Chapter 13

Freight Transportation

Freight Transportation

The economy of the United States depends on freight transportation to link businesses with suppliers and markets throughout the Nation and the world. Freight impacts nearly every American business and household in some way. American farms and mines use inexpensive transportation to compete against their counterparts around the world. Domestic manufacturers rely on remote sources of raw materials to produce goods. Wholesalers and retailers, meanwhile, depend on fast and reliable transportation to obtain inexpensive or specialized goods. In the expanding world of e-commerce, households and small businesses increasingly depend on freight transportation to deliver purchases directly to them. Service providers, public utilities, construction companies, and government agencies rely on freight transportation to obtain needed equipment and supplies from distant sources.

The U.S. economy requires effective freight transportation to operate at minimum cost and respond quickly to demands for goods. As the economy grows, over the next several decades, the demand for goods and the volume of freight transportation activity will only increase. Current volumes of freight are straining the capacity of the transportation system to deliver goods quickly, reliably, and cheaply. Anticipated growth of freight could overwhelm the system's ability to meet the needs of the American economy unless public agencies and private industry work together to improve the system's performance.

All statistics presented in this chapter are from the Freight Analysis Framework (FAF) release 2.2 unless otherwise noted. FAF estimates cover all freight flows to, from, and within the United States, excluding shipments through the United States between foreign countries. Shipments to and from Puerto Rico are counted with Latin America. See www.ops.fhwa.dot.gov/freight/freight_analysis/faf.

Statistics from the FAF and other sources are published in U.S. Department of Transportation, Federal Highway Administration, Freight Facts and Figures 2007, at www.ops.fhwa.dot.gov/freight/freight_analysis/nat_freight_stats/docs/07factsfigures. Many statistics are based on the Economic Census and Commodity Flow Survey (CFS) both conducted once every 5 years. The most recently published data from the Economic Census and CFS are for 2002.

The CFS is conducted in partnership between the U.S. DOT and U.S. Department of Commerce, Bureau of Census. CFS is a component of the Economic Census that measures movement of goods in the United States and is a major input to the FAF.

The Large and Growing Demand for Freight Transportation

According to estimates based on the most recently available Economic Census, the transportation system in the United States moved an average of 53 million tons of freight worth $36 billion per day in 2002. This network served 109 million households, 24.8 million business establishments, and almost 88,000 units of government.[1] More than half the tonnage moved within local areas, and less than 10 percent was an import from, or export to, another country. Close to 60 percent of the weight and two-thirds of the value of shipments moved by truck, as shown in *Exhibit 13-1*. Shipments traveling by more than one mode of transportation accounted for only 1 percent of domestic tons, but 60 percent of the weight of exports and almost 70 percent of imports.

Over the next several decades, the volume of freight that will need to be moved will increase as the economy expands and, in some cases, at a much greater rate. Between 1999 and 2004, container traffic increased 44 percent while Gross Domestic Product increased 13 percent.[2] Over the next three decades, the U.S. economy is expected to grow almost 3 percent per year in gross domestic product (GDP), driven in part by a population increase from 300 million people today to almost 380 million in 2035.[3] The resulting tonnage of goods to be moved is forecast to increase 2.0 percent each year, almost doubling between now and 2035, as shown in *Exhibit 13-2*. International trade is expected to increase even faster.

Exhibit 13-1

Goods Movement by Mode, 2002

Mode	Tons (Millions)	Percent	Value (Billions of Dollars)	Percent
Truck	11,539	59.70%	8,856	67%
Rail	1,879	9.70%	382	2.90%
Water	701	3.60%	103	0.80%
Air	11	0.10%	771	5.80%
Intermodal	1,292	6.70%	1,967	14.90%
Pipeline	3,905	20.20%	1,149	8.70%
Total	**19,328**	**100%**	**13,228**	**100%**

Source: Freight Analysis Framework 2.2.

Note: In the Freight Analysis Framework, air includes shipments over 100 pounds moving by air or by air and truck. Intermodal includes all other shipments moving by more than one mode, ranging from bulk products moving by water and pipeline, to mixed cargo moving by truck and rail, to courier and postal shipments weighing less than 100 pounds moving by air and truck or by rail and truck. Pipeline includes a small quantity of shipments with unknown modes.

The value of commodities moved is greater than the gross domestic product (GDP) because many products counted once for GDP move multiple times during the year. For example, grain moved initially from farm to grain elevator, then from grain elevator to processing plant, and finally as cereal or bread from processing plant to the store is counted three times in freight statistics and only once in GDP as the food being purchased by households.

In addition to moving larger volumes of freight, the transportation system is transporting goods over greater distances. During the past decade, domestic tons increased by slightly more than 20 percent while ton-miles increased by almost 30 percent.[4] This growth in the weighted average distance of shipments may result from several factors. A growing number of consumers in the eastern United States are purchasing Asian products that are reshipped through the West Coast. Export of agricultural goods is growing. Midwestern power plants are shifting from local sources of coal, to coal that is extracted from the Powder River Basin in Montana and Wyoming.

Exhibit 13-2

Goods Movement by Mode, 2002 and 2035

Mode	2002 (Millions of Tons)	Percent	2035 (Millions of Tons)	Percent	Percent Change, 2002/ 2035
Domestic	17,670	91.4%	33,668	90.6%	90.5%
Imports Plus Exports	1,657	8.6%	3,509	9.4%	111.8%
Total	**19,326**	**100%**	**37,178**	**100%**	**92.4%**

Source: Freight Analysis Framework 2.2.

Demands on the Transportation System

Much of the Nation's freight transportation infrastructure was developed before 1960 to provide national connectivity, move goods from farm to market and from fort to port, and serve industrial and population centers concentrated in the Northeast and the Midwest. Since 1960, however, there have been fundamental changes in the American economy. Population and manufacturing have grown in the South and West Coast. There has been a restructuring of the economy as heavy industries such as steel have given away to services such as health care. International trade has placed new demands on the freight system; ports, airports, and border crossings handle dramatically increasing volumes of traffic. Railroads and steamship companies accommodate enormous numbers of containers, a technological novelty five decades ago. Trucks serve new inland distribution centers beyond the urban fringe and air carriers deliver parcels between any location in the country overnight. The freight system must serve an economy that is increasingly organized around just-in-time delivery.

Pressures that existing and anticipated volumes of freight place on the transportation system vary by the type of goods being moved. Routes, facilities, volumes, and service demands differ between higher-valued goods moving at high velocities and lower-valued goods moving in bulk shipments, as shown in *Exhibit 13-3*.

Trucking handles a surprising share of lower-valued bulk tonnage. This share includes activities such as movement of agricultural products from farms, local distribution of gasoline, and pickup of municipal solid waste. The length of haul is typically very short.

Q&A

What is the National Network?

The National Network was authorized by the Surface Transportation Assistance Act of 1982 (P.L. 97-424) and specified in the Code of Federal Regulations (23 CFR 658) to require States to allow conventional combinations on "the Interstate System and those portions of the Federal-aid Primary System… serving to link principal cities and densely developed portions of the States…[on] high volume route[s] utilized extensively by large vehicles for interstate commerce…[which do] not have any unusual characteristics causing current or anticipated safety problems." Conventional combinations are tractors with one semitrailer up to 48 feet in length or with one 28-foot semitrailer and one 28-foot trailer, which can be up to 102 inches wide.

Although the National Network has significant overlap with the National Highway System, they differ in several respects. The National Network provides geographic access for interstate commerce through 210,000 miles of highways, while the National Highway System connects "major population centers, international border crossings, ports, airports, public transportation facilities, other intermodal transportation facilities and other major travel destinations" through a network that cannot exceed 178,250 miles in length (the current NHS mileage is 162,684). The National Network serves trucking on substantial miles of highway beyond the National Highway System, while parts of the National Highway System are designated solely for passenger travel and may exclude trucks (even on the Interstate System). The National Network was designated more than a decade before the National Highway System, which was created by the National Highway System Designation Act of 1995 (P.L. 104-59). The National Network supports interstate commerce through regulation, while the National Highway System supports interstate commerce by focusing Federal investments.

The National Network has not been significantly updated in more than two decades. It changes only if segments are added to the Interstate System or if States petition to have a segment beyond the Interstate System added or deleted. Petitions for modifications have not been received in years, even though the geography of interstate commerce has changed significantly with the growth of smaller places into principal cities and the emergence of new, densely developed areas. Consistency between the National Network and freight-related portions of the more recent National Highway System is not required.

The definition of conventional combinations is also unchanged, even though 48 feet is no longer the maximum length of a single trailer in the majority of States. Single 53-foot trailers are allowed in 25 States without special permits, and in an additional three states subject to limits on the distance between the trailer kingpin and the rearmost axle.

In addition to hauling bulk commodities, trucking moves our Nation's high-value, high-velocity goods. The value of goods that will be moved is forecast to grow in constant dollars by more than 190 percent between 2002 and 2035, nearly twice the growth rate forecast for tonnage. As the value of goods to be moved grows, the cost of holding inventory in warehouses or in transit also increases. Many industries have shifted to just-in-time delivery systems to minimize inventory costs and maximize responsiveness to rapidly changing markets. Just-in-time systems depend on fast and reliable transportation. According to one estimate, companies judged to be best-in-class for supply chain management have 40 percent higher profitability and 25 percent higher sales growth than median companies.[5]

Just-in-time delivery systems contribute to an increase in transportation activity per ton-mile and thus capacity requirements per ton. For many products, just-in-time logistical systems require greater numbers of vehicles hauling smaller payloads to meet market demands. This shift—more vehicles carrying less per vehicle—was a factor in the 71 percent growth in the number of trucks used in for-hire transportation and 115 percent growth in their vehicle miles of travel between 1998 and 2000.[6]

Because of this growth, trucks traffic is increasing on American highways. Trucks were 25 percent of the average daily traffic on almost 31,000 miles of the National Highway System in 2002, and are forecast to be on 37,000 miles in 2035. Freight-hauling vehicles are usually more than twice as long as passenger vehicles, so trucks become a dominant part of the traffic stream when they are every fourth vehicle on the road.

Long distance freight movements by truck are concentrated on the Interstate System (*Exhibit 13-4*). Approximately 25,500 miles of the Interstate System and 600 miles of other portions of the National Highway System serve

Exhibit 13-3

The Spectrum of Freight Moved in 2002

	High-Value, High-Velocity Goods	Bulk Goods
Top 5 Commodity Classes		
	Machinery	Natural gas
	Electronics	Gravel
	Mixed freight	Cereal grains
	Motorized vehicles	Crude petroleum
	Textiles and leather	Coal
Share of Total Tons		
	30%	70%
Share of Total Value		
	85%	15%
Key Performance Variables		
	Reliability	Reliability
	Speed	Cost
	Flexibility	
Share of Tons by Domestic Mode		
	88% truck	51% truck
	7% rail	12% rail
	5% all other	32% pipeline
		5% water
		<1% air and intermodal
Share of Value by Domestic Mode		
	83% truck	36% truck
	10% intermodal	5% rail
	3% rail	53% pipeline
	4% all other	4% water
		2% air and intermodal

Source: Freight Analysis Framework 2.2.

Exhibit 13-4

Freight Share of Vehicle Miles of Travel by Highway System

	Interstate Highways	Balance of National Highway System	Other Highways
All Vehicles	35%	30%	35%
All Trucks	49%	26%	25%
Freight-Hauling Trucks Serving Places at Least 50 Miles Apart	75%	20%	6%

Source: Freight Analysis Framework 2.2.

Note: Numbers do not add to 100 due to rounding.

corridors that carry at least 50 million tons of cargo by truck or by trailer-on-flatcar and container-on-flatcar services. Many locations of economic activity depend on segments on the 210,000-mile National Network to reach the major highway freight corridors.

Freight and Congestion

Congestion affects economic productivity when American businesses require more operators and equipment to deliver goods when movement takes longer, more inventory when deliveries become unreliable, and more distribution centers to reach markets quickly through a slow transportation network. Businesses and households are both affected by sluggish traffic on the ground and in the air, reducing the number of workers and places to work and consume within easy reach of any location. The growth in freight is a major contributor to congestion in urban areas and on intercity routes, and congestion in turn affects timeliness and reliability of freight transportation. Long distance freight movements are often a significant contributor to local congestion, and local congestion typically impedes both local and distant economic activity.

Highway Congestion

Trucks must contend with congested urban areas at some point during most intercity trips. The largest highway freight bottlenecks identified in a study for the Federal Highway Administration (FHWA) are intersections in large cities, where personal vehicles and trucks both clog the road.[7] Recurring peak-period congestion caused slowing on over 10,600 miles of the National Highway System in 2002, and stop-and-go conditions on an additional 6,700 miles.[8] Most of the affected mileage was in major metropolitan areas.

Congestion is forecast to spread from the larger urban areas and a few intercity routes to large stretches of intercity highways in urban and rural areas. Without operational improvements or additional capacity between now and 2035, recurring peak-period congestion is forecast to cause slowing on 20,000 miles of the National Highway System and stop-and-go conditions on an additional 45,000 miles.

Truck congestion occurs throughout the Nation's highways, but some local bottlenecks account for a substantial share of the total disruption. The top 10 highway-interchange bottlenecks cause an average of 1.5 million annual truck hours of delay each, compared to less than 250,000 annual hours of truck delay for other truck bottlenecks.[9]

Trucks are also a source of congestion when space and time for pickups and deliveries are limited. One estimate of urban congestion attributes 947,000 hours of vehicle delay to delivery trucks parked curbside in dense urban areas where office buildings and stores lack off-street loading facilities.[10] Limitations on delivery times place significant demands on highway rest areas as large numbers of trucks park outside major metropolitan areas each night waiting for their destination to open and accept their shipments.[11]

The aforementioned estimates of delay are based on recurring, predictable congestion, which is only part of the problem. Nonrecurring delay for often-unpredictable sources of temporary capacity loss such as incidents, weather, and work zones for maintenance and reconstruction may cause more delay than recurring congestion.[12]

Until recently, estimates of highway delay have been based on comparisons of traffic volumes to physical highway capacity. To supplement these estimates with direct measures, FHWA and the American Transportation Research Institute are working together to calculate average truck speeds and travel time reliability using automatic vehicle location and mapping technologies. Data are being collected for 25 of the most heavily traveled Interstate Highways and at major border crossings.[13] These data will identify congested locations from all sources of delay, including both recurring and non-recurring congestion.

Railroad Congestion

After decades of stagnant demand and a reduction of trackage by about 50 percent, Class 1 (large interregional) freight railroads are experiencing significant growth in tonnage to be moved.[14] Trailer-on flatcar and container-on-flatcar service, once a small market, is now a major source of traffic, with high-speed intermodal trains vying for space on the network with slower trains carrying bulk commodities. Seasonal surges in freight demand and disruptions from incidents and maintenance activities add to congestion as volumes reach capacity on the reduced mainline railroad network. Operational improvements mitigated the effects, at least in the short run, as the average speed of U.S. freight trains has improved from a range of 18 to 24 miles per hour at the beginning of 2006 to a range of 20 to 25 miles per hour in October 2006 depending on the railroad. Terminal dwell time for freight trains improved from a range of 28 to 35 hours down to 20 to 25 hours during the same period.[15] Additionally, Federal investment in the Alameda Corridor in Southern California improved freight flows through a local bottleneck to destinations well beyond the metropolitan area and the State. The project reduced congestion on the rail connections between the ports of Los Angeles and Long Beach and the rest of the Nation, as well as congestion on streets that formerly crossed the railroad at grade.

Congestion on the mainline railroad network is forecast to spread significantly. Using volume-to-capacity comparisons similar to highway calculations, the Association of American Railroads reports that rail lines with unstable flows and service break-down conditions will increase from 108 miles today to almost 16,000 miles (30 percent of the network) in 2035 if current capacity is not increased.[16] Rail routes with moderate to very limited capacity to accommodate maintenance without serious service disruptions and recover quickly from incidents will increase from 6,413 miles today to over 12,000 miles in 2035, affecting 25 percent of the network.[17]

The picture for short-line and regional railroads is far less clear. Very few statistics are collected on this portion of the industry, which included 34 regional railroads and 529 local railroads in 2001.[18] Some of these railroads provide links between port facilities and the Class 1 railroads, while others serve small communities and shippers in rural areas.

Waterway Congestion

Deep draft ports experience congestion as room for increasing volumes of import and export cargo is stagnated by factors such as waterside residential development and environmental and community concerns. Congestion also occurs when vessels arrive at the same time rather than spread through the week. Most ports must look to operational improvements to increase capacity and reduce congestion, such as reducing the amount of demurrage allowed for containers on the terminals, instituting chassis pools, and moving to stack operations.

Even when ports can berth and unload a ship quickly, the increasing size of container ships is moving congestion from peaks in demand to access roads and railroads. The number of the world's post-Panamax vessels, container ships that are too large to fit the Panama Canal, increased from 331 in 2001 to 561 in 2004, with another 426 on order.[19]

On the inland waterways, aging infrastructure and locks (some of which are a century old) are a continuous bottleneck: 39 percent of 539,000 passages of commercial vessels through Federal and State locks experienced delay in 2006.[20] Average delay for tows was 1 hour 19 minutes, and average processing time was almost 13 hours.[21] Inland waterways are especially susceptible to weather, sometimes closed by flooding, sometimes by droughts, and sometimes by ice or other obstructions related to storms.

The Economic Costs of Freight Transportation

Freight transportation has become cheaper for a given level of service over the past quarter century, contributing significantly to enhanced economic productivity and growth. Several forces, however, are conspiring to increase costs in the years ahead. These factors include market forces affecting railroads, environmental forces affecting waterways and fuel prices affecting all modes. These and other forces will increase the cost of moving bulk goods, while congestion and other factors will affect the long and often vulnerable supply chains of high-value, high-velocity commodities. If these forces are not mitigated, the increased cost of moving freight will be felt throughout the economy, affecting businesses and households alike.

Congestion results in enormous costs to shippers, carriers, and the economy. The 2,110 freight bottlenecks on highways throughout the United States cause more than 243 million hours of delay to truckers annually.[22] At a delay cost of $26.70 per hour, the conservative value used by FHWA's Highway Economic Requirements System model for estimating national highway costs and benefits, these bottlenecks cost truckers about $6.5 billion per year. Other examples illustrate the cost of gridlock on the Nation's individual employers.

When shipping delays require Nike to carry an extra 7 to 14 days of inventory, the company must spend an additional $4 million per week.[23] Just one day of delay in American President Line's eastbound trans-Pacific service requires a carrier to increase its use of containers and chassis by 1,300, adding $4 million in costs per year.[24] A week-long disruption to container movements through the Ports of Los Angeles and Long Beach could cost the national economy between $65 million and $150 million per day.[25]

Congestion costs are compounded by continuing increases in operating costs per mile and per hour. The cost of highway-use diesel fuel increased 126 percent over the decade ending in 2006.[26] Future labor costs, meanwhile, are projected to increase at a faster rate than in the past thanks to the growing shortage of truck drivers.[27] To attract and retain more drivers and adjust to new safety regulations, carriers may reduce the number of hours drivers are on the road, which will in turn increase operating costs. Railroads are also facing labor recruitment challenges.[28] Beyond fuel and labor, truck operating costs are also affected by repairs to equipment damage caused by deteriorated infrastructure; taxes and tolls to pay for repair of the deteriorating infrastructure; insurance; and additional equipment required to meet security, safety, and environmental requirements.

Increased costs to carriers are eventually reflected in increased prices paid for freight transportation. Over the 3 years ending in 2006, prices increased 13 percent for truck transportation, 27 percent for rail transportation, 8 percent for scheduled air freight, 11 percent for water transportation, 9 percent for port and harbor operations, 5 percent for marine cargo handling, 22 percent for pipeline transportation of crude petroleum, and 8 percent for pipeline transportation of refined petroleum products.[29]

When the entire economy is taken into account, transportation services contribute more than 5 percent to the production of GDP.[30] Over half this contribution is for-hire and in-house trucking. The importance of transportation varies by sector of the economy. A $1 increase in the final demand for agricultural products, for instance, requires 14.2 cents in transportation services, compared with 9.1 cents for manufactured goods and about 8 cents for mining products. An increase in transportation costs is more critical to lower margin bulk commodities than to the high-velocity, high-value commodities that have higher margins. In either case, an increase in the cost of transportation will ripple through all these industries to affect not only the cost of goods from all economic sectors consumed by the Nation, but those markets that may remain open for the goods.

The Freight Challenge

How can the Nation cheaply and reliably move the increasing volume of goods needed by U.S. businesses and households on an increasingly constrained infrastructure without safety concerns and environmental degradation? This challenge is enormous. Efficiency gains from economic deregulation have been largely achieved and absorbed by the system. Opportunities for operational improvements are still available and must be used; but, new physical capacity is limited by available financing, competition with other needs and uses, and environmental concerns. Traditional strategies aimed at passenger travel may not apply.

The freight challenge is different from other dimensions of the Nation's transportation system:

- While the majority of passenger travel is between local origins and destinations, half of freight involves moving long distances through localities, responding to distant economic demands, and often creating local problems without local benefit.
- Freight movements fluctuate more quickly and in greater relative amounts than passenger travel. While both passenger travel and freight respond to long-term demographic change, freight responds far more than passenger travel to short-term economic fluctuations. Fluctuations can be national or local. The addition or loss of a major business can dramatically change the level of freight activity in a locality.
- Freight movement is heterogeneous compared with passenger travel. Patterns of passenger travel tend to be very similar across metropolitan areas and among large economic and social strata. Freight demands of farms, steel mills, and clothing boutiques differ radically. Solutions aimed at average conditions are less likely to work because the freight demands of each economic sector vary widely.
- Improvements targeted at freight demand may be needed should freight's share of transportation system usage increase. Improvements targeted at general traffic or passenger travel are not certain to aid the flow of freight as an incidental by-product.

Local public action is difficult because freight traffic and the benefits of serving that traffic rarely stay within a single political jurisdiction. Two-thirds of the value and almost half the tonnage of freight move across a State or international boundary. Although metropolitan planning organizations (MPOs) were established by Federal legislation four decades ago to coordinate transportation planning and investment across jurisdictional lines, freight corridors extend well beyond even the largest metropolitan regions and usually involve several States. Creative and ad hoc arrangements are often required. These may involve pooled fund studies and multi-State coalitions that plan and invest in freight corridors that span regions and even the continent. Institutional arrangements to coordinate this type of activity are still relatively few.

Truck routes in urban areas are among the most localized sources of conflict between freight transportation and the surrounding communities.[31] Typically the purview of local officials, restrictions on truck routes can have significant effects on the local economy and its connections with domestic and foreign trading partners. While access for interstate commerce is ensured by Federal requirements to allow conventional combinations on the National Network, public demands for restrictions on trucks may increase as neighborhoods near ports and industrial areas evolve and as trucks become a larger share of the traffic on an increasing number of highways.

Beyond the challenges of intergovernmental coordination, freight transportation raises additional issues involving the relationships between the public and private sectors. Virtually all carriers and many freight facilities are privately owned: $925 billion in equipment plus $515 billion in private structures, compared with $429 billion in transportation equipment plus $2.1 trillion in highways owned by public agencies.[32] Freight railroad facilities and services are almost entirely private. Trucks in the private sector operate over

public highways, air cargo services in the private sector operate in public airways and mostly public airports, and ships in the private sector operate over public waterways and both public and private port facilities. Pipelines are mostly in the private sector, though significantly controlled by public regulation. In the public sector, virtually all truck routes are owned by State or local governments, airports and harbors are typically owned by public authorities, air and water navigation is mostly Federal, and safety is regulated by all levels of government. As a consequence of this mixed ownership and management, most solutions to freight problems require joint action by the public and private sectors. Joint efforts by public agencies and private firms traditionally have been very limited, inhibiting effective measures to improve the performance and minimize the public costs of the freight transportation system.[33]

A Framework for Responding to the Freight Challenge

Freight has moved to the forefront of many policy debates and plans concerning transportation in recent years. Stakeholders increasingly express concern that piecemeal improvements to the freight transportation system are not enough. The freight challenge requires a wide range of activities by the private sector and all levels of government, organized formally or informally to pursue common objectives.

To establish a better understanding of the freight challenge and activities by the private sector and all levels of government, the Transportation Research Board convened individuals from transportation providers, shippers, State agencies, port authorities, and the U.S. Department of Transportation (DOT). These organizations formed a Freight Transportation Industry Roundtable. Members of the roundtable developed an initial Framework for a National Freight Policy to identify freight activities and focus those activities toward common objectives.

The Framework for a National Freight Policy continues to evolve as a joint effort of DOT and its partners in the public and private sectors. These groups are completing an inventory of existing and proposed strategies, tactics, and activities that can improve freight transportation. These are shown in *Exhibit 13-5.* The framework is national rather than Federal, reflecting the critical roles of the Federal government, States, localities, and the private sector. Each strategy has at least one tactic; each tactic has at least one activity; and each activity has "owners" responsible for articulating milestones and consequences for moving the activity forward. The Framework is structured to identify examples of good practice, actions that would benefit from increased collaboration, conflicts needing resolution, and issues needing more attention. It represents a common ground for discussion rather than a formal industry consensus or official views of DOT.

Freight Aspects of the Federal-Aid Highway Program

Freight emerged as a significant component of the Federal-Aid Highway Program in the Safe, Accountable, Flexible, Efficient Transportation Equity Act: Legacy for Users (SAFETEA-LU).[34] SAFETEA-LU authorized $4.6 billion for the freight-oriented infrastructure investments in *Exhibit 13-6.* SAFETEA-LU also, expanded eligibility for financing freight projects under the Transportation Infrastructure Finance and Innovation Act (TIFIA) Program, extended the State Infrastructure Bank (SIB) Program, and modified the tax code to encourage up to $15 billion in investment in freight facilities through private activity bonds.

Beyond concrete and steel, SAFETEA-LU funds freight planning capacity building,[35] and supports freight analysis through the surface transportation congestion relief solutions research initiative.[36] Many State DOTs have established freight offices or designated freight coordinators and several have initiated statewide freight plans. Washington State goes beyond planning to include financing freight projects though its

Exhibit 13-5

Framework for a National Freight Policy

Vision: The U.S. freight transportation system will ensure the efficient, reliable, safe, and secure movement of goods and support the Nation's economic growth while improving environmental quality.

Objectives:	Strategies:
Improve the operations of the existing freight transportation system.	Improve management and operations of existing facilities. Maintain and preserve existing infrastructure. Explore opportunities for privatization. Ensure the availability of a skilled labor pool sufficient to meet transportation needs.
Add physical capacity to the freight transportation system in places where investment makes economic sense.	Facilitate regionally based solutions for freight gateways and projects of national or regional significance. Utilize and promote new/expanded financing tools to incentivize private sector investment in transportation projects. Explore opportunities for public-private partnerships and/or privatization.
Better align all costs and benefits between users and owners of the freight system.	Utilize public sector pricing tools. Utilize private sector pricing tools.
Reduce or remove statutory, regulatory, and institutional barriers to improved freight transportation performance.	Identify/inventory potential statutory, regulatory, and institutional changes. Provide pilot projects with temporary relief from unnecessarily-restrictive regulations and/or processes. Encourage regionally based intermodal gateway responses. Actively engage and support the establishment of international standards to facilitate freight movement.
Proactively identify and address emerging transportation needs.	Develop data and analytical capacity for making future investment decisions. Conduct freight-related research and development. Maintain dialogue between and among public and private sector freight stakeholders. Make public sector institutional arrangements more responsive.
Maximize the safety and security of the freight transportation system.	Ensure a balanced approach to security and efficiency in all freight initiatives. Preserve redundant capacity for security and reliability. Manage public exposure to hazardous materials.
Mitigate and better manage the environmental, health, energy, and community impacts of freight transportation.	Pursue pollution-reduction technologies and operations. Pursue investments to mitigate environmental, health, and community transportation impacts. Promote adaptive reuse of brownfields and dredge material. Prevent introduction of or control invasive species. Pursue energy-conservation strategies and alternative fuels in freight operations.

Source: U.S. Department of Transportation Working Group on Freight Transportation.

Freight Mobility Strategic Investment Board.[37] The Board was established to create a comprehensive and coordinated State program to facilitate freight movement and to find solutions that lessen the impact of freight on local communities. The Board has provided funding for freight mobility projects and technical assistance to eliminate chokepoints and grade crossings so that freight can move smoothly and communities experience fewer disruptions in local traffic. The Board is represented by high-level industry and regional stakeholders who direct the agency's activities.

Exhibit 13-6

Direct Expenditures for Freight Infrastructure in SAFETEA-LU

Projects of National/Regional Significance	$1.779 billion over 5 years
National Corridor Infrastructure Improvement	$1.948 billion over 5 years
Coordinated Border Infrastructure Program	$833 million over 5 years
Freight Intermodal Distribution Pilot Grant Program	$30 million over 5 years
Truck Parking	$25 million over 4 years
Total	**$4.615 billion**

Source: U.S. Department of Transportation, Federal Highway Administration, Office of Freight Management and Operations.

Many States realize that solutions to their freight problems require actions well beyond the State's borders, and have joined in corridor coalitions to develop and pursue those solutions. At least a dozen major corridor coalitions exist today.[38] Coalitions have sponsored research to better understand freight problems throughout their corridor, and several have developed specific plans through the Corridors of the Future Program. One group, the I-95 Corridor Coalition, is developing a Freight Academy to provide continued education to the region's freight transportation professionals.[39]

The MPOs in larger cities are undertaking freight plans and programs and are engaging the private sector stakeholders through Advisory Committees. For example, the Atlanta Regional Commission MPO and Georgia Department of Transportation have jointly undertaken the development of a Regional Freight Mobility Plan to address freight and goods movement needs and challenges in the region.[40] Similar efforts are underway in metropolitan areas such as Philadelphia, Chicago, and Los Angeles.

One of the more notable local initiatives is the PierPASS OffPeak program, created by the marine terminal operators at the Ports of Los Angeles and Long Beach to alleviate truck traffic congestion and improve air quality in the region.[41] Trucks with loaded containers entering or exiting marine terminals during peak hours are charged a Traffic Mitigation Fee, which encourages cargo owners and their carriers to move cargo at night and on weekends and defrays the additional costs of keeping the terminal open longer hours. Thus, congestion is reduced during peak daytime periods at port gates and on major highways around the ports, and air quality is improved.

Carriers, shippers, terminal operators, and other private sector players in the freight transportation industry deal with the freight challenge on a daily basis, either through the actions of individual businesses, collective action through associations, or cooperative ventures with public agencies. The Intermodal Freight Technology Working Group (IFTWG) is a an example of a public-private partnership focused on the identification and evaluation of technology-based options for improving the efficiency, safety, and security of intermodal freight movement. The IFTWG engages in efforts to marry industry and government priorities in a way that leverages collective experience and shared investment.[42] The IFTWG worked with FHWA to establish the Universal Electronic Freight Manifest (EFM) initiative, which provides all supply chain partners with timely access to shipment information to improve the operational efficiency, productivity, and security of the transportation system.[43]

Conclusion

To sustain the nation's economy in the face of global competition, collective action of all stakeholders is needed to maintain and enhance the freight transportation system within environmental and other constraints. Key actions could be initiated through reauthorization of the Federal-aid highway program. Among likely questions to be considered:

- What kinds of investment programs, financial incentives, changes in eligibility, and performance requirements should be targeted in nationally significant freight corridors?
- Should the National Network be updated or changed to provide geographic access by conventional combination trucks to all locations of economic activity?
- Should targeted investments and/or minimum condition and performance standards be established for freight intermodal connectors?
- Should trucks be given special consideration in air quality requirements and greenhouse gas reduction strategies?
- Should new finance mechanisms be established for freight projects?
- Are new institutional arrangements needed to plan, design, finance, build, and operate interrelated projects in a freight corridor that spans several states?
- How do we maintain the flow of information needed to plan and hold accountable improvements in the freight transportation system?

Endnotes

[1] The number of households is from table 57 (07s0057.xls) of the 2007 *Statistical Abstract of the United States* at www.census.gov/compendia/statab. The number of business establishments combines establishments with payrolls from table 738 (07s0738.xls) and nonemployer establishments from table 737 (07s0737.xls). Units of government are from table 415 (07s0415.xls).

[2] Containers in 20-foot equivalent units (TEUs) are from exhibit 7 in *Containership Market Indicators*, Office of Statistical and Economic Analysis, Maritime Administration, U.S. Department of Transportation, August 2005, at www.marad.dot.gov/marad_statistics. Gross domestic product in constant dollars is from the *Economic Report of the President* at www.gpoaccess.gov/eop/2008/B2.xls.

[3] "Forecasts of Economic Variables that Impact Passenger and Freight Demand and the Implication of Alternative Economic Assumptions on Modal Travel Demand." 2007. Battelle for the National Surface Transportation Policy and Revenue Study Commission, Briefing Paper 4B-06, p. 1, at www.transportationfortomorrow.org/final_report/pdf/volume_3/technical_issue_papers/paper4b_06.pdf. And "U.S. Interim Projections by Age, Sex, Race, and Hispanic Origin." 2004. U.S. Census, March, Detail file, at www.census.gov/ipc/www/usinterimproj.

Endnotes, continued

[4] Freight in America: A New National Picture. 2006. Bureau of Transportation Statistics, U.S. Department of Transportation, table 10, page 24, January.

[5] Hermans, Mark. 2006. "Supply Chain Benchmarking." Presentation to the TRB Freight Roundtable, October 23, at www.trb.org/conferences/FDM/Hermans.pdf.

[6] "Vehicle Inventory and Use Survey, 2002." U.S. Bureau of the Census, United States Summary, table 2A, and "Truck Inventory and Use Survey, 1992." U.S. Bureau of the Census, United States Summary, table 2A.

[7] U.S. Department of Transportation, Federal Highway Administration, *An Initial Assessment of Freight Bottlenecks on Highways*, prepared by Cambridge Systematics, October 2005, at www.fhwa.dot.gov/policy/otps/bottlenecks.

[8] U.S. Department of Transportation, Federal Highway Administration, *Freight Facts and Figures 2008*, p. 30.

[9] U.S. Department of Transportation, Federal Highway Administration, *An Initial Assessment of Freight Bottlenecks on Highways*, *op. cit.*

[10] Oak Ridge National Laboratory, *Temporary Losses of Highway Capacity and Impacts on Performance: Phase 2*, ORNL/TM-2004/209, table 36, at www-cta.ornl.gov/cta/Publications/tlc/tlc2_title.shtml.

[11] Truck parking facility demand is analyzed in FHWA, *Study of Adequacy of Commercial Truck Parking Facilities*, www.tfhrc.gov/safety/pubs/01158/.

[12] Incidents, work zones, and weather cause between 50 and 61 percent of all highway delay according to composite estimates from national studies in Oak Ridge National Laboratory, *op. cit.*, p. 101.

[13] Results of the freight performance measurement initiative are available at www.ops.fhwa.dot.gov/freight/freight_analysis/perform_meas.htm.

[14] Rail mileage between 1960 and 2000 in U.S. Department of Transportation, Bureau of Transportation Statistics, *National Transportation Statistics 2000*, table 1-1, at http://www.bts.gov/publications/national_transportation_statistics/html/table_01_01.html.

[15] Class 1 railroad average speed and dwell time data from www.railroadpm.org.

[16] Association of American Railroads, *National Rail Freight Infrastructure Capacity and Investment Study*, prepared by Cambridge Systematics, Inc., September 2007, p. 4-10, at http://www.aar.org/~/media/Files/National_CAP_Study_docs/natl_freight_capacity_study.ashx.

[17] Association of American Railroads, *op. cit.*, p. 5-6.

[18] Annual Data Profile of the American Short Line and Regional Railroad Association, published by the Upper Great Plains Transportation Institute at shortline.ugpti.org/profiles/downloads.Profile2001.pdf.

[19] U.S. Department of Transportation, Maritime Administration, Office of Statistical and Economic Analysis, "Containership Market Indicators," August 2005, exhibit 9.

Endnotes, continued

[20] U.S. Army Corps of Engineers, Lock Performance Monitoring System, www.iwr.usace.army.mil/ndc/lpms/lock2006web.HTM.

[21] *Ibid*.

[22] *An Initial Assessment of Freight Bottlenecks on Highways.* 2005. Federal Highway Administration, U.S. Department of Transportation, prepared by Cambridge Systematics, October, p. ES-2, at www.fhwa.dot.gov/policy/otps/bottlenecks/bottlenecks.pdf.

[23] Isbell, John. 2006. "Maritime and Infrastructure Impact on Nike's Inbound Delivery Supply Chain." Presentation to the TRB Freight Roundtable, October 23, at www.trb.org/conferences/FDM/Isbell.pdf.

[24] Bowe, John. 2006. "The High Cost of Congestion." Presentation to the TRB Freight Roundtable, October 24, www.trb.org/conferences/FDM/Bowe.pdf.

[25] *The Economic Costs of Disruptions in Container Shipments.* 2006. U.S. Congressional Budget Office, March 29, at www.cbo.gov/ftpdocs/71xx/doc7106/03-29-Container_Shipments.pdf.

[26] "Table 5.24: Retail Motor Gasoline and On-Highway Diesel Fuel Prices, 1946-2006." Energy Information Administration, U.S. Department of Transportation, at www.eia.doe.gov/emeu/aer/txt/ptb0524.html.

[27] *The U.S. Truck Driver Shortage: Analysis and Forecasts.* 2005. Global Insight, prepared for the American Trucking Associations, May, at www.gsa.gov/gsa/cm_attachments/GSA_DOCUMENT/ATADriverShortageStudy05_R25-c-d_0Z5RDZ-i34K-pR.pdf.

[28] Reinach, Stephen, and Alex Viale. 2007. *An Examination of Employee Recruitment and Retention in the U.S. Railroad Industry*. Prepared for the Federal Railroad Administration, DOT/FRA/RRP-07/01, August, at www.fra.dot.gov/us/content/1891.

[29] Producer Price Index Data. Bureau of Labor Statistics, U.S. Department of Labor, extracted October 17, 2007, from www.bls.gov/ppi.

[30] *The Economic Importance of Transportation Services: Highlights of the Transportation Satellite Accounts.* 1998. Bureau of Transportation Statistics, U.S. Department of Transportation, BTS/98-TS/4R, April, at www.bts.gov/publications/transportation_statistics_newsletter/issue_04.

[31] Anne Strauss-Wieder, *Integrating Freight Facilities and Operations with Community Goals*, NCHRP Synthesis 320, Transportation Research Board, 2003, at onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_320.pdf.

[32] Fixed assets are for 2005 and include both passenger and freight transportation. See Bureau of Economic Analysis at http://www.bea.gov/national/FA2004/index.asp.

[33] Coordination issues are discussed on Web sites throughout the U.S. Department of Transportation at www.dot.gov/freight.

[34] SAFETEA-LU, Public Law (PL) 109-059.

[35] Section 5204 of SAFETEA-LU, PL 109-059.

Endnotes, continued

[36] Section 5502 of SAFETEA-LU, PL 109-059.

[37] See www.fmsib.wa.gov.

[38] One list of major corridor coalitions is published at http://ops.fhwa.dot.gov/freight/corridor_coal.htm.

[39] See www.freightacademy.org.

[40] See http://www.atlantaregional.com/documents/tp_ARFMP_final_report_2-6-08.pdf.

[41] See www.pierpass.org.

[42] See http://www.intermodal.org/iftwg_files/index.shtml.

[43] See http://ops.fhwa.dot.gov/freight/intermodal/efm_program_plan.htm.