Does More Transit Really Relieve Congestion?

In contrast to TTI's contrived policy question, this paper asks the much more relevant question: Would increasing transit's share of travel by some significant amount (e.g., 50 percent) significantly relieve congestion?

Today, such an increase in market share would require at least tripling transit spending, from less than $35 billion to more than $110 billion per year. Yet, as this paper shows, such an improbable increase in market share would save the average peak-period commuter only 22 seconds each way (44 seconds per day) in lessened traffic. Moreover, the normal growth in traffic in most urban areas would offset that saved 22 seconds in a few months.

Despite the media's focus on the transit industry's misrepresentations, overall, the Texas Transportation Institute's mobility report points the way toward congestion solutions that are far more cost-effective than improving transit. These include freeway ramp metering, traffic signal coordination, and "incident management" (quickly clearing stalled and crashed vehicles from highways). Another effective tool is turning high-occupancy vehicle (HOV) lanes into high-occupancy/toll (HOT) lanes, which would allow low-occupancy vehicles to use those lanes by paying a toll.

Except in rare circumstances, transit has little chance of reducing congestion in U.S. urban areas. Attempts to spend large sums of money to get a few automobile drivers out of their cars risk losing sight of transit's main mission, which is to provide mobility for people who cannot drive. Genuine transit advocates would focus on that mission, while those concerned about congestion should find new tools, such as congestion tolls, that would both reduce congestion and fund needed improvements in the highway system.

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sented TTI's 2003 findings to support their own objectives.

In contrast to past practices, TTI's 2003 report was co-sponsored by the American Public Transportation Association (APTA), which represents transit agencies and transit vendors, including rail transit builders, and the American Road and Transportation Builders Association, whose members build both highways and rail transit. An APTA press release, timed to coincide with the release of TTI's *2003 Annual Urban Mobility Report*,[2] claimed that the congestion report proved that "more public transportation is needed to relieve traffic congestion." In fact, the *Urban Mobility Report* said no such thing.

The 2003 report did ask the hypothetical question of what effect eliminating public transit would have on urban congestion. While such a question might have some academic interest, TTI's answer was used to exaggerate the effects of transit on congestion.

Even accepting TTI's answer, the report did *not* specifically ask whether more investments in transit would relieve traffic congestion and offered no estimates of what such investments would accomplish. In an attempt to fill that gap, this paper will attempt to answer that question as accurately as possible.

Problems with the 2003 Report

To begin, however, several things about the 2003 report seem more accommodating to the interests of the new funders than is justified by the facts. Specifically:

- The report exaggerates the effect of transit on congestion by assuming that all transit riders would drive if publicly funded transit did not exist. (Many would be in carpools, for example, since 70 percent of transit riders do not have either a car or a drivers license.[3])
- Without any supporting evidence, the report erroneously indicates that transit has increased its share of urban travel in the past two decades, when in fact that share has declined.
- In response to the question, "How should we address the mobility problem?" the first answer provided is "more travel options"—a euphemism among transit advocates for more government transit subsidies—even though the report provides no evidence that non-highway options can attract significant numbers of people out of their cars or that they can even be provided outside the dense urban core.[4]
- While in previous years the report was released earlier in the year, the 2003 report was not released until September 30, the day that congressional authorization for federal transportation funding expired, giving transit lobbyists an opportunity to promote the findings at a crucial moment in Congress's debate over future transportation funding.

Relying on data from the Texas Transportation Institute, the U.S. Department of Transportation, and the Census Bureau, this paper shows that transit is not a solution to congestion. Transit plays an important role in America, but attempting to use transit to relieve congestion only diminishes its principal role, which is to provide mobility for those who do not have a car available.

How TTI Measures Urban Congestion

The Texas Transportation Institute's congestion calculations rely on data gathered by state transportation agencies and published by the Federal Highway Administration in its annual *Highway Statistics*

2. Texas Transportation Institute, *The 2003 Annual Urban Mobility Report* (College Station, Tex.: Texas Transportation Institute, 2003), at *mobility.tamu.edu/ums.*
3. Center for Urban Transportation Research, *Public Transit in America: Findings from the 1995 Nationwide Personal Transportation Survey,* University of South Florida, 1998.
4. The report's undocumented comments do not end here. On page 10, the report says, with respect to the Portland indicators, that "perhaps the urban growth and transportation policies are encouraging shorter trips and travel on light rail and other modes." This apparent endorsement of Portland's planning policies flies in the face of the fact that Portland's per capita roadway use has increased more than that of all but four of the 40 urbanized areas with more than 1,000,000 residents since 1982. TTI also notes that Portland's land use and transport policies are intended to create a more dense urban area. In fact, TTI's own estimate shows that Portland's population density has declined since 1982. (The Census Bureau indicates that density has increased, but other urbanized areas, such as Los Angeles and Phoenix, have experienced substantially greater increases.)

reports. Based on these data, TTI uses a computer model that it developed to calculate various measures of congestion for each urban area. These measures include:

- The Travel Time Index, which estimates the time that a trip takes at rush hour relative to the time required in uncongested conditions. An index of 1.50, for example, means that a trip that would normally take an hour takes 90 minutes at rush hour (90 minutes divided by 60 minutes = 1.50).
- The number of hours of delay per person per year and the grand total for each urban area.
- The gallons of fuel per year wasted due to congestion.
- The cost per year of fuel and time wasted due to congestion.[5]
- The Roadway Congestion Index (RCI), which measures the volume of traffic compared to highway capacity.[6] An urban area roadway operating at capacity has an RCI of 1.00. A roadway averaging 25 percent more than capacity has an RCI of 1.25.

The principal purpose of the *Urban Mobility Report* is to assess peak-hour traffic congestion. It focuses on peak periods because most traffic congestion occurs during peak periods.

Further, work trips are particularly important because they are concentrated in peak periods. If work trips, which represent less than one-third of peak-period travel, were evenly spread out through the day, traffic congestion would be considerably less. Congestion during peak periods would be little more than what occurs during the rest of the day.

A Note on TTI's Data

Several caveats must be considered when using the TTI congestion measures. First, the source data are not perfect because they are based on estimates of miles driven made by state transportation agencies. While the agencies do lots of traffic counts, they cannot measure every single mile driven.

A second problem with the data is that agency estimates of urban area populations and sizes are imprecise. When boundaries are redrawn, an urban area may seem suddenly to have built many new miles of roads that in fact already existed outside the old boundary.

Even if the data were perfect, TTI's congestion model is necessarily imperfect. The model assumes that freeways and other highways have a certain flow capacity beyond which traffic must slow down. For example, the model assumes that all freeways have a free-flowing speed of 60 miles per hour and that this speed declines when traffic exceeds a certain fixed capacity. But free-flowing speeds and capacities can vary tremendously within the same class of highway.

A modern interstate freeway with wide lanes and long on- and off-ramps has a much higher capacity per lane mile than many pre-interstate freeways with narrower lanes and shorter on- and off-ramps. An eight-lane freeway has less than twice the capacity of two four-lane freeways because cars need to change lanes more often to get to off-ramps. As fine as the TTI model is, it does not accurately account for all of these variations.

For this reason, congestion comparisons between urban areas must be used with caution. Although the media love to say that a particular urban area is ranked first, second, or third in congestion, this sort of ranking may not be accurate because of the local highways' different histories, designs, and capacities.

More useful is the ranking of changes in congestion, particularly over longer periods of time that can soften the effects of infrequent redefinitions of urban area boundaries. The change in the Travel Time Index is probably the most useful measure provided by the report.

5. Based on an assumption that commuters' time was worth $13.25 an hour in 2001.
6. The Roadway Congestion Index is the original index developed for the annual mobility report, but TTI now relies more on the Travel Time Index.

Transit has the greatest potential to reduce traffic congestion during peak periods, when most congestion occurs. Further, transit ridership is disproportionately work-oriented. Surveys indicate that approximately one-half of all transit trips are to or from work, compared to 23 percent for all modes combined.[7]

In addition to calculating its traditional congestion measures, TTI's 2003 report also includes several new features:

- The report estimates the effect of "existing" public transit systems on congestion.
- It calculates the effects of operational solutions such as ramp metering, traffic signal coordination, and incident management.
- It calculates the effect of high-occupancy vehicle (HOV) lanes on congestion.

The report also estimates the benefits of extending ramp metering, traffic signal coordination, and incident management to all roads in all 75 urban areas. However, it does not estimate any benefits of expanding transit systems or HOV lanes.[8]

Problems with TTI's Public Transit Calculations

By including its new calculation of transit's impact, the TTI study got more than the usual publicity as transit subsidy advocates used the findings to support their case for more government subsidies. But a look behind those numbers shows that transit claims are without foundation and are not supported by the report.

TTI's approach to transit is to ask, "What if transit riders were in the general traffic flow?"[9] In other words, what would happen to congestion if public transit systems disappeared?

While this might be an interesting academic question, it is irrelevant, as no one has proposed to eliminate public transit systems. Even if they did, private systems would emerge to take their place. The answer to this question does not provide any information that contributes to the policy debates, which are centered more on the appropriate response to current congestion problems, including how to structure public transit systems and whether capital-intensive investments in rail and other fixed-guideway transit are worthwhile.

To calculate the effect of public transit on congestion, TTI assumed that the sole alternative to public transit would be automobiles and that all public transit riders would, in the absence of public transit, drive on all trips that now use transit. This assumption is unrealistic, particularly since two-thirds of transit riders use transit precisely because they are unable to drive because of age, income, or disabilities. In fact, most people ride transit because they have no choice, not because they choose it.

Beyond this, the alternative to public transit is not "no transit," but private transit. Before public transit, every urban area in the TTI study had a privately operated transit system, and if the public system were to disappear tomorrow, the private sector would quickly move in to satisfy the demand.

TTI made another unrealistic assumption regarding transit riders: that the value of their time is zero, or that they are indifferent as to how long it takes them to get from one place to another on transit. In calculating the effect of eliminating public transit, TTI added all the people who now ride transit to the highway system and recalculated the Travel Time Index and other congestion measures for each urban area. This increased the travel time for people who currently drive, but it would *decrease* the travel time for people currently riding transit because most transit is much slower than auto travel.[10] People who switch from transit to cars usually do so in part because automobiles are faster.

7. For example, see U.S. Department of Transportation, *Status of the Nation's Highways, Bridges and Transit*, 2002, p. 14-5.
8. Notably, the TTI report does not ask the same "straw man" question about the traffic impact of carpooling: What would be the impact on traffic if there were no carpooling. Carpooling had a work trip market share three times that of transit in 2000.
9. Texas Transportation Institute, *The 2003 Annual Urban Mobility Report*, p. 46.
10. According to the 2000 U.S. Census, transit one-way work trips averaged 43 minutes, compared to 24.8 minutes for other modes, which are overwhelmingly automobile (metropolitan areas over 1,000,000). This does not include access time, such as walking to transit stops or waiting for trains or buses. The University of South Florida has estimated that waiting time alone averages nearly 10 minutes. See Center for Urban Transportation Research, *Public Transit in America*.

Conventional bus service averages around 15 miles per hour. Light rail (trolleys or streetcars) averages around 20 miles per hour. Heavy rail (fully grade-separated subways, elevateds, or metros) averages around 30 miles per hour, while commuter rail (conventional trains operating on tracks shared with freight trains) averages around 35 miles per hour. By comparison, TTI assumed that auto travel in uncongested conditions would average 60 miles per hour on freeways and 35 miles per hour on other roads. Even with congestion, for most transit travelers, switching to automobiles would increase their speeds. This time-savings would offset some of the time lost to other travelers if public transit were eliminated.

Transit "riders understand that [transit] travel might be slower" than auto travel, says TTI. Since they choose to use transit anyway, TTI apparently reasons they must not care about the value of their time. So TTI did not count the time-savings to transit passengers from switching to automobiles; it counted only the time lost to auto drivers if transit passengers were added to the highway flow. Not only is this assumption unrealistic, but it also presumes that the chief reason for getting more people onto transit is to make the commute more convenient for those who remain in their cars. This is demeaning to transit passengers.

By the same token, automobile drivers understand that travel during rush hour will be slower than during other times. Yet TTI does not apply the same logic to automobile users and, unlike its treatment of transit passengers, acknowledges the delay to auto travelers caused by rush-hour congestion.

To make matters worse, TTI counted the delay to former transit passengers who, in the absence of public transit, would drive in congestion and have to spend more time than if they could drive in uncongested traffic. So TTI assumes that time is valuable to transit riders only if they are driving, not if they are riding transit.

For example, a hypothetical transit rider's commute ordinarily takes an hour on light rail but only 30 minutes by automobile in uncongested conditions or 40 minutes in congestion. In counting the cost of eliminating transit, TTI includes the 10 minutes (40 minus 30) spent by the former transit rider in congested traffic but ignores the 20 minutes (60 minus 40) saved by switching to an auto. It appears that close to a fifth of the savings claimed for transit may really be this congestion hypothetically experienced by transit riders. It is simply not reasonable to suggest that a person driving a car for 40 minutes experiences more travel delay that a person who makes the same trip in 60 minutes by transit.

In fact, by shifting people from faster-moving cars to slower-moving transit, overall commute time lengthens because any time-savings that are achieved by lessening congestion are more than offset by lengthening the commute of those who switch from cars to transit. For example, if the transit work trip share in Portland, Oregon, were doubled, the average work trip time for all would rise from 24.4 minutes to 26.7 minutes as some motorists shifted from faster automobiles to slower transit.

Results Skewed by a Few Major Urbanized Areas. Aside from these incredible assumptions, TTI's calculations fundamentally do not make sense. TTI estimates that transit reduces travel delay during peak periods by approximately 30 percent. This is simply not reasonable given that transit represents only 3.8 percent[11] of work trips nationwide and less than 1.9 percent of other trips, and that as many as 70 percent of transit passengers do not have access to a car for their trip.

One reason why TTI's numbers are so skewed is that its data and subsequent calculations are heavily weighted by the disproportionately large impact of the New York urbanized area on any measure of national transit trends. Transit clearly plays a critical role in moving people in and to Manhattan. Without transit, Manhattan could not exist. So it is not surprising that New York accounts for 36 percent of the time-savings that TTI attributes to transit. Transit also plays a role, though less important, in the inner cities of Chicago, San Francisco, Boston, Washington, and Philadelphia. These five regions make up another 29 percent of the calcu-

11. The U.S. Census for 2000 reports that 4.6 percent of work trips are by transit. However, when that estimate is converted to a full-time equivalent by adjusting for those who answer that they use transit some of the time, the actual estimate is 3.8 percent of work trips for 2000.

lated time-savings. The remaining 35 percent is divided among the other 69 urban areas, where transit is relatively unimportant, even by TTI's dubiously generous calculations.

The 2003 report also asked how much transit would have to expand to keep congestion at current levels. It concluded that transit ridership would have to increase by 20 percent per year in urban areas of 3 million people or more, by 60 percent per year in urban areas of 1 million to 3 million people, and by 80 percent to 100 percent per year in smaller urban areas. The report does not ask what kind of investments would be needed to produce these ridership gains or whether the necessary number of commuters would voluntarily give up their cars for a most likely slower and less convenient trip to work.

Indeed, because of transit's decades-long decline in market share, it is difficult to estimate what it would take to reverse this trend and increase transit's share of urban travel. Furthermore, the continuing loss in transit market share is not unique to the United States. Data for the 1980s and early 1990s show that transit's market share has declined in 24 of 30 urban areas in Western Europe, Canada, Asia, and Australia by an average change of 17 percent over 10 years.[12]

Other Data Difficulties. In other sections of the TTI report, the data trends presented are not consistent with data provided by the Department of Transportation or other data presented in the report itself. According to the introduction, for example, "From 1982 to 2001 in the 75 urban areas studied, passenger-miles of travel increased over 91 percent on the freeways and major streets and about 100 percent on the transit systems."[13] This makes it appear that transit ridership is growing faster than auto travel. However, neither of these numbers is supported later in the report, and both are wrong.

According to data in the report, daily miles of vehicle travel on freeways and other major arterials in the 75 urban areas grew by 77.7 percent from 1982 to 2001. This is well short of the 91 percent claimed earlier. But growth in passenger miles of travel was even less. According to the Department of Transportation, vehicle occupancies during that time declined from 1.76 to 1.63.[14] This means that passenger miles of travel grew by only 65.5 percent.

The report exaggerates the increase in transit even more. From 1982 to 2001, total U.S. transit passenger miles grew by just 32.2 percent—one-third of the amount suggested by TTI.[15] Since the 75 urban areas in the TTI study account for 95 percent of the 2001 (and historical) transit passenger miles tracked by the Federal Transit Administration, the figure for these areas can be little different from 32 percent.[16]

Although TTI overestimated both auto and transit growth, the correction reveals a crucial fact: Automobile travel grew twice as fast as transit use. This is important because it helps to dispel the dream that transit can someday replace a significant portion of auto trips.

Transit's Potential to Reduce Traffic Congestion

As noted above, TTI's questionable estimates of the extent to which existing transit system use reduces highway delay during peak hours may be an interesting academic question, but it is irrelevant to public policy since no one seriously proposes canceling all transit service. The less fanciful question

12. See Wendell Cox Consultancy, "Public Transport Market Share Trends: International Urban Areas from 1980," *Urban Transportation Fact Book* (Belleville, Ill.: Wendell Cox Consultancy, 2003), at *www.publicpurpose.com/ut-intlmkt95.htm.*

13. Texas Transportation Institute, *The 2003 Annual Urban Mobility Report*, p. iii.

14. U.S. Department of Transportation, Bureau of Transportation Statistics, *Highlights of the 2001 National Household Travel Survey* (Washington, D.C.: U.S. Department of Transportation, 2003), p. 11, and Patricia Hu and Jennifer Young, *Summary of Travel Trends: 1995 National Personal Transportation Survey* (Oak Ridge, Tenn.: Oak Ridge National Laboratory, 1996), p. 27.

15. American Public Transportation Association, *Transit Facts* (Washington, D.C.: American Public Transportation Association, 1984–2002).

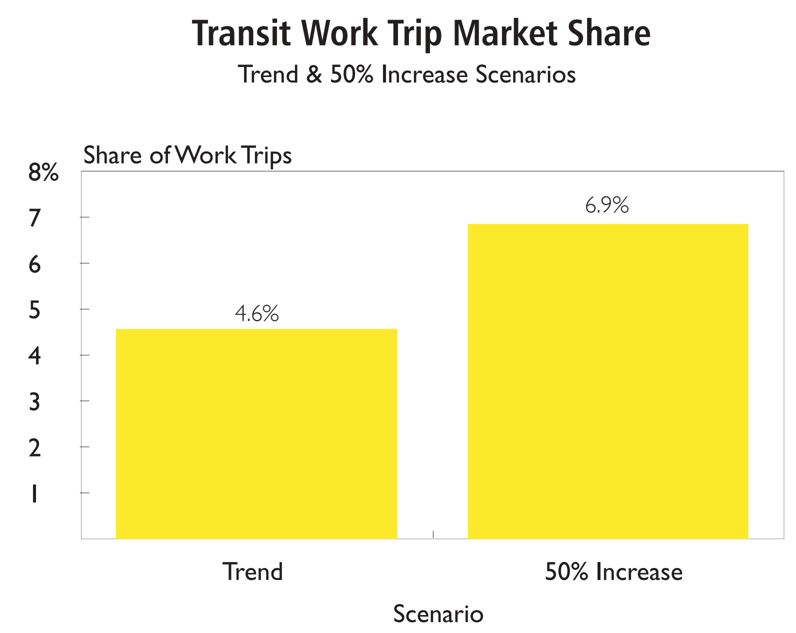
16. Some of the transit data in TTI's report are grossly in error. For example, in 1982, TTI reports that Seattle had 20 million annual vehicle miles. The actual number, according to Federal Transit Administration data, was 427 million—more than 20 times the TTI figure. The transit data in the report are fraught with error, though the Seattle error appears to be the greatest. The APTA might have been expected to have caught these errors.

that should be asked, and the one that this paper attempts to answer, is the extent to which future expansion of transit might reduce travel delay.

More precisely, this paper seeks to estimate the answers to two questions:

1. What would be the traffic impact of a large increase in transit's peak-hour market share?
2. How much would providing the new transit services cost?

Chart 1 B 1721



Source: "Trend" figure from U.S. Census Bureau data for 2000.

The Transit Market Share Increase Scenario—the principal scenario analyzed—assumes that transit increases its share of urban travel during peak period by 50 percent in five years. (See Chart 1.) It also assumes that during these five years, both the Travel Time Index and the peak-period travel delay per capita for each urban area will continue to change at the same rate as in the past five years (1996–2001). A peak-period work trip transit market share was estimated, using transit's work trip market share and the overall share of travel by transit in each urban area.

It is, in fact, highly unlikely that transit could increase its peak-period market share by 50 percent in five years or even over a much longer period. Experience indicates just the opposite. Transit's share of work trips[17] has declined in every decade since the U.S. Census Bureau began collecting the data in 1960. In 2000, transit carried 4.57 percent of work trips, down from 5.12 percent in 1990,[18] so a 50 percent increase would mean that transit's market share would rise to 6.85 percent of work trips.

Overall Results

Using the methodology and estimation process described in detail in the Appendix, it is apparent that a 50 percent increase in transit's market share—if it could even be accomplished—would have little effect on congestion or travel times. Using TTI's Travel Time Index[19] for 2001 as the benchmark—the 75 urban areas registered a 1.249 index that year—projections of transit's peak market share in five years reveal that:

- Without a 50 percent increase in transit's peak-hour market share, the average Travel Time Index would grow to 1.305, an increase of 0.056 over the 2001 Travel Time Index.
- With the 50 percent increase in transit's market share, the average Travel Time Index would be 1.285, an increase of 0.036. The 50 percent

17. It is the concentration of work trips during peak travel periods that strains highways beyond capacity and produces peak-period congestion. Work trips represent transit's best hope for reducing traffic congestion because work trip locations tend to be more concentrated than other types of trips. Finally, approximately 50 percent of transit trips are work trips.

18. U.S. Census, 1990.

19. To show the small projection differences, the Travel Time Index is shown to three digits rather than the customary two. Moreover, some figures will not appear to balance because of rounding.

increase in transit's peak-period market share would thus result in an improvement of 0.019 in the Travel Time Index.

In 2001, the average delay per capita was 17.9 hours per year in the 75 urban areas. In five years, it is projected that:

- With no increase in transit's peak-hour market share, the average annual delay per capita would be 23.8 hours, an increase of 5.9 hours over 2001.
- With a 50 percent increase in transit's market share, the average annual delay per capita would be 23.4 hours, an increase of 5.5 hours. Compared to the estimated trend increase of 5.9 hours, a transit market share increase of 50 percent would save only 0.4 hours (24 minutes) of delay per capita per year compared to the present trend.

The impact of the two scenarios on the daily lives of people can be estimated by reviewing the impacts on average one-way work trip travel times. The average one-way work trip in the 75 urban areas took an estimated 23.5 minutes in 2001.[20] It is projected that in five years:

- With no change in transit's market share, the average work trip travel time would rise to 24.6 minutes, an increase of 1.2 minutes (70 seconds).
- With the 50 percent increase in transit's market share, the average work trip would rise to 24.3 minutes, an increase of 0.8 minutes (48 seconds) from 2001. Overall, the 50 percent increase in transit market share would reduce one-way work trip times by just 0.4 minutes (22 seconds) compared to the present trend.

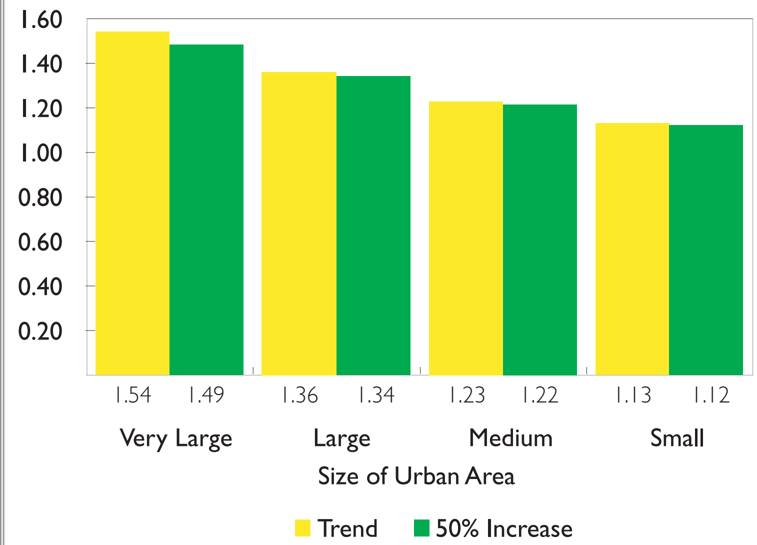
Overall, these are modest impacts; yet to achieve them would require an almost unprecedented and improbable increase in transit's market share at a staggering cost.

Travel Time Index. As insignificant as these estimated travel time improvements would be, they would not be distributed evenly among the metropolitan areas. In fact, most benefits would accrue to residents of large urbanized areas.

Chart 2 B 1721

Travel Time Index

Impact of 50% Increase in Transit Market Share After Five Years



Source: Scenarios extrapolated based on data from Texas Transportation Institute, *The 2003 Annual Urban Mobility Report* (College Station, Tex.: Texas Transportation Institute, 2003), at *mobility.tamu.edu/ums.*

Transit has far more impact in the largest urban areas. It is therefore not surprising that the most significant results occur in what TTI classifies as *very large* urban areas. The 50 percent increase in transit market share would reduce the Travel Time Index (see Chart 2):

- By 0.058 in very large urban areas (population over 3,000,000).
- By 0.017 in large urban areas (population of 1,000,000 to 3,000,000).
- By 0.011 in medium-sized urban areas (population of 500,000 to 1,000,000).
- By 0.009 in small urban areas (population under 500,000).

Of the 75 urban areas, New York was projected to have the greatest impact from the 50 percent increase in transit market share. This is to be

20. This figure is estimated using the 2000 Census work trip travel time (non-transit, which is overwhelmingly automobile) for each urbanized area, adjusting it to account for the Travel Time Index change from 2000 to 2001.

expected, since transit in the New York urbanized area has more than double the market share of any other urban area and four to five times the national average. In New York, the Travel Time Index would be reduced 0.164.

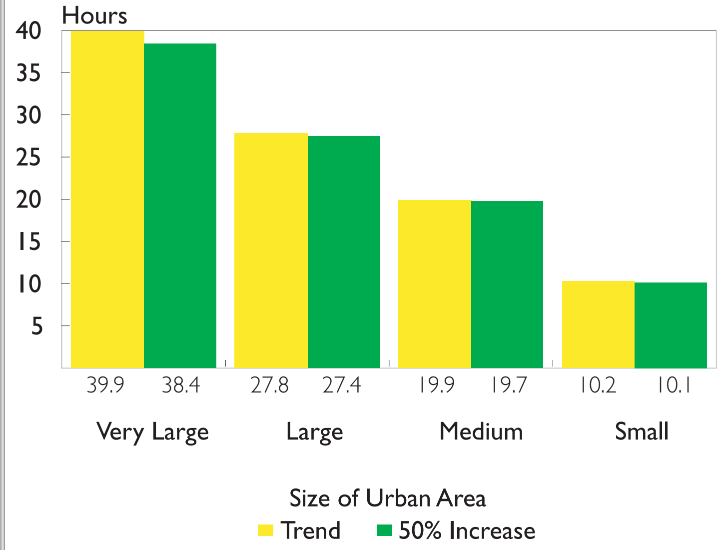
However, in addition to the overall unlikelihood that transit market share could be increased 50 percent, it could be even more difficult in New York. Much of New York's peak-period transit ridership is in or to Manhattan, where transit's work trip market share is approximately 75 percent—a figure that cannot be increased 50 percent.

Delay per Capita. As Chart 3 reveals, the most significant improvements would occur in the largest urban areas. Except for the very large urbanized areas, the delay reduction stemming from a 50 percent increase in transit's market share would be inconsequential.

Chart 3 B 1721

Annual Hours of Delay per Capita

Impact of 50% Increase in Transit Market Share After Five Years



Source: Scenarios extrapolated based on data from Texas Transportation Institute, *The 2003 Annual Urban Mobility Report* (College Station, Tex.: Texas Transportation Institute, 2003), at *mobility.tamu.edu/ums*.

New York was projected to have the greatest reduction (3.8 hours annually) in delay hours per capita from the 50 percent increase in transit market share. However, transit's market share is so high in the core of New York that increasing its market share by 50 percent could be impossible.

Journey to Work. As with the Travel Time Index and annual delay hours per capita, the most significant work trip travel time results occur among the largest urban areas. (See Chart 4.)

What Would it Cost, and Could it be Done?

For decades, transit spending has increased at a much greater rate than inflation and even faster than ridership, as illustrated by trends over the past 10 years. Between 1990 and 2000, annual spending on public transit by all levels of government increased by an inflation-adjusted 28.8 percent in the United States. Over the same period, transit's work trip market share declined by 10.7 percent. In relation to work trip travel—the most critical element of any transit strategy to reduce traffic congestion—transit productivity fell 30 percent over the past decade.[21]

Based upon the historical trend that shows market share declines and expenditure increases, it is difficult to imagine any prospective policy scenario—short of some form of coercion—that would increase transit's market share, much less a 50 percent increase.

The few transit share gains that have been achieved have come at great cost. According to Census data, 11 large metropolitan areas were able to increase their transit work trip market shares from 1990 to 2000.[22] Over that same period, transit expenditures increased by an inflation-adjusted

21. Data from the Federal Transit Administration indicate that overall transit usage increased by 14 percent from 1990 to 2000. This was a slower rate of increase, however, than the rate for urban roadway travel, so transit's overall market share declined from 2.1 percent to 1.9 percent. See Wendell Cox Consultancy, "US Urban Personal Vehicle & Public Transport Market Share from 1945," *Urban Transportation Fact Book* (Belleville, Ill.: Wendell Cox Consultancy, 2003), at *www.publicpurpose.com/ut-usptshare45.htm*.

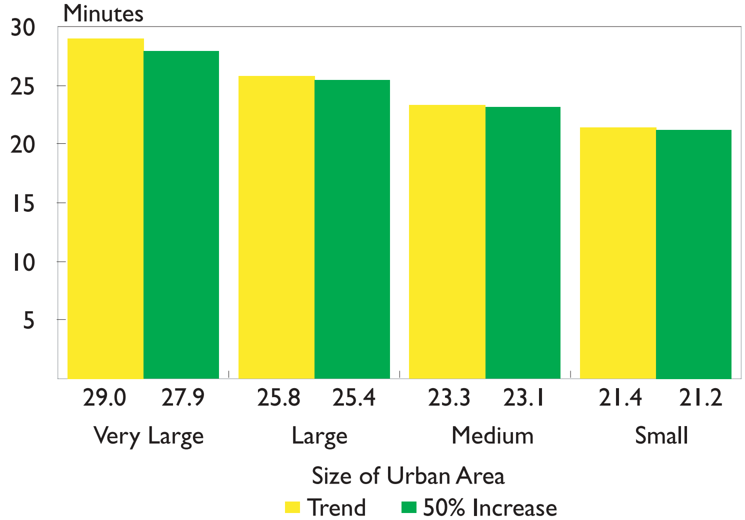
$3.5 billion in those 11 areas. Assuming that non-work travel on transit increased by the same percentage,[23] the cost per new peak-hour traveler was $14,357 annually, or nearly $1,200 per month. This is more than the monthly lease for most cars, including luxury cars such as the Lexus 430 or the Lincoln Town Car.

If the success of these metropolitan areas could be replicated across the nation, the annual additional cost to increase transit's peak-period market share 50 percent would be $85 billion per year, the equivalent of a more than $0.40 increase in the federal gasoline tax.

Chart 4 B 1721

One-Way Work Trip Time

Impact of 50% Increase in Transit Market Share After Five Years



Source: Scenarios extrapolated based on data from Texas Transportation Institute, *The 2003 Annual Urban Mobility Report* (College Station, Tex.: Texas Transportation Institute, 2003), at *mobility.tamu.edu/ums.*

Low-Cost Ways to Relieve Congestion

What Does Work? Fortunately, there are a number of low-cost ways to relieve congestion, some of which were identified by the Texas Transportation Institute in its *2003 Annual Urban Mobility Report*. These include freeway ramp metering, traffic signal coordination, and incident management.

Freeway ramp metering, which puts traffic signals at on-ramps, seems annoying, but it can save motorists' time by smoothing out freeway flows. According to the mobility report, metering currently saves motorists 73 million hours a year. However, many freeways do not yet have ramp metering. TTI estimates that adding it to congested freeways that do not now have it could increase time-savings by nearly 200 million more hours.

Where ramp metering saves time on freeways, traffic signal coordination aims to save people time on arterial roads. Coordinated signals allow motorists to drive at a steady rate of speed without stopping at each signal. TTI calls this "one of the most cost-effective tools to increase mobility" on signaled roads. Yet only about 59 percent of signalized intersections in the areas studied in the mobility report are coordinated. TTI estimates that coordinating the rest could save motorists an added 17.2 million hours a year.

The mobility report estimates that half of all congestion is due to accidents, stalled cars, and similar incidents. Incident management uses video cameras and other means to detect such obstructions, combined with patrols ready to move these obstructions quickly out of traffic. About half of all urban areas had incident management programs in 2001, and the mobility report says these programs saved motorists more than 100 million hours. Implementing it in the remaining urban areas could save motorists another 100 million hours a year.

One technique that did not seem to work as well is high-occupancy vehicle lanes. Initially, planners hoped that such lanes would encourage people to carpool more, but carpooling has declined steadily in tandem with shrinking family sizes. Except in rare instances, such as the San Francisco–Oakland Bay

22. Denver, Los Angeles, Las Vegas, Los Angeles, New York, Orlando, Portland, San Francisco, Sacramento, Seattle, and West Palm Beach.

23. According to data derived from the U.S. Department of Transportation, National Household Travel Survey, 2001, work trips account for 60.7 of peak-period transit travel.

Bridge, carpool lanes have not promoted carpooling or ridesharing.

Nevertheless, carpool lanes can be most effective tools if they end up moving more people, due to higher occupancies, than general-purpose lanes. A lane with two-thirds as many cars as adjacent lanes does more work if those cars have twice as many people as the other lanes. Regrettably, many of the carpool lanes in America's urbanized areas do not carry enough traffic to be worthwhile.

A better way to use HOV lanes is to turn them into **high-occupancy/toll (HOT)** lanes, as recommended by Robert Poole and Ken Orski in a report published in February 2003.[24] High-occupancy vehicles would still use these lanes for free, but low-occupancy vehicles could also use them by paying an electronic toll. This would get more use out of the lanes and give drivers a choice between taking the congested lanes for free or paying a little more and getting home quicker.

HOT lanes will help solve another problem that simply increasing gasoline taxes or using sales or other taxes to pay for transportation improvements would not address. It costs much more to provide roads capable of handling peak demand than it does to provide roads sufficient to meet average demand. Yet gas taxes are the same whether people drive during rush hour or at midnight.

HOT lanes can resolve this problem if they use **value pricing**, meaning that they charge more during congested periods than during other times of the day. This will help encourage people to take advantage of flextime or otherwise drive during less congested times of the day. Since well over half of all traffic on the road during rush hour is not work-related, value pricing can help to relieve congestion by encouraging non–work-related travel to shift to other times of the day.

The revenues from HOT lanes should be dedicated exclusively to expanding a region's HOT-lane network. One way to accomplish this is to create regional toll road authorities. Such authorities could sell bonds, buy land, take over unused state or local rights of way, and build new lanes and roads to relieve congestion.

If these ideas can relieve congestion, why are they not used everywhere? One answer is that the leaders of many urban areas have decided not to solve the congestion problem. Instead, they seek to increase congestion out of a perverse hope that increased congestion will somehow *reduce* congestion by convincing some people to use transit instead of driving.

What Does Not Work. Many urbanized areas have reduced traffic signal coordination; changed one-way streets to two-way (effectively eliminating signal coordination); placed barriers in roads (euphemistically called **traffic calming** but more accurately titled **congestion building**); and spent transportation funds that could be used to reduce congestion on unrelated activities. Supporters of these steps include a **congestion coalition** of planners, urban environmentalists, transit agencies, and transit builders who hope to gain when people agree to build rail transit out of desperation.

Portland, Oregon, is a leader in this movement. Local officials have put speed bumps in collector streets and eliminated lanes from minor arterials. The regional transportation plan for the Portland area calls for turning many arterials into **boulevards**—the planners' term for fewer lanes and wider sidewalks—with the aim of increasing walking and bicycling at the expense of driving. The region's transportation planning models predict that these actions will increase walking and cycling from 5 percent of the region's trips all the way to 6 percent.

Portland is also obsessed with rail transit at the expense of auto driving. A major bottleneck in the region is located on Interstate 5, which runs north and south from Washington, through Oregon and into California. A crucial segment of the highway runs through the city of Portland but has only two lanes each way and is heavily congested. For 50 miles to the north and south of this segment, Interstate 5 is at least a six-lane highway, much of it in rural areas.

Highway planners estimate that adding a new lane to this section would cost around $10 million, but the region has instead spent well over $10 mil-

24. Robert W. Poole, Jr., and C. Kenneth Orski, *HOT Networks: A New Plan for Congestion Relief and Better Transit* (Los Angeles, Calif.: Reason Foundation, 2003).

lion on planning just this section of road. In April 1998, Chairman Henry Hewitt of the Oregon Transportation Commission testified before an interim legislative committee that Portland planners had asked the state not to relieve this bottleneck until a light-rail line is built between Vancouver and Portland. Vancouver has refused to pay the hundreds of millions of dollars required for its share of this light-rail line, and Portland planners are literally holding the cure for this bottleneck hostage until Vancouver funds light rail.

In other words, relieving congestion is less of a technical problem than it is a political problem. Unless the people who are most affected by congestion work together to challenge the congestion coalition, urban congestion will continue to worsen no matter how much money people vote to spend on transportation improvements, because that money will likely be spent on things that will not reduce congestion.

In the long run, it is likely that congestion will be solved, or at least greatly reduced, through the use of intelligent highways on major busy roads. Such highways would include sensors that detect and control cars, with computers that automatically steer, accelerate, and slow cars in tandem. This would allow much higher traffic flows per lane than are currently seen, perhaps quadrupling the capacities of a given highway space.

Many automobiles today have cruise control, and some newer models sense when a car ahead slows down and automatically slow in response. The Toyota 2004 Prius will self-steer. All that will be needed is to connect self-accelerating, self-braking, self-steering cars to an intelligent highway network.

Hybrid-electric cars such as the Prius also virtually eliminate air emissions and greatly reduce energy consumption. Thus, most of the reasons cited for heavy investments in rail transit—saving energy, reducing air pollution, and solving congestion—are being taken care of at a much lower cost without attempting to force people who can drive to use less efficient mass transit.

Conclusion

The evidence cited in this study shows that an increase of at least 200 percent in transit spending would be needed to increase transit's market share of peak-hour commuters by 50 percent. Yet this would save urban commuters no more than an average of 22 seconds each way to work (44 seconds per day). Moreover, in most urban areas, total driving and per capita driving continue to grow so fast that within a few months, at most, all of that savings would be consumed by new traffic.

In recent decades, much federal, state, and regional transportation policy has been based on the assumption that transit can help relieve highway congestion, which has led many urban areas to write plans that spend well over half of their transportation budgets on transit systems that carry well under 5 percent of passenger travel, not to mention virtually no freight.

For example, Atlanta's metropolitan planning organization adopted a 25-year plan committing 56 percent of future funding to transit, which carries approximately 1.5 percent of travel demand. This funding/demand discrepancy is repeated in all other metropolitan regions that propose to build rail transit. One report indicates that the nation's 19 largest urban areas plan to spend half of their transportation funds on transit, while the average transit market share in those areas is less than 3 percent.[25]

There is no indication that this additional money for transit will produce a material shift from cars to transit. Virtually all of the nation's metropolitan planning organizations project that almost all new travel growth will be by automobile rather than transit.

Some transportation planners actually applaud rail transit's inability to reduce congestion. Their goal is to increase congestion. They believe that the residents of their urbanized areas are better served by wasting time in cars that burn fuel and pollute the air in stop-and-go traffic out of a forlorn hope that a few of those drivers will give up in frustration and ride transit. Yet their own transportation planning models show that very few drivers will stop driving because of congestion, principally because

25. "The Myth of Underfunded Mass Transit," *Innovation Briefs*, July/August 2002.

automobile-competitive transit service is provided to few destinations other than downtown.

Urban leaders who seriously want to reduce congestion should demand that transportation planners calculate the dollar cost per hour of delay that is reduced by proposed highway, transit, and other transportation improvements. This consistent test can easily be calculated for almost any transportation capital improvement using urban transport models. There may be other measures by which proposed projects should be judged, but as far as congestion goes, this is the primary if not the only valid measure.

Applying such a measure to highway, transit, and other projects will reveal that many projects are not economically justified, at least on congestion-reduction grounds. Yet many projects can easily save hours of delay at a fairly low cost. These include freeway ramp metering, incident management, and traffic signal coordination. Many low-cost highway expansions and bus improvements will also produce high returns. Rail transit will rarely make the grade.

High-occupancy/toll lanes are a special case. They should require no subsidies, so the only question is whether a particular road can pay for itself. The best way to answer this question is to create an independent toll roads authority that has the power to build roads, charge for them, and fund itself exclusively out of its receipts.

Public transit is important for people who cannot drive, but it is not a solution to congestion. Efforts to build expensive rail transit lines in the hope of reducing congestion are doomed to failure and often detract from transit agencies' ability to carry out their primary mission of providing mobility for people who have no access to cars.

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Appendix: Notes on Methodology

The following method was used to project the impacts of a 50 percent increase in transit peak-period market share in urban areas over a five-year period, with peak periods defined as 6:00 a.m. to 9:00 a.m. and 4:00 p.m. to 7:00 p.m.

"Trend Scenario" Assumptions

- Public transit's peak-period market share would be the same in five years as it was in 2001.
- The Travel Time Index would increase over the next five years at the same rate as between 1996 and 2001 in each urbanized area.
- Annual delay hours per capita would increase over the next five years at the same rate as between 1996 and 2001 in each urbanized area.
- An average journey-to-work time estimate (in minutes) was developed by adjusting the 2000 Census figure for each urbanized area by the change in the Travel Time Index from 2000 to 2001 and by the projected change for five years.

"Transit Market Share Increase Scenario" Assumptions

- Transit market share would increase by 50 percent over trend.
- Transit's peak-period market share was estimated, assuming that transit and auto users would have the same propensity to carpool. According to the National Household Travel Survey, 29 percent of peak-period travel is to or from work.[26] Each urbanized area's journey-to-work market share from the 2000 U.S. Census was used for this portion of transit travel. The other 71 percent of peak-hour travel was assumed to have a transit market share equal to the overall transit market share for each urbanized area (adjusted to 1.25 average automobile occupancy). These weighted figures were combined to establish an estimated peak-period market share for transit. The estimated peak-period transit market share was increased by 50 percent.
- The Travel Time Index and the average annual delay per capita from the "Trend" scenario were reduced by a percentage equal to the transit peak-period market share.
- Average journey-to-work time was estimated by adjusting the "Trend" scenario figure by the difference in the Travel Time Index between the "Trend" scenario and the "Transit Increase" scenario.

26. Derived from U.S. Department of Transportation, National Household Travel Survey, 2001.