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RTA impact on congestion

This is the third in a series of Policy Briefs on the Phase 1 Proposal of the Central Puget Sound Regional Transit Authority (RTA), which will be voted on March 14. The Regional Transit Authority Master Plan *carries the subtitle* Fighting Congestion. Moving People. *This brief examines congestion using traditional tools of economics, drawing examples from the Puget Sound Regional Council's Regional Transportation Model.*

Congestion occurs when highway capacity is scarce. Supply and demand, the economist's traditional tools for evaluating the allocation of scarce resources, clarify the congestion problem.

Demand

Growth in population has increased the demand for automobile transportation. Population in the central Puget Sound region grew by 82 percent from 1960 to 1990 and is expected to grow a further 50 percent from 1990 to 2020.

Other factors combine to further increase the demand for automobile transportation. People choose where to live in order to be close to family and friends, to have access to good schools, and to be near recreational resources. As a result, many locate a fair distance from their workplaces. Low cost suburban land has made it possible for families to live in low density neighborhoods and for employers to locate in low density work sites. These homes and workplaces are not easily connected by public transportation. As a result automobile travel has grown even more rapidly than the region's population.

Supply

Up to now, government has tried to expand the highway network to accommodate the growth in population. However, the ability to increase road capacity in the future will be constrained, in part because of the higher cost of right-of-way acquisition. So we should expect that population growth will increasingly outpace highway system development.

Currently, buses and carpools substitute for additional highway capacity. A full bus takes up less space than would be required if each passenger rode alone in a personal car. Commuter and light rail lines would similarly lessen the competition for scarce highway capacity.

Cost

A driver bears considerable costs when operating a car: gasoline, up keep, depreciation, and the value of his or her time. The driver even pays for road construction and maintenance to the extent that they are funded through the gasoline tax. But there is one important cost the driver does not pay. On a congested road, each additional driver decreases the speed at which traffic flows. He or she increases the travel time of every other driver. Individual drivers do not pay for the time costs they impose on others, thus the private cost of travel by car is less than the social cost.

Equilibrium

Anthony Downs has identified a phenomenon he calls triple convergence, which neatly illustrates the importance of the notion of equilibrium in understanding congestion. Consider commuting from Seattle's northern city limit to downtown. There are a number of different routes that a driver can take: I-5, Aurora Avenue, Lake City Way – Roosevelt – Eastlake, and Greenwood – Holman Road – 15th Avenue for example. If traffic moves at the speed limit, I-5 will provide the quickest route to downtown. With a large number of commuters, however, there will be congestion, and travel on the freeway will be significantly slower. Drivers will respond to the increased time cost of travel on I-5; some by taking another route, others by adjusting their commuting schedule. Still others will shift to another mode of transportation. If the capacity of I-5 were somehow increased and commute patterns remained unchanged, traffic would move much more rapidly. But people will now find I-5 more attractive, and some will shift back to the freeway from other routes, other times, and other modes, until a new equilibrium distribution of choices is reached. Traffic speeds will not increase by as much as one would expect because behavior will changes as a result of the increased capacity

Table 1

System Performances in Simulations by the Puget Sound Regional Council

			2020	
	1990 Baseline	No Investment	Package 1 Existing Resources	Package 2 Existing Resources + RTA Phase 1
Vehicle miles travelled (millions) during the PM peak period	20.2	32.6	32.2	31.3
Average vehicle speed (mph) during the PM peak period	26.2	18.3	19.9	20.2
Percent Mode choice for all trips				
SOV	72.8%	71.7%	70.4%	72.2%
Carpool	19.7	20.6	21.3	16.4
Transit	7.5	7.7	8.3	11.4
Percent of network experiencing congestion				
Freeways	27.2%	44.7%	45.8%	49.9%
Regional Arterials	8.1	26.7	24.3	22.8
Overall	12.0	27.1	26.2	24.0

Source: Puget Sound Regional Council, Draft Metropolitan Transportation Plan, Dec. 1, 1994

Policies to fight congestion

Still, the most obvious way to fight congestion is to increase the supply of roadways. And there is the RTA proposal, which fights congestion in two distinct ways. First, the train systems add to the transportation capacity of the region, providing a transportation option that some people will find inherently more attractive than the automobile. Second, by charging riders fares far below the cost of service, RTA may induce some drivers to give up their cars, allowing those who continue to drive to move more rapidly.

Economists agree that congestion results because drivers do not bear the full costs of their decisions to drive. There is, therefore, little reason for an individual driver to economize on auto use. Further, the choice for low density residential locations and low density work sites is a consequence of artificially low costs of driving. Similarly, the choice of single occupant vehicles (SOV) over public transit or carpooling is encouraged by these low costs. Increasing the cost (by charging fees for travel at peak periods, for example) can influence individual decisions. Such congestion pricing, however, meets with substantial public resistance.

The Regional Transportation Model

The *Draft Metropolitan Transportation Plan,* released on Dec. 1 by the Puget Sound Regional Council, presents an elaborate simulation of transportation and land use in 2020 under a number of alternative programs. These simulations illustrate important aspects of congestion.

The first column of Table 1 shows the 1990 baseline for the model, while the second column shows system performance in 2020 if no significant investments are made in the region's transportation network. Between 1990 and 2020 the region's population is expected to grow by 50 percent. With no investment, congestion increases significantly. Average speed during the PM peak period on the road network drops from 26.2 miles per hour to 18.3. The fraction of freeways experiencing congestion during the PM peak increases from 27.2 percent to 44.7 percent; the fraction of freeways experiencing congestion increases from 8.1 percent to 26.7 percent.

The results for the first package of improvements are shown in the third column of Table 1. This package represents the highway and bus investment that the PSRC anticipates would be made absent by any increase in federal aid or in state and local taxes. These investments yield some improvement in congestion. Average vehicle speed at the PM rush increases by 1.6 miles per hour, while the fraction of the road network experiencing congestion decreases from 27.1 percent to 26.2 percent. Nevertheless, congestion remains much worse than the 1990 baseline. This illustrates a general finding: demand will swamp supply in regional transportation planning.

RTA Phase 1

RTA Phase 1, supplemented with some additional roadway (primarily HOV lanes), is added to Package 1 to form the second package of investments modeled. Again, the share of transit ridership rises only modestly, from 8.3 percent to 11.4 percent, with all of the additional riders coming from carpools. The share of SOV rises, and vehicle speeds rise on average 0.3 mile per hour. The percent of the freeway network that is congested during the PM rush increases from 45.8 percent to 49.9 percent. As PSRC observes, Package 2 brings "very little improvement in systemwide performance when compared to Package 1." This simulation illustrates the manner in which increases in vehicle speeds can draw people into the preferred SOV.

Congestion pricing

Interestingly, when the PSRC models congestion pricing, carpools and transit increase their ridership shares (to 26.6 percent and 18.0 percent, respectively). Average travel speeds increase to 24.6 mph, and the percent of freeway congestion during the afternoon rush falls to 40.3 percent. Here, the decreased congestion does not necessarily result in a shift back to single occupancy vehicle use because there is an explicit cost associated with that choice.

Summary

Congestion will be affected only minimally by public investments to increase capacity, whether in the form of highway construction or the RTA program of expanded transit alternatives.

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