The Cost of U.S. Public Transportation Breakdown

by Paul Gallagher

A "J" train leaving the Chambers Street Station in Manhattan.

June 27—It is a well-known fact that residents of the United States use their personal motor vehicles for almost all travel, and that companies in the country use commercial trucks to ship the great majority of non-bulk freight cargo. It is often remarked that this is because Americans are "addicted" to cars and trucks for cultural reasons and because gasoline is relatively cheap; but the reason is much simpler.

All forms of public rail transportation, from subways to Amtrak inter-city lines, are very slow and unreliable as to schedule; rail freight transport is extremely slow; even air travel is so unreliably scheduled and has so many layover stops as to be slow, relative to driving, for trips up to about 300 miles. This is the result of decades of lack of investment in urban transportation, commuter rail, electric intercity rail, and airports, as well as deregulation of air travel and trucking.

While metropolitan area rail systems have simply deteriorated, leaving buses stuck in the congestion of cars and trucks, the United States has simply ignored the decades' march of technology for electric rail, control, and signaling which have made rail travel considerably faster in most other industrial countries.

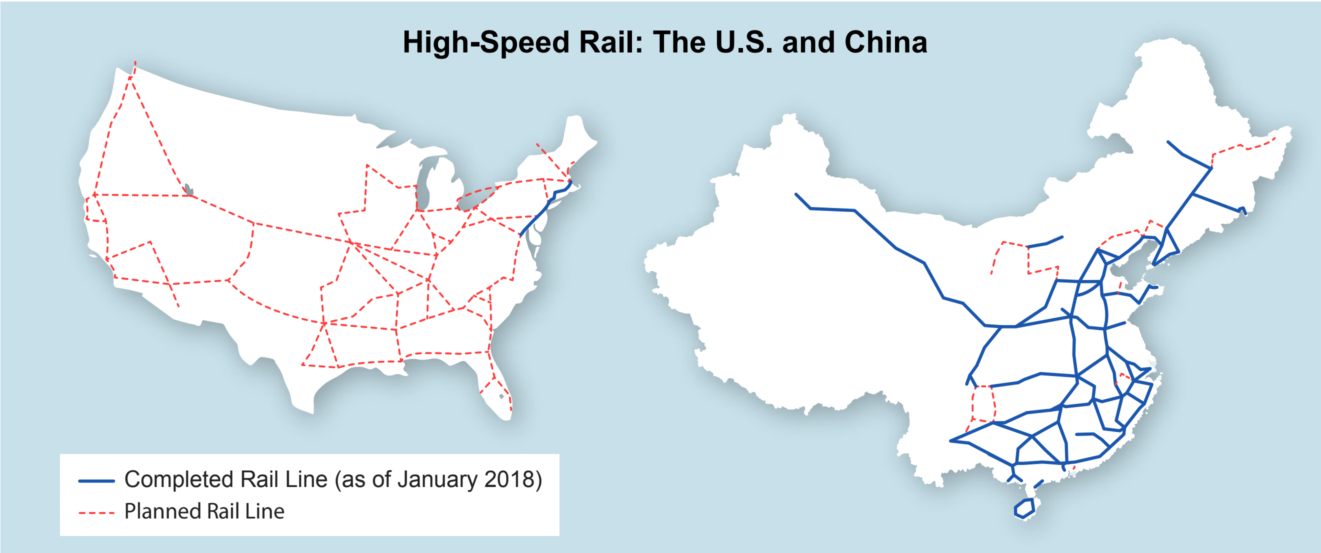
The increasingly frequent claim of "experts" that the United States' destiny is simply to "skip over" the whole of modern rail technology and go directly to universal self-driving electric cars and trucks, is also bogus. China has built an entire high-speed rail system of nearly 13,000 miles in the decade the United States has been talking about the self-driving car future, and will probably get to at least 20,000 miles while Americans continue talking about it.

Here are the average speeds of metropolitan transportation in the United States:

- Metropolitan area rail, average 21 mph
  of which, commuter rail 28 mph
  of which, metro/subway (so-called "heavy rail") rail, 15 mph
- Metropolitan area bus, average 12.2 mph
  (was 13.6 mph in 2000)
- Metropolitan area auto, 31 mph
  (New York, Washington, and San Francisco are under 20 mph).

In the United States, intra-urban transit (rail and bus) averages 14 mph overall. Even across all metropolitan areas defined by the Urban League as having "robust" public transit networks—and there are only 28 such areas—commuting by public transit takes an average of 1.5 to 2 times long as driving for essentially any distance.

In China, according to a Dec. 2016 study published by Springer, average metropolitan rail speed was 45 kph or 27 mph; bus average speed was 23 kph or 14



LPAC/TV

mph. Average speeds in Western Europe are higher than either. But the Chinese averages had risen from 2005–15. The U.S. averages, above, had fallen over the same decade.

The consequence of the incapacity of public transportation described above, is that except for New York City, the vast majority of work commuting throughout the United States is by car. In total, 80% of all passenger-miles of transportation is by car; 6.5% is by bus, 12% by air, and 0.75% by rail. There are only 22,000 miles of double-tracked passenger rail lines in the United States, of which just 122 miles are electrified. The average passenger train speed overall in the country is 59 mph, including 65 mph in the Northeast Corridor. In comparison, China has 45,000 miles of double-tracked passenger rail, average speed on which is 116 kph or 73 mph.

Even for intercity travel—where, in parts of Europe and especially in China, rail effectively competes with air travel for efficiency, while being significantly less expensive—the United States average motor vehicle speed, 62 mph in 2017, was faster than average passenger train speed, 59 mph. And driving appears to be significantly less expensive, if one ignores the costs of parking and repair and maintenance, as most drivers do when comparing the transport modes.

For freight, trucks carry 75% of all freight which does not go through pipelines. Rail freight, by contrast, is just 12% of that total. Again, the sole reason for this tremendously costly and inefficient set of proportions, is speed. Taking Union Pacific as an example, the average speed for freight rail in 2018 was 23.5 mph, down from 25.5 mph in 2014. *No* rail freight is pulled by electric locomotives, even when traveling on the small sections of electrified track.

The average speed of truck travel with freight, outside inner cities, is 55 mph. No contest, from the non-bulk shipper's standpoint.

Sharply Rising Household Expenditures

Congressional Budget Office figures show that public investment in transportation infrastructure has kept falling, from 2002 to 2017—by 5% in state and local funds, and by 19% at the federal level. As those government investments have fallen, the American household's expenses for transportation have risen considerably, and now cost that household more than any other necessity except housing.

The Bureau of Labor Statistics has found the share of household expenditures going to routine transportation (excluding air travel) to have risen from about 16% of household income in 1999 to 21% in 2016, a significant increase. The median household of two persons apparently now spends approximately $11,000/year on such transportation, averaging out to each such household spending $30 daily to get around.

Of this 21% total, a mere 6% of household expenditure is for public transportation. Only 28 U.S. cities have multi-modal (both bus and rail) public transportation systems. More importantly, as shown, the fastest way to get places in the United States—even within central cities—is by driving, since public transportation is so slow and uncertain. Only the time and expense of parking, or inability to afford a car, leans against driving—which is why the use of ride-hailing services and cabs in metropolitan areas is growing rapidly. With it, the amount American households spend on transportation grows further. Since 2015, steady increases in tolling, and increases in state gasoline taxes in 28 states, have accelerated this increase.

Truck driving is the most dangerous occupation in the United States—more dangerous than police, fire, construction work, etc.—as well as being the most harmful to health. So bad an occupation is it, that the American Trucking Associations (ATA) group says there is a 30,000 shortage of long-haul truckers despite their earning an average of $80–90,000 annually. Trucking employment was 1.45 million in 2018, and had not grown since 2005. Truck freight volume was 25% greater, however, due to larger, heavier trucks.

A truck-oriented paradigm of freight transportation is expensive! Heavy trucks are estimated to cause $30 billion/year in damage to roads. The costs to passenger vehicle drivers, who use the damaged and otherwise deteriorated roads, averages $600/driver/year in vehicle repairs. The costs to those drivers, of the extreme congestion of car and truck traffic around all cities and even towns, averages $800/driver/year in extra fuel consumption and lost time. So overall, there is an annual cost of $1400 per driver, due to using a fundamentally damaged and deteriorated road and bridge system. And the average of these costs for trucks themselves—losses to the companies employing truck drivers, from broken down road conditions and extreme congestion at the beginning and end of routes, is just under $2,000 per truck per year, again according to the ATA.

These financial figures do not consider the loss of life caused by motor vehicle crashes. Road fatalities were 39,000 in 2016 and rising by about 6% per year. This number is 13 road fatalities /100,000 population. In Europe there were 84,000 road fatalities in 2019, or about 9/100,000 population.

Electric Powerless

The source of these problems, even before the neglect and decay of public transportation and especially of the rail networks, was and is the complete lack of electrification of rail. Intercity passenger rail travel, on average, is no faster today than it was 80 years ago; on some passenger routes west of the Mississippi, which do not operate any more, it was faster 80 years ago than today. Intercity freight rail travel is notably slower than in the 1930s. This is disgraceful when one looks at the advances which have been made in electric-traction rail speeds in other countries over that 80 years—speeds have doubled, and in some cases tripled—not to mention the magnetic levitation rail which has begun to be introduced in China and Japan.

U.S. Census Bureau publications show that in 1938, the United States reached a peak of electrified track mileage, at 47,000 miles (today it is 4,900 total miles, of which just 122 miles, as mentioned, is intercity passenger rail). Intercity passengers 80 years ago travelled at up to 75 mph—again, on some western routes, at 100 mph or more—and the average speed was 57 mph, essentially the same as in 2018. Intracity (subway and commuter rail) passenger travel at the time was markedly faster (averaging 37 mph) than it is today (21 mph).

For rail freight, even longer ago—at the time of World War I—so-called "fast freight line service" routes comprised 35,000 miles of track, according to United States Census Bureau publications, and on them, freight speed averaged 35-37 mph. Today, as noted above, that average is 23 mph.

The process of electrification has to be repeated—starting with the existing, largely freight, lines—and must be accompanied by double tracking, in order to begin to build a high-speed intercity rail network.

China, for example, has about 13,000 miles of high-speed rail (HSR), heading toward an 18,000-mile target, which travels at 200-300 km/h (120-180 mph). But China did not build any of this HSR until 2004, well over a decade after making the first plans to do so in 1990. It did not have the industrial capacity or capability to do so; and that is the situation in the United States today, which for example does not have any company making train sets and only one which produces diesel-electric locomotives.

In China, writes Michael Molitch-Hou in an article at engineering.com, "the country began improving its railways via the 'Speed-Up' campaign, so that they could handle speeds that would increase from 48 km/h (30 mph) to 160 km/h (100 mph)." The trains, not the workers, were sped up—first by improvement in track and locomotives, and then, during the second half of the 1990s, by *electrification* of existing lines. This allowed using faster electric traction, built into the train set rather than just a locomotive. "The first HSR line was developed from the Guangzhou-Shenzhen Railway, which was kicked up to 160 km/h (99 mph) in 1994 as the first sub-HSR line using diesel trains."

In addition to electrifying existing lines, trainsets were initially acquired from French, German, and Jap-

Army Corps of Engineers/Jack Sweeney

In order to accommodate rising waters, a steam work boat lifts wickets near the bear trap section of the dam at Locks and Dam 52 on the Ohio River at Brookport, Illinios, in October, 2017.

anese trainset manufacturers, then developed in China through technology transfer. Existing rail lines were progressively double-tracked, using new ballastless track technology, allowing for mixed (freight and passenger) use to be separated and true high-speed passenger rail (200-300 km/h) to be developed.

If the United States is to acquire relatively fast and reliable rail transport, for freight and for passenger travel up to the distance that requires going by air, it will have to follow the same steps.

Waterways, Locks and Ports

According to a *Wall Street Journal* analysis of U.S. Army Corps of Engineers data, nearly 80% of lock sites with commercial traffic had at least one unexpected outage in 2017, with an average outage of 144 minutes. In 1993, 71% of such locks had an unexpected outage, with an average outage of 90 minutes. During approximately the same span of time (2000 to 2016), the volume of tonnage on the U.S. waterways system dropped by 13%, to 1.7 billion tons. This lost traffic was diverted to rail and truck.

The average lock system age is 61 years; the operating expected life is 50 years. (In 2017, one lock outage essentially closed down the Ohio River to freight traffic for four months.)

The best port productivity in the United States, in Long Beach, California, is 88 *container moves/hour*, making it only 20th in the world, with the top 19 being in Asia or the Middle East, and showing 120-130 container moves/hour. U.S. ports' berth productivity overall in 2014 was 50% lower than ports in the Asia-Pacific and 15% lower than ports in the European Community. This gets reflected directly in longer ship turnaround times. (This has been studied by the *Journal of Commerce*, which published an international study in 2016.)

On the land side—where the biggest investments are needed—average *truck visit times* are about 90 minutes, with 20% being two hours or longer (according to the Harbor Trucking Association). In Asian and European ports, truck visit times are in the range of 75-80 minutes on average; but the real comparison is to the use of rail. While railcar visit times are in excess of 4 hours on average, a freight train loads hundreds of trucks worth of freight, making this mode of transport potentially very efficient.

Port ship turnaround in U.S. ports (roughly one day) is somewhat slower than European ports and faster than Asia ports, but the U.S. ports are handling smaller ships, 8,000 TEU and smaller, compared to 10,000 up to 18,000 TEU in North European and Asian ports.

Georgia Port Authority

Moving containers from trucks at the Port of Savannah.