Reflections on Transportation and Mobility

A Series of Short Essays

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16. Abstract

The 14 essays in this collection are short pieces authored to share perspectives and encourage reflective thinking about the state of transportation planning and mobility in the United States. These essays are based on personal observation and derive much of their essence from a series of research projects and observations of contemporary issues in transportation planning and policy. Intended to be informative, insightful, and provocative, the author is solely responsible for the accuracy and opinions expressed in these essays. They do not reflect opinions of CUTR, USF, or our clients and sponsors.

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Introduction and Acknowledgments

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They are in reverse chronological order starting with items authored in 1994 and continuing to an item authored in spring 2001. The reader should note the original publication date in the table of contents as that can influence the context.

Special thanks to Daniel Rathbone, editor of the *Urban Transportation Monitor*, the biweekly transportation industry newsletter, which has published each or these essays or an abridged version between 1994 and 2001. Also special thanks to Xuehao Chu, my co-author on some pieces and colleague for many of the research efforts and data assemble tasks that support these opinions. Also thanks to fellow faculty at CUTR who have reviewed and commented on various pieces and offered ideas and comments on style and content.

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The Co$t of Congestion Versus The Co$t of Capacity

Over the past decade the cost of congestion has received increasing attention from transportation planners and the mainstream media. The social and economic impacts of congestion are being explored and the linkages between economic development, quality of life, and travel congestion are being examined in everything from urban area attractiveness rankings to chamber of commerce literature to academic research.

Transportation professionals and the media were eagerly anticipating the Texas Transportation Institute's *2001 Urban Mobility Report*. The *Mobility Report* calculated direct time and fuel costs of congestion for 68 major urban areas as approximately $78 billion annually. Evidence of growing congestion is used as an indication of transportation investment needs at all levels of government. *Easing the Burden*, a companion report by the Surface Transportation Policy Project, builds on the interest in the congestion study by introducing measures of the availability of alternatives to auto travel. A recent report by the American Highway Users Alliance, *Saving Time, Saving Money: The Economics of Unclogging America's Worst Bottlenecks*, also exemplifies the attention given to this issue. That report indicated total economic benefits from eliminating bottlenecks ranging as high as $336 billion.

In addition to the analytical evidence of growing congestion, the real world experiences of America's millions of drivers further confirm growing congestion. While data sources such as Nationwide Personal Transportation Survey and Census Journey-to-Work have historically shown modest improvements in average travel speeds with slight increases in commute travel time due to longer trips, new anecdotal information suggests that, perhaps, an individual's ability to respond to congestion by shifting to higher classification facilities, alternative routes or destinations, or using altered travel departure times, may be exhausted as viable options now that more and more of our roadway network is congested during more hours of each day.

This has left the transportation planning profession with a growing conundrum – a limited ability to find service and investment options that provide a meaningful contribution to solving transportation problems while simultaneously being in step with the public's will to do it. The spirit embodied in the Nike "Just do it" trademark has not been widely embraced by politicians contemplating transportation revenue increases or by the public reacting to specific transportation investment proposals. The interest in transit and smart growth speaks to the zeal for solutions; however, the lack of progress toward meaningful changes in transportation supply or demand speaks volumes about the public's will to actually implement changes.

A logical outgrowth of our interest in the cost of congestion is to explore the relationship between the value of the time lost in congestion and the cost of providing the infrastructure necessary to reduce congestion. While such a relationship is, in fact, very context specific, it is

interesting to explore this issue in aggregate. Are we in equilibrium? If the solution to growing congestion is additional transportation capacity investment, we don't seem to have connected with a will to do it, at least not in many parts of the country. Is the cost of fixing congestion by enhancing capacity greater than the value of our time lost in congestion? The motivation to tax or otherwise assess oneself to expand transportation capacity is influenced by many more factors than tolerance of congestion. Yet, given what is known about capacity costs and the value of time, how bad would congestion have to be for it to be "worth it" to spend more to decrease congestion? Looking at this another way, if the average person spends the equivalent of $630 annually in congestion-induced delay (per the *2001 Urban Mobility Report*) and the money were instead invested in transportation capacity, would it buy enough new capacity to offset our congestion expense?

Exploring this relationship requires information about three things: the value of the time spent in congestion that presumably could be saved if adequate capacity were available, the cost of new capacity, and the relationship between system capacity and congestion. If one assumes various estimates for the magnitude of congestion, one can explore scenarios to test the comparability of the cost of congestion versus the cost of adequate capacity to eliminate the congestion. For example, take the *2001 Mobility Study* estimate of congestion costs of $78 billion annually and factor this up to $100 billion by assuming modest congestion delay outside the 68 study cities. Then, cut this in half to factor out incident congestion versus recurring congestion that can be ameliorated by extra capacity. We end up with about $50 billion annually and growing. Calculating the present value of this stream of annual costs using a 7 percent discount rate for 40 years indicates that the resources available would be approximately $666 billion. Putting this in perspective, this is 13 times the annual total US capital outlay on roadways, which is approximately $52 billion. Thus, if we bonded the equivalent of our congestion cost expenditure stream to build infrastructure today, would it eliminate congestion? Would the annual debt payment fees for enough infrastructure to eliminate congestion be equivalent to congestion costs? (Yes, of course, the temporal shifts in demand will result in there always being some peak-period congestion.)

To understand the impact of this spending, one has to assume a cost for new transportation capacity. Assuming that the critical need is for urban arterial and freeway capacity in congested areas, typical costs per lane mile vary dramatically, but let's assume that we spend $4 million per lane mile. Thus, with all the congestion costs converted to new concrete we could afford 166,000 lane miles of capacity. This is approximately a 10 percent increase in total urban lane miles. Finally, how might our transportation system respond with this new capacity? How likely is a given increment of new capacity to be able to reduce congestion? The *Mobility Report* suggests that we have only been expanding roadway capacity at half the required rate. Cashing in the congestion penalty could roughly double spending annually or provide a one time increment of capacity equal to 13 years worth of investment – this, of course, ignores the expanded operations and maintenance cost obligations. The historical trends in congestion

levels suggest that even an instant 13 years worth of infrastructure would not eliminate congestion.

So maybe we are not quite at the trigger point for change – it appears to be less onerous for the public to spend the time in congestion than the money on capacity. How much worse will congestion have to get before the public is willing to spend more? The data suggest to this analyst that the cost of congestion is not quite high enough to motivate dramatic changes in our willingness to commit more spending to transportation, but we are close. Those who are calling for more spending may be a little premature, or, is that "visionary?" Perhaps they are more cognizant of the time it takes to turn money into transportation capacity and the marginal cost of delayed investment. Things may need to get worse before they can get better. Or maybe I need to check my numbers. The *2001 Urban Mobility Report* is a virtual playground for analysts with calculators, so have at it. Make your own assumptions on congestion cost, capacity cost, and customer response to new capacity. What if that $666 billion were invested in transit – how would congestion be impacted? Let's see, if I were to use the marginal cost of new capacity from Boston's Big Dig or last year's value of time for "dot-commers" from Silicon Valley. . . .

Reflecting on the cost of congestion versus the cost of capacity raises three key issues that perhaps the transportation planning profession knows less about than it should.

1. How well do we understand the public will? Yes, the public wants to reduce congestion but what changes are they willing to make to get there? Spend more? Drive less? Shift locations? Change modes? Nothing? Our understanding of the public will leaves much to be desired. Does the unwillingness to invest reflect a poor understanding of the consequences of inaction, or is it a true reflection of public priorities?

2. How fragile is our transportation system? Doom and gloom "sky is falling" gridlock predictions have not materialized as behavior has shifted to avoid gridlock in most locations, but have we used up most of the reserve capacity of our transportation networks? Is the system level volume/capacity relationship about to reach that point in the curve where small additional increases in demand will result in significant deterioration of our system performance as is the case for individual roads as they approach level of service F? Have we adjusted and adapted as much as we reasonably can? Many urban areas have long-range transportation plans that portray future conditions that would not appear to be tolerable by today's standards. What will change?

It would be nice to know a lot more about how our very dynamic transportation, land use, and travel behavior system will change as population and demand grow.

3. What is the true cost of environmentally responsible and publicly acceptable new capacity for various modes? How much are we really under-funding transportation? If the public were willing

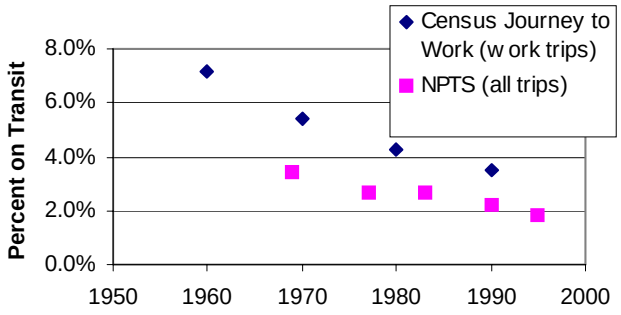
to pay to retain the current level of service, what level of new revenues would be required to keep things from getting worse? And, how well do we understand the cost of delayed investment? As we get further behind in our transportation infrastructure spending we end up with far higher land, maintenance of traffic, adjacent businesses losses, impact mitigation, and utility relocation costs than would have been the case with timely expansion of capacity. Do we understand this cost of procrastination?

Guess we'd better get back to work.

Are We Entering a Bull Market in Transit Mode Share?

Are we entering a bull market in transit mode share? As shown in Figure 1, both Census Journey to Work data and Nationwide Personal Transportation Survey (NPTS) results show the historic decline in transit mode share for the past several decades through the most recently available 1990 Census and 1995 NPTS, respectively. Could the 2000 Census data or the 2001 NPTS/ATS indicate an increasing transit mode share? There is evidence that we may have entered a bull market in Transit Mode Share (TMS).

Figure 1 Transit Mode Share Trends



The American Public Transportation Association's transit ridership data indicate a trend reversal as of 1996, and has shown accelerating year-over-year ridership growth with the most recent quarter (through June 2000) indicating a 4.3 percent increase. Ridership is up in most sectors (large, medium, and small urban areas over 100,000 population) and for all indices (fixed route bus, paratransit, rail, etc.) as noted in Table 1. [1]

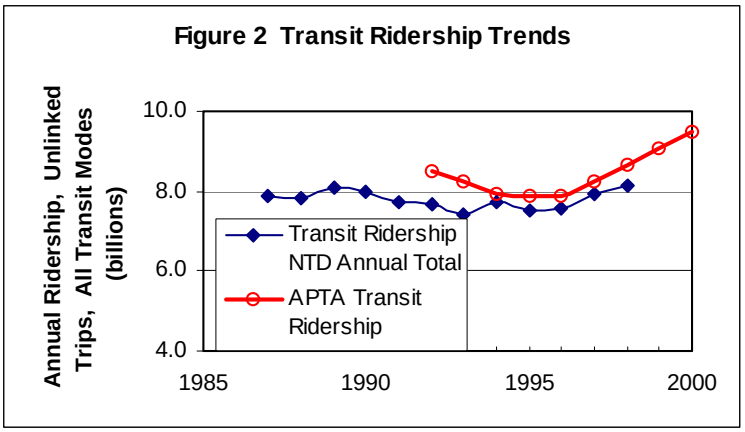
Table 1 APTA Ridership Trends, June 2000

Mode and Urban Area Size	Percent Change, First Six Months of 2000
Heavy Rail	+10.60
Light Rail	+5.75
Commuter Rail	+4.91
Trolleybus	+5.11
Bus, 2,000,000 +	+3.43
Bus, 500,000 -1,999,999	+0.71
Bus, 250,000 - 499,999	+5.03
Bus, 100,000 - 249,999	+3.57
Bus, < 100,000	-1.32

The National Transit Database, comprised of sample data provided to USDOT annually, also shows a recent trend of annual ridership growth. Figure 2 details these trends.

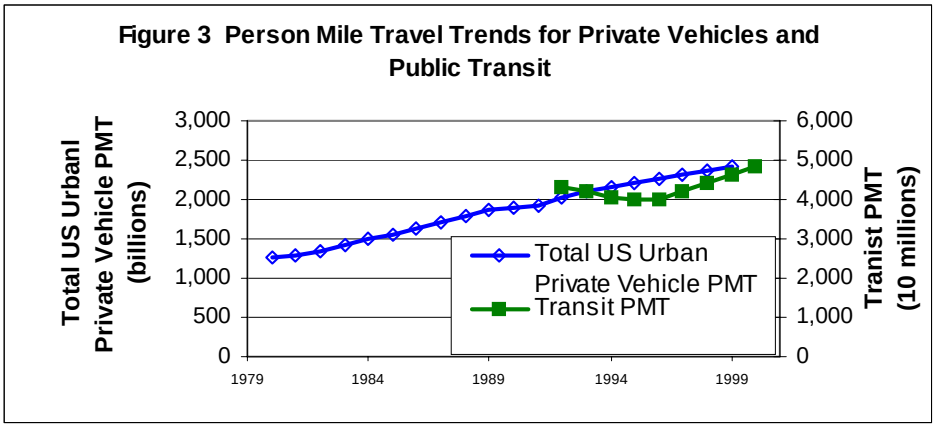
The magnitude of these annual increases in transit boardings in contrast to measures of growth in overall travel demand suggests we may, in fact, be entering a bull market in TMS. While transit trips and roadway vehicle miles of travel (VMT) are not directly comparable for calculating transit mode share, by making some informed assumptions

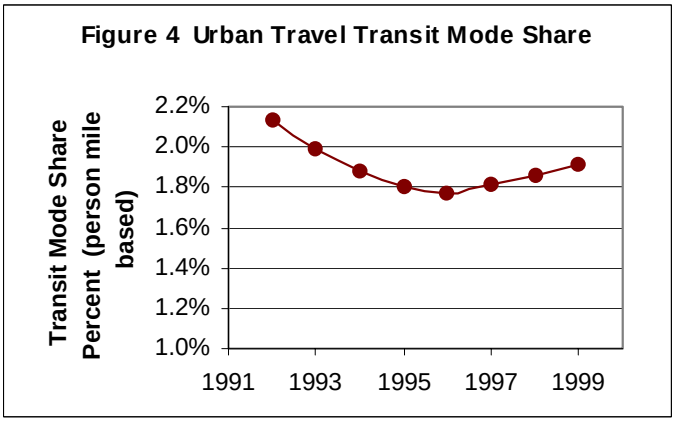
[1] Data from APTA quarterly ridership reports. APTA ridership data for 2000 in Figure 2 is extrapolated and adjusted for the L.A. Strike. Other data are from NPTS and FHWA databases and documents.



regarding average transit trip length (5.1 miles per APTA) and auto occupancies (1.49 for urban areas per 1995 NPTS), one can calculate mode share trends based on person miles of travel (PMT) by mode. Figure 3 details PMT growth trends nationwide for private vehicle travel and for public transit. When transit PMT grows faster than private vehicle PMT, the transit mode share is increasing. Figure 4 shows transit mode share trends. As the graphic indicates, transit mode share has apparently stabilized and, at least for the past few years, begun to increase.

Is this the beginning of a bull market in transit mode share or perhaps a short term rally? Will a slowing economy stifle continued growth in transit ridership? Have the historic





trends in population and activity dispersion, increased auto availability, and age and activity patterns favoring auto use run their course? Will funding levels for both capital and operations enable transit to continue to increase ridership?

The confluence of events that has resulted in the historic decline in transit use and mode share cannot be repeated. The historic downward momentum in transit mode share has clearly been stopped. Some analysts argue that transit is highly undervalued and should play a larger role in every city's portfolio of investments. Others note that America has been investing significantly in spite

of a declining TMS and should wait for clear technical and fundamental strength before increasing support because transit ridership increases have been coaxed with significant increases in public investment.

This analyst believes there is little downside risk and that, pending dramatic economic or policy changes, TMS should continue to move in a neutral to positive direction. Rate TMS a long term accumulate. While fundamentals do not support a breakout to the upside, watch closely for signs of strength. TMS may be in the early stages of a bull market.

Fundamental Differences in How we Pay for Auto and Public Transit Travel

Every so often someone will say, “We need to increase transit use because we can’t afford to build enough roadway capacity.” The comment is often followed by nodding acknowledgment indicating it has face validity with much of the audience, be they citizens or transportation professionals. This statement implies that, while we cannot afford to expand roadway capacity, we can afford to accommodate travelers on transit. To the extent that we envision empty bus and trains seats being filled at very low marginal costs this makes sense, but from a public sector spending perspective, the ability to accommodate growing travel demands on transit with lower public spending levels is, at best, an extremely rare situation. In cases where providing auto capacity involves extraordinarily expensive urban roadway replacement or expansion projects and these costs are allocated to marginal peak period users, the public cost of transit options may, in fact, be lower. For example, the Boston Central Artery project may make heavy rail subway projects look like bargains on a cost per new trip basis. But these contexts are rare.

It is sometimes insightful to reflect on the fundamental differences in how we pay for auto and public transit modes of travel. They are distinctly different and these differences are a major contributor to the political reality of how difficult it is to fund public transit investments. For auto travel, only a modest share of total auto travel costs are paid through the public sector. Individuals pay many of the costs directly – vehicle lease or capital depreciation costs, insurance, fuel, garaging, maintenance, parking, and operating costs are either provided by or paid for by the driver. The principal public expenditure is roadway capital and operating costs. While these are paid through the public sector, funding derives primarily from fuel tax payments. Thus, only a very modest share of the total transportation spending passes through the public sector for auto travel. Various reports cite auto ownership cost varying from $2,500 to over $5,000 annually. EPA and other data suggest annual fuel costs of about $1000 per vehicle may be typical. If one assumes say 40% of the fuel cost is some form of taxes that gets routed through the public coffers to pay for roads, then one could argue that only about 10% of expenses for auto travel are routed through the public sector to build and operate roadway infrastructure. (Arguably, some general fund subsidies to pay for roadways, policing and injury damages from auto accidents are also paid by public revenues. Other externalities of auto travel, while real, aren’t necessarily paid for with dollars).

On the other hand, for public transit, the cost structure is very different. The costs for the guideway or roadway, the vehicles, all maintenance, insurance, storage, and fuel are all borne by the public sector. Thus, these costs are paid by a governmental entity not directly by individuals. A share of revenues comes from fares and the rest is collected by other means and routed through various government entities. For public transit, generally 100 percent of the

capital cost and typically 70 percent of the operating costs are from non-fare, tax-based sources of funding. Even if the total cost per trip is the same for transit and auto modes, far more of the spending for public transit gets routed through the government. More of it is collected as some form of tax or fee and, hence, public transit, regardless of the total cost per trip, is more tax intensive than auto travel. Not surprisingly, this makes transit funding more difficult in an environment where the public is sensitive to taxes or cynical of government spending. The table below, in the second and third columns, notes the differences in who pays which costs for transit versus auto travel. While not new or startling information, it does merit consideration as various interests strategize about public transit playing a larger role in urban travel. We are not just asking people to change modes but we are asking them to accept a significantly different way of paying for transportation.

Funding Transportation				
Expenditure Category	**Who Pays? (Source of Funds)**		**How Paid? (Fixed or Variable per Trip)**	
	Auto Travel	**Public Transit**	**Auto Travel**	**Public Transit**
Roadway/Guideway Capital	Public Taxes or Fees	Public	**Fixed**	**Fixed**
Roadway/Guideway Operations	Public	Public	**Fixed**	**Fixed**
Vehicle	**Individuals**	Public	**Fixed**	**Fixed**
Vehicle Parking/Storage	**Individuals**	Public	**Fixed**/Variable	**Fixed**
Vehicle Maintenance	**Individuals**	Public	**Fixed**/Variable	**Fixed**
Vehicle Insurance	**Individuals**	Public	**Fixed**/Variable	**Fixed**
Fuel/ Energy	**Individuals**	Public	Variable	**Fixed**
Vehicle Operator	**Individuals**	Public/ **Individuals**	None	Variable
Unpaid Social Costs	Public	Public	Unpaid	Unpaid

Equally important in influencing both travel behavior and investment behavior is the nature of how those payments for transportation are made. In the auto mode many of the costs are fixed. The largest shares of insurance, depreciation, licensing, parking (at the home end), and even maintenance, are fixed costs and they are incurred regardless of whether or not we choose auto for a given trip. While in the long run transportation infrastructure spending will vary based on demand, in the short run the costs do not change significantly if we make or forgo a given auto trip. As travel models imply, gasoline costs and destination parking charges are the only costs

typically considered as part of the trip choice decision.

For the transit mode (see columns 4 and 5 in the table) the vast majority of the spending is also fixed regardless of an individual's decision to make a given trip on transit. The fare cost is the only variable cost to the user. Other taxes and fees required to support the service are collected and spent regardless of a decision on an individual trip. Thus, again, the spending for capital and operations are generally fixed. This aspect of the cost structure creates tremendous inertia in the travel behavior of the public. Once an auto is owned, the reward for forgoing an individual auto trip to use transit is modest. The majority of the costs of owning a car and supporting transit are still incurred, thus reducing the benefits of shifting modes.

The reliance on fixed costs for our transportation modes dampens the enthusiasm for major shifts in travel behavior. At the individual level, one's ability to benefit from increased transit spending is limited if they cannot reduce some of their fixed spending on auto costs. Only those households who are in a position to reduce the number of vehicles owned have a reasonable chance of meaningfully offsetting the increased tax payments that may be required to expand transit services. This makes shifts in behavior less popular.

Understanding how auto and transit costs differ in terms of how the costs are paid, and how they are similar in terms of both being driven by high fixed costs and low variable costs, is helpful in understanding the public's behavior. Current travel behavior is quite rational when one considers the cost structures that face individuals as they make decisions on how to travel. We may not like the consequences - but the consumer is a rational choice maker in the context of the financial implications of the choices that they face.

Now, if transportation costs were predominantly variable per trip costs we might see different travel behavior. And, if we think we can avoid additional public investment in transportation by shifting significant numbers of travelers to transit, we are failing to appreciate the reality of how we fund various modes.

DUMB GROWTH VMT
– SMART GROWTH VMT

= THE COST OF SPRAWL

The cost of sprawl is? a) About a 25% increase in per capita VMT
b) A popular media topic and campaign issue
c) Not nearly large enough to explain our congestion levels
d) A strategy for full employment for planners
e) A contributory cause of global warming
f) I'm not sure. Can I use a life line and call a friend?

The baby boomers have settled in the suburbs and exurbs. Satellite photos track the progression of development into agricultural and undeveloped rural lands. Data from rapidly growing areas like Atlanta indicate that land development is far outpacing population growth. Even older no-growth or slow-growth cities have sprawling suburbs. While some folks are concerned that our agricultural land and wildlife habitat is being consumed and it bodes ill for our long-term future, the popular media is increasingly using sprawl as the explanation for the growth in vehicle miles of travel (VMT) and the decline in transit mode share. Sprawl has joined the transportation planners' "if only" club. "If only" we had smart growth this transportation problem would be solved. In fact, sprawl and its counterpart, smart growth, have overshadowed a lack of balanced transportation, poor intermodal planning, inadequate funding, limited transportation land-use coordination, and various other explanations for the shortcomings of our transportation system.

While sprawl is taking a significant share of the blame for our congestion problems, we have a relatively modest information base on the true impacts of sprawl on our transportation system. While there are some data on the comparative travel demands between sprawled and non-sprawled developments, our knowledge is limited and doesn't reflect the rich set of contexts that exist in the U.S. More important, the public who are being bombarded with stories about sprawl have virtually no perspective on the share of the travel demand that might be legitimately attributed to sprawl or how much of the backlog of transportation needs might not exist if we had developed in a less sprawling style.

A lack of sprawl would not wholly solve our transportation problem. We often confuse sprawl with growth. Not only have we had significant population growth in many of the locations that are considered to be "poster children" for sprawl, but we have had dramatic growth in travel demand attributable to a number of factors beyond population growth and sprawl. The relative affordability of auto travel; the change in the composition of households; the high value placed on time, convenience, and travel flexibility; the strong economy and its contribution to growing

travel demand; and other factors have contributed to travel growth beyond the level that might be attributed to sprawl. Sprawl is a factor and is important, but it is hardly the sole contributor to our transportation supply-demand imbalance.

One aspect of sprawl that is often overlooked is the fact that the growth in travel demand per capita has resulted in any excess transportation system capacity in developed areas being consumed by the increased demand from the existing population and, hence, not sitting idle waiting for infill development to use that capacity. If this were not the case then some of the infill advocacy would be more compelling from an infrastructure cost perspective. Absent available transportation system capacity, the cost of sprawl question then becomes one of quantifying the comparative costs of providing additional transportation infrastructure to meet demands in a sprawled versus unsprawled environment.

As an engineer, it is quite easy to build an empirical and theoretical case for lower transportation infrastructure costs as a function of scale. One can build high capacity transportation infrastructure at a lower unit cost than low capacity infrastructure. Thus, less sprawl and higher density would provide economy in transportation infrastructure beyond the fact that total vehicle travel demand might be expected to be lower. Unfortunately, we seldom build high capacity infrastructure as an initial investment. We build transportation infrastructure incrementally. We widen two-lane roads to four or four-lane roads to six or six-lane roads to ten. We do this after adjacent development is in place. We lose the economies of scale of high capacity infrastructure and we end up paying huge amounts for expensive right-of-way. Urban economic theory and empirical data indicate that urban right-of-way is far more expensive than right-of-way on the fringe. We pay a high price for maintenance of traffic and utility relocation as we upgrade our infrastructure. We suffer the mitigation costs and the high planning and delay costs often associated with expanding infrastructure in developed areas.

So the question becomes: “Is the amount of vehicle travel demand enough lower in non-sprawled development to offset the cost differences of incrementally retrofitting transportation infrastructure to meet the growing demand of infill or densification of developed areas?” Thus, is it cheaper to build new suburban/exurban transportation capacity or to retrofit urban systems to higher capacity? This single issue of incrementally expanding capacity versus building high capacity initially is a wholly underappreciated consideration in determining the transportation infrastructure cost of sprawl.

Don’t misunderstand, there are benefits of well-designed urban form, including safety and aesthetics as well as other quality of life and choice issues. Sprawl has other environmental and social impacts that need to be considered. Certainly, the transportation system operating and user costs need to be understood as well. But we also need to fully understand the transportation infrastructure implications of sprawl. We need to be able to differentiate the cost of sprawl from the cost of growth.

If we implement “smart” growth and build “sustainable” cities, if we do everything right in terms of contiguous development, higher densities, mixed land uses and friendly urban design with multimodal choices, might we reduce VMT demand by 15, or 25, or 40 percent per capita for the affected area? Can we plan the ultimate transportation infrastructure capacity initially to avoid the cost penalty of incrementally upgrading infrastructure? And, perhaps most importantly, how well do we understand the costs and other impacts of trying to significantly influence development and are we willing to pay the price for the anticipated benefits?

For this multibillion dollar question, let’s use another lifeline and ask the audience.

Solving the Urban Transportation Problem

Unfortunately, transportation planners seldom frame planning choices in terms of the required changes that the public and travelers will have to make if the plans are implemented. The solutions emanating from planners and policy makers are more likely to be maps and plans of facilities and services that serve as trial balloons to which the public reacts rather than plans that reflect a rich sense of public will and a clear definition of what is expected of the public. Often the planners' prescription of what is best for the public overstates the public's willingness to change. The public's lack of understanding of the consequences of not changing may be part of the reluctance to change, but part may also be the fact that the planners or policy makers may not have a strong sense of what, in fact, the public is willing to do to change current conditions.

Transportation is among the most important concerns of the public. In some respects this is good news in that we don't have serious national crises diverting our attention from local needs. A strong economy, steady progress in reducing crime, few international conflicts which impact the typical U.S. citizen, and the lack of other high profile domestic issues, have enabled transportation to bubble up to the surface of personal concerns, media attention, and government policy debates. Transportation is important. Transportation spending comprises about 19 percent of total household spending and accounts for 11 percent of the nation's economic activity. People spend on average more than 70 minutes of every day traveling. Travel accounts for over half of the petroleum consumed in the U.S. and travel accidents are a major cause of untimely death and injury. Transportation is critical to virtually all of our daily activities including work, school, worship, socializing, shopping, and recreating. Almost everyone uses transportation on a daily basis and most every citizen has personal experiences and a perspective on what the transportation problem is and what should be done to solve it.

Some of the perceived problems and solutions can be readily stereotyped:

> *The solutions are obvious — you change your life style so you live in higher density housing and shop, work, and recreate closer to home. You sell at least one household car and shift back to shared ride, transit, and walk modes of travel, and you spend more for better transit services and bike and pedestrian facilities. Ignore those big box stores and regional malls and shop in the mixed use neighborhood store. We're talking sustainable cities, smart growth, neo-traditional development, livable neighborhoods, stopping sprawl, and protecting our neighborhoods from bulldozers. It's good for you and cheaper in the long run.*
>
> Urban planners overheard at trendy downtown lunch spot

Just start building more roads. Up the gas tax a few cents, quite wasting all that time on complex planning regulations and start meeting the public's demands for more roadway capacity. The market has spoken, the demand is for more roads, let's get on with it. A few Not In My Back Yard (NIMBY) types and tree huggers may be upset but we can't let that stand in the way of progress.

Suburban developer and contractor overheard in luxury skybox at publically subsidized sports stadium.

Toll roads and congestion pricing, it's obvious. We simply use new technologies to apply the time honored laws of supply and demand and reduce congestion by pricing rush hour roadway capacity at a level that will reduce demand. In the meantime we have raised enough money from toll paying travelers to pay for more capacity. Simple economics!

Economist lecturing naive college freshmen

Leverage technology. Let's have smart cars and smart highways. Technology will bail us out yet again by squeezing more capacity out of existing infrastructure. Give us some more money and we will help solve the urban congestion and roadway safety problems (even if we can't seem to get street lights timed decently now). After all, we put a man on the moon we can surely solve this congestion problem.

Intelligent transportation systems engineer daydreaming while stuck in traffic

What transportation problem? Three of every four auto and bus seats are now empty and most of our roads have capacity in the off-peak time periods. We need to modify behavior and implement Transportation Demand Management (TDM). Carpool and transit incentives, flex time, telecommuting, bike use and employer incentives for alternative travel options. These modest cost options could meet our needs without expensive new infrastructure investments.

TDM advocate looking for converts

It's the fault of those working women. First, she insisted on going off to work creating extra travel. Then we needed another car, then a larger house farther out in the new subdivision. With wives away from home all day, we eat out more, shop more now that she has the extra income, and need to purchase more services such as fast food, dry cleaning and day care — all creating extra trips. With mothers feeling guilty about being away from home, we end up chauffeuring the kids between school, soccer, scouts, music lessons and sitters. Wish we had the good old days back and we would have this transportation problem solved.

Redneck hunting buddies reminiscing

We need a win-win solution and a balanced approach. More money for the transit advocates-- transit has several important constituencies. A little more money for the roadway interests--we can't ignore the reality of needing more roads, and an array of projects for smart highways, TDM, and maybe even roadway pricing. We can solve this by working together and making modest changes. We need a "balanced" plan. We may need a new user fee on gas or perhaps a modest sales tax adjustment to make investments that our grandchildren will thank us for.

Politician campaigning at local chamber meeting

You cannot put your car on the road until it is paid for.

Will Rogers prescription for congestion in the 1930's

Something Needs to Change

There is an often paraphrased truism that suggests we can't solve today's problems by continuing to do things the same way we did while those problems developed. So it is for transportation. For the transportation problem to go away something needs to change. We have several choices regarding what might change. First, we could change our expectations regarding transportation. Simply resolve ourselves to the status quo or current trends. Thus, we would solve the problem by deciding it is not a problem that we are willing to solve. Alternatively, we could alter any number of other behaviors ranging from our choices in life styles, to travel behavior changes, to changes in our willingness to spend resources and tolerate impacts of transportation projects.

One option is to live differently and alter travel demand. Literature suggests that a more urban life style results in more walk and transit trips and fewer single occupant auto trips. Thus, one way to reduce roadway travel demand is to encourage much denser mixed-use development patterns. Less draconian tactics might include a variety of policies intended to encourage people to work closer to home or live closer to work and similarly shop, recreate and socialize closer to home. For this to happen we may need to change our willingness to accept far more government intervention in land-use decision making and property development rights. Perhaps through pricing policy and educational persuasion we could manage transportation demand by encouraging folks to travel less.

At the other end of the spectrum we could alter our expectations regarding how much sprawl or neighborhood disruptions we were willing to tolerate to enable expanded transportation capacity. Perhaps we could increase transportation capacity most cheaply in the short run by accepting continued outward growth in development and adding relatively low cost, low

neighborhood impact transportation capacity at the fringes of our urban areas. We may be most effective in addressing air quality and energy concerns by altering the choice of vehicles. Perhaps taxes on gas guzzlers again and incentives for alternatively fueled vehicles, electric cars and small cars. Many of the options, be they transit or roadway focused, will require us to change our willingness to support taxes or fees to pay for transportation capacity and impact mitigation.

Solving transportation problems involves considering a complex set of technical, social and political issues. Solutions will not be easy to find and will require some changes. Which change or changes are we most likely to accept? In what ways is the public willing to change to address the transportation and land use challenges that our urban areas face?

How Many People Use Public Transportation?

Years ago, while sitting in a transit agency staff meeting talking about an upcoming referendum that included a transit funding initiative. Someone remarked that "Just getting the votes of all our daily transit riders should ensure success at the polls." It was noted that nearly a third of our boardings were with transfers, most passengers took round trips and some took several trips a day. As people quickly did math in their heads, it was clear that these adjustments alone took the voter numbers down to a fraction of the daily ridership. It was further noted that we carried a substantial number of students too young to vote, some out of town visitors, and that the demographic profile of our passengers was a poor match for the registered and active voters in our region. Needless to say, the mood turned less optimistic with every passing comment. It was mentioned that we had some different riders each day so that the number of residents exposed to our service was actually higher than the estimate of daily adult passengers -- but no one knew how much higher.

Since that time I have occasionally reviewed new survey results and data bases to see if one could reliably determine a good measure of the share of the general public that has exposure to transit services. While daily ridership is a good measure of service utilization, it is equally important to understand what share of the population uses transit services over any reasonable period of time. These persons are beneficiaries of public transit investments, might be in a position to make informed judgements on service quality, might be a target audience for marketing, and might be in a strong position to support the transit agency at the polls and by word of mouth among the public. These persons might also be able to be communicated with through on-vehicle media such as passenger newsletters and might be folks who would be interested in receiving schedules or system maps.

Recent research by CUTR using the Nationwide Personal Transportation Survey (NPTS) and a report for APTA by McCollom Management Associates sheds some light on the issue of how many people use public transit.

First, lets look at a typical weekday. The 1995 NPTS indicated that the transit mode share is 1.8 percent. That is 1.8% of all local person trips are made on public transit. While modest at the national level, this number increases for larger cities, peak periods, work trips, and can get very high for given corridors or destinations such as downtowns in cities like New York, San Francisco, and Chicago. While on any given day 1.8% of

trips are made on transit, 2.5% of the population uses public transportation for one or more trips. Many transit users don't make all their daily trips on transit, thus, the actual share of persons who use transit at least once on a given day is higher than the 1.8% number. Applying the 2.5% nationally, one get's an estimate of 5.8 million people using transit on any given day in 1995. This estimate is quite close to the *APTA Transit Fact Book* estimate of 6 million during a typical weekday in 1997 (*APTA 1999 Transit Fact Book*, page 66.)

The 1995 NPTS survey also had a question regarding travel during a two month period. Based on these results, we get a richer look at the exposure of transit to the population for a longer period of time. These results indicate that 11.6% percent of the national population uses transit in any given two month period and in our largest cities 21% of the public uses transit at least once in a two month period. Thus, over 28 million people use public transit at least once in a typical two-month period.

Transit User Shares for a Two-Month Period by MSA Size

MSA Size (1,000s)	Market Penetration	
	Number of Transit Users in 2 month period (1995)	Share of Population Using transit at least once in 2 months
Outside MSA	663,115	1.4%
Under 250	1,009,910	5.4%
250-499	1,048,253	6.1%
500-999	1,277,698	6.4%
1,000-2,999	4,136,286	10.0%
3,000+	19,929,540	21.0%
Nation	28,064,802	11.6%

Source: CUTR analysis, 1995 NPTS Data, Person File, Travel Day File, and Segmented File.

Another look at transit use was developed by McCollom Management Consulting in a recent report titled *Transit Performance Monitoring System First Phase Testing*. Based on an analysis of on-board surveys for a number of properties, this approach provides a multiplier to use with daily transit riders to estimate the size of the population that uses

transit at least once in a month.

People Served in a Month	
People served	Multiplier times average daily travelers (in linked round trips)
Small systems	2.30
Medium Systems	3.41
Large Systems	2.96
All Systems	3.04

Source: Transit Performance Monitoring System First Phase Testing, April 1999, McCollom Management Consulting, Draft Final Report, page 38.

Now, I wonder what share of the public uses transit at least once per year? And, next time you do an on-board survey, sneak in a question so we can determine what share of transit users are registered voters.

You're Captive to the Mode on Which You Leave Home

Travelers, at least local trip travelers, are generally captive to the mode on which they leave home. Seemingly obvious, this concept offers some guidance as we plan our transportation services and systems. With few exceptions, people return home by the same mode on which they left. Some do share rides in one direction and use transit on a return trip or perhaps use park-n-ride and make their trip on multiple modes, but, for the most part, once someone leaves home their options for further travel are restricted to the same mode on which they left home. Even travel during the day or at lunch is highly influenced by the mode one used for traveling to work.

So what does this have to do with how we plan transportation? Several things. Most mode choice decisions are made at home. Thus, the quality of services to the home and the knowledge base for decision making provided to the home are critical if we want to influence mode choice for local urban trips.

Over the past few years there have been several initiatives to explore real-time information and other sophisticated customer information systems for travelers at shopping malls, employment centers, and intermodal terminals. For local travel, these systems may have little impact on mode-choice decisions. Someone cannot decide to take a convenient bus home from the mall and leave their car in the parking lot nor can one decide to drive home rather than wait for the bus if they are transit captive because they took the bus to the mall. While public transit users may be able to conveniently time their return trips or perhaps even select from a choice of transit options in large markets where multiple routes exist, there is seldom an opportunity to choose between auto and transit modes at locations other than the home end of trips. Quality customer information is most likely to have value at the home end of urban trips or in locations where visitors and tourists or others who are not captive to their mode of access congregate. And the information needs to be in the home. It is too late to reschedule your walk to the bus stop when you read the departure times posted in the bus shelter — you needed that information at home to plan your departure.

To make transit successful, we must have good transit service to the home end of trips. A number of trends have created a strong interest in transit services to commercial and employment areas. Economic and joint development interests have focused transit service planning on high-density activity areas. With rail system planning, the focus of long range transit planning in many of our larger urban areas, there is a tendency to want to place stations in locations where there is development opportunity and keep stations away from areas where there is a prospect of community resistance, like in neighborhoods. A reluctance to have large park-and-ride lots, new high density development, traffic increases, or other intrusions into neighborhoods can result in a focus on planning systems that serve trip destinations very well,

but do not directly serve the population's homes. The prospects of value capture financing strategies and joint development initiatives also favors transit stations in commercial and employment districts.

Often, the novice transportation "expert" will suggest connecting busy activity centers with a transit link. Simply connecting high-activity locations together with transit or putting transit on or parallel to busy roadway segments is not necessarily as successful as one might think. We need to have quality transit access to residential areas. Connecting downtowns to shopping malls, sports complexes to commercial centers, and airports to downtowns will not be enough if travelers cannot get to or from their homes conveniently on transit service.

Yes, park-n-ride and feeder bus routes can provide access to our major transit facilities. Park-n-ride is a growing and critical access mode for transit facilities, but reliance on this mode of access has significant implications on what we can accomplish with our transit services. We do not eliminate the space required for parking. We only move it to a station, and the spot most probably only gets one use per day and generates two transit trips. We still have the cold-start auto trip, still necessitate the user owning an auto, require collector roadway capacity, perhaps station security, and typically are attractive only to quite lengthy trips. Travelers with an auto available tend to be unwilling to transfer from auto to transit unless that can significantly reduce mileage on their auto or avoid high parking costs characteristic of a downtown. A park-n-rider also is likely to run their errands in their car on their way to and from the transit station rather than shifting additional trips to transit trips.

Feeder bus access is important but hasn't always worked very well. Generally, local circulators for feeding stations are not productive routes, are expensive to operate, require the traveler to experience an additional wait and transfer and thus, are not particularly attractive to choice travelers. Ideally, we need our transit to directly serve from the home ends of trips to destinations to be most attractive.

Direct transit services between residential areas and destinations, services closer to residential concentrations, and more frequent services would provide travelers with more competitive transit choices. Both higher residential densities and larger markets support being able to provide quality transit service because they tend to reduce the access time and enable more frequent services which reduce the wait times. Park-and-ride access and neighborhood circulator routes, while important, have not replaced the advantage of having direct access to transit nor do they offset the advantage of higher density in supporting more frequent service. Direct transit service in close proximity to residences is required for transit to be competitive for choice travelers. Higher residential density provides an irrefutable advantage in making that possible.

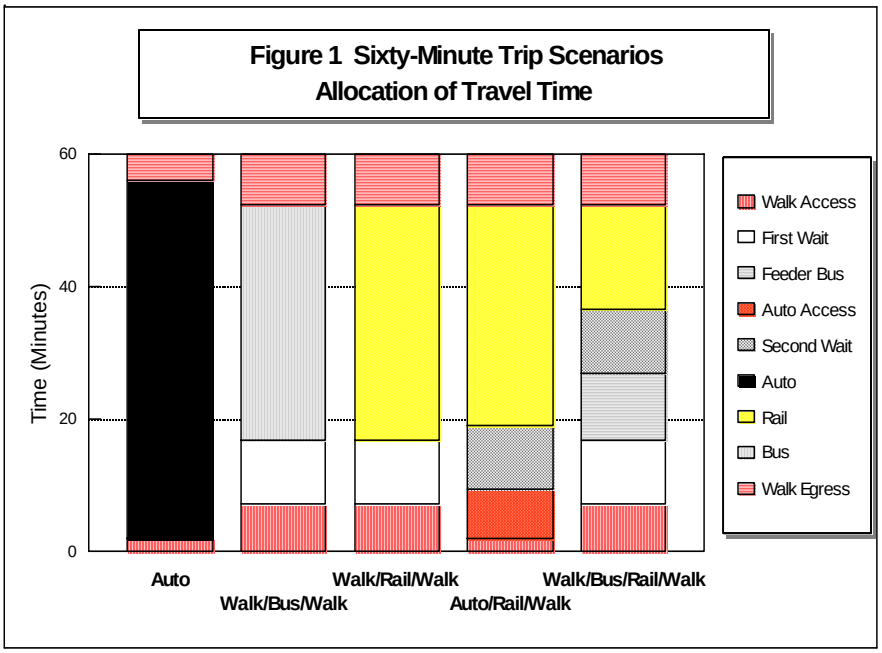
Since we tend to be captive to the mode on which we leave home, transit must conveniently

serve residential areas in order to attain the objectives we have set for it. To attract choice travelers for personal urban travel will require good service to travelers' homes — where they make their mode choice decisions.

Comparative Modal Speeds: Observations from NPTS

The National Personal Transportation Survey (NPTS) provides a useful source of data for understanding travel behavior and trends. Travel behavior, while not always resulting in desirable social consequences, nonetheless, appears to be quite rational from the individual traveler's perspective. It is often useful to review the NPTS empirical data to provide a firm grounding for our perceptions regarding the performance of the modes. The information below resulted from a review of the comparative accessability offered by auto and roadway travel.

Some have argued that as the baby boom ages time becomes more scarce and money relatively more available, resulting in an increase in the value of travel time. Understanding comparative travel times can help explain one important aspect of the competitiveness of our travel choices. Figure 1 indicates how an hour of travel time could be allocated for various typical modes or combinations of modes of travel. The allocation of times is based on the mean times from the 1995 NPTS segmented trip data file. Assumptions for access mode times and estimates for speeds are shown in Table 1. The component modes are indicated in the legend. Not surprisingly, the need to wait for a vehicle, either initially and/or at a transfer point can consume a significant share of the total time. Similarly, access modes, often operating at a slower speed, can consume travel time.

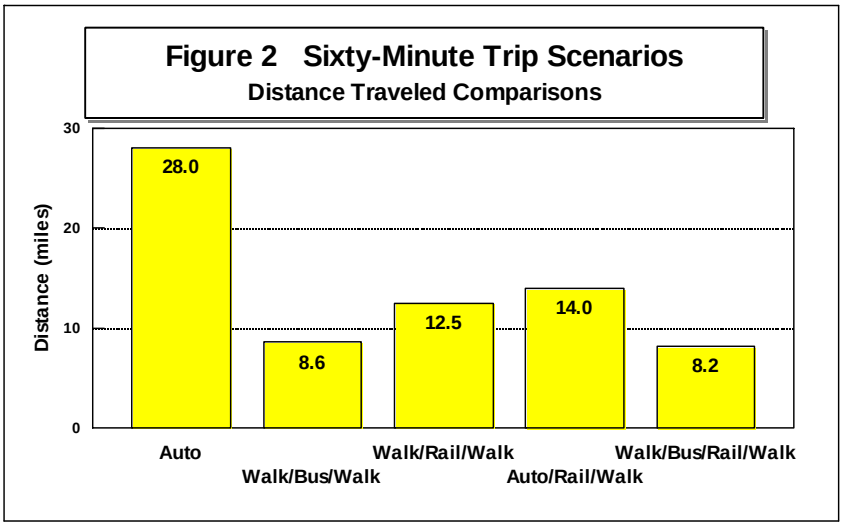


If one explores the implications of these scenarios in terms of the accessibility offered by the mode combinations, one can calculate the distances that a traveler using the noted mode combinations could travel in one hour as indicated in Figure 2. Given the one hour overall trip time, the distances also represent the average door-to-door travel speeds. More than 90 percent of all urban trips are 30 minutes or less, 97.6 percent are less than 60 minutes. The average overall trip length in time from the 1995 NPTS is 14.6 minutes, the trip length for trips involving a transit segment is 33.1 minutes for bus trips and 39.7 minutes for rail trips, and the average auto trip length is 14.5 minutes. The trip lengths in miles are 6.8 overall average, 7.3 for bus, 13.1 for rail, and 7.5 miles for personal auto).

The Figure 2 scenarios indicate significant differences in travel distance for a 60-minute trip depending on the mode combinations. It is very difficult to fit any typical transit trips within the mean 14.6 minute overall average trip time or for that matter within the 22.7 minute mean commute trip time.

Table 1 Mode Speeds and Times from 1995 NPTS			
auto	30.79 mph.	access walk	7.34 minutes
bus	13.24 mph.	egress walk	7.67 minutes
rail	19.87 mph.	wait (for Transit)	9.6 minutes
walk	3.06 mph.	Access to car from home	2 minutes (assumed)
auto access	20.0 mph. (assumed)	Egress from car to destination	4 minutes (assumed)

Note: The segmented trip data file from which the data comes is relatively small. Different data sources on mode speeds, waits and access times might change the relative performance of the mode combinations slightly.



One can graphically characterize the accessibility by the various mode combinations by portraying the distances traveled in an hour in terms of geographic areas that might be accessible. If one considers the possible range of activity opportunities and the transportation network to be distributed uniformly in all directions, then the market of activity opportunities within a 60-minute trip can be visualized as a series of concentric circles around a location as in Figure 3.

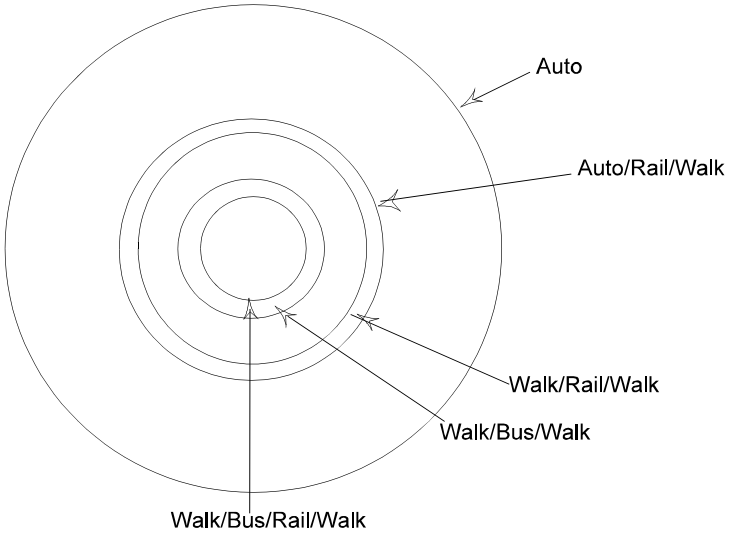
In this hypothetical context, the size of the market of activity opportunities would change as a function of the differences in the areas of the concentric circles, a function of the difference in squares of the radii. Taking the two extremes, the auto commute affords an area of opportunity of 2,463 square miles ($3.14159 * 28^2$) whereas the two transfer transit trip affords an area of access of 211 square miles ($3.14159 * 8.2^2$). In this extreme example the difference in the accessible area is 11.7 times greater for auto travel.

One of the many messages one can draw from this graphic is that for transit to be more time competitive will require efforts to reduce wait and access mode travel times -- meaning more development immediately adjacent to the stations and higher frequency services. This would then shift the relative size of the circles indicating a shift in the relative accessibility offered by transit. Both higher densities and larger size markets support being able to provide quality transit service because they tend to reduce the access time and enable more frequent services which reduce the wait times. These are critical to offering travel time competitive transit

services.

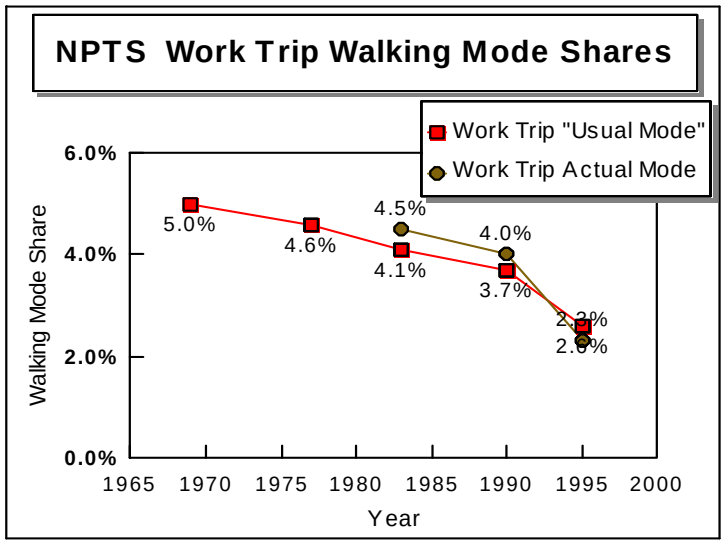
Averages aren't always meaningful, however they do serve to show the magnitude of differences in travel speeds between modes and they help in providing an understanding of the reality that faces many travelers when they make their mode choice decisions.

Figure 3 Access Areas for Sixty Minute Trip by Various Mode Combinations



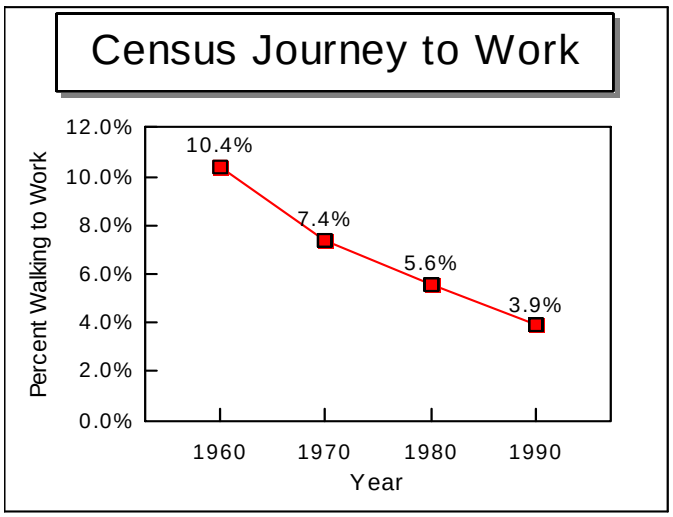
Selling Sidewalks Short

The great equalizer in today's society is that we are all too busy. Evidently too busy to walk. One of the most startling revelations of the newest Nationwide Personal Transportation Survey (NPTS) is the fact that the walk mode is declining precipitously. Yuppies don't walk. Tell the new urbanists to take a hike. Don't waste money on sidewalks. Perhaps all that walking has moved into basements and health clubs. Perhaps not, Nordic Tracs and treadmills are a dime-a-dozen in the classified ads. As the data in the accompanying figures indicate, walking, already on a declining trend, has fallen off the cliff since 1995, or, in this case, driven off a cliff. In a few short years we can fold the sidewalks up and recycle them as aggregate for lane widening.



Source: Historical data from published sources, 1995 data computed from Person File, 1995 NPTS.

So what might explain this accelerating trend. It shouldn't be survey methods. The changes in data collection methods for the 1995 NPTS should have resulted in a much better sampling of trips that are typically more difficult for respondents to recall. Some expected reported walk trips to increase based on the new methodology. Suburban sprawl and a lack of sidewalks? Not likely. Even if every new dwelling unit in the country built since 1990 were built in the suburbs with no sidewalks, that wouldn't begin to explain the changes. How about crime or perceptions of crime? Again, not likely. Crime has actually declined in urban areas in the past few years and it is highly unlikely that perceptions could change enough in five years to have an impact of that magnitude. O.K., so we're all getting fat and lazy. Well some of us are, but that



Source: *Journey to Work Trends in the United States and its Major Metropolitan Areas, 1960-1990*, FHWA, 1993.

doesn't explain it all either. The impact of ISTEA's flexible funding for pedestrian facilities hasn't been felt yet? Hmm, that must be it.

It's got to be time.

If we can all just get attached garages and require employer onsite parking, we can do away with walk lights and crosswalks. Pretty soon there will be no pedestrian accidents. There will be lower pedestrian exposure to street level pollutants. If the average walk trip is about 0.5 miles at 3 miles per hour, and we shifted to auto to save about 8 minutes per trip times 669 million trips per year per percent work trip mode share, we have saved 89 million hours of time with each percent decline in walking mode share for work trips. If sitting in congestion is a waste of time with negative economic impacts, then walking must be too. And think of the savings if we never wear out those expensive walking shoes.

There is a consistent theme to many aspects of travel behavior change over the past several years. We have preserved that 20+ minute commute keeping it pretty much intact by making other changes. We have worked closer to home, made more trips on relatively less congested suburban facilities, shifted more trips to the off-peak periods, shifted more trips to higher speed freeway facilities, shifted away from transit and ridesharing, chained trips, and quit walking. We're too busy and too impatient to walk. It must be easier to talk on the cell phone or worry about the kids, or work, or the household budget while driving than it is while walking.

We have decided to spend more money on sidewalks and pedestrian facilities, but now we're not walking. We have neo-traditional developments and transit/pedestrian friendly design guidelines, but we're not walking. We're concerned about our health and the environment and our communities, but we're not walking. And think of the changes to popular culture. *"These Boots were Made for Walking"* now becomes, These Boots were Made for Tromping the Accelerator.

Now, if we could just find time to walk again.

We Aspire to Build Rail Transit:
Do We Aspire to Live Where Rail Transit Will Work?

Over the past several years the number of urban areas in the "We need to start planning our rail system."list has continued to grow at an accelerating rate. Numerous factors are contributing to this trend. Several cities have recently cut ribbons for new light rail systems including Dallas and St. Louis, and work on extensions is underway in several other cities fueling the neighbor envy phenomenon that is so powerful in motivating rail transit consideration. Good news emanates out of several other newer rail cities including Portland, where one fourth of rail riders are reported to be visiting transit planners, delegations of touring politicians, and chamber contingents from other cities[2]. Denver, Baltimore, and even Cleveland are reporting successful rail initiatives. ISTEA certainly encourages intermodal planning and multimodal transportation systems, and federal discretionary money continues to be earmarked. Perhaps the most powerful factor is a growing perception that rail transit is the only way to compete with the auto. Rail transit, especially light rail, is often considered the only mode capable of offering an alternative to the auto that is affordable; sufficiently attractive to be competitive with auto travel for choice riders, able to motivate the public, business, and local community leaders to commit funding; and, perhaps, able to motivate complementary investments and land use changes.

We have moved from an era where we built rail systems primarily to meet existing travel demand to an era where we expect the presence of the rail system, over many years, to create demand by changing land use. Growing congestion, perhaps some guilt associated with the growing prevalence of 4,000 pound sports utility vehicles and 200 plus horsepower cars, the prospects of the federal government providing a majority of the funding, and most importantly, a desire to reshape urban development patterns, appear to be major motivators in the growing interest in the rail systems. Indeed, evaluation criteria for major investment studies are shifting away from reliance on quantitative measures of system productivity to include more general measures of impacts on urban development and quality of life. Any number of new documents from APTA's *Mobility for the 21st Century* report to new texts such as *Asphalt Nation* and *The Urban Transport Crisis in Europe and North America* to new research reports such as those from the Transit Cooperative Research Program, speak to the role of transit in influencing land use and urban form.

We aren't just implementing rail transit projects, we are making commitments to meaningful shifts in our urban development trends. Or are we? The transit mode share in the US has consistently declined in recent years to where transit trips are now under 2 percent of local person travel. While there are some signs that demographic trends that have driven the rapid growth in travel demand over the past few decades such as the growing labor force participation rate of women and baby boomers hitting the work force, have nearly played themselves out,

[2] Just kidding.

signs of a turnaround in suburbanization or travel behavior changes are scarcely evident anywhere but in the fantasies of planners. While population densities have increased in Portland and other areas are experimenting with development incentives and pedestrian and transit focused development patterns, there are certainly no signs of a significant shift toward regentrification or densification of our core urban areas. Perhaps most relevant, there is no evidence that significant shares of the public aspire to live in the types of environments that both theoretical and empirical evidence suggests are required to make rail systems resource efficient.

In late 1996 the *Atlanta Constitution* quoted a metropolitan analyst as saying, "Atlanta is probably the fastest-growing of any metropolitan area in the history of the world." The article went on to note that the area has grown from 65 to 110 miles north-to-south since 1990[3]. The rail system alone has not been able to stem the tide of the outward exodus of the middle class. The relative appeal of downtown and central city locations have declined and allowed the pace of urban expansion to accelerate.

Indeed, many characteristics of urban areas in which rail transit is likely to be successful are not conditions that Jane or John Q. Public aspire to.

High cost parking increases transit use. Who wants higher cost parking? Not downtown businesses, not downtown employees, not downtown shoppers or visitors, not downtown developers or financiers, perhaps some transit planners. Who wants higher gasoline or auto operating costs? Roadway congestion can provide a competitive advantage for exclusive guideway transit. But who aspires to have congested roadways? A simple regression of roadway congestion indices against the presence of a guideway system indicates the positive relationship between congestion and the presence of guideway-- "the guideway indicator is highly significant, ... and the magnitude of the impact is large."[4] Does transit cause congestion? Of course not, but it does require, and benefit from congestion, and, areas that can support guideway transit tend to be those same areas that have congestion. We do not have much choice ridership on transit unless the roadway level of service is failing horribly.

Delving farther into these relationships one might find that higher costs of living, higher crime rates, lower high school graduation rates, higher poverty levels, lower air quality, and, perhaps, even the presence of panhandlers and pigeons are positively correlated with the presence of productive guideway transit. Transit does not cause any of these conditions and may even help keep some of them from being worse. Yet, guideway transit tends to work best in locations

[3]Atlanta Constitution, December 29, 1996, page D6.

[4]Impacts of Guideway Transit: A Cross Sectional Approach, Center for Urban Transportation Research, October 1996.

where these phenomenon are common. The general population does not seem to be in a hurry to rush back to central city areas or to establish new high density urban environments. Even public housing is moving away from central city high density locations to dispersed lower density sites.

So we have a daunting challenge in front of us. It is not clear that large shares of the metropolitan population want to live in environments in which we know rail transit will work. Can we create urban environments that the public aspires to live in and that, at the same time, are conducive to successful guideway transit? We want guideway transit and we want it to work but do we want the conditions that make it work? Or, can we make it work in different environments?

If an area wants to implement a rail system and supportive environment does not currently exist, a new higher density comprehensive land use plan, higher floor area ratios, higher parking charges, constraints on competing roadway capacity investments, and packages of development incentives and disincentives should be adopted concurrently with the adoption of the preferred rail alternative. But will even that be enough? What else can we, must we do if we want to make guideway viable in more American cities? And does anybody else want to do it?

Prescribing the Future, Not Predicting the Future: Are We Moving Beyond the Need for Travel Demand Modeling?

As teams of travel modelers and other bright researchers work to build a new generation of travel demand models, it is interesting to reflect on the need for travel demand modeling in light of the current trends in transportation investment decision-making. Indeed, one can build a fairly compelling case for the position that travel demand modeling may be losing its relevance.

First, there is the issue of the backlog of transportation capacity needs. If one were to believe all the estimates of investment needs, we are only building capacity to meet yesterday's and perhaps today's needs. Certainly not tomorrow's. We can count the demand. We do not need to forecast it. There are constraints on resources and strong evidence of a continuing growth in demand, as well as evidence that we have consumed much of our reserve transportation capacity, at least in our urban areas. We appear to have all we can do to stretch the existing resources to cover maintenance and renovation costs and, perhaps, some capacity additions in instances where the need is very obvious.

Second, and most important, we are increasingly making transportation investments in response to a far broader set of goals. Where capacity, cost, and safety were once the dominant objectives for transportation investment, we now weigh community, environmental, economic development, land use, and other goals very heavily in the decision-making. Thus, demand can be far less significant. Some investments are rejected in spite of very strong demand and other investments are made even with evidence of limited demand. This is not necessarily bad, just different, and it contributes to a much less reliance on demand modeling as a consideration in decision-making.

Third, policy considerations are increasingly critical in transportation investment. Take for example, the policy initiative in Florida where the Secretary of Transportation has capped the expansion of interstate capacity to ten lanes. Hailed as a wise policy consistent with the environmental and financial constraints that exist today, this policy, nonetheless, limits the importance of travel demand forecasting. An unwillingness to suffer the impacts of facility expansion resulting from environmental, financial or other considerations is curtailing the relevance of demand forecasting.

At the local level, policies are also reducing the relevance of demand forecasting. Equity considerations are often resulting in facility allocation decisions only modestly influenced by demand. Design guidelines and standards, often driven by safety considerations, are shaping facility design. Public input and local policies are influencing the placement of ramps, stations, and other elements of transportation investments. Our litigious society has resulted in standards more so than capacity demands influencing many aspects of design. Equity

considerations, be they jurisdictional, social, ethnic, or other, have resulted in factors other than demand influencing the design, location and capacity of investments.

Fourth, and meriting its own point, transportation land use relationships are increasingly critical to transportation investment decision-making and are not well handled in our travel demand modeling. The nature and strength of the basic relationship between transportation investments and land use development can best be characterized as uncertain. We certainly have not captured these relationships in our analysis tools or evaluation criteria to a degree that anyone finds satisfactory. In many contexts, an observer could quickly draw the conclusion that the dominant motivation for transportation system investment is the premise that this is the fundamental mechanism available to planners to influence land development. Yet, we are not very good at predicting this impact. We are clearly moving toward a situation where many planners want to prescribe a land use and policy environment to support a transportation investment rather than predict future needs. We are prescribing rather than predicting the future. If we continue in this direction then the need for travel demand modeling is further reduced.

Fifth, the models are not sensitive to many issues of relevance to today's decision makers. We have been struggling to adapt the models to accommodate sensitivities to a whole range of policy and operational considerations. Transportation demand management strategies, for example, are not readily accommodated in travel demand models. Similarly, ITS strategies are difficult to accommodate. We even struggle to accommodate sensitivities to air quality and energy considerations. Security, reliability, customer information, and many other aspects of service quality are among the attributes of transit service that models have not been sensitive to.

Sixth, demand models aren't any good anyway. At least that is the opinion that one could draw from a review of the literature. Concerns over uncertainty, bias, the quality of input assumptions, and unsound methodologies have resulted in a substantial degree of skepticism regarding the validity of any travel demand model. These arguments lend credence to those who might question the value of extensive efforts to forecast demand. After all, don't most roadway investments come in rather discrete, even integer numbers of lanes? Can't most transit investments be readily adopted to actual demand by expanding or contracting service. Isn't incremental investment the more prudent way to go anyway? So why spend a lot of time on demand estimation?

Finally, saturation of the workplace with powerful personal computers and increasingly user friendly modeling capabilities is resulting in a switch from a somewhat exclusive cadre of modelers who often (not always) supplemented their work with years of wisdom and experience, to an era where most any young planner can be developing forecasts oblivious to the detailed

scrutiny and rich appreciation of travel behavior that their predecessors exercised in forecasting. Computing power and software improvements have made modeling capabilities widely available at the same time our need for modeling may be waning and we may have lost confidence in the transferability of this skill to the masses.

No, the need for travel demand modeling has not gone away, but the context is changing rapidly. Many of the factors referenced above have been with us for several years, yet the cumulative consequence of these factors is often overlooked by those steeped in traditional transportation planning. Demand forecasting's relevance has and is continuing to change. Its importance is less in our multi objective decision-making environments.

When one hears terms like "addicted to asphalt" and "trolley jolly" used to characterize players in the debates over transportation investment priorities, we know that motivations influencing decisions go well beyond travel demand to a much deeper set of values and expectations. We should hope that travel demand modeling - determining the needs of the traveling public - remains relevant to transportation investment decisions, but we must recognize how rapidly the transportation planning and decision-making environment has changed. And, if travel demand modeling continues to have diminished significance, we have a lot of work to do to make our transportation planning activities more relevant.

What is Balanced Transportation?

As the time for ISTEA reauthorization, approaches one increasingly hears a great deal of posturing taking place regarding various aspects of the legislation. It is particularly intriguing to hear discussions regarding how ISTEA should support a balanced transportation system. Just what does balanced mean? Balanced is one of those powerful, emotionally compelling words that has strong intuitive appeal to the listener. It evokes images of fairness and equity, rationality and reason. Who would want an unbalanced transportation system? We are, after all, supposed to have a balanced diet, a balance between work and play, and a well-balanced disposition. Budgets should be balanced and, most assuredly, we want everything from our car tires to the arrangement of art and photographs on our walls to be balanced. Of course we need a balanced transportation system.

At some level, balanced transportation seems to mean spending a lot more money on public transportation and at least some more money on pedestrian and bicycle facilities. Should we spend the same amount on public transportation as on highways? Perhaps the same amount on transit as highways in urban areas? The same amount in dense urban areas? Or does balanced mean that we simply have the same matching requirements for roadway and transit projects? Maybe it just means that we balance the public subsidy. But, is the gas tax a user fee or a subsidy? If we really want to be balanced, shouldn't we spend an equal share on walk, bike and perhaps other modes?

The shares for person travel modes in the US are approximately 86% personal vehicle, 2.5% transit, 8 % walk, and 3.5% school bus, bike and other modes. Should we balance our spending to meet demands? Recent data suggest the US is spending 84% of federal transportation funds on roadways versus 16% on public transportation. The transit industry would like 20% of any new revenues in the transportation trust fund dedicated to public transit. In some urban areas the share of total federal, state, and local investments on transit approaches or exceeds 50%. Is that balanced? If we balance spending long enough, will we enable or force demand to be balanced, too?

Perhaps we can strive for a balanced transportation system if we measure it in terms of the cost per person trip or person mile. Now armed with myriad PCs and an enlightened understanding of the full social costs and benefits of each mode, we must be balancing our spending relative to total cost for each mode. Right! If you believe that then you believed that the tobacco industry is interested in American's health, the Army Corp of Engineers epitomized objective analysis of waterway investments, and that all transportation major investment studies are objective analyses of a full range of options. Indeed, the transportation industry, partially because of the modal divisions, harbors self interests as strong as most any profession. Have you ever heard a highway builders' organization that came out against a highway project, a transit industry

trade group that argued against a rail project, or an ITS industry representative who preached a go slow plan for ITS implementation?

OK, so what does balanced mean? What should we be striving for in a balanced transportation system? Do we balance our investments with the needs and wants of the population? What if the market forces are not as balanced as the visions of the planners or some community leaders? Do we articulate and educate, or perhaps advocate the wisdom of our positions? Should we lead the public or be public servants and follow the public's lead? Is it wise to base our evaluation of transportation investment choices on the total or social costs of each mode when there is no shared perspective of total costs. Furthermore, is this visionary, or misguided when we are unable to ensure total costs are reflected in travelers' behavior and land use development decisions that might result in transportation demand eventually matching our plan for balanced transportation supply? How do we balance the public's best interests with our own professional and personal interests as we contemplate ISTEA reauthorization?

We need to move from using the term "balanced" as a powerful verbal tool that implies that our predecessors, or perhaps, ourselves before we saw the light, were unbalanced to a far more sophisticated discussion of how best to make transportation investment decisions. In these deliberations, we have to make sure that the diversity of transportation goals, the reality of market forces, the pragmatism of political will, and an honest understanding of transportation costs and benefits are brought into balance as we weigh in on ISTEA reauthorization.

A Step Towards Paying the Full Cost of Travel

Since the passage of ISTEA in late 1991 there has been increasing discussion concerning how travelers can be made to pay the "true" or "full cost" of automobile use and how we can move toward a "level playing field" where public policies do not intentionally or otherwise favor one mode of travel over another. These discussions can cover the range of expectations from modest increases in user fees so that no general fund revenues are used to build highway facilities, to far more radical scenarios. The extreme includes visions where gasoline costs are increased to several dollars a gallon if the currently unpaid "costs" of auto use including air quality, health, and energy impacts were quantified and totally incorporated into user fees. While these are interesting discussions, they appear to be mostly academic as politicians debate for months pennies per gallon fuel taxes that usually involve amounts less than the differences in gas prices on various corners of busy intersections.

But there is one way we can increase the share of true costs of driving paid by users and perhaps make some progress in moving toward a level playing field. The way is to make progress in requiring that auto drivers pay the cost of auto insurance. Currently, data indicate that the share of drivers without insurance varies by state from high single digit percentages to as high as 40%. In Florida, our third largest state, approximately 30 percent of drivers do not have auto insurance.[5] Nationwide the share of bodily injury losses caused by uninsured and underinsured drivers is estimated to be 23% of total losses in this category.[6] Others have suggested that in parts of some urban areas the percentage of uninsured motorists may be as high as 50 percent. What does this mean? It means, at a minimum, that other drivers pay more than their fair share for insurance costs. It also means that the public, businesses, medical care providers and others bear the costs as uninsured drivers damage vehicles, property, and persons in accidents where no one has insurance coverage.

What might happen if we had greater enforcement of insurance coverage requirements? Some drivers would simply get insurance coverage, thereby, increasing their costs but decreasing the costs of others. A lot of other things might happen as well. Some share of those persons would no longer drive. We would get some drivers off the roads - and, most likely, they would be drivers with less than perfect driving records. We would probably get a disproportional share of gas guzzlers and smog generators off the roads. In addition, a large share of the hit-and-run drivers and unreported accidents most probably involve uninsured drivers.

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[5]Information provided by Insurance Information Institute. Source of data cited as National Association of Insurance Commissioners, 1989 and State Insurance Departments.

[6] *Uninsured and Underinsured Motorists Insurance: A perspective*, Insurance Services Office, Inc., 1992, Page 20.

As a significant share of drivers face paying more of the full cost of operating vehicles, some of them would choose alternatives. Transit might pick up some passengers and auto occupancies may increase. A segment of the public that has difficulty affording insurance may very likely be one that could be attracted to transit or other non-single-occupant vehicle alternatives.

Mobility afforded by low cost auto use is clearly an important contributor to the economic well being of our country. That does not mean, however, that we should tolerate blatant abuse of requirements that drivers have insurance. One might argue that this should not be a high priority for law enforcement in an era when we have serious problems with violence and personal property crimes. Perhaps, alternatives such as incorporating the cost of insurance in the pump price of fuel can address some of the administrative/enforcement challenges of making persons pay the cost of insurance. Maybe increasing the out of pocket costs of driving by pay-at-the-pump insurance would be a far more effective and easier way to influence travel behavior than the host of expensive and modestly effective transportation demand management strategies transportation planners are trying to implement.

All auto travelers should pay their fair share or pay the fare.

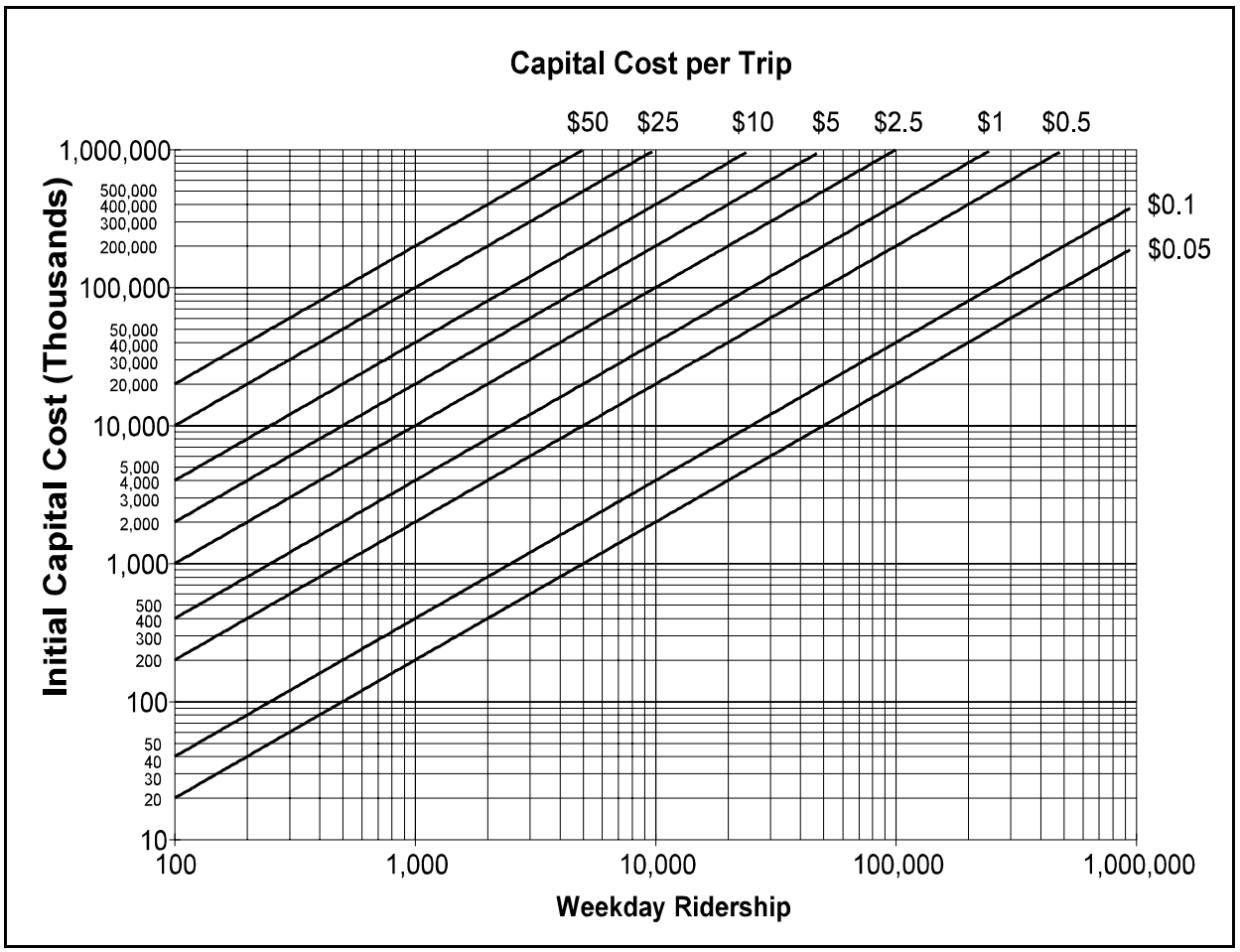
Cost Per Trip is Relevant

We increasingly live in an era when the range of goals for transportation service and investments goes well beyond the traditional transportation goals of adequate accessibility, capacity, safety, and cost effectiveness. A host of quality of life factors including environmental impacts, energy conservation, and economic developmental considerations now impact transportation planning and decision making. Transportation is increasingly seen as a tool to influence urban land use and economic development, create jobs and even influence social and cultural trends by reinforcing traditional development patterns, encouraging social interaction on public transit, and supporting pedestrian friendly environments. Combined with these objectives are a range of goals addressing things like receiving an equitable allocation of resources, enhancing an area's image, and leveraging what might be fleeting political opportunities to "bring home the bacon" or as stated in more politically correct terms, "receive the region's fair share".

In the midst of this plethora of goals it is often easy to loose sight of cost effectiveness or at least relegate cost effectiveness to a far less significant status in project evaluation/selection. Yet, cost per trip is relevant. Cost per trip measures adds perspective and reinforce the reality that resources are limited. The figure below is a spreadsheet generated graphic that can serve as a handy aid for reviewing cost effectiveness per trip. This graphic was generated using a 7 percent discount rate and a 40 year project life for annualizing costs. Daily traffic/ridership was annualized by multiplying by 300. The scales are logarithmic which enables the ranges in the costs (y-axis) and trips (x-axis) to vary enough to cover the vast majority of capital projects and traffic/ridership ranges. The graphic can be used for either marginal analysis; where the marginal trips from a capital investment are evaluated against the marginal cost for the investment, or for total cost and ridership/traffic. One can quite easily develop a spreadsheet to provide similar graphics for different ranges in cost and ridership or for different assumptions concerning discount rate, annualization factor or project life. This figure uses average daily ridership/traffic, however, annual numbers can also be used.

Try it. Find the cost of one of your recent capital project proposals on the vertical axis and the estimated ridership or volume on the horizontal axis and see what the approximate capital cost per trip is by interpolating between the diagonal lines.

Capital cost per trip is relevant in an era of limited resources and vast unmet needs.


Capital Cost per Trip
$50
$25
$10
$5
$2.5
$1
$0.5
$0.1
$0.05
Initial Capital Cost (Thousands)
1,000,000
500,000
400,000
300,000
200,000
100,000
50,000
40,000
30,000
20,000
10,000
5,000
4,000
3,000
2,000
1,000
500
400
300
200
100
50
40
30
20
10
100
1,000
10,000
100,000
1,000,000
Weekday Ridership