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Urban transit is important for those who lack access to automobiles. But the history of the last four decades shows that transit cannot and will not play a significant role in saving energy or preventing climate change.

Forty years ago, American cities were choked with air pollution, so Congress passed the Clean Air Act of 1970 and created the Environmental Protection Agency (EPA) to administer the law. The EPA adopted two strategies to reduce pollution. First, it required automakers to make cars that polluted less. Second, it also encouraged cities to promote transit and adopt other policies aimed at getting people to drive less.

Today, we know what worked and what did not. Automotive air pollution has declined by at least two-thirds since 1970. This entire decline was due to technological changes in automobiles. Far from responding to transit investments by reducing driving and taking transit more, Americans today drive far more than they did in 1970.

As the late University of California (Irvine) economist Charles Lave demonstrated in the October, 1979 *Atlantic Monthly,* investing in transit fails to save energy or reduce air pollution for two reasons:

- First, spending more money on transit does not significantly reduce driving.
- Second, transit uses just about as much energy as cars, so even if we could persuade people to take transit it would not save energy (see http://www.theatlantic.com/doc/197910/197910).

Dr. Lave's arguments are as valid today as they were in 1979, and as valid for greenhouse gas emissions as for energy and other pollutants. The difference between 1979 and today is that today we have much more evidence to back up Dr. Lave's points.

Transit Investments Do Not Significantly Increase Transit Ridership

Transit subsidies have historically had only a trivial effect on ridership. Between 1987 and 2007, annual subsidies in real dollars grew by 68 percent. Yet annual ridership grew by only 18 percent. While capital subsidies are sketchy before 1987, operating subsidies increased by 1240 percent since 1970. Yet ridership grew by only 45 percent.

More importantly, despite total real subsidies of well over three-quarters of a trillion dollars since 1970, per-capita transit ridership and passenger miles actually declined. Figure one (on page 8) shows that per-capita transit travel declined more-or-less steadily from 1970 through 1995. Although per-capita transit usage has grown a little since 1995, it remains below 1988, and far below 1970, levels.

Moreover, as figure two shows, while per-capita transit travel was declining, per-capita urban driving grew by 120 percent. Transit carried more than 4 percent of urban travel in 1970; but it fell below 2 percent in 1990 and now stands at 1.6 percent.

My former hometown of Portland, Oregon has invested more than $2 billion in light rail and streetcars. Yet this has had almost no effect on Portland travel habits. In 1980, before Portland built its first light-rail line, the census found 9.8 percent of Portland urbanized area commuters took transit to work. Today, Portland has four light-rail routes and a streetcar line, yet the Census Bureau's American Community Survey says only 6.5 percent of Portland commuters take transit to work.

The number of Portland-area residents taking transit to work actually declined between 2000 and 2007. These census numbers are confirmed by a 100-percent census of downtown employers conducted by the Portland Business Alliance in 2001 through 2007. More than two-thirds of all Portland-area transit commuters work in downtown Portland, but this census found that 7 percent fewer downtown workers took transit to work in 2007 than in 2001.

Transit Is Not Significantly Cleaner than Driving

Even if more subsidies to transit could attract significant numbers of people out of their cars, it would not save energy or reduce greenhouse gas emissions because transit uses as much energy and generates nearly as much greenhouse gas per passenger mile as urban driving. As described in my Cato Institute Policy Analysis no. 615 (http://www.cato.org/pubs/pas/pa-615.pdf), the following data are based on the Department of Energy's Transportation Energy Data Book, the Federal Transit Administration's National Transit Database, and the Federal Highway Administration's *Highway Statistics*.

In 2006, the nation's transit systems used an average of 3,444 BTUs and emitted 213 grams of CO_2 per passenger mile. The average passenger car used 3,445 BTUs—just 1 BTU more—and emitted 245 grams of CO_2 per passenger mile, just 15 percent more. While transit appears slightly cleaner than autos, as shown in figure three, auto and light truck energy efficiencies have rapidly improved, while transit energy efficiencies have declined. Since CO_2 emissions are proportional to energy consumption, these trends hold for greenhouse gas production as well.

We can expect these trends to continue. If auto manufacturers meet the Obama administration's new fuel-economy standards for 2016—even if they fail to improve energy efficiencies beyond that—by 2025 the average car on the road will consume only 2,600 BTUs and emit only about 186 grams of CO_2 per passenger mile—considerably less than most transit systems (figure four).

This rapid improvement is possible because America's auto fleet almost completely turns over every 18 years. By comparison, cities that invest in rail transit are stuck with the technology they choose for at least 30 years. This means potential investments in transit must be compared, not with today's cars, but with cars 15 to 20 years from now.

In much of the country, the fossil-fuel-burning plants used to generate electricity for rail transit emit enormous amounts of greenhouse gases. Washington's Metrorail system, for example, generates more than 280 grams of CO_2 per passenger mile—considerably more than the average passenger car. Light-rail systems in Baltimore, Cleveland, Denver, Philadelphia, and Pittsburgh all emit more greenhouse gases per passenger mile than the average SUV.

In places, such as the West Coast, that get much of their electricity from renewable sources, it would be wiser and more cost-effective to apply that electricity to plug-in hybrids or other electric cars that can recharge their batteries at night when renewable power plants generate surplus energy. As Professor Lave said, the "law of large proportions" dictates that "the biggest components matter most." In other words, since more than 90 percent of urban travel is by auto and only 1.6 percent is by transit, small improvements in autos can be far more significant than large investments in transit.

Transit has several other disadvantages as a way of reducing greenhouse gas emissions. First, even where electric-powered rail transit generates less greenhouse gases than cars or buses, the trains are supported by feeder bus systems that emit lots of greenhouse gases. While the trunk line buses that new rail transit lines replace typically run fairly full, the feeder buses that support rail transit run fairly empty because many rail riders drive to transit stations. The result is that greenhouse gas emissions on many transit systems increase after opening rail transit lines. After opening its first light-rail line, CO_2 emissions from St. Louis' transit system climbed from 340 to 400 grams per passenger mile, while Houston's grew from 218 to 263 grams per passenger mile.

Construction of rail transit also consumes huge amounts of energy and releases enormous amounts of greenhouse gases. Portland planners estimated that the energy cost of constructing one of the city's light-rail lines would equal 170 years worth of energy savings.

Highway construction also generates greenhouse gases, but because highways are much more heavily used than most rail transit lines, the emissions per passenger mile are far lower. Contrary to claims that rail transit can carry as many people as four or more freeway lanes, the New York City subway is the only rail transit line in America that carries more passenger miles per rail mile than one urban freeway lane mile. Outside of New York, the average urban freeway lane mile carries 12 times as many passenger miles as the average commuter rail mile, 7.5 times as many as the average light-rail mile, and 2.4 times as many as the average subway/elevated mile.

Further, as we tragically learned in the recent Washington Metrorail crash, rail transit systems must be completely rebuilt or rehabilitated every 30 years or so. The energy costs and greenhouse gas emissions from such reconstruction must be taken into account when considering rail transit. As a recent Federal Transit Administration report calculated, rehabilitation of rail lines in the nation's seven largest transit systems will cost at least $50 billion—money those agencies don't have. This is just one more indication that rail transit is not financially sustainable.

In the rare case where a transit investment really will reduce greenhouse gas emissions, the cost is exorbitantly high. McKinsey & Company says the United States can cut its greenhouse emissions roughly in half by 2030 by investing in technologies that cost no more than $50 per ton of CO_2 equivalent. But transit investments, if they reduce emissions at all, do so at costs of $5,000 per ton or more.

The American Transit Model Is Broken

Transit's poor performance is symptomatic of government-subsidized transit systems. Transit agencies that typically get three-quarters of their funds from taxpayers and only a quarter from transit users are politically obligated to run transit throughout their taxing districts no matter how few people want to use transit. The result is that the average transit vehicle, whether bus, light rail, subway, or commuter-rail car, runs an average of only one-sixth full.

Far from being short of funds, transit agencies have too much money, which they spend in the wrong places. Instead of providing economical transportation to users, they spend it on urban monuments such as light-rail and streetcar lines whose transportation value is negligibly different from buses. Agencies often go heavily into debt building these lines and are also obligated to huge operations and maintenance costs. Almost inevitably, they suffer budget crises that force them to significantly curtail service.

On a passenger-mile basis, transit buses typically consume as much energy and emit as much CO_2 per passenger mile as SUVs. By comparison, private bus companies have an incentive to fill as many seats as possible, so they typically operate half to two-thirds full and consume little more than 10 percent as much energy per passenger mile as public transit buses. Between Boston and Washington, for example, at least 14 bus companies carry more passengers each day than Amtrak and do so using less than half as much energy and emitting about half as much greenhouse gases.

To make transit more environmentally friendly, we need to completely redesign our transit systems. This means either privatizing transit systems or, at the least, operating them entirely out of user fees rather than subsidies. If states feel the need to support people who have no access to automobiles, they can give such people transportation vouchers that they can use on any public conveyances.

Transport Strategies to Reduce Greenhouse Gas Emissions

At the same time, we can significantly reduce greenhouse gas emissions from automobiles without engaging in futile efforts to try to get people to stop driving. The Texas Transportation Institute says urban congestion wastes nearly 3 billion gallons of fuel each year. Simple, low-cost techniques to relieve this congestion can do far more to reduce greenhouse gas emissions than investing more in a failed transit model.

One such technique is traffic signal coordination. A small investment in signal coordination can do more to reduce greenhouse gas emissions than billions invested in transit. For example, San Jose recently coordinated signals at 223 intersections, which reduced emissions by 4,200 tons per year at a cost of about $7 per ton. When the savings to motorists are counted, the project actually saved $200 per ton of reduced emissions. Yet the Federal Highway Administration estimates that three-quarters of the nation's traffic signals are obsolete or have no coordination at all.

Congestion pricing on existing HOV lanes and all new urban highways will also significantly reduce congestion. Looking to the future, accelerated investments in vehicle-to-vehicle and vehicle-to-infrastructure communications can greatly reduce congestion and increase personal mobility while saving energy and greenhouse gas emissions.

In short, instead of a futile effort to change American lifestyles, we simply need to make the form of transportation used most by Americans (as well as most Europeans and Japanese) even more efficient than it is today.

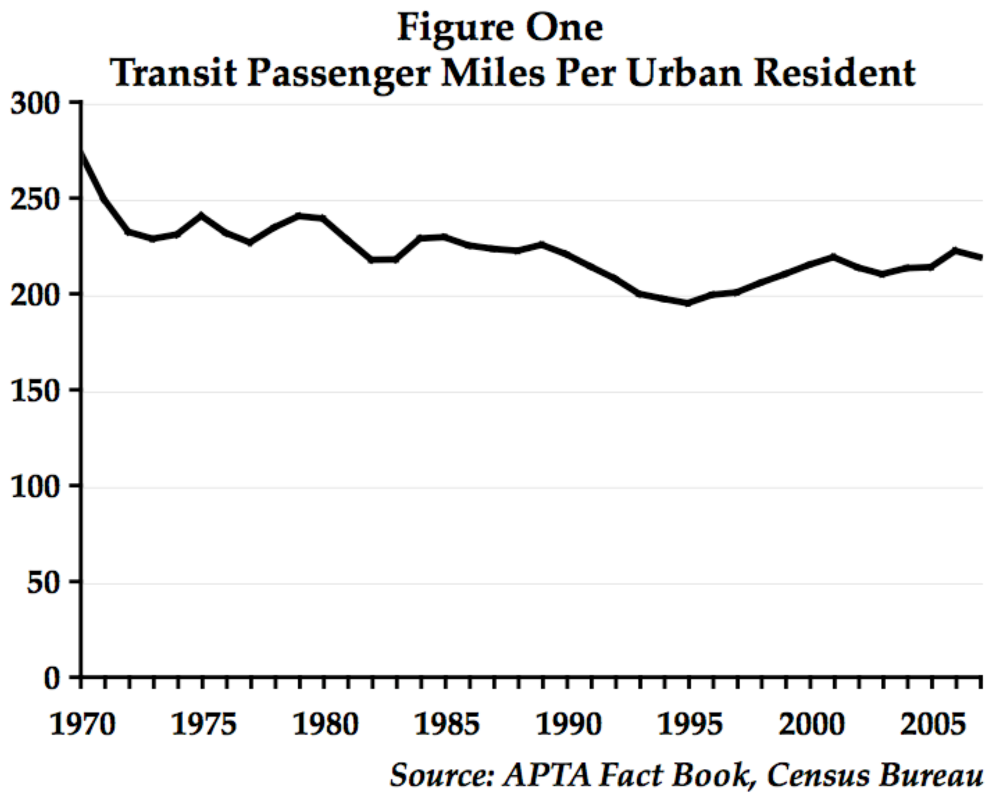


Figure One
Transit Passenger Miles Per Urban Resident
300
250
200
150
100
50
0
1970
1975
1980
1985
1990
1995
2000
2005
Source: APTA Fact Book, Census Bureau

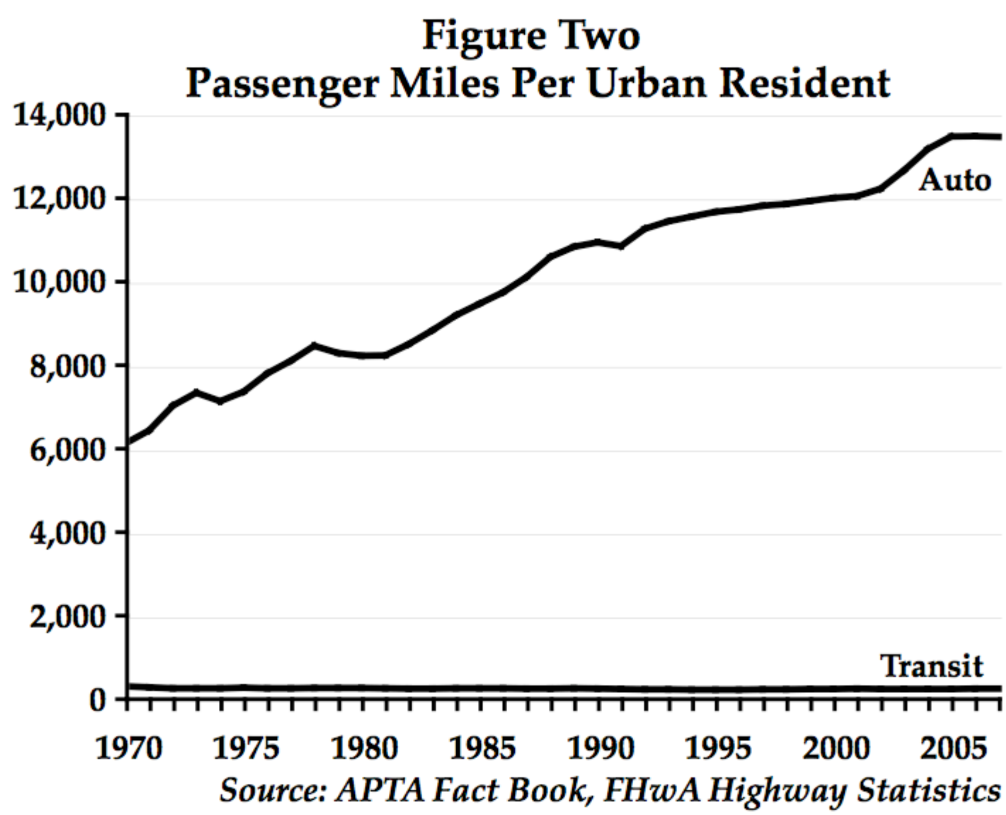
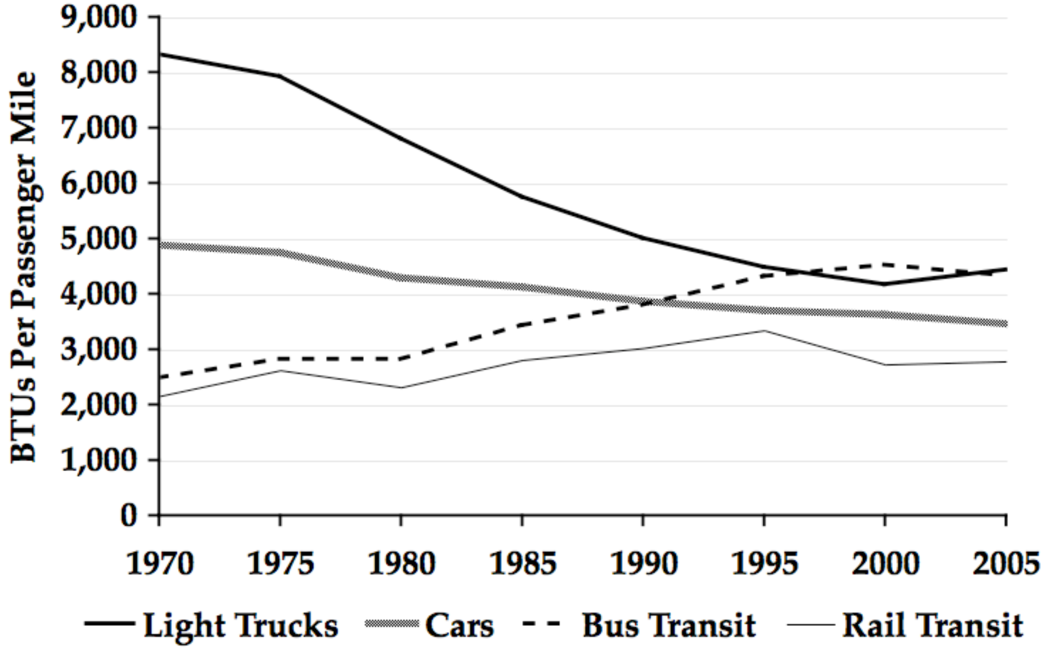


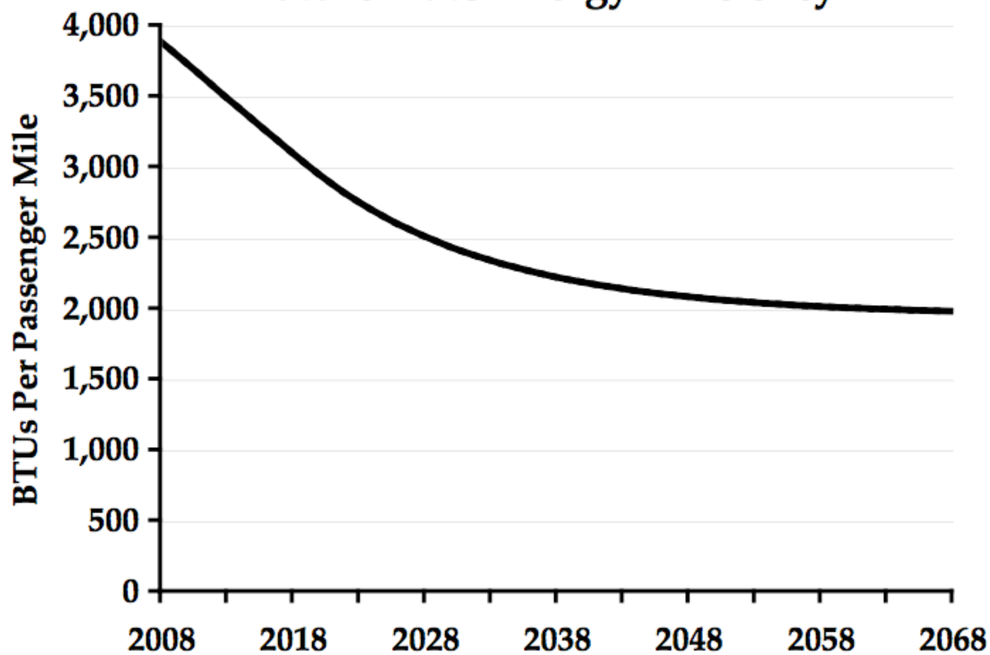
Figure Two
Passenger Miles Per Urban Resident
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Auto
Transit
1970
1975
1980
1985
1990
1995
2000
2005
Source: APTA Fact Book, FHwA Highway Statistics

Figure Three
Energy Intensity of Passenger Transport



Source: DOE, Transportation Energy Data Book

Figure Four
Future Auto Energy Efficiency



Source: Calculations based on Obama's fuel-economy mandates