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Great Rail Disasters

The Impact of Rail Transit on Urban Livability

by Randal O'Toole

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Center for the American Dream
Independence Institute
14142 Denver West Parkway, Suite 185
Golden, Colorado 80401
303-279-6536
independenceinstitute.org/cad.aspx
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Abstract

This paper grades rail transit in twenty-three urban areas on thirteen different criteria:
1. The change in transit ridership from 1990 to 2000;
2. The change in transit's share of motorized passenger travel from 1990 to 2000;
3. The change in transit commuting in the 1990s;
4. The change in transit's share of commuting in the 1990s;
5. The reliability of construction cost forecasts;
6. The reliability of ridership forecasts;
7. Changes in congestion from 1982 to 2001;
8. Changes in per capita driving from 1982 to 2001;
9. The cost effectiveness of rail transit relative to freeways;
10. The cost effectiveness of rail transit relative to buses;
11. The safety of rail relative to autos and buses between 1992 and 2001;
12. The energy efficiency of rail relative to passenger cars in 2002; and
13. The effects of rail transit on land-use regulation and property rights.

The results show that rail transit has negative net impacts on every urban area in which it is located. In particular, rail transit offers no guarantee that transit commuting will increase or that transit will increase its share of travel. The twenty-three urban areas with rail transit collectively lost more than 14,000 transit commuters during the 1990s, while the urban areas without rail transit collectively gained more than 53,000 transit commuters. During the same time period, per capita transit ridership and transit's share of motorized travel declined in about half of the rail regions, while transit's share of commuters declined in 60 percent of rail regions.

Regions that emphasize rail transit typically spend 30 to 80 percent of their transportation capital budgets on transit even though transit carries only 1 to 5 percent of regional travel. As a result, rail transit is strongly associated with increased congestion: Sixteen of the twenty regions with the fastest growing congestion are rail regions.

Nor is rail transit environmentally friendly. Sixty percent of rail transit systems consume more energy per passenger mile than private cars and the congestion created by rail transit adds to air pollution. Rail transit, especially light rail and commuter rail, can also be deadly. Commuter-rail lines kill more than twice as many people, per billion passenger miles, as buses or urban interstate freeways, while light rail kills three times as many.

This paper also profiles transit in each of the major urban areas that have rail transit. The profiles detail transit trends and compare rail line productivity with the productivity of freeway lanes in the same urban areas. The results show that few rail lines carry as many people as a single freeway lane.

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Executive Summary

The stampede to plan and build rail transit lines in American cities has led and is leading to a series of financial and mobility disasters. They are financial disasters because rail projects spend billions of taxpayers' dollars and produce little in return. They are mobility disasters because rail transit almost always increases regional congestion and usually reduces transit's share of commuting and general travel.

Out of the nation's fifty largest urban areas, twenty-three had rail transit in 2000. This study reviews those twenty-three regions and finds:

- Half of all rail regions lost transit commuters during the 1990s;
- Taken together, rail regions lost 14,100 transit commuters in the 1990s;
- In contrast, bus-only regions gained 53,000 transit commuters in the 1990s;
- Transit lost market share of commuters in two-thirds of all rail regions in the 1990s;
- Per capita transit rides declined in half the rail regions;
- Transit's share of total travel declined in a majority of rail regions;
- Sixteen of the twenty urban areas with the fastest growing congestion are rail regions—and one of the other four is building rail transit;
- By comparison, only three of the twenty urban areas with the slowest growing congestion are rail regions—and only because all three have nearly zero population growth.

Based on these and other criteria, including cost effectiveness, safety, energy, and land use, this paper constructs a *Rail Livability Index* that assesses the effects of rail transit on urban areas. Every rail region earned a negative score, suggesting rail reduces urban livability.

Rail transit is not only expensive, it usually costs more to build and often costs more to operate than originally projected. To pay for cost overruns, transit agencies often must boost transit fares or cut transit service outside of rail corridors. Thus, rail transit tends to harm most transit users.

Rail transit also harms most auto drivers. Most regions building rail transit expect to spend half to four-fifths of their transportation capital budgets on transit systems that carry 0.5 to 4 percent of passenger travel. This imbalanced funding makes it impossible to remove highway bottlenecks and leads to growing congestion.

Rail's high cost makes it ineffective at reducing congestion. On average, $13 spent on rail transit is less effective at reducing congestion than $1 spent on freeway improvements. Investments in rail transit are only about half as effective as investments in bus transit.

Rail transit also tends to be more dangerous than other forms of travel. Interstate freeways cause 3.9 deaths per billion passenger miles. Accidents on urban roads and streets in general lead to about 6.8 deaths per billion passenger miles. Among the various forms of urban transit, buses, at 4.3 deaths per billion passenger miles, are the safest; heavy rail averages 5.0, commuter rail 11.3, and light rail 14.8.

Rail transit does little to save energy. The average light-rail line consumes more energy per passenger mile than passenger cars. While some commuter- and heavy-rail transit operations use a little less energy per passenger mile than cars, the energy consumed to construct rail lines can more than make up for this savings.

Nor is rail transit an effective way to clean the air. Even where rail transit has attracted new transit riders out of their cars, rail transit costs roughly $1 million per ton of air pollution eliminated. Many other techniques to clean the air cost less than $10,000 per ton.

Rail transit attracts riders because of its higher frequencies and fewer stops—and thus higher speeds—than bus transit. Yet buses can also operate more frequently with fewer stops. Rail transit requires years to build and can cost fifty times as much to start as comparable bus transit. As a result, the cost of attracting one auto commuter onto rail transit, relative to bus improvements, averages $10,000 a year or more.

For many, rail transit's incredible expense is its main attraction. Auto-haters love rail transit because it consumes funds that could otherwise be spent reducing congestion. Politicians love rail transit because the companies that will profit from it are a source of campaign contributions. Transit agencies love rail transit because it boosts their budgets and national prestige. But the public should not be fooled: For everyone else, rail transit is a disaster.

Pork Lovers, Auto Haters, and Nostalgia Buffs

America built thousands of miles of urban rail lines between 1880 and 1930. The biggest cities such as New York and Chicago built subways or elevateds (now known as *heavy rail*). Many large and a few medium-sized cities had commuter trains that ran on the same tracks as freight trains. Smaller cities built streetcar or interurban lines (now called *light rail*) that often ran in the same streets as horses, carriages, and automobiles. Nearly all of these rail lines were privately built.

Rail transit peaked in 1920, when the average urbanite took nearly 290 transit trips a year. By this time, however, Henry Ford's inexpensive cars were rapidly replacing transit. At the end of the 1920s, half of American families owned an automobile, and private construction of rail transit had ceased.

By 1930, buses were faster, more flexible, and less expensive to operate than rails, so transit companies used buses for new transit routes. As rail lines wore out, few transit operators could afford the cost of replacing rail cars, roadbeds, tracks, and electrical transmission facilities, so they replaced them with buses.

Contrary to popular belief, General Motors did not conspire to eliminate streetcars from American cities. GM was found guilty of trying to monopolize the sale of buses to transit companies that were replacing streetcars.[1] Far from eliminating transit, the General Motors group "injected badly needed capital into a dying industry" which possibly "prevented the financial collapse of the industry," says UCLA historian Scott Bottles.[2] Though most American transit systems were never under General Motors' control, almost every transit company in the U.S. soon replaced rail transit with buses. In 1966, when St. Louis converted its last rail line to buses, rail transit could only be found in New York, Chicago, Boston, Philadelphia, San Francisco, Washington, Pittsburgh, New Orleans, and Cleveland.

In 1960, the average urbanite rode transit only 75 times a year; most people didn't use it at all. Just 12 percent of Americans rode transit to work, while 64 percent drove to work. Though there were more urban residents than ever before, total transit trips had dropped to little more than half of their 1920 levels. Transit agencies could not afford to provide the intensive services available in 1920, especially in the lower density suburbs. Taken as a whole, the transit industry was profitable, but many companies were financially shaky and it was clearly not a growth industry.

Many became concerned that declining transit services would leave behind people who could not drive due to age, disability, or poverty. In 1964, Congress passed the Urban Mass Transit Act, offering to help cities and regions purchase and reequip transit companies so as to maintain service. Within a decade, cities eager for federal handouts replaced all but a handful of private transit companies with public transit agencies.

Initially, most agencies concentrated on improving bus service. The only major rail projects planned in the late 1960s were for Washington's Metrorail and San Francisco's Bay Area Rapid Transit, both of which were designed to replace older, obsolete rail systems.

In the early 1970s, Massachusetts Governor Francis Sargent decided to stop building freeways in the Boston area. Rather than lose the millions of dollars of federal funds that would have been spent on those roads, Sargent convinced Congress to allow cities to spend canceled-interstate-highway funds on transit instead.

Considering the growing opposition to inner-city highways, Sargent's idea was attractive to many cities, but it created a new problem. Federal transit funds could be spent only on capital improvements, not on operating costs. The funds released by canceling one highway could double a transit agency's bus fleet, but agencies could not afford to operate all of those buses.

Rail transit answered this dilemma. Rail's high capital costs could soak up federal funds without imposing high operating costs. But rail transit would also serve only a small percentage of people in an urban area.

The first wave of new rail construction in the 1970s included heavy-rail lines in Atlanta, Baltimore, and Miami; a light-rail line in San Diego; and people movers in Detroit and Miami. The people movers proved spectacularly unsuccessful, carrying less than a quarter of the riders predicted by planners. Heavy rail had much higher operating costs than anyone predicted.

That left light rail. San Diego was the first U.S. city to build a modern light-rail line, and it may have been the most successful U.S. rail transit line built in the last fifty years. Costs were low—$7 million a mile ($14 mil-

lion in 2003 dollars)—and ridership was high enough to cover a substantial percentage of operating costs. Portland, Sacramento, San Jose, and other urban areas that built light rail in the 1980s were no doubt influenced by San Diego's success.

Yet light rail was far from perfect. San Diego's was built without any federal funds, but costs zoomed when regions started tapping into the federal treasury. San Diego itself spent $30 million a mile on lines it built in the 1990s, and many other regions spent $50 million a mile or more. Light-rail routes in many regions attracted far fewer riders than planners projected.

The first important report suggesting that rail transit construction was proving disastrous was by Don Pickrell, a Department of Transportation economist. Looking at ten rail projects in 1989, Pickrell found that ridership predictions made at the time the decision to build was made were almost always significantly higher than actual ridership. He also found that predicted costs were almost always significantly lower than actual costs.[3]

Rail advocates argue that ridership and cost projections are more accurate today. While this is sometimes true, planners have also discovered that many urban leaders will support rail no matter how high the cost and how low the ridership. For them, rail transit is not about transportation but about pork barrel and the ego value of having a rail line in their region.

Much of the attraction to rail, says transportation researcher Jonathon Richmond, is based on myth. After interviewing public officials in Los Angeles, he concluded that rail supporters "tended to reject findings which failed to confirm their prior beliefs."[4] Light rail, Richmond concluded, "is not the result of a calculated, let alone reflective, effort to provide for the transportation needs" of people. "It is the creation of a mythology."

As *The Onion* satirically reports, "98 percent of Americans support the use of mass transit by others."[5]

Other, more sinister agendas support rail transit. First, rail makes better pork than buses. Engineering and construction companies, railcar manufacturers, bond dealers, and labor unions provide most of the financial support for rail campaigns.

Grassroots support for rail campaigns comes from car haters. Most legitimate objections to autos—including air pollution, safety, and energy concerns—have been or can easily be resolved with improved technology. Yet some people remain viscerally opposed to the idea that others are free to drive around. To them, rail transit's high cost is an advantage because dollars spent on rails cannot be spent on roads.

Some even argue that the inflexibility of rail transit is an advantage.[6] Exclusive bus ways, they fear, could easily be turned into regular highway lanes, thus reducing congestion. A similar conversion of rail lines would be more costly.

Today, many people nostalgically imagine that new rail lines will lead Americans to discard their autos. But the mobility provided by automobiles a few decades later is close to ten times greater than that provided by rail transit. In transit's peak year of 1920, the average urban American traveled about 1,600 miles a year by transit.[7] The average urban American now travels 13,300 miles a year by automobile within urban areas, and thousands of miles more between urban areas.[8]

Automobility has given Americans higher paying jobs, low-cost consumer goods, and recreation and social opportunities that did not exist in the streetcar era. Americans will not give up convenient and economical automobility to use trains that are slow, do not go where people want to go, and cost far more than autos to use.

Light rail may run on exclusive rights-of-way but sometimes also runs in streets with autos and pedestrians.

Heavy rail runs on exclusive rights-of-way, either subways or elevateds, that do not intersect with pedestrians or automobiles.

Commuter rail usually consists of Diesel-powered trains that often share tracks with freight trains.

Measuring Disaster

Rail advocates promise that investments in rail transit will improve service for current transit riders, attract large numbers of new transit riders, reduce congestion and air pollution, save taxpayers' money, and lead to positive urban redevelopment. This paper will show that, by these terms, rail transit is a financial and mobility disaster because it not only fails to achieve these goals, it often achieves the opposite.

To compare rail transit systems, this paper uses thirteen measures of the effects of rail transit on urban livability. These include:

1. The change in total transit ridership between 1990 and 2000;
2. The change in transit's share of motorized urban travel from 1990 to 2000;
3. The change in transit commuters between 1990 and 2000;
4. The change in transit's share of commuting from 1990 to 2000;
5. The estimated cost of building rail transit vs. its actual cost;
6. The estimated number of rail transit riders vs. actual riders;
7. The change in the travel time index (the additional time required to drive during rush hour vs. in non-congested conditions) between 1982 and 2001;
8. The change in per capita driving between 1982 and 2001;
9. The cost effectiveness of rail relative to freeways;
10. The cost effectiveness of rail relative to buses;
11. The safety of rail transit relative to autos and buses;
12. The energy cost or savings of rail transit relative to autos;
13. The effect of transit-oriented land-use policies on homebuyers.

There are four measures of the effects of rail transit on transit users, two measures of the effects on congestion, two measures of the reliability of transit planning, one measure of the effects on taxpayers, and three other measures of livability: safety, energy efficiency, and land use. Since transit users are a relatively tiny percentage of most urban populations, this might be overly weighted toward such users.

To rank the various urban areas with rail transit systems, this paper awards points to each urban area for each of these measures, usually equal to a percentage of the measure. For example, if transit ridership increased by 10 percent in a region, the region gets 10 points, while if ridership dropped by 10 percent, the region gets minus 10 points.

To keep the numbers roughly comparable, measures are chosen that mostly yield results between plus and minus 100. In all cases, the measures can return either positive or negative results, so the final total for any urban area could be somewhere between roughly plus or minus 1,000. The actual results range from about minus 50 to minus 500, indicating rail transit has net negative effects on all urban areas.

Of the nation's fifty largest urban areas, twenty-three had rail transit in 2000 and are included in this study. Some have had rail transit for more than a century; a few began rail service only near the end of the period covered by the study. Transit agencies in most of these areas have ambitious plans to expand their rail systems.

Three major forms of rail transit are reviewed in this study: light rail, heavy rail, and commuter rail. Streetcars such as those found in Memphis and Seattle are ignored because they mainly serve tourists, but the New Orleans streetcar system is included because it is designed to also serve commuters. People movers such as those in Detroit, Miami, and Jacksonville are not considered. New London to New Haven commuter rail service is considered only briefly because New Haven is outside of the top fifty urban areas.

Beginning on page 20, the second half of this paper includes detailed profiles of each of the twenty-three urban rail systems, briefer profiles of rail transit in Burlington and New Haven, and rail projects in the Twin Cities, Phoenix, and Trenton. These profiles contain additional data on transit ridership and market share trends plus indicators of rail transit performance in each of the regions.

Change in Transit Ridership and Transit's Share of Travel

What is measured and why: To find out if rail boosts ridership, this measure compares1990 transit ridership with 2000. The change in transit's share of motorized travel is also calculated over the same period.

How it is calculated: Federal Transit Administration reports show the annual trips and passenger miles carried by transit agency.[9] Trips are used to calculate ridership growth.

To calculate transit's share of travel, transit passenger miles are compared with the vehicle miles of travel in each urban area reported in the Federal Highway Administration's annual *Highway Statistics* report.[10] To get passenger miles of travel, vehicle miles of travel are multiplied by the average vehicle occupancy of 1.6, based on the *National Household Transportation Survey*.[11]

Results: Five rail regions lost transit riders in the 1990s and ridership growth in six other regions was slower than population growth. Transit lost share of passenger travel in nearly two out of three rail regions, and gains in several other regions were very small.

Between 1990 and 2000, annual transit trips in all rail regions combined grew by 8.3 percent. More than 77 percent of this increase was due to the 15-percent growth in New York transit trips, which was due mainly to fare reductions, not improved rail transit.

Excluding New York, transit trips in rail regions grew by only 3.4 percent. Even this increase is suspect because the opening of rail transit leads to more transfers as formerly through bus routes become feeder buses to rail transit stations. Each transfer is counted as a separate trip. Annual transit trips for non-rail regions grew by 1.0 percent, which is not significantly different from rail regions once the transfer rate is considered.

Special notes: Most transit trips are shorter than auto trips, so San Jose transit can gain riders and still lose travel share. But commuter rail trips tend to be long, so where commuter rail is popular, as in Boston, transit share may increase with only a small ridership growth.

Perhaps the biggest surprises are Chicago and Washington, DC. Despite its extensive rail network, Chicago's transit systems carried 100 million fewer trips in 2000 than in 1990. Despite a $12 billion subway system, Washington had only a small increase in transit ridership and a significant drop in transit market share.

Interpretation: Rail transit can negatively affect overall transit ridership because the cost of rail transit is so high that agencies often raise fares or reduce bus service, a problem that has particularly plagued Los Angeles transit and is now facing San Jose. Also, rail transit—particularly light-rail transit—reduces service for many transit riders. Light rail typically goes just 20 miles an hour. When rail opens for service, agencies cancel express buses that average 35 miles per hour or faster, thus lengthening the trip for many riders.

Florida researchers observe that many rail "systems have not generally been able to show steady growth in productivity over time."[12] The opening of new rail lines increases total ridership. But after two or three years, ridership either stops growing or grows no faster (and often slower) than before rail construction began. Further rider gains only happen if more rail lines open.

Table One
Change in Transit Ridership and Share of Passenger Travel

	Ridership growth	Population growth	Change in share
Atlanta	14%	62%	-20%
Baltimore	-3%	10%	-4%
Boston	10%	45%	21%
Buffalo	-5%	2%	-24%
Chicago	-15%	22%	-20%
Cleveland	-14%	7%	-15%
Dallas-Fort Worth	31%	30%	-7%
Denver	40%	31%	1%
Los Angeles	14%	10%	3%
Miami-Ft. Lauderdale	43%	25%	-14%
New Orleans	-26%	-3%	-14%
New York	15%	11%	2%
Philadelphia	12%	22%	-14%
Pittsburgh	13%	4%	-26%
Portland	59%	35%	28%
Sacramento	48%	27%	19%
Salt Lake City	3%	12%	-32%
San Diego	51%	14%	19%
San Francisco-Oakland	5%	11%	-2%
San Jose	23%	7%	-0%
Seattle	30%	55%	6%
St. Louis	22%	7%	-17%
Washington	3%	17%	-9%

Source: US DOT

Transit Commuting and Share of Commuting

What is measured and why: While transit's share of total travel may be small, rail transit is often advertised as a way of reducing congestion by carrying lots of commuters. This measure asks how transit commuting and transit's share of commuters has changed in rail regions.

How it is calculated: The decennial census asks one out of every six households how workers in that household commute to work. The American Factfinder on the census.gov web site allows users to compare these data for urbanized areas in 1990 and 2000. Some urbanized areas were merged or divided between 1990 and 2000, so data for those areas are combined in years in which they are separate.

Urbanized area is smaller than the more commonly used *metropolitan statistical area*; the former includes only developed land (roughly including all suburban census tracts denser than about 1,000 people per square mile and contiguous with the central city); the latter includes all the land in counties that may be only partly urbanized. The San Bernardino metropolitan statistical area, for example, extends all the way through the Mojave Desert to the Nevada border. Urbanized data make more sense when reviewing urban transportation data.

Results: About half of all rail regions lost transit commuters during the 1990s. Losses are particularly surprising in Washington, Baltimore, Chicago, and Los Angeles, which have significant rail transit systems. Chicago, Philadelphia, and Washington all lost more than 20,000 transit commuters.

Taken together, the twenty-three regions with rail transit systems lost 14,100 transit commuters between 1990 and 2000. By comparison, transit in urban areas that did not have rail transit carried 53,000 more commuters in 2000 than in 1990. Transit lost market share of commuters in 60 percent of the rail regions. Of the regions that gained commuting share, only four gained more than 5 percent.

Special notes: Los Angeles is unusual in that it lost almost 5 percent of transit commuters, but it lost an even larger percent of total jobs, so transit managed to gain a share of commuters. Meanwhile, the good news in San Jose is mitigated by the huge reduction in transit ridership, and especially in rail transit ridership, since 2000. Because of the recession, San Jose has lost 28 percent of its bus riders and an astounding 44 percent of its light-rail riders.

Interpretation: Losses of transit commuters and transit's share of commuting reflect the continuing suburbanization of jobs in most urban regions. For example, Cook County (which is mostly Chicago) lost 18,000 jobs in the 1990s, while Chicago's suburban counties gained more than 300,000 jobs. Rail transit obviously has not been able to reverse this trend, even in regions with extensive rail networks.

Table Two
Change in Transit Commuters and
Share of Commuter Travel

	Change in Commuters	Percent Change	Change in Share
Atlanta	3,724	6%	-28%
Baltimore	-14,011	-17%	-19%
Boston	26,665	12%	-2%
Buffalo	-5,864	-26%	-4%
Chicago	-33,794	-7%	-20%
Cleveland	-10,031	-20%	-26%
Dallas-Fort Worth	-1,288	-3%	-20%
Denver	13,169	37%	6%
Los Angeles	-13,890	-5%	3%
Miami-Ft. Lauderdale	1,474	2%	-10%
New Orleans	-5,725	-16%	-14%
New York	11,999	1%	-1%
Philadelphia	-35,575	-13%	-25%
Pittsburgh	-10,549	-14%	-20%
Portland	20,907	56%	15%
Sacramento	3,333	24%	4%
Salt Lake City	3,126	26%	4%
San Diego	3,671	9%	1%
San Francisco-Oakland	16,975	7%	1%
San Jose	3,400	15%	17%
Seattle	24,544	31%	11%
St. Louis	-3,838	-12%	-18%
Washington	-21,258	-7%	-13%

Source: Census Bureau

Forecast vs. Actual Costs and Ridership

What is measured and why: Ridership and cost projections made at the time local governments or voters agree to build rail transit lines are often wildly optimistic. This measure compares projections with the actual outcomes.

How it is calculated: Some data are taken from Pickrell's 1989 evaluation of forecast and actual cost and ridership.[13] Other are from environmental impact statements for individual projects and published figures on actual costs and ridership. Costs are all adjusted for inflation to constant dollars. In regions with more than one recent rail project, numbers were summed for all recent projects for which data are available.

Data for some regions are blank because they have not built many rail lines in recent years. For example, the Hudson-Bergen light rail represents an insignificant share of New York's transit, so it is not included here. Other regions have cost data but no ridership data comparable to projections, which are usually made for several years after the line opens.

Results: In the regions for which data are available, ridership fell short of expectations in every case and costs were higher than expected in all but one case. This accords with a recent survey of American transportation projects that found that, on average, rail construction projects cost 41 percent more than the original estimates (compared with only 8 percent for highway projects).[14]

Special notes: These results conflict with claims made by many transit agencies that rail projects are under budget or carry more than the expected number of riders. This is because agencies often revise costs upward and ridership forecasts downward after the decision has been made to build but before it is completed.

Interpretation: One analyst calls the overestimate of rail costs "strategic misrepresentation," meaning that transit planners underestimate costs in order to get their rail plans approved.[15] Another simply calls it lying.[16]

"I am convinced that the cost overruns and patronage overestimates were not the result of technical errors, honest mistakes, or inadequate methods," says University of California Professor Martin Wachs. "In case after case, planners, engineers, and economists have told me that they have had to 'revise' their forecasts many times because they failed to satisfy their superiors."[17]

Congress has given regional leaders an incentive to distort data. Most federal transit grants go for capital funding, not operations. Since rail transit has high capital costs, regions can maximize federal pork barrel by focusing on rail. "The systematic tendency to overestimate ridership and underestimate capital and operating costs introduces a distinct bias toward the selection of capital-intensive transit improvements such as rail lines," observes US DOT researcher Don Pickrell.[18]

Rail advocates claim projections are more accurate today than a few years ago. While this appears true in Salt Lake City and a few other instances, many recent projects have gone well over budget, including rail lines in Dallas, Seattle, and San Francisco. Portland planners recently increased the estimated cost of an approved commuter rail line by 45 percent.

Table Three
Cost & Ridership as Percent Difference from Forecast

	Cost Overrun	Rider Shortfall
Atlanta	58%	-63%
Baltimore	60%	-59%
Boston		
Buffalo	61%	-68%
Chicago		
Cleveland		
Dallas-Fort Worth	37%	
Denver	79%	
Los Angeles	100%	-50%
Miami-Ft. Lauderdale	58%	-85%
New Orleans	0%	
New York		
Philadelphia		
Pittsburgh	-11%	-66%
Portland	65%	-50%
Sacramento	13%	-71%
Salt Lake City	2%	0%
San Diego		
San Francisco-Oakland	33%	-49%
San Jose	32%	
Seattle	88%	
St. Louis	45%	
Washington	83%	-28%

Blanks indicate no new transit lines or no data available.

Congestion

What is measured and why: Many voters support rail transit in the hope it will reduce congestion. The Texas Transportation Institute estimates that congestion costs Americans $60 billion and wastes 6 billion gallons of fuel each year.[19] Congestion also poses serious safety hazards and significantly contributes to air pollution.

Two measures of traffic growth are used here. The *travel time index* is the amount of time it takes to travel during rush hour compared with travel when there is no congestion. The second measure, the vehicle miles of travel per person, is used because an important goal of rail transit is to reduce auto driving. If per capita driving increases, then rail transit has failed.

How it is calculated: The Texas Transportation Institute calculated travel time indices and delay hours for seventy-five urban areas from 1982 to 2001.[20] The numbers here are based on the growth in travel time index and growth in per capita driving between 1982 and 2001. For the purposes of the Rail Livability Index, a minus sign will be added to each of these scores. In other words, if a region experiences a 10 percent growth in the travel time index, it gets a minus 10.

Results: All regions suffered an increase in congestion and enjoyed an increase in per capita driving (which is regarded as a negative only because rail is supposed to substitute for auto driving). Some of the largest increases are in regions where rail is supposedly successful. St. Louis and Portland, for example, both had huge increases in per capita driving.

Special notes: Many regions that have invested huge amounts in rail transit suffered the greatest increases in congestion. Transportation plans for rail regions call for spending 30 to 80 percent of the region's transportation capital funds on transit systems that carry (including buses) just 0.75 to 5.0 percent of passenger travel. That is not a prescription for reducing congestion.

Interpretation: Rail transit can do little to reduce congestion because transit's share of travel is so small in most regions. As Brookings Institution economist Anthony Downs points out, if transit grew by 5 percent a year and highway driving grew by only 1 percent a year, it would take more than thirty years for transit's national share to increase from 1 to 5 percent.[21]

In short, twice nearly nothing is still nearly nothing.

Out of the seventy-five regions included in the Texas Transportation Institute's data, rail regions form sixteen of the twenty with the fastest-growing TTI and twelve of the twenty with the fastest-growing hours of delay per commuter. Only three rail regions are among the twenty with the slowest-growing TTI and only four are among the twenty with the slowest-growing hours of delay per commuter. Slow population growth, not rail transit, helped those rail regions escape congestion.

Rail transit can make congestion worse in two ways. First, light rail and commuter rail both directly increase congestion at grade crossings while light rail increases congestion by occupying lanes formerly reserved for or open to autos. Second, rail can indirectly increase congestion by diverting transportation funds away from projects that could actually reduce congestion.

Table Four
Growth in Congestion and Per Capita Driving

	Travel Time	VMT/Capita
Atlanta	29	68
Baltimore	22	46
Boston	29	28
Buffalo	5	62
Chicago	25	47
Cleveland	10	37
Dallas-Fort Worth	24	14
Denver	34	14
Los Angeles	41	10
Miami-Ft. Lauderdale	28	41
New Orleans	7	29
New York	25	21
Philadelphia	17	35
Pittsburgh	2	35
Portland	37	71
Sacramento	24	13
Salt Lake City	17	45
San Diego	28	40
San Francisco-Oakland	32	35
San Jose	21	37
Seattle	31	39
St. Louis	12	86
Washington	25	35

Source: Calculated from Texas Transportation Institute data.

Cost Effectiveness

What is measured and why: Rail transit is expensive, but is it worth the cost? This section looks at rail's cost effectiveness compared with freeways and with buses.

How it is calculated: Freeway construction costs average $5 to $10 million per lane mile. For the purpose of this analysis, the upper figure was compared with the cost of rail transit in each region. Construction costs were used in the case of rail lines built since 1970. For rail lines built before 1970, costs are based on capital improvements made in the past decade (1992 to 2001).

The actual ridership of each rail line, in terms of daily passenger miles per route mile, was also compared with the actual use of the average freeway lane in each region. If the average rail mile cost twice as much as the the average freeway lane mile, and the average freeway lane mile carried twice as many passenger miles per day as the average rail mile, then the rail line was judged to be 75 percent less cost effective than a freeway.

Similar calculations were made for buses assuming that capital costs include enough buses to provide as much capacity as is provided by the rail vehicles and that operating costs are the same as the average bus operating costs of the dominant transit provider in each region. This is generous because bus operating costs in major corridors are likely to be significantly lower than average. If the combination of amortized capital costs plus operating costs of buses is 75 percent that of rails, then the rail system is scored minus 25.

Results: Freeways are an average of 14 times more cost effective than rails and are more cost effective than rails in every region. Buses are rated less cost effective than rails in five regions, but on the average are 1.7 times more cost effective than rails.

Special notes: St. Louis and San Diego are the only new-rail regions in which buses appear less cost effective than rails. In the case of St. Louis, this is because the agency reports bus loads that are 35 percent below average, making for high bus operating costs. If buses only average loadings on light-rail routes, they would be more cost effective than rails. San Diego has typical bus operating costs but light-rail operating costs that are less than half the national average for light-rail lines.

Interpretation: Though rail advocates often argue that a single rail line has the capacity to carry more people than an eight-lane freeway, the fact is that no rail route outside of New York carries as much as 1.25 freeway lanes. Since most new rail construction costs far more per mile than a mile of freeway lane, rail simply cannot compete with freeways as cost effective transportation. Rails appear to be a bit more competitive with buses, but buses operated in major corridors tend to have far lower than average operating costs, which would make buses far more cost effective in rail corridors.

Transportation funds are limited. Transit dollars spent on rail transit can't be spent on bus transit, where they can usually do more good for transit riders. Transportation dollars spent on rail transit can't be spent on roadway improvements, where they could be far more effective at reducing congestion. Transit projects that cost hundreds of millions or billions of dollars and produce so few benefits are bound to end up as disasters.

Table Five

Rail Cost Effectiveness Relative to Freeways and Buses

	Freeway	Bus	Cost v. fwy	Cost v. bus
Atlanta	13.4	1.7	-93%	-42%
Baltimore	29.5	3.8	-97%	-74%
Boston	2.8	0.7	-64%	44%
Buffalo	38.9	4.7	-97%	-79%
Chicago	1.9	0.6	-47%	80%
Cleveland	9.4	1.2	-89%	-19%
Dallas-Fort Worth	9.0	1.5	-89%	-31%
Denver	9.9	1.4	-90%	-29%
Los Angeles	11.2	1.4	-91%	-30%
Miami-Ft. Lauderdale	14.4	1.9	-93%	-48%
New Orleans	19.2	2.0	-95%	-50%
New York	1.4	0.5	-27%	87%
Philadelphia	2.3	0.7	-56%	49%
Pittsburgh	5.9	2.0	-83%	-50%
Portland	10.4	1.3	-90%	-25%
Sacramento	9.8	1.7	-90%	-40%
Salt Lake City	8.1	3.0	-88%	-66%
San Diego	5.9	0.7	-83%	35%
San Francisco-Oakland	14.1	1.6	-93%	-39%
San Jose	14.3	1.6	-93%	-39%
Seattle	28.5	2.5	-97%	-61%
St. Louis	10.0	0.7	-90%	35%
Washington	10.7	1.3	-91%	-23%

Source: Calculated from Federal Transit Administration data.

Safety

What is measured and why: Rail transit is safe for its users, but because rail vehicles are so heavy, they can be dangerous for auto users and pedestrians. Heavy-rail lines are separated from auto and pedestrian traffic, so they produce few fatalities. But light- and commuter-rail lines injure and kill many people each year. This measure compares rail safety with the safety of urban roads and buses.

How it is calculated: The 1992 through 2001 National Transit Data Base included data on collision-related fatalities for all transit systems. Urban driving results in 6.8 fatalities per billion passenger miles and transit buses cause about 4.3 per billion miles. This paper calculates the number of lives saved or lost by rail transit assuming that, without rail transit, half of rail riders would take the bus and half would drive. To account for population differences among regions, the paper uses an index of lives saved or lost per ten million people.

Results: Rails are more deadly than the alternatives in 15 out of 23 rail regions. Statistically, rail systems in Atlanta and Washington, DC, saved nearly 70 lives. But rail systems in Chicago and New York each cost twice that many lives, and Los Angeles rail cost more than 70 lives. The bottom line is that rail transit unnecessarily kills about 45 people per year.

Special notes: Though light-rail lines tend to be dangerous, those in Buffalo, Cleveland, Dallas, Pittsburgh, and St. Louis seem to be safely designed. Seattle's commuter-rail line is too new to have caused many accidents.

Interpretation: Because heavy rail is separated from autos and pedestrians, it tends to be safer than most forms of travel, though not buses or urban interstate highways. Atlanta and Washington score well because they rely exclusively or mainly on heavy rail. Commuter rail and light rail can be quite dangerous because they so often intersect streets and pedestrian ways.

Table Six

Rail Safety Relative to Autos and Buses

	Fatalities Per Billion Passenger Miles				Lives saved	Population	Saved/Lost Per 10
	CR	HR	LR	Average	or lost	(thousands)	million residents
Atlanta		3.6		3.6	9	3,500	25
Baltimore	0.7	8.2	19.9	11.3	-7	2,076	-32
Boston	13.1	5.5	3.6	8.9	-39	4,032	-96
Buffalo			0.0	0.0	1	977	10
Chicago	16.0	4.6		11.7	-151	8,308	-182
Cleveland		7.5	3.6	6.1	0	1,787	-3
Dallas	0.0		7.0	5.9	0	4,146	0
Denver			25.7	25.7	-5	1,985	-17
Los Angeles	20.4	3.3	37.8	26.2	-73	12,493	-59
Miami	24.8	2.7		11.7	-12	4,919	-24
New Orleans			14.0	14.0	-1	1,009	-12
New York	8.8	5.1		6.6	-138	17,800	-77
Philadelphia	13.5	7.2	10.9	10.0	-42	5,149	-81
Pittsburgh			5.3	5.3	0	1,753	1
Portland			12.0	12.0	-5	1,583	-31
Sacramento			15.7	15.7	-4	1,393	-28
Salt Lake City			29.9	29.9	-2	888	-28
San Diego	34.0		16.8	18.9	-20	2,674	-74
San Francisco	32.8	2.9	9.5	7.1	-20	4,015	-50
San Jose	0.0		17.3	13.1	-3	1,538	-23
Seattle	0.0			0.0	0	2,712	0
St. Louis			3.0	3.0	2	2,078	8
Washington	0.5	1.0		0.9	59	3,934	150

Source: National Transit Data Base, 1992-2001.

Energy

What is measured and why: Because rail cars can hold lots of people, they are often presumed to consume less energy per passenger mile than autos. This measure calculates the energy cost per passenger mile of each rail system relative to the cost for passenger cars.

How it is calculated: The 2002 National Transit Data Base details the fuel consumption of most transit systems by mode. Kilowatt hours are converted to British thermal units (BTUs) by multiplying by 11,765. Gallons of Diesel fuel are converted to BTUs by multiplying by 128,700. These multipliers are from the U.S. Department of Energy's Transportation Energy Data Book.[22] The results are compared with the average energy consumption of passenger cars, which is about 3,500 BTUs per passenger mile.[23] Minus 20 percent means that the rail system consumes 20 percent more energy than passenger cars, while plus 20 percent means the rail system uses 20 percent less energy than cars.

Results: More than half the rail systems consume more energy per passenger mile than passenger autos. Heavy rail systems tend to be most efficient, but what really counts is ridership: rail lines that carry lots of passengers per vehicle are obviously going to do best.

Special notes: Unfortunately, 2002 data are not available for several Diesel-powered commuter-rail lines, including those in Dallas, Los Angeles, Ft. Lauderdale, San Francisco, Seattle, and Washington. Lines in Dallas and Seattle tend to be more poorly patronized than average, so they may be less energy efficient.

An audit of Vermont's Champlain Flyer commuter train found that the train saved 53,000 gallons of gasoline each year by taking cars off the road. But to do so, the Diesel engine consumed 124,000 gallons of Diesel fuel, for a net loss of 71,000 gallons a year.

Interpretation: Rail advocates in cities that scored well by this measure should not jump for joy. Against any savings must be counted the energy cost of constructing rail transit lines. Portland light-rail planners estimate that construction of one proposed rail line would save 1.4 billion BTUs per weekday. However, construction would use 11 trillion BTUs, so it would take twenty-five years of savings to make up for the energy cost of construction.[24] But automobiles are likely to become much more efficient in twenty-five years, thus prolonging the time before there is any net energy savings.

Table Seven

Rail Energy Usage Relative to Passenger Autos

Atlanta	-22%
Baltimore	-43%
Boston	19%
Buffalo	-99%
Chicago	3%
Cleveland	-86%
Dallas-Fort Worth	-100%
Denver	-1%
Los Angeles	-19%
Miami-Ft. Lauderdale	-101%
New Orleans	24%
New York	26%
Philadelphia	-51%
Pittsburgh	-110%
Portland	29%
Sacramento	-20%
Salt Lake City	-1%
San Diego	18%
San Francisco-Oakland	14%
San Jose	-147%
Seattle	
St. Louis	24%
Washington	8%

Source: 2002 National Transit Data Base, table 17. Data are not available for Seattle because the agency failed to report fuel consumption. Some or all commuter lines in Dallas-Ft. Worth, Los Angeles, Miami-Ft. Lauderdale, Philadelphia, San Francisco, and Washington are left out for the same reason.

Land-Use Regulation and Property Rights

What is measured and why: Many of the urban areas in this study use a variety of land-use planning tools to promote rail transit ridership. These tools include zoning and subsidies for transit-oriented development and urban-growth boundaries to increase population densities. These tools also restrict property rights and, by creating shortages of the low-density housing that most people want, they can make housing less affordable. This measure attempts to account for this by comparing housing affordability in each rail region with the national average.

How it is calculated: The National Association of Home Builders published a "housing opportunity index" that measured the percent of homes affordable to a median-income family in most major urban areas. Nationally, the average is about 67 percent.[25] This measure compares affordability in each rail region with this national average. For example, if the housing opportunity index for an urban area is 60 percent, which is about 10 percent less than 67 percent, that urban area is scored minus 10.

Results: Housing in about half of rail regions is significantly less affordable than the national average. Not by coincidence, these are the regions known to have some of the most restrictive land-use policies, particularly San Jose, San Diego, San Francisco-Oakland, and Portland.

Special notes: Easy housing affordability in some rail regions is probably not due to transit-oriented zoning and planning. Instead, it seems to be more due to a lack of land-use regulation, in regions such as Atlanta and Dallas, or to lack of population growth in regions such as Cleveland and Buffalo. To be fair, however, such regions are still awarded positive points.

Interpretation: In regions that lack affordable housing, a recent study published by Harvard University found, "zoning and other land-use controls play the dominant role in making housing expensive. . . . Measures of zoning strictness are highly correlated with high prices."[26] Zoning reform, the authors conclude, is the best way to make housing more affordable. However, the zoning rules surrounding rail transit lines move in the opposite direction.

Table Eight
Housing Opportunity Index and Housing Affordability in Rail Regions Relative to National Average

	HOI	Affordability
Atlanta	81.8	22%
Baltimore	77.4	16%
Boston	48.2	-28%
Buffalo	80.1	20%
Chicago	73.7	10%
Cleveland	79.9	19%
Dallas-Fort Worth	70.5	5%
Denver	59.6	-11%
Los Angeles	34.4	-49%
Miami-Ft. Lauderdale	64.2	-4%
New Orleans	69.5	4%
New York	49.9	-26%
Philadelphia	76.7	14%
Pittsburgh	69.4	4%
Portland	46.6	-30%
Sacramento	43.7	-35%
Salt Lake City	68.3	2%
San Diego	21.6	-68%
San Francisco-Oakland	9.2	-86%
San Jose	20.1	-70%
Seattle	63.1	-6%
St. Louis	77.6	16%
Washington	78.3	17%

Source: National Association of Home Builders.

Air Pollution

Unfortunately, not all effects of rail transit can be easily measured. The most important gap in our data is rail's effect on air pollution. Advocates of rail transit enthusiastically play on public fears that automotive air pollution has reached crisis proportions. In fact, though Americans drive two-and-one-half times as many miles as they did thirty years ago, today's automobiles are so clean that they emit far less total pollution.

For the foreseeable future, the average automobile on the road in any given year will produce 10 percent less emissions than the previous year's average. Since urban driving is increasing at only about 3.5 percent per year, total emissions are declining by more than 6 percent per year.[27]

Where air pollution is still a problem, rail transit is just about the least-effective way of controlling it. "Rail projects typically cost about $1 million per ton of ozone precursors eliminated," says Joel Schwartz, "yet regulators do not consider an air pollution reduction measure to be cost effective unless it costs less than about $10,000 to $20,000 per ton of pollution eliminated."[28]

For example, a joint EPA-Department of Transportation report on auto-related air pollution found that coordinating traffic signals was by far the most cost-effective way to reduce pollution. San Jose recently retimed traffic signals on twenty-eight of the city's most congested streets at a cost of $500,000. Based on measurements of congestion before and after the project, engineers estimate that they reduced travel times by 16 percent, saved 471,000 gallons of gasoline a year, and reduced pollution by 53 tons a year. If the $500,000 cost is spread out over ten years, that's a cost of less than $1,000 a ton—and it is more than paid for in the first year by the savings to drivers in gasoline.[30]

In contrast, some rail transit projects actually increase air pollution. Light rail can lead to increased pollution when traffic congestion is worsened by converting auto lanes that to rail lanes. The Diesel locomotives that usually power commuter rail emit a variety of pollutants. The Champlain Flyer, a commuter rail experiment in Vermont, was terminated when an audit showed, among other things, that the Diesel locomotives produced more particulates, nitrogen oxides, and other pollutants than the automobiles it took off the road.[31]

Rating Disaster Using a Rail Livability Index

Table nine creates a *Rail Livability Index* by totaling scores from all thirteen categories for each urban area. The worst scores are in Buffalo, Baltimore, Miami, and San Jose, where rail transit lines have been major failures.

The least-disastrous score is for New York, the one region in America where rail transit comes close to making sense. This is partly because New York has had rail transit for many decades and did not lose many points for recent wasteful spending on rail transit. If New York builds the $2.1 billion per mile Second Avenue Subway and other expensive proposals, its score would decline.

Relatively high scores are achieved in Denver, mainly due to its successful bus system; Boston, which has enjoyed significant transit growth; San Diego, which some say has the nation's least-disastrous light-rail line; and Washington, mainly due to the safety of its subway system. But even these cities would have done better with other modes of transportation.

While some may quarrel with the particular weighting of any given issue, the overwhelming evidence is that rail has a negative effect on urban livability.

- No one category dominates. Throwing out each region's worst score in any category still leaves a negative score in all regions except New York.
- While every category can potentially score positive points, only one region gets a positive score in more than five categories, and most regions get positive scores in four or fewer categories.
- The categories that affect the most people—congestion and cost effectiveness relative to freeways—are negative in every region.
- Conversely, the only categories that returned many positive numbers—ridership growth and commuter growth—affect the fewest urbanites because so few people regularly ride transit.
- All categories could have been either positive or negative, but four had no positive scores in any rail region and one had only one positive score.

Table Nine
Rail Livability Index

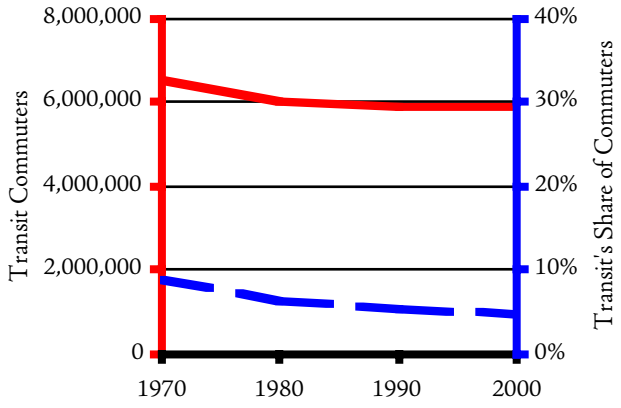
	Rider Growth	Travel Share	Commuter Growth	Commuter Share	Cost Overrun	Rider Shortfall	TTI Growth	VMT/Cap Growth	Cost Effective v. Fwys	Cost Effective v. Buses	Safety	Energy	Land Use	Total
Atlanta	14	-20	6	-28	-58	-63	-29	-68	-93	-42	25	-22	22	-356
Baltimore	-3	-4	-17	-19	-60	-59	-22	-46	-97	-74	-32	-43	16	-460
Boston	10	21	12	-2	0	0	-29	-28	-64	44	-96	19	-28	-141
Buffalo	-5	-24	-26	-4	-61	-68	-5	-62	-97	-79	10	-99	20	-500
Chicago	-15	-20	-7	-20	0	0	-25	-47	-47	80	-182	3	10	-291
Cleveland	-14	-15	-20	-26	0	0	-10	-37	-89	-19	-3	-86	19	-300
Dallas	31	-7	-3	-20	-37	0	-24	-14	-89	-31	0	-100	5	-289
Denver	40	1	37	6	-79	0	-34	-14	-90	-29	-17	-1	-11	-191
Los Angeles	14	3	-5	3	-56	-50	-41	-10	-91	-30	-59	-19	-49	-390
Miami	43	-14	2	-10	-58	-85	-28	-41	-93	-48	-24	-101	-4	-461
New Orleans	-26	-14	-16	-14	0	0	-7	-29	-95	-50	-12	24	4	-235
New York	15	2	1	-1	0	0	-25	-21	-27	87	-77	26	-26	-46
Philadelphia	12	-14	-13	-25	0	0	-17	-35	-56	49	-81	-51	14	-217
Pittsburgh	13	-26	-14	-20	11	-66	-2	-35	-83	-50	1	-110	4	-377
Portland	59	28	56	15	-65	-50	-37	-71	-90	-25	-31	29	-30	-212
Sacramento	48	19	24	4	-13	-71	-24	-13	-90	-40	-28	-20	-35	-239
Salt Lake City	3	-32	26	4	-2	0	-17	-45	-88	-66	-28	-1	2	-244
San Diego	51	19	9	1	0	0	-28	-40	-83	35	-74	18	-68	-160
San Francisco	5	-2	7	1	-33	-49	-32	-35	-93	-39	-50	14	-86	-392
San Jose	23	0	15	17	-32	0	-21	-37	-93	-39	-23	-147	-70	-407
Seattle	30	6	31	11	-88	0	-31	-39	-97	-61	0	0	-6	-244
St. Louis	22	-17	-12	-18	-45	0	-12	-86	-90	35	8	24	16	-175
Washington	3	-9	-30	-13	-83	-28	-25	-35	-91	-23	150	8	17	-159

Disaster Profiles

The remainder of this report consists of a brief history of the rail systems in each of the twenty-three rail regions as well as a description of rail plans in a few other regions. Data on rail miles, construction costs, ridership, and future plans are taken from a variety of sources, including the National Transit Data Base, the Federal Transit Administration's annual New Starts reports, individual transit agency web sites, and environmental impact statements for rail projects. Some of the numbers, especially the number of miles of rail lines in each region, may not be quite up to date if new lines have recently opened.

Most profiles are accompanied by two tables of data and a chart. The chart uses census data to show transit commuter trends from 1970 through 2000. The solid red line shows the number of people in each region who say they usually ride transit to work and should be read against the left vertical axis. The numbers on this axis vary depending on the region. The dashed blue line shows transit's share of all commuters and should be read against the right vertical axis. This axis is held constant at a maximum of 40 percent, the level approached by New York in 1970. The summary graph below includes data for the entire U.S.

U.S. Transit Commuting Trends



The "Transit System Data" table shows the number of trips carried by each region's transit agencies and the share of motorized passenger miles carried by transit in 1990 and 2000. Transit numbers are from the National Transit Data Base. To calculate market share, *Highway Statistics* for 1990 and 2000 provided vehicle miles traveled in each region; as usual, these are multiplied by average occupancies of 1.6 people per car to get passenger miles. The summary table below presents national averages for all urban areas.

U.S. Urban Transit System Data

	Trips (millions)	Share of of Travel
1990	8,799	2.02%
2000	9,363	1.79%

The "Rail Transit Data" table includes six items for each rail system based on the 2002 *National Transit Data Base*:

- *Avg. Occup.* is the average number of people carried in each rail vehicle calculated by dividing passenger miles by the number of vehicle revenue miles. This is "the best single measure of transportation productivity of a transit investment" say researchers at the Center for Urban Transportation Research.
- *Cost/Trip* is the average operating cost per passenger trip. The Federal Transit Administration does not require agencies to report fares by mode, so fares cannot be easily compared with operating costs. Nationally, fares averaged about 92 cents a trip in 2001, but are higher for many rail trips. Cost per trip is a reasonable measure of efficiency for light-rail and heavy-rail transit because both light- and heavy-rail trips tend to be about the same length as bus trips.
- *Cost/PM* is the average operating cost per passenger mile. Commuter-rail trips tend to be significantly longer than bus trips, so cost per passenger mile is a better measure of commuter-rail efficiency than cost per trip.
- *PM/Rt Mi* is the average number of passenger miles carried per bidirectional route mile each day. A *bidirectional route mile* includes trains going in both directions, usually on two tracks. For comparison, the average freeway lane mile in rail regions carries 27,860 passenger miles per day; Los Angeles freeways carry an average of 37,000 passenger miles per lane mile per day.

- *% Fwy Ln Mi* is the PM/Rt Mi as a percent of the passenger miles carried by the average freeway lane mile in the same region. Because most commuter-rail lines operate only a few hours a day, they average just 30 percent of a freeway lane mile. Light rail does a little better and heavy rail tends to do much better. A few rail lines actually carry more than a freeway lane mile, but only New York subways and PATH trains carry more than two lane miles worth of passenger miles.
- *Travel Share* is the share of regional motorized passenger travel carried by each rail system.

Comparative data for the average commuter-, heavy-, and light-rail lines are shown below. Because New York overwhelms the data for commuter and heavy rail and is not representative of other regions, the averages for these two modes are also shown for rail regions excluding New York.

Rail Transit Data for Twenty-Three Rail Regions

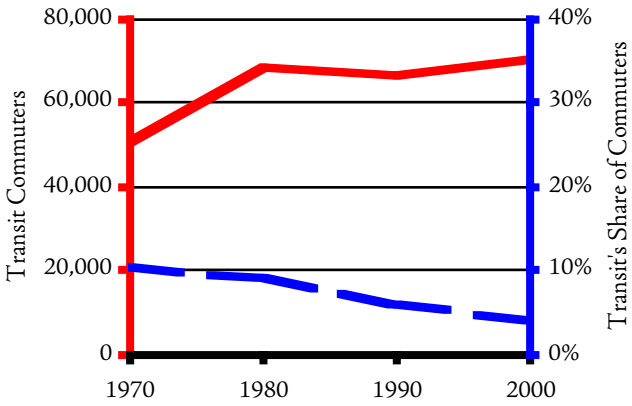
	Avg. Occup.	Cost/ Trip	Cost/ PM	PM/ Rt Mi	% Fwy Ln Mi	Travel Share
Commuter	36	7.23	0.32	7,621	27%	1.0%
CR– NY	36	6.55	0.31	4,489	16%	0.5%
Heavy rail	23	1.59	0.31	47,635	170%	1.6%
HR– NY	22	1.94	0.33	30,063	107%	0.8%
Light rail	24	2.33	0.54	8,447	30%	0.2%

Atlanta

Description: Atlanta started building its heavy-rail system in the 1970s, and opened its first line in 1979. Today, Atlanta's 48-mile rail system has four main spokes, with two smaller branches. With twice the land area of the DC metro area and less than half as many miles of rail, rail transit serves only a small portion of the vast Atlanta region. With an average speed of about 30 miles per hour, rail isn't competitive with the auto for most people.

Why it is a disaster: The Pickrell report says that Atlanta's rail system cost 58 percent more than original estimates and its operating costs were three times greater than anticipated. Pickrell estimated that each new transit ride cost taxpayers nearly $30, and each new commuter cost $15,000 per year.

Atlanta Transit Commuting Trends



Rail transit has been accompanied by a huge loss in transit's share of both commuting and total travel. While the 2000 census reported 6,000 new transit commuters since 1990, more than a third of these usually use taxis, not public transit. Rail commuters increased by 6,400, but this was partly offset by a 2,800 decline in bus commuters. The rail line to the airport carries about 5 percent of air travelers.[34]

Atlanta Transit System Data

	Trips (millions)	Share of of Travel
1990	149.6	1.68%
2000	170.0	1.35%

Future plans: Atlanta's enthusiasm for heavy rail has waned due to cost overruns. Yet the transit agency is now studying the possibility of building an eight-mile light-rail line.

Atlanta Rail Transit Data

	Avg. Occup.	Cost/ Trip	Cost/ PM	PM/ Rt Mi	% Fwy Ln Mi	Travel Share
Heavy rail	19	1.49	0.24	29,100	94%	0.85%

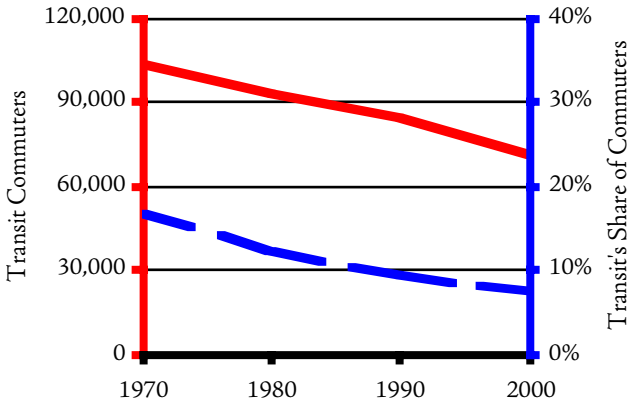
Baltimore

Description: The Maryland Transit Administration (MTA) has a 15-mile subway line that first opened in 1983. The agency opened Baltimore's first light-rail line in 1992 and now has nearly 29 miles of light-rail lines.

Maryland also operates nearly 190 miles of commuter rail lines serving both the Baltimore and Wash-

ington, DC, areas. However, according to the Maryland Transit Authority, 90 percent of the commuter train commuters work in the Washington, not Baltimore, region, so Maryland commuter rail is considered in the Washington profile.

Baltimore Transit Commuting Trends



Why it is a disaster: The 1989 Pickrell report found that Baltimore's subway line cost 60 percent more to build than originally estimated and carried nearly 60 percent fewer riders than anticipated. Today, both the subway and the light-rail line carry less-than-average loads. Only the Hudson-Bergen and San Jose light-rail lines carry fewer passenger miles per route mile than the Baltimore line, while only the Cleveland and Staten Island heavy-rail lines carry fewer passenger miles per route mile than the Baltimore subway.

Baltimore's airport line carries far fewer riders than anticipated and only carries 2.6 percent of air travelers.[35]

Baltimore Transit System Data

	Trips (millions)	Share of of Travel
1990	113.2	1.83%
2000	115.1	1.72%

Future plans: There are few plans to extend Baltimore's subway, but several plans for expanding the light-rail lines. In 2003 MTA began double tracking the central light-rail corridor, which will cost taxpayers $153.7 million but will not result in many new transit riders.

Baltimore Rail Transit Data

	Avg. Occup.	Cost/ Trip	Cost/ PM	PM/ Rt Mi	% Fwy Ln Mi	Travel Share
Heavy rail	14	2.76	0.62	11,879	45%	0.21%
Light rail	21	3.64	0.57	5,389	20%	0.19%

Boston

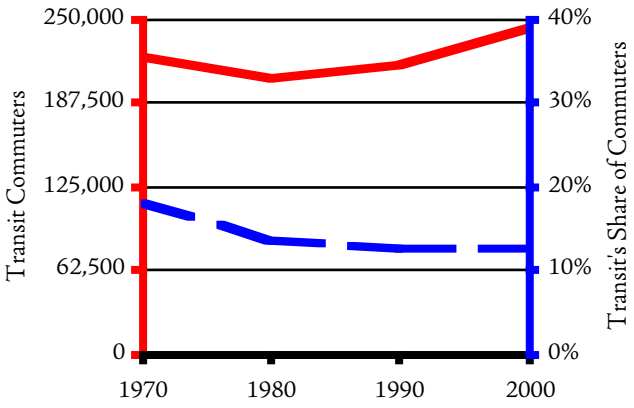
Description: The Massachusetts Bay Transportation Authority (MBTA) operates 35 miles of light-rail lines that date back to 1888, 38 miles of heavy-rail lines that date back to 1897, and just over 400 miles of commuter-rail lines. Only New York, Chicago, and Los Angeles have more rail miles, but Boston's transit system has a significantly higher market share of total travel than either Chicago's or Los Angeles'. Unlike L.A.'s and Chicago's, both ridership and market share are increasing.

Boston Transit System Data

	Trips (millions)	Share of of Travel
1990	323.7	3.82%
2000	355.2	4.62%

Why it is a disaster: Boston was the first urban area in the nation to decide to stop building highways and spend most its transportation dollars on transit. In the past twenty years, the cost of congestion per commuter has hextupled, which is not the worst in the nation but is nothing to be proud about.

Boston Transit Commuting Trends



While Boston transit increased its market share of total travel in the 1990s, its share of commuters has declined. Most of increase in total travel has been from people riding the far-flung network of commuter rail lines, which doesn't necessarily translate to a huge reduction of inner-city congestion. Thus, transit's impact on congestion may be smaller than is suggested by the increase in transport market share.

Future plans: Boston is expanding commuter rail service and working on plans for bus-rapid transit.

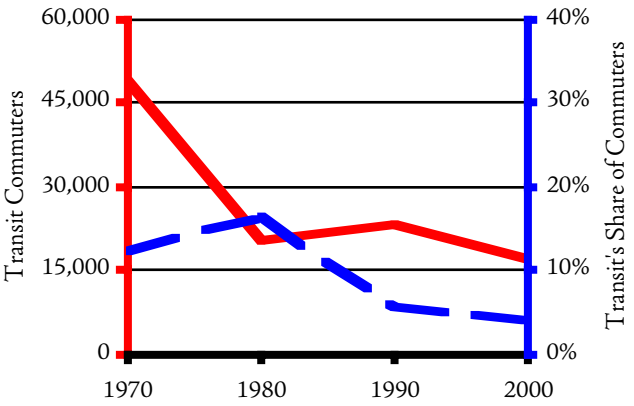
Boston Rail Transit Data

	Avg. Occup.	Cost/ Trip	Cost/ PM	PM/ Rt Mi	% Fwy Ln Mi	Travel Share
Commuter	34	4.90	0.25	5,891	22%	1.56%
Heavy rail	27	1.28	0.37	40,373	153%	1.15%
Light rail	30	1.31	0.56	18,556	71%	0.35%

Buffalo

Description: Buffalo built its 6-mile light-rail line in the 1980s.

Buffalo Transit Commuting Trends



Why it is a disaster: Buffalo's light-rail line was one of the first to be built in the late-twentieth century frenzy of rail construction, and it was also one of the first to be considered a failure. Pickrell reports that it went 61 percent over budget and carries less than a third of the anticipated riders. Transit has not only lost market share in Buffalo, it has lost both transit commuters and total transit riders.

Buffalo Transit System Data

	Trips (millions)	Share of of Travel
1990	30.4	0.89%
2000	29.0	0.68%

Future plans: Buffalo has no plans to build more rail transit..

Buffalo Rail Transit Data

	Avg. Occup.	Cost/ Trip	Cost/ PM	PM/ Rt Mi	% Fwy Ln Mi	Travel Share
Light rail	17	2.54	1.04	6,256	38%	0.11%

Burlington

Description: Burlington, VT, started a 13-mile experimental commuter train called the Champlain Flyer in 2000. The train operated for about two years and was then cancelled when it failed to meet the standards set for it by the state legislature.

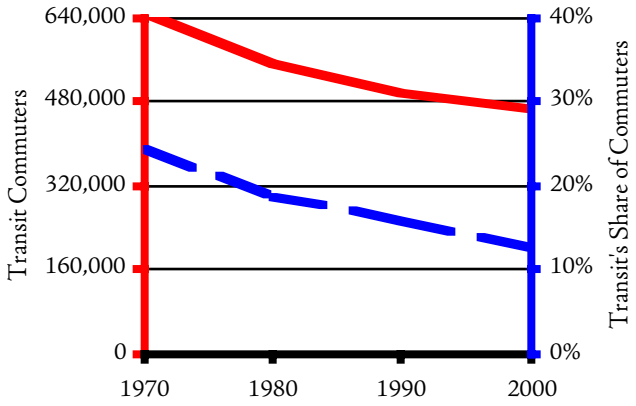
Why it is a disaster: The train's capital costs turned out to be more than twice the projected costs and operating costs were 2.6 times those projected. Ridership was less than 40 percent of projected levels. Calculations showed that the Diesel locomotives pulling the train consumed more fuel and emitted more sulfur dioxide, nitrogen oxides, particulates, and greenhouse gases than the autos it took off the road. While the train was a failure, it was not really a disaster because Vermont's experimental approach minimized the cost and ended the project when it was clearly not working.

Future plans: Vermont appears to have learned its lesson and has no plans for more rail transit.

Chicago

Description: Chicago has an extensive network of rail transit that includes more than 550 miles of Metra commuter rail and 100 miles of Chicago Transit Authority (CTA) heavy rail. Most of this was built in the late nineteenth or early twentieth centuries, but Chicago has recently extended some of its heavy-rail lines, including a new line to O'Hare Airport.

Chicago Transit Commuting Trends



Why it is a disaster: Despite its huge rail network, Chicago is losing transit riders by every measure. Transit ridership declined by 15 percent between 1990 and 2000. Chicago gained 30,000 rail commuters in the 1990s, but lost more than 64,000 bus commuters. Commuter rail lines carried 19 percent more passenger miles in 2000 than in 1990, but bus passenger miles declined by 19 percent and heavy rail miles declined by 2 percent.

In common with many other urban areas, Chicago's problem is that most job growth is the suburbs. Between 1990 and 2000, Cook County (which is mainly Chicago) lost more than 18,000 jobs while suburban counties gained more than 310,000 jobs. Since rail transit mainly serves downtown areas, Chicago's rail network is increasingly irrelevant. Meanwhile, Chicago's new O'Hare Airport rail line carries only about 4 percent of air travelers.[36] If rail transit doesn't work in Chicago, how can it work in places like Phoenix or Houston?

Chicago Transit System Data

	Trips (millions)	Share of of Travel
1990	699.2	4.84%
2000	597.2	3.87%

Future plans: Metra is extending one commuter rail line.

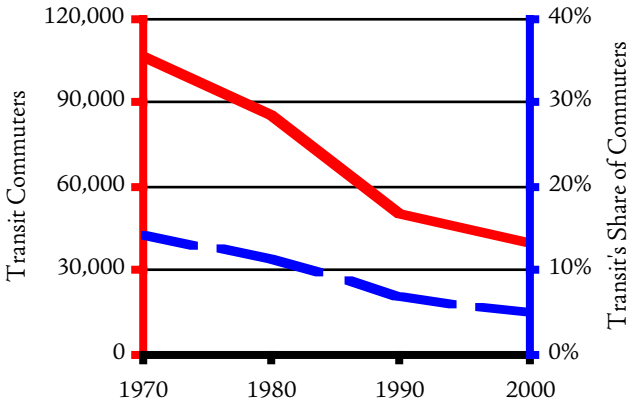
Chicago Rail Transit Data

	Avg. Occup.	Cost/ Trip	Cost/ PM	PM/ Rt Mi	% Fwy Ln Mi	Travel Share
Indiana CR	33	7.82	0.29	2,998	10%	0.10%
Metra CR	41	6.08	0.28	8,940	29%	1.53%
Heavy rail	16	1.99	0.36	26,444	85%	0.99%

Cleveland

Description: Cleveland has a 19-mile heavy-rail line built in the 1950s and 1960s and 15-miles of light-rail lines, first built in the 1910s and modernized in the early 1980s. In 1968, Cleveland became the nation's first city to open a rail line to its airport.

Cleveland Transit Commuting Trends



Why it is a disaster: By every measure, Cleveland's transit system is losing riders and market share. The 2000 census reported that the number of commuters using rail transit declined by 400 since 1990, while the number using bus transit declined by nearly 9,800. The total number of transit trips and passenger miles in 2000 were both significantly less than in 1990. The airport line carries less than 3 percent of air travelers.[37]

Cleveland Transit System Data

	Trips (millions)	Share of of Travel
1990	74.7	1.53%
2000	64.5	1.30%

Future plans: Cleveland is currently working on plans for bus-rapid transit.

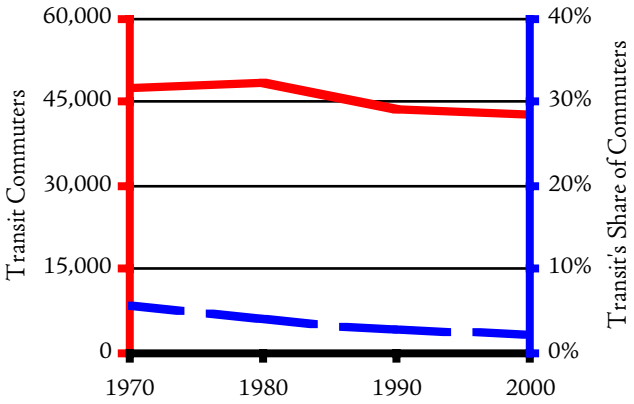
Cleveland Rail Transit Data

	Avg. Occup.	Cost/ Trip	Cost/ PM	PM/ Rt Mi	% Fwy Ln Mi	Travel Share
Heavy rail	25	3.18	0.43	7,760	38%	0.25%
Light rail	19	4.26	0.66	3,256	16%	0.08%

Dallas-Ft. Worth

Description: At the end of 2001, Dallas Area Rapid Transit (DART) had 22 miles of light-rail lines. In 2002, DART extended its light-rail lines, doubling the length of the system. DART and the Fort Worth Transportation Authority jointly operate a 34-mile commuter-rail line known as the Trinity Rail Express.

Dallas-Ft. Worth Transit Commuting Trends



Why it is a disaster: Transit carries an insignificant share of travel in the Dallas-Ft. Worth area, and despite—or perhaps because of—investments in rail transit, that share is declining. The 2000 census revealed that Dallas transit gained 3,300 rail commuters in the 1990s at the expense of losing more than 4,600 bus commuters. While Dallas transit reported a huge increase in trips carried in the 1990s, this growth was not as fast as the growth in driving, so transit lost market share of total travel.

When DART doubled the number of miles of its light-rail system in 2002, light-rail ridership grew by 45 percent. However, DART lost almost as many bus riders as it gained rail riders, so that the overall increase in transit ridership was less than 5 percent.

Dallas-Ft. Worth Transit System Data

	Trips (millions)	Share of of Travel
1990	56.6	0.58%
2000	74.4	0.54%

Future plans: DART wants to build nearly 50 more miles of light-rail lines.

Dallas-Ft. Worth Rail Transit Data

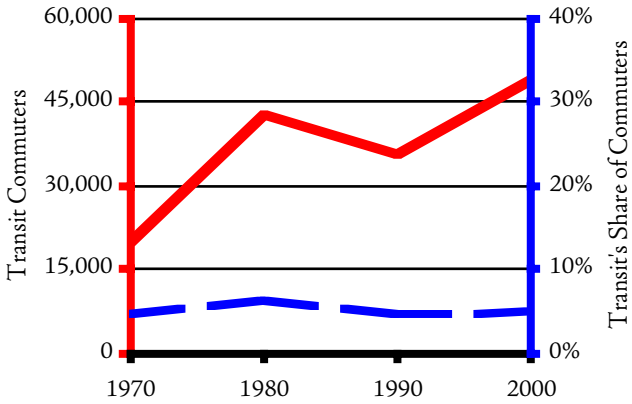
	Avg. Occup.	Cost/ Trip	Cost/ PM	PM/ Rt Mi	% Fwy Ln Mi	Travel Share
Commuter	23	12.30	0.89	2,333	9%	0.05%
Light rail	19	3.27	0.60	5,672	21%	0.12%

Denver

Description: Denver has 16 miles of light rail, essentially one line with two branches that serve different parts of downtown. Another 19 miles are under construction and due to open in 2007 at a cost of $46 million a mile.

Denver's transit agency, RTD, also has a number of innovative bus services, including a free downtown mall bus, express bus service to Boulder and other suburbs, and specially marked bus lines (such as the "Hop," "Skip," and "Jump") in various parts of the region. About half of Denver's bus routes are contracted out to private operators, saving taxpayers money and allowing RTD to spend that money on improvements elsewhere.

Denver Transit Commuting Trends



Why it is a disaster: Denver increased transit patrons and slightly increased market share in the 1990s, but almost 90 percent of the increase was bus riders. Meanwhile, Denver's light-rail line is one of the most dangerous in the nation, killing close to 26 people per billion passenger miles. Transit has done little to relieve the region's rapidly growing congestion. The 2002 National Transit Data Base reveals that increased light-rail ridership that year was almost exactly matched by decreased bus ridership, suggesting the existing rail line has produced most of the growth it is going to capture.

Denver Transit System Data

	Trips (millions)	Share of of Travel
1990	55.5	1.42%
2000	77.4	1.44%

Future plans: RTD is spending $46 million a mile building a 19.1-mile light-rail line, more than four times the cost per lane mile of a parallel freeway expansion. RTD has a plan for 40 more miles of light rail at nearly $50 million a mile and 80 miles of commuter rail at $20 million a mile for a total cost (including maintenance facilities) of more than $4 billion. Voters will consider a tax increase for these lines in November 2004.

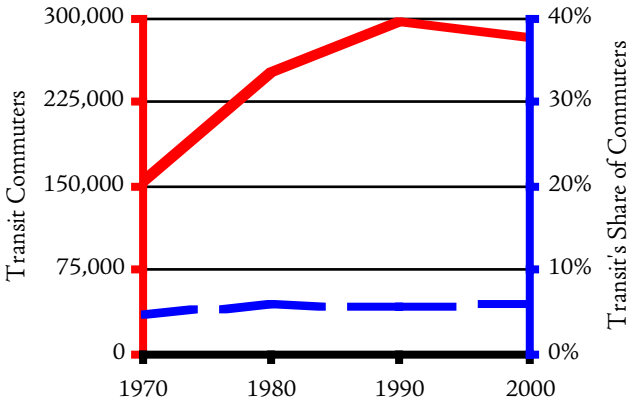
Denver Rail Transit Data

	Avg. Occup.	Cost/ Trip	Cost/ PM	PM/ Rt Mi	% Fwy Ln Mi	Travel Share
Light rail	15	1.82	0.43	7,730	29%	0.17%

Los Angeles

Description: The Los Angeles County Metropolitan Transit Authority has built 16 miles of heavy rail and 41 miles of light rail. Another agency, Metrolink, operates more than 400 miles of commuter rail.

Los Angeles Transit Commuting Trends



Why it is a disaster: Los Angeles voters agreed to a sales tax that, they were told, would be sufficient to build fourteen rail lines before 2000. Even after the tax was increased, only three lines were completed, including one subway and two light-rail lines. Those three lines each cost several times the early projections and carry far fewer riders than anticipated.

To help pay for the cost overruns, the transit agency cut back on bus services and improvements, leading the NAACP to charge it with discrimination against minorities who ride buses. The agency agreed to buy 200 new buses, but even after halting construction on rail lines, lacked the funds to do so. When it asked drivers to work fewer overtime hours so it could save money, they went on strike for a month.

Los Angeles commuter rail mileage sounds impressive, but commuter trains carry less than a quarter as many people as either the 16 miles of subway or the 41 miles of light rail.

Los Angeles Transit System Data

	Trips (millions)	Share of of Travel
1990	515.4	1.42%
2000	588.9	1.46%

Future plans: Despite all of the problems with cost overruns, ridership shortfalls, and lawsuits, the Los Angeles County Metropolitan Transit Authority wants to build more light-rail lines and extend the existing ones. The Federal Transit Administration says that it "has serious concerns" about one light-rail proposal because "the underlying assumptions used by the project sponsor may have produced an inaccurate representation of the benefits of the project."[38]

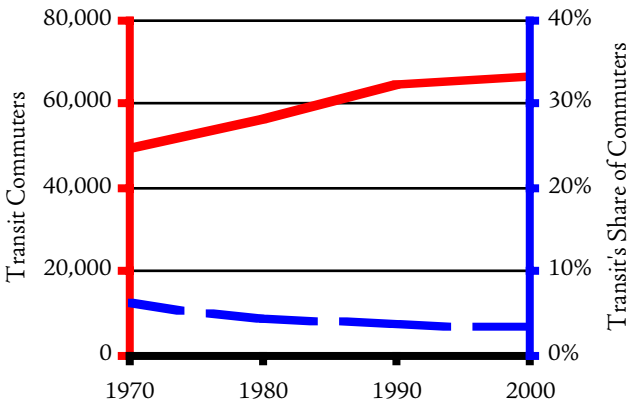
Los Angeles Rail Transit Data

	Avg. Occup.	Cost/ Trip	Cost/ PM	PM/ Rt Mi	% Fwy Ln Mi	Travel Share
Commuter	37	12.75	0.38	1,890	5%	0.15%
Heavy rail	28	1.80	0.38	28,158	76%	0.09%
Light rail	40	2.57	0.37	15,213	41%	0.13%

Miami-Ft. Lauderdale

Description: Miami built a people mover and a 21-mile heavy-rail line in the 1980s. The Tri-County Commuter Rail Authority (Tri-Rail) began running 71 miles of commuter-rail service in 1989 to provide people with an alternative during a five-year reconstruction project on the adjacent Interstate 95. The commuter trains continued in service even after construction was completed.

Miami-Ft. Lauderdale Transit Commuting Trends



Why it is a disaster: In 1989, Pickrell found that the people mover went 58 percent overbudget and carries less than 25 percent of predicted riders. Miami's heavy-rail line went 33 percent over budget and carries only 15 percent of predicted riders. Today, the line is one of the poorest performing heavy-rail lines in the nation, carrying less than a third as many passenger miles per route mile than the average heavy-rail system and costing nearly three times as much per rider. The typical Miami rail car carries an average of 15 people at a time, compared with more than 24 people on other heavy-rail systems.

The commuter-rail line carries fewer than 5,000 round trips a day and only about one-twentieth of a freeway lane's worth of traffic. Only about 3,100 of the 2 million workers in the Miami-Ft. Lauderdale region told the 2000 census takers that they ride the commuter trains to work, meaning Tri-Rail has a market share of about 0.15 percent of commuters.

Miami-Ft. Lauderdale Transit System Data

	Trips (millions)	Share of of Travel
1990	52.1	1.20%
2000	74.3	1.00%

Future plans: Miami wants to spend $77 million a mile extending its heavy-rail line by 9.5 miles. Despite Tri-Rail's tiny market share, the agency has ambitious plans to double-track the entire route at a cost of more than $400 million, which is almost more than 150 percent of the cost of original line.

Miami-Ft. Lauderdale Rail Transit Data

	Avg. Occup.	Cost/ Trip	Cost/ PM	PM/ Rt Mi	% Fwy Ln Mi	Travel Share
Commuter	38	8.79	0.29	2,929	10%	0.11%
Heavy rail	15	4.47	0.57	14,000	47%	0.15%

New Haven

Description: Connecticut operates 51 miles of commuter rail service between New Haven and London.

Why it is a disaster: The commuter-rail line is costly to operate and carries an insignificant number of passengers and less than 0.1 percent of the region's commuters. While service improvements led to ridership gains in the 1990s, the operating cost of $1.17 per passenger mile is the highest of any commuter rail line in the nation, and nearly four times as great as the average commuter rail system.

Rail Transit Data

	Avg. Occup.	Cost/ Trip	Cost/ PM	PM/ Rt Mi	% Fwy Ln Mi	Travel Share
Commuter	11	22.31	1.01	352	2%	0.08%

Future plans: Connecticut has no plans to extend this service beyond New London.

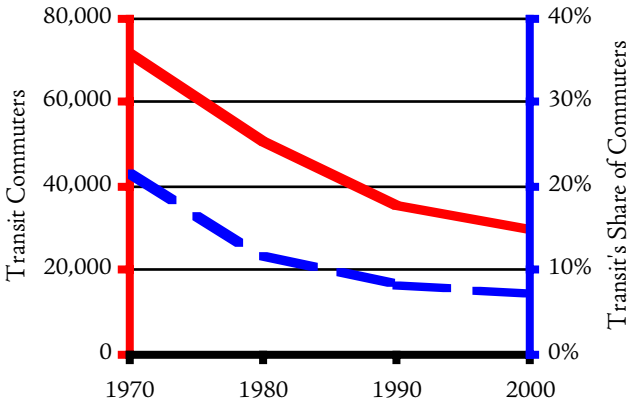
New Orleans

Description: Unlike most streetcar cities, New Orleans never replaced its 1920s-era streetcars with the more modern PCC cars of the 1930s. By 1964, it had replaced most streetcars with buses, but its 8.6-mile St. Charles streetcar line remains the oldest continuously operating streetcar line in America. While most of the riders are tourists, the line is long enough to serve many commuters as well. During the 1990s, the city build a new streetcar line along the riverfront, mainly for tourists, and is currently building a new 3.6-mile line on Canal Street, at a cost of $139 million ($38 million a mile), which it hopes will be used by both commuters and tourists.

Why it is a disaster: If $38 million a mile is too much for a 20-mile-per-hour light-rail line, it is even more so

for a streetcar line that goes no faster than 15 miles per hour. New Orleans' transit ridership and transit commuters both declined dramatically in the 1990s, and building streetcar lines will do nothing to reverse this trend or improve regional mobility.

New Orleans Transit Commuting Trends



New Orleans Transit System Data

	Trips (millions)	Share of of Travel
1990	85.5	2.29%
2000	63.0	1.95%

Future plans: The New Orleans Regional Transit Authority wants to build another 2.9-mile streetcar line, also at a cost of about $38 million a mile, along the old Desire Street streetcar route. The line will also increase transit operating costs by $1.7 million a year. The environmental impact statement for this plan projects that the streetcar would "improve mobility" by reducing driving by a massive 190 auto trips per day (0.005 percent), but that congestion would actually increase because of conflicts between the streetcar and autos. The line would gain only about 1,560 new rides per day (some of which would be transfers from new feeder bus trips to new streetcar trips). The average cost per new ride of about $20 is exorbitant for any system, but is especially high for a line that will go only about 15 miles per hour.

New Orleans Rail Transit Data

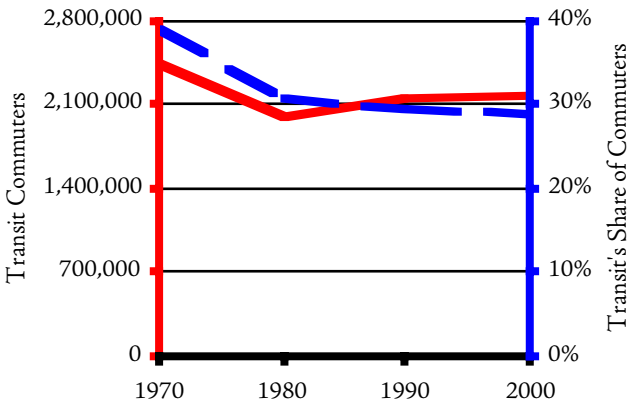
	Avg. Occup.	Cost/ Trip	Cost/ PM	PM/ Rt Mi	% Fwy Ln Mi	Travel Share
Streetcar	19	1.59	0.68	4,292	19%	0.13%

New York

Description: New York is the nation's transit Mecca, with more than 1,100 miles of commuter rail and nearly 300 miles of heavy rail. New York also has 2.5 million jobs concentrated in Manhattan, which is also by far the densest county in the United States. As a result, more than 60 percent of workers who live in Manhattan and nearly 55 percent of workers in New York City ride transit to work. In the New York urban area, transit carries about 30 percent of workers and 11 percent of all passenger travel.

Despite the success of commuter rail and heavy rail, New Jersey Transit jumped on the light-rail bandwagon and built the 8-mile Hudson-Bergen light-rail line. Another, older light-rail line in Newark is only 4 miles long.

New York Transit Commuting Trends



Why it is a disaster: New York rail transit is the most productive in the nation, but it has several weak spots. For one, New York's safety record is abysmal, killing an average of 80 people a year. Slightly more than half are killed by commuter rail, the rest by subways. By comparison, Washington's rail system, which carries a tenth as many passenger miles, kills only 1.4 percent as many people.

While New York transit gained riders during the 1990s, much of that gain was a result of fare reductions. For example, in 1997 transit riders were allowed free transfers between buses and subways for the first time. This led to a huge increase in ridership but a modest drop in revenues as people who previously paid to trans-

fer now transfer for free.[39] This suggests that, if the goal is to increase ridership, fare reductions can do the job at a much lower cost than building rail transit. Even with the fare reductions, transit lost market share of commuter travel.

Nearly 99.9 percent of New York rail transit riders use heavy rail or commuter rail. On the west side of the Hudson River, New Jersey Transit's efforts to introduce light rail have been a complete disaster. Constructions costs on the Hudson-Bergen light rail went three times over budget and the line only carries about half the riders projected for it. Its basic flaw is that, although it travels through some of the densest residential areas in America, it doesn't go to any particular job centers.

As a result, in 2001, the Hudson-Bergen line cost $14 per ride to operate, compared with an average of $2 for other light-rail lines. Where other light-rail lines carry an average of a third of a freeway lane's worth of traffic, the Hudson-Bergen line carries just 10 percent. Declining ridership on San Jose's light rail led it to take the claim of "worst-performing rail line" from Hudson-Bergen in 2002, but the South Jersey light rail, scheduled to open in March, 2004, may reclaim the title.

New York is no stranger to cost overruns. The city-built IND subway line, which was built by the city in the 1920s and 1930s, cost twice its original projections.[40] As one history notes, the privately built IRT and BRT lines were constrained by the need to earn a profit, but the city "spent freely on its own system with the taxpayers' money."[41] The Metropolitan Transit Agency (MTA) is currently spending more than three times the original projection to construct a headquarters building.[42]

New York Transit System Data

	Trips (millions)	Share of of Travel
1990	2,807.6	10.54%
2000	3,224.3	10.79%

Future plans: New York City wants to build a new subway line along Second Avenue. This eight-mile line is expected to cost a phenomenal $16.8 billion, or $2.1 billion per mile. While it would carry a predicted 1 million riders a day, all but 25,000 of them would otherwise ride another subway route or the bus. The Federal Transit Administration recommends funding this line because of the 18 million hours of time it would save existing subway riders—an average of about 4 minutes per ride. When fully amortized, that represents a cost of more than $80 per hour saved. When campaigning for office, Mayor Michael Bloomburg said the subway was too expensive and he proposed bus-rapid transit instead. But he has minimal influence over MTA, whose board is appointed by the state governor.

Another expensive proposal is the extension of the Long Island Railroad commuter line, which now serves Pennsylvania Station, to Grand Central Station. This 4-mile line is expected to cost $5.3 billion. Meanwhile, New Jersey Transit wants to extend the 4-mile Newark light-rail line another 8.8 miles to Elizabeth at a cost of more than $80 million a mile.

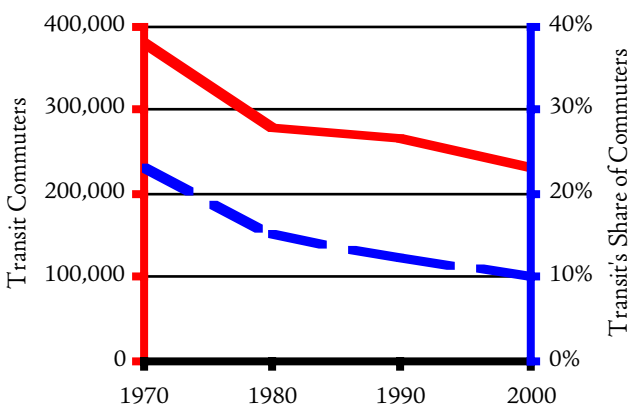
New York Rail Transit Data

	Avg. Occup.	Cost/ Trip	Cost/ PM	PM/ Rt Mi	% Fwy Ln Mi	Travel Share
NJT CR	33	7.16	0.30	7,752	31%	0.86%
LIRR	36	7.78	0.37	17,979	72%	1.17%
Metro-N.	43	8.19	0.28	21,383	86%	1.19%
Staten I. HR	11	7.02	1.10	4,443	18%	0.01%
PATH HR	22	2.73	0.70	53,812	216%	0.14%
NYC sub.	24	1.33	0.29	87,285	351%	4.39%
H-B LR	16	6.58	2.77	3,814	14%	0.01%
Newark LR	23	4.62	1.24	7,332	29%	0.01%

Philadelphia

Description: Philadelphia has 300 miles of commuter rail, 50 miles of heavy rail, and 35 miles of light rail.

Philadelphia Transit Commuting Trends



Why it is a disaster: During the 1990s, Philadelphia transit lost by just about every measure: riders, commuters, and market share. Not only was Philadelphia rail transit considerably less safe than buses or freeways, it consumed more energy per passenger mile than autos. A rail line serving the airport carries only about 2 percent of air travelers.[43]

Philadelphia Transit System Data

	Trips (millions)	Share of of Travel
1990	372.2	3.75%
2000	328.7	3.23%

Future plans: The Southeast Pennsylvania Transportation Authority wants to spend $1.8 billion extending commuter rail service 74 miles to Reading.

Data include Wilmington, DE, which the Census Bureau merged with the Philadelphia urbanized area in 2000.

Philadelphia Rail Transit Data

	Avg. Occup.	Cost/ Trip	Cost/ PM	PM/ Rt Mi	% Fwy Ln Mi	Travel Share
Penn CR	19	35.83	0.49	556	2%	0.03%
SEPTA CR	26	5.46	0.41	4,992	21%	0.73%
PATCO HR	19	3.38	0.39	13,886	56%	0.14%
SEPTA HR	24	1.40	0.32	27,106	115%	0.67%
SEPTA LR	18	1.86	0.78	4,316	18%	0.10%

Pittsburgh

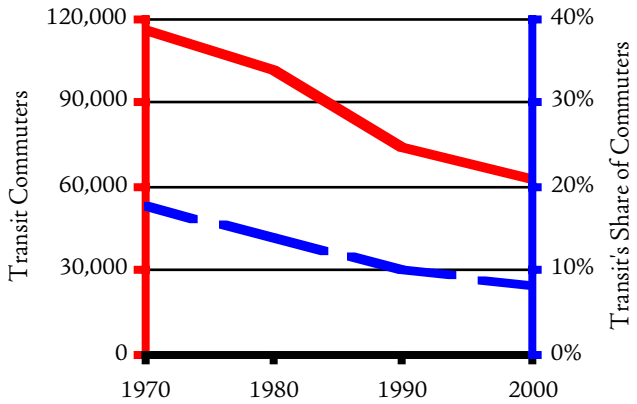
Description: Pittsburgh rebuilt 17 miles of streetcar lines into modern light-rail lines in the early 1980s. Since then it improved bus service by building several exclusive bus lanes. It is now rebuilding another 5.5 miles of old streetcar line into a light-rail line at a cost of $70 million a mile.

Pittsburgh Transit System Data

	Trips (millions)	Share of of Travel
1990	89.9	2.18%
2000	78.6	1.63%

Why it is a disaster: Pickrell says that the light-rail lines were actually built (or rebuilt) under budget, but that they carry only a third of the predicted riders. He estimates the cost per new rider was $35.

Pittsburgh Transit Commuting Trends



Future plans: Pittsburgh wants to spend $390 million building 1.6 miles of light rail in the downtown area, which may be a record cost for light rail of $243 million a mile. The Federal Transit Administration recommended against this proposal, but supports reconstruction of 12 more miles of trolley lines into modern light-rail lines.

Pittsburgh Rail Transit Data

	Avg. Occup.	Cost/ Trip	Cost/ PM	PM/ Rt Mi	% Fwy Ln Mi	Travel Share
Light rail	21	4.04	0.92	5,186	34%	0.15%

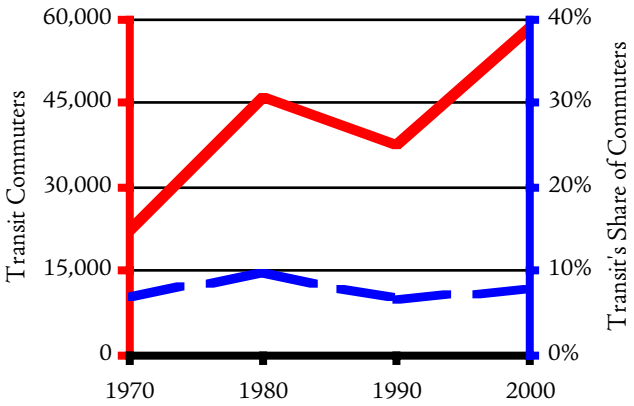
Portland

Description: Portland has 35 miles of light-rail lines with two major spokes and a branch to the airport. Portland also has a short streetcar line connecting downtown with a high-density neighborhood in Northwest Portland. The lines are run by Tri-Met, which also runs Portland's bus service.

Why it is a disaster: Portland's light-rail lines were built with the usual cost underestimates and ridership overestimates. The first line, opened in 1986, cost 55 percent more to build and 45 percent more to operate than anticipated while it carries around half the projected riders. The second line, opened in 1998, cost nearly four

times the initial estimates and also carries just half the projected riders. Bechtel received the contract to build the airport branch without any competitive bidding, so no one knows whether the cost was reasonable. It also carries far fewer riders than anticipated.

Portland Transit Commuting Trends



Still, by some measures, Portland's light-rail lines are among the most successful in the nation. Transit has increased both ridership and market share of both commuting and total travel. These numbers would be more inspiring were it not for the fact that Portland's neighbor, Seattle, experienced similar increases in ridership and market shares with a pure-bus system.

At least some reviewers attribute the success of Portland transit to the region's draconian land-use policies. Planners used light rail as a weapon to bludgeon nearby neighborhoods into accepting higher-density developments. As Portland planner John Fregonese said in 1995, light rail "is not worth the cost if you are just looking at transit. It's a way to develop your community at higher densities."

After rezoning neighborhoods to higher densities over the protests of local residents, Portland realized that developers wouldn't build high-density housing projects because they were costly to construct and the market for high-density development was already saturated by existing apartments. So the region has given several hundred million dollars in subsidies, in the form of tax breaks, infrastructure subsidies, and direct grants, to transit-oriented developments. Since most of the people living in these developments drive for most of their trips, this concentration has merely increased congestion in the transit corridors.

As another way of attracting people to downtown transit-oriented developments, Portland used local funds to build a streetcar line that barely exceeds walking speed. The city's operating subsidies to this line have climbed by 50 percent even as its backlog of streets needing repavement has grown from 527 to nearly 600 miles. Yet the city is committed to extending the line to a new transit-oriented development south of downtown that is expected to receive around $250 million in subsidies.

Although Portland's market-share gains in the 1990s are the second-best of all rail regions, neighbor Seattle scored gains that were nearly as great with a pure-bus system. Portland's gains would be more impressive if Portland hadn't made even bigger gains by making low-cost improvements to bus service in the 1970s—gains that were squandered in the 1980s by fare increases and cut-backs in bus service needed to pay for light rail.

Portland Transit System Data

	Trips (millions)	Share of of Travel
1990	59.0	1.63%
2000	93.7	2.09%

Future plans: Tri-Met is building a 5.8-mile line in north Portland even though voters rejected funding for that line in three different elections. Plans are also being developed for a line south to Clackamas or Oregon City, probably along a route that aims more to capture funds from urban-renewal districts than to attract passengers.

Suburban Washington County wants to start a commuter-rail service between the suburbs of Wilsonville and Beaverton, though the projected cost of starting that service has already increased by 45 percent and the Federal Transit Administration is skeptical of Tri-Met's ridership projections. While the north Portland line is likely to carry a respectable number of people, the Clackamas light-rail line and Washington County commuter rail line are likely to be flops because the corridors they will serve, while thick with traffic, do not reach any concentrated job centers.

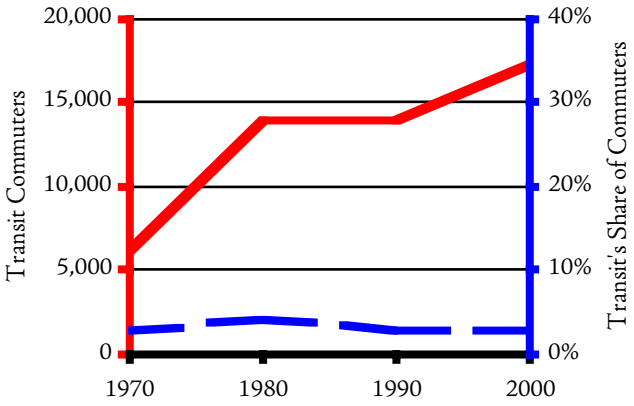
Portland Rail Transit Data

	Avg. Occup.	Cost/ Trip	Cost/ PM	PM/ Rt Mi	% Fwy Ln Mi	Travel Share
Light rail	30	1.99	0.34	11,292	39%	0.88%

Sacramento

Description: The Sacramento Regional Transit District opened its 20.6-mile light-rail line in 1987 at a cost of about $9.6 million a mile ($14 million in 2003 dollars). In 2003 it added a new 6.3-mile line at a cost of about $20 million a mile.

Sacramento Transit Commuting Trends



Why it is a disaster: Pickrell reports that the initial line went only 13 percent over budget, but it carried less than 30 percent as many riders as originally anticipated. In fact, the total number of riders carried by Sacramento's transit system declined after the first line was opened.

Sacramento Transit System Data

	Trips (millions)	Share of of Travel
1990	20.3	0.71%
2000	30.0	0.84%

Ridership has recovered and even made a modest gain in market share in the 1990s. But rail accounts for less than 5 percent of the increase in transit commuters; buses account for 90 percent of the increase. As of 2001, the Sacramento light rail carried only about two-thirds as many passenger miles per route mile as the average light-rail system.

Sacramento Rail Transit Data

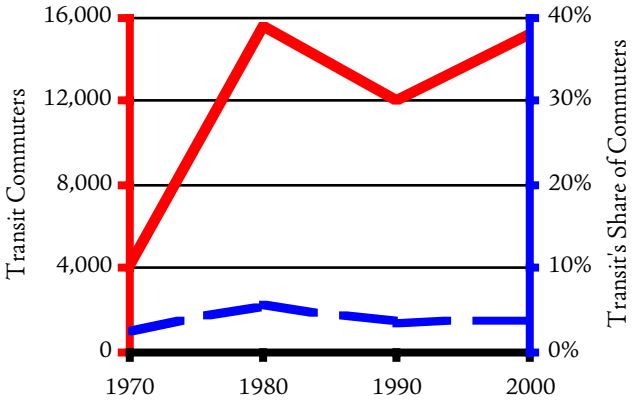
	Avg. Occup.	Cost/ Trip	Cost/ PM	PM/ Rt Mi	% Fwy Ln Mi	Travel Share
Light rail	22	2.83	0.52	6,288	21%	0.26%

Future plans: Sacramento is extending the 2003 line another 4 miles and wants to build a third 11-mile line at a cost of about $21 million a mile.

Salt Lake City

Description: Salt Lake has 17 miles of light rail with two lines. The first line is a 15-mile line down the middle of the valley parallel to I-15. The second is a 2-mile line to the university. A 1.5 mile extension of the university line will open soon. The lines are run by Utah Transit Administration (UTA), which also runs the bus system.

Salt Lake City Transit Commuting Trends



Why it is a disaster: Construction of Salt Lake's light-rail lines went only slightly over budget and ridership has equaled expectations. Opening the first light-rail line led to about a 10-percent increase in transit ridership. After the line opened, however, ridership stopped growing until the second line opened.

During construction, Main Street was completely closed and lost 30 percent of its existing businesses, many of which moved to suburban malls. Although light rail was expected to spur development along the line, the street remains a blighted area and to date there is no new development near the line.

When light-rail lines opened, UTA discontinued all parallel express bus services. One route carried 90 riders on a 45-minute express trip to downtown. When this line was connected to LRT the trip time increased to 90 minutes and the route now carries just six riders. Former bus riders now drive to park-and-ride stations, increasing congestion on the east-west streets.

Salt Lake City Transit System Data

	Trips (millions)	Share of of Travel
1990	23.9	1.68%
2000	24.6	1.13%

To build more light-rail lines, UTA asked voters to double the sales tax dedicated to transit in 2000. For about two months prior to the election, UTA ran an intensive television campaign of "image advertising" which neither mentioned the election nor asked anyone to ride transit. Instead, the ads merely claimed that light rail reduced congestion. Although voters approved the tax increase, UTA remains short of funds and has raised bus fares and is considering asking for another tax increase.

Salt Lake City Rail Transit Data

	Avg. Occup.	Cost/ Trip	Cost/ PM	PM/ Rt Mi	% Fwy Ln Mi	Travel Share
Light rail	23	2.30	0.42	8,612	34%	0.40%

Future plans: UTA has purchased some 120 miles of rail line from Union Pacific and wants to turn them into light- or commuter-rail lines.

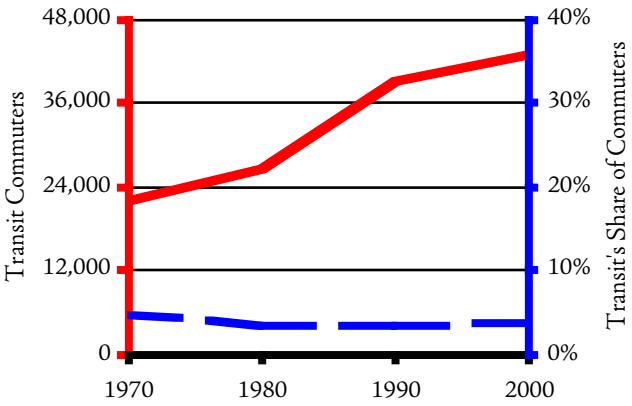
San Diego

Description: In 1981, San Diego became the first American city to open a modern light-rail line. The 16.5-mile transit line connecting San Ysidro (just north of the Mexican border) with downtown San Diego was rebuilt from an existing freight railroad to for just $7 million a mile ($14 million in 2002 dollars), which is incredibly inexpensive by today's standards. The route was so popular that transit fares covered 80 percent of its operating costs. The secret was that it was built entirely with local funds, thus avoiding the onerous federal planning process, not to mention the temptation to use "free" federal dollars to gold plate the rail line.

San Diego Transit System Data

	Trips (millions)	Share of of Travel
1990	68.2	1.24%
2000	102.8	1.48%

San Diego Transit Commuting Trends



In 1986, San Diego opened the first 4.5 miles of a second light-rail line, which was also built at a cost of just $7 million a mile. By the mid-1990s, however, extensions of this line were costing a more typical $30 to $34 million a mile (about $35 to $36 million a mile in 2002 dollars). Average operating costs also increased, while average fares remained about the same, so fares in 2001 only covered about 60 percent of operating costs—which is still higher than for almost any other rail line.

San Diego also has 42 miles of commuter rail service.

Why it is a disaster: The Tijuana Trolley's low cost and high ridership make it one of the most successful light-rail lines in the country. Yet it is still worth asking whether it was necessary, as it replaced a profitable, private bus service with a subsidized rail service. Light-rail lines built in the 1990s cost far more than the original line yet have lower ridership. Ridership on the commuter-rail line is insignificant.

Future plans: San Diego wants to build several more light-rail lines.

San Diego Rail Transit Data

	Avg. Occup.	Cost/ Trip	Cost/ PM	PM/ Rt Mi	% Fwy Ln Mi	Travel Share
Light rail	21	1.47	0.25	8,526	29%	0.38%
Commuter	30	8.76	0.31	2,424	8%	0.09%

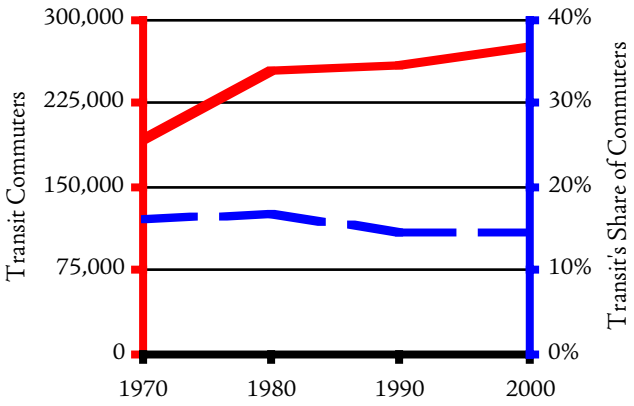
San Francisco Bay Area

Description: The Bay Area Rapid Transit District

(BART) operates 104 miles of heavy rail. BART's opened its first Oakland line in 1972 and reached San Francisco a year later. By 1974 72 miles were in operation at a construction cost of $1.6 billion ($6.2 billion in today's dollars), which works out to about $80 million a mile in today's dollars. Later extensions also cost about $80 million a mile, except for the recent 9-mile extension to San Francisco Airport, which cost $180 million a mile.

CalTrans runs 77 miles of commuter rail, a legacy of Southern Pacific commuter rail service that dates back to the late nineteenth century. In addition to 5.3 miles of cable cars, the San Francisco Municipal Railway (Muni) runs 37 miles of light rail whose history dates back to the horsecar era of 1860.

San Francisco Bay Area Transit Commuting Trends



Why it is a disaster: Approved by voters in 1962, the BART system suffered so many cost overruns and technical problems that it provided one of the more important chapters of Peter Hall's book, *Great Planning Disasters*. Today, BART carries lots of passengers and a larger percentage of regional passenger travel than any rail system outside of New York. While it is one of the few rail systems to carry as many people per route mile as a freeway lane, it cost at least eight times as much to build per mile as a lane mile of freeway.

As the Bay Area becomes one of the most congested regions in the nation, planners want to spend 80 percent of the region's transport dollars on transit. Yet they don't expect this to significantly increase transit's share of travel. Of the dollars that will be spent on transit, spending more on BART is particularly questionable. The recently completed airport line carries far fewer passengers than expected, and a proposed BART line to San Jose is expected to cost more than $100 per new ride.

San Francisco Bay Area Transit System Data

	Trips (millions)	Share of of Travel
1990	414.1	4.39%
2000	436.6	4.29%

Future plans: In addition to the BART line to San Jose, BART wants to build an "aerial guideway" between the Oakland Airport and the nearest BART station. Meanwhile, Muni is planning a new 5.4 mile light-rail line to the CalTrains station at a cost of more than $100 million a mile and wants to build a 1.7 mile subway as an extension of this line which will cost $450 million a mile.

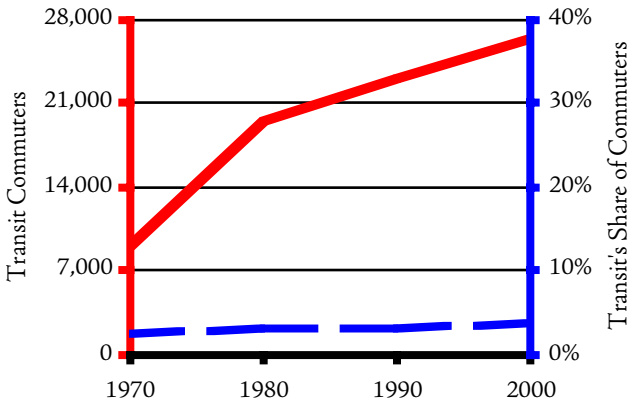
San Francisco Bay Area Rail Transit Data

	Avg. Occup.	Cost/ Trip	Cost/ PM	PM/ Rt Mi	% Fwy Ln Mi	Travel Share
CalTrans	30	7.54	0.37	5,942	18%	0.30%
BART	20	3.41	0.28	33,906	105%	2.10%
Muni LR	22	2.40	0.97	8,856	28%	0.21%

San Jose

Description: The Santa Clara Valley Transportation Authority (VTA) has built 30 miles of light-rail lines on two major routes. The first line opened in phases between 1988 and 1992. The second line opened in 2000.

San Jose Transit Commuting Trends



Why it is a disaster: Ridership growth of as much as 30 percent per year resulted from improvements in San Jose bus service in the late 1970s and early 1980s. But growth stagnated when light-rail construction began in the mid 1980s. After the rail line opened, ridership grew by as much as 10 percent per year for three years but then stagnated again. A new line that opened in 2000 led to a 35 percent increase in rail ridership, but only a 4 percent increase in total ridership.

San Jose Transit System Data

	Trips (millions)	Share of of Travel
1990	45.7	0.98%
2000	56.3	0.98%

When the 2001 recession hit, ridership dropped along with the sales tax revenues that support transit operations, leading to a fiscal crisis within the agency. VTA responded by cutting service by 15 percent and raising fares. The recession plus these changes led to a 28-percent fall in bus ridership and an astounding 44-percent drop in light-rail ridership.[44] As a result, San Jose's was the nation's worst-peforming light-rail line by most measures in 2002, and it is expected to fall even further in 2003.

Even as VTA considered severe service cuts, it continued to build new light-rail lines (which are funded out of other taxes) that it couldn't afford to operate. It is now funding its operations out of its capital funds, a move that its attorneys considered illegal but that it decided to do anyway. At least that means that it won't be building as many rail lines right away.

San Jose Rail Transit Data

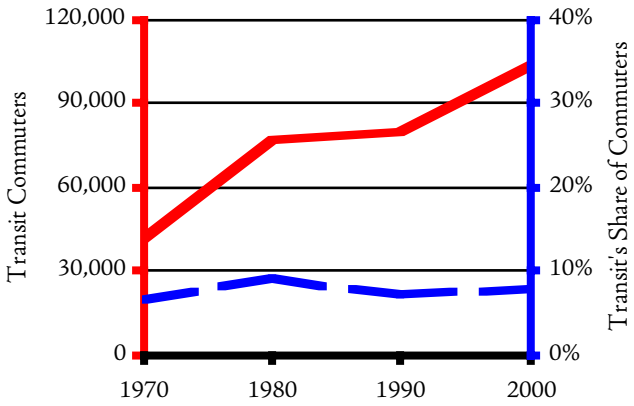
	Avg. Occup.	Cost/ Trip	Cost/ PM	PM/ Rt Mi	% Fwy Ln Mi	Travel Share
Altamont	50	19.59	0.43	1,166	4%	0.16%
Light rail	14	6.88	1.55	3,252	11%	0.15%

Future plans: VTA is building another 10 miles of light rail and has plans for several more lines. Voters also approved funding to extend BART rail service to San Jose. VTA's financial crisis has delayed the BART extension by as much as two decades. If it had been completed on schedule, the region's Metropolitan Transportation Commission predicts that it would have cost more than $100 per new ride, making it one of the most exorbitant transit projects ever.

Seattle

Description: After getting voter approval for rail transit in 1996, Sound Transit began operating 31 miles of commuter rail service between Tacoma and Seattle in 1999. It also built a 1.6-mile streetcar line in downtown Tacoma at a cost of $50 million a mile, a third more than planned. As of December, 2003, it also operates a 35-mile commuter rail line from Everett to Seattle.

Seattle Transit Commuting Trends



Why it is a disaster: Sound Transit's Seattle-Tacoma commuter-rail line is one of the least productive in the nation, carrying less than one seventh as many passenger miles per route mile as the average commuter-rail line. As a result it has one of the highest operating costs per trip or per passenger mile of any commuter rail line. Despite starting out with free service, the Everett line has been running more than 70 percent empty. Nearly 99 percent of the increase in transit commuting during the 1990s is bus transit.

Seattle Transit System Data

	Trips (millions)	Share of of Travel
1990	100.3	2.52%
2000	130.6	2.67%

Since Seattle acquired rail transit very late in the decade of the 1990s, it is not really representative of a

rail region by most measures in this report. Transit's growth in travel and market share is almost entirely due to bus transit, not rail transit. But the growth in the region's congestion is due to decisions made early in the decade to concentrate on rail transit rather than highway construction. Those decisions have harmed Seattle-area residents in many ways represented by the rail livability index, including the cost overruns, congestion, transit's cost ineffectiveness, and housing prices.

Future plans: Sound Transit wants to spend at least $3.6 billion on a light-rail line in Seattle. The agency originally projected that the cost of building a 24-mile light-rail line from the Seattle-Tacoma airport to the University of Washington and Northgate would be $2.4 billion. Shortly after receiving voter approval, the agency increased this estimate to $3.6 billion and the cost may actually reach much more than that. Sound Transit wants to use the funds that voters approved for the planned 24-mile line to build a scaled-back 14-mile segment. In 2002, voters also approved a 14-mile, $1.75 billion extension to the 1962 monorail line, which is scheduled for completion in 2009.

Seattle Rail Transit Data

	Avg. Occup.	Cost/ Trip	Cost/ PM	PM/ Rt Mi	% Fwy Ln Mi	Travel Share
Commuter	69	14.75	0.59	1,436	5%	0.05%

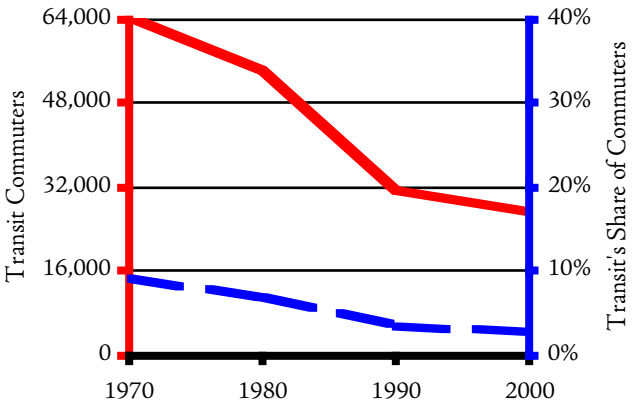
St. Louis

Description: The Bi-State Development Agency (BSDA) opened a 17-mile light-rail line in 1993 and added another 17 miles by 2001 and a second 3.5-mile extension in 2003.

Why it is a disaster: Almost as soon as the first light-rail line was completed, BSDA announced that it did not have enough money to operate the line and threatened to shut down unless it received emergency operating funds from the state. Then it asked voters to approve funding to build four more lines. After receiving approval, the agency was able to build only one line with the funds.

St. Louis transit ridership steadily declined from 56.5 million trips per year in 1981 to 42.9 million trips in 1992. Opening the first light-rail line in 1993 reversed this trend, and transit ridership grew to 54.5 million trips in 1998. Success was short-lived, however: Despite doubling the light-rail system in 2001, ridership declined to less than 48 million trips in 2002. The line serving the airport carries about 5 percent of air travelers.[45]

St. Louis Transit Commuting Trends



St. Louis Rail Transit Data

	Avg. Occup.	Cost/ Trip	Cost/ PM	PM/ Rt Mi	% Fwy Ln Mi	Travel Share
Light rail	25	2.32	0.27	10,094	43%	0.36%

Future plans: Bi-State has begun construction on another 8-mile light-rail line at a cost of $550 million, or nearly $70 million per mile.

St. Louis Transit System Data

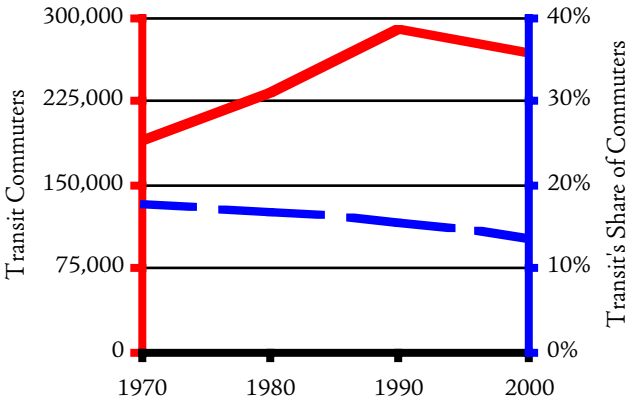
	Trips (millions)	Share of of Travel
1990	44.6	0.73%
2000	54.2	0.78%

Washington

Description: Washington DC's Metrorail system is a joy to ride. The 103-mile heavy-rail network has nine spokes that weave through the downtown providing access to most government buildings and other major facilities in the inner city. It is heavily used by tourists, many of whom no doubt go home wishing their cities could have a similar system. The subway system is supplemented by 275 miles of commuter rail lines in Maryland and Virginia.

Why it is a disaster: Built mostly in the 1970s and 1980s at a cost of about $12 billion, the Metrorail system already has a $12 billion backlog of deferred maintenance. Administrators warn that unless funds are raised to replace cars, escalators, track, and other facilities, breakdowns and delays will become commonplace. The systems elevators and escalators are already notoriously unreliable, and Metrorail relies on such mechanisms more than any U.S. rail systems.

Washington Transit Commuting Trends



According to the Pickrell report, Metrorail construction went 83 percent over budget, and operations cost three times as much as originally anticipated. Ridership fell short of expectations by 28 percent, largely because planners mistakenly assumed that Washington would not experience the suburbanization that was taking place in so many other urban areas. Initial estimates claimed that Metrorail would carry 70 percent of commuters into downtown Washington; as of 2002, it carries only 40 percent. Pickrell estimated that the cost per new rider was $12.

An extension currently under construction is costing well over $100 million per mile.

Despite the huge investment, transit's share of regional travel continues to decline. The 2000 census revealed that rail transit had gained 24,000 new commuters since 1990, but bus transit lost 45,000 commuters, for a net loss (including other modes) of 22,000 transit commuters. Since the DC area gained 113,000 new commuters in the 1990s, this represents a huge loss in market share for transit. As with Chicago, this is largely due to a suburbanization of jobs.

Transit also lost market share of total travel during the 1990s. DC-area transit agencies reported a 1.4 percent increase in transit trips and an 8 percent increase in transit passenger miles, but DC-area highways supported a 29-percent in driving.

The Ballston corridor in Virginia is frequently cited as a model of rail-inspired transit-oriented development. However, rail advocates fail to mention that much of Ballston's success is due to the completion of Interstate 66, which serves the entire Ballston area.

Metrorail's service to Reagan National Airport is the best rail service to any airport in the nation. Yet in the mid 1990s only 9 percent of air travelers used Metrorail to get to or from National Airport.[46] (Planners say it has since increased to 12 percent.) The commuter rail lines carry few passenger miles per route mile but operating costs are about average.

Washington Transit System Data

	Trips (millions)	Share of of Travel
1990	376.1	4.33%
2000	381.4	3.97%

Future plans: A $4 billion proposal to build a 23-mile rail extension to Dulles Airport is under consideration. The supplemental draft environmental impact statement for the line projects it will get 52,000 daily riders (only 4,300 of whom would get on or off at the airport station), compared with 31,000 (3,700 at the airport station) using a bus-rapid transit line that would cost only 12 percent as much. One analyst suggests that a Dulles rail extension would be so unproductive that, even if it cost nothing to build, it would be cheaper to pave it and turn it into HOT lanes than to continue to operate it.

Washington Rail Transit Data

	Avg. Occup.	Cost/ Trip	Cost/ PM	PM/ Rt Mi	% Fwy Ln Mi	Travel Share
Metrorail	28	1.90	0.32	38,148	125%	2.73%
MD CR	40	9.00	0.29	2,494	8%	0.35%
VA CR	55	8.45	0.25	3,088	10%	0.17%

Disasters in the Making

Light-rail lines now being built or in planning stages in Houston, Minneapolis-St. Paul, Phoenix, Seattle, and South Jersey are all headed for disaster. Houston has completed one short light-rail line and just received voter approval for several more. The Twin Cities and South Jersey light-rail are nearly complete, and both have gone well over budget. Not a spade has been turned for Seattle's light-rail line, yet it is already so far over budget that the *Seattle Times*, which originally endorsed its construction, now advocates scrapping the project. An environmental impact statement written for Phoenix's planned light-rail line predicts it will increase both congestion and pollution. The Seattle line is described above and the other four are profiled below.

Other cities are planning rail lines that are not discussed here in detail. Charlotte, North Carolina, expects to begin operating an 11-mile light-rail line in 2006 at a cost of $350 million, or nearly $32 million a mile. Fortunately, voters in Tucson and Kansas City both rejected rail measures on the November 2003 ballot and voters in Cincinnati rejected light-rail in November 2002.

The list of other regions that dream of building rail is staggering, and includes Livermore, Oceanside, Orange County, Santa Barbara, and Santa Cruz, CA; Ft. Collins and Vail, Colorado; Stamford, CT; Orlando and Tampa, FL; Savannah, GA; Honolulu, Kauai, and Maui, HA; Indianapolis, IN; Louisville, KY; Baton Rouge, LA; Detroit, MI; Las Vegas, NV; Albuquerque, NM; Rochester, NY; Cincinnati and Columbus, OH; Greenville, SC; Memphis, TN; Austin, El Paso, and San Antonio, TX; Norfolk and Roanoke, VA; Spokane, WA; and Madison, WI. This doesn't even count various "vintage trolley" plans in a number of other cities.

Houston

Description: Metro, Houston's transit agency, opened a 7.5-mile light-rail line connecting the city center with the Astrodome (Reliant Park) on January 1, 2004.

Why it is a disaster: At a cost of $324 million, or $43 million a mile, the line is expected to carry only about 33,000 riders per day. In the unlikely event that everyone rides the full distance, this is less than a quarter of a percent of regional travel. The rail line has already caused at least eleven accidents, one leading to the death of a woman whose automobile tire apparently got caught in the groove next to one of the rails.

Houston Transit System Data

	Trips (millions)	Share of of Travel
1990	90.7	1.09%
2000	100.5	1.10%

Future plans: Metro wants to spend $8 billion building 80 more miles of light-rail and commuter-rail lines. In November, 2003, voters approved, by a 51-49 vote, a measure to build the next 22 miles of light rail.

Minneapolis-St. Paul

Description: Construction is nearly complete on the Twin Cities' first light-rail line, a 12-mile line from downtown Minneapolis to the airport and Mall of America.

Why it is a disaster: Originally expected to cost $460 million, the cost is now up to $715 million. Planners predicted the line will take 9,000 auto trips off the road each day, for a cost per new ride of more than $18. At the higher construction cost, the real cost will be closer to $26 per new ride.

Minneapolis-St. Paul Transit System Data

	Trips (millions)	Share of of Travel
1990	69.6	1.03%
2000	79.5	1.00%

Future plans: Planners want to start commuter rail service on a corridor northwest from Minneapolis and to build more light-rail lines including one between Minneapolis and St. Paul.

Phoenix

Description: After twice rejecting funding for light rail, voters approved a plan to build 24 miles of light-rail

lines in 2000. The first line is expected to open in 2006.

Phoenix Transit System Data

	Trips (millions)	Share of of Travel
1990	32.1	0.59%
2000	39.9	0.49%

Why it is a disaster: The environmental impact statement (EIS) for the light-rail project predicts that it will reduce regional driving by a mere 0.04 percent. Because it will occupy lanes now open to autos, it will increase congestion, resulting in 0.45 percent more delay to motorists. The EIS also predicts an increase in carbon monoxide emissions, probably as a result of the added congestion.[47]

South Jersey

Description: Scheduled to open March 14, 2004, the South Jersey light-rail line is a 34-mile project connecting Trenton with Camden. This rail line is really a part of the greater Philadelphia urban area, but is expected to be such a disaster that it deserves its own profile.

Why it is a disaster: The South Jersey rail line is so bad that it is almost a New-Jersey-caricature of everything wrong with rail transit.

- Originally projected to cost $314 million, the final cost is now expected to be $950 million.
- Originally projected to carry 9,000 people a day (which is far less than most light-rail lines carry), the state has revised its projections downward to 4,500 and some think that is optimistic.
- Most rail lines operate to or past midnight, but conflicts with freight trains mean that this line cannot operate after 10 PM.
- Prior to the decision to build the line, the route it follows was "way down on the list of 'most congested' areas in South Jersey." Yet now most of the funds available for congestion relief are being poured into this route, including funds to start shuttle-bus service to the line.[48]
- The only reason it is being built is to placate South Jersey politicians who were jealous of the pork involved in the North Jersey Hudson-Bergen light-rail line. While the Hudson-Bergen and San Jose lines are the worst-performing light-rail lines in the U.S., the South Jersey line may do even worse.
- New Jersey Transit had studied the feasibility of building a light-rail line in Trenton several times and always concluded that the line would be such a loser that even the federal government wouldn't contribute to it. So a state senator from south Jersey who happened to chair the senate transportation committee simply drew a line on a map and ordered that the line be built.
- The decision to build the line was made before any public meetings were held. When public "hearings" were finally held, they were only for distributing information, not for soliciting public input.
- Barely a week after the state transportation commissioner signed the contracts to build the line, he quit his job to take a position with, and soon become president of, the company that expects to earn at least $72 million in profits overseeing construction of the line.
- The consortium of companies building the line have already sued the state asking for $100 million more than they agreed to be paid to build it.
- Completion of the project has been delayed by more than a year, most recently because eighteen crossing gates don't operate properly.

If nothing else, the South Jersey rail line may take the crown of worst performing light-rail line in the country away from the Hudson-Bergen and San Jose lines.

Alternatives to Rail Transit

If rail transit is not the solution to urban transportation problems, what is? A detailed discussion of alternatives is beyond the scope of this report. Briefly, however, the ideal alternative would use transportation dollars on the most effective investments, as measured by the cost per hour of reduced delay. This may mean highway investments, it may mean improvements in bus service, and in a few places it may even mean commuter rail or other rail improvements. But investments made without considering this standard are likely to be wasteful and impractical.

Planners should also recognize that capacity expansions are not the only solution to congestion. Traffic signal coordination, freeway ramp metering, and incident management (rapid detection and removal of highway obstructions) have all been identified by the Texas Transportation Institute as cost-effective ways of reducing congestion.[32]

Another important tool is congestion pricing of roads. Such pricing aims to smooth the peaks in rush-hour traffic. Most traffic at rush hour is not commuters, and congestion pricing can encourage some of these people to drive at other times of the day. One way to implement congestion pricing is to convert carpool lanes to high-occupancy/toll (HOT) lanes and use the revenues from low-occupancy vehicles using these lanes to build a HOT-lane network throughout the urban area.

As a transit alternative to rail, many now promote the idea of bus-rapid transit, which means running buses on rail schedules, with fewer stops (and thus higher average speeds) and higher frequencies. The General Accounting Office recently found that bus-rapid transit lines can cost less to start, cost less to operate, and move people faster than light rail.[33]

An effective combination of these ideas would be for regions to operate bus-rapid transit on HOT lanes. The HOT lanes would reduce congestion for the auto travelers that make up a majority of the region while the bus-rapid transit would cost-effectively improve transit service for those who cannot drive or choose to use transit.

If these alternatives are so good, then why are regions building rail transit instead? The simple answer is that the coalition of pork-lovers, auto-haters, and nostalgia buffs that support rail have no reason to support HOT lanes and bus-rapid transit. Bus-rapid transit provides little pork, HOT lanes displease auto haters by relieving congestion, and buses are not as romantic as rails. But if the goal is to reduce congestion and air pollution at a reasonable cost, then HOT lanes, traffic signal coordination, bus-rapid transit, and similar programs are much more effective than any rail transit.

About the Appendix

Many of the raw data used in this report can be found in an appendix on pages 44 and 45. These data included the 2002 route miles, ridership, passenger miles,vehicle revenue miles, and operating costs for each of the 51 light-, heavy-, and commuter-rail lines described in the above profiles. The data also include 2002 energy costs and 1992 to 2001 fatalities. All of these numbers are extracted from the National Transit Data Base, which is maintained by the U.S. Department of Transportation.

For comparison, the appendix also shows the number of daily passenger miles per freeway lane mile and total annual highway passenger miles in each urban area. These numbers are based on table HM-72 of the 2002 *Highway Statistics*, also published by the U.S. Department of Transportation.

Conclusions

Reviewing the transit profiles together with the data collected for the Rail Livability Index results in several important conclusions. The data also suggest several additional hypotheses that may be confirmed with further research.

Most important, **rail transit is not the urban savior that its advocates claim.** For every region in which rail is associated with increasing transit ridership, another can be found in which rail did not prevent a decrease in per capita ridership. For example, transit is attracting riders in Boston, a city with a long rail heritage, but it is failing miserably in Chicago, another city with a long rail history. Transit ridership is growing in the new-rail city of San Diego, but by most measures it is falling in Washington despite its sparkling subway.

It appears likely that for every rail region where transit is doing well, transit is doing equally well in some other non-rail region. This can be seen by comparing Portland with Seattle, two regions with comparable transit growth even though the latter region did not open its first commuter rail line until 1999. Even more striking is Las Vegas, whose pure-bus system experienced huge increases in transit ridership and transit's share of travel in the 1990s.

Increases in transit ridership after rail lines open are often short lived. Though rail transit improvements often lead to increase ridership, as observed by researchers at the Center for Urban Transportation Research, these increases taper off after three or four years. In the long run, region-wide transit service and ridership often suffers, probably because rail transit is so costly that transit agencies must raise fares or cut bus services.

Nor does rail reverse the decentralization of jobs and populace derisively termed "sprawl." For every rail region with an inner-city renaissance, another can be found in which rail did not slow the flight to the suburbs of jobs and populace. For example, the city of Portland is thriving, but—despite a growth of the St. Louis region as a whole—the city of St. Louis continues to lose population.

This is confirmed by a study funded by the Federal Transit Administration that found rail transit "no longer has the ability to shape urban form the way it did in the streetcar and subway era." "Rail transit investments rarely 'create' new growth," the study added, "but more typically redistribute growth that would have taken place without the investment."[49] Downtown areas are the main beneficiaries of transit.

While there is no clear association between rail transit and transit growth or inner-city redevelopment, **rail transit is strongly associated with increased congestion.** The only rail regions that escaped large increases in congestion were regions whose populations were nearly stagnant. Far from curing congestion, rail transit seems to insure that congestion will worsen.

Rail transit also makes transit agencies more vulnerable to economic downturns. As demonstrated in St. Louis, San Jose, and elsewhere, the inflexibility of rail transit and high fixed costs in the face of declining tax revenues mean that agencies with rail transit are more likely to face fiscal crises.

The biggest problem with rail transit is its great cost, which imposes a tax burden on urban areas most of whose residents rarely, if ever, use rail transit. On top of the tax burden is the opportunity cost of things that cannot be funded with dollars dedicated to rail construction, especially considering that a large share federal transportation dollars, which are funded out of gasoline taxes and other highway user fees, can be spent on either transit or highways.

Even if construction were free, there are significant reasons to oppose rail transit. In comparable corridors, rail transit is usually more costly to operate than buses. Rail transit is more dangerous than buses and light- and commuter-rail transit are more dangerous than autos. Light rail increases congestion whenever it occupies lanes formerly used by autos. Rail's inflexibility means that it cannot respond to short-term incidents or long-term changes in travel patterns. Many rail systems consume more energy than autos and Diesel-powered commuter rail may produce more pollution.

For all of these reasons, it is clear that rail transit detracts from urban livability by far more than it adds. Regions considering rail transit should carefully evaluate bus-rapid transit, high-occupancy/toll lanes, and other alternatives. Where congestion is a problem, the most important criterion for evaluating these alternatives should be the cost per hour of reduced delay.

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Appendix: Rail Transit

Region (System)	Mode	Route Miles	Trips (1000s)	Passenger Miles (1000s)	Vehicle Rev. Miles (1000s)	Operating Cost Total ($1000s)	Operating Cost Per Trip	Occupancy Per PM.	Occupancy (PM/ VRM)	Daily PM/ Rt. Mi.	Daily PM /Freeway Lane Mile
Atlanta	HR	48	82,339	510,362	23,552	122,276	1.49	0.24	22	29,100	30,821
Baltimore	HR	15	14,240	63,736	4,580	39,345	2.76	0.62	14	11,879	26,654
Baltimore	LR	29	8,795	56,647	2,635	32,027	3.64	0.57	21	5,389	26,654
Boston	CR	356	39,267	764,775	22,694	192,233	4.90	0.25	34	5,891	26,314
Boston	HR	38	161,282	562,184	20,802	206,319	1.28	0.37	27	40,373	26,314
Boston	LR	26	73,763	172,709	5,689	96,698	1.31	0.56	30	18,556	26,314
Buffalo	LR	6	5,797	14,158	838	14,735	2.54	1.04	17	6,256	16,323
Chicago (N Ind)	CR	90	3,590	98,368	2,988	28,062	7.82	0.29	33	2,998	30,947
Chicago (Metra)	CR	470	69,610	1,534,309	37,605	423,543	6.08	0.28	41	8,940	30,947
Chicago	HR	103	180,400	995,621	61,533	359,022	1.99	0.36	16	26,444	30,947
Cleveland	HR	19	7,186	53,955	2,126	22,877	3.18	0.42	25	7,760	20,618
Cleveland	LR	15	3,058	18,063	941	13,031	4.26	0.72	19	3,256	20,618
Dallas-Ft. Worth	CR	35	2146	29594	1,307	26,401	12.30	0.89	23	2,333	26,427
Dallas-Ft. Worth	LR	36	13,733	74,433	3,972	44,918	3.27	0.60	19	5,672	26,427
Denver	LR	16	10,430	44,578	2,976	18,984	1.82	0.43	15	7,730	26,562
Los Angeles	CR	384	7,911	265,148	7,256	100,882	12.75	0.38	37	1,890	37,022
Los Angeles	HR	16	34,551	163,931	5,957	62,229	1.80	0.38	28	28,158	37,022
Los Angeles	LR	41	32,606	228,780	5,782	83,689	2.57	0.37	40	15,213	37,022
Miami-Ft. Lauderdale	CR	71	2,530	76,015	1,981	22,233	8.79	0.29	38	2,929	28,186
Miami-Ft. Lauderdale	HR	21	13,754	107,822	7,376	61,512	4.47	0.57	15	14,000	29,802
New Haven	CR	51	295	6,507	593	6,581	22.31	1.01	11	352	23,219
New Orleans	SC	8	5,370	12,532	648	8,522	1.59	0.68	19	4,292	22,650
New York (NJT)	CR	546	64,342	1,544,125	47,364	460,774	7.16	0.30	33	7,752	24,877
New York (LIRR)	CR	319	100,504	2,094,067	57,535	782,133	7.78	0.37	36	17,979	24,877
New York (Metro-North)	CR	273	73,130	2,129,537	49,463	598,894	8.19	0.28	43	21,383	24,877
New York (Staten Island)	HR	14	3,618	23,188	2,148	25,409	7.02	1.10	11	4,443	24,877
New York (PATH)	HR	13	62,639	245,518	11,384	170,699	2.73	0.70	22	53,812	24,877
New York (subway)	HR	247	1,694,027	7,865,983	333,566	2,255,945	1.33	0.29	24	87,285	24,877
New York (H-B)	LR	8	3,092	11,555	705	14,292	4.62	1.24	16	3,814	24,877
New York (Newark)	LR	4	4,668	11,106	479	30,712	6.58	2.77	23	7,332	24,877
Philadelphia (PennDOT)	CR	72	201	14,677	763	7,202	35.83	0.49	19	557	23,624
Philadelphia (SEPTA)	CR	225	30,824	409,243	15,535	168,402	5.46	0.41	26	4,992	23,624
Philadelphia (PATCO)	HR	16	9,288	79,825	4,131	31,375	3.38	0.39	19	13,886	24,877
Philadelphia (SEPTA)	HR	38	84,708	376,457	15,685	118,744	1.40	0.32	24	27,106	23,624
Philadelphia (SEPTA)	LR	35	22,750	54,575	3,028	42,425	1.86	0.78	18	4,315	23,624
Pittsburgh	LR	17	7,483	32,937	1,605	30,268	4.04	0.92	21	5,186	15,392
Portland	LR	41	28,254	167,555	5,664	56,258	1.99	0.34	30	11,293	28,987
Sacramento	LR	20	8,541	46,711	2,128	24,129	2.83	0.52	22	6,289	29,914
Salt Lake City	LR	17	9,755	53,747	2,322	22,410	2.30	0.42	23	8,611	25,086
San Diego	CR	41	1,281	36,371	1,194	11,226	8.76	0.31	30	2,424	29,291
San Diego	LR	48	25,433	150,309	7,047	37,359	1.47	0.25	21	8,526	29,291
San Francisco (CalTrains)	CR	77	8,138	166,648	5,571	61,364	7.54	0.37	30	5,941	32,200
San Francisco (BART)	HR	95	97,146	1,176,306	58,437	330,954	3.41	0.28	20	33,906	32,200
San Francisco (Muni)	LR	36	47,898	117,816	5,459	114,752	2.40	0.97	22	8,856	32,200
San Jose (Altamont)	CR	86	804	36,610	739	15,750	19.59	0.43	50	1,166	29,998
San Jose	LR	29	7,790	34,656	2,466	53,581	6.88	1.55	14	3,252	29,998
Seattle	CR	39	817	20,592	298	12,052	14.75	0.59	69	1,436	28,019
St. Louis	LR	34	14,680	126,729	5,156	34,025	2.32	0.27	25	10,093	23,259
Washington (MD)	CR	200	5,955	182,228	4,583	53,590	9.00	0.29	40	2,494	29,546
Washington (VA)	CR	81	2,735	91,014	1,662	23,107	8.45	0.25	55	3,088	29,546
Washington	HR	103	242,794	1,438,336	52,192	460,755	1.90	0.32	28	38,148	29,546

and Transportation Data

Rail as % of Fwy Lane Mile	Annual Highway Pass. Miles	Annual Transit Pass. Miles	Transit Share	Rail Share	Electric Energy KWHr	Diesel Fuel (1000s of gallons)	BTUs	BTUs/ Pass Mile	Fatalities 92-01	Pass. Miles 92-01 (1000s)	Fatalities Per BPM
94.4%	59,218,678	844,183	1.41%	0.85%	185,732		2,185,134,627	4,282	16	4,463,727	3.6
44.6%	29,349,504	630,771	2.10%	0.21%	26,417		310,799,535	4,876	5	609,242	8.2
20.2%	29,349,504	630,771	2.10%	0.19%	24,658		290,099,017	5,121	8	402,664	19.9
22.4%	47,124,712	1,825,068	3.73%	1.56%		11,691	1,504,623,978	1,967	72	5,493,398	13.1
153.4%	47,124,712	1,825,068	3.73%	1.15%	182,083		2,142,204,142	3,811	26	4,724,366	5.5
70.5%	47,124,712	1,825,068	3.73%	0.35%	52,817		621,387,299	3,598	5	1,379,100	3.6
38.3%	12,650,608	74,522	0.59%	0.11%	8,390		98,704,821	6,972	0	168,953	0.0
9.7%	96,648,496	3,699,985	3.69%	0.10%	16,333		192,155,392	1,953	35	866,652	40.4
28.9%	96,648,496	3,699,985	3.69%	1.53%	109,446	24,613	4,455,313,597	2,904	210	14,482,005	14.5
85.5%	96,648,496	3,699,985	3.69%	0.99%	366,053		4,306,618,251	4,326	41	8,994,504	4.6
37.6%	21,466,088	255,810	1.18%	0.25%	27,559		324,226,929	6,009	4	525,090	7.6
15.8%	21,466,088	255,810	1.18%	0.08%	12,340		145,174,218	8,037	1	278,666	3.6
8.8%	62,662,032	443,243	0.70%	0.05%						32,277	0.0
21.5%	62,662,032	443,243	0.70%	0.12%	44,359		521,885,988	7,011	2	286,838	7.0
29.1%	26,559,736	385,041	1.43%	0.17%	13,400		440,693,370	3,536	6	155,971	38.5
5.1%	170,829,344	2,864,198	1.65%	0.15%					36	1,738,911	20.7
76.1%	170,829,344	2,864,198	1.65%	0.09%	88,677		1,043,284,905	6,364	1	307,362	3.3
41.1%	170,829,344	2,864,198	1.65%	0.13%	50,651		595,905,486	2,605	56	1,481,598	37.8
10.4%	70,156,504	684,615	0.97%	0.11%					19	765,890	24.8
47.0%	70,156,504	684,615	0.97%	0.15%	64,448		758,234,250	7,032	3	1,106,531	2.7
1.5%	7,921,376			0.08%					2	59,789	33.5
18.9%	9,311,880	142,265	1.50%	0.13%	2,843		33,451,425	2,669	2	143,226	14.0
31.2%	160,463,928	18,589,493	10.38%	0.86%	98,070	10,441	2,497,605,260	1,617	95	11,758,487	8.1
72.3%	160,463,928	18,589,493	10.38%	1.17%	422,297	6,8323	5,847,635,333	2,792	194	18,562,562	10.5
86.0%	160,463,928	18,589,493	10.38%	1.19%	397,535	6,152	5,468,794,403	2,568	168	21,817,897	7.7
17.9%	160,463,928	18,589,493	10.38%	0.01%	23,768		279,630,520	12,059		326,661	0.0
216.3%	160,463,928	18,589,493	10.38%	0.14%	88,205		1,037,730,649	4,227	15	2,970,899	5.0
350.9%	160,463,928	18,589,493	10.38%	4.39%	1,785,020		21,000,760,300	2,670	355	69,204,651	5.1
15.3%	160,463,928	18,589,493	10.38%	0.01%	2,959		34,817,341	3,013	0	6,961	0.0
29.5%	160,463,928	18,589,493	10.38%	0.01%					0	114,212	0.0
2.4%	54,571,880	1,428,383	2.55%	0.03%					6	125,361	47.9
21.1%	54,571,880	1,428,383	2.55%	0.73%	208,603		2,454,214,295	5,997	44	3,591,014	12.3
55.8%	54,571,880	1,428,383	2.55%	0.14%	38,837		456,918,482	5,724		950,853	0.0
114.7%	54,571,880	1,428,383	2.55%	0.67%	136,334		1,603,967,157	4,261	35	3,880,755	9.0
18.3%	54,571,880	1,428,383	2.55%	0.10%	29,791		350,491,115	6,422	8	736,507	10.9
33.7%	21,113,936	352,486	1.64%	0.15%	20,594		242,291,940	7,356	2	379,636	5.3
39.0%	18,586,384	446,958	2.35%	0.88%	35,592		418,735,174	2,499	9	749,812	12.0
21.0%	17,824,264	136,832	0.76%	0.26%	16,610		195,417,827	4,184	6	382,685	15.7
34.3%	13,185,552	154,714	1.16%	0.40%	16,119		189,634,153	3,528	3	100,252	29.9
8.3%	38,772,344	509,854	1.30%	0.09%					6	176,332	34.0
29.1%	38,772,344	509,854	1.30%	0.38%	36,702		431,795,501	2,873	22	1,306,923	16.8
18.5%	53,695,880	2,315,401	4.13%	0.30%					51	1,554,375	32.8
105.3%	53,695,880	2,315,401	4.13%	2.10%	276,261		3,250,213,018	2,763	29	10,043,754	2.9
27.5%	53,695,880	2,315,401	4.13%	0.21%	54,235		638,074,775	5,416	10	1,051,205	9.5
3.9%	23,148,008	222,327	0.95%	0.16%						110,244	0.0
10.8%	23,148,008	222,327	0.95%	0.15%	25,500		300,006,324	8,657	6	346,187	17.3
5.1%	39,320,720	912,362	2.27%	0.05%						17,848	0.0
43.4%	35,210,528	283,761	0.80%	0.36%	28,679		337,411,965	2,662	2	661,326	3.0
8.4%	50,527,096	2,156,079	4.09%	0.35%					0	1,482,058	0.0
10.5%	50,527,096	2,156,079	4.09%	0.17%					1	588,816	1.7
129.1%	50,527,096	2,156,079	4.09%	2.73%	393,671		4,631,540,492	3,220	11	10,870,617	1.0

Center for the American Dream
of mobility and home ownership

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About the Center for the American Dream

The Independence Institute's Center for the American Dream is working to give people freedom of choice in land use and transportation while protecting urban livability and environmental quality. The "dream" of the Center for the American Dream is affordable homeownership, mobility, a clean and livable environment, and personal freedom for all Americans, not just an elite few.

The Center for the American Dream does not advocate that people drive everywhere or take public transit, live in low-density suburbs or high-density urban centers. All of these are legitimate lifestyles. The Center does oppose coercive planning efforts that attempt to engineer lifestyles through subsidies, regulation, and limits on personal and economic freedom.

Randal O'Toole, the author of this report, is also the director of the Center for the American Dream. As the author of *Reforming the Forest Service* and *The Vanishing Automobile and Other Urban Myths*, Mr. O'Toole has a national reputation in environmental policy analysis. In addition to doing research on a variety of urban and rural environmental issues, Mr. O'Toole has taught at Yale, the University of California at Berkeley, and Utah State University.

About Great Rail Disasters

Some two dozen U.S. urban areas have rail transit, and many more want to build new rail lines. Will these rail lines keep the promises made for them by rail advocates? This paper constructs a *Rail Livability Index* using thirteen measures of the impact rail transit has had on urban areas, including transit ridership, congestion, cost effectiveness, safety, and land use.

The paper concludes that rail has had a negative effect on all the urban areas that have it.

- Collectively, the two-dozen urban areas with rail lost 33,000 transit commuters during the 1990s, while the two-dozen largest urban areas with bus-only transit gained 27,000 transit commuters.
- Rail transit is strongly associated with rapidly growing congestion: Sixteen of the twenty regions with the fastest growing congestion are rail regions.
- On the average, one dollar spent on freeway construction will move as many people as fourteen dollars spent on rail construction.
- Building rail lines is much less cost effective than bus-rapid transit and other bus improvements.
- Rail transit is more dangerous than buses or urban interstate freeways, with commuter rail and light rail being particularly deadly to pedestrians and auto users.
- Three out of five rail lines use more energy per passenger mile than passenger autos.

In general, regions that improve bus transit will be much better off than regions that build rail transit.