Breaking the Gridlock: Real Solutions for Transportation Problems

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Executive Summary

In 1982, 35% of our freeways were congested. In 1997, that number had increased to 65% of our freeways backed up with traffic. Traffic costs us time and money. It costs drivers in our state over two billion dollars a year in wasted fuel and wasted time. The old fashioned way to try and solve this problem has been to simply build more roads. As this report, and our experience here locally indicates, the old ways do not work anymore. In fact, building freeways to address these issues can exacerbate the existing problems.

Here in Washington, development on the east side of Lake Washington increased the numbers of commuters crossing the lake each day in the late 80's. Roads and bridges became heavily congested. In 1989, the Department of Transportation attempted to solve the problem by expanding the capacity of one of the floating bridges on Interstate 90 in order to decrease traffic congestion. Taxpayers spent 1.4 billion dollars on a 6.9 mile project-that's over $200 million per mile. Each car traveling on the newly expanded road was basically paying over $13,000 for that "benefit." The first month the newly added lanes were put to use, cars traveling over the bridge jumped from 65,000 cars to 104,000 cars per day. The Department of Transportation surveyed patterns from surrounding arterial options including SR522 and the 520 bridge and found no significant decrease in traffic there, meaning that the significant increase across I-90 was not a result of commuters changing their travel routes.[1] These "generated" trips defeated the purpose of the expansion: addressing traffic congestion.

"Generated" or "induced" traffic leads to increased road congestion and is a result of many factors:

- Drivers taking additional and longer trips to more distant destinations that now seem more reachable by new road capacity.
- Drivers using the new facility because of the perception that this will save time over previous routes or modes of travel.
- Drivers traveling to new development that was made possible by new roads.

Nationwide, 50-80% of new highway capacity can be filled with generated traffic. Transportation planners need to take this phenomenon into account in order to construct working solutions for traffic congestion. We have already invested in road expansion to address our congestion and have had little or no success. The Seattle-Everett area increased its miles of highways and roadways by 44% between 1982 and 1997 while the population only increased by 36%. And yet we still sit in traffic.

[1] The figures fro the WSDOT indicate that travel on I-90 in 1988 was 64,780 vehicles and in 1989 was 106,410 vehicles. Surveys of 520 showed an increase from 108,500 vehicles in 1988 to 110,300 in 1989, no decrease in traffic volumes at all; in fact, a slight increase.

Key Findings

- **Building roads does not necessarily alleviate traffic.** A study of seventy different urban areas over a span of fifteen years found that cities that invested in expanding road capacity did not alleviate traffic congestion any more significantly than cities that had not.

- **Building roads can actually attract new traffic to those roads, causing more congestion.** For every ten percent increase in a city's highway network, drivers add five percent on to their driving.

- **Newly constructed roads often fill up much faster than anticipated, providing little to no relief.** State highway officials in Maryland projected that a highway expansion project would meet capacity needs for twenty years but capacity was exceeded in less than eight years.

- **Road construction projects can cause more delays than the eventual benefits are worth.** In the case of the Springfield Interchange reconstruction outside of Washington DC, commuters are projected to never make up the time that they will lose during the eight years of construction.

- **Road construction leads to urban and suburban sprawl.** In the five years before the widening of I-270 in Maryland, 1,745 new homes were approved in the 12 miles north of Rockville, the major community on the route. In the following five years, 13,642 were approved- over a 700% increase.

- **Increasing road construction decreases public transportation availability.** In Albuquerque, New Mexico road expansions have led to a low-density urban area that makes it economically inefficient for public transportation to run as often as it needs to in order to be a viable choice. 94% of Albuquerque residents use a private vehicle as their predominant mode of transportation, while only 1.4% use the bus.

Recommendations

We have working solutions for traffic congestion available to us; it is up to policy makers to take decisive action to implement them. Washington is at a crossroads in our development, it is time for our elected officials and transportation and land use planners to make smart investments in options that will get us moving again. These investments reflect three basic strategies:

1) **Increase the efficient use of roadways.** Expanding Commute Trip Reduction programs can help alleviate up to 85% of single occupancy vehicle usage within participating businesses and organizations. We then need to provide HOV facilities to accommodate these expanded programs.

2) **Increase the usage of public transportation systems**. Incentive programs like offering passes at discounted rates have increased public transportation ridership by up to seventy percent in participating organizations.

3) **Implement smart growth for the state.** Traffic problems are reinforced by bad development choices. So, by building developments that accommodate multiple modes of transportation we create a more livable community and fewer congestion problems.

Transportation that works for us is not as complicated as it seems. It is dependent on implementing a cohesive and interdependent strategy. This strategy must actively encourage effective programs that help commuters and drivers choose methods of travel that make efficient use of our roadways. At the same time, we need to make sure that we make smart development choices that enhance both our quality of life and our access to these transportation choices.

Introduction

Traffic congestion is costly to consumers and to the environment. So is the cost of increasing roadway capacity. In Washington, we have not sufficiently allocated funds or planned for an efficient transportation system. The first stumbling block towards a working transportation policy is the emphasis placed on new roads, hence restricting transportation choices to the automobile. We have many examples of how road building is the top priority. The state constitution specifically allocates the revenue from our gas tax to be used only for road construction and maintenance. The parking revenues collected by the city of Seattle are not reallocated to public transportation or incentive programs the way that efficient and effective transportation plans utilize financial resources. Instead those funds go towards the general operating budget and are distributed in a piece meal fashion. The types of expansive programs necessary to develop a working solution for Washington are held hostage by making highway expansion the focal point of transportation planning systems.

Real solutions to transportation problems increase the choices available to people and provide real balance to the transportation system. Additionally, the costs and benefits of planning a particular mode of travel need to be assimilated into the planning process. The benefits that one receives because of an expanded road may be outweighed by the costs that one incurs waiting in traffic while the road is constructed. Smart planning involves assessing the costs of a system (highways that lead to more sprawl, more air pollution, higher costs of delay during long construction projects, taxpayer money that pays for those projects) versus benefits (supposed decreased travel times) to then create an effective decision about the best possibility.

In fact, building roads as the primary method to create a sustainable solution to congestion problems is a very poor choice. Increasing roadway capacity is not an effective solution for our transportation problems and does not lead to a comprehensive transportation plan. Their construction often exacerbates problems for a region. While maintenance should be a part of a total solution, increasing road capacity often results in an array of additional problems. These include urban and suburban sprawl, increased air pollution, decreases in access to public transportation, and ultimately increases in the very problem it was supposed to solve: traffic congestion. It is far better to create a more balanced transportation system that uses resources more efficiently.

Road Building Makes Congestion Worse

The Congestion Problem

The population in Seattle and the surrounding area has increased by 36% since 1982.[2] The area represents 815 square miles, with a population density of 2,405 people per square mile-or close to 2,500 people living within a square mile throughout the area. This growth in population has occurred at the same time traffic congestion has gotten worse-but it is not the only cause.

The Texas Transportation Institute (TTI) Urban Mobility travel rate index (TRI) is an indicator of the additional travel time that is necessary for an individual to make a trip during peak driving hours because of congestion. It places the Seattle-Everett area at the top of the list for its population size group. So for example, an area with a TRI of 1.2 would mean that it would take a driver 20% longer to reach her destination during peak as opposed to non-peak driving times. A trip that usually took 20 minutes would take an additional four minutes. Using this traffic indicator, the Seattle-Everett area ranks worst in the country for its population size group. Seattle's TRI is 1.43, which means trips taken during peak driving times take 40% longer than they would under normal driving conditions. (Appendix A) This trend continues to increase with the Seattle area increasing in time penalties, or additional time spent due to congestion as measured by the TRI, over two hundred percent over the past two decades. (Appendix B)

The Seattle-Everett area also was rated as the worst in its population group for causing congestion delays for drivers.

Population group	Urban area	Hours of delay per driver (annually)
Very large	Los Angeles	82
Large	**Seattle-Everett area**	**69**
Medium	Austin	53
Small	Colorado Springs	16

Source: Texas Transportation Institute

So, in the Seattle area the average driver wastes the equivalent of almost two weeks worth of work each year (assuming a forty hour week) sitting in traffic. Not only is this aggravating for the driver, it is a waste of economic resources for both the commuter and the place of his or her employment. These losses are substantial to this region's commuters when compared to those costs incurred by other commuters across the nation.

[2] Urban Mobility Study Texas Transportation Institute 1999

In fact, according to the Texas Transportation Institute Seattle is ranked as the worst in the country in its population category for costs incurred by each driver. (Appendix C)

The congestion problem is a statewide phenomenon, occurring in urban areas all over the state. In Spokane, the average driver wastes $200 a year, in Tacoma $500, in Seattle $1,165. The Seattle area is ranked third worst in the country for individual congestion costs with drivers wasting about four dollars a day. (Appendix D) Delay as a result of traffic has more than quadrupled in cities in both eastern and western Washington.

Annual Delay per driver (hours)

Urban area	1982	1997	% increase in delay
Spokane	2	11	450%
Vancouver	9	52	478%
Tacoma	5	29	480%
Seattle-Everett	21	69	229%

Source: Texas Transportation Institute

These delays are more than a waste of time; the hours spent idling on the freeway waste fuel as well. In fact, 165 million gallons of fuel were wasted in 1997 in the Seattle area.[3] Combining figures from the three largest urban areas in the state (excluding Vancouver) Washington state wastes close to two hundred million gallons of gas every year and over 120 million hours from congestion problems. (Appendix E) This results in a huge economic blow, over two billion dollars to our state.

Annual Congestion Cost

Urban area	Delay	Fuel	Total
Seattle-Everett	$1,585,000,000	$220,000,000	$1,805,000,000
Tacoma	$200,000,000	$25,000,000	$225,000,000
Spokane	$40,000,000	$10,000,000	$50,000,000

Source: Texas Transportation Institute

In 1982, 35% of our freeways were congested. In 1997, that number had increased to 65% of our freeways backed up with traffic. The Texas Transportation study states that traffic demand is outpacing capacity increases. While the first impulse to respond to this increased demand is to simply increase capacity by more freeway construction, it is not enough to just build roads to address increasing problems with congestion. The TTI report concludes that it is "uncertain that urban areas will be able to add enough roads to satisfy demand for them." Highway construction is an ineffective means of managing congestion. In fact, numerous studies indicate that highway construction often generates more traffic, raising congestion levels.[4] An analysis of the TTI data indicates that of the metro areas studied, a 10% increase in the size of the highway network is associated with a 5.3% increase in the amount of driving. For example, if a city adds 10 miles worth of roads to a 100 mile network the people using it will actually increase the amount they

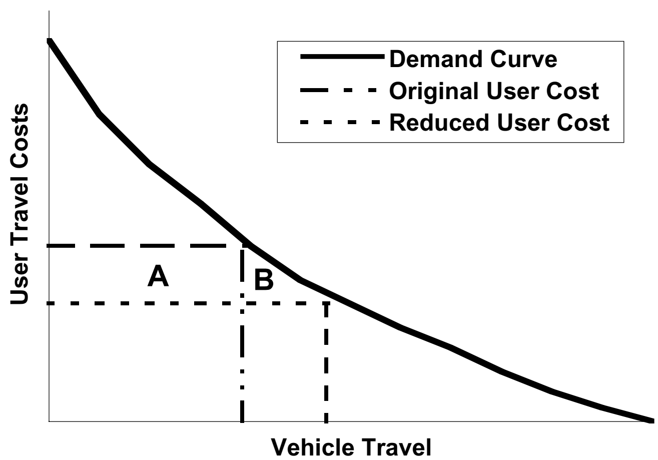
[3] Urban Mobility Study Texas Transportation Institute 1999

[4] An Analysis Between Highway Expansion and Congestion in Metropolitan Area: Lessons from the 15-Year Texas Transportation Institute Study by the Surface Transportation Policy Project

drive by about five percent. This suggests that building more highways encourages more driving so that really congestion is encouraged to grow along with the growing pavement.

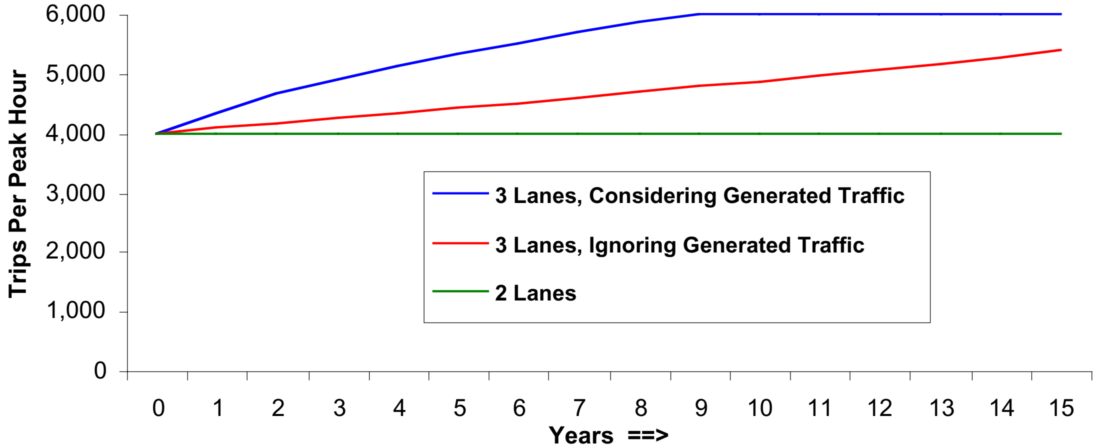
Generated Traffic

The concept of generated traffic is straightforward. Just like in microeconomic theory where an increase in supply causes an increase in demand, when the "cost" of travel decreases because of added capacity, people travel more. The supply of roads increases, the demand for those roads increases. Roadway capacity increases that alleviate congestion reduce the generalized cost of driving so that the perception that travel will be easier makes the trip seem "less expensive," thus new roads encourage more trips and more mileage. In fact, most urban road systems have latent travel demand: additional peak-period vehicle trips that will occur if congestion is relieved. A graphic interpretation below illustrates that the "demand curve" shifts to increase travel when capacity increases:



Reduced user costs (downward shift on Y axis) increases vehicle travel (rightward shift on X axis). Rectangle A shows savings to existing trips. Triangle B shows generated travel benefits. (Source: Victoria Transport Policy Institute)

So, in addition to the TTI's assessment that urban areas will be unable to increase capacity enough to fulfill driving increases, this capacity actually exacerbates existing congestion problems. In the Seattle area, 66,780 additional trips are taken every year- Tacoma and Spokane are following this trend as well with 19,665 trips and 8,890 trips added respectively. Building more capacity instead of investing in a balanced transportation infrastructure will lead to more delays and congestion. The Seattle-Everett area increased their highway capacity by 44% from 1982 to 1997 while their population only increased by 36%. If highway expansion was the answer to congestion problems, the area should have seen some relief by now. Instead, traffic in the region is worse than ever and the projections made about the effectiveness of this expansion have proven to be inaccurate. The U.S. Dept. of Transportation concluded that models that fail to incorporate feedback (the idea that congestion causes people to change their behavior) tend to underestimate future congestion delays, and overestimate the benefits of roadway capacity expansion.[5]



If generated traffic is ignored the model predicts that traffic volumes will grow at a steady 2% per year if the project is implemented. If generated traffic is considered the model predicts a higher initial growth rate, which eventually declines when the road once again reaches capacity and becomes congested. (Source: Victoria Transport Policy Institute)

Where the capacity of roadways is increased, the behavior of commuters is altered. The "extra time" given to a particular trip that led to people leaving at staggered times now is no longer the case with commuters all perceiving that the increased capacity will allow them to leave later for their destinations. Therefore, the inability of increased capacity to reduce congestion is most visible during peak travel times and is due to travelers shifting to preferred departure times.[6] Since most congestion occurs during the morning and evening commute, this phenomenon amplifies the inability of road expansion to address congestion problems.

Each new mile of highway added can actually increase the number of people who use those routes.[7] In one study, researchers found that every 1% increase in urban highway lane miles generated a 0.6% - 0.9% increase in traffic within five years, negating the congestion-easing effect of new lanes.[8] In fact, lane miles are found to generally have a statistically significant relationship with VMT (Vehicle Miles of Travel) of about a 0.3 to 0.6 percent increase in the short run and between 0.7 and 1.0 percent increase in the long run so that miles traveled increases up to 0.6% in the first few years after additional lanes are added and up to a full percentage point in the long run.[9] A highway carrying 100,000 cars will add 1,000 cars to its traffic just by expanding.

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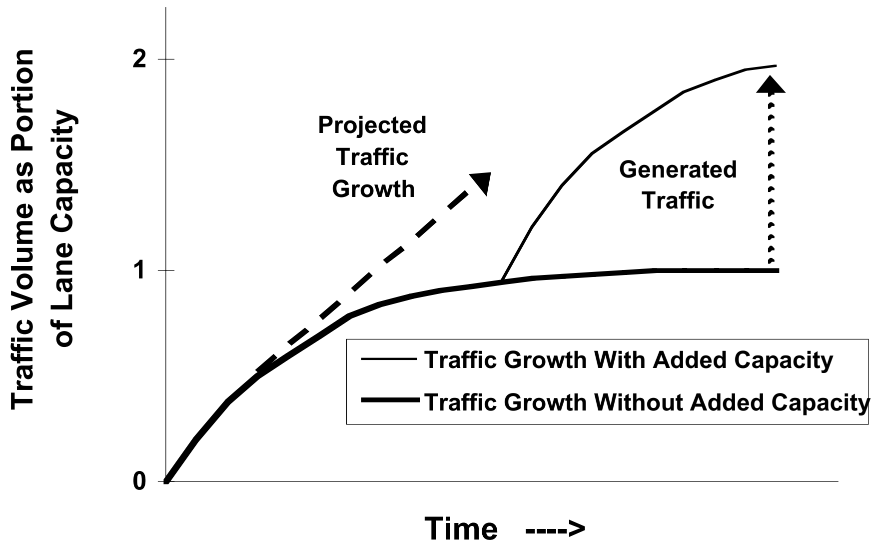
[5] "Incorporating Feedback in Travel Forecasting: Methods, Pitfalls and Common Concerns" by Comsis Corporation, USDOT (Washington DC; available on BTS-CD-11), March 1996
[6] Ibid. p.5
[7] The elasticity of vehicle travel with respect to highway lane miles is 0.6-0.7 at the county level and 0.9 at the metropolitan level within 5 years of new construction.(Hansen and Huang 1997)
[8] Road Supply and Traffic in California Urban Areas" by Mark Hansen and Yuanlin Huang, Transportation Research, Part A (Vol. 31A, No. 3, pp. 205-218), May 1997
[9] Relationships Between Highway Capacity and Induced Vehicle Travel from abstract



Traffic grows when roads are uncongested, but the growth rate declines as congestion develops, reaching a self-limiting equilibrium (indicated by the curve becoming horizontal). If capacity is added, traffic growth continues until it reaches a new equilibrium. The additional vehicle travel that results from increased roadway capacity is called "generated traffic" or "induced travel." (Source: Victoria Transport Policy Institute)

There are other forms of generated traffic that all contribute to the increase in congestion that occurs soon after an expansion project is completed. The following table outlines each type:

Type of Generated Traffic	Category	Time Frame	Travel Impacts	Cost Impacts
Shorter Route Improved road allows drivers to use more direct route.	Diverted trip	Short term	Reduction	Reduction
Longer Route Improved road attracts traffic from more direct routes.	Diverted trip	Short term	Small increase	Slight increase
Time Change Reduced peak period congestion reduces the need to defer trips to off-peak periods.	Diverted trip.	Short term	None	Slight increase
Mode Shift; Existing Travel Choices Improved traffic flow makes driving relatively more attractive than other modes.	Induced vehicle trip	Short term	Increased driving	Moderate to large increase
Mode Shift; Changes in Travel Choice Less demand leads to reduced rail and bus service, less suitable conditions for walking and cycling, and more automobile ownership.	Induced vehicle trip	Long term	Increased driving, reduced alternatives	Large increase, reduced equity
Destination Change; Existing Land Use Reduced travel costs allow drivers to choose farther destinations. No change in land use patterns.	Longer trip	Short term	Increase	Moderate to large increase
Destination Change; Land Use Changes Improved access allows land use changes, especially urban fringe development.	Longer trip	Long term	Increased driving and auto dependency	Moderate to large increase, equity costs
New Trip; No Land Use Changes Improved travel time allows driving to substitute for non-travel activities.	Induced trip	Short term	Increase	Large increase
Automobile Dependency Synergetic effects of increased automobile oriented land use and transportation system.	Induced trip	Long term	Increased driving, fewer alternatives	Large increase, reduced equity

(Source: Victoria Transport Policy Institute)

Each of these types of generated traffic can create increased congestion. It is therefore not surprising to find that metro areas that invested heavily in road capacity expansion fared no better in easing congestion than metro areas that did not.[10] (Appendix J) Much of the new capacity was filled by new traffic within a decade of its expansion. In fact, a recent analysis of urban areas has concluded that congestion in some areas would have increased less rapidly if no new highways or additional lanes were built at all. Up to 50% of traffic in Indianapolis, Indiana and up to 77% of traffic in Louisville, Kentucky can be filled with traffic that has resulted because of road expansion.[11] Even though these trends continue to be documented many transportation agencies still focus on roadway expansion as a viable means of addressing congestion problems. One such road, a segment of I-287 in northern New Jersey, filled up with traffic (especially trucks) just two years after construction, prompting Princeton University Professor David Bernstein to complain that "It's as if we hadn't learned anything in the last 50 years."[12]

[10] An Analysis Between Highway Expansion and Congestion in Metropolitan Area: Lessons from the 15-Year Texas Transportation Institute Study by the Surface Transportation Policy Project
[11] Analysis of Metropolitan Highway Capacity and the Growth in Vehicle Miles of Travel. Robert Noland and W.A. Cowart. Presented at 79th Annual Transportation Research Board in Washington, D.C.
[12] Ibid.

Construction Delays

In addition to the congestion that is created after a road project is completed, significant delays occur during construction as well. Motorists can lose more time in road construction delays than they will save in years of driving on the newly "improved" road.[13] In the case of the Springfield Interchange reconstruction outside of Washington DC, commuters are projected to never make up the time that they will lose during the eight years of construction.[14] Drivers that are sitting in traffic through the construction of I-15 in Salt Lake City are not expected to break even on their time investment until 2010, eight years after the project is completed.[15] And in fact, these projections do not take into account the phenomenon of generated traffic, so the actual time lapse between the completion of these projects and the benefits accrued to drivers may be much, much longer.

The Sprawl Problem

When roads are created as the priority in a transportation plan, the increased construction of freeways and by ways leads to other new construction as well. The smart planning of this growth is what protects us from the increase in problems that come with mismanagement of resources, both financial and natural. Unbalanced transportation infrastructures focused on the perpetuation of automobile use to the detriment of transportation choice fail to provide a sustainable solution to congestion problems. They only increase the amount of land paved for roads and parking which has economic, social and environmental costs.[16] Automobile oriented cities devote up to three times as much land to roads and parking as traditional, pedestrian-oriented cities.[17] The following figure illustrates this tendency by showing per passenger road space requirements for various modes of travel:

Road Space By Mode[18]

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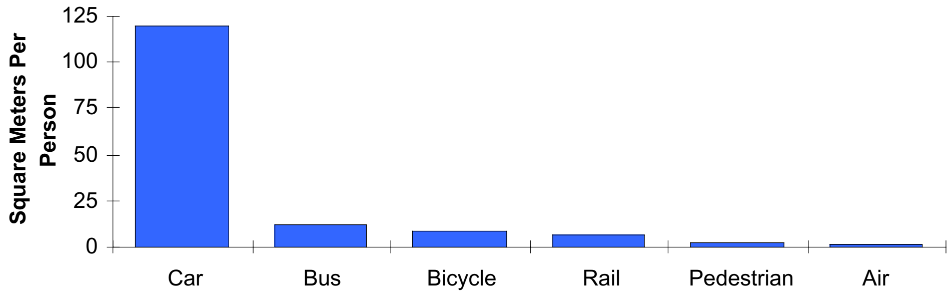
[13] Road Work Ahead: Is Construction Worth the Wait? by the Surface Transportation Policy Project

[14] Ibid.
[15] Ibid.
[16] Chester Arnold and James Gibbons, Impervious Surface Coverage: The Emergence of a Key Environmental Indicator, *Am. Planning Association Journal*, Vol. 62, No. 2, Spring 1996, pp. 243-258.
[17] Harry Dimitriou, *Urban Transport Planning*, Routledge, (NY), 1993, p. 136.
[18] D. Teufel, Die Zuykunft des Autoverkehrs (The Future of Motorized Transport), Umwelt- und Prognose Institut, Heidelberg, 1989, in *Transportation, The Environment and Sustainable Development*, p. 184.



Automobiles require more road space per passenger than other travel modes. (Source: Victoria Transport Policy Institute)

Landscape planners argue that an automobile oriented urban area is inherently ugly because retail businesses must “shout” at passing motorists with garish signs, because so much of the land must be used for automobile parking, and because the settlement pattern has no clear form.[19] Attractive and healthy landscapes are inherently valuable in both an aesthetic and an economic sense as indicated by their importance in attracting tourism and increasing adjacent property values.[20] Here in the Northwest, we have a unique quality of “attractive and healthy” landscape, with tourists coming to visit our pristine forests from all over the world. If we continue to pave over this magnificent state, we are losing more than our natural heritage. We currently have 80,000 miles of paved roadways throughout the state.[21] This does not factor the parking lots and development surrounding these roadways. And it appears that the development continues to overstep planned boundaries. Currently 38% of the new development permits in Pierce County are outside the Urban Growth Area, and 58% are issued outside the Urban Growth Boundary in Kitsap County.[22]

This sprawl is in turn a cause for more traffic. The whole process of road expansion to address congestion leads to more sprawl which leads to more congestion. In fact, over fifty percent of the increase in driving from 1983 to 1990 was due to factors influenced by sprawl, such as longer car trips and a switch to driving from walking or transit. Population growth itself was only responsible for 13 percent of the growth in driving. The road capacity increase to accommodate just this one factor in increased driving would require adding at least 70 miles of roads and freeways-that represents at least a billion dollars of taxpayers money.[23] Here in Washington, the Puget Sound region experienced a 36% increase in population but driving increased by seventy percent. Expanding the capacity of roads to address this increase in driving not only would cost much more, but the investment would encourage even more increases in driving.

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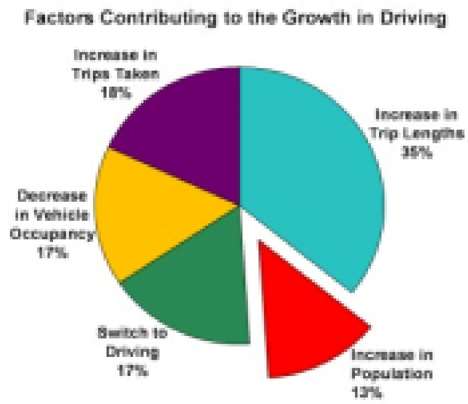
[19] William Shore, Recentralization; The Single Answer to More Than a Dozen United States Problems and A Major Answer to Poverty, *American Planning Assoc. Journal*, Vol. 61, No. 4, Summer 1995, 496-503.
[20] Charles Fausold and Robert Lileiholm, *The Economic Value of Open Space: A Review and Synthesis*, Lincoln Institute of Land Policy (Cambridge; www.lincolninst.edu), 1996.
[21] Puget Sound Regional Council
[22] Smart growth for Washington Report by 1000 Friends of Washington, www.1000friends.org

[23] Surface Transportation Policy Project



Source: *Travel Behavior Issues in the 90's.* U.S. Department of Transportation, Federal Transit Administration. Washington, DC, July 1992: p. 14.

Reduced Transportation Choices

The allocation of resources towards road construction can impact alternative transportation as well. Reductions in public transportation can occur because of increases in road supply.[24] This has a negative impact on traffic patterns. In the Puget Sound region, forty percent of all commuters use public transportation during peak hours.[25] These riders dependent on busses and ferries would have to make alternate choices-in many cases switching to automobiles-should funds be diverted towards road construction. Reductions in transit service due to increase in road supply, known as the Downs-Thomson paradox, results when an increase in road supply makes traveling by auto preferable to transit alternatives.[26] For example, in Albuquerque, New Mexico road expansions have led to a low-density urban area that makes it economically inefficient for public transportation to run as often as it needs to in order to be a viable choice. 94% of Albuquerque residents use a private vehicle as their predominant mode of transportation, while only 1.4% use the bus. Although higher density, public transportation oriented areas tend to have more intense congestion with more tightly packed traffic in usually narrower streets, automobile dependent areas actually have greater total congestion with more delays and more frequent back-ups. Automobile dependent cities such as Los Angeles and Houston have much higher per capita delays than cities with more balanced transportation, such as New York and Chicago.[27]

[24] From "Modeling Transit Convenience: Impacts on Transit Ridership of Headway Increases", by Noland, paper no. 991527 of 78th Annual Meeting of the Transportation Research Board
[25] Puget Sound Regional Council
[26] "The Economics of Traffic Congestion" by Arnott and Small, American Scientist 1994, 82: pp. 446-455.
[27] Peter Gordon and Harry W. Richardson, Congestion Trends in Metropolitan Areas, *Curbing Gridlock*, Special Report 242, Transportation Research Board. 1994

Unbalanced transportation plans restrict choices for transportation available to the public. For example, a transportation plan that allocates funding towards roads over transportation choices would be eliminating public transportation options for a great number of Washington citizens. Each day, there are 370,000 trips made using public transportation. The state would have to build over 500 miles worth of new highway to accommodate all of the people moving out of public transportation and onto the highways just to maintain the current congestion we have now. This expansion, which is the equivalent of a highway stretching from Seattle to the California border, would cost us up to seven and a half billion dollars and it wouldn t even begin to actually solve our traffic problems.

Real Transportation Solutions

A recent Urban Land Institute report found that the key to minimizing regional traffic congestion is for a community's leaders to clearly identify the problem, to advocate an overall strategic solution and then to coordinate with each other to implement a cohesive and balanced transportation plan. The report noted that “a successful congestion relief program must be well publicized, should include a balanced approach utilizing a variety of transportation strategies, and it should also include some way of measuring progress towards a consistent vision of the travel improvements which a region is seeking.”[28] Automobiles are certainly a part of that balance, but the role of single occupancy vehicles in the transportation mix needs to be reduced if we are going to effectively address congestion problems. As Todd Litman of the Victoria Transport Policy Institute notes, “Reducing excessive automobile dependency is no more anti-automobile than healthy diets are anti-food.” Unbalanced transportation systems that focus on the automobile ensure that more and more automobiles will be put to use. In other words, the more that a transportation plan involves increasing road capacity, the fewer the resources that are available for other parts of a “balanced” infrastructure. In this scenario, the alternatives to automobiles are utilized less and less and automobiles are used increasingly more leading to more air pollution, more congestion, and more sprawl.

[28] Dunphy, Robert, "Moving Beyond Gridlock: Traffic and Development," Urban Land Institute, 1997.

In order to create a working transportation plan we need to incorporate three key strategies into how we allocate resources for solutions:

Increase the efficient use of existing roadways

We need to focus on methods that help to use the roadways we have more efficiently. The average vehicle in Washington is only carrying 1.1person for any given trip.[29] Increasing that average to just two people would help alleviate a significant portion of congestion. The most heavily congested travel times are during the morning and evening commute so programs that implement incentives for people to share rides to work, whether carpooling or vanpooling, are a good way to increase the efficient use of existing highways and roads. Already, worksites participating in our state s Commuter Trip Reduction program removed 18,500 vehicles from our roads during the morning commute in 1999.[30] But the CTR program is only being used in eleven hundred worksites statewide. Each worksite participating in the program removes an average of 16 cars from the road. Doubling the number of participants, we could remove almost forty thousand cars from our traffic every morning. These programs should be reinforced by the expansion of HOV lanes in order to accommodate increased ride-sharing. HOV lanes facilitate more traffic flow per mile; for example, on Interstate 5 north of Seattle the HOV lane carries over 6,000 people per hour during peak travel times, while the single occupancy lanes carry only 2,000 each.[31]

Increase usage of public transportation systems

There are many ways to increase ridership of public transportation systems by creating incentives for people to utilize these alternatives. One great example of the impact these programs can have on decreasing single occupancy vehicle usage is the U-pass program at the University of Washington, which issues one pass each quarter for a set price that facilitates travel on all modes of public transportation, as well as a comprehensive set of other benefits like free parking for carpoolers. Between 1990 and 1999, Metro estimates that total UW Seattle ridership grew to 7.2 million trips annually, a 68 percent increase.˚ The number of faculty/staff single-occupancy-vehicle (SOV) parking permits in circulation in October 1999 declined 20 percent from October 1990.˚ The number of student parking permits in circulation, most of which are issued to students living in residence halls, has declined 41 percent from 1990.

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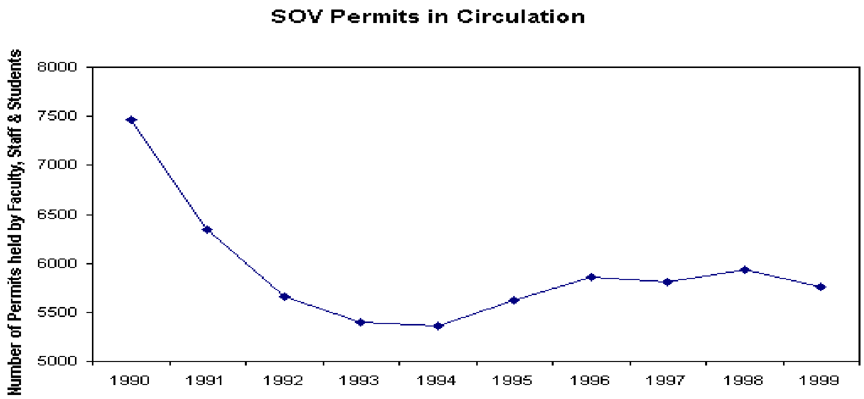
[29] Puget Sound Regional Council
[30] Commute Trip Reduction legislative report, 1999
[31] Washington State Department of Transportation



Source: University of Washington U-Pass Annual Report 1998-99

Local businesses around the state have experienced similar successes with Commute Trip Reduction programs. The key to their success is a commitment on the part of the management, a comprehensive plan that addresses many needs of commuters, and recognition of the benefits that are accrued. The following table illustrates the impact that comprehensive commuter plans have had on Washington businesses:

Business	CTR Plan	% Reduction in SOV
ConnexT	• Free annual FlexPass for full and part-time "partners" ($633 value) • $40 monthly value in "park free days" for occasional use by partners who primarily use an alternative commute mode • $40 monthly value in Commuter Bonus vouchers (for discounted fares) with neighboring transit systems • Commuter Bonus Plus coupons (for discounts at participating retailers) are available for those who carpool, bike, walk or ride the ferry • Guaranteed ride home • Personalized ridematching assistance • Program kick-off with popcorn, door prizes, and ConnexT day-at-the-Kingdome Mariners game following informational transportation event • Showers and lockers • Member of Unico Properties ETC network	85%
Safeco	• $21 to $28.20 monthly bus pass and vanpool subsidy • Preferential parking for vanpools • Fleet cars and vans with cell phones for ridesharing, work trips, and errands • Telework • Central library link to RiderLink Web site	40%

	• Guaranteed ride home • On-line commuting benefits, customized bus information • Showers and lockers • Prize drawing, zip-to-lunch events for employees in the same zipcode, and transportation fairs • Program Manager is President of Greater Redmond TMA	
Children's Hospital	• 100% vanpool subsidy (up to $65 monthly) • 100% bus pass subsidy • 17, 11, and 8 cents/hour subsidy up to $30 monthly (based on time of day) for carpoolers, drop-offs, walkers, bicyclists, and teleworkers • 17, 11, and 8 cents/hour charge up to $30 monthly for drive-alone parking • Flex-time • Priority parking spaces for vanpools and carpools • Personalized ridematching assistance • ETC chairs Southwest/Southcentral Seattle Employer Transportation Network	45%
CH2M HILL	• $84 annual FlexPass (bus pass valued at $633), can also be applied toward a Metro vanpool fare at a monthly value of $39.50 • 28 fleet vehicles for work-related and personal trips • $40 transportation allowance to each employee • $10 monthly Community Transit subsidy • Guaranteed ride home • Flexible work schedule • Program promotion and personalized ridematching assistance • Showers, lockers, and bicycle racks • Member of TransManage, a transportation management association	57%

Other investments can be made that would both address congestion problems and complement one another so that each action worked towards better solutions instead of more problems:

Support cash-out programs to offer financial incentives to employees to leave cars at home (this is where employers use the subsidy for parking they receive to pay employees cash for giving up their space). Furthermore, parking pricing reform could bring over $20 million in revenues to our state to fund alternative transportation.[32]

[32] Road Relief by Todd Litman, Charles Komanoff, and Douglas Howell. Prepared for the Energy Outreach Center 1998.

Encourage employers to offer transit passes as part of a salary benefits package: these are tax free under TEA-21, the Transporation Equity Act passed by Congress in 1998 that enables municipal areas around the country to implement alternatives to single occupancy vehicle travel. This measure works to reduce both traffic congestion and air pollution nationwide. Transit passes given as benefits reduces commuter trips in SOV s and saves employers and employees tax expense.

Increase the number of Park-and-Ride stations/terminals so that public transportation options are more accessible.

Increase the number of express routes from suburban to urban areas to more adequately fulfill commuter needs.

Increase the frequency of runs for popular routes and during heavy commuting times to facilitate more passenger usage.

Support investment towards creating more transportation choices that encompass cars(carpooling), vanpooling, busses, rail systems, bicycling and pedestrian options. The more choices commuters have, the more likely they are to utilize them. Already the Puget Sound Regional Council estimates that carpools will comprise 4.74 million daily trips by 2010. Increasing this participation would increase the efficiency of existing roadways in a cost effective manner.

Advocate insurance reform that allows for distance based pricing on insurance rates-thus encouraging a decrease in driving and therefore pollution. Each driver would be rewarded for decreasing the mileage they drove each year by a lower premium. An odometer reading from year to year would track how many miles that vehicle had traveled and this information would be reported to the insurance company-just as accidents negatively affect insurance rates, mileage would affect rates. The use of the roads would be paid for by those who used them the most. Right now, our roadways are underpriced so people over-use them. This reform would create a more equitable system where the incentive for drivers to decrease their mileage would reduce statewide vehicle use by approximately 10%.[33]

Implement a weight distance fee to pay for road construction instead of the fuel tax- this would effectively lower local taxes while ensuring that those who use roads pay for them (This is also known as Flexible Funding because it allows funds to be utilized in an intelligent and effective way as opposed to being restricted by outdated provisionary laws). Flexible Funding could raise over $700 million towards alternative transportation development, making more efficient use of our roadways. (Appendix K)

[33] Ibid.

Enhance bikeways and footpaths to support non-automobile travel, thus easing traffic congestion, increasing air quality, and helping create more livable communities.

Implement Smart Growth for the state

In order to address a long-term solution to traffic problems, we need to recognize that development is an integral part of any comprehensive transportation strategy. Washingtonians have shown support for both smart transportation choices (voting for RTA in 1996) and smart growth (Washington legislature passed the Growth Management Act in 1990). Still, we need to make sure that these choices are implemented effectively:

Advocate for the implementation of the Growth Management Plan. We need to halt sprawl development on the periphery by enforcing urban growth boundaries.

Support zoning legislation that allows for multi-use: Revise zoning laws to allow markets, restaurants, video rental stores and other neighborhood businesses to locate along major roads in residential areas, thus decreasing the need for automobile travel to and from these destinations.

Revise zoning laws to replace off-street parking minimum requirements with maximum parking spaces allowed, and severely restrict the ground coverage of parking facilities, thus using policy to encourage a decrease in automobile usage. Also, create tax incentives for in-fill building development that develops urban, central land to be more livable. The Pearl District in Portland, Oregon is a good example of a previously unused industrial area being transformed into workplaces, apartments, restaurants and galleries.

Site new development near public transportation facilities, stores and services.

Conclusion

Washington needs to look to the future and not to the past for transportation solutions. Building roads to address congestion problems fails to recognize that in order to create a working solution, we need to balance roads, public transportation, and other forms of travel. Each choice needs to be supported within the set of solutions. It is better to increase the efficient use of vehicles and therefore increase the utility of the highways and roads that we already have instead of wasting billions of dollars on projects that will just fill up with traffic again. Long-term solutions involve incentives for increasing capacity through ridesharing and public transportation, parking management, and smart development choices. We will never be able to pave our way out of our problems, but we can make intelligent investments that will work to get us moving again for many years to come.

Appendix

Appendix A

Travel Rate Indices/ Highest in nation per group size

Population group	Urban area	Travel rate index
Very large	Los Angeles	1.51
Large	Seattle-Everett area	1.43
Medium	Tacoma	1.26
Small	Colorado Springs	1.10

Appendix B

Seattle-Everett/ Tacoma Travel Rate Index Trends

Urban area	1982	1986	1990	1992	1995	1996	1997	% increase (time penalty)
Seattle-Everett	1.13	1.22	1.36	1.41	1.38	1.39	1.43	231%
Tacoma	1.04	1.10	1.19	1.23	1.23	1.24	1.26	550%

Source: Texas Transportation Institute

Appendix C

Wasted fuel

Urban area	Annual gallons of fuel wasted	Annual Excess Fuel consumed per capital (gallons)	Excess fuel consumed per eligible driver (gallons)
Seattle-Everett	165,000,000	84	106
Tacoma	21,000,000	36	47
Spokane	4,000,000	12	16

Source: Texas Transportation Institute

Appendix D

Urban Area	Annual Congestion cost per driver	Rank
Los Angeles, CA	1,370	1
Washington, D.C.-MD-VA	1,260	2
Seattle-Everett, WA	**1,165**	**3**
Atlanta, GA	1,125	4
Boston, MA	1,095	5
Detroit, MI	1,010	6
San Francisco-Oakland, CA	995	7

Dallas, TX	975	8
Houston, TX	960	9
Miami-Hialeah, FL	930	10

Urban areas with the highest annual congestion cost per driver

Population group	Urban area	Congestion cost/driver
Very large	Los Angeles	$1,370
Large	**Seattle**	**$1,165**
Medium	Austin	$880
Small	Colorado Springs	$275

Source: Texas Transportation Institute

Appendix E

Annual Person Hours of Delay – How much total time is wasted sitting in traffic

Urban area	Hours wasted
Seattle-Everett	106,500,000
Tacoma	13,065,000
Spokane	2,770,000

The average time wasted for an area of the same size as the Seattle area is 49,253,000, so we waste twice as much time as other areas across the country.

Appendix F

Generated Traffic Example

Suzanne must deliver a package 10 miles across town. Her time is worth $15 per hour, her vehicle costs 10¢ per mile to operate under free flowing conditions and 15¢ under congested conditions. The trip takes 30 minutes when roads are uncongested and 60 minutes when congested. Her alternative is to ship the package, which takes 10 minutes, and costs $5.00, a total cost of $7.50. She delivers the package herself if the road is uncongested, saving $0.50, but mails it if roads are congested, saving $5.50. A congestion reduction project would generate this trip.

User Costs

	Car Trip, Uncongested	*Car Trip, Congested*	*Mail Package*
Time	$5.00	$10.00	$2.50
Postage	0.00	0.00	5.00
Vehicle cost	2.00	3.00	0.00
Total cost	*$7.00*	*$13.00*	*$7.50*

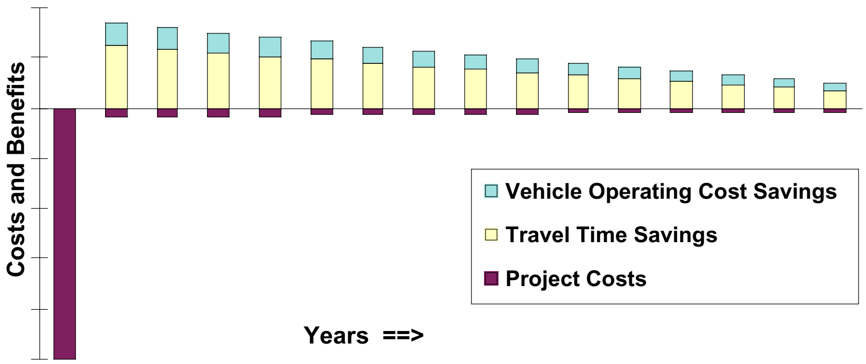
The generated trip imposes external costs, including congestion, pollution, parking, and accident risk. Assume the average external cost of driving is 50¢ per mile under congested condition and 25¢ per automobile mile under uncongested conditions, a delivery truck carries 250 packages, imposes costs double those of an automobile. The total cost of driving is actually higher than the total cost of mailing the package under either level of congestion.

Total Costs			
	Car Trip, Uncongested	*Car Trip, Congested*	*Mail Package*
Internal Costs	$7.00	$13.00	$7.50
External Costs	5.00	10.00	0.08
Total Costs	*$12.00*	*$23.00*	*$7.58*

Source: Victoria Transport Policy institute

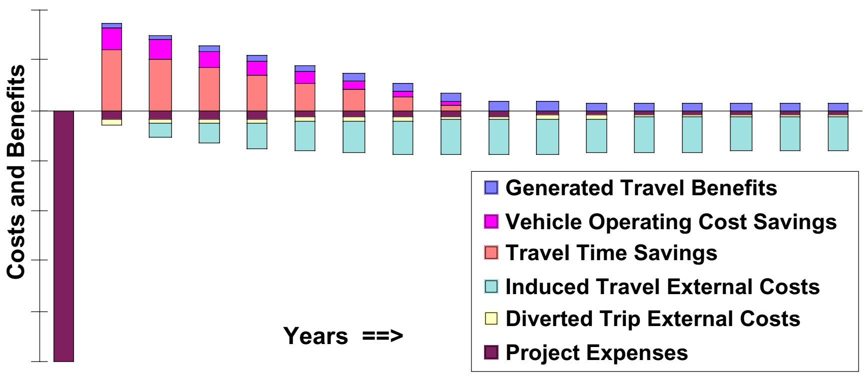
Appendix G

Estimated Costs and Benefits, Ignoring Generated Traffic



This figure illustrates annual benefits and costs when generated traffic is ignored, using Medium assumptions. Benefits are bars above the baseline, costs are bars below the baseline. Project expenses are the only cost category.

Estimated Costs and Benefits, Considering Generated Traffic



This figure illustrates benefits and costs when generated traffic is considered, using medium assumptions. Benefits are bars above the baseline, costs are bars below the baseline. It includes consumer benefits and external costs associated with generated traffic. Travel time and vehicle operating cost savings end after about 10 years, when traffic volumes per lane return to pre-project levels, resulting in no congestion reduction benefits after that time.

Analysis of Three Cases

Data Input	Most Favorable	Medium	Least Favorable
Generated Traffic Growth Rate (from Figure 2)	L	M	H
Discount Rate	6%	6%	6%
Maximum Peak Vehicles Per Lane	2,200	2,000	1,800
Before Average Traffic Speed (km/hr)	40	50	60
After Average Traffic Speed (km/hr)	110	100	90
Value of Peak-Period Travel Time (per veh-hr)	$12.00	$8.00	$6.00
Vehicle Operating Costs (per km)	$0.15	$0.12	$0.10
Annual Lane Hours at Capacity Each Direction	1,200	1,000	800
Diverted Trip External Costs (per km)	$0.00	$0.10	$0.15
Induced Travel External Costs (per km)	$0.20	$0.30	$0.50
Net Present Value (millions)			
NPV Without Consideration of Generated Traffic	*$204.8*	*$45.2*	*-$9.8*
NPV With Consideration of Generated Traffic	*$124.5*	*-$32.1*	*-$95.7*
Difference	*-$80.3*	*-$77.3*	*-$85.8*
Benefit/Cost Ratio			
Without Generated Traffic	*6.90*	*2.30*	*0.72*
With Generated Traffic	*3.37*	*0.59*	*0.11*

This table summarizes the assumptions used in the previous analysis.
Source: Victoria Transport Policy Institute

Appendix H

Estimated Cost of New Lane-Miles for a Family of Four

Rank	Metro Area	New Lane-Miles Required Annually to Hold Congestion Levels Constant, as Estimated by TTI	Cost of Those Lanes, as Estimated by STPP	Cost per Year for a Family of Four
1	Nashville, TN	101.35	$506,750,000	$3,243
2	Austin, TX	92.88	$464,400,000	$2,996
3	Orlando, FL	147.75	$738,750,000	$2,801
4	Indianapolis, IN	138.18	$690,900,000	$2,764
5	Corpus Christi, TX	39.58	$197,900,000	$2,554
6	Jacksonville, FL	98.46	$492,300,000	$2,401
7	Albuquerque, NM	62.81	$314,050,000	$2,243
8	Atlanta, GA	275.32	$1,376,600,000	$2,229
9	Charlotte, NC	61.71	$308,550,000	$2,165

10	Louisville, KY-IN	82.94	$414,700,000	$1,987
11	Kansas City, MO-KS	129.19	$645,950,000	$1,928
12	San Antonio, TX	108.06	$540,300,000	$1,764
13	Fort Worth, TX	102.94	$514,700,000	$1,615
14	Tucson, AZ	50.41	$252,050,000	$1,575
15	Tampa, FL	62.11	$310,550,000	$1,515
16	Bakersfield, CA	27.61	$138,050,000	$1,513
17	Laredo, TX	11.05	$55,250,000	$1,473
18	Beaumont, TX	10.28	$51,400,000	$1,469
19	Harrisburg, PA	22.22	$111,100,000	$1,411
20	St. Louis, MO-IL	133.72	$668,600,000	$1,324
21	Oklahoma City, OK	63.75	$318,750,000	$1,301
22	Ft. Lauderdale-Hollywood-Pompano Beach, FL	91.23	$456,150,000	$1,229
23	Memphis, TN-AR-MS	55.85	$279,250,000	$1,164
24	Omaha, NE-IA	32.22	$161,100,000	$1,161
25	Portland-Vancouver, OR-WA	73.92	$369,600,000	$1,160
26	Phoenix, AZ	134.09	$670,450,000	$1,146
27	Las Vegas, NV	61.52	$307,600,000	$1,145
28	Colorado Springs, CO	22.09	$110,450,000	$1,105
29	El Paso, TX-NM	33.14	$165,700,000	$1,096
30	San Jose, CA	83.88	$419,400,000	$1,052
31	Dallas, TX	120.28	$601,400,000	$1,050
32	Denver, CO	85.73	$428,650,000	$969
33	Houston, TX	147.91	$739,550,000	$967
34	Columbus, OH	48.44	$242,200,000	$959

35	Salt Lake City, UT	41.69	$208,450,000	$932
36	Minneapolis-St. Paul, MN	102.19	$510,950,000	$908
37	Boulder, CO	4.71	$23,550,000	$897
38	Milwaukee, WI	55.9	$279,500,000	$894
39	Norfolk, VA	45.11	$225,550,000	$893
40	Albany-Schenectady-Troy, NY	21.33	$106,650,000	$862
41	Allentown-Bethlehem-Easton, PA-NJ	19.71	$98,550,000	$848
42	Cincinnati, OH-KY	52.55	$262,750,000	$831
43	Brownsville, TX	5.37	$26,850,000	$796
44	Washington, DC-MD-VA	128.42	$642,100,000	$742
45	Providence-Pawtucket, RI-MA	33.16	$165,800,000	$737
46	Baltimore, MD	76.91	$384,550,000	$717
47	New Orleans, LA	39.88	$199,400,000	$715
48	Detroit, MI	133.65	$668,250,000	$709
49	Chicago, IL-Northwestern IN	271.8	$1,359,000,000	$692
50	Fresno, CA	18.27	$91,350,000	$689
51	San Bernardino-Riverside, CA	46.2	$231,000,000	$684
52	Miami-Hialeah, FL	69.57	$347,850,000	$679
53	Eugene-Springfield, OR	7	$35,000,000	$667
54	Pittsburgh, PA	64.24	$321,200,000	$666
55	**Spokane, WA**	**9.89**	**$49,450,000**	**$609**
56	Hartford-Middletown, CT	19.16	$95,800,000	$603
57	Cleveland, OH	55.94	$279,700,000	$602
58	Sacramento, CA	36.06	$180,300,000	$586
59	Rochester, NY	17.74	$88,700,000	$572

60	Salem, OR	5.05	$25,250,000	$561
61	Boston, MA	84.04	$420,200,000	$558
62	Honolulu, HI	19.39	$96,950,000	$550
63	Philadelphia, PA-NJ	95.99	$479,950,000	$365
64	New York, NY-Northeastern NJ	273.58	$1,367,900,000	$319
65	Los Angeles, CA	185.7	$928,500,000	$304
66	**Tacoma, WA**	**8.64**	**$43,200,000**	**$293**
67	Buffalo-Niagara, NY	15.74	$78,700,000	$293
68	San Diego, CA	34.12	$170,600,000	$266
69	**Seattle-Everett, WA**	**25.2**	**$126,000,000**	**$258**
70	San Francisco-Oakland, CA	35.13	$175,650,000	$181

Appendix I

Characteristics of Areas Studied by TTI, Ranked by Growth in Lane-Miles (%)

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Metro Area	Roadway Congestion Index	Population Growth	Growth in Urban Area size (square miles)	Population Density (persons per square mile)	% Growth in Lane Miles (1982-1996)
Albany-Schenectady-Troy, NY	0.81	-1%	3%	1338	9%
Buffalo-Niagara, NY	0.78	0%	52%	1886	9%
Boston, MA	1.09	6%	27%	2606	14%
Eugene-Springfield, OR	0.92	11%	31%	2000	14%
Fresno, CA	0.78	54%	75%	3029	16%
Tacoma, WA	**1.18**	**40%**	**36%**	**1735**	**17%**
Denver, CO	1.12	31%	15%	1853	18%
Los Angeles, CA	1.57	23%	23%	5443	18%
Cleveland, OH	1.02	6%	24%	2385	18%
Spokane, WA	**0.84**	**18%**	**10%**	**1970**	**18%**
New York, NY-Northeastern NJ	1.18	3%	10%	4900	20%
El Paso, TX-NM	0.80	34%	57%	2574	20%
Salem, OR	0.88	13%	7%	2400	20%
San Francisco-Oakland, CA	1.33	18%	35%	3705	21%
Columbus, OH	1.01	21%	56%	2126	21%
Cincinnati, OH-KY	1.07	12%	16%	1946	21%
Seattle-Everett, WA	**1.27**	**35%**	**25%**	**2407**	**22%**
San Diego, CA	1.23	44%	23%	3420	22%
San Jose, CA	1.11	33%	17%	3358	22%

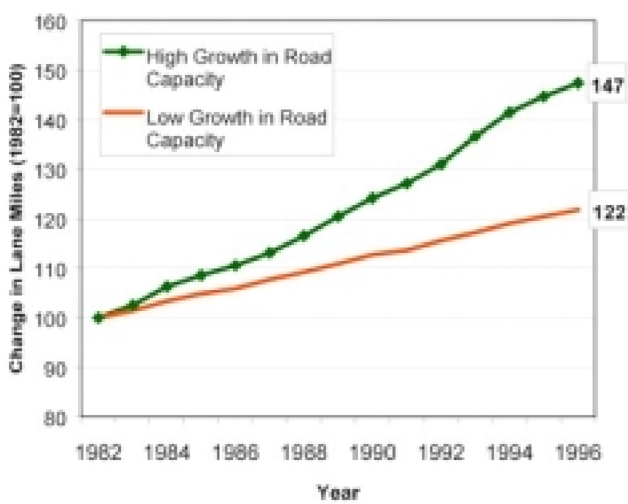
Beaumont, TX	0.76	22%	24%	1333	25%
Dallas, TX	1.11	27%	16%	1436	25%
Detroit, MI	1.24	-1%	20%	2890	26%
Omaha, NE-IA	1.00	11%	15%	2467	26%
Milwaukee, WI	1.03	3%	2%	2232	28%
Philadelphia, PA-NJ	1.07	29%	55%	3498	29%
Brownsville, TX	0.79	50%	50%	3000	29%
Miami-Hialeah, FL	1.34	18%	32%	3796	29%
Colorado Springs, CO	0.74	43%	57%	1455	29%
Honolulu, HI	1.10	24%	61%	3811	30%
Baltimore, MD	1.09	26%	64%	2899	30%
Kansas City, MO-KS	0.81	23%	40%	1740	31%
Indianapolis, IN	1.00	16%	17%	2041	31%
Rochester, NY	0.87	-3%	16%	1851	32%
San Antonio, TX	0.99	29%	19%	2402	32%
Fort Worth, TX	1.01	18%	19%	1328	33%
Oklahoma City, OK	0.91	53%	55%	1508	33%
Pittsburgh, PA	0.85	7%	39%	2042	34%
Hartford-Middletown, CT	0.93	12%	7%	1693	34%
Norfolk, VA	0.96	31%	5%	1210	34%
St. Louis, MO-IL	1.05	9%	31%	2376	34%
New Orleans, LA	1.09	3%	9%	3014	34%
Ft. Lauderdale-Hollywood-Pompano Beach, FL	1.03	39%	44%	3031	35%
Boulder, CO	0.79	31%	100%	2625	36%
Minneapolis-St. Paul, MN	1.12	29%	46%	1860	36%

Allentown-Bethlehem-Easton, PA-NJ	0.87	16%	50%	2385	38%
Harrisburg, PA	0.88	15%	72%	1465	39%
Corpus Christi, TX	0.78	24%	15%	1590	39%
San Bernardino-Riverside, CA	1.22	43%	30%	2596	41%
Washington, DC-MD-VA	1.43	28%	26%	3460	42%
Sacramento, CA	1.07	48%	41%	3114	46%
Chicago, IL-Northwestern IN	1.34	11%	44%	2865	46%
Charlotte, NC	0.98	63%	60%	1781	46%
Jacksonville, FL	0.99	33%	25%	1262	47%
Louisville, KY-IN	1.04	8%	10%	2114	47%
Orlando, FL	0.91	73%	36%	2049	48%
Las Vegas, NV	1.20	139%	244%	3909	50%
Houston, TX	1.11	28%	10%	1821	51%
Portland-Vancouver, OR-WA	1.16	26%	34%	2713	52%
Memphis, TX-AR-MS	1.11	26%	30%	2110	53%
Nashville, TN	1.00	25%	54%	1068	53%
Providence-Pawtucket, RI-MA	0.96	9%	16%	1731	54%
Bakersfield, CA	0.68	59%	157%	2028	55%
Albuquerque, NM	1.01	27%	31%	2036	57%
Salt Lake City, UT	1.00	32%	38%	1808	57%
Phoenix, AZ	1.14	64%	96%	2167	57%
Atlanta, GA	1.24	53%	22%	1384	69%
Tampa, FL	1.06	52%	47%	1592	73%
Laredo, TX	0.73	58%	80%	3333	90%
Austin, TX	1.03	63%	32%	1570	107%
Tucson, AZ	1.02	42%	87%	2286	130%

Appendix J°

The following figures represent data from the TTI as interpreted by Surface Transportation Policy Project. Each show that while different metropolitan areas invested low and high amounts towards road construction, high road investment did not lead to reduced congestion costs.

Changes in Lane Miles in Metro Areas (1982-1996)



°**Figure 2: Congestion Costs Per Capita (Mean Dollars)**

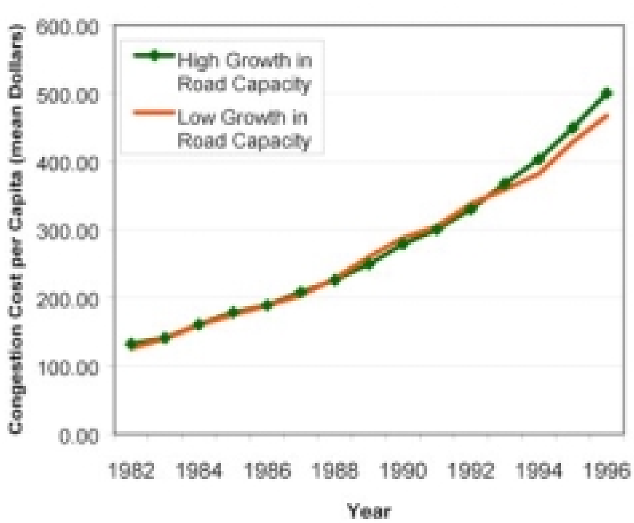


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Figure 3: Excess Fuel Per Capita (Mean Gallons)

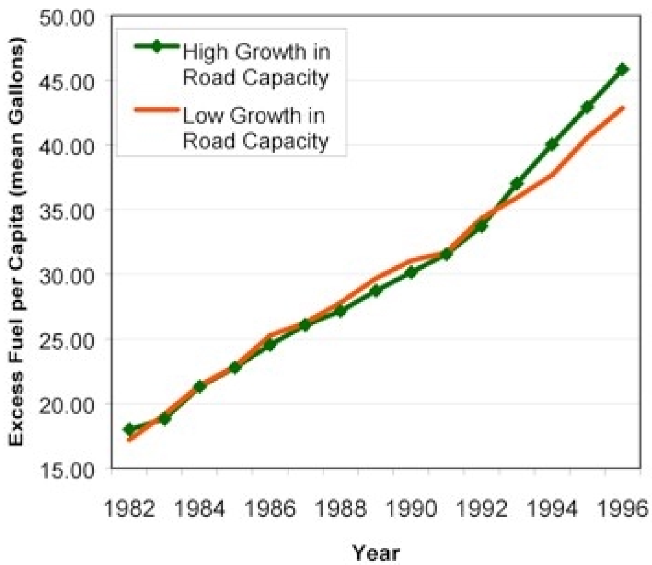


Figure 4: Delay Per Capita (Mean Person-Hours)

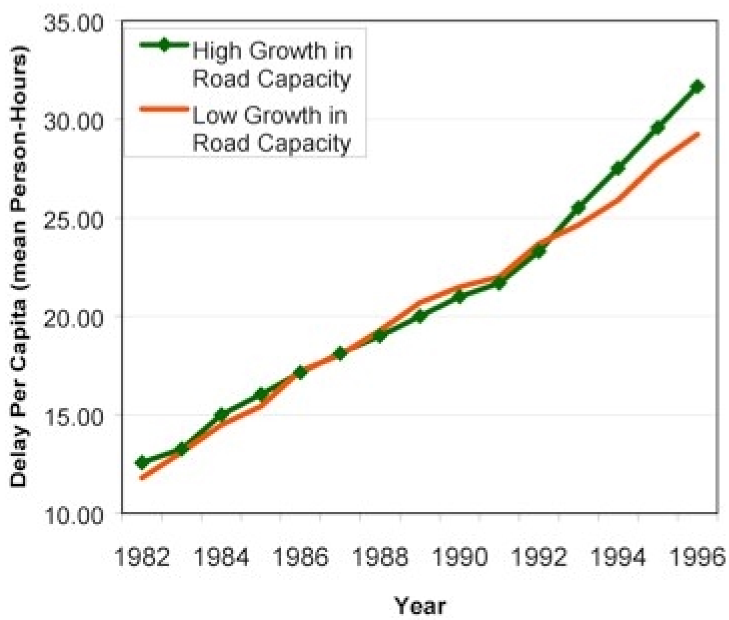
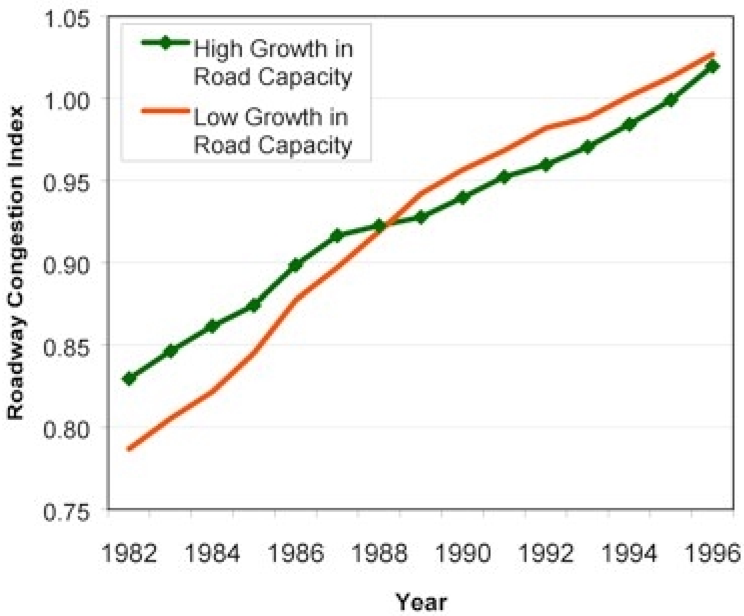


Figure 5: Roadway Congestion Index (Mean)



Appendix K

Gas Tax	**Flexible Funding**
Possible Uses • Roads • Bridges • Ferries	Possible Uses • Roads • Bridges • Ferries • **Bus Transit** • **Commuter Rail** • **Light Rail** • **Vanpools** • **Carpools** • **Intercity Rail** • **Trip Reduction Programs** • **Transportation Demand Management Programs** • **Telecommuting**

Methodology

The data that was utilized from the Texas Transportation Institute s annual report, *Urban Roadway Congestion,* is available at TTI s website at http://mobility.tamu.edu. Particularly, the Surface Transportation Policy Project s analysis utilized the TTI s fifteen year study and did not control for other factors which might influence congestion levels, such as changes in population, economic activity, and land use changes. However, the large size of the data set (70 metropolitan areas) and the long duration of the study period (15 years) make it more likely for underlying relationships to emerge. Therefore, if road building were an effective congestion relief strategy, it was assumed that it would have been observable from the data set.

Public Transportation

In order to assess how many roads were necessary to accommodate public transportation riders, we first tallied how many trips were taken using the system each day in the Puget Sound region. We then divided that sum by half, assuming that each trip represented transport to and from the destination. That figure was then divided by the average number of occupants per vehicle for the state in order to assess the number of cars that would be in use. The increase in percentage of cars on the road that this represented was then utilized for the formula created by Tim Lomax of the TTI which was used for the report Dollars and Sense by the Community Transportation Association in order to extrapolate the increased lane mileage needed.

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Figures for the induced traffic phenomenon were given by Peter Briglia based on internal documents of the Washington State Department of Transportation. Copies are on file at Washington State Public Interest Research group.