

THE FUTURE OF FREIGHT In a Real-Time World



A CONFERENCE BACKGROUND PAPER

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“I don’t care what train I’m on, as long as it keeps rollin’ on ...”

Freight Train, Elizabeth Cotton, American blues and folk musician (1895-1987)

Freight is not a common focus of the sustainability movement. However, the extensive cargo moving systems of the US and Canada fundamentally enable the lifestyles to which we are accustomed. Transportation is the second largest US industrial sector, following agriculture. The environmental impacts of freight transportation are diverse and widespread—and a key point of leverage for making broad changes in how goods move. At issue are both modes of transportation and the principles that govern shipping.

Freight is moved by ship or barge, train, airplane, and—most ubiquitously—truck. The Federal Highway Administration has forecast that by 2020 the share of each of mode of cargo movement inside the USA by dollar value and by weight will be:

<u>SOURCE</u>	<i>Share by value</i>	<i>Share by tonnage</i>
Truck	82%	68%
Air	9%	1%
Rail	7%	20%
Water	2%	11%

The trend thus far, due to globalization, is a steady increase in demand for all options. Notice that truck and air are oriented to higher value goods, while rail and water to heavier commodities. However, sustainability incentives and disincentives may alter both the demand for freight transport and redistribute mode share.

Trucking

Trucking is both the most wide-spread and perhaps environmentally consequential form of freight transportation. In 2002, trucks were responsible for moving 64 percent of the value and 58 percent of the tonnage of total US commercial freight. As shown in the table above, trucking’s share is expected by the U.S. Government to grow, despite the issues troubling this industry: low driver retention, increasing fuel costs, and growing congestion.



The industry has been plagued for decades by labor shortages, projected to soar to a deficiency of 100,000 drivers as baby boomers retire. These shortages are driven by negative incentives. Trucking companies promise fast delivery times and low costs to keep customers, while shippers and receivers have insufficient incentives to load or unload on-time arriving trucks promptly. As a result, drivers are often expected to deliver loads faster than is safe or legal and be paid for shorter distances than they drive. Hours-of-service laws are designed to ensure drivers have adequate sleep. However, too few approved parking areas exist for trucks, and more and more states prohibit truck parking on highway on-off ramps. When drivers want to rest they often have nowhere practical to stop.

The industry is highly competitive, with low profits per load, which creates perverse incentives for trucking companies to scrimp on maintenance, driver salaries, and driver training. The industry is easy to enter but challenging, so turnover is high. New drivers must be trained, and too many companies recruit trainers who themselves have little experience, perhaps only six months—so safety suffers. The cost of fuel has skyrocketed for trucks that get only 5-7 mpg, with no consistent pass-through of fuel costs to customers. More and more state or local laws fine drivers for idling, even if they don't own their trucks and have to idle for livable conditions in cold or heat. The result is a beleaguered population of drivers who cannot afford new requirements that impose further burdens of time, money, or effort without some corresponding advantage. Systemic changes offering more humane conditions for the majority of drivers, who are non-unionized, are part of sustainable solutions.

Sustainable Recommendations for Trucking

- Congress *has* introduced fuel surcharge legislation that requires 100% pass-through to the individual paying for the fuel—the customer. Not only is this fair to trucking companies and drivers, but better reflects the real costs of transportation. In time, this and other monetary (dis)incentives may influence manufacturing, shipping, and purchasing behaviors in favor of local and regional trade, also cutting carbon emissions and minimizing energy use.
- Uniform capping of trucks' top speeds via engine governors can decrease fuel use and environmental impact—but must be applied across the industry in order not to advantage drivers and companies from non-participating states.
- The EPA and Owner-Operator Independent Drivers Association have crafted a model state idling law with the goal of “reducing emissions while conserving fuel and maintaining adequate rest and safety of all drivers of diesel vehicles.” This law addresses the problem of company drivers who are fined because their companies have not purchased costly auxiliary power units (APU's). Wide adoption of the model law will encourage the purchase of these low-emission APU's.
- *The Oregonian* reports that “the U.S. Environmental Protection Agency, Oregon, Washington and The Climate Trust are funding the electrification of hundreds of truck-stop spaces along I-5 to cut diesel emissions from idling rigs. Eugene's Cascade Sierra Solutions has collared federal and state money to open outreach centers on I-5, providing truckers information on and financing for a variety of emission-reduction technologies.”
- Congestion pricing is becoming inevitable as fuel tax revenues decline, but it must take into account that transportation is not discretionary for truck companies and drivers. Company officials have varying opinions on whether tolls and fees can be

passed on to customers in the face of competition from the several modes and diverse freight corridors that compete with different cost structures. If trucking companies and drivers are forced to pay their own tolls and fees, outcomes will likely be longer delivery times and more truck traffic on secondary roads.

- There is a trend toward supply chains using two or more modes of surface transportation, usually meaning standardized intermodal freight containers that travel on both trucks and rail cars. Intermodal terminals or hubs can promote low-cost, low-emission rail or sea transport and shorter truck routes. Intermodal facilities that include truck parking will ease the parking shortage. Short-haul loads can, in theory, lead to more reasonable driver work schedules, although short in-city movement between marine terminals and warehouses, called drayage, is prominent for causing economic abuse of independent haulers paid too little to do too much.
- Road design should take into account the potential benefits of truck-only-toll (TOT) lanes, high occupancy toll (HOT) lanes that allow small commercial trucks to buy in, and enforced loading zones in congested districts.
- Geographically close merchants may respond to public policy incentives to better coordinate freight hauling and delivery, including using centralized distribution centers.
- Economic incentives may increase metropolitan nighttime use of roads for freight movement and delivery, although there are tradeoffs with noise pollution in nearby residential areas when people are trying to sleep. However, this is not a complete solution, since long-distance deliveries often need to traverse metro areas in peak periods.
- Incentives are needed to encourage trucking companies and drivers *not* to purchase used and pre-2007 trucks, which lack new engine emission standards. Europe has created strong incentives for smaller, more fuel-efficient, low-emission trucks through its Euro 4 and Euro 5 standards, an approach warranting consideration in North America.
- Low-emission technology applications for cleaner new engines and retrofits is emerging. For example, International Corp.'s Green Diesel Technology lowers nitrogen oxide emissions and uses ultra-low-sulfur diesel fuel and a special filter to cut emissions by 99%.
- In its "Green Freight Initiative," California has promoted the use of landscaped buffers to minimize community impacts from roadway noise and pollution.
- Specialized heavy-haul trucks and commercial vehicles cannot be left out of the equation. Municipal and private fleets of dump trucks, garbage trucks, earth moving and construction machinery, and school buses get low gas mileage and are usually high-polluting. Natural gas vehicles may be the best option in the short-term. However, these vehicles are expensive to replace in any case—\$120,000 for a garbage truck—and fuel prices add to fiscal woes. School districts are already struggling to provide bussing out of budgets apportioned with significantly lower gas prices in mind.

Rail-Based Freight

Rail may be a reasonable substitute for some of today's truck-heavy long-haul transport, although trucks are easier and faster to load and unload, and roads go to far more places than

tracks. On the plus side, the railroads deliver freight at rates that have dropped significantly since deregulation in 1980, and productivity has risen. Rail is also likely to be at best a long-term fix, because presently rail is running close to or at capacity. Track and train control upgrades will take years. Rail is best for heavy tonnage, not particularly time-sensitive and often low-value loads—coal makes up half of freight shipped by rail. However, each new freight train can remove 280 trucks from the highways.



Railroads are private, so they own both their trains and the land beneath the tracks. Track lines are extremely expensive to purchase, construct, and maintain. Extensive redirection to train transport will require massive infusions of capital and the time to develop new lines—and profit margins to justify them. Perhaps as a portent of things to come, Bill Gates is now the largest investor in Canadian National Railway, and Warren Buffett and George Soros have bought heavily into Union Pacific.

Water-Based Freight

Sea transport vies with rail as the most economical and lowest-emission freight option, when water movement along coasts and rivers is an option. It is constrained not only by the geography of water, but also by high load and unload costs, and slow delivery times compared to trucks. Nevertheless, “short sea shipping” has been gaining adherents of late. Intercoastal and riverway shipping is a reasonable option in certain cases *if* customers reevaluate their reliance on just-in-time (JIT) delivery. By building higher inventory capacity, freight customers’ lower-cost freight options will expand. At the same time, the fragility and vulnerability to delays inherent in a JIT truck-based system will decrease.

These implications for JIT delivery hold true for rail transport, too. A new balance between the recent trend of increasing JIT – called warehousing on wheels – and more reliance on buffer inventory stocks delivered by slower means may be an unavoidable consequence of rising energy costs and unrelenting congestion.

Air-Based Freight

There has been strong growth in air transport in recent years, driven by JIT demand for high-value items. Nevertheless, in terms of tonnage, air transport remains minimal—less than 5%. Air transport is fuel- and emissions-intensive. Adding carbon offset payments to the price of air transport will add to prices already rising because of fuel costs. In the future we can expect air shipping to account for only the most time-sensitive and high-value transport. However, the cost of freight movement by airplane may drop with the gradual introduction of unmanned, remotely-controlled cargo aircraft in the foreseeable future, an application that is seeing rapid development, partially as a spinoff from now extensively-used military technology.

Principles for Broader Impact

Freight is just one part of a larger system involving environment, society, and economy. A *systems approach* will help us look for and recognize examples of the interdependent nature of things. One example: As a result of the international movement of freight, more than 205 non-native species have been either introduced or first detected in the United States—just

in the 1980s through early 1990s. The long-term impacts to native flora, fauna, and ecosystems cannot be adequately foreseen. Developing an eye for possible unintended consequences and ripple effects of actions and policy decisions is key. In the world of freight, the impacts of decisions are magnified due to the disparate geographies, materials, and modes of freight transport, in addition to its vast tonnage.

A report by the Federal Highway Administration identifies several important issues that should drive policy, including: 1) congestion and expanding capacity, 2) improving systems operations, 3) planning and financing freight projects, 4) the safety and environmental effects of freight transport, 5) national security, and 6) building professional capacity in the freight sector. As if the diverse issues facing the diverse modes of freight were not enough, meta-issues must be considered as well. At the risk of a jarring mnemonic, developing *comfort with complexity is a core competency*—for leaders in the public and private sectors and, ideally—among citizens.

Despite the complicated nature of it all, a variety of interventions can leverage sustainability impact. As discussed above, reevaluating an economy built around JIT delivery is key. As modes of transport are constrained by fuel costs and increasingly subject to taxes and surcharges that offset environmental impact, slower delivery times will become a fact of life.

Corporations play a key role in sustainability through their supply chain and delivery choices. According to a leader in the supply chain field, companies committed to carbon neutrality need to make choices up front since “over 80% of this target is only achievable at the design stage.” Software solutions now exist to help companies determine the most cost-efficient and environmentally friendly means of transport for all their freight movement. Given this, the time is ripe for a certification system that recognizes companies’ freight movement at certain high levels of environmental sustainability, ideally alongside just labor practices that include transportation safety.

Another promising arena: creating intermodal freight solutions that contribute to more seamless freight delivery with lower environmental impacts. Ideally, long-haul freight will be increasingly entrusted to rail and water transport, with short-hauls taken on by trucks that are increasingly fuel efficient, environmentally friendly, and using assigned freight corridors designed to avoid environmental impacts to pedestrian and bicycle-oriented development.

Finally, sustainable freight transformations rely on partnerships at all levels, among numerous constituencies: governmental bodies, freight companies and their corporate customers, non profits, community groups, and academics. In other words, the future of collaborative freight solutions will pool the best thinking of a broad range of stakeholders—similar to that assembled for *Meeting of the Minds*.

About the Author

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