



The Positive Environmental Effects of Increased Freight by Rail Movements in America

How moving freight from roads to rail would
reduce carbon emissions in the United States

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Abstract

Moving freight by rail instead of truck lowers greenhouse gas emissions by up to 75%, on average. AAR analysis of federal data finds: If 25% of the truck traffic moving at least 750 miles went by rail instead, annual greenhouse gas emissions would fall by approximately 13.1 million tons; If 50% of the truck traffic moving at least 750 miles went by rail instead, greenhouse gas emissions would fall by approximately 26.2 million tons.

Executive Summary

Transportation is the single largest source of U.S. greenhouse gas emissions, accounting for approximately 27% of total emissions, according to the Environmental Protection Agency ([EPA](#)).

Passenger vehicles contribute 60% of total transportation-related emissions, amounting to 19% of all U.S. emissions. Medium and heavy-duty trucks are the second largest contributor, with some 23% of transportation-related emissions, or 6.4% of all U.S. emissions. U.S. freight railroads, however, account for just 2.1% of transportation related emissions, or 0.6% of total U.S. greenhouse gas emissions.

Recent [forecasts](#) from the Federal Highway Administration (FHWA) suggest that total U.S. freight shipments will rise from 18.6 billion tons in 2018 to 24.1 billion tons in 2040 — a 30% increase.

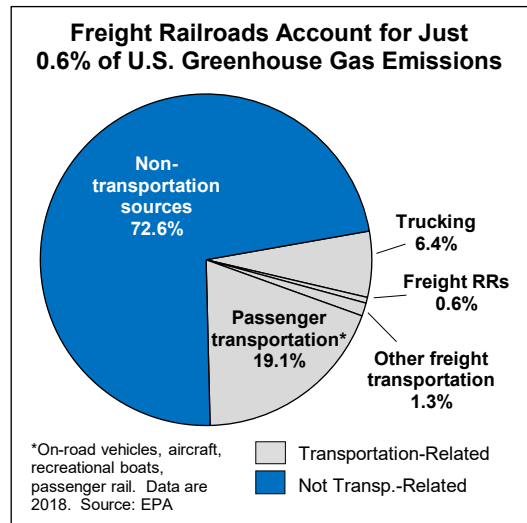
Thus, the question should be asked: **how can increased freight movements coincide with the bipartisan goal of reducing greenhouse gas emissions?**

Railroads have made significant operational and technological improvements to improve fuel efficiency, which hold great promise in addressing this challenge. Because moving freight by rail instead of truck lowers greenhouse gas emissions by up to 75%, on average, **increasing freight-by-rail movements would have a real and positive effect in reducing greenhouse gas emissions.**

In this report, economists at the Association of American Railroads (AAR) analyze data from the FHWA's Freight Analysis Framework to estimate the impact on emissions of increased freight-by-rail movements in the U.S. The analysis shows:

- If 25% of the truck traffic moving at least 750 miles were transported by rail instead, annual fuel savings would be some 1.2 billion gallons with a corresponding reduction of greenhouse gas emissions of approximately 13.1 million tons.
- If 50% of the truck traffic moving at least 750 miles were transported by rail instead, annual fuel savings would be approximately 2.3 billion gallons with a corresponding reduction of greenhouse gas emissions of approximately 26.2 million tons.

This paper contextualizes how and why freight rail provides a solution that helps decrease the country's carbon emissions and reduces transportation's overall environmental impact. It also outlines related matters of public policy — including areas that would clearly deter increased freight-by-rail movements. In sum, while railroads will continue to modernize their operations and infrastructure to compete for and earn additional business, the industry presents a compelling case for reducing greenhouse emissions by increasing rail movements.



Background

From one end of the country to the other, America is connected by the best freight rail system in the world. The seven large “Class I” railroads, working with hundreds of smaller railroads and tens of thousands of rail customers, deliver economic growth and support job creation through safe, cost effective and reliable freight transportation.



American railroads deliver 4.5 million tons of goods, on average, to ports, manufacturers, distribution centers, businesses and more — every day. Railroads are the heavy hauler of the economy. They carry enormous amounts of:

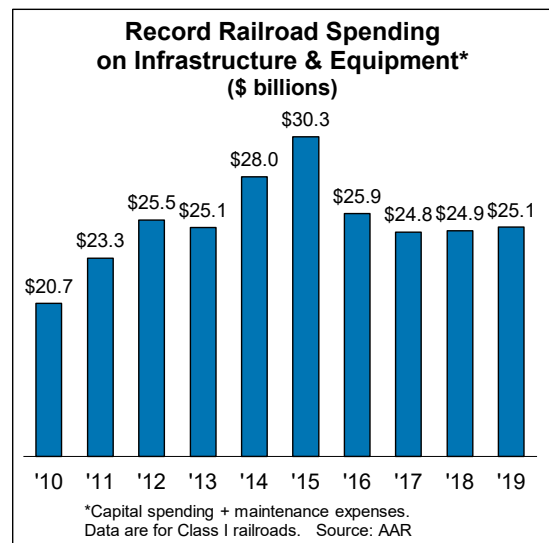
- Animal feed, canned goods, corn syrup, flour, fresh and frozen foods, beer and countless other food products;
- Autos and auto parts;
- Cement, sand and crushed stone for construction;
- Corn, wheat, soybeans and other grains;
- Fertilizers, plastic resins and a vast array of other chemicals;
- Iron ore, coke, limestone and scrap metal for steelmaking;
- Lumber and drywall to build our homes, as well as paper products; and
- Steel and other metal products; crude oil, liquefied gases and other petroleum products.

Rail intermodal — the movement of shipping containers and truck trailers by rail — has been the fastest growing major rail traffic segment over the past 25 years. In recent years, railroads have invested in infrastructure improvements, adopted new technology and modernized operations to provide the capacity and service reliability that meet the unique needs of this customer base.

Unlike trucks, barges, and airplanes, **America's freight railroads operate overwhelmingly on infrastructure that they own, build, maintain and pay for themselves.**

From 1980 to 2019, America's freight railroads spent more than \$710 billion — of their own funds, not taxpayer's — on capital expenditures and maintenance expenses related to locomotives, freight cars, tracks, bridges, tunnels, technology, and other infrastructure and equipment.

That's more than 40 cents out of each revenue dollar. America's freight railroads have been spending more in recent years than ever before on their network, creating the best freight rail system in the world and readying themselves to help our economy grow in the years ahead.



More Freight by Rail, Better for the Environment

According to the Texas Transportation Institute's 2019 Urban [Mobility Report](#), highway congestion cost Americans some \$166 billion in wasted time (8.8 billion hours) and wasted fuel (3.3 billion gallons). Lost productivity, cargo delays and other costs add tens of billions of dollars to this tab.

A single freight train, though, can replace several hundred trucks, freeing up space on the highway for other motorists. Shifting freight from trucks to rail also reduces highway wear and tear and the pressure to build costly new highways.

Moving freight by rail also yields environmental advantages that benefit us all. In 2019, U.S. freight railroads moved one ton of freight an average of 472 miles per gallon of fuel. That's equivalent to the distance from Chicago to Omaha or New York City to Cleveland. On average, **railroads are three to four times more fuel efficient than trucks**.

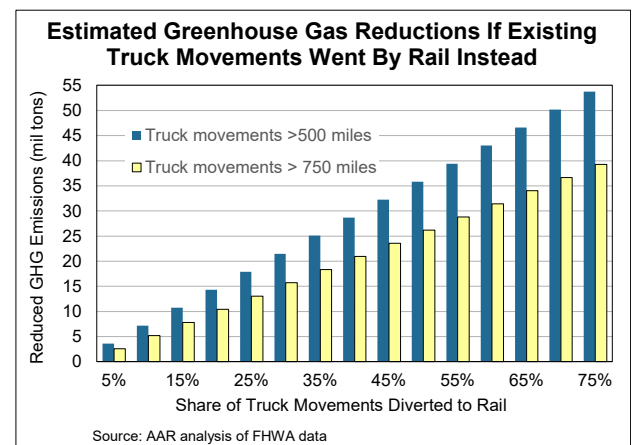
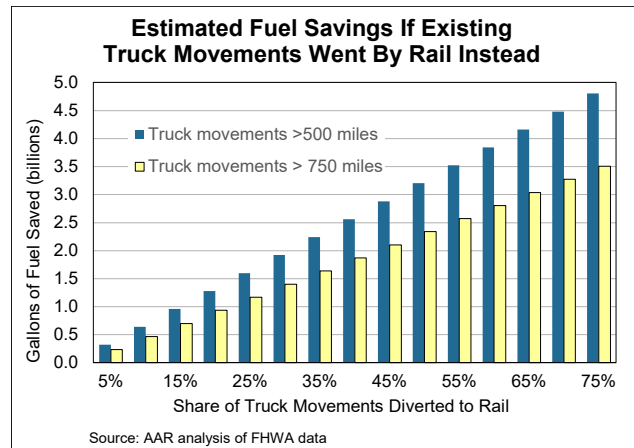
Transportation-related greenhouse gas emissions are directly related to fuel consumption. That means **moving freight by rail instead of truck lowers greenhouse gas emissions by up to 75%**, on average.

Freight railroads account for just 0.6% of total U.S. greenhouse gas emissions, according to the EPA, and just 2.1% of transportation-related greenhouse gas emissions. By contrast, trucks account for roughly 23% of transportation-related emissions, 6.4% of all emissions.

If existing long-haul truck movements were shifted to rail instead, fuel savings and greenhouse gas reductions would be substantial. The greater the shift from trucks to trains, the greater the fuel savings and greenhouse gas reductions would be.

Based on data from the FHWA:

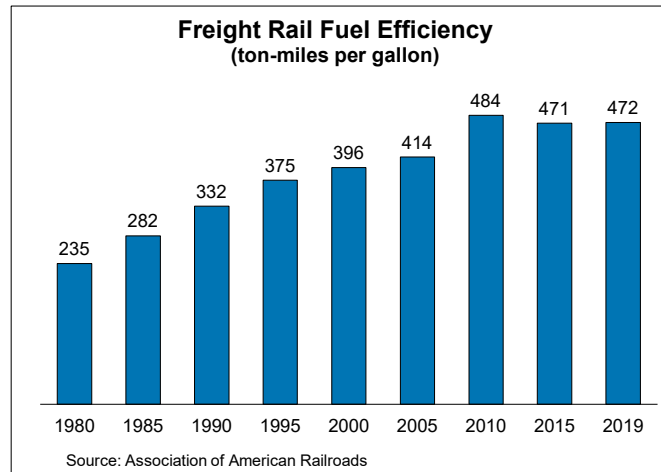
- If 25% of the truck traffic moving at least 750 miles went by rail instead, annual fuel savings would be some 1.2 billion gallons and annual greenhouse gas emissions would fall by approximately 13.1 million tons. That would be equivalent to taking 2.6 million cars off the highway for a year or planting nearly 200 million trees.
- If 50% of the truck traffic moving at least 750 miles went by rail instead, annual fuel savings would be approximately 2.3 billion gallons and greenhouse gas emissions would fall by approximately 26.2 million tons. That would be equivalent to taking 5.1 million cars off the highway or planting nearly 400 million trees.



Railroads Are Innovating to Reduce Fuel Use

U.S. freight rail volume is higher than it used to be, but railroad fuel consumption is much lower. In 2019 alone, U.S. freight railroads consumed 656 million fewer gallons of fuel and emitted 7.3 million fewer tons of carbon dioxide than they would have if their fuel efficiency had remained constant since 2000.

From 2000 through 2019, U.S. freight railroads consumed 9.6 billion fewer gallons of fuel and emitted 108 million fewer tons of carbon dioxide than they would have if their fuel efficiency had not improved.



How did railroads do this?

Through technological innovations, new investments, improved operating practices and a lot of hard work. Steps railroads have taken include:

- Using new, more efficient locomotives that produce fewer emissions of all kinds — not just carbon dioxide — and removing from service older, less fuel-efficient locomotives.
- **Increasing the amount of freight on trains.** Thanks to improved railcar design, more efficient locomotives and other factors, the amount of freight railroads carried in an average train in 2019 was 3,667 tons, up from 2,923 tons in 2000.
- Installing **computer software systems** that calculate the most fuel-efficient speed for a train on a given route; determine the most efficient spacing and timing of trains on a railroad's system; and monitor locomotive performance to ensure efficiency.
- Installing idling-reduction technologies, such as **stop-start systems** that shut down a locomotive when it is not in use and restart it when it is needed, and expanding the use of **distributed power** (positioning locomotives in the middle of trains) to reduce the total horsepower required for train movements.

For the Benefit of the Environment, Policymakers Should Not Impede Freight Rail

Recent forecasts from the FHWA say that total U.S. freight shipments will rise from 18.6 billion tons in 2018 to 24.1 billion tons in 2040 — a 30% increase. Railroads are the best way to handle much of this growth while helping achieve broader environmental goals. If the country is to have the socially optimal amount of rail capacity, policymakers must help. Steps they can take include:

- **Maintain balanced rate and service regulation:** Railroads today operate in an intensely competitive transportation marketplace. If a railroad faces no effective competition for its services in a particular market, the Surface Transportation Board (STB) — an independent federal agency — can limit what the railroad can charge. Unfortunately, some rail critics want the STB to sharply increase its regulation of the rail industry. Increasing regulation would make railroads less competitive at a time when trucks are rapidly evolving, reduce the incentives railroads have to reinvest in their networks and move freight *away* from railroads. Over time rail service would become slower, less responsive and less reliable — and the substantial environmental benefits associated with moving freight by rail would fall too.
- **Retain existing truck size and weight limits and return to a “user pays” system:** Heavy trucks cause far more damage to roads and bridges than other vehicles. The taxes and fees heavy trucks pay only cover about 80% of the damage they cause to America's infrastructure. These underpayments mean that the general public pays for much of the damage heavy trucks cause. Moreover, as the Government Accountability Office has [pointed out](#), these underpayments distort the competitive marketplace “by making it appear that heavier trucks are...less expensive...than they actually are and puts other modes, such as rail and maritime, at a disadvantage.” Longer and heavier trucks would cause freight to divert from railroads to trucks, leading over time to millions of additional trucks on our already overcrowded highways.
- **Embrace rail technology and automation to ensure competition:** Railroads' efforts to harness the power of technology will not be as effective as they should be if legislative and regulatory requirements fail to keep up, or are not well grounded in evidence-based, scientific understanding. To enable the industry to modernize and compete with a trucking sector racing towards automation, regulators should shift their focus away from inflexible command-and-control and move toward performance-based standards which define the desired result from the rail industry's operations.