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Don Hirasuna,* Legislative Analyst
651-296-8038

Congestion Policy:
A Literature Review

This policy brief is a literature review of policies related to reducing traffic congestion. The brief reviews research on many policies including land-use patterns, metering, congestion pricing, and light rail transit. Included are past suggestions on the effectiveness of these policies and research specifically related to the Twin Cities metropolitan area.

Contents

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*For information regarding this policy brief, contact Don Hirasuna. For information regarding traffic congestion in general, contact legislative analyst John Williams, 651-296-5045.

Introduction

Traffic congestion in the Twin Cities and Greater Minnesota will likely be a continuing issue. As population and employment increase, the need for greater congestion management systems will be a recurring issue. Several policies attempt to deal with this issue; this brief reviews research on the effects of congestion policy.

In this review, we include both peer reviewed academic articles and research from local institutions.[1] There is a wealth of research on congestion specific to the Twin Cities, so to help provide information on Greater Minnesota, we include research from the state of Minnesota, the Metropolitan Council, and the University of Minnesota.

Many of the policies, like metering and bus transit, are currently being used in the Twin Cities metropolitan area. We include these policies because they may provide evaluation information on the past success of these policies. Also, the brief may provide information for other Minnesota metropolitan areas who are considering congestion policies.

In reading this brief, it may be useful to consider bundling several policies together. Any single policy may make little difference, but bundling several behaviorally consistent policies may yield larger effects. Bundling policies bring additional expenses, thus policymakers must weigh the potential costs and benefits.

This brief only reports on traffic-related congestion. Incident-related congestion, such as accidents and road construction, is not included. Congestion caused by incidents affects many drivers; however, a discussion of incident-related congestion deserves more consideration than can be given in this paper.

Summary

Decreasing Congestion by Constructing Highways

New or wider highways may reduce congestion but they may be controversial. Highway construction is expensive and must be balanced against the benefits to individuals paying for the new construction. Also, highway construction may place the state on a never-ending cycle of increased construction and suburban sprawl. (Pg. 4)

[1] Research from the Center for Transportation Studies at the University of Minnesota, Minnesota Department of Transportation, and Metropolitan Council.

Decreasing Congestion by Changing Land-Use

Polycentric Metropolitan Areas are cities with multiple business districts. The development of these metropolitan areas is sometimes related to reduced congestion. Some researchers have examined the potential for policy to aid development of polycentric metropolitan areas. These efforts focused on reassigning housing, jobs, or both. Research appears to suggest that these attempts may do little in reducing congestion. (Pg. 5)

Increased Residential Density is associated with increased public transit ridership, shorter commuting distances, and fewer roads. However, it is uncertain whether compact urban development will reduce congestion. (Pg. 7)

Decreasing Congestion by Increasing Public Transit Ridership

The Public Bus System may offer limited potential for reducing traffic congestion. Examples of attempts to increase bus ridership include increasing the quality of bus rides and decreasing fares. (Pg. 7)

Mass Rail Transit is suggested by some to do little in reducing traffic congestion. Part of the reason may be that commuters will substitute light rail for buses. Previous studies suggest that improving the bus system may be less expensive than adding light rail transit. (Pg. 9)

Changing the Way We Use Automobiles

Market Incentives encourage fewer single-person commutes by making it more expensive than ridesharing. Two often discussed policies are congestion pricing and parking fees. Congestion pricing has been imposed with some success in Singapore, but it is largely untested in the United States. Parking fees offer some potential, but may be too new for an evaluation. (Pg. 10)

Ridesharing (a.k.a. Carpooling or Vanpooling) can theoretically reduce traffic congestion by a considerable amount. One model suggests that if 30 percent of the single-car commuters switched to two-person car pools, traffic congestion would decrease by 10 percent. However, some suggest that a 10 percent decrease in the number of single-car commutes would be a large and unlikely change. (Pg. 13)

Flexible Work Places is an alternative strategy to decrease congestion. Employers could stagger work schedules allowing some workers to come in later in the day and leave after peak hours, or work hours on weekends. Fax machines, modems, Internet access, and other recent innovations could allow workers to work at home. (Pg. 13)

Changing the Way We Use the Roads

High Occupancy Vehicle (HOV) And Diamond Lanes provide an incentive for ridesharing by reducing the commute times. However, some suggest that HOV lanes will not necessarily reduce congestion. Unless new lanes are added, designated HOV lanes may reduce the overall road-carrying capacity and intensify congestion in single occupancy vehicle lanes. Other evidence suggests that money savings rather than time savings will more effectively encourage ridesharing. (Pg. 14)

Metering entrance onto freeways has been successful at increasing traffic speed. Successful programs have been introduced in Los Angeles and Dallas. (Pg. 15)

Intelligent Vehicle Highway Systems (IVHS) are made possible by recent advances in Global Positioning Systems (GPS) and other technological advancements. The effect of these programs upon congestion is uncertain. Some suggest that peak hour pricing or parking fees may be a more effective and less expensive way to reduce traffic congestion. (Pg. 15)

Highway Construction

In the 1950s and 1960s the typical solution to traffic congestion was to widen or build more highways. Because wider highways increase highway capacity, the volume of cars able to flow on a route at any moment in time increases. When congestion builds, planners may increase the capacity of the highway, albeit with some controversy.

Building highways is undeniably expensive. In adding a lane, the costs should be balanced against the benefits, such as shorter time for travelers going from one place to another. Typically, the balance allows for some congestion. Part of the reason is that the benefits may be small and accrue to only rush-hour travelers. Also, when planners consider costs and benefits in a much wider framework—impacts on the environment, impacts on urban sprawl and its related infrastructure costs, use of alternative routes, and use of alternative modes of transportation—the net benefits to building highways may be less than when examining only the direct costs and benefits.[2]

Of particular concern for some policy analysts is the cycle of highway construction—an endless and potentially harmful process of ever-increasing highway investments and ever-widening urban sprawl. New or wider highways lead to shorter commuting times which may provide an incentive for more dispersed development and increased population in the suburbs spread over larger areas (i.e., not denser developments). In turn, increased suburban population may lead to congestion and more requests for subsidized highway investment.[3]

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[2] Meyer and Gómez-Ibáñez (1981)

[3] Suburban growth may partly result from population growth and more employers within the metropolitan area. Their choice to locate in the suburbs may not be singularly related to congestion and its costs, but it may

Land Use

In addressing congestion, some have focused attention on the cycle of highway investment. By redirecting or limiting land-use development, some hope the automobile will become less attractive than public transit and other modes of travel.[4] Also, some forms of development may lead to shorter commutes. Policy-driven changes in land-use patterns often cluster in two alternatives—polycentric metropolitan areas and increased residential density.[5]

Changing land-use patterns may have pervasive effects on other issues. Changing land-use patterns potentially affects affordable housing, availability of large lot-single family homes, green space, air pollution, and municipal tax revenue. In light of the many issues brought into the matrix of consideration, some suggest land-use policies should be considered with other issues.[6]

Polycentric Metropolitan Areas

As the name implies, polycentric metropolitan areas are cities with multiple business districts. To some extent, this type of development is already occurring in Los Angeles, San Francisco, Minneapolis-St. Paul, and many U.S. metropolitan areas. Some suggest the development pattern is an outcome of market forces related to agglomeration and the desire to minimize transportation expenses.[7] The development of suburban employment centers may have reduced congestion.[8] However, at least one study questions this assertion, noting that many cities exhibited increased commuting times concomitant with growth of suburban employment centers.[9]

Some have examined the potential for policy-aided development of polycentric metropolitan areas to reduce traffic congestion. These efforts focused on reassigning housing, jobs, or both so that commuters can reduce their length of travel. Some researchers suggest that attempts to shorten commuting distance may do little in reducing congestion.[10] The problem is that the commuting

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serve as one of the incentives (Anas and Xu 1999, Plane 1995).

[4] Burchell (1998)

[5] Land-use policies are a prime example of the need to consider the bundle of issues associated with the problem. For example, different land-use patterns will affect opportunities for housing in different parts of the metropolitan area. It may also impact green space preservation, housing segregation, and job accessibility (Barnes 1999).

[6] Described through conversations with members from the Center for Transportation Studies at the University of Minnesota (Barnes 1999).

[7] Anas and Kim (1996), White (1994)

[8] Gordon, Kumar, and Richardson (1989), Cervero and Wu (1997)

[9] Rosetti and Eversole (1993)

[10] Giuliano and Small (1993), Downs (1992)

decision must be weighed with job market realities and other household priorities. For example, members of a household may change jobs over time, they may be unable to find the right combination of amenities and housing type in a location near their job, households with two working parents may minimize costs by locating in between two job centers, or they may prefer not to live near their place of work.[11]

Moving Housing is One Option.

Simple housing reassignment by building or providing incentives for large developments is expected to produce little reduction in commute times because people will not necessarily travel to jobs nearest their place of housing.

Clustered development near transit stops may produce larger reductions than simple housing reassignment. However, there is little possibility of large reductions in congestion in the short-term because existing housing is spread out rather than clustered.

Example State Programs: Build incentives and disincentives into the property tax system through loans, grants, tax increment financing; assess development fees for building outside of targeted housing areas; award grants, loans, and other awards for housing projects that increase access to public transit routes.

Moving Jobs Is Another Option.

Clustering jobs and nonresidential activities into several locations may increase the demand for public transportation, thereby narrowly reducing congestion. Given the dominance of private automobile transportation, the gains will likely be small. Some note that developing job centers may be a politically difficult task. Although the Twin Cities may have an advantage with a regional government with revenue sharing, the task may require assigning a limited number of employment centers over multiple jurisdictions and communities.

Example State Programs: Build incentives and disincentives into the property tax system through loans, grants, tax increment financing; assess fees for building low-density units or building outside of targeted zones; use fees for public projects inside of employment centers; increase revenue sharing between employment centers and other cities; create special appropriation for economic development projects; and create enterprise zones.

[11] Cropper and Gordon (1991), White (1994), Crane (1996), Pratt (1996), Giuliano and Small (1993), Downs (1992), Turner and Niemeier (1997)

Increased Residential Density

Increasing residential density is associated with increased public transit ridership, shorter commuting distances, and fewer roads.[12] However, it is uncertain whether compact urban developments will reduce congestion. Some suggest that congestion will increase because there will be more automobiles and buses on the same roads.[13] Others suggest that compact developments may reduce congestion because commutes are shorter and there are fewer potential bottlenecks.[14]

Limiting growth may produce some social benefits by reducing the need to construct new state highways and city roads; the costs of which will be transferred onto taxpayers. It may also produce some inequities by increasing land prices. Those renting an apartment or looking to buy their first home, typically individuals with less income, will disproportionately suffer from higher prices.

> **Example State Programs:** Set urban growth boundaries; set a minimum density for new developments; build disincentives into the property tax system; assess impact fees for new development.

Public Transit

Bus

Modifying the public bus system may offer limited potential for reducing traffic congestion. From a common sense point of view, a fully loaded bus of 50 people takes up considerably less highway space than 50 automobiles with single drivers.[15] Nationwide, public transit ridership is low. For 1983, ridership comprised approximately 7 percent of all rides and 3 percent for suburban residents.[16] One estimation suggests that a doubling of public transit ridership among suburban commuters would produce a relatively small 3 percent decrease in commutes, not enough to produce a large effect upon overall travel times or travel speeds. Also, evidence suggests that even in neighborhoods with easy access to public transportation, the automobile easily remains the

[12] Newman and Kenworthy (1989), Small (1985), Downs (1992), Tong and Wong (1997), Burchell (1998)

[13] Gordon, Kumar, and Richardson (1989), Cervero and Wu (1997)

[14] Downs (1992)

[15] Meyer and Gómez-Ibáñez (1981) note that a fully loaded 50-passenger bus takes up 3 percent to 8 percent of the space required by 50 single car drivers.

[16] Downs (1992)

dominant mode of transportation and large gains in public transit ridership are unlikely.[17] Part of the reason may be related to preferences and the practical advantages of using automobiles. Through an attitudinal study, some note that driving gives them more freedom and allows them to get more done.[18]

Increasing quality is one way of increasing ridership on public buses. Making buses more comfortable, decreasing travel time, and decreasing distance from bus stops to destination may increase the number of bus riders.[19] Street layouts with easy access to transit stops are found to increase public transit ridership.[20]

Example State Programs: Increase number of transit stations and transit stops; design new housing and streets to cluster around transit stops; decrease the time on a bus by more use of designated or HOV lanes; contract mini-busses or vanpools to large employers; offer free shuttle buses from large employers to transit stops; increase bus frequency.

Decreased fares could increase the demand for bus rides and reduce the number of automobiles.[21] However, this may be controversial since bus systems already require subsidization.

Example State Programs: Provide subsidies for bus tickets; provide discounts to employers that provide bus passes to workers; regulate ticket prices; make special arrangements for frequent or disadvantaged riders.

Light Rail Transit

Some suggest that light rail transit does little in reducing traffic congestion.[22] Part of the reason is that the provision of light rail causes riders to substitute this transit for buses.

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[17] Cervero (1996)

[18] Kitamura, Mokhatarian, and Laidet (1997)

[19] Horowitz (1995), Downs (1992), Giuliano and Small (1995)

[20] Cervero (1996)

[21] Some suggest that a public bus system may be run more efficiently as a private, for-profit company. The companies might become profitable, albeit with higher prices and reduced service (Winston and Shirley 1998). At least one study suggests that the current public subsidies are negatively related to bus performance and productivity. Moreover, the suggestion that buses constitute a natural monopoly may not be true. However, there is some risk of failure of privatized bus systems in smaller markets. If more than one bus system can operate within the same metropolitan area, then there may be an increased chance of providing continued service. Also, privatized bus services run the risk of not providing services to targeted groups within the population (Fielding 1995, Winston and Shirley 1998).

[22] Giuliano (1995), Bollinger and Ihlanfeldt (1997)

From a cost-benefit analysis, most light rail projects are unsuccessful public finance ventures.[23] Expected revenue rarely meets actual revenue and rarely meets the combined operating costs and fixed costs of laying down track and purchasing trains. Previous studies suggest that improving the bus system may be less expensive than adding light rail transit.

One study examined ten new rail lines finding revenue 15 percent to 75 percent below the forecasts needed to justify the expenditures.[24] San Francisco's BART, Atlanta's MARTA, and other projects in San Jose, Miami-Dade, and Buffalo are examples of projects that may have failed a cost-benefit test. The light rail project in San Diego, which might be one of the more successful, covers approximately 75 percent of its operating cost with fare revenue.[25]

There are many elements necessary for a successful project, most are related to increasing accessibility to a central business district with a relatively large amount of land devoted to nonresidential activities.[26] One example is the Lindenwold line that links several suburban communities in New Jersey to Philadelphia. Part of the Lindenwold's success may be that it was built around an existing rail right-of-way which lowered costs, it provides frequent service, and it provides access to an otherwise limited area by serving as an alternative to building another bridge to Philadelphia. In addition, bridge tolls were set in an attempt to further increase the demand for rail. Some suggest that a combination of policies may be needed to encourage sufficient ridership for light rail transit.

Giulliano (1995) suggests the following conditions are necessary for a successful rail project: (1) coordination of local land use and transit plans at the local level; (2) favorable traffic and parking policies; (3) provision of public infrastructure to support development around transit stations; and (4) provision of financial incentives to attract development around transit stations.

In some cases, light rail transit projects will raise property values. However, the beneficial increase remains concentrated near the rail line and diminishes with distance away from it, and there typically is no significant gain in citywide property taxes.[27]

> **Example State Programs:** Create special appropriation or bonds for light rail transit, taxes, and user fees to help pay for light rail transit; implement compatible land-use development; offer financial incentives and disincentives aimed at increasing public transit ridership.

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[23] Giuliano (1995), Plane (1995), Fielding (1995)

[24] Pickrell (1992)

[25] Conversation with the City of San Diego.

[26] Giuliano (1995), Fielding (1995), Plane (1995), Bollinger and Ihlanfeldt (1997)

[27] McDonald and Osuji (1995), Anas (1995)

Automobiles

A wide array of policies are aimed at helping individuals make more efficient automobile commuting decisions.

Market Incentives

Congestion pricing can be used as a disincentive to commuting by car. Theoretically, the optimal toll amount would equal the cost a driver imposes on others by entering the freeway and slowing down traffic.[28] In the past, congestion tolling may have been expensive to administer. Today, recent technological advances make the prospect more feasible.[29]

After more than 20 years of imposing a congestion toll in Singapore, traffic remains below its 1974 level. In evaluating Singapore's success, some take exception to the results noting that Singapore's government imposes stricter controls on growth in comparison to U.S. cities.

In the Twin Cities, a modeling exercise suggests that a toll on all congested roads will reduce miles traveled by commuters by as much as 19 percent on expressways and 8 percent on other roads. Much of this will depend upon how many commuters begin commuting by bus or by carpool.[30]

There are many suggestions on the exact form of tolling. Some suggest that all roads leading into the central business district carry tolls so that commuters cannot shift congestion onto non-toll routes.[31] Variable or peak-hour tolling can be imposed to price congestion appropriately.[32] If flat fees are imposed, individuals may benefit with information on expected travel times by routes to and from the central business district.[33]

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[28] Meyer and Gómez-Ibáñez (1981)

[29] Plane (1995), Li (1999)

[30] Anderson and Mohring (1996). Another study conducted a telephone survey and found that public acceptance of congestion tolls depends upon factors which include providing transportation alternatives, reducing the impacts on lower income persons, and mitigating traffic diversion to local roads (Wilbur Smith Associates 1997).

[31] Downs (1992)

[32] Downs (1992), Winston and Shirley (1998)

[33] Verhoef, Emmerink, Nijkamp, and Rietveld (1996)

One potential benefit to a congestion toll is reduced urban sprawl. Theoretically, some suggest that the increased transportation costs may provide incentives for persons to live closer to downtown. However, there is a countervailing effect that employers will want to escape increased land prices by moving to the suburbs. The end effect is thus ambiguous.

This is partly due to the fact that instead of moving closer to the downtown, persons may avoid it altogether and travel to shopping malls and office parks located in subcenters throughout the metropolitan area.[34]

Some raise concerns that a congestion toll is regressive.[35] However, there may be ways to reduce the regressivity including increasing efforts to reduce housing desegregation, compensating lower-income individuals with money from the congestion toll or from some other revenue source, and varying the price of the congestion toll.

Example State Programs: Make congestion tolls either flat or variable, compensating to reduce regressivity; provide information on travel times by route; convert HOV lanes to single and multiple riders with congestion toll; levy fees on developers of new buildings for estimated contribution to congestion; redistribute congestion tax revenue to lower the cost of public transit.[36]

Parking fees raise the cost of commuting and provide an incentive for cost-sharing through car pools or van pools. More than 90 percent of U.S. workers were offered free parking at their place of work in 1990.[37] From 1983 to 1990, the nationwide percentage of single-person commutes increased and the average number of persons per vehicle decreased from 1.3 to 1.1.

Some suggest that employer paid parking encourages single-person commutes.[38] Moreover, some suggest that raising the cost of parking will significantly decrease single-car commutes and to a lesser extent, reduce congestion.[39] One forecast suggests that if an employer increases daily parking costs from $0 to $5, the share of single-car commutes

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[34] Anas and Xu (1999)

[35] Segal and Steinmeier (1980), Downs (1992), Plane (1995)

[36] A similar approach would be to raise gasoline prices through higher taxes. Some suggest that an increase in gas prices may result in a decrease in demand for single car trips. Although theoretically plausible, there are many possible outcomes. For example, a gasoline tax may result in substitution towards more fuel efficient automobiles. Fuel consumption may decrease but congestion may not. Another possibility is that some individuals may choose to cross state boundaries to purchase gas (Downs 1992). If a gasoline tax is adopted, it may be a regressive tax and may be appropriate for some type of redistribution policy.

[37] Shoup (1982), Giuliano and Small (1995)

[38] Small (1992), Giuliano (1995), and Shoup (1982) note that employer-paid parking distorts the market because it is considered a fringe benefit and is non-taxable income. Alternatively, employer-paid bus passes are considered taxable income.

[39] Shoup (1982), Downs (1992), Giuliano and Small (1995), Plane (1995), and Small (1992)

will decrease by 23 percent.[40] A shortcoming of these forecasts is that they are not based on actual programs and some doubt whether the actual benefits will be as large as the forecasts.[41] Moreover, some doubt that significant reductions in congestion can be achieved, partly because some peak-hour traffic is from persons who drive through the central business district or from persons who can vary the amount of time they park.[42]

There are several suggestions for raising parking fees. One policy underway in California requires large employers who lease parking spaces to employees to offer a cash-out plan. Employees may choose either to continue to accept the parking space at below market prices, or accept cash in lieu of the space. If they accept the cash-out option, then they are free to rideshare or take public transit.[43]

Some suggest that the reduction in congestion may be larger for a parking fee imposed on all parking lots within an employment center and with easy access to public transit. This would raise the cost of parking for both privately owned and public parking spaces.[44] The increased cost would encourage all workers to substitute for cheaper modes of transportation. If an areawide parking fee is imposed, then there will be an additional source of revenue that can be used for a public purpose (e.g., downtown revitalization, public transit programs, commercial and industrial property tax reductions, or HOV lanes).[45] Like many market disincentives, a parking fee may be a regressive policy. It will raise the price of commuting by automobile and will impose a disproportionately large reduction in the budget of individuals with lesser income.[46] One may wish to consider ways to compensate employees and job seekers from lower income groups.

Example State Programs: Offer cash-out programs; assess areawide parking fees; vary parking fees by time of day; offer employer-paid parking for car pools and van pools; allow income tax deduction for employer-paid bus passes.

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[40] Wilson (1992)

[41] Wachs (1995)

[42] Glazer and Niskanen (1992)

[43] Plane (1995)

[44] Higgins (1992), Downs (1992)

[45] The size of these measures would depend upon the revenue gained from parking fees.

[46] Downs (1992)

Ridesharing (a.k.a. Carpooling or Vanpooling)

Theoretically, ridesharing can reduce traffic congestion by a considerable amount. One model suggests that if 30 percent of the single-car commuters switched to two-person car pools, traffic congestion would decrease by 10 percent.[47] However, some suggest that a 10 percent decrease in the number of single-car commutes would be a large change. Carpooling is less popular than in the 1970s. The reasons are related to the availability of the automobile, cheaper gasoline prices, increased fuel efficiency of cars, and demographic changes. The data shows that older individuals and individuals with more years of education tend to be less likely to carpool. Also, the increase in the percent of single persons and persons without children is related to a decrease in car pools.[48]

There are many policy suggestions related to increasing ridesharing. Many policies offer some type of financial incentive to employers or directly to individuals. One study suggests that employer-paid parking for car pools and HOV lanes can produce significant gains in the percent who carpool. These policies, combined with rideshare cost subsidies and guaranteed rides home, was estimated to produce between 11 percent and 18 percent increase in carpooling. Some suggest that whatever the policy, several should be put in place that are tailor-made to a target population who may be likely to choose carpooling.[49]

> **Example State Programs:** Offer employer-paid or discount parking for car or van pools; award subsidies through employers; guarantee rides home for ridesharers; provide vans to employees who agree to drive car pools; offer convenient parking spaces for car or van pools; use data centers to match individuals seeking to join a car pool; provide income tax deductibility for commuting allowance for workers who take public transit or rideshare.

Flexible Work Places

In 1983, approximately 50.3 percent of all 6 to 9 a.m. trips were for earning a living; and from 4 to 7 p.m., approximately 31.1 percent of all trips were for earning a living. Off-peak work hours and telecommuting are alternative strategies to decrease congestion. Employers could stagger work schedules allowing some workers to come in later in the day and leave after peak hours, or work extra hours on weekends. Fax machines, modems, Internet access, and other recent innovations could allow workers to work at home. There may even be some combination of telecommuting for part of the day and going to work during off-peak hours. If 10 percent of work trips were shifted outside of peak periods, total morning peak trips would reduce by 5 percent.[50] Some suggest that achieving a 10 percent decrease in peak-hour trips may be a difficult

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[47] Downs (1992)

[48] Ferguson (1997)

[49] Plane (1995)

[50] Depending upon where the workers are traveling, this could mean a substantial decrease in congestion for some transportation routes (Plane 1995).

task. Whether telecommunications can substantively decrease congestion is uncertain. The recent technological advances may be too new for an effective evaluation.[51]

> **Example State Programs:** Give tax credits to employers for the number of workers who are on staggered work schedules or telecommute; prevent telephone companies from charging higher rates for fax or modem transmissions; make sure health and workers compensation programs cover injuries while working at home; award income tax deductions for workers purchasing equipment and incurring business expenses related to working at home; lobby Congress to ease restrictions on flexible work schedules.

Road Use

A final set of policies are aimed at reducing congestion by changing the way we use highways. These types of measures typically change the way motorists drive by providing information or setting rules for driving.

HOV and Diamond Lanes

The theory is that if HOV and diamond lane travelers can travel faster, then other drivers will be encouraged to rideshare. However, some suggest that these lanes will not necessarily reduce congestion. Unless new lanes are added, designated HOV lanes may reduce the overall road carrying capacity and intensify congestion in single occupancy vehicle lanes. Other evidence suggests that money savings rather than time savings will more effectively encourage ridesharing.

Policies that combine these lanes with financial incentives, such as widespread employer sponsored programs for carpooling may result in reduced congestion. Even with little potential gain, HOV lanes may be more effective in reducing congestion in comparison to building highways, because the new HOV lanes encourage ridesharing.[52]

Another possibility of further reducing congestion is to charge tolls for single-car commuters traveling on HOV lanes. A mail survey for drivers commuting to Minneapolis along I-394 finds that 46 percent of the respondents would be willing to pay $0.50 to use the HOV lane. A higher toll of $1.00 would result in 26 percent of commuters willing to pay for the HOV lane.[53]

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[51] Downs (1992)

[52] Downs (1992)

[53] Kwon and Kelen (1998)

Example State Programs: Create HOV and diamond lanes; impose financial incentives and disincentives that promote ridesharing; assess tolls for single passengers.

Metering

Placing stoplights or gates on freeway entry ramps has been successful at increasing traffic speed. The meters help prevent traffic from exceeding certain capacity levels thereby helping ensure a minimum speed. Some suggest that metering can reduce travel time and highway construction costs by mitigating the need to construct wider roads.[54] Metering was successfully used on the Harbor freeway in Los Angeles where peak hour traffic speeds increased by 15 to 20 miles per hour. It was also used in Dallas where peak hour speeds increased by approximately 15 miles per hour.

Example State Programs: Install a metering system.

Intelligent Vehicle Highway Systems (IVHS)

IHVSs are made possible through recent advances in GPS and in other technological advancements. The new systems can increase the efficiency of existing traffic control devices. They can route drivers to other roads. Travel times for alternative routes can be posted upon these signs with sufficient advance notice to let drivers choose among alternative routes. The ultimate IVHS would allow drivers to go on autopilot while computers maneuver the cars from origin to destination. A goal of the federal Intermodal Surface Transportation Efficiency Act (ISTEA) was to have a highway or test track of this futuristic system in operation by 1997. The effect of these programs upon congestion is uncertain.

Example State Programs: Appropriate money for experimental or full-scale traffic management systems; coordinate stoplights; install information signs along highways; install computer and monitoring systems necessary to carry out an IVHS.

[54] O'Dea (1999) also suggests that metering cannot wholly replace congestion pricing in that there will still be wait times getting onto the highway and construction costs from building entry ramps.

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