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# **The Facts on Light Rail**

*A comparative analysis of light rail systems in six West Coast cities*

by Michael Ennis  
Director, Center for Transportation

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## Key Findings

As Washington cities consider whether light rail is right for them, this study on the performance of the six existing systems on the West Coast provides factual, real life examples of what taxpayers could expect here. Policymakers and the public should consider whether diverting transportation taxes away from other programs and services is worth the opportunity costs. Based on the data, this analysis concludes that it is not.

Often, public agencies try to estimate, with little success, how such a system in Washington would perform. Through unrealistic modeling and ambitious assumptions, they typically underestimate operating and capital costs, and overestimate revenue and passenger demand.

This is especially true with light rail systems.

For example, in 1996, Sound Transit officials in the Seattle area promised its first light rail segment would be completed by 2006 and would cost about \$5 billion.<sup>1</sup> Today, Sound Transit says the total cost is about \$15 billion and the segment will not be finished until around 2020.<sup>2</sup>

Analyzing the performance of existing light rail systems sidesteps these guesses and offers a factual picture.

There are six light rail systems on the West Coast that have been operating since at least 1995: Los Angeles, Portland, Sacramento, San Jose, San Diego and San Francisco. This study looks at their past performance and results in the following key findings:

- **Light rail systems on the West Coast served only about 2% of the workforce in the service areas of the six systems.**
- **On average, these systems only remove between 0.39% and 1.1% of cars from the roadway.**
- **On average, West Coast light rail systems require taxpayer subsidies to pay for 73% of operations and 100% of capital improvements per year.**
- **The average cost to add one additional rider to the light rail systems on the West Coast is between \$82,285 and \$242,014 per rider.**
- **Attracting a new rider to light rail costs 16 to 47 times as much as attracting a new rider to a traditional bus system.**

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<sup>1</sup> Sound Move, The 10-Year Regional Transit System Plan, May 1996.

<sup>2</sup> Sound Transit, University Link Financial Plan, June 2006.

- **When accounting for passenger demand, light rail on the West Coast is 12% more expensive to operate than bus service.**
- **In the ten years between 1996 and 2005, the public subsidy (operating costs only) for all light rail systems in the U.S. grew from \$250 million to \$729 million. An increase of 191%.**
- **The relationship between light rail and any environmental or economic development advantages is so slight that their use on influencing policy decisions should be proportionally minor.**

Examining the six existing light rail systems in major West Coast cities helps residents in the Puget Sound, Vancouver and Spokane understand what they could expect from spending on similar systems in Washington.

The most relatively efficient systems on the West Coast are San Francisco and Portland. They move the most people for the least cost and beat the six-city average in most cases.

By a large margin, the worst-performing system is San Jose. In every category, its performance is worse than the six-city average.

Regardless of how each system ranks with another, the overall poor performance of all six light rail systems on the West Coast shows that there is a very large gap between public costs and public benefits.

Even the best-performing systems require a large taxpayer subsidy and have little or no affect on reducing traffic congestion. And on average, light rail is more expensive to operate than a normal bus service.

Policymakers and the public should consider whether diverting transportation taxes away from other programs and services is worth the opportunity costs. Based on the data, this analysis concludes that it is not. There must be a stronger relationship between public spending and congestion relief. Spending significant amounts of transportation tax revenue on projects that have no influence on reducing congestion inevitably makes traffic worse.

## Introduction

As congestion continues to grow in major cities across the United States, policymakers are looking toward light rail transit as a possible solution. In 1980, there were only nine light rail systems in the U.S.; today, there are twenty-nine.<sup>3</sup>

In Washington, Puget Sound voters in 1996 approved the region's first light rail segment by authorizing Sound Transit to build a line between the airport and North of Seattle. Last November, regional voters rejected Sound Transit's proposed second phase, which would have added another 40-50 miles of light rail. Sound Transit officials are already planning to go to voters with a second measure.

In Clark County, public officials are considering a light rail system across a new Columbia River bridge to Portland. And while Spokane voters recently rejected continuing to look at light rail, officials there may yet try again to fund a system.

This study compares the performance of the six major West Coast cities operating light rail since 1995. The cities are Los Angeles, Portland, Sacramento, San Jose, San Diego and San Francisco. The following table summarizes key background data (2004) on each system.<sup>4</sup>

**Six major cities on the West Coast with light rail, 2004 data**

	System Length, in Miles	Light Rail Vehicles	Individual Riders per day <sup>5</sup>	Annual Operating Cost	Annual Farebox Revenue
Los Angeles	116.3	121	40,503	\$111,654,300	\$18,899,600
Portland	92.9	105	38,856	\$56,965,800	\$19,822,200
Sacramento	62.6	72	13,589	\$35,225,800	\$7,853,400
San Diego	97	123	32,718	\$41,830,500	\$24,196,900
San Francisco	72.9	181	55,710	\$105,899,500	\$21,473,700
San Jose	71.5	80	6,748	\$45,752,500	\$4,367,700

Source: National Transit Database

<sup>3</sup> Bureau of Transportation Statistics, Available at

[http://www.bts.gov/publications/national\\_transportation\\_statistics/html/table\\_transit\\_profile.html](http://www.bts.gov/publications/national_transportation_statistics/html/table_transit_profile.html)

<sup>4</sup> Data adapted from the American Public Transportation Association (APTA), Rail Statistics. Available at:

<http://www.apta.com/research/stats/rail/index.cfm>

<sup>5</sup> Light rail ridership is typically measured in unlinked trips. The American Public Transportation Association defines unlinked trips as "the number of passengers who board public transportation vehicles. Passengers are counted each time they board vehicles no matter how many vehicles they use to travel from their origin to their destination." Unlinked trips can double or triple count the same rider. In order to translate unlinked trips into *individual* daily riders, this report uses a conversion factor of 45%.

Spending transportation taxes on light rail instead of traffic relief is a controversial decision. Light rail opponents often argue it is too expensive for such little benefit, while supporters like its reliability and speed.

Based on its rapid growth across the country, light rail supporters are clearly winning the public debate. Today, there are nearly 1,400 miles of light rail track in cities across the country with another 190 miles under construction.<sup>6</sup>

But analyzing the performance data of existing systems shows that light rail is not providing the benefits supporters so eagerly claim.

In a recent study by the Brookings Institution, *On the Social Desirability of Urban Rail Transit Systems*, authors Clifford Winston and Vikram Maheshri argue that every public transit rail system (25 at the time of the study) had a negative impact on social welfare; meaning the average value of the service was less than the average cost to society.<sup>7</sup>

Annual Net Social Cost of Rail to Six Major West Coast Cities	
Los Angeles	\$125 million
Portland	\$221 million
Sacramento	\$106 million
San Diego	\$29 million
San Francisco	\$250 million
San Jose	\$211 million

Winston and Maheshri show the annual monetary social cost of rail to the host city. The adjacent table shows these costs to the six major West Coast cities that have had light rail since 1995.

As the authors point out, these negative impacts occur for two reasons: high costs (capital and operating) and low passenger demand.

As with any public transit system, passenger fares only recover a minor percentage of the total operating costs and no capital expenditures. In 1995, the public subsidy (operating costs only) for all light rail systems in the U.S. was \$250 million. In 2005, public assistance grew by 191%, to \$729 million.<sup>8</sup> Combining both capital and operating costs, the public subsidy for light rail in 1995 was \$938 million. In 2005, the subsidy grew to \$3.2 billion.<sup>9</sup>

As with most public services, taxpayers will tolerate high costs as long as they think their purchase results in a proportional benefit. Winston and Maheshri show that rail transit fails to produce this return on investment. And comparing the performance of the six systems on the West Coast indicates they are right.

<sup>6</sup> APTA, 2007 Public Transportation Fact Book. Available at [http://www.apta.com/research/stats/factbook/documents/section\\_19\\_rail\\_pages\\_63\\_to\\_79.pdf](http://www.apta.com/research/stats/factbook/documents/section_19_rail_pages_63_to_79.pdf).

<sup>7</sup> C. Winston, V. Maheshri, *On the social desirability of urban rail transit systems*, Journal of Urban Economics, 2006.

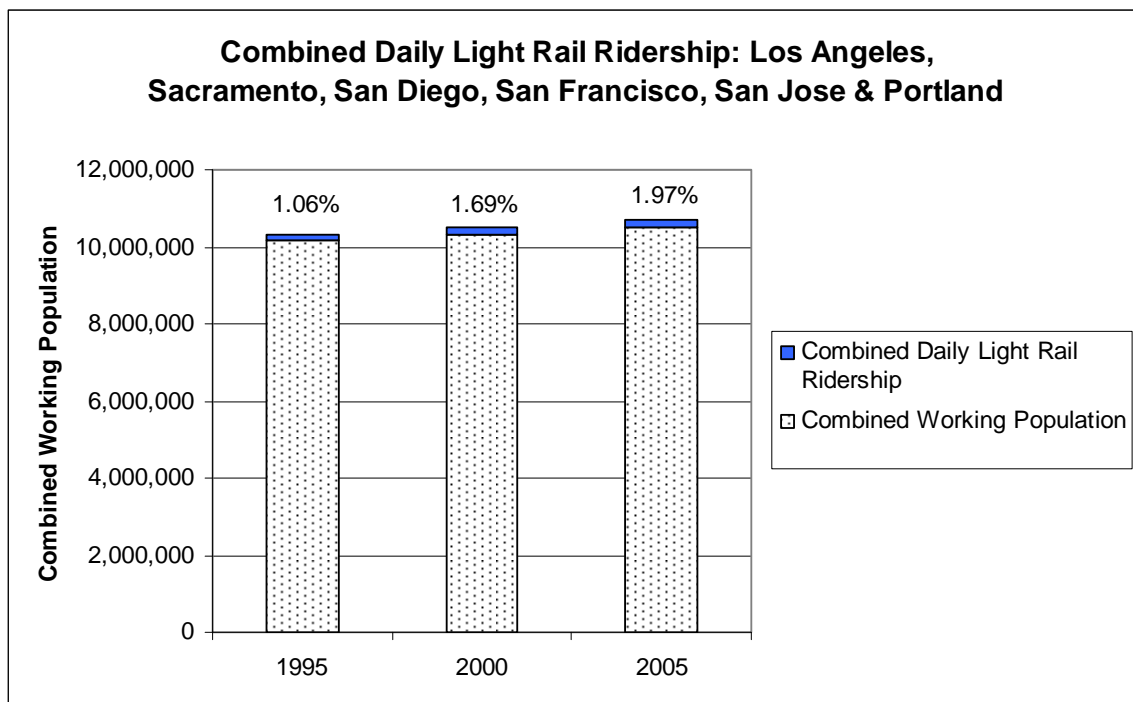
<sup>8</sup> APTA, 2007 Public Transportation Fact Book. Available at [http://www.apta.com/research/stats/factbook/documents/section\\_19\\_rail\\_pages\\_63\\_to\\_79.pdf](http://www.apta.com/research/stats/factbook/documents/section_19_rail_pages_63_to_79.pdf).

<sup>9</sup> Ibid.

## Light Rail Demand is Low

Ridership is generally the best factor for measuring the success of any transit service, and light rail is no different. If passenger demand is high enough, then the space between cost and benefits is small. Likewise, if passenger demand is low, then the space between cost and benefits is high.

Consider the following table that compares the combined working populations of the six major west coast cities with their respective light rail passenger demand in 1995, 2000 and 2005.



The combined regional working population of the six West Coast cities that have light rail was about 10.7 million people in 2005.<sup>10</sup> The number of daily riders using light rail in the same cities in 2005 was about 206,694 per day.<sup>11</sup> This means only 1.97% of all workers within those cities choose to use light rail in any given day.

<sup>10</sup> Population data adapted from the Federal Highway Administration. Available at: <http://www.fhwa.dot.gov/ctpp/jtw/jtw8.htm>.

<sup>11</sup> Light rail ridership is typically measured in unlinked trips. The American Public Transportation Association defines unlinked trips as "the number of passengers who board public transportation vehicles. Passengers are counted each time they board vehicles no matter how many vehicles they use to travel from their origin to their destination." Unlinked trips can double or triple count the same rider. In order to translate unlinked trips into *individual* daily riders, this report uses a conversion factor of 45%.

## Light Rail Does Not Reduce Congestion

For transit to appreciably reduce traffic congestion, it must shift a large number of drivers from the roadways to its system.

It is unlikely the 206,694 daily riders on West Coast light rail systems in 2005 translate to an equal number of cars that would otherwise be on the roadway. Most light rail riders come from the existing bus systems.

For example, Sound Transit officials in Seattle estimated that nearly two-thirds of its ridership would have come from the existing transit system if its second phase had been approved in 2007.<sup>12</sup>

206,694 cars are not insignificant but there are about 18 million vehicles in the six regions studied.<sup>13</sup> Assuming two-thirds of passenger demand draws from existing public transit, the light rail systems on the West Coast shift a miniscule 0.39% of cars off the roadway. Assuming every rider translates to one vehicle, then light rail still only removes 1.1% of cars from the roadway.

In either case, passenger ridership on light rail is not nearly great enough to reduce traffic congestion. In fact, it can be argued that diverting such a large proportion of transportation tax revenue to light rail takes money away from and weakens programs that actually reduce congestion.

## Per-Rider Cost is High

Accounting for passenger demand shows the eye-popping cost required to add one additional rider to a light rail system on the West Coast.

Combined ridership in 1995 was 107,751 people per day for all six systems. Over the next ten years, the six cities spent about \$8.1 billion in capital and operating expenses to serve an additional 98,943 people per day.<sup>14</sup> So the capital cost to add one additional rider to the system between 1996 and 2005 was \$82,284 per person.

Again, assuming two thirds of those riders came from existing bus transit means the capital cost to add one additional *new transit* rider was \$242,015 per person.

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<sup>12</sup> Gregory Roberts, *Prop 1. no cure for commute*, Seattle Post Intelligencer, 2007. Available online at: [http://seattlepi.nwsourc.com/transportation/336095\\_worth19.html](http://seattlepi.nwsourc.com/transportation/336095_worth19.html)

<sup>13</sup> <http://www.fhwa.dot.gov/ctpp/jtw/jtw8.htm>

<sup>14</sup> Data adapted from the federal government's National Transit Database. Available at: <http://www.ntdprogram.gov/ntdprogram/data.htm>.

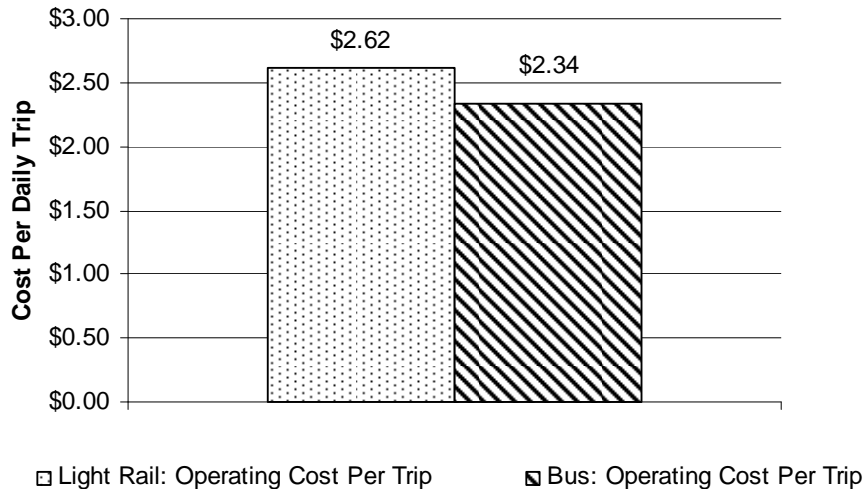
To put this in perspective, King County (Seattle) recently passed Transit Now, which will expand its bus system by 20%.

King County officials estimate Transit Now will add up to 27,000 new daily riders to the county's transit system. Adjusting for inflation, the cost of Transit Now will be about \$140 million per year. This means the total cost for King County to add one *new* rider to its system will be about \$5,185 per person.<sup>15</sup>

This means attracting a new rider to light rail costs 16 to 47 times as much as attracting a new rider to a traditional bus system.

Weighing these costs and benefits shows that light rail is extremely inefficient, even when compared to other public transportation alternatives. To look at it another way, consider the following chart, which compares the total cost per trip between light rail and traditional bus service on the same six agencies on the West Coast.

**Operating Cost Per Trip (2005): Bus & Light Rail.  
Los Angeles, Sacramento, San Diego, San Francisco,  
San Jose, Portland**



The total annual operating costs (not including capital) for the six light rail systems on the West Coast was about \$439 million in 2005.<sup>16</sup> The total trips for the

<sup>15</sup> Part V: The Imbalance of Roads and Transit, 2007. Washington Policy Center. Available at: [http://www.washingtonpolicy.org/Transportation/PN\\_partvimbalance.html](http://www.washingtonpolicy.org/Transportation/PN_partvimbalance.html).

<sup>16</sup> Data adapted from the federal government's National Transit Database. Available at: <http://www.ntdprogram.gov/ntdprogram/data.htm>.



same systems in 2005 were 167.6 million.<sup>17</sup> This means the operating cost for the six light rail systems on the West Coast was \$2.62 per trip.

The total operating costs for traditional bus service in the same six agencies was about \$1.5 billion and annual trips were about 642 million.<sup>18</sup> The operating cost for traditional bus service in 2005 was about \$2.34 per trip.

When accounting for passenger demand, light rail on the West Coast costs 12% more to operate than traditional bus service.

This is important because light rail supporters will say that after the initial capital spending, light rail is cheaper to operate than other modes of public transit. On average and among the six western cities with light rail, this is not true.

## Other Benefits of Light Rail Lack Evidence

Backers also claim that light rail has certain environmental and economic development benefits that help justify costs. But there is little evidence to support these claims.

For example, Portland officials say that the Max light rail system has brought more than \$6 billion in new development since the decision for light rail was made in 1978.<sup>19</sup> But through zoning changes, tax breaks, outright grants and selling publicly owned property at below market rates, the city was able to attract development along the rail line or near the stations.<sup>20</sup> More than light rail, the large public subsidies were likely the main reason for the new development.

The commercial growth claim also fails to account for potential development that would have naturally occurred in other areas. The Brookings Institution's Winston and Maheshri say,

“Case studies have yet to show that after their construction transit systems have had a significant effect on employment or land use close to stations and that such benefits greatly exceed the benefits from commercial development that would have occurred elsewhere in the absence of rail construction.”<sup>21</sup>

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<sup>17</sup> *Ibid.*

<sup>18</sup> *Ibid.*

<sup>19</sup> <http://trimet.org/about/history/maxoverview.htm>.

<sup>20</sup> Randal O'Toole, *Debunking Portland*, CATO, 2007. Available online at: <http://www.cato.org/pubs/pas/pa-596.pdf>.

<sup>21</sup> C. Winston, V. Maheshri, *On the social desirability of urban rail transit systems*, *Journal of Urban Economics*, 2006.

Because of these alternative and perhaps more influential variables, it is difficult to casually conclude that a light rail system stimulates economic development; light rail is not as impactful for economic development as public agencies try to claim.

Furthermore, because ridership is so low, the environmental benefits of light rail over the same riders using higher emission buses or passenger cars are easily erased with slight improvements in efficiency and alternative fuels.<sup>22</sup> Likewise, light rail construction and expansion also tempers any environmental advantages due to its long construction period and high energy consumption.

The relationship between light rail and any environmental or economic development advantages is so slight that their use on influencing policy decisions should be proportionally minor.

## Conclusion

Examining the six existing light rail systems in major West Coast cities helps residents in the Puget Sound, Vancouver and Spokane understand what they can expect from spending on similar systems in Washington.

The following table illustrates the combined mean, high and low results of several key performance data in the six West Coast cities with light rail.

**Key performance of six West Coast cities with light rail, 2004 data**

	Individual Riders Per Day	Daily Riders Per Track Mile	Mode Share as a Percent of Workers	Annual Public Subsidy, Operating Costs	Annual Public Subsidy, Operating & Capital Costs	Operating Cost Per Rider, Light Rail	Operating Cost Per Rider, Bus
Los Angeles	40,503	348	1.08%	83%	91%	\$2,757	\$1,759
Portland	38,856	418	3.23%	65%	89%	\$907	\$2,258
Sacramento	13,589	217	1.61%	78%	86%	\$3,078	\$3,109
San Diego	32,718	337	2.47%	42%	89%	\$3,237	\$2,398
San Jose	6,748	94	Included in SF	90%	97%	\$6,781	\$4,490
San Francisco	55,710	764	1.77%	80%	91%	\$1,023	\$1,542
<b>Average</b>	<b>31,354</b>	<b>363</b>	<b>2.03%</b>	<b>73%</b>	<b>91%</b>	<b>\$2,964</b>	<b>\$2,593</b>

Source: National Transit Database

<sup>22</sup> Todd Myers, *Light Rail on I-90 Will Do Little to Reduce CO2*, Washington Policy Center, 2007. Available online at: [http://www.washingtonpolicy.org/Centers/environment/PolicyBrief/07\\_light\\_rail.html](http://www.washingtonpolicy.org/Centers/environment/PolicyBrief/07_light_rail.html).

The most relatively efficient systems on the West Coast are San Francisco and Portland. They move the most people for the least cost and beat the six-city average in most cases.

By a large margin, the worst performing system is San Jose. In every category, its performance is worse than the six-city average.

Further study should be conducted to gain a better understanding on why San Francisco, Portland and San Jose appear so far from the average of the other systems.

Regardless of how each system ranks with another, the overall poor performance of the six light rail systems on the West Coast shows that there is a very large gap between public costs and public benefits.

Even the best-performing systems require a large taxpayer subsidy and have little or no affect on reducing congestion. On average, light rail is more expensive to operate than a normal bus service.

Policymakers and the public should consider whether diverting transportation taxes away from other programs and services is worth the opportunity costs. Based on the data, this analysis concludes that it is not.

There must be a stronger relationship between public spending and traffic congestion relief. Spending transportation tax revenue on projects that have no influence on reducing congestion inevitably makes traffic worse.

## About the Author



**Michael Ennis** is the Director of the Center for Transportation at Washington Policy Center. Before joining WPC, Michael worked for the Washington state Senate and House of Representatives and was formerly a staff assistant for U.S. Senator Slade Gorton. Michael served in the U.S. Army with the 2nd Ranger Battalion and has been active in local government affairs. He earned his Bachelor's degree from the University of Washington where he studied Political Science. He also earned his Master's of Public Administration degree from the Daniel J Evans School of Public Affairs also at the University of Washington.

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Washington Policy Center  
PO Box 3643  
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E-mail: [wpc@washingtonpolicy.org](mailto:wpc@washingtonpolicy.org).

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