IMPACT OF EMPLOYER-BASED PROGRAMS ON TRANSIT SYSTEM RIDERSHIP AND TRANSPORTATION SYSTEM PERFORMANCE

BACKGROUND

Nationally, in 2003, traffic congestion caused 3.7 billion hours of travel delay and 2.3 billion gallons of wasted fuel, which amounted to more than $63 billion and represented an increase of 79 million hours and 69 million gallons from 2002. To overcome the impacts of congestion and improve system efficiency and performance, experts recommend a balanced approach including adding capacity, changing policies, applying demand management practices, and aggressively pursuing operational improvements to relieve critical bottlenecks. While much is known about the effects of various capacity and operational improvements, the effect of transportation demand management (TDM) on system performance remains less understood and, thus, may not receive the appropriate level of consideration as a transportation system improvement tool.

There are numerous examples and case studies documenting the effects of TDM at the worksite-level, and there are gross measures such as changes in travel behavior, vehicle miles of travel (VMT), or vehicle trips (VT) reduced. However, little is known about the cumulative impacts of these programs on measures such as changes in delay and travel speeds; or, likewise, the cumulative effect of employer-based programs. The VMT and VT reductions are likely to be spread geographically and temporally, so the observed impact may be difficult to discern. However, transportation professionals realize that small reductions in traffic volume at the right place and time can yield a "tipping point" whereby significant improvements to traffic flow can be achieved. From a traffic operations and transportation planning point of view, the question becomes how to assess the significance of wide-scale adoption of TDM strategies on a corridor's performance?

OBJECTIVES

The hypothesis of the study was that a wide-scale adoption of employer-based TDM strategies is likely to have a noticeable effect on the system performance of a corridor. The project's main objective was to establish the relationship between these strategies and corridor performance expressed in commonly used traffic performance indicators. This research tackled the following questions:

1. Are there better ways to communicate TDM successes to communities and decision makers?
2. Can TDM programs convey effectiveness by relating employer-based TDM programs directly to traffic congestion?
3. Can TDM strategies demonstrate their effectiveness in ways that would make them viable solutions for consideration by traffic operations staff?
4. Can a methodology be developed where TDM benefits are calculated in terms of widely used measures of transportation system efficiency? If such a methodology exists, would different users with varied backgrounds and expertise be able to utilize it for assessing TDM impacts on their perspective areas of interest?
5. Would a graphical representation of a transportation system with employer-based TDM program(s) impacts clearly visualized in terms of speed and time be helpful?

FINDINGS AND CONCLUSIONS

Combining a microsimulation tool (CORSIM) with mode split and origin/destination data for 63,000 commuters working at 189 worksites along an 8.6-mile Interstate corridor, this project affirmatively answered the above questions. The current behavior (*With TDM*) scenario (and its 14 percent vehicle trip reduction) was compared to what likely would have occurred without the Commute Trip Reduction (CTR) requirement on large employers but without eliminating the existence of baseline TDM efforts. The criteria used to express these impacts were commonly accepted performance measures used by traffic operations staff and decision-makers. This project graphically presented the results of analysis of corridor performance *With TDM* and *Without TDM* programs, showing the isolated impacts of TDM on a study area.

In the corridor analyzed, savings in delay were estimated to be 152,489 and 169,486 vehicle-minutes for the AM and PM periods, respectively, attributable to the extensive worksite TDM programs. The TDM programs resulted in a reduction of 102 lane-miles of spatial congestion in the AM peak period and 143 lane-miles in the PM peak period. A significant congestion reduction was observed; 60 and 45 minutes for the AM and PM peak periods, respectively. The average speeds increased up to 19 mph and 11 mph for the AM and PM peak periods, respectively. VMT reductions ranged from 17,297 vehicle-miles in the AM peak to 14,511 vehicle-miles in the PM peak. Fuel savings for all travelers, not just those using non-single occupant vehicles, were estimated to be 3,489 gallons during the AM peak period and 4,314 gallons during the PM periods. Estimated peak hour emission reductions due to improved traffic flow were 16.4 and 21.7 kilograms of hydrocarbon (HC) emissions and 1,109 and 1,545 kilograms of carbon monoxide (CO) emissions for the AM and PM peaks, respectively.

Researchers performed sensitivity analyses, assuming a conservative estimate of a 4 percent decrease in average VT reduction due to less intensive trip reduction efforts versus the observed 14 percent due to CTR programs (the *With TDM* scenario). The analyses indicated a 21.9 percent reduction in vehicle-minutes of delay compared to 31.5 percent from the *With TDM* scenario for the AM peak period and 32.3 percent compared to 42.0 percent for the PM period. As for spatial extent of congestion, ratios between the conservative scenario and the *With TDM* scenario were 11.1 to 18.7 percent and 24.6 to 30.6 percent for the AM and PM peak periods, respectively.

BENEFITS

This project clearly demonstrated that small changes in the location or time could substantially alter transportation system performance. In many areas of the study corridor and/or times of day, TDM made a significant impact on congestion but not in all areas or during all times of day. Thus, TDM, like every other transportation solution, will not eliminate delay for every congested highway segment or time period. However, TDM should be recognized as an effective tool in the congestion reduction toolbox.

This project resulted in a web-based course that will provide guidance to transportation and traffic professionals for using the developed methodology to measure the impacts of TDM on transportation system performance.

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