

HOUSTON'S TRAVEL RATE IMPROVEMENT PROGRAM

“TOOLBOX” OF IMPROVEMENT STRATEGIES

MANAGE THE DEMAND

**Prepared for
Greater Houston Partnership**

**Prepared by
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MANAGE THE DEMAND

Peak hour congestion on urban freeways is largely due to the predominance of the standard 8 AM to 5 PM work schedule. The structure of many large cities can also compound congestion as widely distributed workers funnel through a few congested corridors to several large activity centers. The peak hour trips associated with the 8 AM to 5 PM schedule not only saturate freeway corridors, but also saturate downtown streets, parking facilities, and elevators.

The strategies listed in this section promote reduced vehicle trip making. Many of them are oriented toward commute trips—those are the trips that endure the most congestion and those that may be most amenable to travel modes other than single-occupant private vehicles. Reducing the commute trips has many benefits to individuals and the community as a whole. Individuals benefit from low stress communities with time to read, sleep, etc., lower fuel consumption, reduced travel time, and parking fee savings. The community benefits from reduced congestion, lower emissions due to fewer cold starts, and reduced parking demand.

The “tools” included in this category are:

- ◆ Variable Pricing
- ◆ Alternative Hours of Travel
- ◆ Telecommuting
- ◆ Ridesharing
- ◆ Vanpools
- ◆ Local Bus Service
- ◆ Express and Park & Ride Bus Service
- ◆ Park and Ride Lots
- ◆ Activity Center Circulator Buses
- ◆ Neighborhood Circulator Buses
- ◆ Demand-Response and Hybrid Bus Service
- ◆ Fare Strategies

Variable Pricing

Description

Variable pricing on toll facilities is a strategy used to manage congestion during peak periods. Motorists are charged higher tolls during the peak period and charged lower tolls or no tolls in the off-peak hours. The purpose of variable pricing is to spread peak hour demand over a greater time period to reduce the peaking characteristics of rush hour traffic flow. Studies have shown that pricing is the most effective method of changing motorist travel behavior, whether influencing a motorist's decision on route choice, departure time, or travel mode. Some portion of motorists will alter their travel times to incur smaller tolls, alter their route to non-tolled facilities, switch transportation modes, telecommute, eliminate lower value trips, or combine multiple trips into a single trip. Although the concept of variable pricing is not a new idea, advances in electronic toll collection have made variable pricing strategies feasible. Strategies can also be implemented to further encourage transit and carpool/vanpool usage by allowing those vehicles to travel at reduced tolls or for free.

Implementation

Hurdles:	Public & Federal
Level:	Target Markets
Sector:	Public
Locations:	Routes

An example of a variable pricing program to manage transportation demand is the toll schedule being used on California's SR-91 Express Lanes. There is a different toll schedule for each day of the week and each direction of travel. Tolls on weekdays are varied an average of 10 times each day in increments as small as one hour. Tolls range from a low of 75 cents to a high of \$3.75. As an example, the toll schedule on a Wednesday for the Eastbound lanes is (toll in parenthesis): 12 AM to 7 AM (\$0.75), 7 AM to 1 PM (\$1.50), 1 PM to 2 PM (\$2.00), 2 PM to 3 PM (\$2.95), 3 PM to 4 PM (\$3.20), 4 PM to 6 PM (\$3.50), 6 PM to 7 PM (\$3.20), 7 PM to 8 PM (\$2.25), 8 PM to 10 PM (\$1.50), and 10 PM to 12 AM (\$0.75).

Information on toll schedules for the SR-91 toll road is disseminated through a website: www.91expresslanes.com, at their customer service center, and a toll free automated fax-back request line (800) 600-9191. Users are notified to check the actual toll on advance dynamic message signs before entering the lanes, as toll schedules are subject to change without notice.

Target Market

Variable pricing can be implemented in combination with other demand management measures. Parking management and transit operations can be part of a package of options for travelers to large activity centers. Electronic collection of fees can accommodate equity concerns and transition to work programs by automatically debiting an amount less than the regular fee for trips taken by program participants.

Benefits and Costs

The SR-91 express lanes provide a travel time savings of approximately 20 minutes over the 10 mile length compared with the adjacent free general purpose lanes. Public opinion surveys report the project is viewed favorably by 65 percent of the express lane users, 62 percent of the free HOV lane users (3+ vehicles use express lanes for free), and 53 percent of the mainlane users (1).

The New Jersey Turnpike Authority is planning a variable pricing structure for commercial truck traffic. The goal is to offer incentives to encourage truck traffic during off-peak hours. The planned structure for off peak travel will give a 15 percent discount for companies that spend \$50 to \$200 per month, a 12.5 percent discount to companies that spend \$200 to \$500 per month, and a 7.5 percent discount to companies that spend over \$500 per month. This structure was selected to avoid the potential for a large decrease in toll revenue (2).

Implementation Issues

The variety of possible options is limited only by a widespread lack of knowledge about pricing program benefits and resistance to a technique that initially appears to charge for a commodity that had been free. The notion of congestion having a cost, however, is more widely discussed, and variable pricing can play a role in addressing mobility concerns if public support can be developed.

Existing toll facilities can benefit from a variable pricing program that encourages use at times other than the usually congested periods. But the entire transportation system can also benefit if toll facilities are only one part of a broader pricing strategy.

1. Sullivan, E. Evaluating the Impacts of the SR 91 Variable Toll Express Lane Facility – Draft Final Report, Cal Poly State University, San Luis Obispo, CA, January 1998.
2. Wyckoff, P. Turnpike Out to Cut Off-Peak Toll Rates, Star-Ledger Newspaper, June 12, 1998.

Alternative Work Hours

Description

Flexible work hour programs allow employees to work a schedule within a range of time periods. For example, employees may be allowed to work an eight-hour shift starting between 6 AM and 9 AM and ending between 3 PM and 6 PM. Some programs allow participants to shift their schedule on a day to day basis, while other programs require that participants work a selected schedule on a routine basis. This flexibility allows employees to shift trips to and from work either before or after the peak hour.

Staggered work hour programs vary the arrival and departure times of groups of employees within a company before and after the typical 8 AM to 5 PM schedule. The term staggered indicates that employees arrive in different shifts at different times within a time period. Unlike flexible work hours, employees in a staggered work schedule may have no ability to choose which shift they work on.

Implementation	
Hurdles:	Public
Level:	Target Markets
Sector:	Private
Locations:	Businesses

Compressed workweek schedules typically involve longer, but fewer, workdays (e.g., 10-hour, 4-day workweeks). Compressed workweeks are advantageous in two ways. Days of commuting and commute trips are eliminated and longer work days require the employees to arrive earlier and leave later, removing trips from the peak hours.

Target Market

An increasing number of businesses are candidates for alternate work hour strategies. As electronic communication technology improves and computers become more available at home and office, new segments of the economy have the possibility of using the flexibility they provide. Staggered work hours are advantageous for large companies or plants to alleviate on-site crowding at entrances/exits, parking areas, or elevators. Staggered work hours work well for assembly line type operations where the beginning and end of work shifts can be easily managed. Flexible work schedules work especially well for persons that work independently.

Benefits and Costs

In Bishop Ranch, California, 14,800 employees took part in a flextime program as part of a required trip reduction program. The percentage of employees arriving before 7 AM increased from 8 to 17 percent, while the percentage of employees arriving after 9 AM increased from 1 to 9 percent (1). The City of Berkeley reported that its flextime program reduced annual overtime costs by \$18,000 and sick leave costs by \$26,000 (2). Similarly, the Pacific Gas and Electric Company of San Francisco reported that its flextime program reduced sick leave costs by \$20,000 and resulted in savings of \$46,000 in decreased use of work time for personal business (2).

Several studies in the 1970s in New York and Ottawa, Canada showed that staggered work hours can smooth out the peaking characteristics of arrivals and departures for work trips. The Ottawa study involved 33,000 government employees (47 percent of downtown employees) using a

combination of staggered work hours and flexible work hours. A study showed the morning peak 15-minute arrivals were reduced by approximately 50 percent and the evening peak 15-minute departures were reduced by approximately 57 percent (3). A 1988 study in Honolulu showed that staggered work hours for 7 percent of the workforce benefited participants with travel time reductions of three to four minutes. When surveyed, however, 80 percent of participants were against mandatory schedule changes, while 80 percent favored voluntary schedule changes (4). In a 1992 study in Denver, a total of 9,000 federal employees in 42 agencies participated in a 4-day, 10-hour compressed work week program. The maximum percentage of arrivals in any one half-hour period decreased from 56 percent to 42 percent. The maximum percentage of departures in any one half-hour period decreased from 47 percent to 34 percent (5).

Implementation Issues

There are costs and business proactive changes that must be made to begin these types of programs. Businesses in many sectors of the economy have found, however, that providing flexibility in work schedules or altering the work times have benefits to their employees, as well as decreasing the load on the transportation system. There is some reluctance to initiate these programs when company ridesharing programs are also encouraged—because flexible work hours decrease the possible rideshare partners—but if groups of companies in buildings, office parks or activity centers coordinate their programs, the businesses, employees and the transportation system can all benefit.

1. Beroldo, S. Bishop Ranch 1990 Transportation Survey, Rides for the Bay Area, San Francisco, CA, December 1990.
2. Seattle METRO. Transportation Demand Management Strategy Cost Estimates, Service Development Division, Seattle, WA, July 1989.
3. Safavian, R. and McLean, K. Alternate Work Schedules: Impacts on Transportation, NCHRP Synthesis of Highway Practice No. 73, Transportation Research Board, Washington D.C., November 1980.
4. Giuliano, G. and Golob, T. Staggered Work Hours for Traffic Management: A Case Study. In Transportation Research Record 1280, Transportation Research Board, National Research Council, Washington D.C. 1990, pp. 46-58.
5. Atherton, T. Transportation Related Impacts of Compressed Workweek: The Denver Experiment, Transportation Research Record 845, Transportation Research Board, Washington D.C., 1982.

Telecommuting

Description

Telecommuting allows workers to either eliminate a commute trip all together by working from home or to reduce trip length by working from a satellite office. Telecommunications and computers have made it possible to reduce trips by performing a variety of trip purposes over the telecommunications network. For example, telecommuters can access work files and programs via the Internet from home.

Teleconferencing allows workers at multiple locations to conduct meetings, shopping can now be done over the Internet, and banking transactions can be done over the Internet or at automated teller machines (ATMs). The capability of making electronic transactions either eliminates trips or reduces vehicle travel.

Target Market

Telecommuting is not an option in all work positions, but professional and managerial staffs tend to be the most applicable positions, while business services, wholesaling, and banking/finance tend to be the applicable industries. The costs of establishing a telecommuting program are usually minimal as many individuals have home computers and Internet access. Some telecommuters are able to do their work without the need for a computer.

Satellite worksites may be owned/operated by a single company or by multiple organizations. These facilities are typically equipped with computers and modems to allow workers that would normally travel long distances to be connected electronically to their offices. While these facilities may be effective in reducing vehicle miles traveled, they are typically not effective in reducing emissions from cold starts and may actually increase vehicle trips as members of rideshare programs or transit may opt to drive alone to a nearby center.

The majority of telecommuters split time between the home and office. A 1991 US DOT survey of telecommuters showed that the average total time per week worked at home by telecommuters was 18.6 hours. Approximately 26 percent of the survey participants reported working at home an average less than eight hours per week (1).

Benefits and Costs

Improved productivity is one of the benefits cited as being associated with telecommuting programs. Control Data Corporation telecommuters estimated their productivity increased by 35 percent on telecommuting days, while their managers similarly estimated the productivity improvement at 30 percent (2). Pacific Bell managers estimated productivity improvements of 20 percent due to telecommuting in addition to office space savings (3).

Reduced cold starts, emissions, and VMT are all benefits of telecommuting. A study of 400 State of California employees participating in a telecommuting program showed that on telecommuting days, participants reduced their cold starts by 39 percent, CO emissions by 64 percent, NOx emissions by 69 percent, particulate matter emissions by 78 percent, and total VMT by 77 percent.

Implementation

Hurdles: Public
Level: Areawide
Sector: Private
Locations: Business

Implementation Issues

There are no implementation issues associated with this initiative. However, the public sector can play a major role in educating both employers and employees regarding the potential positive impacts of telecommuting as well as in helping employers identify specific jobs that might be appropriate candidates for the initiative.

1. 1991 Home Office Overview, No. 0322, LINK Resources Corporation, December 1991.
2. A Toolbox for Alleviating Traffic Congestion and Enhancing Mobility, Institute of Transportation Engineers, Washington D.C., 1997.
3. Turnbull, K., Higgins, L., Puckett, D., and Lewis, C. Potential of Telecommuting For Travel Demand Management, Report 1446-1, Texas Transportation Institute, Texas A&M University, College Station, TX, November 1995.

Ridesharing

Description and Target Market

Ridesharing programs provide a service of matching up potential carpoolers and/or vanpoolers through a database of interested participants based on the locations of their origins/destinations. Rideshare programs are commonly developed at the regional level, sub-regional level, and by private employers. Regional programs are typically sponsored by a department of transportation or transit agency to promote ridesharing for an entire region. A local unit of government such as a city or county may sponsor subregional programs with the program often being tailored for the local market. Privately sponsored programs are limited to employees within a company. The company may establish its own rideshare matching capabilities or utilize the services of a local or regional ridesharing agency.



Implementation

• Hurdles:	Public
• Level:	Target Market
• Sector:	Public
• Locations:	All

Benefits and Costs

Incentives are widely used in privately sponsored rideshare programs to encourage employee participation. Elements that increase benefits or enhance ride-sharing include high occupancy vehicle lanes, high occupancy vehicle ramp meter bypasses, guaranteed ride home programs, flexible work schedules, preferential parking for high occupancy vehicles, and strong employer management support.

Guaranteed ride home programs provide rides to rideshare participants in the event of an emergency, a key concern of potential program participants. Studies have shown that guaranteed ride home program costs are low because participants tend to rely on coworkers, family, and friends in most cases and typically use the guaranteed ride home program as a last resort. Studies have shown program costs to range between \$15 to \$20 per participant per year. A study of 250 people registered for a guaranteed ride home program in Bellevue, Washington found that only 12 percent of participants used the program in the first year (2).

Implementation Issues

There are several areas where the public-sector can assist in such programs. For example, the public-sector can play an important role in matching riders as well as in assisting in the development of a guaranteed ride home program to assist riders who have family emergencies, illness, or other unanticipated transportation needs during the day. Parking incentives, both public and private, can also help encourage ridesharing efforts.

1. Schuetz, J. A Regional Transportation Demand Management Strategy for Southeastern Wisconsin, Proceedings of the 77th Annual Meeting of the Transportation Research Board, Washington D.C., 1998.
2. Transportation Demand Management Strategy Cost Estimates, Service Development Division, Seattle METRO, Seattle, Washington, July 1989.

Vanpools

Description

Vanpools use passenger vans to provide organized transit service to a registered group of individuals. Vanpools reduce congestion by organizing groups of individuals to share trips made in a van with driver service provided by an employee of the vanpool program or by one of the vanpool participants. Vanpools are most effective serving long distance commuters and are an effective tool for reducing vehicle miles of travel (VMT). Park and ride lots and park and pool lots often serve as meeting places for vanpool participants. Employers participating in vanpool programs may benefit through improved worker moral, reduced absenteeism/ tardiness, and lower parking costs (in cases where parking costs are subsidized by the employer).



Implementation

Hurdles: None
 Level: Area
 Sector: Private
 Locations: Business

Target Market

Three main types of vanpool programs are: company sponsored vanpools, third party vanpools, and owner operated vanpools. In a company sponsored vanpool program, the company either owns or leases a van and administers the program. In a third party vanpool program, a third party agency administers the program assuming all liabilities associated with operation and providing ridematching services. Owner/operator vanpool programs are the sole responsibility of the owner/operator. In some cases, employers subsidize some of the costs associated with the program, while the patron may assume a portion or all of the costs, typically through a monthly subscription fee.

A task force of cities and transportation agencies in the Boston region is considering a two year incentive program to promote vanpool usage. Under the proposed plan, commuters would lease vanpool vehicles from a vehicle vendor. The commuters leasing the vehicle would receive financial incentives over a six month period that would be paid directly to the vehicle vendor on the commuter's behalf. The incentives would gradually decrease over the six month period to prepare the commuters to pay the actual costs associated with the leased vehicle (1).

Benefits and Costs

A voucher program in the Puget Sound region of Washington allows employers to purchase vouchers, which are given to employees and redeemed for full or partial fare payment for transit or vanpool fares. The vouchers are good for a period of 13 months. There are currently over 100 companies participating in the voucher program, with the program being credited for attracting approximately 440 new vanpool users in 1997. Metro Transit has a fleet of 615 active vanpool vans and provided 2.8 million vanpool rider trips in 1997.

Student and faculty/staff of the University of Washington Seattle campus may participate in the U-PASS program, which allows them to purchase quarterly passes for unlimited usage of King County Metro and Community Transit bus service. The program also provides subsidized

vanpool fares. U-PASS holders receive a \$40 discount on the monthly vanpool fare, which is determined by a number of factors including trip distance, number of riders, and size of van. The cost of the U-PASS is only \$31 for students and \$42 for faculty and staff per quarter. Prior to the U-PASS program there were eight vanpools in operation with 79 participants. Since the implementation of the program in 1991, the vanpool program has grown to 31 vanpools with a total of 266 participants in 1999 (2).

Implementation Issues

Vanpools are, in most cases, a private-sector function so there are no direct public-sector implementation issues involved. However, there are several issues the public sector can address in order to encourage and facilitate the development of privately-operated vanpools. Those issues range from direct subsidies to cover part of the cost of van operations to discounted parking rates at park and ride lots or destination lots.

1. Allen, G., Lipton, S., and Brooke, B. Unique Voucher Programs Increase Alternative Commuting, Proceedings for the ITE 2000 Annual Meeting, Institute of Transportation Engineers, Washington, D.C., August 2000.
2. Dewey, P. and Rutherford, G. The Evolution of a Successful Travel Demand Management Program, Proceedings for the ITE 2000 Annual Meeting, Institute of Transportation Engineers, Washington, D.C., August 2000.

Local Bus Service

Description

Local bus service is the backbone of a transit system. Local service provides access to and from all parts of the community, with closely spaced routes and bus stops. In Houston, local service covers most of the area inside of Beltway 8. Local bus routes can be split into two groups—radial routes and cross-town routes. Radial routes are oriented to or through downtown but may also serve other major activity centers. Local radial routes, which operate limited-stop with the purpose of relieving route congestion or improving average speeds, are also included in this category. Buses typically travel on major arterials, with bus stops every quarter mile. In Houston, most radial routes also serve one or more neighborhood or regional transit centers to allow patrons to transfer to and from other bus routes. Cross-town routes do not serve downtown and are typically anchored at other major activity centers or transit centers. These routes generally operate along arterials and are perpendicular to radial routes; they may travel in a circle or back-and-forth along a street.



Implementation

Hurdles:	None
Level:	Area
Sector:	Public
Locations:	Routes

Most local radial and cross-town routes in Houston are served with 35- to 40-foot long (standard) buses. Some high demand local radial routes are also served with higher capacity buses, such as articulated (bending) or coach buses. Standard buses have a seated capacity of approximately 40 persons, while articulated buses have seated capacities of 60 to 67 persons. For short distances in the peak periods, an additional 25% of passengers may be standing on local routes.

Target Market

Target markets for transit can be defined by geography, trip purpose, time of day, motivation to use transit, and many other ways. Local bus service by its very nature is designed to serve as many origins and destinations as possible, particularly within the dense inner city. Local radial and cross-town bus service provides access from residential areas to local and regional activity centers.

Examining target markets by trip purpose, most METRO local riders (57% from 1995 Origin-Destination Survey) are traveling to or from work. Another 16% are traveling to or from school or college, with the remaining passengers using transit for shopping (9%), recreation (6%), medical appointments (5%), or other reasons. Since the dominant trip purposes are work and school, most of these trips are during the peak periods when traffic congestion is highest (2).

A 1999 survey of Houston METRO riders showed differing reasons among local bus service passengers for using transit. The top four reasons cited by users of local bus service include: no car available (63 percent), reduced costs (25 percent), no drivers license (17 percent), and less stressful (16 percent). The “service” nature of METRO was indicated by patrons as elements of what they liked most (3).

Benefits and Costs

METRO's local bus service carries about 85% of the weekday transit boardings (4), with some routes carrying more than 14,000 daily passenger trips. Where unmet demand exists, increases in local bus service can generally result in additional increases in transit ridership. As service is extended into areas of lower density, the incremental passengers per revenue mile and cost per passenger trip generally increases. In the 15-year period from 1986 to 2000, METRO increased service by 45% (as measured in revenue miles) and ridership increased by 35%. Unadjusted for inflation, the cost per passenger trip over the same 15-year period grew only very slightly from \$2.00 to \$2.19 (5).

Other examples of changes in transit operations that have resulted in increased ridership are as follows. In Flint, Michigan, the number of miles served by buses was increased by 114 percent over a four-year period, resulting in an increase in passenger boardings of over 100 percent. In Riverside, California, changes implemented between 1991 and 1993 included new shuttle service, express routes, reducing headways by 50 percent in key corridors, new fares, discounted passes, and improved marketing. Annual ridership grew by 21.8 percent in 1991, 7.6 percent in 1992, and 12.8 percent in 1993. In Miami, changes were implemented to improve travel times by reducing stops in key corridors, smaller buses in lower demand corridors, emphasize service for special events, and improve transfers to other modes. Ridership increased by 11.4 percent after these changes (1).

1. A Toolbox for Alleviating Traffic Congestion and Enhancing Mobility, Institute of Transportation Engineers, Washington D.C., 1997.
2. Houston METRO, 1995 Origin-Destination Survey.
3. Houston METRO, 1995 Customer Satisfaction Survey.
4. Houston METRO, FY2000 Average Weekday Customer Boardings Report.
5. Houston METRO, Office of Management and Budget Database.

Express and Park & Ride Bus Service

Description

Express and park & ride services also operate regularly scheduled service with designated stops; however, there may be either no intermediate stops or a very limited number of intermediate stops between origin and destination areas. Express and park & ride services are commonly used to provide fast service from suburban areas to major activity centers. These services can offer substantial travel time savings over automobile travel in the mainlanes when used in conjunction with HOV lanes. In Houston, express routes generally provide some local collection service followed by express operation to a major activity center. Service that collects passengers at a park & ride lot rather than with local buses is called park & ride service.



Implementation

Hurdles:	None
Level:	Target Markets
Sector:	Public
Locations:	Routes

Express and park & ride services generally operate on major arterials or freeways (which may also offer HOV lanes) to keep operating speeds high. Express service is usually provided with 35- to 40-foot long (standard) buses but may also be operated with over-the-road coaches. Higher capacity buses, such as articulated or coach buses, may be used in corridors with high transit demand. Park & ride service is often provided with over-the-road coaches that provide high passenger amenities for the longer transit trip (reclining seats, reading lights, package racks). Depending on the level of demand, the park & ride coaches can be standard, articulated, or mini buses. Standard buses have a seated capacity of approximately 40 persons, articulated buses have seated capacities of 60 to 67 persons, and mini-buses have a seated capacity of 20 to 25 passengers. Transit quality standards for express and park & ride services usually call for sufficient service to prevent the need for standees.

Park & ride services operate out of one or more park & ride lots. Park & ride lots are an important tool for encouraging carpool, vanpool, and transit usage by creating locations where people can leave their cars/bicycles and make the next portion of their journey in higher occupancy vehicles, be they carpool, vanpool, or transit vehicle. Parking facilities are most often independent, but can be shared, such as a signed area of a shopping mall parking lot. Park & ride lots are commonly used to support HOV/transit systems and may have direct access connections to the HOV lane. Parking facilities should be easily accessible, in a convenient location, and provide patron/vehicle safety elements such as perimeter fencing, overhead lighting, and on-site security. Park and pool lots are facilities that do not have transit service.

Target Market

The primary target market of express and park & ride services is activity center employees living in low-density suburban areas (at least 10 miles from destination) who own their own vehicles. A 1999 survey of Houston METRO riders showed the following top four reasons cited by users of express/park & ride bus service for using the service: less stressful (78 percent), reduced costs (71 percent), reduced parking costs (59 percent), and time to read, etc. (54 percent).

Approximately 81 percent of the express/park & ride bus riders previously used an automobile to commute, while approximately 43 percent of local bus riders previously used an automobile to commute (2). When return trips in the off-peak direction are made more frequent and off-peak-direction fare adjustments are made, the service can also serve a growing “reverse commute” market, as demonstrated by a number of Park and Ride routes in Houston.

A study involving users of 305 park & ride lots near HOV lanes was conducted in 1986 to determine the previous mode of travel by users. An average of 49 percent of patrons previously traveled in a single occupant vehicle, 23 percent were in a carpool, 10 percent used transit, and 15 percent did not previously make the trip. Houston presently has 25 park & ride lots and 5 park and pool lots associated with the HOV lane system. A total of 30,770 spaces are provided at these facilities with daily use measured in June 2000 of almost 16,000 parked vehicles. These parked vehicles correspond to approximately 32,000 daily vehicle trips being removed from the mainlanes of freeways.

Benefits and Costs

The benefits to express and park & ride services are compelling. Transit agencies offering express bus service have seen increases in transit usage. These services have been proven to attract users from single occupant vehicles, thus reducing congestion and emissions. In FY 2000, METRO carried over 20,000 passenger trips per weekday on its express routes and nearly 30,000 passenger trips per day on its park & ride routes (3). Ridership increased by 17 percent in Pittsburgh after express service was introduced. Corridor ridership increased by 100 percent in Washington, DC with work trip mode share increasing from 27 to 41 percent. Corridor ridership in Los Angeles increased approximately 200 percent with work trip mode share increasing from 12 to 24 percent. A new express service in Miami, in conjunction with a new park and ride lot, drew approximately 800 passengers a day, of which 64 percent previously traveled by automobile.

Express and park & ride service can be expensive (compared to local service) to provide. The service requires frequent service in the peak periods, with little demand for service in the off-peak period. Services with high peak period to base period ratios are costly, because the cost of the equipment and operators is spread over fewer hours of service. In addition, the premium vehicles needed to attract the target market are expensive.

Costs associated with the implementation of park & ride lots depend largely on land acquisition costs, the size of the lot, facilities such as parking structures and patron shelters, and presence of elevated direct access ramps to an HOV lane. In general, park & ride lots with direct access connectors to HOV lanes cost two to three times as much as facilities without direct access, because they are typically larger and the elevated ramps are costly to construct. Construction costs for seven of the Houston park & ride facilities without direct HOV access ranged from \$3.9 to \$5.5 million with an average of \$4.5 million. Construction costs for eight of the Houston park & ride facilities with direct access connectors ranged from \$8.1 to \$15.8 million with an average of \$11.3 million.

Lower cost parking facility alternatives to park & ride lots are park and pool lots. These facilities provide designated parking (paved surface, signing, and lighting) to encourage carpool and vanpool use, but are not typically served by buses. Park and pool lots are often located

within existing right-of-way in one of the corners of a freeway/cross street interchange. The costs to implement the three park-and-pool lots in the Katy Freeway corridor were approximately \$200,000 each in 1995 dollars.

1. A Toolbox for Alleviating Traffic Congestion and Enhancing Mobility, Institute of Transportation Engineers, Washington D.C., 1997.
2. Houston METRO 1999 Customer Satisfaction Survey.
3. Houston METRO FY2000 Average Weekday Customer Boardings Report.

Park and Ride Lots

Description

Park and ride lots are an important tool for encouraging carpool, vanpool, and transit usage by creating locations where people can leave their cars/bicycles and join up with higher occupancy vehicles. Facilities are most often independent, but can be shared, such as a signed area of a shopping mall parking lot. Park and ride lots are commonly used to support HOV/transit systems and may have direct access connectors to the lane. Facilities should be easily accessible, in a convenient location, and provide patron/vehicle safety elements such as perimeter fencing, overhead lighting, and on-site security. Park and pool lots are facilities that do not have transit service.



Implementation

• Hurdles:	Public
• Level:	Target Market
• Sector:	Public
• Locations:	Sites

Target Market

A study involving users of 305 park and ride lots near HOV lanes was conducted in 1986 to determine the previous mode of travel by users. An average of 49 percent of patrons previously traveled in a single occupant vehicle, 23 percent were in a carpool, 10 percent used transit, and 15 percent did not previously make the trip (1). Houston presently has 25 park and ride lots and 5 park and pool lots associated with the HOV lane system. A total of 30,770 spaces are provided at these facilities with daily use measured in June 2000 of almost 16,000 parked vehicles. These parked vehicles correspond to approximately 32,000 daily vehicle trips being removed from the mainlanes of freeways (2).

Benefits and Costs

Costs associated with the implementation of park and ride lots depend largely on land acquisition costs, the size of the lot, facilities such as parking structures and patron shelters, and presence of elevated direct access ramps to an HOV lane. In general, park and ride lots with direct access connectors to HOV lanes cost two to three times as much as facilities without direct access, because they are typically larger and the elevated ramps are costly to construct. Construction costs for seven of the Houston park and ride facilities without direct HOV access ranged from \$3.9 to \$5.5 million with an average of \$4.5 million. Construction costs for eight of the Houston park and ride facilities with direct access connectors ranged from \$8.1 to \$15.8 million with an average of \$11.3 million (3).

Lower cost parking facility alternatives to park and ride lots are park and pool lots. These facilities provide designated parking (paved surface, signing, and lighting) to encourage carpool and vanpool use, but are not typically served by buses. Park and pool lots are often located within existing right-of-way in one of the corners of a freeway/cross street interchange. The costs to implement the three park-and-pool lots in the Katy Freeway corridor were approximately \$200,000 each in 1995 dollars (3).

Implementation Issues

There are no major implementation issues *per se* related to park and ride lots. Clearly, land use law case precedent, if necessary, will support the acquisition of the necessary space. As noted above, there are potentially major cost considerations involved. For example, the closer the facility is to H.O.V. access, the greater the cost is likely to be to acquire the land. However, the return on the land in terms of it's utility as a park and ride lot is likely to be greater. Conversely, the further away the facility is from H.O.V. access, the lower the cost is likely to be, but so to is the utility of the land as a park and ride lot.

1. Bowler, C. et al. Park and Ride Facilities, Guidelines for Planning, Design, and Operation, Federal Highway Administration, Washington D.C., 1986.
2. Houston High Occupancy Vehicle Lane Operations Summary, Texas Transportation Institute, Texas A&M University, College Station , Texas, July 2000.
3. Henk, R., Morris, D., and Christiansen, D. An Evaluation of High-Occupancy Vehicle Lanes in Texas, 1995. Research Report FHWA/TX-97/1353-4, Texas Transportation Institute, Texas A&M University, College Station, TX, October 1996.

Activity Center Circulator Buses

Description

Activity center circulators are bus routes that serve trips within a major activity center. To provide an attractive service, the stops are close together (every block or every other block) and service frequency is high (generally every 10 minutes or more frequent). The service can be operated with any type of vehicle but is sometimes operated with distinctive vehicles (such as the reproduction historic trolleys operated in downtown Houston) or with smaller vehicles. In the Houston area, activity center circulators are provided by a variety of entities in downtown Houston, the Texas Medical Center, Westchase, Clear Lake, and downtown Galveston (with a rail trolley). This type of service offers an opportunity for public/private partnership.



Implementation

Hurdles: None
Level: Target Markets
Sector: Public & Private
Locations: Businesses

Route alignments should be easy for users to identify. This requires that stop locations be clearly marked and maps display streets, stops, turns, directions and where possible, well-known landmarks and popular destinations. Schedule information should be available at each bus stop.

A specific vehicle type for the service also provides easy identification of the service and reinforces its image as a special service. Vintage trolley-style buses have been implemented in downtown Houston. While these vehicles are popular, the demand and purpose of each route must be considered when specifying vehicle type. A trolley bus may be appropriate and popular with lunchtime customers where a larger vehicle may be more appropriate for routes serving peripheral parking (such as in the Texas Medical Center) or special events. An issue with specialized vehicles may be the cost of purchasing a separate fleet that cannot be easily deployed for other services when needed.

Target Market

The target markets for activity center circulators vary by activity center but may include: parking shuttle, lunch destinations, visitors, special events, and special venues. Key factors for successful activity center circulators are: frequent service (generally, at least every 10 minutes), easy-to-understand route alignments, appropriate locations, and easily identifiable vehicles.

The span of service depends on the route: routes designed for the office worker market may run only weekdays during business hours while routes designed for entertainment circulation may run very late at night. Routes and schedules may vary according to time of day. Schedule and routing variations should be based on trip demand occurring during morning and afternoon peaks, noon/lunchtime, midday, evening, and weekends. Seasonal variations in service may also be necessary, particularly related to sport venues and retail centers (1).

Benefits and Costs

The benefits of activity center circulators include benefits to the community such as increased attractiveness of the activity centers for new retail and employment sites, reduced demand for parking in congested cores, opportunity to redevelop land dedicated to parking into more productive land uses, and removal of circulating traffic from congested activity centers. The transit agency may also benefit from increased awareness of its services and capture new riders for whom activity center circulators provide a test use of transit. Further, activity center ridership can be a growing market for transit. Ridership on METRO's downtown trolleys reached nearly 9,000 boardings per weekday, growing nearly 70% over the prior year (2).

The service can be costly, however, if the frequency and coverage is appropriately high. But provision of these services by the private sector or through public/private partnerships is possible.

1. A Toolbox for Alleviating Traffic Congestion and Enhancing Mobility, Institute of Transportation Engineers, Washington D.C., 1997.
2. Houston METRO, FY2000 Average Weekday Customer Boardings Report.

Neighborhood Circulator Buses

Description

To supplement local bus service, many transit agencies provide neighborhood circulator routes. These routes circulate through neighborhoods, often on collector streets as well as minor arterials, picking up passengers destined within the neighborhood or transporting passengers to a nearby transit center or park and ride lot. At the transit center or park & ride lot, the passenger can transfer to other routes that operate to other parts of town. (1)

Often, neighborhood circulator routes are served with smaller capacity buses (seating 20 to 25 passengers). Smaller buses may be used for two reasons: (1) demand is lower and (2) neighborhood street sizes and configurations and residential community perception may make operation of a large bus difficult or disruptive, while a smaller vehicle can be accommodated.



Implementation

Hurdles: None
Level: Target Markets
Sector: Public
Locations: Homes

Target Market

The geographic target markets of neighborhood circulators are suburban neighborhoods or inner city neighborhoods that are not well penetrated by major arterials. As with local service, these routes serve all trips purposes as feeders to the rest of the bus system.

Benefits and Costs

The benefits to neighborhood circulators include improved access to transit with reduced impacts to the neighborhoods. The cost to provide service is similar to that for local service, with some limited ability to reduce costs with reduced vehicle size. Ridership on neighborhood circulator routes is usually lower than for local routes, with daily ridership on METRO neighborhood circulators ranging from 200 to 2,300 riders per weekday (2).

1. A Toolbox for Alleviating Traffic Congestion and Enhancing Mobility, Institute of Transportation Engineers, Washington D.C., 1997.
2. Houston METRO, FY2000 Average Weekday Customer Boardings Report.

Demand-Response and Hybrid Bus Service

Description

Demand-response bus service provides curb-to-curb service on demand (generally with a reservation), often in a defined geographic area. Hybrid services can include route deviation service, where the bus operates over a fixed route with a fixed schedule but can deviate a certain distance from that route, and point deviation service, where the bus operates on a fixed schedule but with no fixed route. These services are usually provided with small buses, with capacities ranging from 12 to 25 passengers. Demand response and hybrid services can also be provided using vans.



Implementation

Hurdles: None
Level: Target Markets
Sector: Public
Locations: All

Target Market

While this type of service is often associated with services for the disabled, demand-response service can be provided to the general public as well. General public demand-response and hybrid services are generally used in areas where population densities and demand are low or where the roadway network makes the design of efficient fixed routes impossible. General public demand-response service has been provided in suburban areas of Austin, and Fort Worth is currently using point deviation service in its lower demand areas. Demand-response services for the disabled are designed for individuals whose disabilities do not allow them to use fixed-route services, even if the fixed-route buses are equipped with wheelchair lifts.

Benefits and Costs

The benefits of these general public innovative bus concepts include the ability to cost effectively serve low density areas and the ability to test and grow a transit market prior to the commitment of more extensive transit services. Demand-response services for the disabled provide a critical lifeline that allows these individuals the ability to work, play, and participate in society. The cost of providing these services varies greatly. Demand-response service provided by a transit agency in compliance with the Americans with Disabilities Act (ADA) can be costly, since the trip lengths can be very long and scheduling efficiencies (due to disparate origins and destinations) can be low. The cost per passenger of the general public services can be significantly lower than for ADA services, since the service can be much more narrowly defined.

Fare Strategies

Description

An important element of transit service (both bus and rail) is fare structure and collection method. Differential fare structures often exist within a transit system to provide various services or to increase ridership in certain markets for a number of reasons.

Implementation

Hurdles:	Funding
Level:	Areawide
Sector:	Public
Locations:	All

Target Market

Discounted fares may be offered to increase mobility options of various groups based on age, financial capacity, disabilities, or affiliation (students, employer, etc.). Discounts may be offered based on factors such as frequency of use, prepayment, and time commitment of purchase (weekly pass, monthly pass, annual pass). Fare structures may also be differentiated based on trip characteristics such as trip location, length, and duration, time of trip (peak or off-peak, weekday or weekend), mode, and quality of service (express or local).

METRO provides discounts based on many of these stratifications, including discounts for prepaid fares, seniors, students, and the disabled. METRO provides its downtown circulator service free to encourage downtown workers to leave their cars for short trips. .

Benefits and Costs

An example of a transit incentive program is the U-PASS program on the campus of the University of Washington in Seattle. This program provides the 55,000 students and staff members of the University highly discounted transit services. Students and faculty/staff pay \$31 and \$42 a quarter respectively for the pass. Eighty five percent of students participate in the program. Single-occupant vehicle (SOV) use has declined from 44 to 40 percent among faculty/staff, while carpooling has increased from 15 to 19 percent, and transit use has increased from 25 to 35 percent. SOV usage among students has decreased from 25 to 16 percent. In similar college campus programs, students may be able to receive transit services at no cost.

Another example of a transit incentive program is the Commuter Bonus program available in the five county Puget Sound area, comprising 69 percent of Washington's population. The program is exclusively administered by King County Metro Transit. Under the program, employers purchase vouchers and give them to their employees. Employees can redeem the vouchers at over 200 outlets for full or partial fare payment for bus or vanpool use. The program is cited for being responsible for approximately 85,000 new annual bus trips and 440 new vanpoolers in one year. In Seattle, congestion was reduced by 2 to 4 percent after a fare free transit zone was established. .

Implementation Issues

Methods of fare collection include cash, token, magnetic stripe passes (prepaid pass), and magnetic stripe card/smart card (stored value card). Prepaid fares reduce cash handling and may decrease boarding times. Electronic fare payment systems also reduce cash handling and may decrease boarding times, but also allow transit agencies the flexibility to modify fares easily. These methods of fare collection can be used on all transit modes.

When fares are collected can also vary by mode and by agency. On most bus systems, patrons pay as they board the bus. Therefore, the bus must be stopped while each patron interacts with the bus driver or farebox. Fares can also be collected before the transit vehicle arrives, with the establishment of fare paid areas. Fare collection on most heavy rail systems is handled with paid fare areas. Fares are paid (likely through a turnstile) as the patron enters a loading area. Therefore, when the transit vehicle arrives, riders can board quickly through multiple doors. While this method is most common on heavy rail systems, it can be used on bus systems as well, particularly BRT systems or special event services.

Most fare strategies designed to increase ridership require a funding source to replace the revenue that would otherwise be collected. For this reason, not every fare category or ridership enhancement idea can be pursued.

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4. Transit Ridership Initiative, Research Results Digest, No. 4, Transit Cooperative Research Program, Transportation Research Board, Washington, D.C., February 1995.