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Travel Demand Management

Strategy Paper

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1 WHAT IS TRANSPORTATION DEMAND MANAGEMENT?

Transportation Demand Management (TDM) is a strategy to reduce demand for single occupancy vehicle use on the regional transportation network. As a regional strategy to improve transportation system performance, TDM can reduce highway congestion and traveler delay; improve air quality; and improve access to jobs, schools, and other opportunities.

TDM strategies can be broken down into the following categories:

- Traveler Information – coordinated regional multi-modal traveler information/511 services, itinerary route and transit planning assistance, awareness campaigns, construction congestion-mitigation.

- Employer and Campus Transportation Demand Management – support for employer, campus, TMA, and other site-specific TDM programs

- Auxiliary Transit Services. Emergency ride home programs, carpool and vanpool development programs, car sharing, rail shuttles.

- Market and Financial Incentives – tax incentives for commuters and employers, commuter rewards programs, pay-as-you-drive insurance and taxation.

In addition, the following programs and policies can also be considered TDM measures, but are largely covered in other GO TO 2040 strategy papers. For a complete list of strategy papers under development, please visit: http://www.goto2040.org/strategy_papers.aspx.

- Managed Lanes– high-occupancy-vehicle (HOV) and high-occupancy-toll systems (HOT), congestion pricing, and associated facilities to improve the performance of dedicated highway facilities.

- Parking Management – strategies to manage travel demand by changes in the supply, price, and utilization of parking

- Walking and Cycling – strategies to facilitate short trips and transit access by non-motorized modes.

TDM strategies are implemented to reduce the demand for single occupancy vehicle trips on congested highway facilities. By increasing passenger vehicle occupancy or by diverting trips to transit, walking, and cycling, TDM can simultaneously increase person throughput on a corridor and reduce vehicle

delay. Secondary benefits include reduced energy consumption, reduced pollution, and support for compact land uses.

TDM is a system management strategy. The focus of TDM techniques is on supporting travel choices for individual travelers. Thus, TDM requires that there be a range of travel choices for the public, and that the managing agency be able to identify suitable transportation options for a given traveler.

Because TDM success is conditional upon an appropriate mix of facilities, services, and supportive land use, estimating the effects of TDM strategies is very dependent on the context. Thus, while the paper will put bounds on likely impacts, this paper also will present the historical impact of a TDM strategy and the conditions or environment of the strategy's success. Where applicable, the paper will also review how and where the strategy might be effectively implemented or expanded in metropolitan Chicago.

2 Review and Analysis Individual TDM Strategies

2.1 Traveler Information and Support

Benefits

Providing traveler information and support allows travelers to intelligently choose mode, route, destination, and time-of-day for their trips. Information provides travelers real choices for their trips. Thus, the benefits of such services are very large. For average conditions, the upper bound of such travel time benefits may be estimated from regional travel demand models by hypothesizing that the differences in travel times between model iterations reflects traveler response to improved traveler information about congestion. Advancing such a hypothesis would imply that the travel time benefits of highway information would be the difference between the aggregated travel times in the first iteration traffic assignment model run and the final run. In addition, estimating the effects of multi-modal traveler information would be the difference in aggregated travel times between the iterations involving distribution, mode split, and assignment. While the former is the subject of future research, 2009 regional travel demand model runs indicate an estimate of multi-modal information at approximately 3% reduction in aggregated travel time during the morning peak period.

Experience with the regional travel demand model also indicates that the information required during peak periods is greater than during off-peak periods. An analysis of the *2020 Regional Transportation Plan* travel models indicated that more than 25 iterations were required to converge during peak periods, while as few as three were required during less congested periods.[1] Experience with a

[1] Chicago Metropolitan Agency for Planning. *2030 Regional Transportation Plan, Conformity Analysis Appendix B.* p. 81. Posted at

511 travel information system during the Salt Lake City Winter Olympiad of 2002 indicates that spatial knowledge can be acquired rapidly for travel purposes.[2]

Zhu, Levinson, and Zhang point out that traffic information is experiential, but such experience is obtained both through personal experience and through social interaction.[3] Noting that travel information is not specified in current travel demand model practice, they propose agent-based route-choice modeling as an alternative framework to model not only spatial knowledge among travelers, but also the effects of advanced travel information systems (ATIS), and applied the model to the Chicago Sketch Planning Network.[4]

However, while information overall is theoretically significant at a regional level, empirically-based estimates of the effects of individual information infrastructure improvements are not possible at this time. Lappin and Bottom summarize the problem:

> *No one is yet able to accurately predict, for a VMS [Variable Message Sign] displaying a particular message at a particular location in a particular network, what the effect on individual travelers or on overall network conditions will be. Only limited data is available on individual responses to information, from operational deployments or from surveys investigating user reactions to hypothetical systems. Available data tends to be concentrated in specific areas such as commuter driving behavior; much less is known about information effects on non-commute trips, transit riders and commercial vehicle operators, for example.* [5]

Thus, we suggest that highway information systems be evaluated from a system standpoint. Such an evaluation can determine benefits for average daily travel, as outlined above, but also be extended to evaluate information impacts during periods of travel time variability.

Selections of particular information infrastructure improvements to be implemented should be based on best practices and appropriateness for the individual application (e.g., considering crashes, average speeds, speed variability, alternative routes and modes available, etc.). The evaluations and

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http://www.cmap.illinois.gov/uploadedFiles/publications/other_publications/pm25_conformity_analysis_b.pdf Accessed January, 2009.

[2] Glazer and Cruz. *Intelligent Transportation Systems at the 2002 Salt Lake City Winter Olympic Games: Event Study: Traffic Management and Traveler Information.* Prepared by Iteris, Inc. Prepared for Utah Department of Transportation. April, 2003. Posted at http://www.itsdocs.fhwa.dot.gov//JPODOCS/REPTS_TE//13850.html. Accessed December, 2008

[3] Shanjiang Zhu, David Levinson, and Lei Zhang. *An Agent-based Route Choice Model.* April, 2007. P. 7. Posted at http://nexus.umn.edu/Papers/ARC.pdf. Accessed January, 2009.

[4] Ibid., pp. 7-13, 16-18.

[5] Jane Lappin and Jon Bottom. *Understanding and Predicting Traveler Response to Information: A Literature Review.* Prepared by Volpe National Transportation Systems Center for Federal Highway Administration. December 2001, p. 3. Posted at http://ntl.bts.gov/lib/jpodocs/repts_te/13953_files/13953.pdf. Accessed January, 2009.

programming decision should also consider other uses for the infrastructure improvement needs.

A review of the potential components to the regional traveler information systems continues below. Where applicable and available, ad hoc evaluations of these component parts are also included, keeping in mind the caveat above.

Specific Strategy: 511 and Other Coordinated Regional Multi-Modal Traveler Information Services

Multi-modal traveler information services may provide the following:

- Highway advisories regarding construction and special events;
- Up-to-the-minute highway congestion and travel time information;
- Suggested highway directions, given origin, destination, and arrival time, considering travel time index and planning time index data for area highways.
- Transit itineraries for a given origin, destination, arrival time, and transit disability;
- Highway and transit incident information;
- Commercial vehicle information, including restrictions and facilities;
- Paratransit service scheduling;
- Rideshare and vanpool services; and
- Walking and cycling directions, including for transit access.

Such services can be offered interactively via the Internet or over the phone. Nationally, *511* is a number reserved for such multi-modal traveler information.

511 systems are also an important way to transmit traveler information. For example, a phone survey found that 49% of users of the *511 Virginia* system had changed their route based on 511 information.[6] A survey of *511* users in Utah during the Winter Olympic games found that while usage was low (4%) among residents, the usage was moderate (17%) among Olympic visitors, who used it for traffic (63% of visiting users); transit (37% of visiting users); Olympic information (42%); and road conditions (16%). Usage peaked at 4000 calls on the first day of the Olympics, then quickly fell to less than half that volume as the Olympics proceeded and travelers found their way.[7]

A coordinated system of traveler information allows trained staff to provide expert directions, itineraries, and travel advisory information. While important to the public seeking such information, such a centralized information resource is critical for services such as Smart Trips, which provide “how-to” information regarding travel alternatives.

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[6] Swan et al. *511 Virginia Evaluation.* Prepared by Virginia Tech Transportation Institute. Prepared for Virginia Department of Transportation. January, 2004. pp. 104-105. Posted at http://www.itsdocs.fhwa.dot.gov//JPODOCS/REPTS_TE/13987.html. Accessed December, 2008.

7 Glazer and Cruz. *Op. cit.*.

Nationally, multi-modal traveler information systems have been implemented as *511* systems at the state or regional level. For example, the Metropolitan Transportation Council has implemented a 511 system in the San Francisco Bay area. Kansas has developed a state-wide 511 system. Illinois hosts a Web site, *Getting Around Illinois.* However, an Illinois DOT effort to develop a statewide 511 system was not successful. The Regional Transportation Authority is developing a multi-modal traveler information system. Multi-modal traveler information is also available commercially from Google Maps and from Navteq Discover Cities. A comparison of these systems is presented in Table 1.

Table 1: Comparison of Selected Multi-Modal Traveler Information Systems (Web Implementation Accessed January, 2009)

System	Operator	Other Agencies Participating?	Congestion / Travel Times	Construction	Special Events	Incidents	Transit Itineraries	Rideshare Services	Walking and Cycling
511 NY www.511ny.org	New York State DOT	☑	Speed Only	☑	? None Listed	☑	☑	☑	Walking Maps in Transit Itinerary
511 SF Bay Area www.511.org	Metropolitan Trans-portation Council	☑	☑	☑	? None Listed	☑	☑	☑	Walking Maps in Transit Itinerary; Bike Map
SunGuide Traveler Information www.511southflorida.com (South Florida)	Florida DOT	?	Very Limited	☑	? None Listed	☑	Web site Disconnected	No	No
Seattle Area Traffic http://www.wsdot.wa.gov/traffic/seattle/ http://www.wsdot.wa.gov/traffic/default.aspx	Washington State DOT	?	Much Info	☑	? None Listed	☑	?	Indirect – Follow Several Links	No – Program data only – No travel info
Minnesota 511 http://www.511mn.org/index.asp	Minnesota DOT	?	Conge stion Map; Limited Travel Times	☑	? None Listed	☑	Indirect – Follow Several Links	?	No

SPECIFIC STRATEGY: INDIVIDUALIZED MARKETING

Individualized marketing is one of the most promising strategies to change trip behavior. An established program in Portland, Oregon estimates that the intensive program has reduced drive-alone trips by between 8.6% and 12.8% in targeted residential areas.[8] In Portland, walking, transit, and cycling mode shares have increased by 3-5%, 1-3%, and 1-2%, respectively.[9] These changes are the result of efficiently targeting people willing to change trip behavior in neighborhoods with transportation options.[10]

The premise of an individualized marketing program is that people in the target market need to be involved through dialogue, opportunity, and process.[11] For such programs, the goal is to provide information for people to switch a small number of trips per week away from single-occupant vehicles using modes and trips that work for the traveler.[12]

The steps in the Portland SmartTrips process are:

- Establish specific zones for SmartTrip Activities;
- Collect "before" data.
- Establish community partnerships.
- Prepare program and materials tailored to established zones.
- Mail program introduction with questionnaire and order form to households in established zones.
- Hand-deliver requested materials to households using knowledgeable staff to answer questions and provide "how-to" information.
- Implement program activities (walks, bike-rides, clinics, workshops, etc.).
- Produce and distribute newsletters.
- Follow-up and collect "after" data.[13]

To measure success, the Portland program typically does the following:

- Conducts a phone survey;
- Mails a program evaluation to participating households;
- Conducts bicycle and pedestrian video counts;
- Counts carpool web site sign-ups; and
- Collects transit boarding and alighting data.[14]

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[8] Ginenthal and Roberts. *SmartTrips: Converting Car Trips to Active Trips.* Webinar Presentation. Hosted by Association of Pedestrian and Bicycle Professionals. December, 2008.
[9] Ibid.
[10] Ibid.
[11] Ginenthal and Roberts. *SmartTrips: Converting Car Trips to Active Trips.* Webinar Presentation. Hosted by Association of Pedestrian and Bicycle Professionals. December, 2008.
[12] Ibid.
[13] Portland Office of Transportation. *SmartTrips Southwest Final Report.* December, 2008. Posted at http://www.portlandonline.com/transportation/index.cfm?c=46030&a=220818. Accessed January, 2008.
[14] Ginenthal and Roberts, op. cit.

For Portland's Southwest SmartTrips project, a sample of quantities of materials distributed includes the following:

- Newsletters: 3 mailings of 21.5K each; 2 newsletters of 4.5K each.
- Information Order Forms: 21.5K
- CarpoolMatchNW.org materials: 0.2K
- TriMet (Public Transit) Maps and Schedules: 7K
- Zipcar Information: 0.5K
- Southwest Portland Walking/Bicycling Map: 7K
- Miscellanous Bicycle Information and Maps: 0.6K-6K
- Miscellanous Walking Information: 1.5K – 5K[15]

More than 80% of participants request materials for more than one mode.[16] The program avoids distributing heavy objects, materials not specifically requested, and "cheap throw-aways."[17]

Individualized marketing programs originated in Perth,[18] extended to the rest of Australia,[19] and have recently expanded to the United States[20] and to the United Kingdom.[21] In the United States, programs have been established in Portland, Alameda County (CA), Columbia (MO), Boulder (CO),[22] and Chicago. The Chicago program, "Go Healthy," was operated by the Active Transportation Alliance on a pilot basis, and involved approximately 100 families in the Logan Square neighborhood.[23]

Specific Strategy: En-Route Information

In addition to the 511/Multi-modal travel information systems, travel demand management may be accomplished real-time through en-route information. A study of traveler response to variable message sign information in metropolitan Paris demonstrated that messages displaying the length of the queue had a substantial impact on the capacity utilization of an on-ramp. In the study, a message indicating a four-kilometer queue was associated with on-ramp volumes 30% below capacity; a three-kilometer queue message was associated with volumes 15% below capacity; on-ramp volumes for two-kilometer queue messages were 10% below capacity; on-ramp volumes for one-kilometer queue

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[15] Ibid., p. 14.
[16] Ginenthal and Roberts, op. cit.
[17] Ibid.
[18] Government of Western Australia. *TravelSmart.* http://www.dpi.wa.gov.au/travelsmart/14890.asp. Accessed January, 2009.
[19] TravelSmart Australia. *TravelSmart Australia*. http://www.travelsmart.gov.au/index.html. Accessed January, 2009.
[20] City of Portland. *SmartTrips.* http://www.portlandonline.com/transportation/index.cfm?c=43801. Accessed January, 2009.
[21] Sustrans. *TravelSmart.* http://www.sustrans.org.uk/default.asp?sID=1090834131404. Accessed January, 2009.
[22] Ginenthal and Roberts, op. cit.
[23] Chicagoland Bicycle Federation. *Go Healthy! 2007 Pilot Final Report.* December, 2007. Posted at http://www.biketraffic.org/docs/modeshift/go_healthy_final_report.pdf. Accessed January, 2009. Funding for this pilot was limited to $12,500.

messages were 7% below capacity; no traveler response was detected for messages of queues one-half kilometer in length.[24] While these response rates were significant, they were somewhat below expectations from survey data.[25]

En-route information may be distributed via commercial radio broadcast stations, highway advisory radio, or variable message signs. Typically, these resources are used in concert for mutually reinforcing messages. UC-Berkeley's ITS Decision notes that information these resources can transmit to travelers include information about alternative routes, construction, lane closures, and detours; roadside facilities; weather; HOV/HOT, toll, and ramp meter information; speeds and travel times.[26] ITS Decision notes the importance of transmitting precise, correct information.[27]

Specific Strategy: Other Awareness and Marketing Campaigns

Other awareness and marketing campaigns that have been implemented in the Chicago metropolitan area include the following:

- Partners for Clean Air is a coalition coordinating episodic voluntary ozone controls in Greater Chicagoland, including encouragement of transportation alternatives.[28,29] No formal measurement of the impact of the program has been found.
- Several area foundations and the USEPA also support a continuous air pollution control program called *Clean Air Counts* that includes information on transportation options for participating agencies.[30] There is no "but for" analysis of the program's benefits, though there are testimonials regarding savings for program participants that have implemented employer commute programs.[31]
- In order to reduce travel demand during the reconstruction of the Dan Ryan Expressway, the Regional Transportation Authority launched a "Drive Less Live More" campaign in 2006. The campaign was relaunched

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[24] Youngbin Yin and Jean-Luc Ygnace. "Link Flow Evaluation Using Loop Detector Data: Traveler Response to Variable Message Signs." *Transportation Research Record 1550.* Washington: Transportation Research Board. 1996. pp. 58-64.
[25] Ibid.
[26] ITS Decision. *Variable Message Signs.* Hosted by Institute of Transportation Studies at UC-Berkeley and Caltrans. http://www.calccit.org/itsdecision/serv_and_tech/Traveler_information/Enroute/vms_summary.html Accessed January, 2009.
[27] Ibid.
[28] Partners for Clean Air. http://www.cleantheair.org/overview.shtml.. Accessed January, 2009.
[29] Alex Farrell. "Episodic, Voluntary Ozone Control Strategies in 1995: Review and Summary." Prepared by Wharton Risk Management and Decision Processes Center. Presented to U.S. Environmental Protection Agency, Region 3. Posted at http://opim.wharton.upenn.edu/risk/downloads/archive/arch6.pdf. Accessed January, 1995.
[30] Clean Air Counts. "Workplace Transportation Options." http://www.cleanaircounts.org/workplacetransportationoptions.aspx. Accessed January, 2009.
[31] Clean Air Counts. "Underwriters Laboratories" and Others. Linked to http://www.cleanaircounts.org/aboutcac.aspx. Accessed January, 2009.

with broader participation in 2008.[32] No effect on travel demand has been documented to date.

2.2 Employer and Campus Transportation Demand management

Transportation demand management has been implemented by many employers, colleges, and business parks. These sites may engage in TDM activities to attract and retain employees by improving their commutes, to reduce on-side parking demand and construction costs, to reduce taxes and other expenses, to improve the environment and reduce energy consumption.[33] Local governments may also require TDM to be implemented by sites or employers by ordinance, or as part of stipulations in the development approval and permitting process. For example, the State of Washington requires concurrent transportation development in the form of either TDM measures or infrastructure to accommodate land development.[34] In Arlington, Virginia, a TDM plan is required for each development site plan with required TDM strategies; a standard site plan condition implements the required TDM strategies.[35]

Benefits

The USEPA has prepared a "commuter model" to estimate the impacts of typical site-related TDM program elements, including alternative work schedules, employer support programs, financial incentives, transit service improvements, and on-site pedestrian access improvements. Table 2 summarizes the EPA's estimates of the impacts on various program levels on the percent reduction in Vehicle Miles Traveled (VMT) for a hypothesized office park with average commute characteristics for metropolitan Chicago.

Clearly, an analysis like Table 2 does not consider the transportation assets of a particular site and, in the analysis undertaken, considers neither the interaction between strategies nor the impact of the implementation on other transportation system users; such analyses would require full travel demand modeling that is beyond the scope of this work and generally beyond the scope of analysis necessary for a site's evaluation of TDM implementation. Rather, a site-specific analysis with programs appropriate for a location may be appropriate. This paper's experience shows that such an analysis is a reasonable undertaking prior to a substantial investment by an employer or campus.

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[32] Regional Transportation Authority. "About Us." http://drivelesslivemore.com/aboutus.aspx Accessed January, 2009.
[33] Center for Urban Transportation Research. "Program Overview." *Best Workplaces for Commuters.* http://www.bestworkplaces.org/about/overview.htm. Accessed January, 2009.
[34] Meck, ed. "Commentary: Concurrency and Adequate Public Facilities Controls." *Growing Smart Legislative Guidebook.* American Planning Association. 2002. Posted at http://www.planning.org/growingsmart/guidebook/eight04.htm. Accessed January, 2009.
[35] 1990 Transportation Demand Management Policy Statement (Dollar amount CPI Adjusted (2008 dollars). City of Arlington, VA. Posted at http://www.commuterpage.com/tdm/pdf/TDM_Policy1990_2008.pdf Accessed January, 2009.

Table 2. USEPA Commuter Model V2.0 Estimates of Percent Reduction in Vehicle Miles Traveled – Site-Based Analysis

Program Element	Moderate Level of Effort		Medium Level of Effort		High Level of Effort	
	Implementation	VMT Change	Implementation	VMT Change	Implementation	VMT Change
Site Walking Access Improvements	1-Minute Reduction for Transit, Walking, and Bicycling Trip Times	-0.5%	2-Minute Reduction for Transit, Walking, and Bicycling Trip Times	-1.0%	3-Minute Reduction for Transit, Walking, and Bicycling Trip Times	-1.5%
Transit Service Improvements	1-Minute Reduction in Service Headway Plus 1-Minute Reduction in Transit Travel Time	-0.4%	2-Minute Reduction in Service Headway + 2-Minute Reduction in Transit Travel Time	-0.8%	5-Minute Reduction in Service Headway + 5-Minute Reduction in Transit Travel Time	-2.0%
Financial Incentives	Transit-Check Tax Savings, Only	-0.9%	$1.00 Parking Surcharge for Drive-Alone, Carpool, and Vanpool Commuters. Transit-Check Tax Savings	-2.0%	$5.00 Parking Surcharge. 50% Transit Discount.	-10.5%
Employer Support	Quarter-Time Transportation Coordinator; Provision of Commute Options Information; In-house Ride-Match Services; Work Hours Flexibility	-2.2%	Moderate-Level Activities Plus Half-Time Transportation Coordinator; Preferential Parking for Rideshare; Vanpool Development and Operating Assistance; On-Site Transit Sales; Bicycle Parking and Showers	-5.0%	Medium-Level Activities Plus Full-Time Transportation Coordinator; Vanpool Financial and Technical Support; Guaranteed Ride Home; Workplace Bicycling Promotion and Infrastructure	-8.3%
Alternative Work Schedules	10% Participation in a Compressed 9-Day/80-Hour Schedule; 10% Percent Participation in Staggered Hours	-0.8% (-2.8% During Peak-Period)	Moderate-Level Activities Plus 10% Flex-Time; 10% Compressed 4-Day/40-Hour Schedule	-2.4% (-6.3% During Peak-Period)	Medium-Level Activities Plus 10% Telecommute	-4.0% (-7.9% During Peak-Period)
Comprehensive Program	All of the Above	-5.0% (-7.2% During Peak-Period)	All of the Above	-11.9% (-16.0% During Peak-Period)		-31.3% (-35.1% During Peak-Period)

Notes: Commuter Model V2.0 and Manual are posted at http://www.epa.gov/OMS/stateresources/policy/pag_transp.htm#cp (Accessed January, 2009). This CMAP analysis used the following parameters: Large Metropolitan Area Size; Site/Employer Based Analysis Scope; Non-CBD High Density Commercial Analysis Area Type; Office Employment 12,500; Non-Office Employment 2,500. Existing Work-Trip Mode Shares: Drive-Alone 70.2%; Carpool 9.2%; Vanpool 0.1%; Transit 12.2%; Bicycle 0.5%; Walk 3.0%; Other 4.8%. Default Work Trip Lengths; Default Vehicle Occupancy; Default Length of Peak Period and Percent of Work Trips in Peak Period. Transit-check savings estimated at $1.00 per day. Used suggested Chicago mode choice model coefficients.

Numerous sites within metropolitan Chicago have implemented such comprehensive TDM programs, with substantial benefits for both the employer and the region. For example, the University of Chicago's Transportation and Parking Services provides a successful, comprehensive travel demand management program, and is planning to enhance the program. The current program consists of bicycling support (cyclist gym membership for showers); student transit passes, campus-oriented transit services, and a qualified transit benefit plan; SafeRide, a guaranteed ride home program; car sharing, car pooling (including preferred parking), and parking passes for occasional parkers.[36] Importantly, the University avoids free parking; parking fees range from $75/month to $175/month.[37] By spring of 2008, the University had reduced parking permit sales by 10%, conserved funds by delaying plans for a new parking garage, and responded to campus needs for more buildings by facilitating adaption to the loss of surface parking facilities.[38]

Specific Strategies: Transportation Management Associations

Suburban Transportation Management Associations can have substantial positive impacts on travel behavior. By 2000, the TMA of Lake Cook has increased the alternative (non-single occupant vehicle) mode share to 14% for 50,000 employees along suburban Lake-Cook Road in the Highand Park, Deefield, Glencoe and Northbrook area,[39] while the Prairie Stone TMA had achieved a 19% alternative mode share for more than 7,000 employees.[40] By comparison, comparable areas without active TMAs had lower alternative mode shares: 10% for 56,000 employees in the 22nd Street-Butterfield Road corridor in the Oak Brook and Oakbrook Terrace area,[41] and 11% for 39,000 employees in the I-88 corridor in the Naperville, Aurora, and Warrenville area.[42]

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[36] University of Chicago Facilities Services. *Transportation and Parking.* http://facilities.uchicago.edu/transpparking/ Accessed January, 2009.

[37] University of Chicago Facilities Services. *FY 09 Parking Rates and Programs.* http://facilities.uchicago.edu/transpparking/parking/rates-memo-fy09-lex.shtml and http://facilities.uchicago.edu/transpparking/parking/rates-memo-fy09-others.shtml.

[38] Brian D. Shaw, Director of Campus Transportation and Parking Services. "Transportation Demand Management at the University of Chicago." Presentation at Mode*Shift* Conference. February, 2008. Posted at http://www.biketraffic.org/docs/modeshift/presentations/brian_shaw_u_of_c.pdf. Accessed January, 2009.

[39] Regional Transportation Authority. "2000 Work Trip Flows." *Regional Transit Asset Management System.* www.rtams.org. Defined destination (work site) custom geography zones 209, 5994, 5995, 5996, 5997, 5998, 5999, 6000, 6001, 6002, 6003, 6004, 6005, 6006, 6007, 6008, 6009, 6010, 6021, 6023, 6024, 6027, 6028, 6078, 820, 821, 822, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919; all origins.

[40] Ibid. Defined destination zones 256, 257, 258

[41] Ibid. Defined destination zones 209, 5994, 5995, 5996, 5997, 5998, 5999, 6000, 6001, 6002, 6003, 6004, 6005, 6006, 6007, 6008, 6009, 6010, 6021, 6023, 6024, 6027, 6028, 6078, 820, 821, 822, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919.

[42] Ibid. Defined destinations zones 209, 5994, 5995, 5996, 5997, 5998, 5999, 6000, 6001, 6002, 6003, 6004, 6005, 6006, 6007, 6008, 6009, 6010, 6021, 6023, 6024, 6027, 6028, 6078, 820, 821, 822, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919.

In many cases, TDM would be much more difficult or infeasible without the assistance of a TMA. For example, the TMA of Lake Cook has focused corporate leadership on providing alternative travel options for the TMA's member employers, including expanded city-to-suburb and suburb-to-suburb commuter rail service and stations, and a national-model shuttle service from commuter rail stations to employment sites. The Shuttle Bug service grew from 110 rides per day when it opened in 1996 to 500 trips per day in 1998, and 800 trips per day in 2001.[43] By 2008, the Shuttle Bug was a public-private partnership between the TMA of Lake Cook, Metra, and area businesses that provided 1700 shuttle rides per day.[44] Among riders, 72% drove alone to work before taking the shuttle; 15% of riders "would not be able to get to work without the shuttle service."[45] As of 2008, sixteen shuttle routes served 32 companies from North Central Service, Milwaukee District North Line, and Union Pacific North Line stations.[46] Such coordination between so many businesses and government agencies is possible only with the deliberate, systematic efforts of a TMA or similar organization.

2.3 Auxiliary Transit Services

Auxiliary transit services include the following:

- Services such as ridesharing for markets where, when, or for whom traditional transit would not be economical or desirable.
- Services such as carsharing and "guaranteed ride home" that facilitate transit use.

The benefits of auxiliary transit services are typically closely related to transit services. The benefits of individual programs are discussed below.

Specific Strategies: Regional Rideshare Programs

The regional rideshare program is an extension of the regional transit system. In areas that cannot support fixed-route transit services, alternatives such as carpools and vanpools can often work effectively. In northeastern Illinois, Pace Suburban Bus Service operates the both ridematching and vanpool programs.

Regional ridematching programs facilitate not only on-site employer-based services, evaluated in section 2.2, but also facilitate people from different

[43] Timothy Jackson and Tom Murtha. "A Synopsis of CMAQ Demonstration Projects: Demonstration Projects funded by the Congestion Mitigation and Air Quality Improvement Program in Northeastern Illinois, Fiscal Years 1992-2001." Chicago Area Transportation Study Working Paper 01-10. May 2001. Posted at http://www.catsmpo.org/workingpapers/01-10.pdf. Accessed January, 2009.
[44] TMA of Lake Cook. "TMA Shuttle Program" http://www.tmalakecook.org/shuttle_overview.html. Accessed January, 2009; updated 2008 counts from personal email communications.
[45] Ibid.
[46] TMA of Lake Cook. "TMA Overview." http://www.tmalakecook.org/overview.html. Accessed January, 2009.

employers to find matches based on similar travel paths and travel times. In northeastern Illinois, such ridematching is accomplished via a website "pacerideshare.com."[47] Regionwide freeway and arterial signs still indicate 800-920-RIDE, but callers to that number are referred by a recorded message to the Web site.[48]

Very little public data exists regarding the effectiveness of regional ridematching programs. While carpooling is a popular means of transportation to work (accounting for more than 10% of work trips for the region in 2000),[49] nothing indicates that regional programs contribute to this. Data from the Chicago Area Transportation Study, a predecessor of CMAP, indicates that the number of complete rideshare applications per week was related to radio advertising spots. When radio advertising was airing (up to 70 spots per week, but typically 40-60 per week), 10-25 non-employer based rideshare applications were completed per week, but fell to 10 applications or fewer without substantial radio advertising.[50] Even at the higher level of 25 applications per week, the number of carpoolers and vanpoolers per day in 2000 was more than 16,000 times the number of weekly rideshare applications. Further, there is little public information on how many rideshare applications successfully form a carpool.

Most carpools form organically, rather than through direct government activity. We do not fully understand how this is achieved or the implications for the transportation system. Thus, additional study of carpooling behavior, using the "Travel Tracker" survey data, is now planned as part of on-going studies of travel mode share.

Data for vanpools is more accessible, owing to the public ownership of the vans. 695 Pace vans are now operating; these vans provided an estimated 1,919,000 rides in 2008,[51] or 2,761 rides per van per year.

Aside from cases where rideshare activities are presented as an alternative to fixed route transit service for a group of people organized to request such a service, the evidence for regional rideshare supports the program in the context of individualized marketing focused on particular neighborhoods and in the context of employment/campus site programs. Regional campaign activities are not supported by strong evidence.

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[47] https://www.pacerideshare.com/en-US/default.aspx. Accessed January, 2009.
[48] Phone call to 800-920-RIDE (7433) January, 2009.
[49] Maureen Smith. "Analysis of Absolute Change in Carpool and Vanpool Numbers in Northeastern Illinois from 1990 to 2000." Chicago Area Transportation Study. Working Paper 05-01. February, 2005. p. 13. Posted at http://www.catsmpo.org/workingpapers/05-01.pdf.
[50] Jose Rodriguez. Public Reception of Ridematch 21." Chicago Area Transportation Study. Working Paper 04-07. September, 2004. p. 7. Posted at http://www.catsmpo.org/workingpapers/04-07.pdf. Accessed January, 2009.
[51] Kris Skogsbakken, Pace Suburban Bus Service. Personal Communication with Author, February 3, 2009.

Innovations in Rideshare Programs

Commentary. Rideshare program success requires broad participation to achieve a database large enough to produce matches. However, innovation usually is tested on a micro scale that is unlikely to produce such broad participation. Successful innovation will likely require a *nearly automated, on-the fly* plug-in to travel plans, on-line social networks, and wireless communications, overcoming the rigidity of typical carpooling arrangements. An entrepreneurial firm, Carticipate, is moving toward this vision on the iPhone and on Facebook.[52] Other rideshare lists are forming organically or entrepreneurially, although the proliferation of such rideshare lists may make matches less likely and more time-consuming.[53] Nonetheless, this private sector innovation certainly merits watching, encouragement, and perhaps future adoption as the new technologies mature.

SPECIFIC STRATEGIES: GUARANTEED RIDE HOME PROGRAMS

Guaranteed Ride Home (GRH, sometimes known as Emergency Ride Home) programs can be made available to prospective transit users and ridesharers to alleviate the fear of not having a personal vehicle available in an emergency situation such as tending to a sick or injured child. Thus, GRH supplements and facilitates other transit and rideshare services. GRH programs can be administered on a single employer, employer group (e.g. TMA) or regionwide basis.[54] GRH programs work by providing vouchers or reimbursement for the use of a taxi or in some cases a rental vehicle to attend to an emergency.[55] How permissively "emergency" is defined affects the attractiveness of the program, but also affects the utilization of the guarantee; usage of the service can vary from 0.5% of eligible participants per year to 20% of eligible participants, depending on whether such "emergencies" as overtime and social engagements are eligible.[56] Locally, to control costs, the Pace Vanpool Program's Guaranteed Ride Home program does not reimburse for overtime, and limits annual costs to $125 per participant per year.[57]

The Atlanta Regional Commission broadened the Guaranteed Ride Home concept in February 2008 to be region-wide and to include transit, carpooling,

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[52] Steffen Frost. Carticipate Talk, http://www.youtube.com/watch?v=kaphdB6Wafs.
[53] http://zimride.com/home.php, http://chicago.craigslist.org/rid/, http://twitride.com/index.php, http://www.carpoolworld.com/, http://www.reliablerider.com/default.aspx,. A full 21 sites are listed at http://www.nctr.usf.edu/clearinghouse/ridematching.htm.
[54] Victoria Transport Policy Institute. "Guaranteed Ride Home: A Backup for Commuters Who Use Alternative Modes." *TDM Encyclopedia.* http://www.vtpi.org/tdm/tdm18.htm. Accessed January, 2009.
[55] Ibid.
[56] Ibid.
[57] Pace Suburban Bus Service. Vanpool Programs – Traditional Vanpool. http://www.pacebus.com/sub/vanpool/traditional_vanpool.asp

vanpooling, and bicycling.[58] The Madison Area Transportation Planning Board offers a similar program with broad eligibility.[59]

No formal evaluation of GRH programs was found. Victoria Transport Policy Institute relates the following findings from other studies and surveys:

- "GRH is among the most important factors determining the effectiveness of a commute trip reduction program."
- "59% of rideshare and transit patrons consider GRH important in their decision to use alternate modes."
- "The availability of GRH has a value roughly equivalent to subsidized transit fare at a fraction of the cost."[60]

SPECIFIC STRATEGIES: CARSHARE PROGRAMS

Carsharing programs provide individuals the access to a vehicle without the associated ownership, parking, operating, insurance and maintenance costs. Users typically participate in a carshare program to supplement the mobility achieved with transit, bicycling, and walking. A separate strategy paper on this topic is available at http://goto2040.org/ideazone/forum.aspx?id=700.

SPECIFIC STRATEGIES: PARK AND RIDE/PARK AND POOL LOTS.

This strategy is being considered in the forthcoming strategy paper on Parking Management. See http://www.cmap.illinois.gov/cmp/strategies.aspx.

2.4 MARKET AND FINANCIAL INCENTIVES

Travel demand is peculiar. First, demand for transportation is a derived demand, "as users of transport are very often consuming the service not because they benefit from consumption directly (except in cases such as pleasure cruises), but because they wish to partake in other consumption elsewhere."[61] In addition, financial cost of transportation is only part of the total, generalized cost, which includes travel times and other items affecting utility.[62]

Nevertheless, monetary prices have a substantial impact on transportation demand. For example, as gasoline prices rose to 33.9% over year-earlier levels in summer of 2008, travel demand abated, causing substantial declines in

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[58] Atlanta Regional Commission. "RideSmart Guaranteed Ride Home Program." https://www.myridesmart.com/html/grh.htm. Accessed January, 2009.
[59] Madsion Area Transportation Planning Board. "Rideshare/etc." http://www.madisonareampo.org/Otheredoc_pdf/rideflyer07.pdf. Accessed January, 2009.
[60] Victoria Transport Policy Institute. Op. Cit.
[61] http://en.wikipedia.org/wiki/Derived_demand. Accessed January, 2009.
[62] Chicago Metropolitan Agency for Planning. *Transportation Conformity Analysis for the PM2.5 and 8-Hour Ozone National Ambient Air Quality Standards. Appendix B.* P. B-4 Posted at http://www.cmap.illinois.gov/uploadedFiles/publications/other_publications/pm25_conformity_analysis_b.pdf. Accessed January, 2009.

highway traffic congestion in most major cities.[63] Nationally, Congested Hours fell from 5 hours, 25 minutes in 2007 to 4 hours, 21 minutes in 2008; the travel time index fell from 1.314 to 1.250, and the planning time index fell from 1.671 to 1.561.[64] In Chicago, partly because of heavy construction and an increase in incidents, congested hours rose by 41 minutes to 13 hours, 19 minutes, but the travel time index and planning time index both fell by more than 5 percent and the VMT served fell by 14.6%.[65]

A primary method to address travel demand through market mechanisms is through the development of managed lanes, already addressed in strategy paper form (http://www.goto2040.org/WorkArea/showcontent.aspx?id=10182). In this report, we will discuss broader measures to affect travel demand through the price mechanism. These measures include a VMT tax, transit price incentives, and mileage-based insurance.

Specific Strategies: "Pay-As-You-Drive" Fees

Illinois currently receives substantial revenues for its highway program both from vehicle registration fees and from motor fuel taxes. However, as noted in the final report of the National Surface Transportation Policy and Revenue Study Commission, motor fuel taxes will likely need to be replaced within the next twenty years as vehicles switch to alternative energy sources.[66] The Commission notes that the current gasoline tax structure has fallen behind the general increase in prices and is substantially behind increases in construction costs.[67] The Commission has proposed increases in the gasoline tax, though these proposals are met with some skepticism, even on the Commission.[68] The Minority Report calls for change within 10 years.[69]

Therefore, while short-term Motor Fuel Tax increases are likely, particularly at the federal level, we should explore and understand alternative revenue streams, particularly those that have the strategic impact of improving the operation of the transportation system while raising revenue. The 10-year or even the 20-year time-frames for change, offered above, are both well within the 2040 planning horizon. We are therefore discussing these alternative revenue streams in the context of medium- to long-term planning.

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[63] Federal Highway Administration. "Urban Congestion Report, June-August 2008: National Executive Summary." November, 2008.
[64] Ibid. For an explanation of terms, see http://www.cmap.illinois.gov/cmp/measurement.aspx.
[65] Ibid.
[66] National Surface Transportation Policy and Revenue Study Commission. *Final Report: Volume 1: Recommendations.* P. 40. Posted at http://transportationfortomorrow.org/final_report/pdf/volume_1.pdf. Accessed January, 2009.
[67] Ibid., ff.
[68] National Surface Transportation Policy and Revenue Study Commission. *Final Report: Volume 1: Minority Views.* Pp 60-61. Posted at http://transportationfortomorrow.org/final_report/pdf/volume_1_minority_views.pdf. Accessed January, 2009.
[69] Ibid., p. 63.

Annual Miles Travelled. Table 3 is a summary of the number of vehicles by miles traveled per year per vehicle in Illinois.

Table 3. Number of Passenger Car and B-Plate Trucks Registered in Illinois by Miles Driven per Year and Location, 2003-2007.

Annual Miles Driven	Number of Vehicles (with Percent of Vehicles in Geographic Area)				
	City of Chicago	Suburban Cook County	Collar Counties	Downstate	State of Illinois Total
0-3000	65,560 (5.5%)	90,163 (5.1%)	95,876 (4.0%)	139,255 (4.1%)	390,854 (4.5%)
3001-6000	172,157 (14.4%)	236,618 (13.3%)	248,895 (10.4%)	308,963 (9.2%)	966,633 (11.1%)
6001-9000	258,522 (21.6%)	371,158 (20.8%)	432,017 (18.0%)	485,565 (14.4%)	1,547,262 (17.7%)
9001-12000	263,639 (22.0%)	399,543 (22.4%)	537,678 (22.4%)	642,763 (19.1%)	1,843,624 (21.1%)
12001-15000	195,503 (16.3%)	306,358 (17.2%)	460,828 (19.2%)	654,954 (19.5%)	1,617,643 (18.5%)
15001-18000	114,805 (9.6%)	180,736 (10.1%)	295,416 (12.3%)	496,386 (14.8%)	1,087,343 (12.4%)
18001-24000	85,254 (7.1%)	141,437 (7.9%)	239,379 (10.0%)	463,467 (13.8%)	929,536 (10.6%)
24001-36000	27,645 (2.3%)	44,871 (2.5%)	72,635 (3.0%)	146,012 (4.3%)	291,163 (3.3%)
36001-48000	7,679 (0.6%)	6,363 (0.4%)	8,171 (0.3%)	14,793 (0.4%)	37,007 (0.4%)
48001-72000	6,883 (0.6%)	4,550 (0.3%)	5,068 (0.2%)	8,903 (0.3%)	25,405 (0.3%)
>72000	1,907 (0.2%)	1,439 (0.1%)	1,742 (0.1%)	2,648 (0.1%)	7,736 (0.1%)
Total	1,199,554 (100%)	1,783,238 100%	2,397,706 100%	3,363,708 100%	8,744,206 100%

Source: CMAP. Calculations by authors using approximately 1.5 million VIN records from biennial emissions testing, matched to earlier testing odometer records or, for new VINs, annual mileage calculated from odometer and digit 10 of VIN. Sample was weighted against actual registrations (registration source: Illinois Secretary of State http://www.cyberdriveillinois.com/departments/vehicles/2007countystats.html). Approximate sample weights: City of Chicago: 3.61; Suburban Cook County: 3.90; DuPage County: 3.90; Kane County: 4.10; Kendall County: 7.79; Lake County: 3.72; McHenry County: 6.11; Will County: 4.58; Downstate: 45.66;

How Might a VMT Fee Work? An initial idea for a fee on Vehicle Miles Traveled (VMT Fee) is presented below and is analyzed using a detailed version of the table above (with vehicle travel estimated to the nearest 250 miles):

1. The VMT Fee could be presented with, but as a voluntary alternative to, a substantial increase in vehicle registration fees. The base assumption would be that motorists would sign up for the increased registration fees

unless the VMT Fee would be a cheaper alternative, in which case they would pay the VMT Fee instead.

2. Vehicle registration fees would continue to be "flat." The alternative VMT Fees would be on a per-mile basis, with no minimum.

Table 4 shows a summary of the analysis of such a fee implemented on a modest basis in a variety of scenarios. At higher levels, the fee could replace the motor fuel tax.

Table 4. Estimated Annual VMT Tax Revenue

Fee Plan	Annual Revenues (Dollars)	% of Vehicles Paying No More than $25	% of Vehicles Paying No More than $50	% of Vehicles Paying Less than Maximum
$2.00 per 1K Miles or $100 Max	$210,382,917	57.8%	96.6%	99.6%
$2.00 per 1K Miles or $150 Max	$211,164,464	57.8%	96.6%	99.9%
$4.00 per 1K Miles or $100 Max	$410,540,545	16.8%	57.8%	96.4%
$4.00 per 1K Miles or $150 Max	$417,244,497	16.8%	57.8%	99.3%
$4.00 per 1K Miles or $200 Max	$419,454,781	16.8%	57.8%	99.6%
$6.00 per 1K Miles or $100 Max	$573,220,208	7.3%	28.3%	79.8%
$6.00 per 1K Miles or $150 Max	$613,885,446	7.3%	28.3%	96.4%
$6.00 per 1K Miles or $200 Max	$622,045,812	7.3%	28.3%	99.0%
$8.00 per 1K Miles or $100 Max	$673,910,139	4.5%	16.8%	56.2%

Source: CMAP. Calculations by the authors based on detailed statewide estimates of the number of vehicles by miles traveled per year per vehicle in Illinois, estimated from approximately 1.5 million vehicle odometer readings matched with VINs. Transport price elasticities ***are*** addressed in these calculations. The elasticities mean slightly reduced travel demand, but also includes a slight dampening of program revenues and a reduction in motor fuel tax revenues (the calculation above is net of these offsets).

Again, the revenues above were assumed to be in addition to the current revenue stream. The authors of this paper also calculated the fee structure required to *replace* the Illinois motor fuel tax (MFT) for gasoline and gasohol. The 19-cent/gallon state gasoline/gasohol MFT generated nearly $1 billion in 2007. To replace such revenues, a mileage fee of $15 per thousand miles with a $150 maximum would be required for each Illinois registered passenger car and b-plate truck.

Issues to be addressed in implementing mileage fees include reliably determining mileage to be taxed. This can be accomplished in the same way as for "pay-as-you-drive" auto insurance, as described by the Victoria Transport Policy Institute:

> *Pay-As-You-Drive pricing requires verified mileage data. This can be collected in various ways. The simplest approach is to have brokers or vehicle owners report odometer readings, by email or mail, with random verification spot checks. More sophisticated systems use electronic devices which automatically send mileage data, or even track when and where a vehicle is driven. The cost of automated data collection is declining since most newer cars have odometer data recorded in the engine computer, and many have wireless communication systems or GPS transponders. Two insurance companies use mileage data that is automatically transferred each time a vehicle is refueled. Another approach is to require odometer audits as described below. This could provide data as accurate as other metered goods (such as electricity) at little extra cost.*[70]

SPECIFIC STRATEGIES: "PAY-AS-YOU-DRIVE" INSURANCE

Current auto insurance policy pricing in Illinois is based on lump sums and does not directly encourage less driving or safer driving. However, According to Bordoff and Noel,

> Switching to PAYD could yield substantial benefits, according to our recent findings, which are based on data from the 2001 National Household Transportation Survey. The average driver would face a per-mile insurance premium of 6.6 cents per mile, instead of a yearly lump-sum cost of about $800. Because drivers could save money by driving less, we estimate driving (miles travelled) would fall by about 8%.[71]

Burdoff and Noel note that, currently, lump-sum pricing allows motorists driving 50,000 miles per year to pay nearly the same premiums as motorists driving 5,000 miles per year, even though low-income people, on average, drive less

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[70] Victoria Transport Policy Institute. "Pay-as-You-Drive Vehicle Insurance." *TDM Encyclopedia.*
[71] Jason Bordoff and Pascal Noel. "Pay-As You Drive Auto Insurance." *Weekly Policy Commentary.* Resources for the Future. http://www.rff.org/Publications/WPC/Pages/12_15_08_pay-as-you-drive_insurance.aspx. Accessed February, 2009.

than other people.[72] They estimated that two-thirds of households would save an average of $270 per vehicle under "pay-as-you-drive."[73]

"Pay-as-You-Drive" insurance pricing includes a direct measure of miles driven. Several insurance carriers offer the policies in other states and nations. For one such carrier, Progressive Insurance, the concept is that not only how much, but when and how a car is driven should be among the risk factors to be accounted for in rating an insurance policy; thus, for their pay-as-you-drive policies, devices in the car monitor miles driven as well as safe driving behavior.[74]

How Elastic Is Travel Demand?

In this paper and other strategy papers on parking and managed lanes, several key points involved the response of travelers to changes in prices. These strategies rely on elastic travel demand, responsive to some degree to price.[75] A summary of research on travel elasticities has been prepared by Todd Litman of the Victoria Transport Policy Institute.[76] Litman's report notes the following:

- Consumer perceptions. Litman presents evidence that consumers will put a higher value on their losses than their gains; consumers will also measure price changes with respect to what they perceive as theirs.
- Commute trips are less elastic than other trips.
- Elasticities are dependent upon alternatives. E.g., "highway tolls tend to be more price-sensitive if there are parallel untolled roadways."
- When measured on the basis of total user costs, or "generalized costs" when travel time costs are included, travel elasticity measures are much more elastic than component elasticities individually measured. Alas, elasticities for driving are often measured on only a portion of driving costs. As Litman notes, "since fuel is only about 15% of total vehicle costs, a -0.2 elasticity of driving with respect to fuel price represents an elasticity of -1.3 with respect to total financial cost." A "typical value" for generalized cost is -0.5, but these values may vary by mode, time of day, and dynamic effects.[77] Thus while short-term elasticities for generalized costs may be -0.5 to -1.0, long-term generalized cost elasticities may be as high as -1.0 to -2.0.[78]

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[72] Ibid.
[73] Ibid.
[74] Progressive Insurance. *"Are You Ready to Pay as You Drive?"* http://www.progressive.com/myrate/myrate-default.aspx Accessed February, 2009.
[75] Interpreting Elasticities: An elasticity of "0" indicates that the item is inelastic to the component; absolute values above 1 indicate high elasticity (e.g., a one-percent rise in price is associated with more than a one-percent fall in quantity demanded). Negative values indicate inverse relationships (as prices rise, demand falls). Positive values indicate positive relationships (e.g., as incomes rise, demand rises).
[76] Victoria Transport Policy Institute. "Transportation Elasticities: How Prices and Other Factors Affect Travel Behavior." *TDM Encyclopedia.* November, 2008. http://www.vtpi.org/elasticities.pdf. Accessed February, 2009.
[77] Ibid., p. 34.
[78] Ibid.

- Long-term transportation elasticities increase over time, since decisions that have an impact on travel behavior (e.g., residential and job location, vehicle ownership, and available travel modes) tend to emerge infrequently. Such major decisions can be expected in response to long-term price changes, not short-term changes, so elasticities for time periods less than two years tend to be only one-third of the elasticities measured for periods more than ten years.

A comprehensive review of the research in the United States and abroad on travel demand elasticities with regard to fuel prices and incomes has been developed by Goodwin, Dargay, and Handly for what is now the U.K. Department of Transport.[79] They summarize fuel price effects thus:

> *If the real price of fuel rises by 10% and stays at that level, the result is a dynamic process of adjustment such that the following occur:*
>
> > *(a) Volume of traffic will fall by roundly 1% within about a year, building up to a reduction of about 3% in the longer run (about 5 years or so).*
> >
> > *(b) Volume of fuel consumed will fall by about 2.5% within a year, building up to a reduction of over 6% in the longer run.*
>
> *The reason why fuel consumed falls by more than the volume of traffic is probably because price increases trigger a more efficient use of fuel (by a combination of technical improvements to vehicles, more fuel-conserving driving styles and driving in easier traffic conditions). A further probable differential effect is between high- and low-consumption vehicles, since with high prices, gas-guzzlers are more likely to be the vehicles left at home or scrapped.*
>
> *Therefore, further consequences of the same price increase are:*
>
> > *(c) Efficiency of the use of fuel rises by about 1.5% within a year, and around 4% in the longer run.*
> >
> > *(d) Total number of vehicles owned falls by less than 1% in the short run, and by 2.5% in the longer run.* [80]

Goodwin, Dargay, and Handly summarize the income effects on travel thus:

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[79] Phil Goodwin, Joyce Dargay, and Mark Hanly. "Elasticities of Road Traffic and Fuel Consumption with Respect to Price and Income: A Review." *Transport Reviews,* Vol. 24, No. 3 (May 2004). pp. 275–292. Prepared for the United Kingdom Department of Environment, Transport, and Regions [now the Department of Transport].

[80] Ibid., p. 278. The authors note the following "strong caveat: many studies only assess the effects on car ownership, on traffic or on use per car, but not at the same time or when using the same data. Therefore, this conclusion is based on drawing together quite different studies. Considerations of sample sizes suggest that the two effects (c) and (d) are somewhat less well supported than (a) and (b). At this stage, the authors' [Goodwin, Dargay and Hanley's] view is that the results *do* support the idea that the effects of prices on car ownership are important enough to take seriously, but are *not* necessarily such an overwhelmingly large part of the overall effect."

If real income goes up by 10%, the following occurs:

- *The number of vehicles, and the total amount of fuel they consume, will both rise by nearly 4% within about a year, and by over 10% in the longer run.*
- *However, the volume of traffic does not grow in proportion: 2% within a year and about 5% in the longer run.*[81]

While fuel prices have been a focus of study of price elasticities, there are many other areas where price could be used as a policy tool to affect behavior. Todd Litman has set forth the types of price changes that affect various travel behaviors (see Table 5).

Table 5. Impacts of Different Types of Pricing

"Different price changes have different impacts on travel behavior."

Type of Impacts	Vehicle Fees	Fuel Price	Fixed Toll	Congestion Pricing	Parking Fee	Transit Fare
Vehicle ownership. Consumers change the number of vehicles they own.	☑				☑	☑
Vehicle type. Motorist chooses different vehicle (more fuel efficient, alternative fuel, etc.)	☑	☑				
Route Change. Traveler shifts travel route.			☑	☑	☑	
Time Change. Motorist shifts trip to off-peak periods				☑	☑	
Mode Shift. Traveler shifts to another mode.		☑	☑	☑	☑	☑
Destination Change. Motorist shifts trip to alternative destination.		☑	☑	☑	☑	☑
Trip Generation. People take fewer total trips (including consolidating trips).		☑	☑	☑	☑	
Land use changes. Changes in location decisions, such as where to live and work.			☑		☑	☑

Source: Todd Litman. "Transportation Elasticities: How Prices and Other Factors Affect Travel Behavior." *TDM Encyclopedia.* Victoria Transport Policy Institute. P. 8. Posted at http://www.vtpi.org/elasticities.pdf. Accessed February, 2009.

[81] Ibid., pp. 278-279.

Specific price elasticities for public transit and for freight are reviewed here, though a review of all transportation price elasticities is beyond the scope of this paper.

Transit Fare Elasticities. A comprehensive review of international transit demand studies was conducted by the Transport Research Laboratory (TRL).[82] The TRL report notes that "fare elasticities are dynamic, varying over time for a considerable period following fare changes. Therefore, it is increasingly common for analysts to distinguish between short-run, long-run and sometimes medium-run elasticity."[83] TRL estimates that "short-run bus fare elasticity averages -0.4 in the short run, -0.56 in the medium run, and -1.0 in the long run," raising a question about the effectiveness of fare increases in raising long-run transit system revenues. Urban rapid transit fare elasticities are estimated at -0.3 in the short run and -0.6 in the long run. Suburban rail fare elasticities are estimated at -0.3 in the short run.[84] The higher absolute values of the long-term transit price elasticities also show that transit fare discounts may raise long-term ridership somewhat more than previously thought, though more U.S. research is desirable.

Freight Elasticities. Because freight activities are typically private-sector, much of the information regarding the response to market conditions is privately held. However, some studies are available internationally indicating price responsiveness in how freight is handled. Specifically, a Danish study indicated that freight ton-kilometer elasticity is -0.47, and freight truck-kilometer elasticity is -0.81, though freight energy consumption elasticity is only -0.1.[85] This indicates that increasing freight efficiencies from price increases may not extend to all aspects of the operations.

Moreover, Litman's summary of freight elasticities notes that freight elasticity estimates vary widely by commodity.[86]

Elasticities and Equity Impacts

Using prices as a mechanism to manage demand requires that complementary measures need to be put in place to address the equity impacts. Litman notes that transportation equity can be applied both horizontally (e.g., "fairness"),

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[82] Transport Research Laboratory. *The Demand for Public Transport: A Practical Guide.* Report TRL593. Posted at http://www.demandforpublictransport.co.uk/TRL593.pdf. Accessed February, 2009. For a summary of additional transit pricing reports, see also Litman's elasticity report (op cit., p. 37 ff.) and Brian McCollom and Richard Pratt. "Transit Pricing and Fares." *Report 95: Traveler Response to Transportation System Changes.* Chapter 12. Transit Cooperative Research Program. 2004. Posted at http://onlinepubs.trb.org/Onlinepubs/tcrp/tcrp_rpt_95c12.pdf. Accessed February, 2009.

[83] Ibid., p 15.

[84] Ibid. and p 43 ff.

[85] Thomas Bue Bjørner, quoted in Todd Litman. "Transportation Elasticities: How Prices and Other Factors Affect Travel Behavior." Op. Cit. P. 53.

[86] Todd Litman. "Transportation Elasticities: How Prices and Other Factors Affect Travel Behavior." Op. Cit. P. 53

vertically (e.g., "social justice") and vertically with regard to transportation ability and need (e.g., "universal design").[87] He also points out that providing transportation for emergencies, public services and utilities, health care, food, clothing, education and employment, some activities, mail, and freight may be a right, leading to subsidies for some services such as public transport, and also leading to standards of service, such as those for people with disabilities.[88]

Adam Smith, in *The Wealth of Nations,* points out the equity of user charges in financing transportation improvements:

> *When the carriages which pass over a highway or a bridge, and the lighters which sail upon a navigable canal, pay toll in proportion to their weight or their tonnage, they pay for the maintenance of those public works exactly in proportion to the wear and tear which they occasion of them. It seems scarce possible to invent a more equitable way of maintaining such works*.[89]

Thus, Adam Smith argues for transportation user charges to further horizontal equity. However, in the next few paragraphs, Smith goes substantially further, suggesting the tolls be levied to further vertical equity:

> *When the toll upon carriages of luxury upon coaches, post-chaises, etc., is made somewhat higher in proportion to their weight than upon carriages of necessary use, such as carts, waggons, etc., the indolence and vanity of the rich is made to contribute in a very easy manner to the relief of the poor, by rendering cheaper the transportation of heavy goods to all the different parts of the country.*[90]

Total expenditures on transportation rise with incomes, but as shown in Table 6, the share of expenditures on transportation is highest for middle-income groups. For lower-income groups, lower expenditure shares for transportation are related to lower vehicle ownership, as also shown by the 2007 Bureau of Labor Statistics Consumer Expenditure Survey data in Table 6. Nevertheless, consumer expenditures for transportation are substantial for low-income groups.

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[87] Todd Litman. "Evaluating Transportation Equity: Guidance for Incorporating Distributional Impacts in Transportation Planning." *TDM Encyclopedia.* Victoria Transport Policy Institute. July, 2007. Posted at http://www.vtpi.org/equity.pdf. Accessed February, 2009. P. 3

[88] Ibid., p. 7.

[89] Adam Smith. "Of the Public Works and Institutions for Facilitating the Commerce of the Society." *An Inquiry into the Nature and Causes of the Wealth of Nations*. Book 5, Chapter 1, Part 3, Article 1. 1776. Posted at http://www.adamsmith.org/smith/won-b5-c1-article-1-ss1.htm. Accessed February, 2009.

[90] Ibid.

Table 6. 2007 Consumer Transportation Expenditures and Shares by Income Quintile

Item	All Consumer Units	Lowest 20%	Second 20%	Third 20%	Fourth 20%	Highest 20%
Income Range	N.A.	Up To 19,300	$19,301 To 36,069	$36,070 To 57,943	$57,944 To 91,296	$91,297 And Up
Average Income Before Taxes	$63,091	$10,531	$27,674	$46,213	$72,460	$158,388
At Least One Vehicle Owned or Leased (%)	88%	65%	89%	94%	96%	98%
Number of Vehicles	1.9	0.9	1.5	2.0	2.4	2.8
Average Annual Expenditures on Transportation (Share is Shown in Parentheses).	$8,758 (17.6%)	$3,242 (15.8%)	$5,717 (18.4%)	$7,926 (18.7%)	$11,058 (19.3%)	$15,831 (16.4%)
• Vehicle Purchases	$3,244 (6.5%)	$1,075 (5.2%)	$1,945 (6.2%)	$2,601 (6.1%)	$4,460 (7.8%)	$6,133 (6.3%)
• Gasoline and Motor Oil	2,384 (4.8%)	1,046 (5.1%)	1,768 (5.7%)	2,418 (5.7%)	2,988 (5.2%)	3,696 (3.8%)
• Vehicle Finance Charges	305 (0.6%)	73 (0.4%)	164 (0.5%)	297 (0.7%)	442 (0.8%)	550 (0.6%)
• Maintenance and Repairs	738 (1.5%)	271 (1.3%)	499 (1.6%)	693 (1.6%)	920 (1.6%)	1,304 (1.3%)
• Vehicle Insurance	1,071 (2.2%)	471 (2.3%)	882 (2.8%)	1,220 (2.9%)	1,189 (2.1%)	1,594 (1.6%)
• Vehicle Rental, Leases, Licenses, Other Charges	478 (1.0%)	135 (0.7%)	217 (0.7%)	335 (0.8%)	554 (1.0%)	1,147 (1.2%)
• Public Transport	538 (1.1%)	171 (0.8%)	242 (0.8%)	362 (0.9%)	506 (0.9%)	1,406 (1.5%)

Sources: Bureau of Labor Statistics. *Consumer Expenditure Survey*. "Table 1. Quintiles of Income before Taxes: Average Annual Expenditures and Characteristics, Consumer Expenditure Survey, 2007" Posted at http://www.bls.gov/cex/2007/Standard/quintile.pdf. Accessed February, 2009. And "Table 45. Quintiles of Income before Taxes: Shares of Average Annual Expenditures and Sources of Income." Posted at http://www.bls.gov/cex/2007/share/quintile.pdf. Accessed February, 2009.

Price elasticities also vary by income group. The United States Environmental Protection Agency (USEPA) estimated the impacts of a VMT fee in Los Angeles and San Francisco, California, using the STEP model and 1991 income, population, and travel behavior as a base.[91] The analyses, shown in Tables 7 and 8, show that while low-income groups have a small share of daily VMT and a low per-capita VMT rate, these groups would be substantially affected by a VMT fee. Furthermore, "the lower middle class (quintiles two and three) would sustain much of the impact of pricing policies."[92] That said, the analyses should be used cautiously, since the data is old and the results are highly dependent upon travel conditions in the affected region (Chicago was not analyzed).

Table 7. Estimated Equity Implications of a VMT Fee in the Los Angeles Region - 1991

VMT Fee (cents per mile)	Absolute Change in Daily VMT by Income Quintile (Percentage Change Is Indicated Parenthetically)					
	Q1	Q2	Q3	Q4	Q5	Total
1	-1.8 (-7.0%)	-1.9 (-4.2%)	-1.4 (-2.6%)	-1.1 (-1.5%)	-0.5 (-.5%)	-6.6 (-2.3%)
2	-3.4 (-13.3%)	-3.7 (-8.2%)	-2.8 (-5.1%)	-2.2 (-3.1%)	-0.9 (-1.0%)	-13.0 (-4.5%)
3	-4.9 (-19.1%)	-5.4 (-12.0%)	-4.1 (-7.5%)	-3.3 (-4.6%)	-1.5 (-1.6%)	-19.2 (-6.6%)
4	-6.2 (-24.3%)	-7.0 (-15.6%)	-5.5 (-10.0%)	-4.4 (-6.2%)	-2.0 (-2.2%)	-25.2 (-8.7%)
5	-7.4 (-29.1%)	-8.6 (-19.1%)	-6.8 (-12.4%)	-5.6 (-7.7%)	-2.6 (-2.8%)	-31.0 (-10.7%)
6	-8.5 (-33.5%)	-10.1 (-22.4%)	-8.1 (-14.7%)	-6.7 (-9.3%)	-3.2 (-3.5%)	-36.6 (-12.6%)
7	-9.5 (-37.4%)	-11.5 (-25.6%)	-9.3 (-17.0%)	-7.8 (-10.8%)	-3.8 (-4.1%)	-42.0 (-14.5%)
8	-10.5 (-41.0%)	-12.9 (-28.7%)	-10.5 (-19.2%)	-8.9 (-12.4%)	-4.5 (-4.8%)	-47.2 (-16.3%)
9	-11.3 (-44.2%)	-14.2 (-31.5%)	-11.7 (-21.4%)	-10.0 (-13.9%)	-5.1 (-5.5%)	-52.3 (-18.0%)
10	-12.0 (-47.2%)	-15.4 (-34.3%)	-12.9 (-23.5%)	-11.1 (-15.4%)	-5.8 (-6.3%)	-57.3 (-19.7%)
Base VMT (Daily, Millions)	25.5	45.0	54.8	71.9	92.8	290.0
Per Capita Daily VMT	11.7	17.3	19.1	22.0	25.8	20.0

Source: USEPA. *Technical Methods for Analyzing Pricing Measures to Reduce Transportation Emissions.* Report EPA-231-R-98-006. August, 1998. Table B-21, p. B-59. Posted at http://www.epa.gov/otaq/stateresources/policy/transp/tcms/anpricng.pdf. Accessed February, 2009.

[91] USEPA. *Technical Methods for Analyzing Pricing Measures to Reduce Transportation Emissions.* Report EPA-231-R-98-006. August, 1998. Posted at http://www.epa.gov/otaq/stateresources/policy/transp/tcms/anpricng.pdf. Accessed February, 2009.

[92] Ibid.

Table 8. Estimated Equity Implications of a VMT Fee in the San Francisco Bay Area - 1991

VMT Fee (cents per mile)	Absolute Change in Daily VMT by Income Quintile in Millions (Percentage Change Is Indicated Parenthetically)					
	Q1	Q2	Q3	Q4	Q5	Total
1	-0.2 (-2.2%)	-0.2 (-1.2%)	-0.1 (-0.6%)	-0.1 (-0.2%)	0.0 (0.1%)	-0.6 (-0.5%)
2	-0.3 (-4.2%)	-0.3 (-2.3%)	-0.2 (-1.1%)	-0.1 (-0.5%)	0.1 (0.2%)	-1.1 (-1.0%)
3	-0.4 (-6.0%)	-0.5 (-3.3%)	-0.3 (-1.7%)	-0.2 (-0.7%)	0.1 (0.3%)	-1.6 (-1.4%)
4	-0.5 (-7.5%)	-0.6 (-4.2%)	-0.4 (-2.2%)	-0.3 (-1.0%)	0.1 (0.4%)	-2.1 (-1.8%)
5	-0.6 (-8.8%)	-0.7 (-5.0%)	-0.5 (-2.6%)	-0.4 (-1.2%)	0.2 (0.5%)	-2.5 (-2.2%)
6	-0.7 (-10.0%)	-0.8 (-5.7%)	-0.6 (-3.0%)	-0.4 (-1.5%)	0.2 (0.5%)	-2.9 (-2.5%)
7	-0.8 (-11.0%)	-0.9 (-6.4%)	-0.7 (-3.4%)	-0.5 (-1.8%)	0.3 (0.6%)	-3.3 (-2.9%)
8	-0.8 (-11.8%)	-1.0 (-7.0%)	-0.7 (-3.8%)	-0.6 (-2.0%)	0.3 (0.6%)	-3.6 (-3.2%)
9	-0.9 (-12.4%)	-1.1 (-7.5%)	-0.8 (-4.2%)	-0.7 (-2.3%)	0.3 (0.6%)	-3.9 (-3.4%)
10	-0.9 (-12.9%)	-1.1 (-8.0%)	-0.9 (-4.5%)	-0.8 (-2.6%)	0.3 (0.6%)	-4.2 (-3.7%)
Base VMT (Daily, Millions)	7.2	14.0	19.6	30.3	44.0	115
Per Capita Daily VMT	10.0	15.3	16.8	19.5	22.6	18.3

Note: Arithmetic error in original. Source: USEPA. *Technical Methods for Analyzing Pricing Measures to Reduce Transportation Emissions.* Report EPA-231-R-98-006. August, 1998. Table B-22, p. B-60. Posted at http://www.epa.gov/otaq/stateresources/policy/transp/tcms/anpricng.pdf. Accessed February, 2009.

Facilitating auto use with low road-use prices for everyone is not necessarily the most equitable strategy to provide mobility and accessibility for people with low incomes. As Litman notes,

> *Because driving is costly, regressive and difficult (particularly for some disadvantaged people, such as people with disabilities and immigrants who do not speak English), automobile-oriented solutions create additional equity problems. Cheap automobiles affordable to poor people tend to be unreliable, and are sometimes unsafe. Lower-income drivers often share vehicles with other household members. Even poor people who own an automobile often rely somewhat on other modes. As a result, disadvantaged people tend to benefit from a more diverse transport system. In other words, disadvantaged people may benefit from policies*

that help them drive, but they can benefit even more overall from policies and programs that increase total travel options.[93]

Thus, three strategies should be considered to address equity concerns regarding the use of price in managing transportation demand. First, as suggested in the USEPA's *Technical Methods for Analyzing Pricing Measures to Reduce Transportation Emissions,* equity concerns should be carefully examined. If adverse consequences are found, consider the use of tax revenues to benefit those who are disproportionately affected, "such as increased funding for public transportation services, use of revenue to provide tax exemptions (life-line rates) for low-income users, or use of tax revenues to replace existing taxes that disproportionately burden low-income taxpayers."[94] Second, transportation demand management strategies may in themselves have positive equity benefits and should be considered as a direct response to equity concerns. Litman discusses these responses extensively in his paper.[95] His summary of how these may be applied is shown here as Table 9:

Table 9. Strategies for Achieving Equity Objectives (Litman, 2007)

Strategy	**Treats Everybody Equally**	**People Bear the Costs They Impose**	**Progressive With Respect To Income**	**Benefits Transport Disadvantaged**	**Improves Basic Access**
Pricing reforms (higher fuel taxes, road and parking pricing, distance-based fees).	☑	☑			☑
Increased transport system diversity (improvements to modes used by disadvantaged people).			☑	☑	☑
More accessible land use, and location-efficient development			☑	☑	☑
More affordable automobile options (PAYD insurance, carsharing, need-based discounts, etc.)			☑		☑
Correct policies that favor automobile travel over other modes (planning and investment reforms).	☑	☑	☑	☑	
Improve Public Involvement in Transportation Planning	☑			☑	
Improve data collection (more information on disadvantaged people and alternative modes).	☑		☑	☑	

Source: [1] Todd Litman. "Evaluating Transportation Equity: Guidance for Incorporating Distributional Impacts in Transportation Planning." *TDM Encyclopedia.* Victoria Transport Policy Institute. July, 2007. Posted at http://www.vtpi.org/equity.pdf. Accessed February, 2009. P. 36.

[93] Ibid., p. 22.
[94] USEPA, op. cit. p. B-62.
[95] Todd Litman. "Evaluating Transportation Equity: Guidance for Incorporating Distributional Impacts in Transportation Planning." Op. Cit.

Commentary. The third strategy to address equity concerns about using price to manage demand is to focus on pricing strategies that will more likely have a positive impact on equity. For example, converting fixed costs to variable costs, as in Pay-As-You-Drive Insurance, is likely to be at TDM strategy that both moderates travel demand and increases vertical equity.

CMAP has produced substantial information pointing to the need to address regional highway congestion.[96] Pricing may need to be broadly applied in the future because of need to better manage our facilities and reduce this identified congestion. In addition, as noted earlier, road pricing may be necessary because motor fuel taxes may become obsolete. Implementing pricing mechanisms that increase equity may be a first step to facilitating eventual transitions to these systems.

3 The Regional Role

3.1 How Others See the Regional Role

ACT. Brian Shaw, the Director of Transportation and Parking Services at the University of Chicago, and an officer with the Association for Commuter Transportation (ACT), laid out "next steps" for travel demand management for Metropolitan Chicago at the 2008 ModeShift Conference sponsored by the Active Transportation Alliance:

- "Engage the private sector."
- "Need public sector champions – CMAP, CDOT, RTA, CTA, Pace, Metra."
- "Need funding allocated toward supporting programs – Guaranteed Ride Home, outreach, marketing."
- "Coordinated regional advertising and messaging."
- "Regional incentive programs."[97]

VTPI. The Victoria Transport Policy Institute (VTPI) has compiled a comprehensive list of "Best TDM Strategies - particularly suitable for implementation by regional governments and organizations" (many, but not all, of these actions are considered in this or other CMAP strategy papers; links are provided below to VTPI's write-up on each strategy).[98]

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[96] http://www.cmap.illinois.gov/cmp/measurement.aspx.

[97] Brian D. Shaw, Director of Campus Transportation and Parking Services. "Transportation Demand Management at the University of Chicago." Presentation at Mode*Shift* Conference. February, 2008. Posted at http://www.biketraffic.org/docs/modeshift/presentations/brian_shaw_u_of_c.pdf. Accessed February, 2009.

[98] Victoria Transport Policy Institute. "Regional and County Government Actions." *TDM Encyclopedia.* http://www.vtpi.org/tdm/tdm205.htm. Accessed February, 2009. Note: *TDM Encyclopedia* is a secondary source that includes excellent references. These references are frequently very useful for a full analysis of the issue being considered.

Asset Management Policies and programs to preserve the value of assets such as roadways and parking facilities.
Bus Rapid Transit Bus Rapid Transit (BRT) systems provide high quality bus service on busy urban corridors.
Change Management Ways to build support for institutional change.
Freight Transportation Management Strategies for improving the efficiency of freight and commercial transport.
Funding Options Describes various ways to fund transportation programs and evaluates the degree to which they support TDM objectives.
HOV Priority Strategies that give transit and rideshare vehicles priority over other traffic.
Institutional Reforms Creating organizations that support efficient transport.
Least-Cost Planning Creating an unbiased framework for transport planning.
Light Rail Transit Light Rail Transit systems provide convenient local transit service on busy urban corridors.
Location Efficient Development Development that maximizes multi-modal accessibility.
Operations and Management Programs that encourage more efficient use of existing roadway systems.
Park-and-Ride Providing convenient parking at transit and rideshare stations.
Regulatory Reform Policy changes to encourage competition, innovation, diversity and efficiency in transport services.
Ridesharing Encouraging carpooling and vanpooling.
Road Pricing Congestion pricing, value pricing, road tolls and HOT lanes.
Smart Growth Land use practices to create more efficient and livable communities.
Smart Growth Reforms Policy and planning reforms that encourage Smart Growth.
TDM Programs Developing an institutional framework for implementing TDM.
Transit Improvements Strategies for improving public transit services.
Transit Station Improvements Improve public transit stops and stations so they are more convenient, comfortable and attractive.
Transit Oriented Development Using transit stations as a catalyst for creating livable communities.
Transportation Management Associations Member-controlled organizations that provide transportation services in a particular area.
Transportation Model Improvements Discusses ways to improve transport models.[99]

U.S. Department of Transportation. The Federal Highway and Federal Transit Administrations have developed *An Interim Guidebook on the Congestion Management Process in Metropolitan Transportation Planning.*[100] The *Guidebook* lays out an eight-step Congestion Management Process:

1. Develop congestion management objectives.
2. Determine area of application.
3. Establish a system definition.
4. Develop and use performance measures.
5. Develop a performance monitoring plan.
6. Identify and evaluate strategies.
7. Implement and manage process.
8. Monitor strategy effectiveness.[101]

As part of step six, the Congestion Management Process identifies three sub-steps:

1. “Identifying congested locations;”

[99] Ibid.
[100] Posted at http://www.ops.fhwa.dot.gov/publications/cmpguidebook/cmpguidebook.pdf. Accessed February, 2009.
[101] Ibid., pp. 3-3 – 3-8

2. "Selecting appropriate analytical tools;" and
3. "Congestion Management Process strategies," including 37 specific strategies grouped by:
    a. "Adding more base capacity;"
    b. "Operating existing capacity more efficiently;" and
    c. "Encouraging travel and land use patterns that use the system in less congestion-producing ways."[102]

Among the 37 specific CMP strategies identified in the *Guidebook*, the following 14 strategies can be classified as TDM strategies:

- Adding capacity to the transit system (buses, urban rail or commuter rail systems);
- High-occupancy vehicle (HOV) lanes;
- Reserved travel lanes or rights-of-way for transit operation;
- Realigned transit service schedules and stop locations;
- Providing travelers with information on travel conditions as well as alternative routes and modes;
- Providing real-time information on transit schedules and arrivals;
- Anticipating and addressing special events, including emergency evacuations, that cause surges in traffic;
- Congestion pricing strategies, including high occupancy toll (HOT) lanes;
- Programs that encourage transit use and ridesharing;
- Flexible work hours;
- Telecommuting programs;
- Bikeways and other strategies that promote nonmotorized travel;
- Pricing fees for the use of travel lanes by the number of persons in the vehicle and the time-of-day;
- Pricing fees for parking spaces by the number of persons in the vehicle, the time-of-day, or location;[103]

Thus, TDM strategies are an integral part of the Congestion Management Process mandated as part of our metropolitan transportation process.

3.2 Our Regional Role

CMAP has a duty to advance travel demand management in the context of a Congestion Management Process, as part of our role as the Metropolitan Planning Organization for northeastern Illinois. The process is sketched out above, and is explained fully in the *Interim Guidebook on the Congestion Management Process in Metropolitan Transportation Planning.*[104] Our role in supporting and implementing transportation demand management begins with this federally-mandated process.

[102] Ibid., pp. 3-6 – 3-8.
[103] Ibid.
[104] USDOT, Op. Cit. http://www.ops.fhwa.dot.gov/publications/cmpguidebook/cmpguidebook.pdf.

In the context of this process and the lessons learned from this strategy review, we also compiled the following specific roles for CMAP in implementing TDM in Metropolitan Chicago's Congestion Management Process:

- Traveler Information:
  - As is the case for the Metropolitan Transportation Commission in the San Francisco Bay area, CMAP should consider a leading role for the development and implementation of *511* for Metropolitan Chicago.
  - CMAP together with the RTA should consider funding and leading a large-scale individualized marketing program for transit, walking, bicycling, carpooling, and other TDM strategies.
  - CMAP should work with partner agencies to assure that the information infrastructure is in place for agency implementation of en-route information.
- Employer and Campus TDM:
  - CMAP should consider funding Transportation Management Association startups to match the success of existing TMA's.
  - CMAP should consider requiring TMA's as part of corridor management plans for new and improved highway infrastructure.
  - CMAP should consider requiring transportation management strategies consistent with some level of Table 2 of this paper as part of the "development of regional importance" process and as part of corridor management plans for new and improved highway infrastructure.
- Auxiliary Transit Services:
  - CMAP should investigate rideshare activity data available through the *Travel Tracker* survey to better understand whether and how ridesharing can be encouraged.
  - CMAP should work with Pace to determine whether automated on-the-fly rideshare matching is feasible through social networks on a large scale, and whether there is a government role for such a program.
- Guaranteed Ride Home Programs:
  - CMAP should determine whether guaranteed ride home can be strategically expanded to encourage TDM in certain congested corridors.
- Carshare Programs:
  - CMAP should encourage participation in carsharing to assure that the programs are self-supporting and to maximize program benefits.
- Pay-As-You-Drive Fees:
  - CMAP should continue to investigate Pay-As-You-Drive fees in anticipation of the eventual need to replace the motor fuel tax, with policy support for implementation as appropriate.
- Pay-As-You-Drive Insurance:

    - CMAP should consider strong policy support of pay-as-you-drive vehicle insurance. Vertical equity benefits, increased likelihood of insurance requirement compliance, and TDM benefits of mileage fees argue strongly for CMAP support of such auto insurance options in Illinois.
- Transportation Equity:
    - CMAP should support TDM strategies as supportive of transportation equity.
    - CMAP should investigate, and support as appropriate, user fees that further transportation efficiency combined with TDM strategies (particularly transit services) to enhance system equity.