part of the "preferred alternative," the final implementation of these investments is often 5-10 years down the road. Demand-side programs often take much less time and money to implement, and can provide valuable transportation services in the early years of implementation. Systems management strategies can achieve near-term, incremental improvements to traffic flow. Demand-side measures can enhance available travel choices and establish key partnerships with corridor businesses.

2. **Construction Mitigation.** The (re)construction of major corridor infrastructure projects often takes many years to complete. During this time period, transportation capacity in the corridor is often degraded and access to businesses limited. Demand-side programs provide critical mitigation strategies to reduce the negative impacts of construction, including:
   - Providing traveler information regarding construction activities like ramp closures, and offering details and assistance on alternative travel modes, travel routes and travel times.
   - Working with corridor employers and other businesses to provide traveler information and to develop access alternatives, such as transit, vanpooling, flexible work hours or telework.
   - Working with transportation agencies to adjust existing transportation facilities and services, such as adding temporary HOV lanes or adding additional transit services.

3. **Complementing Build Alternatives.** Demand-side programs often play an important role as a complement to a build alternative, in two key ways:

ATLANTA, GEORGIA

A. Maximizing the utilization of build alternatives.Strategies implemented vary, based on the nature of the build alternative. For example:
   - For corridors adding HOV lanes, appropriate strategies might include partnerships with employers for promotion of transit and ridesharing, development of incentives, education and marketing of associated travel time and travel cost savings for HOV lane use, information on lane access times and locations, etc.
   - For corridors adding transit systems, appropriate strategies might include working with employers to improve connections to the transit stops/stations, development of transit pass programs, marketing and education of transit routes, stops and schedules, real-time transit schedule information, etc.

B. Providing enhanced travel choices for trip patterns not well served by the major investment. For example, construction of new general purpose lanes and a rail transit line along a north-south corridor may not provide significant benefits for east-west travel patterns in the area. Transportation management strategies can augment the major north-south investment with systems management strategies to improve traffic flow and demand-side programs to provide enhanced travel choices for east-west trips. These same programs also enhance access to major north-south investments.

Employer-Based Commute Programs

As a travel market, work-related trips tend to reflect the highest percentage of peak-period trips made within a region. Typically, commute trips occur regularly and are sometimes easier to arrange for a consistent alternative to driving alone than other trip types. For this reason, many demand-side strategies are implemented through employer-based and work site specific programs that encourage employees to switch from driving alone to carpooling, vanpooling, or using some other alternate means of travel. Often programs deployed at a work site level encourage employees to ad-

Case Study Examples

T-REX – DENVER, CO. For the Transportation Expansion Project (T-REX) in metropolitan Denver, Colorado, project sponsors have dedicated $3 million to the TransOptions program, a TDM-based construction mitigation program. (www.trexproject.com)

US 101 – SAN LUIS OBISPO, CA. As part of the reconstruction of US 101 in the Cuesta Grade in central California, the San Luis Obispo Council of Governments developed an integrated set of demand-side strategies to enhance mobility during the reconstruction period. The program included increased commuter bus service, special vanpool promotion and subsidies, and carpool incentives. An evaluation of the demand-side programs showed a reduction of about 300 cars per day from the highway, eliminating about 8,000 miles of daily vehicle travel. Average auto occupancy on the highway rose from 1.206 to 1.266. The evaluation showed that the carpool incentives were the most cost effective means among the three programs for removing cars from the highway.

just work schedules or even reevaluate the need to travel (i.e. telecommute). Regional demand-side programs also focus on commute trip reduction strategies that complement local transportation programs and facilities such as light rail, regional bus service, and rideshare programs. As an incentive, employers are typically eligible for tax benefits by providing certain qualifying transportation benefits.

LONDON HEATHROW. On a large scale, BAA's London Heathrow has invested in a sustainable future for public transport involving an integrated system of rail, transit, and managing and monitoring traffic demand.

JFK, NY. In addition to improving access to the John F. Kennedy Airport (JFK) in New York City, the $1.9 billion JFK AirTrain investment provides access for passengers traveling between terminals and other ground facilities.

Airports

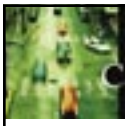
In recent years, increased attention has been given to transportation systems supporting airports both locally as well as internationally. Airports are vital to local economies and therefore should be given due diligence for continued and orderly expansion. Transportation management efforts, whether or not expansion is on the horizon, include internal circulation plans, overall master planning efforts, and regional transportation infrastructure investments. Planning efforts should take a critical look at airfield capacity, terminal and parking space and access issues. Besides encouraging travelers to use alternative means to travel to, from and within airport property, successful planning efforts have incorporated transportation options for airport employees. Since the terrorist events on September 11, 2001, transportation infrastructure as it relates to maintaining airport security has also been taken to a level of elevated importance and scrutiny.

Incidents & Emergencies

Strategies to improve traveler awareness of an unplanned event and to expedite the response to incidents on the roadway network are essential for maintaining freeway operations. Traffic incidents are a significant cause of freeway congestion. When an incident occurs, roadway capacity is typically reduced by blocking a lane or introducing a distraction in the traveling environment that causes motorists to reduce travel speed. Considerable documentation is already available on incident and emergency management programs throughout the country. FHWA has numerous publications, including the Benefits Brochures series, highlighting technology for incident and emergency response. AASHTO has published the Connecticut Department of Transportation (CONNDOT) Incident Management System (IMS) as one of their highlighted Success Stories. CONNDOTs IMS, like many throughout the country, monitors traffic operations at a traffic operations center, dispatches and coordinates interagency emergency response, adjusts traffic signal systems to manage flow, and supports highway service patrols. Transportation management plans are also critical to emergency preparedness planning efforts for natural disasters and other major, unexpected occurrences

Freight Transportation

Considering that commercial vehicle traffic typically comprises a steady percentage of daily traffic on state highways and the interstate system, further research on non-commute demand-side strategies would benefit from a more detailed discussion of freight management and commercial transportation. As a function of their size, freight trucks have been attributed with adding to congestion, road surface degradation and traffic accident severity. Commercial vehicle travel reductions can provide benefit to both the highway system and local roads utilized for delivery. There are a number of programs around the country that have been implemented to streamline commercial vehicle operations. FHWA has also documented the benefits of commercial vehicle electronic screening in their Benefits Brochures series. Besides streamlining operations, perhaps the most effective way to manage commercial vehicle travel is to encourage off-peak travel or alternative routes. Improving scheduling and truck routing processes can contribute to a reduction in freight vehicle mileage.



Case Study Examples

DEMAND-SIDE FREIGHT STRATEGIES – LONG BEACH, CA. The Los Angeles region has 16 million residents, 9 million jobs, and one of the busiest freight ports in the world. In the Los Angeles area, the Long Beach port moves close to 13,000 20-foot long containers each day. To better manage this high level of goods movement, Intelligent Transportation Systems can be used as a tool to implement Transportation Demand Management concepts traditionally seen in personal commuting. TDM concepts in goods movement include better scheduling, better routing and reduction of bottlenecks at check points.

On December 10th, 2003, the Marine Terminal Operators (MTO) introduced a new truck identification technology that has potential to reduce air pollution and relieve truck congestion around the port. The two tracking devices currently being considered are radio frequency identification tags (RFID) and Real-Time Locating System tags (RTLS). Both systems are similar to electronic toll collection devices currently used in private automobiles across the country. At the MTO's expense, these devices will be installed in over 30,000 trucks that use the Long Beach terminal.

The new technologies will help reduce congestion in several ways. First, it allows the MTO to identify and register trucks without the need for them to stop at port entrances. Electronic identification also will reduce the entrance gate personnel requirements for the MTO, making off-hour deliveries less expensive and more realistic. Increasing off-hour deliveries has the potential to shift delivery schedules to times of the day that experience less commuter congestion. Thirdly, the new technologies could locate lost truck drivers and facilitate route finding back to the terminal. Finally, electronic identification provides an excellent tool to gather data on truck contributions to local highway congestion.

The Vice Mayor and City Councilman of Long Beach, Frank Colonna is excited about the potential to reduce the impacts of truck congestion on neighboring communities. Mr. Colonna has said, "I like the initiative. It will provide a pathway to better manage truck traffic, minimize congestion, [and] reduce air pollution..." The MTO intends to have the system up and running by March 2004. For more information contact: Port of Long Beach, (562) 437-0041, info@pobl.com.

SUMMARY OF CASE STUDY EXPERIENCE

this section reviews the case studies collected and key lessons learned from the case study exploration

Mitigating Traffic Congestion provides over 25 in-depth case examples of demand-side programs implemented in a rich and varied range of locations, including the following (with corresponding page numbers):

Demand-side programs have also been applied to major employment centers, new development sites, airports, freight movement, and to entire regions (via road pricing and travel reduction regulations).

This shows the diversity of applications for demand-side strategies, some focused on the traditional commuter market and others applied to school, recreation, and other types of travel. The common theme is the desire to reduce peak period travel by managing demand and removing cars from the most congested places (parking lots, roads, highways) and the most congested times. This is accomplished by facilitating efficient traveler choices of the mode of travel used, the time of departure, the route used, and by reducing the need for some trips altogether.

Another commonality is the use of demand-side strategies to address very specific problems, such as:

- Inadequate parking or road space for employees, visitors, fans, customers, etc.
- Harmful effects from automobile emissions.
- Employee tardiness or absence due to travel delays or lack of travel options.
- Recruitment and retention of skilled workers with minimal stress from commuting.

The more targeted the problem and travel market, the better chance that demand-side programs can provide an effective solution or be part of a package of solutions.

All of these problems impose a tangible cost on travelers, on business, on government, and on society as a whole. The benefit-to-cost ratio of many demand-side programs is quite high, as is discussed below.

What Works Best? A Review of International Experience

Several seminal research projects and guidance reports have been produced since the 1993 FHWA report "Implementing Effective TDM Measures" (COMSIS, 1993). This body of knowledge includes studies performed at the regional, state, national and international levels. Considerable research has been performed in U.S. regions that require employer trip reduction programs (e.g., WA and AZ); in states that embrace TDM (e.g., Florida); among research organizations (e.g., TRB and TCRP); and federal agencies (FHWA, FTA, EPA). Among the more important recent references is the TCRP Report 95, the "Traveler Response to Transportation System Changes," which documents the impacts of various demand management strategies in chapters covering: HOV facilities, vanpools, pricing, parking management, and employer TDM (R.H. Pratt Consultant, 2003).

An example of this research comes from another TCRP project, B-4, "Cost Effectiveness of TDM Programs," that evaluated some 50 employer-based demand management programs in the U.S., but provides insight into demand management effectiveness in both commute and non-commute applications. The study estimated that the average reduction in vehicle trips among all these "successful" programs was 15.3% (at a cost of about $0.75 per trip reduced). However, programs that focused on information/promotion alone exhibited no measurable decrease in trips. Programs that provided enhanced alternatives, such as vanpools or shuttle buses, realized a 8.5% reduction in trips. Programs that focused on financial incentives and disincentives realized a 16.4% reduction of trips and

programs that combined enhanced alternatives with incentives/disincentives for their use, realized a 24.5% reduction in vehicle trips. (COMSIS, 1994).

Evidence also suggests that the number of strategies implemented, or the size of the budget, does not positively correlate with higher effectiveness. Some of the simplest, albeit politically controversial, measures involve pricing of automobile travel and subsidies for high occupancy modes. So, one researcher concluded: "It's more what you do to influence commute behavior (the strategies/incentive utilized), more than how you market the program or how much you spend" (ESTC, 1998).

Another important study, the Congressionally-mandated review of the Congestion Mitigation Air Quality (CMAQ) federal funding program performed by the Transportation Research Board, revealed that four of the five most cost-effective strategies (measured as the cost per pound of emissions reduced) funded by CMAQ were demand-side strategies, including: regional rideshare programs, charges and fees for drivers, vanpool programs, and "miscellaneous TDM" programs, (TRB 2002).

Many other recent research projects have documented the effectiveness of TDM strategies to reduce automobile travel for school trips, recreation and special event trips. This was accomplished by increasing auto occupancy (which is already higher than work travel) and providing quality shuttle service and traveler information.

The scope of demand-side strategies has evolved over the past 30 years in the U.S. However, these measures (referred to as Mobility Management in Europe and some other regions of the world) are a growing phenomenon in other countries and are even integrated into national policy in places like:

- **Sweden.** Where a region must consider demand management solutions before considered new road capacity.
- **The Netherlands.** Where travel reduction goals have been set and TDM is an integral part of the program to meet these goals.
- **United Kingdom.** Where all regions are required to have "green travel plan" capabilities and integrate TDM into land development approvals (AMOR, 2003).

Many other innovative applications of demand-side strategies have been tested, evaluated, and documented in Europe, Australia, Canada, etc. In Europe especially, demand-side strategies are being applied to non-commute travel markets (tourists, schools, special events) in a conscious effort to address the growth in automobile use that is affecting most countries of the world. The E.U.–funded project MOST (MObility STrategies for the next decades) provides comprehensive findings from over 30 pilot projects (AMOR 2003). A recent study by the Organization of Economic Cooperation and Development (OECD), "Road Travel Demand: Meeting the Challenge," documents world-wide experience with demand management strategies (OECD, 2002). The resource section of this report provides references and links to related websites.

LESSONS LEARNED FROM THE CASE STUDIES

all the research on, and experience with, demand-side programs and strategies cannot possibly be summarized in 10 brief points. However, a few common findings and lessons can be offered here

1. Demand-Side Strategies Are About Choices – As the term implies, demand-side strategies intend to modulate the demand for travel in a way that is based on choices (mode, time, route, etc.), and incentives for using alternatives to driving alone and avoiding the most congested conditions. A good example of this is the I-15 FasTrak program in San Diego, which allows solo drivers to pay to use the HOV lanes and allows those sharing a ride to use the lanes for free, but does not force a fee on any driver or require anyone to use a particular facility (OECD, 2002).

2. Time and Financial Incentives Are Most Effective – Time savings for alternative mode users (such as HOV lanes), financial incentives (such as vanpool subsidies or tax incentives) and financial disincentives (such as parking or road pricing) are consistently cited as the most effective demand-side strategies. These intervening influences help to balance out the perceived convenience and speed of driving alone (ITE, forthcoming).

3. Incentives and Disincentives Require Good Alternatives – Time and financial incentives and disincentives are most effective when they support good travel alternatives, such as transit service, vanpool formation, carpool matching, bicycle facilities, etc. The TCRP B-4 study, cited earlier, provides tangible evidence of this symbiosis by showing that the most effective programs combined financial incentives (such as transit subsidies) with improved alternatives (such as more frequent and convenient bus service (COMSIS, 1994).

4. Managing Demand Can Be a Cost-Effective Tool – Many studies that have compared mobility and air quality strategies have concluded that demand management strategies are among the most cost-effective in that they can reduce a trip, mile of travel or ton of emissions for a relatively modest amount of money. Demand-side strategies may not be the primary solution to these problems, but if they are applied in the right situation, they can help address traffic and air pollution problems in modest, yet very affordable ways (TRB, 2002).

5. Information Technology Enhances Demand-Side Programs – While incentives and disincentives are perhaps the key to effectiveness, much of managing demand relies on good information about travel conditions and alternatives. Advances in information technology make managing demand more effective by providing real-time, accurate information on travel options, traffic conditions, alternative routes, and even dynamic matching of travelers into shared ride arrangements.

6. The Implementing Organization Should Match the Scope of the Strategies – The organizational home for demand-side programs should match the scope of the application. For example, strategies to reduce congestion around employment centers or in corridors might be managed by Transportation Management Associations, whereas regional traveler information and ridematching services might better be implemented by regional agencies with access to appropriate resources and information. Multiple organizations are often involved in a given urban area, calling for coordination and cooperation to maximize impacts

7. Packaging Demand-Side Strategies Can Create Synergies – Research indicates that the greatest potential for demand management lies in strategic grouping of measures into "programs" of reinforcing actions. For example, limiting parking in a high-density commercial development served by convenient, reliable transit can do more to reduce vehicle trips than can solely limiting parking supply (ITE, forthcoming). One study concluded that "packaged, complementary solutions are usually more effective than a single measure" (OECD, 2002).

8. Expectations Need to Be Realistic – Demand-side programs are not a panacea for all social ills or a cure-all for traffic congestion problems. However, they can have a significant impact on travel. If the correct incentives and disincentives are used to facilitate shifts to alternative modes, demand-side strategies can reduce vehicle trips and VMT 10%-20%. Most decision-makers, however, are reluctant to adopt certain disincentives (such as parking pricing) to change travel behavior in a significant way. In the absence of these strategies, most demand management programs should only be expected to reduce travel by 0% - 5% (COMSIS, 1993). At the same time, it is important to recognize that the goals for demand-side programs often extend beyond reducing VMT to include mobility, accessibility, environmental, and other outcomes.

9. Plans for Managing Demand Should Be Integrated into Overall Transportation Plans – Demand-side strategies should be considered a set of measures to better manage existing infrastructure, but they still need to be well-planned. Demand management actions should be considered simultaneously with related transit, traffic engineering, and land use plans (ITE, forthcoming). Since many metropolitan planning organizations and regional councils now fund and oversee demand management efforts, it is important to integrate demand-side strategies into long-range plans, as well as shorter-term management and operations actions. It is also important to evaluate the impacts of actual demand-side measures, as implemented, to better inform future decision-making.

10. Demand-Side Strategies Are Practical – Demand-side strategies are compatible with sustainability, transportation-land use interaction, and other longer-term goals. Yet, it is most applicable to managing demand for finite travel markets, to solve real problem that provide tangible benefits to users and implementers. Travels are smart consumers and, when faced with tangible changes in out-of-pocket costs and travel time, will change their travel behavior in immediate and significant ways (ESTC, 2003).

CONCLUSIONS & FUTURE DEVELOPMENTS

a summary of concluding thoughts from the publication and highlights of important future developments

This report offers a new, broader perspective on demand-side strategies. These programs can be a critical component of a comprehensive transportation improvement program to improve the efficiency of the current transportation system, and they can also be an integral part of longer-term transportation and land use plans in order to change the fundamental influences on demand for the single occupant vehicle traveling at peak periods on congested roads. Ultimately, demand-side programs can be a critical factor in "decoupling" the link between economic growth and transportation growth. Economic growth creates new demands for travel and not all of this new demand can be accommodated on current or future roads (OECD, 2002).

Demand-side programs, in their traditional form of commute trip reduction, were born from energy crises of the 1970s as a response to fuel shortages. In the new millennium, managing demand extends to all types of travel, be it parents walking a group of kids to school in a "walking bus," visitors to a National Park leaving their cars off-site and using clean shuttles, new residents opting to live in "transit-oriented developments" to avoid the need for an extra car, or shippers coordinating deliveries to avoid congested roads and clogged city streets.

This is all demand management. Many of the tools used today by transportation planners, traffic engineers, and traffic operations managers are designed to modulate the demand for travel (by mode, route, location or time) rather than provide more capacity in the system to accommodate more trips. This new perspective on demand-side programs can still benefit from some of the findings from the 1993 FHWA report, "Implementing Effective TDM Measures." That report discussed the "economics of TDM" by estimating that the average cost to society to accommodate a one-way daily solo commute trip was $6.75, whereas the cost to employers to reduce a commute trip was $1.33. Carpooling cost commuters $1.92 per trip, whereas driving alone cost $4.81. (COMSIS 1993) These economics are as compelling today and they were ten years ago. Perhaps as the "demand for TDM" grows and is applied to other travel markets, the economics are even more compelling.

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In the future, the role of demand-side programs in solving specific problems and contributing to larger goals will be even greater as our inability to squeeze more cars into a limited road system compels us to look for ways to do things "smarter" and to focus on moving people, goods, and information rather than cars and other vehicles.

ADDITIONAL RESOURCES & CITATIONS

a collection of organizations, publications and internet resources, along with citations from this publication

GENERAL RESOURCES

Association for Commuter Transportation – www.actweb.org

America Bikes – www.americabikes.org

American Planning Association – www.planning.org

American Public Transportation Association:
Homepage – www.apta.com
APTA Transit Resource Guides – www.apta.com/research/info/briefings/

Best Workplaces for Commuters[SM] – www.bwc.gov

Better Environmentally Sound Transportation (BEST) – www.sustainability.com/best

Commuter Choice – www.commuterchoice.com

Institute of Transportation Engineers – www.ite.org

International Telework Association & Council – www.telecommute.org

National TDM and Telework Clearinghouse, National Center for Transit Research – www.nctr.usf.edu/clearinghouse

Northwest TDM Resource Center – www.wsdot.wa.gov/Mobility/TDM/default.htm

Organization for Economic Co-operation and Development – www.oecd.org

Pedestrian & Bicycle Information Center – www.bicyclinginfo.org, www.walkinginfo.org/

Promotional Materials Clearing House at F.S.U.'s The Marketing Institute – http://nctr.cob.fsu.edu/

Smart Card Alliance – www.smartcardalliance.org

Surface Transportation Policy Project – www.transact.org

Victoria Transport Policy Institute, Online TDM Encyclopedia – www.vtpi.org

U.S. Department of Transportation (DOT):
ITS/Operations Resource Guide – www.its.dot.gov/guide.html
ITS Benefits & Costs Database – www.benefitcost.its.dot.gov/
FHWA Office of Operations – www.ops.fhwa.dot.gov

U.S. DOT 511 Resources – www.itsdocs.fhwa.dot.gov/511/511.htm, www.deploy511.org/

International Experience

Association for Commuter Transport (United Kingdom) – www.act-uk.com

Australian TravelSmart Program – www.dpi.wa.gov.au/travelsmart/

European Union, MOST, Mobility Management Strategies for the Next Decade – http://mo.st

European Commission, PORTAL (Promotion Of Results in Transport Research And Learning) – www.eu-portal.net

European Platform on Mobility Management – www.epomm.org

International Association of Public Transport – http://www.uitp.com

National Travelwise Association (United Kingdom) – www.ntwa.org.uk/

VM2, Vereniging Mobiliteitsmanagement (The Netherlands) – www.vm2.nl

World Bank, Transport – www.worldbank.org/transport/

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