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Surface Freight Transportation: Modal Options

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SUMMARY

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July 9, 2025

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Surface Freight Transportation: Modal Options

Economic growth and expanded global trade have led to substantial increases in goods movement. The Federal Highway Administration (FHWA) projects that freight tonnage in the United States will increase at an average of about 1.6% per year between 2023 and 2050, with truck tonnage growing faster than other modes. Current surface transportation authorization largely expires at the end of FY2026; as part of any reauthorization, Congress may wish to consider the different modes of transportation used by the freight system and whether incentives to promote the use of one mode over another could optimize the effectiveness of federal transportation investment.

Most freight moved in the United States moves by truck alone. By weight, roughly 65% moves by truck, compared to 8% by rail and 3% by multiple modes (which includes truck-rail and truck-water). However, when distance is taken into account, this distribution shifts: Trucks generate 44% of freight ton-miles, compared to 19% by rail and 10% by multiple modes. Most freight journeys in the United States are shorter than 250 miles, though, and other modes have found it difficult to compete with trucks for these short-haul trips.

Freight transportation customers ("shippers") decide which modes to use based on various factors. These factors include freight rates (i.e., prices), service quality, the type of cargo being shipped, the distance the cargo will travel, and the time of year. Policymakers at all levels of government may wish to promote other modal freight options in markets currently dominated by truck traffic. Because a single train or barge can carry many hundreds of containers, a shift in mode share can result in many fewer trucks on congested roadways. While federal programs currently exist to promote waterborne freight in congested highway and railroad corridors, no federal program or agency has an explicit policy goal to shift freight volume from any one surface mode to another.

Given the role of freight movement in interstate commerce, Congress may wish to provide oversight and facilitate stakeholder engagement in the freight industry to better understand current freight movement and modal choice. Congress may be interested in considering shifts in how freight is transported (e.g., promoting increased use of rail) where doing so may have economic and safety benefits. Policies to achieve these goals could be part of a larger potential surface transportation reauthorization bill. Among other actions, Congress could

- extend or expand financial assistance to smaller railroads responsible for first-mile and last-mile freight service;
- take steps to improve the reliability of freight rail service;
- remove barriers to rail intermodal service over shorter distances currently dominated by trucks; and
- explore new technologies to automate or otherwise improve local freight rail service.

Congress also could choose to not take action to shift freight toward or away from one specific mode or another.

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Introduction

Economic growth and expanded global trade have led to substantial increases in goods movement. The Federal Highway Administration (FHWA) projects that freight tonnage within the United States will increase at an average rate of about 1.6% per year between 2023 and 2050, with truck tonnage growing faster than other modes.[1] The growth in freight transportation demand, along with growing passenger demand, has caused congestion in parts of the transportation system, making some freight movements slower and less reliable.

The condition and performance of freight infrastructure play a considerable role in the efficiency of the freight system. For this reason, Congress may be interested in federal support of freight infrastructure investment. In particular, Members may be interested in the potential reauthorization of surface transportation programs currently authorized by the Infrastructure Investment and Jobs Act (IIJA; P.L. 117-58); the funding for many of these programs is set to expire in FY2026. As part of any surface transportation program reauthorization, Congress may consider the modes of transportation used by the freight system and whether incentives to promote the use of one mode over another could increase the effectiveness of federal transportation investment.

This report considers some of the relative advantages and disadvantages presented by highways, railroads, and waterways for the domestic movement of freight. It includes considerations for Congress that predominantly concern trucks and rail. These two modes currently move more freight than ships, and both operate overland, providing more opportunities for modal shifts. Both trucking and rail are likely to be included in considerations of surface transportation program reauthorization. Water transportation has historically been addressed in separate legislation, including the Water Resources Development Act (WRDA, for lock and dam infrastructure) and the National Defense Authorization Act (NDAA, for Port Infrastructure and Marine Highway grants).[2]

Movement of Goods

Most freight moved in the United States moves by truck alone. By weight, roughly 65% moves by truck, compared to 8% by rail and 3% by multiple modes (which includes truck-rail and truck-water; see **Figure 1**).[3] However, when distance is taken into account, this distribution shifts somewhat: Trucks generate 44% of freight ton-miles, compared to 19% by rail and 10% by multiple modes (**Figure 2**).[4] For freight journeys longer than 500 miles, more freight moves by rail or multiple modes than by truck, indicating the competitive advantage enjoyed by modes other than trucks in the long-haul market. Nevertheless, most freight journeys in the United States

[1] Department of Transportation (DOT), Bureau of Transportation Statistics, *Freight Facts and Figures*, https://data.bts.gov/stories/s/Moving-Goods-in-the-United-States/bcyt-rqmu.

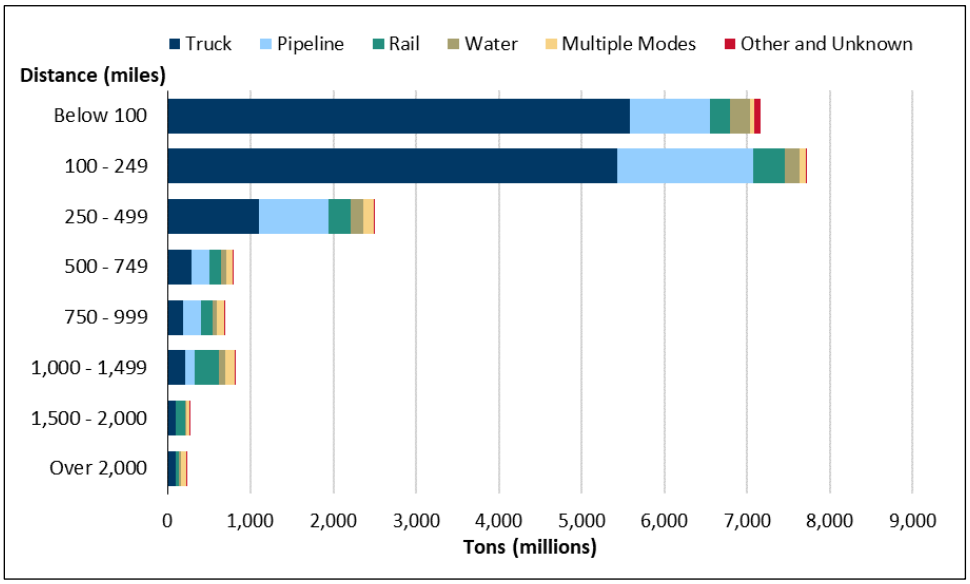
[2] For more on federal programs to support maritime freight, see CRS Report R46654, *U.S. Maritime Administration (MARAD) Shipping and Shipbuilding Support Programs*, by Ben Goldman.

[3] The second-largest share of freight moves by pipelines, which are not considered in this report due to their fixed nature. Pipelines and pipeline safety are the subject of separate authorizing statutes; for more information, see CRS Report R44201, *DOT's Federal Pipeline Safety Program: Background and Issues for Congress*, by Paul W. Parfomak.

[4] A ton-mile is equivalent to a single ton moving a single mile.

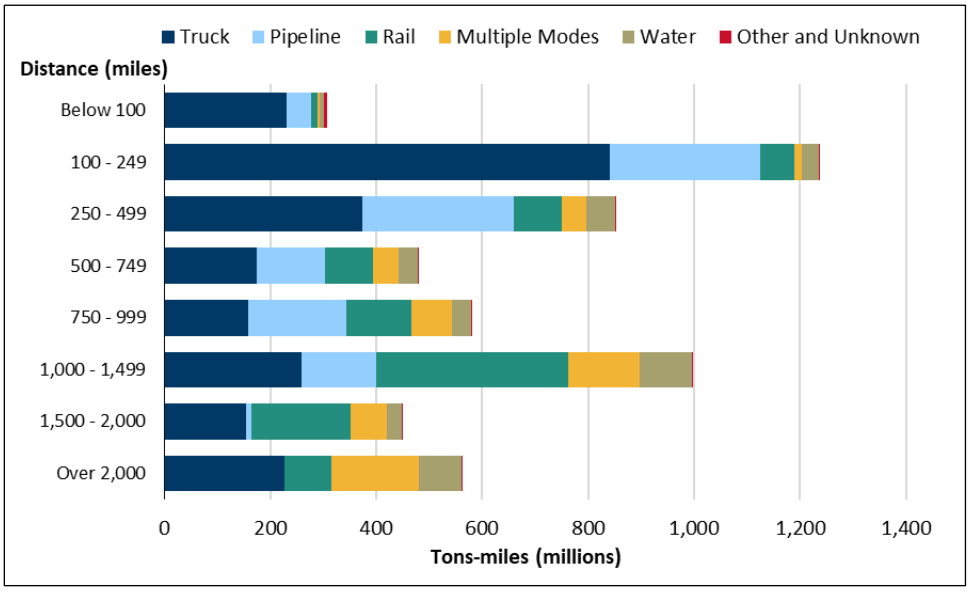
are shorter than 250 miles (with roughly three in four shorter than 500 miles), and trucks are the dominant mode of transportation for these trips.[5]

Figure 1. Weight of Freight by Mode and Distance, 2023



Source: Figure created by CRS using data from U.S. Department of Transportation (DOT), Bureau of Transportation Statistics, "Weight of Freight by Mode and Distance," *Freight Facts and Figures*, https://data.bts.gov/stories/s/Moving-Goods-in-the-United-States/bcyt-rqmu.

Figure 2. Ton-Miles of Freight by Mode and Distance, 2023



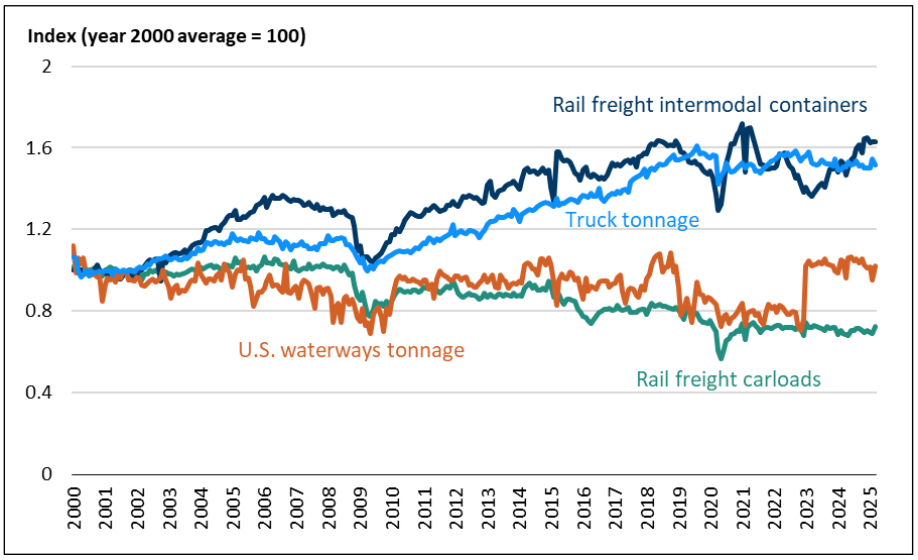
Source: Figure created by CRS using data from DOT, Bureau of Transportation Statistics, "Ton-Miles of Freight by Mode and Distance," *Freight Facts and Figures*, https://data.bts.gov/stories/s/Moving-Goods-in-the-United-States/bcyt-rqmu. One ton-mile is equal to one ton of freight transported one mile.

[5] Generally, a range of 150-250 miles is considered the outer limit of short-haul trucking, and distances of up to 500-700 miles have been used to define short-haul rail. This report uses 500-mile of short-haul freight to define both modes.

Other modes have found it difficult to compete with trucks for short-haul transport. When the rail industry reorganized from the 1970s through the 1990s, companies consolidated networks, abandoned redundant parallel routes, and shed unprofitable branch lines, concentrating on long-haul routes. At the same time, the truck industry was undergoing its own period of deregulation and reform; this resulted in lower barriers to entry for trucking companies and greater flexibility to compete on price. **Figure 3** shows the Bureau of Transportation Statistics' seasonally adjusted data for freight transportation output by mode relative to the year 2000. Rail carload traffic has had a general downward trend relative to truck tonnage and rail intermodal volume, which have generally increased.

Figure 3. Modal Data Included in Freight Transportation Services Index

Seasonally adjusted; values indexed to year 2000 average value



Source: Figure created by CRS using data from DOT, Bureau of Transportation Statistics, seasonally adjusted transportation data, https://data.bts.gov/stories/s/Freight-Transportation-the-Economy/6ix2-c8dn.

Notes: Shaded areas indicate economic recessions. The Transportation Services Index, which is seasonally adjusted, combines available data on freight traffic, as well as passenger travel, that have been weighted to yield a monthly measure of transportation services output. For more information, see Bureau of Transportation Statistics, "Transportation Services Index and Seasonally-Adjusted Transportation Data," https://data.bts.gov/Research-and-Statistics/Transportation-Services-Index-and-Seasonally-Adjus/bw6n-ddqk/about_data.

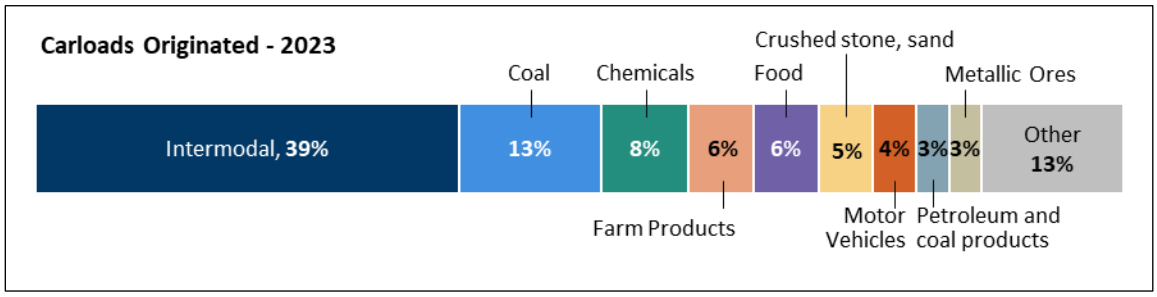
Intermodal Freight

A large share of the freight that moves by multiple modes is transported in standardized intermodal shipping containers. These containers can be loaded at the point of origin and transferred between truck trailers, railroad flat cars, and container ships without unloading their contents. The introduction and standardization of shipping containers in the mid-20th century altered freight transportation and facilitated the growth of global supply chains.[6] In 2023, intermodal containers made up over one-third of carloads originating on U.S. railroads, though this accounted for less than one-tenth of railroad traffic in terms of tonnage (**Figure 4** and **Figure 5**). Transportation of freight in bulk railcars allows a higher tonnage to be transported per carload

[6] Marc Levinson, *The Box: How the Shipping Container Made the World Smaller and the World Economy Bigger*, 2nd ed. (Princeton University Press, 2016).

than in intermodal containers (**Figure 4** and **Figure 5**), but an intermodal container allows for more flexibility of use.

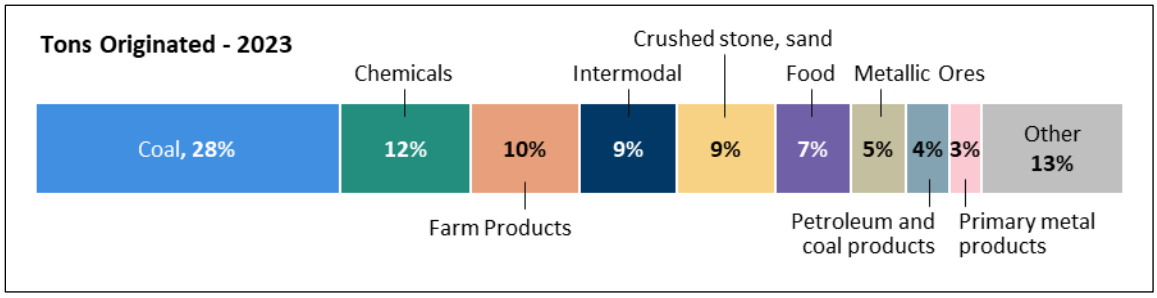
Figure 4. Rail Carloads Originated, 2023



Source: Figure created by CRS using data from Association of American Railroads, *Railroad Facts 2024*.

Notes: "Intermodal" includes several commodities that are either entirely or mostly transported via multiple modes. Some intermodal movement is also interspersed in other categories.

Figure 5. Rail Tons Originated, 2023



Source: Figure created by CRS using data from Association of American Railroads, *Railroad Facts 2024*.

Notes: "Intermodal" includes several commodities that are either entirely or mostly transported via multiple modes. Some intermodal movement is also interspersed in other categories.

Choosing a Freight Mode

Freight transportation customers ("shippers") base their decisions about which modes to use on various factors. These factors include freight rates (i.e., prices), service time and quality, the type of cargo being shipped, the distance the cargo will travel, and the time of year.[7] As supply chains have moved to "just-in-time" delivery models in order to keep warehousing and inventory costs low, reliability and punctuality have increased in importance. For cargo that is capable of being transported by different modes, trucks can typically offer greater reliability and flexibility than rail, even if they do not always offer a lower price. Trucks primarily operate on preexisting highways and local roads and do not require as much dedicated infrastructure as rail, which requires investment in and access to rail-served facilities. Customers with direct rail service may be served by only one railroad company, and if a shipment originates or terminates in an area that company does not serve, an interchange agreement may be required. If shipper origins or destinations are located near "transloading" terminals where cargo can be moved from one mode to another, cargo can be shipped by truck for part of the journey, then switched to rail or water

[7] National Academies of Science, Engineering, and Medicine, *Impacts of Policy-Induced Freight Modal Shifts* (National Academies Press, 2019), pp. 6-7.

carrier and back again to truck if necessary (assuming the cargo is containerized or otherwise modular enough to be easily transferred between vehicles).

Rail and water transportation both offer the benefit of being able to move larger quantities of freight using smaller quantities of energy compared with truck transportation. While one truck can move a single load or container (sometimes more, where permitted), one train or barge can move several dozen to several hundred loads or containers. Trucking, on the other hand, offers faster transit times than rail or water transport and the benefit of an easily accessible road network. Interchanges among trucking companies are rarely required for a shipment to reach its destination, and competing trucking companies may be readily available for service to disparate locations.

For various reasons, policymakers at all levels of government may wish to promote a variety of modal freight options in markets currently dominated by truck traffic. The interplay and trade-offs of switching among modal freight options can be challenging to assess because the different transportation modes are interrelated. Because a single train or barge can carry many hundreds of containers, a shift in mode share can result in fewer trucks on congested roadways, though it may also result in increased congestion at rail terminals or along routes shared with passenger trains. Heavy trucks generate more wear and tear on road surfaces than do smaller vehicles—a reduced volume of trucks may help reduce road maintenance costs.[8] However, reduced truck miles traveled would also reduce amount of fuel used and therefore the amount of diesel tax paid by trucks into the Highway Trust Fund and state funds that support road construction and maintenance and any revenues forgone from truck travel on tolled roads.[9]

Federal programs or agencies do not express an explicit policy goal to shift freight volume from any one surface mode to another, although certain federal programs exist to promote waterborne freight in congested highway and railroad corridors.[10]

Issues for Congress

Shipping by rail and water present certain benefits compared to trucking, but lack flexibility in routing due to limited infrastructure. The U.S. freight rail system provides comparatively greater flexibility in route choice than shipping over water, which is possible only on coasts and through certain inland waterways.

Given the context of potential reauthorization of surface transportation programs and the role of freight movement in interstate commerce, Congress may wish to provide oversight and facilitate stakeholder engagement in the freight industry to better understand freight movement and modal choice. Congress may be interested in considering shifts in how freight is transported if policymakers were to identify sufficient benefits to pursuing these options. Congress could

[8] An oft-cited figure from a 1979 GAO report (General Accounting Office, *Truck Weight and Its Effect on Highways*, July 23, 2979, https://www.gao.gov/products/109954) illustrates that a fully loaded five-axle tractor-trailer causes as much damage to pavement as 9,600 cars. This figure is derived from research and road tests conducted by the American Association of State Highway Officials in 1958-1960 and does not reflect subsequent advances in road engineering and vehicle construction. A more recent study commissioned by the trucking industry indicated that a single truck can cause as much damage to pavement as several hundred cars; see Allan Bradley and Papa-Masseck Thiam, *Analysis of Car and Truck Pavement Impacts*, FPInnovations Info Note, October 2018, https://www.trucking.org/sites/default/files/2022-01/Analysis%20of%20car%20and%20truck%20pavement%20impacts-FINAL.pdf.

[9] See CRS Report R48472, *The Highway Trust Fund's Highway Account*, by Ali E. Lohman.

[10] For example, see the U.S. Marine Highway Program administered by the U.S. Maritime Administration (MARAD) as authorized by 46 U.S.C. §55601.

provide oversight and facilitate stakeholder engagement in the freight industry to better understand current freight movement and modal choice to gather additional information and insight regarding market forces and industry preference. Alternatively, Congress could consider actions to

- extend or expand financial assistance to smaller railroads responsible for first-mile and last-mile freight services;
- take steps to improve the reliability of freight rail service;
- remove barriers to rail intermodal service over shorter distances where trucks are preferred; and
- explore new technologies to automate or otherwise improve local freight rail service.

Approaches to Modal Infrastructure Needs

Different modes of transportation have different infrastructure needs, but some modes are more reliant on federal dollars for upkeep and expansion of infrastructure than others. In potentially reauthorizing surface transportation programs, Congress could consider the ways in which it supports this infrastructure and whether federal dollars are being directed toward (or away from) projects that permit each mode to optimize its efficiencies.

Trucks make use of the nation's 4.2-million-mile public road and street network, including a federally designated 200,000-mile network where conventional combination trucks—one tractor pulling one trailer—must be permitted to operate.[11] Highway infrastructure is generally built and maintained at public expense. This includes revenues generated by federal motor fuels taxes and deposited in the Highway Trust Fund (HTF).[12]

States may wish to target infrastructure investments in areas where truck congestion or the anticipated growth in truck traffic is more pronounced. As identified by DOT, the 25 most congested segments for trucks are generally urban interstate highway interchanges.[13] A trucking industry study estimates that 86% of the total costs of congestion for trucks are concentrated on 17% of interstate highway mileage.[14] The current highway funding mechanisms that allocate HTF dollars to state departments of transportation may not be sufficient to address this issue, as the benefits of alleviating congestion may redound to states other than the one in which the interchange is located. DOT administers several programs, including INFRA and the National Infrastructure Project Assistance (MEGA) grant programs, to address infrastructure projects that may outstrip the resources of a single state.

For some shippers, the obstacle to shipping by rail may be the up-front costs of obtaining direct rail access, whether by acquiring an existing rail-served facility or constructing a rail line to serve what would otherwise be truck-only facilities. Some federal grant programs could support the investments necessary for a rail line to compete with other modes. Infrastructure funding

[11] DOT, Bureau of Transportation Statistics, "National Network for Conventional Combination Trucks," *Freight Facts and Figures*, 2024, https://data.bts.gov/stories/s/Freight-Transportation-System-Extent-Use/r3vy-npqd.

[12] CRS Report R48472, *The Highway Trust Fund's Highway Account*, by Ali E. Lohman.

[13] DOT, Bureau of Transportation Statistics, "Top Congested Freight-Significant Corridors," *Freight Facts and Figures*, 2024, https://data.bts.gov/stories/s/Freight-Transportation-System-Condition-Performanc/vvk5-xjjp.

[14] American Transportation Research Institute, *Cost of Congestion to the Trucking Industry: 2024 Update*, https://truckingresearch.org/2024/12/cost-of-congestion-to-the-trucking-industry-2024-update/.

programs could be leveraged to address this issue. Examples of such infrastructure funding programs include

- the Consolidated Rail Infrastructure and Safety Improvement (CRISI) program, administered by the Federal Railroad Administration (FRA);
- the Local and Regional Project Assistance (also known as Better Utilizing Investment to Leverage Development, or BUILD) program, administered by the Office of the Secretary of Transportation (OST); and
- the Rail Rehabilitation and Improvement Finance (RRIF) loan program, administered by OST.

Funding authorizations for all three programs are set to run through the end of FY2026.

The busiest freight rail carriers may not consider availability of federal funding among their key concerns. The largest (Class I) freight railroads are highly profitable and do not generally seek federal financial assistance for their infrastructure improvements or capacity expansion projects.[15] Because Class I railroads are broadly free to pursue business strategies that permit them to remain financially self-sufficient, they tend not to seek direct federal financial assistance that might impose new restrictions or requirements. Class I carriers have tended to specialize in long-haul freight, as evidenced by an average length of haul exceeding 1,000 miles.[16] Consequently, the task of serving local customers over shorter distances sometimes falls to Class II "regional" or Class III "short line" railroads. These railroads may be more likely to seek federal financial assistance, and they have supported the CRISI program in particular.[17]

A longer-term approach might be to extend or prioritize project eligibilities for industrial development and land use plans in order to encourage rail freight use. If industrial development can be encouraged to cluster along railroad lines, and ideally near existing railroad terminals or transloading facilities, it can make it easier for shippers to use rail, either by providing direct access or by shortening the first- or last-mile truck journey needed to reach the rail line. Class I rail carriers have taken steps along these lines, whether by developing large rail-served industrial parks themselves[18] or by providing specialized outreach and other assistance to potential customers in designated areas.[19] The extent to which such activities may arise, as they have in the past, from the private sector versus be encouraged or incentivized as a matter of federal policy may be a topic of debate in the context of reauthorizing rail infrastructure grant programs.

[15] A Class I railroad has annual operating revenues of at least $900 million in inflation-adjusted 2019 dollars. The six such railroads currently operating in the United States are BNSF Railway, Canadian National Railway, CPKC, CSX Transportation, Norfolk Southern, and Union Pacific.

[16] DOT, Bureau of Transportation Statistics, "Average Length of Haul, Domestic Freight and Passenger Modes," *National Transportation Statistics*, https://www.bts.gov/content/average-length-haul-domestic-freight-and-passenger-modes-miles.

[17] Testimony of Chuck Baker, president, American Short Line and Regional Railroad Association (ASLRRA), in U.S. Congress, House Committee on Transportation and Infrastructure, Subcommittee on Railroads, Pipelines, and Hazardous Materials, *American Builds: Examining America's Freight and Passenger Rail Network*, 119th Cong., 1st sess., January 23, 2025, https://transportation.house.gov/uploadedfiles/01-23-2025_rph_hearing_-_chuck_baker_-_testimony.pdf.

[18] Examples include BNSF, "Barstow International Gateway (BIG)," https://bnsfcalifornia.com/projects/barstow-international-gateway-big/; BNSF, "Logistics Park Phoenix," https://bnsflpp.com/; and Union Pacific, "Phoenix Intermodal Terminal," https://www.up.com/customers/premium/intmap/phoenix/index.htm.

[19] For one example of this, see CSX, "Select Sites," https://www.csx.com/index.cfm/customers/industrial-development/search-property-types/csx-select-sites/.

Service Reliability

Shipping by rail can be less expensive than shipping by truck in certain circumstances, but shippers have voiced concerns about the reliability of rail service and indicated that this has influenced their mode choices. At hearings convened by the Surface Transportation Board (STB) in 2022 and 2024, witnesses testified that deteriorating service reliability was one reason customers were choosing to ship by truck even when a rail or intermodal option was available to them.[20]

In September 2024, STB began collecting weekly data from Class I rail carriers on two local service metrics. These metrics can be used by shippers seeking to compel a railroad to accept a "reciprocal switching" agreement whereby a competing rail carrier would be allowed to take over some of the shipper's existing service if reliability dips below a certain threshold. Some bills introduced in prior Congresses have proposed the establishment of an enforceable system-wide reliability standard for freight rail or the clarification that a railroad's status as a "common carrier" obliges it to provide reliable service.[21]

Implementing a system-wide reliability standard for freight rail similar to that for passenger trains could prove difficult. The law requiring new on-time performance standards for Amtrak trains was first enacted in 2008 but took effect in 2021 following legal challenges from the freight railroad industry.[22] In the first three years under those standards, many Amtrak routes consistently fell short of the required performance standard. Amtrak operates roughly 300 trains per day on a 21,000-mile network; Class I railroads collectively operate several thousand trains per day on a 91,000-mile network, with Class II and III carriers operating a further 45,000 miles.

Short Haul Intermodal

One option for rail to increase its share of surface freight transportation is through expanding short-haul intermodal service. One industry analysis estimates that as many as 23 million truckloads of intermodal-compatible freight moving 250-750 miles could be shifted from truck alone to truck-rail intermodal if shippers so chose, an estimate that would represent 50% of all such truckloads in that distance band.[23]

As the railroad industry consolidated, the largest railroads emphasized their long-haul service. Local service or more frequent stops to attach or detach a small number of railcars reduces the efficiency of the long-haul business. If a sufficiently large number of cars can be attached or detached at a single stop, a large carrier might be able to set out or pick up blocks of cars at select yards while retaining the route's efficiency. From there, either another locomotive crew could haul the cars to an intermodal terminal or trucks could pick up or drop off containers directly.

If the added expense of stopping and/or transferring cargo is not offset by the added revenue from the customers being served, a rail carrier is unlikely to offer such services. Conversely, if insufficient service frequency is offered by a railroad, a shipper is unlikely to seek out rail

[20] Surface Transportation Board, "Urgent Issues in Freight Rail Service, Docket No. EP 770," April 26-27, 2022, and "Growth in the Freight Rail Industry, Docket No. EP 775," September 16-17, 2024, transcripts available at https://www.stb.gov/news-communications/transcripts-statements/.

[21] For example, see S. 4961 (116th Congress) and S. 2071 (118th Congress).

[22] P.L. 110-432, Div. B, §207.

[23] Matthew Schabas, "Following the Freight—Where to Find Rail Intermodal Growth," Oliver Wyman, June 2024, https://www.oliverwyman.com/our-expertise/insights/2024/jun/where-to-find-rail-intermodal-growth.html.

service.[24] A recent study found that when partnering with a Class I railroad, a Class II or III railroad typically accommodates at least three trains per week hauling 100 revenue containers per train, but that "consistency in traffic volumes and ease of interchange may lower the required volume for a given service."[25]

Many projects that could improve freight rail competitiveness are likely eligible to apply for funding under existing infrastructure grant programs that do not focus on freight rail competitiveness. These include the CRISI program administered by FRA, or the multimodal INFRA program administered by the Office of the Secretary of Transportation.[26] The U.S. Marine Highway Program, by contrast, specifically targets waterborne freight projects that aim to mitigate or relieve landside (i.e., truck or rail) congestion or provide a "coordinated and capable alternative to landside transportation."[27] In reauthorizing CRISI, INFRA, and other grant programs, Congress could follow a similar model to encourage short-haul intermodal: It could direct DOT to prioritize rail projects that aim to provide alternatives or relief to especially congested highway routes. Critics of such a policy may argue that it might favor one industry at the expense of another.

Automation

Labor costs can be a primary contributor to overall transport costs, regardless of mode. Freight carriers, vehicle manufacturers, and technology companies have explored the potential of autonomous vehicle technology to reduce labor costs.[28] One potential use of vehicle automation is *platooning*, in which several trucks travel bunched close together, with their speed controlled by the (human) operator of the lead truck. Testing by the trucking industry has shown that platooning can reduce fuel consumption. However, widespread adoption of platooning faces several economic and regulatory hurdles.[29]

Similar economic incentives and regulatory hurdles exist for automation in the railroad industry. Several examples exist of autonomous trains in local passenger service, but fewer examples of driverless freight trains. In Australia in 2019, the mining company Rio Tinto began using driverless trains to haul iron ore some 175 miles from mines to a port, in what the company has called "the world's first fully autonomous, long distance, heavy-haul rail network."[30]

Some companies in the United States and abroad have begun developing self-propelled railcars that can transport cargo without the need for a crewed locomotive. The railcars are intended to operate alone or in platoons of several cars, potentially reducing the labor costs associated with moving smaller shipments, and potentially mitigating the transit time penalty associated with frequent stops in rail yards to connect or disconnect cars serving other customers. Self-propelled

[24] See International Transport Forum (ITF), *Mode Choice in Freight Transport*, ITF Research Reports, OECD Publishing, Paris, 2022, p. 23: "For this reason, service frequency is often considered one of the most important mode-choice criteria for shippers, as it provides them with the possibility to limit or catch up with transport delays."

[25] Sean P. Pengelly and C. Tyler Dick, "Economics and Planning of Short-Haul and Short-Line Railway Intermodal Service: Lessons from Previous and Current Operations," *Transportation Research Record*, no. 2608 (2017), pp. 105-114.

[26] CRISI is authorized under 49 U.S.C. §22907; INFRA is authorized under 23 U.S.C. §117.

[27] 46 U.S.C. §55601(b)(1)(A).

[28] See CRS In Focus IF10737, *Autonomous and Semi-autonomous Trucks*, by John Frittelli.

[29] Anirudh Kishore Bhoopalam et al., "The Long Road to Automated Trucking: Insights from Driver Focus Groups," *Transportation Research Part C*, vol. 156, p. 104351.

[30] Rio Tinto, "How Did One of the World's Largest Robots End Up Here?" September 9, 2019, https://www.riotinto.com/en/news/stories/how-did-worlds-biggest-robot.

railcars likely require general and specialized support infrastructure. Proper cargo-loading equipment would likely still need to be present at origins and destinations. The self-propelling cars would need access to battery-charging equipment in their service area or perhaps be recharged while connected to a conventional locomotive-hauled train.

Various companies are at different stages of automation development. In February 2025, FRA approved a request from Los Angeles-based Parallel Systems and its rail carrier partner to waive a number of safety rules in order to test the company's proprietary autonomous railcars on a short segment of a short line railroad in Georgia.[31] A number of issues related to safety (especially at-grade crossings) remain unresolved with the technology, and Parallel Systems' waiver request was opposed by several labor unions representing rail workers.[32] Another company, St. Louis-based Intramotev, has retrofitted existing railcars to be self-propelled and remote-controlled, and it has deployed its technology on railcars in mining service in Michigan.[33]

If Members were to support an expansion of automated railcar efforts, Congress could direct FRA to fund its own research and testing of self-propelled railcars, direct efforts to develop or recommend rules for the use of autonomous railcars, or set aside funding under other grant programs for research, development, and testing of automated rail equipment by carriers or manufacturers.

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[31] DOT, Federal Railroad Administration, "Program Approval: Georgia Central Railway, L.P. and Heart of Georgia Railroad, Inc.," 90 *Federal Register* 9053, February 5, 2025.

[32] See comments at Regulations.gov, Docket FRA-2023-0066, from the SMART Transportation Division Florida Legislative Board; BMWED; the SMART Transportation Division; and the Transport Workers Union of America (TWU). (BMWED is the Brotherhood of Maintenance of Way Employees Division of the International Brotherhood of Teamsters. SMART is the International Association of Sheet Metal, Air, Rail and Transportation Workers.)

[33] "Battery-electric railcar retrofits deployed at Carmeuse's calcium mine in Michigan," *mining.com*, December 5, 2024, https://www.mining.com/battery-electric-railcar-retrofits-deployed-at-carmeuse-americas-mine-in-michigan/#:~:text=Intramotev%2C%20a%20Missouri%2Dbased%20technology,revenue%20service%2C%20the%20company%20said.

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