
NATIONAL
FREIGHT
STRATEGIC
PLAN
U.S. Department of Transportation

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Executive Summary

Our nation's freight transportation system is a vast, complex network of almost seven million miles of highways, local roads, railways, navigable waterways, and pipelines. The components of this network are linked to each other through thousands of seaports, airports, and intermodal facilities. This system accommodates the movement of raw materials and finished products from the entire spectrum of the agricultural, industrial, retail, and service sectors of our economy. More than 3.1 million Americans are employed in operating and supporting the millions of trucks, trains, aircraft, ships, and barges that traverse this network, as well as in businesses that coordinate the logistics of these operations. Collectively, this multimodal network directly supports 44 million jobs and affects the quality of life that every American has come to rely on today. It is a critical force in the world's largest economy, with United States (U.S.) gross domestic product (GDP) estimated to exceed $17.9 trillion in 2015. Each day, the system moves *55 million tons of goods, worth more than $49 billion;* over the course of a year, that's over *63 tons for each one of us*.

Moving local, regional, national, and global products safely, smoothly, and efficiently is critical to the continued growth and success of our nation's economy. Historically, we have been well served to meet these challenges by one of the world's best transportation systems. Freight is moved by private sector entities on infrastructure built and operated by a mix of Federal, State, and local governmental agencies and private sector companies. By some calculations, today's transportation and logistics costs represent only eight percent of GDP, down from 16 percent three decades ago. This is one of the lowest figures in the world, providing the U.S. with a competitive advantage in world commerce.

Our freight transportation is safer, more environmentally friendly, and imposes fewer adverse impacts on most communities today than in past decades. Even so, growing population, increasing demand for goods, sudden changes in commodities and movement patterns (like the emergence of Bakken oil), the need to remain competitive in an increasingly complex global marketplace, and aging transportation infrastructure have placed our freight system under serious strain. At the same time, the level of investment in and dedication to addressing freight-specific transportation needs has not kept pace with our growing economy, further adding to this strain.

Recognizing these increasing challenges, Congress and the Executive Branch have worked closely with States and industry to develop a more sophisticated understanding of our nation's freight transportation needs.

The most recent surface transportation reauthorization law, the Moving Ahead for Progress in the 21st Century Act (MAP-21), includes freight planning and project delivery provisions. It also establishes a National Freight Policy (NFP) for the first time. The NFP specifies goals to increase economic competitiveness, efficiency, and productivity of the network; reduce congestion; enhance the safety, security, and resilience of freight movement; improve the state of good

repair and accountability of operations and maintenance; make greater use of advanced technology and innovation; and reduce environmental impacts. MAP-21 encourages the development of State Freight Advisory Committees and State Freight Plans to improve coordination of freight transportation planning. It also mandates that the U.S. Department of Transportation (U.S. DOT) produce a **National Freight Strategic Plan (NFSP, or "Plan")**, which is contained in this document. The NFSP aims to describe the freight transportation system and future demands on it; identify major corridors and gateways; assess physical, institutional, and financial barriers to improvement; and specify best practices for enhancing the system.

Key Trends and Challenges in Freight Transportation

The NFSP discusses six major trends affecting freight transportation and the challenges they present. If our freight transportation system is to continue to enable our way of life and serve as a competitive advantage for the U.S. economy, we must confront these challenges and seize on the resulting opportunities:

1. *Expected Growth in Freight Tonnage*. The U.S. economy is expected to double in size over the next 30 years. By 2045, the nation's population is projected to increase to 389 million people, compared to 321 million in 2015. Americans will increasingly live in congested urban and suburban areas, with fewer than 10 percent living in rural areas by 2040 (compared to 16 percent in 2010 and 23 percent in 1980). To support our projected population and economic growth, freight movements across all modes are expected to grow by roughly 42 percent by the year 2040. For example, container traffic at ports will increase steadily as the volume of imports and exports transported by our freight system more than doubles over this period. Air freight is expected to triple in response to demand for the rapid movement of high-value merchandise, while multimodal shipments are predicted to more than double.

2. *Underinvestment in the Freight System.* Numerous studies have identified the need for more and better directed investment in freight infrastructure. Freight projects can be costly to undertake. There are seldom public-sector funds dedicated to them and they do not compete well with non-freight projects because of the manner in which public investments are evaluated. As noted below, they often involve multiple transportation modes, jurisdictions, and stakeholders, each of which may have different objectives or operate under different investment timeframes. There may be adequate private sector financing to invest in privately owned freight railroad and pipeline infrastructure. These private sector investments may not include features to generate public benefits, however, unless the private sector believes its investments in these features will result in compensation through freight rates. Further, there is growing recognition that the workforce needed to build, maintain, and operate the system—including truck drivers, railroad engineers, skilled planners, and others—will be insufficient unless further investment is made in education, recruitment, and training.

3. *Difficulty in Planning and Implementing Freight Projects.* Most of our publicly owned freight system (apart from the waterway system) is planned and managed by State and local governments, as well as by Metropolitan Planning Organizations (MPOs). These agencies must work with each other and a broad array of Federal and private sector partners, including freight railroads, trucking companies, and pipeline companies. This decentralized approach has many benefits, including greater flexibility to identify and react to local needs. But when it comes to freight projects, especially those with national-level impacts, this approach presents a number of challenges such as fragmented decision-making.

4. *Continued Need to Address Safety, Security, and Resilience.* Recent trends show impressive improvements in freight safety. There was a 27 percent increase in freight ton-miles for all surface modes between 1990 and 2011, but freight-related fatalities across all modes declined by 33 percent over that same period. However, more progress must be made. In 2013, 543 people died in incidents associated with freight rail, vessel, and pipeline operations. In 2013, 3,964 people were killed in crashes involving large trucks. Specific risks associated with our physical and cyber infrastructures—ranging from transport of crude oil by rail to climate change—create vulnerabilities that must be addressed.

5. *Increased Global Economic Competition.* Our economy is increasingly reliant on international trade. Many imported goods or goods produced for export are carried overseas in ships that continue to grow in average size. Significant amounts of goods also move by air, truck, and train through land border crossings with Mexico and Canada. Ports must address congestion, dimensional, and equipment-shortage challenges generated by bigger, new-generation container ships as well as the larger bulk ships now able to transit the expanded Panama Canal with grain and energy exports. Port authorities are investing to modernize their facilities by dredging harbors, raising bridges, automating and expanding container yards, purchasing larger ship-to-shore cranes, and improving roads and rail connections to surface infrastructure. Where port congestion occurs, supply chains are increasingly able to react by changing supply sources, routes, and transportation modes. Even so, notable incidents of congestion (particularly at ports) have occurred over the last several years, most recently due to management-labor disputes on the U.S. West Coast. Land border crossings also face rising commercial traffic and congestion; from 1995 to 2012, surface trade between the U.S. and Mexico quadrupled from approximately $100 billion to $400 billion per year. Additionally, we have recently experienced a surge in domestic energy production and increased domestic manufacturing and assembly work. Ensuring that these products can efficiently reach both domestic and international markets is critical to the long-term success of these industries.

6. *Application and Deployment of New Technologies.* The freight industry is experiencing a technological revolution as information and communications technologies are applied to optimize global supply chains. Better data collection and analysis capabilities will enable faster and more accurate analysis of freight routes, travel times, and infrastructure capacity. Advanced automation will increase productivity in the freight industry and change the skill sets needed to work in freight, requiring skilled workers to maintain and operate new

technologies. Technology will also automate and expedite inspection processes, improving safety and lowering costs. Growth in autonomous vehicle technologies may soon transform freight transportation, allowing for increased throughput and more reliable trips on existing capacity. Technologies such as positive train control and the Federal Aviation Administration's Next Generation air traffic control systems should also provide additional benefits.

Projections of these trends are subject to significant amounts of uncertainty. New technologies and products may be developed and deployed more quickly than expected; geopolitical events and recessions may suddenly alter growth, trade, and production patterns; and adverse effects of climate change on our coastal cities may arrive sooner. As demonstrated by recent fluctuations in oil and coal markets, even near-term freight projections made less than a decade ago can change dramatically. The recent severe economic recession upended many projections for both short-term and long-term growth at ports and facilities across the nation. Similarly, the ability of modern supply chain management to respond dynamically to building congestion at one location by using less congested ports or changing freight distribution patterns can alter projections of location-specific delays. This Plan will offer suggestions to help build flexibility and enhanced data collection into planning efforts to respond to this uncertainty.

Strategies

The NFSP aims to present solutions and strategies to address the infrastructure, institutional, and financial bottlenecks that hinder the safe and efficient movement of goods. It also identifies many successful programs already in place to improve freight planning and investment; some examples include the Freight Analysis Framework, Every Day Counts (EDC) program, and the National Performance Management Research Data Set that are described in more detail later in this Plan. Further, the NFSP identifies new programs, such as funding dedicated to freight projects and improved planning tools, which could help foster additional progress.

Of the strategies outlined in this Plan, some are those the U.S. DOT is now or may consider undertaking, either on its own or in collaboration with partners, and can be implemented with existing statutory authority and resources. Other strategies may require statutory changes, new partners, technologies, funding sources, or other innovations. Many of the strategies presented in this Plan focus on encouraging collaboration among private, State, and local stakeholders to ensure the greatest flexibility possible to plan for an uncertain future.

Strategies to Address Infrastructure Bottlenecks

Infrastructure bottlenecks are physical locations (e.g., bridges, border crossing facilities, at-grade railroad crossings, truck gates at ports) that disrupt the free flow of goods. Strategies to address infrastructure bottlenecks include the following:

- *Reduce congestion to improve performance of the freight transportation system.* U.S. DOT has worked extensively to reduce congestion across the entire transportation system (including the freight system). Efforts include project grants, such as the Transportation Investment Generating Economic Recovery (TIGER) program, as well as the development of methods (e.g., monitoring freight activity using Global Positioning System [GPS] probe data) to support congestion mitigation and facilitate freight flows. U.S. DOT can further work with external partners to identify and share best practices for utilizing existing capacities of all freight transportation modes to increase efficiencies and alleviate congestion. U.S. DOT can also encourage adoption or implementation of these practices where and when appropriate, including through incentives in formula and discretionary funding programs.

- *Improve the safety, security, and resilience of the freight transportation system.* Ensuring the safety, security, and resilience of freight transportation is of paramount concern to the U.S. DOT. In addition to the primary importance of ensuring the safety of human life, a safe, secure, and resilient freight transportation system is less prone to traffic disruptions caused by crashes or infrastructure failures resulting from natural and man-made disasters. To support this need, U.S. DOT is implementing and enforcing safety regulations to address driver fatigue, vehicle stability systems, and transportation of hazardous liquids (including its recent final rule governing the transportation of flammable liquids by rail). U.S. DOT could also consider new regulations to replace and improve outdated freight vehicle operating safety rules. U.S. DOT will work with the Department of Homeland Security to assure the security of the transportation system, including in the growing area of cybersecurity as systems become more automated. In addition, U.S. DOT is pursuing strategies to include infrastructure vulnerability and resilience assessments as part of long-range planning efforts.

- *Facilitate intermodal connectivity*. Intermodal connectivity is critical to ensure the safe, resilient, and efficient flow of freight movement across the overall freight transportation system. U.S. DOT has facilitated intermodal connectivity through efforts that assess, categorize, and collect data on intermodal links and how freight traffic moves through them. U.S. DOT also intends to encourage use of existing resources to support intermodal solutions, including TIGER grants, Railroad Rehabilitation & Improvement Financing, and Transportation Infrastructure Finance and Innovation Act loans. Surface Transportation Program funds could help support projects that improve connectivity. The Administration has also proposed two targeted multimodal freight investment programs through the Generating Renewal, Opportunity, and Work with Accelerated Mobility, Efficiency, and Rebuilding of Infrastructure and Communities throughout America (GROW AMERICA) Act that would improve the intermodal movement of freight.

- *Identify major trade gateways and multimodal national freight networks/corridors.* To support a sound and effective national freight strategy, U.S. DOT is proposing a Multimodal Freight Network (MFN) map to inform planners, private sector stakeholders, and the public about where major freight flows occur and where special attention to freight issues may be most warranted. U.S. DOT and the U.S. Department of Commerce have monitored and analyzed major trade gateways and freight corridors for decades, but the MFN combines the most critical modal components and shows the connections between them.

- *Mitigate impacts of freight projects/movements on communities*. Safe, secure, and environmentally friendly freight movement is vital to the well-being of communities across the nation and helps ensure the efficient movement of goods that support our economy. Unless properly mitigated, freight movements may impose adverse impacts such as air, water, and noise pollution, and diminished access to jobs, healthcare, and education that can reduce the quality of life for people living in communities adjacent to or isolated by these movements. Community opposition to these potential adverse effects can also impede freight project implementation unless the needs of communities are carefully considered during freight transportation project planning, environmental review, and permitting. U.S. DOT is working closely with numerous partners, including the U.S. Environmental Protection Agency, U.S. Department of Energy, and U.S. Army Corps of Engineers (USACE), to continue to reduce adverse impacts of freight activities. Collaborative efforts include providing funds to reduce air pollution and traffic congestion caused by freight vehicles, supporting research on less impactful freight technologies, and efforts to facilitate freight project planning and implementation.

- *Support research and promote adoption of new technologies and best practices.* Identifying and applying technologies, as well as sharing best practices, play extremely important roles in ensuring the safe and efficient movement of goods. For example, FHWA's EDC program has been highly effective in identifying and deploying innovations aimed at shortening project delivery, enhancing the safety of roadways, and protecting the environment. Congress should re-establish the successful, multimodal National Cooperative Freight Research Program (NCFRP) as proposed in the Administration's GROW AMERICA Act. NCFRP focused on research to inform investment and operations decisions for improving the nation's freight transportation system performance.

Strategies to Address <u>Institutional</u> Bottlenecks

Institutional bottlenecks make it difficult to plan, prioritize, implement, and fund freight projects. U.S. DOT and its many partners each have processes in place to plan for, review, permit, and implement transportation projects. However, stakeholders may have different capabilities, priorities, and objectives that must be reconciled to effectively plan and implement projects.

- *Streamline project planning, review, permitting, and approvals.* U.S. DOT has encouraged, funded, and shared research on analytic tools and best practices for streamlining project

selection and design, contracting, and construction to expedite transportation project delivery. This has included an effort to create an interagency group to help reduce project delivery timelines and improve outcomes for communities and the environment. It has also included cooperation with USACE to implement environmental and permitting reforms of the Water Resources Reform and Development Act of 2014. In addition, in September 2015, the White House issued guidance requiring agencies to report schedule and environmental metrics on a Permitting Dashboard for all major infrastructure projects. This guidance was issued concurrently with the updated "Red Book" with guidance for field staff on synchronizing project review schedules. Congress should take additional steps to help advance these efforts, including: creating an Interagency Infrastructure Permitting Improvement Center; pursuing strategies to reduce fragmentation of metropolitan planning by statutorily preventing the formation of new MPOs within metropolitan areas already served by an existing MPO; and creating stronger incentives to encourage effective State freight planning, as proposed in the GROW AMERICA Act.

- *Facilitate multijurisdictional, multimodal collaboration and solutions*. Because freight transcends modal, local, regional, State, and international borders, it is critical for State and local agencies to participate in multijurisdictional collaboration when creating policies that affect freight movement and planning for/programming freight projects. This is particularly true for projects that affect international trade flows—flows that are in many cases multimodal. U.S. DOT will continue its work to support local, State, and interagency collaboration, including developing improved freight transportation models, data, and performance measurement; sharing best practices for freight planning; making periodic updates to the NFSP to encourage multimodal policies and programs; supporting advisory committees and public forums with stakeholders; and encouraging effective use of funding available at the national level.

- *Improve coordination between public and private sectors*. To identify and respond to critical freight system needs, it is essential to facilitate public and private sector partnerships to achieve the best planning process outcomes. U.S. DOT currently addresses these needs by encouraging coordination and interaction among all participants in data sharing and State freight planning. For example, U.S. DOT provides public-private partnerships access to Federal financing arranged through the Build America Transportation Investment Center (BATIC).

- *Ensure availability of better data and models*. Improvements in data collection, information sharing, freight modeling tools, and analytic methods can help the public and private sectors better understand freight trends and make more informed decisions that may affect the freight system. U.S. DOT has advanced freight data through use of GPS-based truck location information (probe data) in its Freight Performance Measurement program. U.S. DOT also publicly shares and continually updates the Freight Analysis Framework, which combines data sources to create a comprehensive picture of freight movement to, from, and within States and major metropolitan areas by all modes of transportation. U.S. DOT will continue to develop and deploy newer and more advanced freight data resources to the

planning community and advance the measurement and analysis of transit times for different commodities from a multimodal, origin-to-destination perspective (referred to as "freight fluidity"). Congress could enhance U.S. DOT's authority to collect intermodal freight data by giving U.S. DOT's Bureau of Transportation Statistics the authority to assemble intermodal freight movement data under the Intermodal Transportation Data Program, as proposed in the GROW AMERICA Act.

- *Develop the next generation freight transportation workforce*. U.S. DOT currently works with the Departments of Labor and Education, as well as State and local governments, to support developing the transportation workforce. Efforts include developing freight skills for State transportation agency and MPO staff through a growing body of resources and guidance on freight planning, and pushing for greater authority to develop workforce plans. U.S. DOT also fosters improved workforce skills through its Talking Freight webinar program, Surface Transportation Workforce Centers Network, operation of or support to maritime academies, and other forums. U.S. DOT is committed to promoting economic opportunity through high-quality transportation jobs as part of the President's Ladders of Opportunity Initiative.[1]

Strategies to Address <u>Financial</u> Bottlenecks

It is critical to establish Federal freight transportation funding that is substantial, continuing, multimodal, reliable, and specifically dedicated to freight transportation projects. This Federal freight funding should augment, rather than simply redirect, existing Federal transportation funding sources. Also, the availability of freight funding should trigger a meaningful change in the types of projects funded to those with specific benefits to freight movements. Freight-specific funding should not be directed to the same mix of projects contemplated, absent a targeted freight strategy.

The availability of such funds would assure States, MPOs, and local governments that major freight transportation projects could be funded and completed. Multimodal eligibility for these funds would enable planners to select the best overall modal or intermodal solutions to move freight more safely and efficiently. Dedicated Federal funding would make it easier for local governments to agree to fund project features that generate benefits external to their jurisdictions. It would also assist private partners to incorporate project features that generate public benefits for which they would not otherwise be compensated. Similarly, Federal funds can help alleviate localized community impacts that might otherwise create opposition to beneficial projects.

- *Ensure dedicated freight funding*. The Administration's GROW AMERICA proposal would provide $18 billion over six years through two dedicated, multimodal freight grant

[1] The President's Ladders of Opportunity Initiative is a series of efforts across the Administration intended to develop opportunities for Americans working hard to move into the middle class.

programs for targeted investments. The intent of these investments is to improve the movement of freight and meet regional economic demand, which would require or incentivize State Freight Advisory Committees, State Freight Plans, and cross-jurisdictional/cooperative planning.

- *Use existing grant programs to support freight.* Although not dedicated to freight, national competitive grant and credit programs could also support multimodal freight projects. U.S. DOT's TIGER program has provided funding for a full range of freight planning and infrastructure projects, including port projects, intermodal highway and rail projects, and ground access to airport freight facilities. BATIC is already showing positive results in linking promising freight projects to available grant and loan programs. Assistance provided from these and other programs leverages additional capital from non-Federal governmental and private sources.

Our freight transportation network is an ever-changing system of systems. While we wait for Congress to act on multi-year funding, U.S. DOT and other Federal agencies are working with State and local partners to apply innovative finance strategies, encourage public-private partnerships, and use existing grant programs to support freight movement. With additional funding resources—combined with prudent use of regulatory authority and strong support for research and data resources—the Federal government will be ideally suited to ensure coordination in freight planning and implementation. This will help all of the key players to work together more efficiently, effectively, and productively to implement projects that benefit not only goods movement but also communities, regions, States, and the nation as a whole. Only through such collaboration and support will we be able to improve our multimodal freight system to respond to the array of challenges and opportunities of the 21st century.

Executive Summary References

The references listed below supported development of content for the Executive Summary and/or are specifically mentioned in the Executive Summary. The references are listed in alphabetical order. This ordering does not necessarily correspond to when the references were used or mentioned in the NFSP's text. Not all materials consulted are listed here.

- Federal Highway Administration. 2015. 2015 Red Book: Synchronizing Environmental Reviews for Transportation and Other Infrastructure Projects. September. (https://www.environment.fhwa.dot.gov/strmlng/RedBook_2015.asp)
- United States Department of Transportation, Department of Education, and Department of Labor. 2015. *Strengthening Skills Training and Career Pathways across the Transportation Industry.* August. (https://s3.amazonaws.com/PCRN/docs/Strengthening_Skills_Training_and_Career_Pathways_Across_Transportation_Industry_Data_Report_091115.pdf).
- United States Department of Transportation. MAP-21 Section 1115. P.L. 112-141. Codified at 23 USC 167.

Section I. Introduction

The United States (U.S.) is the world's largest economy, with a gross domestic product (GDP) estimated to exceed $17.9 trillion in 2015. Trade is an important and growing component of our economy, equivalent in value (for both goods and services) to approximately 30 percent of our GDP. Every year, we import and export more than two billion tons of products, worth an estimated four trillion dollars. Moving these products safely, reliably, and efficiently is critical to the continued growth and success of our nation's economy. Historically, we have been well served in this challenge by one of the world's best transportation systems.

Each day, our roads, rails, bridges, seaports, airports, and waterways transport *55 million tons of goods, worth more than $49 billion.* Over the course of a year, that is over *63 tons for each one of us*. Over *44 million jobs* directly depend on freight transportation. We all participate in the transportation of freight, whether we drive a truck, ship agricultural products, or simply purchase groceries and products at our neighborhood stores. Much of what we call our "freight transportation system" relies upon the same roads, bridges, airports, and rails we all use for our own travel. Viewed through the lens of freight, however, that same infrastructure presents a host of challenges not always visible from the perspective of passengers.

Freight transportation makes our economy and quality of life possible.

Without freight transportation to get goods where they need to go and when they need to get there…

….shelves in our local grocery stores and retail shops would be empty. We would be unable to receive and send mail and packages. Hospitals would be unable to procure highly specialized devices needed for medical procedures. Our cars and other vehicles would sit in driveways or in garages with empty gas tanks. Our homes would be unheated. Freight transportation is critical to allow us to get the goods and services we need, when we need them.

We are proud of the transportation network our nation has built: it is fundamental to our economic well-being. It helps keep us competitive in the world economy by keeping transportation and congestion costs down. This network has also made it possible for freight to move reliably and flexibly across different modes. The quality of our infrastructure and our overall investment in it has made possible our economic rise: it enabled the growth of our great cities and gave us an advantage compared to other nations. Today, by some calculations, transportation and logistics costs represent only eight percent of GDP, down from 16 percent three decades ago. This is one of the lowest figures in the world—it compares favorably to Europe and is less than half the share that transportation and logistics represents of China's GDP.

But freight is not just about a strong economy. Ultimately, each of us, individually and together, has a stake in building and maintaining a reliable, efficient, affordable, safe, and sustainable freight system. For some of us, our stake is as consumers, for whom a strong freight system helps to keep the costs of goods down. For some, it is as travelers, for whom the safety of the

trucks and trains we travel next to is of paramount importance. Shippers and receivers need a reliable and efficient system to support their businesses. And for all of us, minimizing the environmental consequences associated with freight travel and facilities is of great concern to our near- and long-term welfare.

Our freight system is one of the strongest in the world, but this position is being challenged. If we want to maintain the health of our economy and America's competitive edge, we have work to do: we have a host of challenges to confront.

Our nation has prospered on the foundation of a strong freight transportation system. The last several decades, however, have presented significant challenges to maintaining and growing that system and ensuring that it can meet the demands of future generations. Growing population and increasing demand for freight, coupled with aging transportation infrastructure and decades of underinvestment, have placed our freight system under serious strain. Our roads and railways and some of our largest, busiest ports and airports are becoming increasingly congested. One-quarter of our road system's bridges require significant repair, or cannot efficiently handle today's traffic. Many of our ports must make investments to accommodate larger vessels. Some components of our inland waterway lock and dam infrastructure are in need of repair, maintenance, and modernization. Pressures on this system will grow. The population of the U.S. is expected to increase by nearly 70 million people by 2045 to reach a total of 389 million people. This population will be concentrated in our cities and suburban areas.

At the same time, freight patterns are changing both domestically and globally, creating new opportunities for the American economy, but also placing new strains on our transportation system. International trade is increasing, global manufacturing centers are shifting, and new trade routes are opening. Firms are driving down logistics costs through just-in-time shipping. Online shopping is increasing demand for home delivery of consumer products. Ports—here and around the world—are becoming increasingly automated. Intermodal freight carried in containers by ships, trains, and trucks is increasing. Surging domestic energy production has strained infrastructure in oil- and gas-producing regions. Domestic manufacturing is increasing. There are signs that previous trends to "offshore" manufacturing and assembly work to companies in China and other parts of Asia due to economic considerations are slowing or reversing in some industries. Since 2010, more than 200 companies (mostly U.S.-based) have brought back production they had sent out of the country. And, over the next 30 years, changes in freight demand, shipping, manufacturing, logistics, technology, and energy production are poised to transform the economics of transportation yet again.

The U.S. Department of Transportation (U.S. DOT) periodically commissions economic forecasts for the national economy to inform its expectations for freight movements both domestically and internationally. The most recent of these economic forecasts is used to inform this Plan. This forecast is necessarily based on numerous assumptions about the future economic environment, including that real GDP growth will average 2.6 percent per year through 2040, inflation will remain moderate, deficits in the current account and the Federal budget will

persist, real oil prices will remain high by historical standards, the U.S. economy will not experience exogenous shocks or major mishaps, and other factors. Based on these assumptions, demand for freight transportation is projected to increase. For example, overall freight movements are expected to increase by approximately 42 percent by 2040. Air freight is expected to triple; multimodal shipments are predicted to more than double. The volume of imports and exports transported by our freight system is also expected to more than double by 2040. These freight trends are of course subject to the accuracy of the assumptions behind them, and perhaps most critically assume that our transportation system is sound and has the capacity and adaptability to accommodate this growth. If we do not have the infrastructure in place, if we do not make the investments we need, and if modal systems do not interconnect with each other to facilitate flexible responses to changing needs, our future cannot be one of growth.

More than half of the nation's population lives in suburban areas, while one-third of people live in urban areas. The share of rural population has declined from 23 percent of Americans in 1980 to 16 percent in 2010; by 2040 the rural share is projected to fall below 10 percent. As our economy and population grow and become more centered in major cities and suburbs, how will we accommodate the increased demand for freight? The greatest portion of freight is moved by trucks, which must share urban and residential roads with passenger vehicles, and faces many of the same congestion and safety challenges. Bottlenecks at heavily trafficked interchanges on the outskirts of major cities, as well as in proximity to major ports in core urban areas, increases the time and cost of moving goods to our fastest-growing population centers. On our railroad network, freight movement faces chokepoints and competes with passenger traffic in major cities.

Climate change also poses a threat to efficient freight movements. Many of our ports and rail yards are vulnerable to the severe storm surges that may occur with increasing frequency as sea levels and ocean temperatures rise. Rails can buckle and become unusable under extreme heat conditions. Increasingly frequent severe-weather events may make freight movement less reliable and less safe. Recent research indicates that warming of close to 1.5°C (2.7 °F) above pre-industrial times is already locked into Earth's atmospheric system by past and predicted greenhouse gas (GHG) emissions. This research also indicates that without concerted action to reduce emissions, this increase could rise to 2°C (3.6°F) by mid-century and 4°C (7.2°F) in the latter part of this century. Transportation planners must begin now to address the effects of climate changes, including by providing less vulnerable infrastructure with more than one modal means of access.

Advances in technology may help us confront some of these challenges. Improvements in navigation and information technology systems are already revolutionizing logistics and likely account for much of the efficiency gains in freight over the past decade. Automatic braking systems and lane departure warning systems on trucks are making important contributions to highway safety for trucking companies who have purchased them. Increasing automation of vehicles, ships, trains, ports, intermodal facilities, and aircraft promises to make freight movement safer and more cost-effective. Facilitating the development of these technologies

may require adapting existing infrastructure, policies, and regulations, and may also raise new challenges to citizen privacy, security, and safety that will need to be addressed.

Despite widespread evidence of these mounting challenges, the legislation of recent years has actually *decreased* Federal investment in our transportation network. This decrease creates problems for transportation in general and freight in particular, because freight has interstate benefits that may not be realized without Federal dollars. We need to recapitalize the system—and we must do so smartly. Our roads, rails, and pipelines have little spare capacity in many locations. We have a fragmented vision of how our freight system should look and operate, rather than a unified vision, with little clear accountability for its performance.

It is imperative that we take action now to strengthen our nation's freight transportation system to ensure it can accommodate our population's current needs as well as anticipated future trends. U.S. DOT's proposed surface transportation reauthorization bill, the Generating Renewal, Opportunity, and Work with Accelerated Mobility, Efficiency, and Rebuilding of Infrastructure and Communities throughout America (GROW AMERICA) Act, presents an important opportunity for many of these actions. **If passed, the GROW AMERICA Act would make critical investments to help improve the safe and efficient movement of freight across all modes of transportation — highway, rail, port, and pipeline.**

Our challenge

To assure America's strong economic future—and our economic competitiveness—we must confront, head-on, the freight challenges of our time. In recent years, the freight system has operated in an environment of great uncertainty: about funding and overall policy. Important decisions have been postponed; short-term extensions of existing laws and funding sources have only made it more difficult to tackle the biggest problems we face.

In 2012, the Moving Ahead for Progress in the 21st Century Act (MAP-21) articulated a **National Freight Policy (NFP):**

> to improve the condition and performance of the national freight network to provide the foundation for the U.S. to compete in the global economy and achieve goals related to economic competitiveness and efficiency; congestion; productivity; safety, security, and resilience of freight movement; infrastructure condition; use of advanced technology; performance, innovation, competition, and accountability in the operation and maintenance of the network; and environmental impacts. *[MAP-21 §1115; 23 USC 167]*

To help implement this policy, MAP-21 required the development of several documents including the **National Freight Strategic Plan (NFSP, or "Plan")**, the Freight Transportation Conditions and Performance Report, and the designation of the Primary Freight Network**.** In this Plan, the U.S. DOT aims to accomplish several tasks:

- Section II, "Key Trends and Challenges," identifies the driving forces that will shape the future of our freight transportation system.

- Section III, "Strategies," lays out different actions that are being taken, can be taken, or should be taken to overcome barriers of three types: infrastructure, institutional, and financial. These strategies draw on U.S. DOT's GROW AMERICA legislative proposal, the recommendations of the National Freight Advisory Committee as established by the Secretary of Transportation, the findings of the U.S. House of Representatives' Transportation and Infrastructure Committee, and other sources.

The Plan acknowledges the importance of *all* participants in the national freight transportation system, including Federal agencies, States, regional coalitions, Metropolitan Planning Organizations (MPOs), local governments, Tribal governments, the private sector, researchers, workers, and communities. The Plan does not mandate a list of freight projects; instead, it proposes the means by which all of these participants can work together to meet our nation's long-term economic needs in an effective way. Recent experience, such as with the Transportation Investment Generating Economic Recovery (TIGER) program (which required collaboration among many of these same participants as a condition for success), provides a strong foundation to build upon.

If we fail to take *action*, we are taking *risks:*
… the risk that our freight transportation system will fail to function as critical pieces of infrastructure either cannot keep up with growing demands or suffer physical deterioration, leading to higher costs for producers and consumers.
… the risk that technological innovations, and our way of life, will be inhibited as shipping grows ever more inflexible and unreliable.
… the risk that we may be out-competed economically by other nations, who stand to reap the jobs and other benefits we will be forced to forego.
…the risk that recent progress toward safer, more secure, and more environmentally sustainable freight traffic will stop or be reversed on our roads and rails, through our ports, and in the air.

But if we work together to meet our challenges, as we have done before, we can continue to fulfill the great promise of our freight transportation system: that we will be prepared for the rest of what this century has to offer; that our freight network will *enhance* and *enable* our economy for many years to come.

Section I References

The references listed below supported development of content for Section I and/or are specifically mentioned in Section I. The references are listed in alphabetical order. This ordering does not necessarily correspond to when the references were used or mentioned in the NFSP's text. Not all materials consulted are listed here.

- Bureau of Labor Statistics. 2014. Current Employment Statistics. (http://www.bls.gov/ces)
- Bureau of Transportation Statistics. Table 3-1. National Transportation Statistics. (http://www.rita.dot.gov/bts/node/490976)
- Federal Highway Administration. Designation of the Primary Freight Network: Notice, Request for Comments. Docket No. FHWA–2013–0050, Federal Register / Vol. 78, No. 223. November 19, 2013.
- Federal Highway Administration. 2011. Annual vehicle distance traveled in miles and related data by highway category and vehicle type. Highway Statistics. (http://www.fhwa.dot.gov/policyinformation/statistics/2011/vm1.cfm)
- Federal Highway Administration. 2013. Freight Facts and Figures 2013. p.3.
- National Cooperative Freight Research Program. 2012. Report 16, Preserving and Protecting Freight Infrastructure and Routes. p.1. (http://onlinepubs.trb.org/onlinepubs/ncfrp/ncfrp_rpt_016.pdf)
- United States Department of Transportation: Section 1115, MAP-21 (P.L. 112-141) (Codified at 23 USC 167)

Section II. Key Trends and Challenges

This section describes **key trends and challenges:** the driving forces that will shape the future of our freight transportation system. This section also describes the components that comprise our nation's freight system, including its infrastructure and the various types of vehicles that operate on this infrastructure, as well as how and how much freight flows through the system.

America's freight system is the economic backbone for our nation's nearly 320 million citizens and 6.2 million employers. It is supported by more than four million centerline miles of public roads (of which 230,000 miles of road are interstates or other high-volume highways) and 607,000 public road bridges; almost 140,000 route miles of railways; approximately 500 commercial airports, and many thousands more general aviation airports that can accommodate freight; 360 commercial sea, river, and lake ports that provide approximately 3,200 cargo and passenger handling facilities; 12,000 miles of navigable inland waterways with 240 locks and dams to support navigation plus 16,000 miles of coastal, Great Lakes, and other water routes; more than 160 land ports of entry; and more than 2.6 million miles of petroleum and natural gas pipelines. A significant share of freight is transported on more than one transportation mode in moving from origin to destination.

Also operating on this vast system are almost 2.5 million combination trucks (e.g., tractor-trailers) that carry heavy freight as well as millions of single unit trucks and vans that pick up and deliver freight items; more than 24,000 diesel-electric locomotives and 1.28 million freight rail cars; more than 38,600 domestic maritime vessels (largely tugs and barges that operate in domestic freight trade, but also large oceangoing vessels), and more than 700 domestic all-cargo aircraft, as well as international all-cargo aircraft and cargo carried in the bellies of passenger aircraft.[2]

Principal freight flows in terms of tonnage for highways, railroads, and waterways are shown in Figure 1. Trucks carry the largest share of goods by tonnage and value, at 70 percent and 64 percent, respectively (see Figures 2 and 3). Approximately eight percent of freight by tonnage and 17 percent by value is now transported from origin to destination by more than one (multiple) transportation modes (e.g., from ship to truck to train). In addition, almost all air cargo moves by ground transportation for part of its trip. For freight shipments moving more than 750 miles (beyond this distance, the benefits of multimodal shipping become more pronounced), 35 percent of U.S. freight by value (including air freight and mails) moves on multiple freight modes. Railroads carry more than nine percent of the nation's freight by tonnage and three percent by value. Pipelines carry almost eight percent of freight by tonnage and six percent by value. The tonnage of freight carried by water is listed at four percent, but this amount is likely undercounted due to the omission of some liquid cargoes.

[2] Please see *Improving the Nation's Freight Transportation System: Findings and Recommendations of the Special Panel on 21st Century Freight Transportation* for more detailed information on the history of the freight transportation system and its characteristics.
http://transportation.house.gov/uploadedfiles/freightreportsmall.pdf.

Certain types of goods tend to rely on specific modes for their journeys. For example, air freight is generally comprised of high-value, time-sensitive, lightweight goods (such as some highly specialized medical devices); pipelines principally carry energy commodities such as natural gas (although energy commodities may also be transported by rail, barge, or truck). On a tonnage basis, rail predominantly carries heavy, bulk shipments such as cereal grains, crushed stone, chemicals, and coal over long distances; however on a carload/intermodal unit basis rail also carries substantial amounts of both bulk and intermodal cargoes.

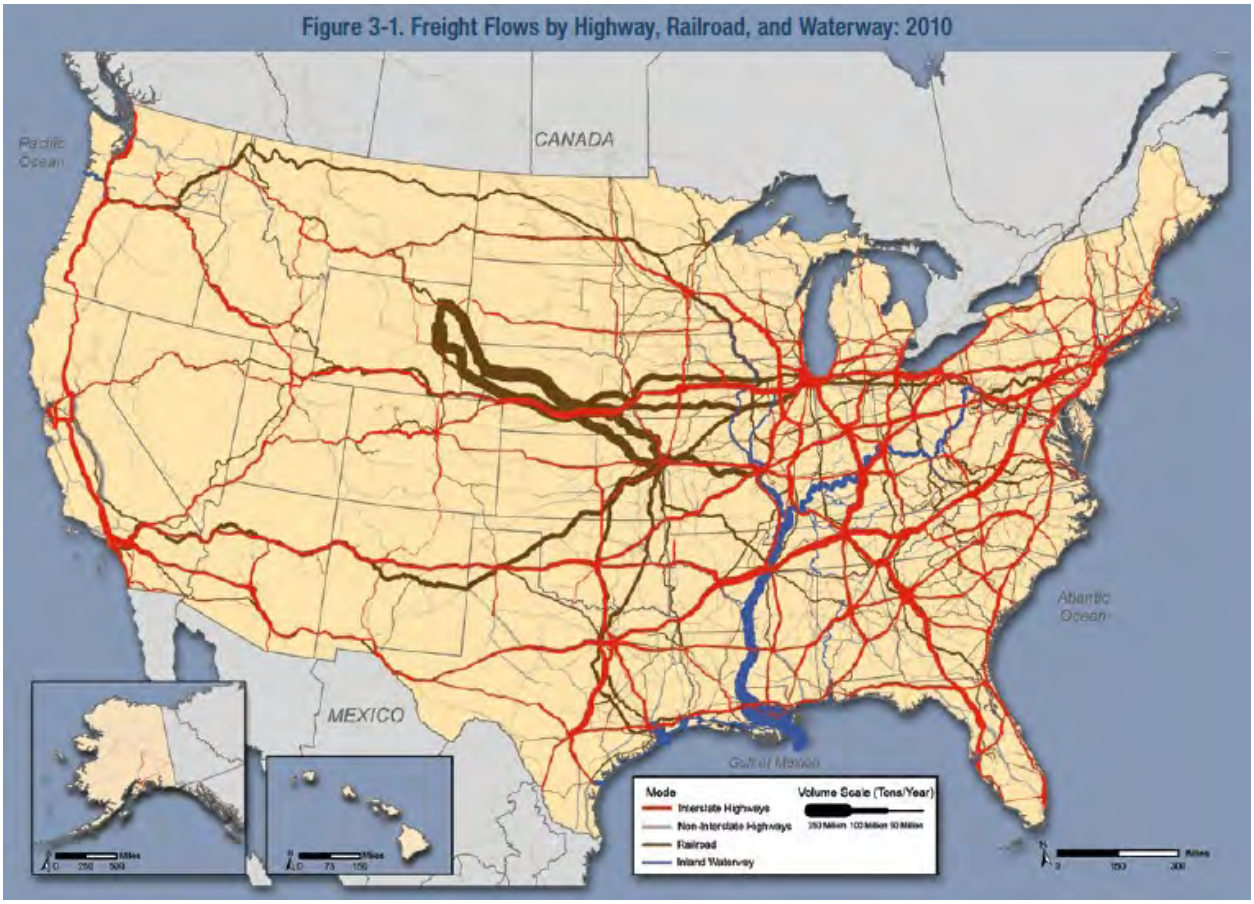


Figure 1. Freight Flows by Highway, Railroad, and Waterway: 2010. (Source: U.S. DOT's Freight Facts and Figures, (2013)

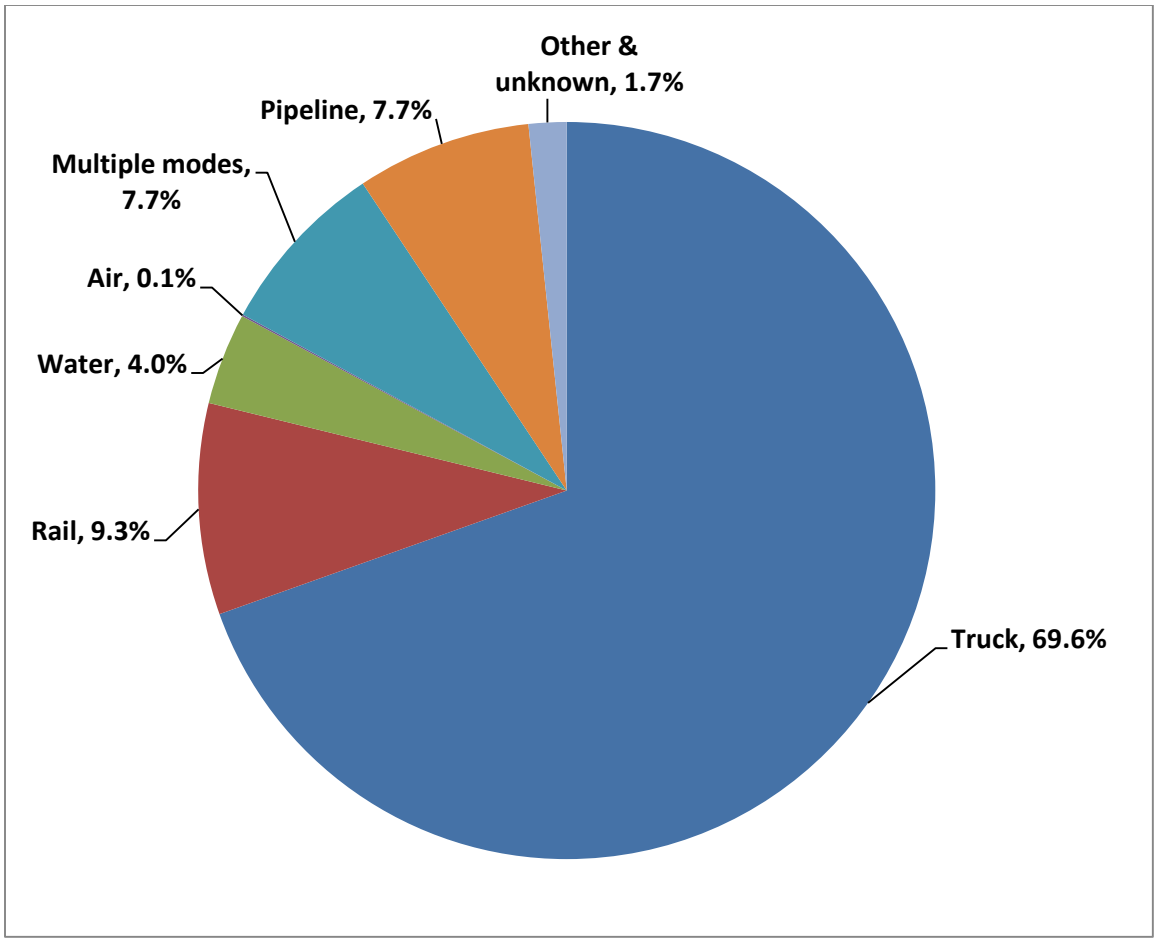


Figure 2. Tonnage of U.S. Shipments by Mode (2013)

(Source: U.S. Department of Transportation, Bureau of Transportation Statistics and Federal Highway Administration, Freight Analysis Framework, version 3.6, 2015)

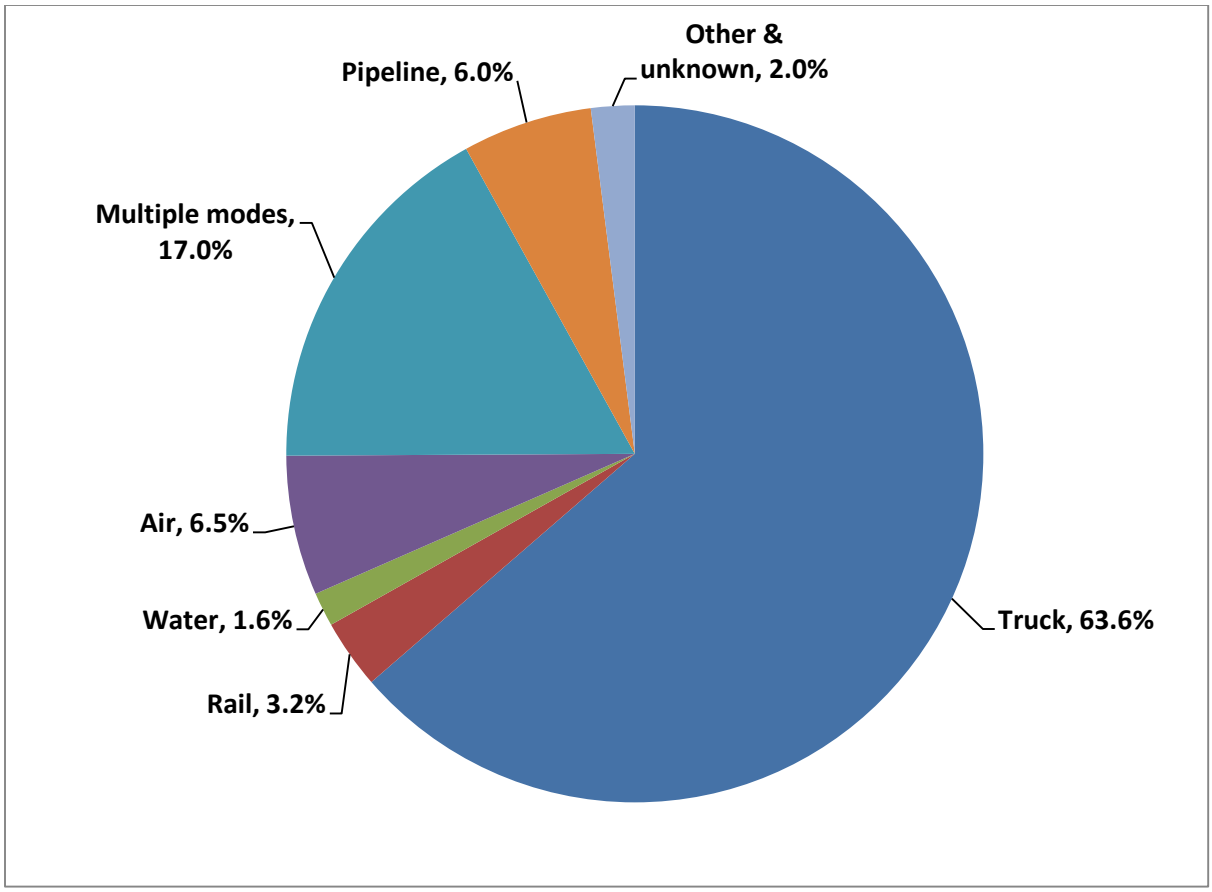


Figure 3. Value of U.S. Shipments by Mode (2013)

(Source: U.S. Department of Transportation, Bureau of Transportation Statistics and Federal Highway Administration, Freight Analysis Framework, version 3.6, 2015)

Freight transportation directly or indirectly supports the great majority of jobs in the nation through the delivery of raw and intermediate materials and the transport of final products to and from the entire spectrum of farm, industrial, retail, and service sectors. Over 44 million jobs in these sectors directly depend on freight transportation. Freight transportation also directly provides jobs in the transportation and warehousing sectors as well as in related industries. For example, in 2014 the freight transportation and warehousing sector employed 3.14 million people; the for-hire trucking industry alone employed 1.42 million workers. Employment in the for-hire air, rail, pipeline, and water sectors accounted for an additional 792,000 workers, while warehousing, storage, and support activities employed 738,000 workers. Many additional industries support freight-related jobs, such as retail trade, which includes private transportation networks and warehouses as part of its supply chains.

This is the impressive, complicated, altogether critical system that we depend on every day. And every new day brings new challenges and opportunities as changes in the world around us and emerging trends affect our freight system with far-reaching effects. We must confront

these challenges and seize on these opportunities if our freight transportation system is to continue to enable our way of life.

The following sub-sections detail six driving forces affecting freight transportation:

A. **Expected growth** in freight traffic
B. **Underinvestment** in the freight transportation system
C. **Difficulty of planning and implementing** freight projects under our current governance structure
D. **Safety and security problems** associated with freight transportation and facilities
E. **International trade** and our freight transportation system
F. New **technologies** affecting freight

II. A. Expected growth in freight traffic

Our freight system moves approximately 63 tons of goods per American each year. As our population grows and our economy expands, demand for freight will grow as well, placing additional strain on an already challenged transportation system. U.S. freight demand will be affected by several trends:

- Freight will grow across all transportation modes.
- The changing nature of our economy and population will affect where and how freight moves.
- All else being equal, growth in overall freight demand will place increased pressure on infrastructure throughout the country, with particularly significant impacts concentrated in certain areas.
- Increasing domestic energy production will have profound implications for our transportation system.

Freight will grow across all transportation modes. Even by conservative estimates, our economy is expected to double in size over the next 30 years. As the economy grows, freight movement is forecasted to increase as well, albeit at a slower rate as measured by tonnage. Freight movements are expected to increase at a rate of approximately 1.3 percent per year, or by roughly 42 percent by the year 2040 (see Figure 4). Air freight is expected to triple in response to demand for the rapid movement of high-value merchandise, while multimodal shipments are projected to more than double. Container traffic at ports is steadily increasing. Overall, the volume of imports and exports transported by our freight system is expected to more than double in the next 30 years. This growth in trade will have implications for ports, which handle 72 percent of America's international merchandise trade by tonnage; air cargo, which handles 25 percent of our international merchandise trade by value; and intermodal carriers that move imports and exports between ports of entry and inland locations.

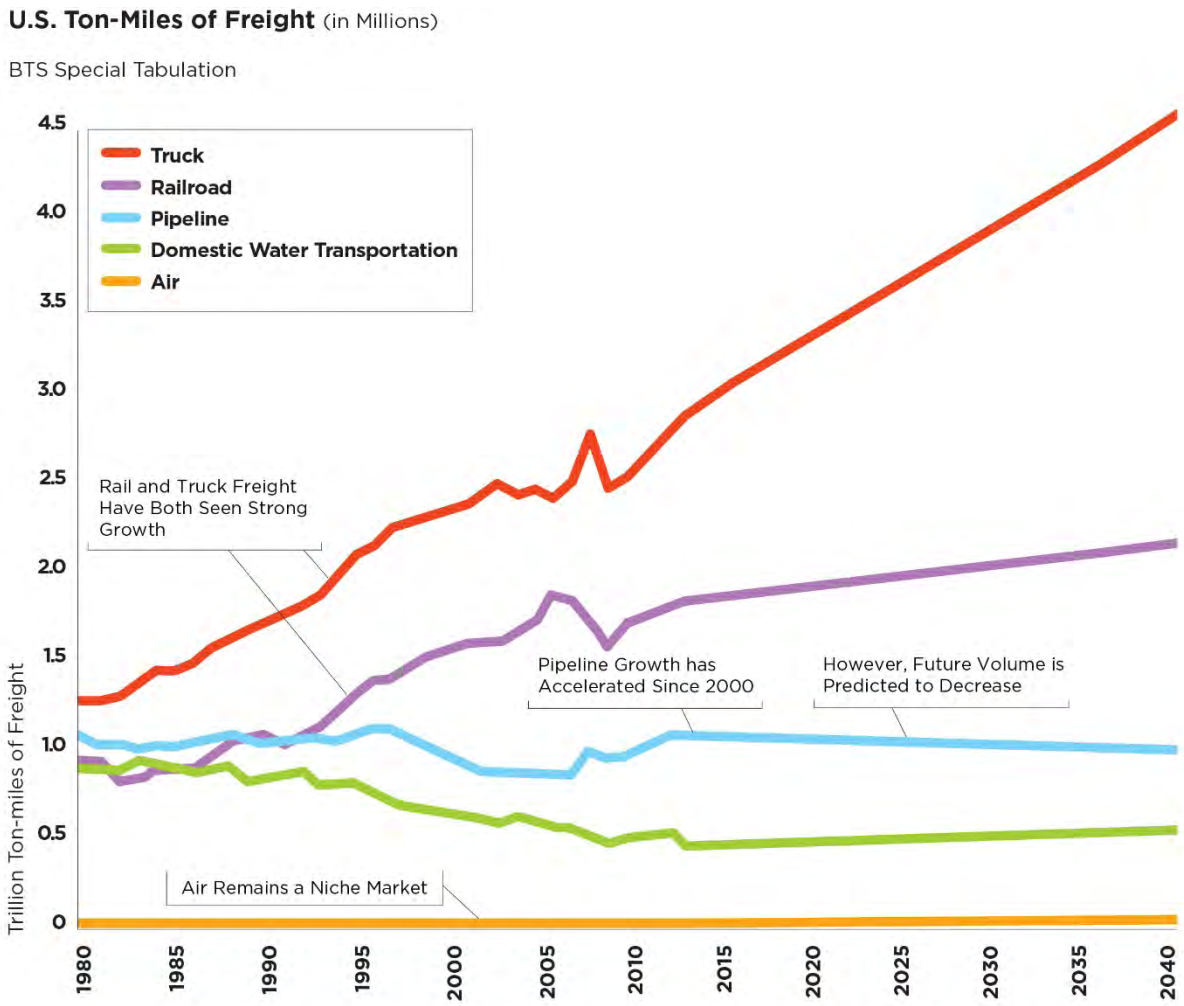


Figure 4. Expected Growth of U.S. Ton-Miles of Freight (in millions)

(Source: Beyond Traffic)

Table 1 shows a more detailed view of the expected growth of freight tonnage by transportation mode for 2007, 2013, and 2040 (forecasted), broken down into domestic movements, exports, and imports. Table 2 shows similar information, but for value of freight.

Table 1. Tonnage of Freight Carried by Transportation Mode (millions of tons) (Source: U.S. Department of Transportation, Bureau of Transportation Statistics and Federal Highway Administration, Freight Analysis Framework, version 3.6, 2015)

	2007				2013				2040			
	Total	**Domestic**	**Exports[1]**	**Imports[1]**	**Total**	**Domestic**	**Exports[1]**	**Imports[1]**	**Total**	**Domestic**	**Exports[1]**	**Imports[1]**
Total	**18,879**	**16,851**	**655**	**1,372**	**20,063**	**17,950**	**914**	**1,199**	**28,520**	**23,095**	**2,632**	**2,794**
Truck	12,778	12,587	95	97	13,955	13,732	120	103	18,786	18,083	368	335
Rail	1,900	1,745	61	93	1,858	1,681	82	94	2,770	2,182	388	201
Water	950	504	65	381	808	410	89	309	1,070	559	164	347
Air, air & truck	13	3	4	6	15	3	5	7	53	6	20	27
Multiple modes & mail	1,429	433	389	606	1,554	459	559	536	3,575	645	1,546	1,383
Pipeline	1,493	1,314	4	175	1,539	1,391	11	137	1,740	1,257	17	467
Other & unknown	316	266	36	14	333	274	47	13	526	362	130	34

[1]Data do not include imports and exports that pass through the United States from a foreign origin to a foreign destination by any mode.

Notes: Numbers may not add to totals due to rounding. The 2013 data are provisional estimates that are based on selected modal and economic trend data. All truck, rail, water, and pipeline movements that involve more than one mode, including exports and imports that change mode at international gateways, are included in multiple modes & mail to avoid double counting. As a consequence, rail and water totals in this table are less than other published sources.

Table 2. Value of Freight Carried by Transportation Mode (billions of 2007 dollars) (Source: U.S. Department of Transportation, Bureau of Transportation Statistics and Federal Highway Administration, Freight Analysis Framework, version 3.6, 2015)

	2007				2013				2040			
	Total	**Domestic**	**Exports[1]**	**Imports[1]**	**Total**	**Domestic**	**Exports[1]**	**Imports[1]**	**Total**	**Domestic**	**Exports[1]**	**Imports[1]**
Total	**16,651**	**13,457**	**1,196**	**1,997**	**17,983**	**14,496**	**1,380**	**2,107**	**39,265**	**27,131**	**5,303**	**6,831**
Truck	10,780	10,225	267	287	11,444	10,841	312	291	21,465	19,315	985	1,166
Rail	512	374	45	93	577	424	54	99	898	555	148	195
Water	340	158	15	167	284	131	20	133	337	138	46	153
Air, air & truck	1,077	151	422	505	1,167	134	425	609	5,043	834	1,997	2,212
Multiple modes & mail	2,884	1,646	394	844	3,065	1,695	500	870	9,925	5,203	1,911	2,811
Pipeline	716	651	4	61	1,083	1,003	15	65	776	605	17	154
Other & unknown	341	252	48	41	363	270	53	40	821	482	199	139

[1]Data do not include imports and exports that pass through the United States from a foreign origin to a foreign destination by any mode.

Notes: Numbers may not add to totals due to rounding. The 2013 data are provisional estimates that are based on selected modal and economic trend data. All truck, rail, water, and pipeline movements that involve more than one mode, including exports and imports that change mode at international gateways, are included in multiple modes & mail to avoid double counting. As a consequence, rail and water totals in this table are less than other published sources.

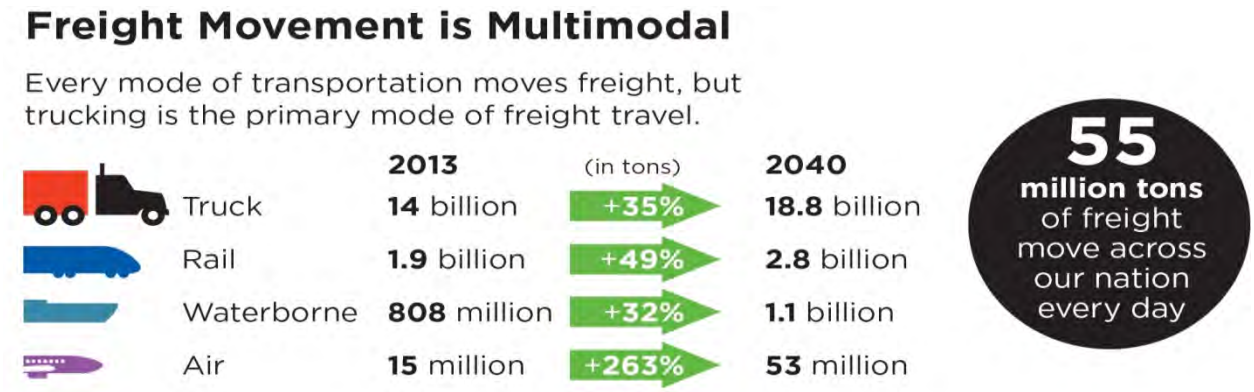
In 2013, approximately 10 million trucks moved nearly 14 billion tons of freight across America's highways. As noted earlier, trucks carry the greatest share of the nation's freight by both tonnage and value; trucks also participate in the carriage of the eight percent of tonnage and 17 percent of value of freight that moves by multiple transportation modes.

The volume of goods moved by rail has increased steadily since 1980, and is projected to increase by 49 percent by 2040. With increases in passenger traffic and freight demand, track congestion may increase, especially in higher-traffic passenger corridors. Growing congestion may reduce the railway network's reliability for both freight and passenger movements unless appropriate investments are made. Waterborne freight will continue to be an important mode of domestic freight, particularly for heavy-bulk goods and energy products, while increasing levels of imports and exports will intensify traffic at our ports and border crossings.

Much more detailed projections of freight flows in five-year increments through 2040 are available at the Federal Highway Administration's (FHWA) Freight Analysis Framework (FAF) website.[3] U.S. DOT cautions that all forecasts are necessarily based on assumptions that can change based on domestic and world events. Given the complexity of these events, forecasts must be adjusted over time, sometimes significantly. The difficulty in making accurate long-term projections places a premium on having a transportation workforce with strong freight planning skills and access to good data and freight models; flexible and reliable public funding sources to support freight projects; and ensuring a resilient multimodal freight system that can react quickly to changing circumstances. Techniques like scenario planning can be very helpful to prepare planners for a variety of plausible future freight outlooks, including allowing them to identify investments that can accommodate a variety of potential future freight flows.

***Different modes of transportation frequently work together to move cargo*.** Our freight system relies on the ability to make efficient, high-speed, intermodal transfers of economically large units of freight. These intermodal transfers can involve either bulk or non-bulk cargoes, and typically occur between ships, railcars, truck chassis, and barges. For bulk movements, grain, ore, coal, and petroleum cargoes are often transferred from rail to river barge, rail to bulk ships operating on the Great Lakes, river barges to larger ships, or truck to rail. Intermodalism is most widely recognized, however, in the movement of non-bulk cargoes via shipping containers. The advent of containerization has placed a premium on seamless intermodal freight movements. It is difficult to overstate the importance of containerization for the U.S. and international economies. It has facilitated economies of scale in vessel and train sizes. It has also enabled improvements in handling speed and throughput, particularly for shipments of higher value commodities. Use of containers to move freight reduces handling time, labor costs, packing costs, as well as damage and theft during transport.

[3] This website is available at http://www.ops.fhwa.dot.gov/freight/freight_analysis/faf/index.htm.

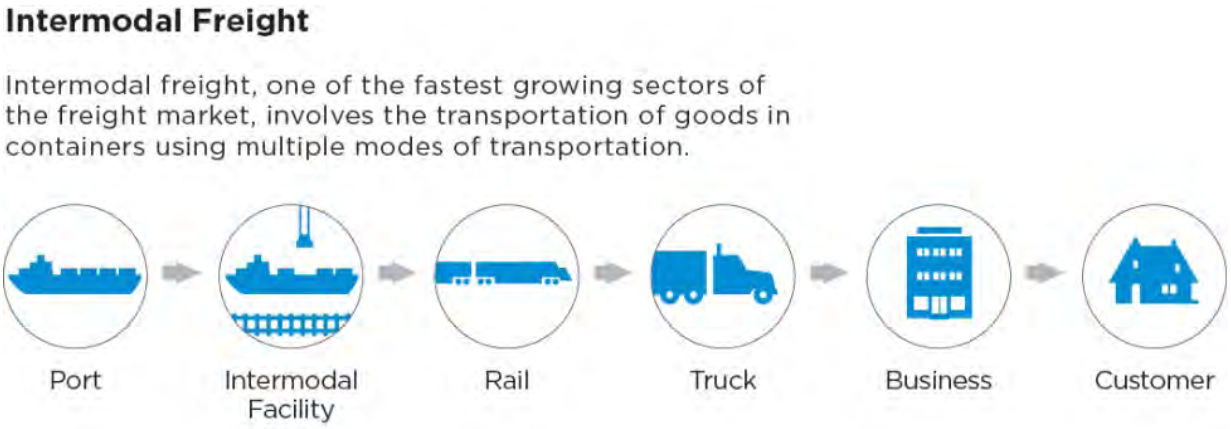


Source: Beyond Traffic

The efficiency of our freight system now depends on fast and effective intermodal transfers of goods. Intermodal facilities (often located near dense urban areas) where cargo is stored, assembled, and transferred have become increasingly important for the efficient movement of freight (see Figure 5). Many of the operational bottlenecks that cause delays and raise the costs of moving freight occur at or around intermodal transfer points that include ports, rail facilities, and distribution centers.

The classic forms of rail intermodal transportation are trailer-on-flatcar, container-on-flatcar, and container in double-stack railcar (the latter is the most efficient means of carriage). These services are spread throughout the U.S. with the largest concentrations on routes between Pacific Coast ports and Chicago; southern California and Texas; and Chicago and New York. As trade makes up a larger share of our economy and the value of freight has increased, rail intermodal transportation has increased rapidly as a share of overall freight movements. The number of intermodal shipments has increased by approximately 60 percent over the past 15 years. FAF data project multimodal shipments of freight to triple over the next 30 years.

The number of intermodal rail shipments increased from 2 million in 1980 to 12.8 million in 2013.



Source: Beyond Traffic

The changing nature of our economy is affecting where and how freight moves. The American economy has benefited from the economic deregulation of the trucking, aviation, and rail industries, which has led to increases in productivity and innovations in supply chain logistics. Over the long term, transportation and logistics costs have declined as a percentage of the U.S. GDP. By some calculations, logistics and transportation costs have declined from 16 percent of GDP to 8 percent over the past 30 years. Logistics costs as a share of the American economy are some of the lowest in the world, comparing favorably to Europe and less than half those in China.

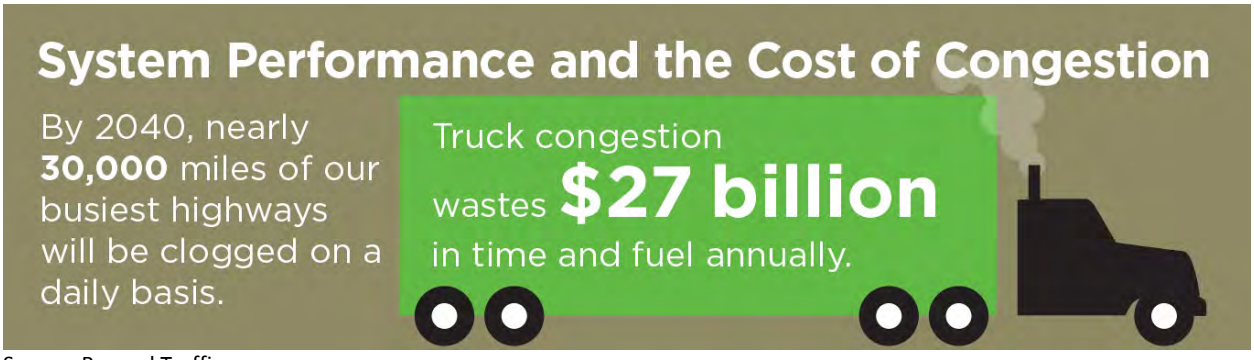
Tonnage of freight moved by our freight transportation system increased by almost 29 percent between 1998 and 2012 and is projected to grow further over the next decades. This will place increased pressure on our infrastructure. Over the same period, however, the American economy, as measured by real GDP, grew by more than 33 percent. This indicates that the economy has become somewhat less freight-intensive than it was in the past. This trend reflects a general shift in the U.S. from a manufacturing economy toward a more service-oriented economy. It also reflects our increasing production and consumption of higher-value, lower-weight products such as pharmaceuticals and personal electronics. The fact that freight movements have declined in proportion to the total economy does not reduce the need for more investment in infrastructure (the amount of freight will in fact grow), but it does suggest that the types and locations of investments need to reflect changing needs. The transportation of high-value, time-sensitive goods requires different routes, facilities, and services than does the movement of low-value, bulk commodities. In particular, the freight system must serve an economy that is increasingly decentralized and organized around just-in-time delivery. For example, air carriers need to be able to deliver parcels anywhere in the country and much of the world overnight.

Likewise, as our economy has become increasingly dependent on foreign trade, the nature and location of freight movements has shifted. More goods produced by American factories and farms are now bound for exports. Manufactured goods are increasingly imported from overseas through our ports. Accordingly, ports, airports, and border crossings handle very large volumes of traffic. Railroads and trucks accommodate an enormous number of container shipments.

Domestic demographic shifts are also changing freight movements. The growth of population and manufacturing in the southern U.S. and along the West Coast, coupled with the growth of urban and suburban populations, have gradually changed where and how freight moves. The increasing need to move freight in congested urban and residential areas can increase transportation and logistics costs as well as passenger-freight conflicts.

Growth in overall freight demand will put increased pressure on infrastructure throughout the country. Freight systems across all modes face capacity constraints and rising maintenance costs. After decades of consolidation, rail companies face rising infrastructure costs to resolve chokepoints and provide capacity to meet rising demand. At some ports, growth in freight will place new demands on channels, cranes, container yards, and the highway and rail networks that connect to them, including in heavily populated urban areas.

Freight transportation by truck experiences and contributes to heavy congestion on 4,500 of the busiest highway miles in the nation. Bottlenecks severely limit the performance and capacity of the highway system by delaying large numbers of truck freight shipments. Areas with the worst truck delays include major international trade gateways and hubs, such as Los Angeles (California), New York (New York), and Chicago (Illinois), as well as major distribution centers such as Atlanta (Georgia), Charlotte (North Carolina), Dallas-Fort Worth (Texas), Denver (Colorado), Columbus (Ohio), and Portland (Oregon). Border crossings are also bottlenecks. At two major Mexico border crossings, it takes trucks nearly an hour on average to enter the U.S.



Source: Beyond Traffic

Assuming no changes in network capacity and no changes in technologies, increases in truck and passenger vehicle traffic are forecasted to expand in areas of recurring peak-period congestion to 34 percent of the National Highway System (NHS) in 2040, as compared with 10 percent in 2011 (see Figures 5 and 6). This would slow traffic on nearly 30,000 miles of the NHS and create stop-and-go conditions on an additional 46,000 miles. Overall, this would lead to

enormous costs to the economy with strong localized impacts, unless new capacity (including new transit capacity in congested urban areas), improved intermodal connections, and advanced technologies are deployed in time and in the right places. Similarly, capacity in other modes is being pushed to its limits, leading to aggressive investment activity by railroads and pipeline industries and a growing concern about port and lock capacity on our waterways.

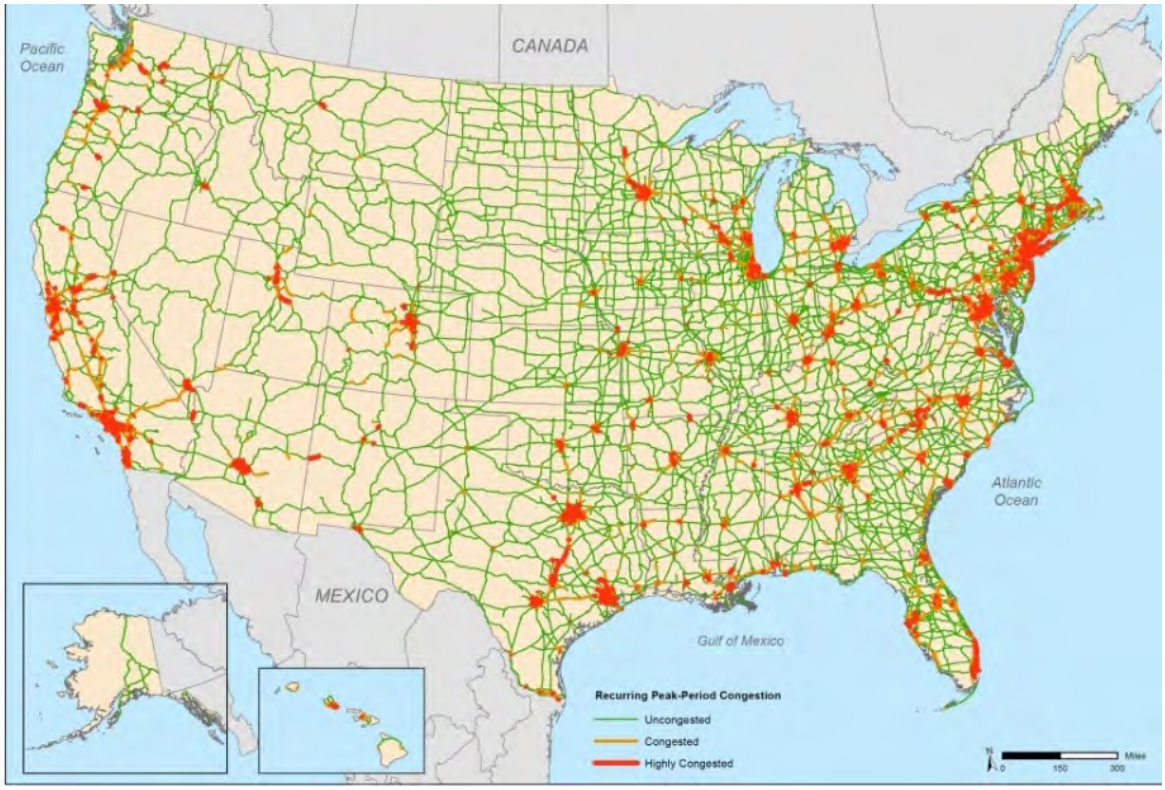


Figure 5. Peak-Period Congestion on the NHS: 2011

Source: U.S. DOT's Freight Facts and Figures (2013); Link: http://www.ops.fhwa.dot.gov/freight/freight_analysis/nat_freight_stats/docs/13factsfigures/pdfs/fff2013_highres.pdf

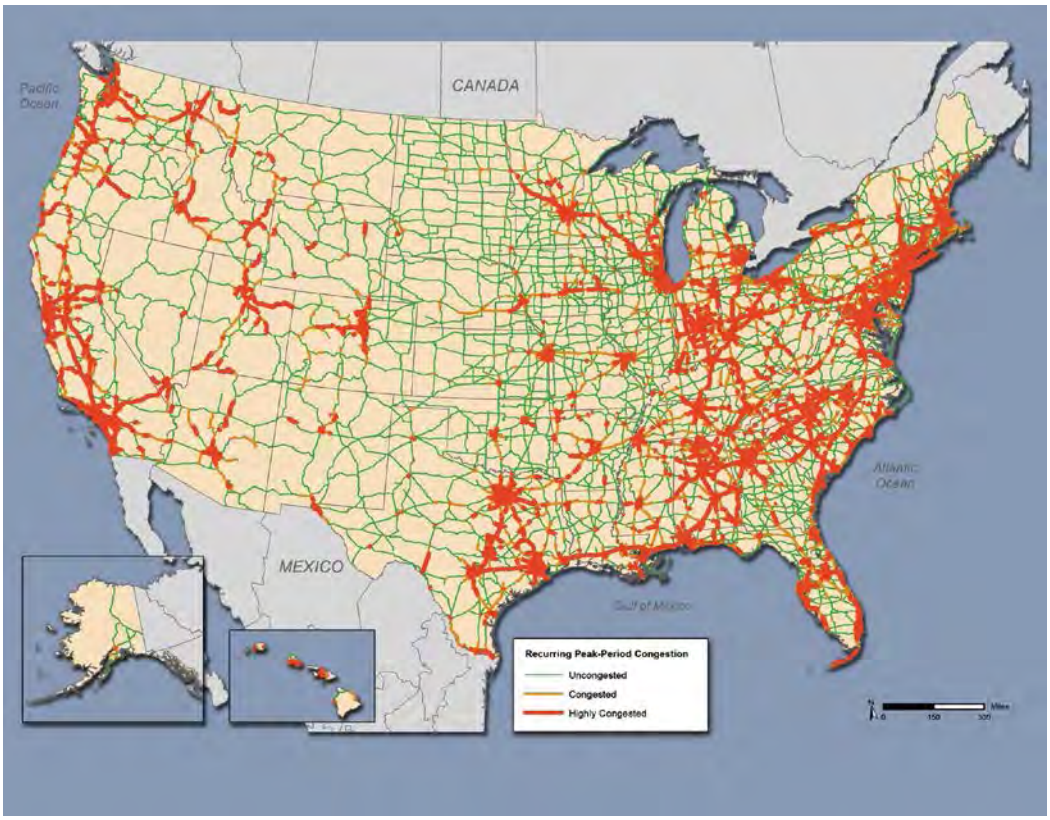


Figure 6. Peak-Period Congestion on the National Highway System: 2040

Source: U.S. DOT's Freight Facts and Figures (2013); Link: http://www.ops.fhwa.dot.gov/freight/freight_analysis/nat_freight_stats/docs/13factsfigures/pdfs/fff2013_highres.pdf

***Increasing domestic energy production could have profound implications for our transportation system*.** Energy products already account for more than 30 percent of the domestic ton-miles of freight moved each year. Existing petroleum pipelines and directional flows of oil seemed well positioned for the energy transportation outlook a decade ago. Today, they are generally not well positioned to move significant portions of new production in the Bakken fields in North Dakota and Montana, the Eagle Ford and Permian Basins in Texas, and locations in the eastern U.S. The current pipeline network is oriented toward imports arriving at Gulf Coast refineries and does not connect the East and West Coasts to newer domestic oil supplies. In some regions, limited pipeline capacity has led to shipping of oil by rail and barge, which costs more than shipping petroleum by pipelines. In 2014, 650,000 carloads of crude oil were expected to be carried by railroads, as compared to 9,500 carloads in 2008. The need to transport increasing volumes of crude oil from non-traditional production sites not served by pipelines or marine vessels has created stresses on the railroads, contributing to some accidents among North American carriers and concerns about rail safety.

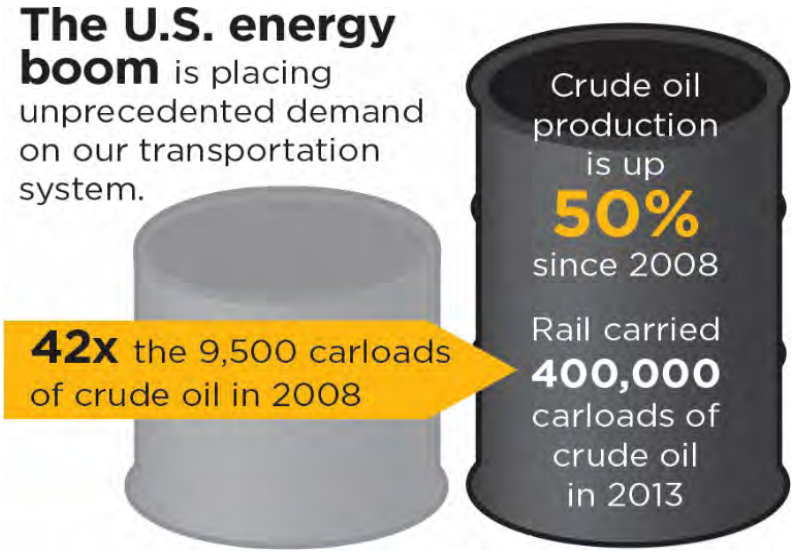
TRAINS CARRYING CRUDE OIL. U.S. PRODUCTION OF CRUDE OIL HAS INCREASED RAPIDLY IN THE PAST SEVERAL YEARS. IN FACT, SINCE 2008, U.S. OIL PRODUCTION HAS GROWN BY OVER 50 PERCENT. PRODUCERS ARE INCREASINGLY TURNING TO RAIL TO MOVE CRUDE OIL FROM PRODUCTION AREAS TO REFINERIES. TRANSPORTING OIL BY RAIL CAN BE SAFE AND EFFICIENT, BUT THE DRAMATIC INCREASE IN MOVING OIL BY RAIL WITHIN A SHORT TIME HAS UNDERSCORED SAFETY AND ENVIRONMENTAL CONCERNS, AMONG OTHERS.

SOURCES: HTTP://WWW.TRANSPORTATION.GOV/FASTLANE/EMERGENCY-ORDER-ANOTHER-STEP-FORWARD-RAIL-SAFETY AND HTTPS://WWW.FAS.ORG/SGP/CRS/MISC/R43390.PDF AND HTTP://WWW.API.ORG/~/MEDIA/FILES/OIL-AND-NATURAL-GAS/CRUDE-OIL-PRODUCT-MARKETS/CRUDE-OIL-PRIMER/UNDERSTANDING-CRUDE-OIL-AND-PRODUCT-MARKETS-PRIMER-LOW.PDF

THE ENERGY TRANSPORTATION NETWORK OF THE UNITED STATES CONSISTS OF OVER 2.6 MILLION MILES OF PIPELINES. PIPELINES PLAY A VITAL ROLE IN OUR DAILY LIVES. FOR EXAMPLE, THEY TRANSPORT FUELS THAT WE USE IN COOKING AND CLEANING, IN OUR DAILY COMMUTES AND TRAVEL, IN HEATING OUR HOMES AND BUSINESSES, AND IN MANUFACTURING HUNDREDS OF PRODUCTS WE USE DAILY. IN THE PAST SEVERAL YEARS, AN UNPRECEDENTED INCREASE IN NORTH AMERICAN ENERGY PRODUCTION HAS UNDERSCORED THE NEED FOR SAFE, EFFICIENT, AND ADEQUATE PIPELINE INFRASTRUCTURE. (SOURCE: HTTP://WWW.PHMSA.DOT.GOV/PIPELINE/NATURALGAS)

At the same time, coal movements, which accounted for 38.8 percent of railroad tonnage and 20.2 percent of rail carloads in 2014, have steadily declined in recent years largely because of a new abundance of low-cost natural gas that competes as a fuel for electric utilities. The railroad industry reports that Class I railroads originated 6.11 million carloads of coal in 2014, down almost 21 percent from a peak of 7.71 million carloads in 2008. Downward trends may continue, but forecasts of coal movements by rail and water are subject to great uncertainty.

Ultimately, continued growth in production of energy products in the U.S. will depend on world prices of oil and natural gas, the extent to which renewable energy sources are developed domestically and abroad, and efforts in the U.S. and abroad to reduce GHG, criteria pollutant, and toxic air emissions. Growth in U.S. energy production may also be affected by potential removal of restrictions on the export of U.S. crude oil, and other factors that are difficult to forecast but could have major impacts. Recent declines in the world price of oil and gas, for instance, have led to sharp drops in domestic shale oil and gas drilling activities. Such activities can resume quickly with a recovery in prices. Similarly, the current strain on domestic and rail and barge systems may be alleviated in the future as new petroleum pipelines are opened.



Source: Beyond Traffic

Increased demand and changing transportation patterns for energy goods could lead to higher transportation costs across all freight transportation modes as existing transportation capacity becomes increasingly saturated with intermodal shipments and non-energy bulk goods, and as the economy continues to grow. Efficient and reliable movements of bulk goods, such as grain, fertilizer, coal, and ore are also critical to our economy. Bulk goods are typically high-weight, low-value products. Transportation costs for bulk goods account for a higher proportion of their overall price than is the case for higher-value manufactured goods (even though the shipping price per ton-mile of bulk goods is typically lower than for manufactured goods). For example, one dollar of final demand for agricultural products generally requires about 14 cents of transportation services. Manufactured goods and mining products require only between eight and nine cents of transportation services. Higher freight costs for bulk goods could increase the

prices that American consumers pay for goods, by negatively impacting local economies—particularly in rural areas—and reducing U.S. competitiveness when exporting products abroad. In a global economy, transportation costs can have a major impact on whether U.S. products are competitively priced.

II. B. Underinvestment in the freight transportation system

While there is a need to invest funding and other resources in our nation's freight system, there is now concern across many sectors—including all levels of government, the private sector, and academic/research institutions—that investment has not kept pace with the demands of a growing economy.

There is no single data source showing unfunded freight projects in America, but a number of major national studies have concluded that freight funding and financing methods are inadequate. For example, a 2008 study by the Government Accountability Office (GAO) included interviews with numerous freight stakeholders, who said that limited funds targeted to freight needs is an ongoing challenge that hinders implementation of freight projects. A 2015 study by the GAO concluded that traditional funding sources are eroding and that funding is further complicated by the Federal government's financial condition and fiscal outlook. As evidence of the high demand for freight funding, U.S. DOT's TIGER program has received requests for approximately $19.5 billion for rail and port projects. This does not include requests for highway freight projects, the costs for which could also be significant.

Examples of Underinvestment

- One quarter of our public road bridges are either structurally deficient or functionally obsolete. Although not unsafe, such bridges may require the posting of vehicle weight or height restrictions, causing trucks to take less efficient routings or detours to bypass them or to carry less than full cargo loads.
- New and heavier rail track and improved railroad bridges are needed, especially on short line railroads to handle the extra weight and larger dimensions of modern rail cars.
- Highway-rail crossings must be improved or separated in both urban and rural areas to reduce freight-passenger car conflicts.
- Pipelines safely move crude oil, petroleum products, and natural gas at a lower cost per ton-mile than other transportation modes, but significant investment is needed to bring pipeline capacity to new shale oil and gas producing regions.
- At some airports, moderate enhancements to airport infrastructure are needed to safely and efficiently accommodate larger cargo aircraft.
- At some ports, investments in channels and berths, port and terminal facilities, intermodal connectors, and other infrastructure are being made or will be needed to support an increase in cargo volumes or larger ships.

Other stakeholders, including the American Association of State Highway and Transportation Officials and the U.S. Chamber of Commerce, have publicly expressed

concern that funding levels are inadequate to meet expected demands on our freight system. Freight plans from California, Washington, and Oregon all view additional funding for freight projects as key to economic growth in those States. California identified $138 billion in needed funding for freight projects.

The costs of underinvestment and lack of better targeted investment in freight transportation and related infrastructure include the following:

- The annual cost of congestion, including passenger car delay on roads shared with trucks, is estimated at $1 trillion, roughly seven percent of U.S. economic output.

- Each day, approximately 13,500 miles of the highway system slow below posted speed limits and an additional 8,700 miles experience stop-and-go conditions.

- Congestion alone causes American trucking companies to incur an estimated $27 billion a year in extra freight transportation costs because of lost time and fuel consumption, which increases shipping delays and raises prices on everyday products.

- Infrastructure failures can lead to sudden, significant adverse economic impacts, as well as adverse safety impacts. For example, as a result of the 2007 Interstate 35 West bridge collapse in Minnesota, the State's economy lost an estimated $60 million in economic output from 2007-2008.

- Bottlenecks at major gateways and trade corridors slow trade and often represent environmental hot spots which may disproportionately impact adjacent communities.

- Almost 5,000 people die each year in collisions and incidents associated with freight transportation, in addition to many more people suffering injuries.

- Lack of intermodal connections diminishes the ability of freight modes to cooperate with each other and negatively affects the transportation system's resilience, safety, reliability, and efficiency.

Investing in the system requires identifying infrastructure challenges, including those that often do not receive sufficient attention from State and local planners and budget analysts. For example, a clear and immediate need exists at many locations across the country for new highway, rail, port, border crossing, and other capacity to relieve bottlenecks and better accommodate freight movements. At the same time, there are less apparent but important needs for improvements to infrastructure design to accommodate safe and efficient first- and last-mile urban freight delivery.

Investing in the system requires dedicated funding and other resources to help address infrastructure capacity challenges. It also requires dedicated resources to help the public and private sectors work together to plan and implement freight projects and to more effectively

recruit, train, and sustain an adequate freight transportation system workforce. Furthermore, resources need to be dedicated to significantly reduce fatality and serious injury levels associated with freight transportation. Finally, resources need to be dedicated to help reduce adverse environmental and community impacts of freight transportation.

The Transportation Research Board's (TRB) Special Report 297[4] on freight transportation projects summarizes the seriousness of underfunded freight projects in this way:

> *The consistent points in the frequently expressed criticism is that the transportation system suffers from a gap between the rate of spending that would allow service to be maintained and improved and the spending that the public and private sectors are willing to undertake. The gap is widening to the point of crisis; the evidence of the crisis is growing congestion and physical deterioration. In the public sector, the gap is the result of bias in spending decisions against projects important for freight; arbitrary restrictions on project eligibility in funding programs, especially the Federal-aid program; and unwillingness of elected officials to increase the special taxes that fund most government transportation spending.*

B.1. Reasons for Underinvestment

The U.S. transportation system is aging and it has been increasingly difficult to fund its operation, maintenance, and expansion. This is particularly true for freight transportation projects. For one, public resources are scarce and freight projects—with benefits that extend beyond State and local boundaries—do not always compete well at the State and metropolitan planning levels against more popular projects that address local passenger traffic. Freight projects can be particularly costly because they are often located in aging industrial zones or urban areas where available right-of-way may be limited and expensive to acquire, and supporting infrastructure (storm water, utilities) must be extensively upgraded to accommodate new projects. Large freight projects can involve multiple modes (trucks, trains, airplanes, barges, and ships) and involve multiple jurisdictions and stakeholders, often operating under different investment timeframes, objectives, and constraints. This complexity makes it difficult to come to a consensus on project design and funding. In comparison, non-freight, single mode projects are typically much easier to fund under existing Federal transportation funding programs. Additionally, because much of the freight transportation system is operated by the private sector, there has been some amount of historic tension around how to best define, assess, and communicate the public benefits of that system to justify public dollar expenditures.

The uncertainty of Federal funding in recent years, as evidenced by the need to use multiple last-minute, short-term extensions of reauthorization bills, is particularly problematic to planning and implementing freight projects. The high costs of many of these projects require dependable multiyear funding streams to proceed; however, even smaller non-freight

[4] This report is available at http://onlinepubs.trb.org/onlinepubs/sr/sr297.pdf.

transportation projects are adversely affected by funding uncertainty. States have suggested they might delay or cancel funding for planned transportation projects of all types based on uncertainty relating to the Highway Trust Fund (HTF).[5] Georgia, for example, announced in May 2015 that over 300 projects totaling $715 million would be delayed. In 2015, at least 11 States have delayed or cancelled projects representing nearly two billion dollars in surface infrastructure investments.

Other institutional factors contribute to the nation's historic underinvestment in freight. As described in more detail later in this Plan, State and local agencies generally do not have access to sufficient freight data, freight travel demand models, and freight planning personnel to identify freight problems and plan investments to address them effectively. Partly as a result of lack of data, public and private officials are often unable to explain the positive public and/or local benefits to the public of a well-functioning freight transportation system. Similarly, lack of data and information may contribute to community fears that freight projects could adversely affect them.

The availability of adequate and reliable funding dedicated to freight projects—which could be used for any transportation mode or mix of modes—would alleviate many of the project cost and competitive problems described above. With such funding, freight projects that have broad regional and interstate benefits could compete on an equal footing for State and local public resources with local non-freight projects, given that dedicated freight funds would cover the costs of extra-jurisdictional benefits. This type of funding, however, is generally not currently available from Federal or State government sources.

Some States have established dedicated freight funds to address some of the problems caused by freight underinvestment, but these programs usually offer only very limited funding. Even in instances where such funds are substantial, as in California's Trade Corridors Improvement Fund Program, they are still not adequate relative to freight investment needs. Only the Federal government will typically have the resources to assure that an adequate pool of dedicated funding is available for projects with interstate benefits.

The Federal government is also best able to assure that State and local planners address the interstate needs of freight as a condition for receiving freight funds. State and local governments using their own resources may be more inclined to develop locally focused solutions to address freight problems. They may not have the resources to coordinate with neighboring States or jurisdictions, which similarly may lack resources to reciprocate. Moreover, by using only their own funds for project investments, States and local governments may not address environmental and other requirements attached to the use of Federal funds, which have important national benefits, or may not address regional freight needs. It is therefore important to establish a reliable and substantial source of Federal freight transportation funding to incentivize regional collaboration and national-level solutions.

[5] See Section 2B for additional information on the HTF and the uncertainty surrounding its funding.

Public-private partnerships (P3s) are one method of non-Federal financing for public infrastructure that offers the ability to pursue freight projects with national benefits and public and private beneficiaries.[6] In a P3, one or more private firms invests equity upfront to help pay for the design and construction costs of the project. Over the long run, the private partner seeks to recover competitive rates of return on those investments by collecting tolls or other fees from users or annual payments from the public sponsor. Freight transportation projects could become even more suitable for P3s as freight users increase their willingness to accept tolls in exchange for tangible monetizable benefits, including time savings. In an effort to leverage more private sector investment in transportation infrastructure, U.S. DOT is currently engaging with State and local governments and private sector investors to encourage collaboration, expand the market for P3s, and put Federal credit programs to greater use. These Federal actions to further incentivize the use of P3s are described later in this Plan.

B.2. Underinvestment Challenges by Mode[7]

As detailed earlier in this Plan, the U.S. freight transportation system consists of a vast network of highways, railways, waterways, airways, and pipelines, with connections between these modes occurring at ports, airports, rail yards, and other points. Each of the freight modes has particular strengths. Trucking is perhaps the most versatile mode, able to provide door-to-door service through most of the U.S. As Figure 7 shows, the great majority of the nation's freight by tonnage moves by truck over distances of less than 500 miles. Figure 8 shows that the role of trucking is less dominant at trip distances of over 500 miles, and particularly for distances over 750 miles, due to the lower per ton-mile costs of freight rail, waterways, and pipelines over these distances.

Also as discussed previously in this Plan, a great strength of the U.S. transportation system is intermodalism, which enables shippers to make use of the best features of two or more modes to move freight from producer to consumer. Intermodal transfers are facilitated by a large number of ports, airports, and rail yards with highway access throughout the country. Goods can be transported by truck from a factory to a nearby rail yard or port, shifted to long-haul non-truck modes, and then shifted back to truck in proximity to the final delivery point.

Each transportation mode faces a different investment environment. The great majority of highway and road infrastructure is owned and funded through public investment, although these funds have been largely raised from taxes paid by private system users. Freight railroad infrastructure is privately owned and funded, as is the infrastructure of the nation's pipeline industry. Inland waterways are publicly owned and funded, in part based on user taxes,

[6] Additional information on P3s is available on the Building America Transportation Investment Center website: http://www.transportation.gov/buildamerica

[7] Additional information on existing U.S. DOT programs that provide funding for freight projects is available on the FHWA Congestion Mitigation and Air Quality Improvement Program (CMAQ) website, as well as the Transportation Infrastructure Finance and Innovation Act (TIFIA) website:
http://www.fhwa.dot.gov/environment/air_quality/cmaq/
http://www.fhwa.dot.gov/ipd/tifia/

whereas ports and airports are funded through a mixture of public and private monies. Each of these modes faces different problems associated with securing adequate investment, as detailed in the sections below.

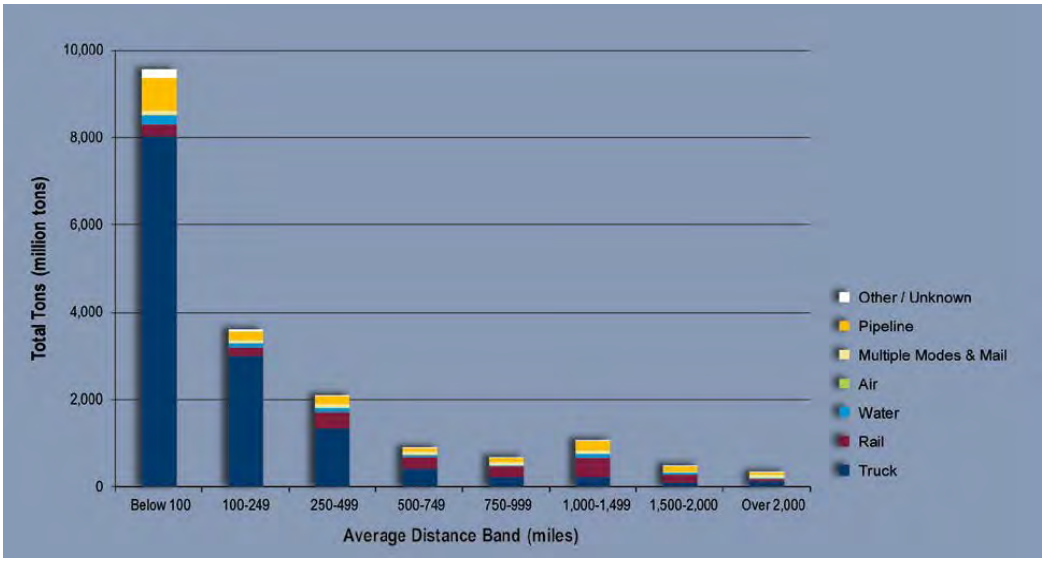


Figure 7. Total Freight Tonnage by Distance Band: 2007

Source: U.S. DOT's Freight Facts and Figures (2013); Link:
http://www.ops.fhwa.dot.gov/freight/freight_analysis/nat_freight_stats/docs/13factsfigures/pdfs/fff2013_highres.pdf

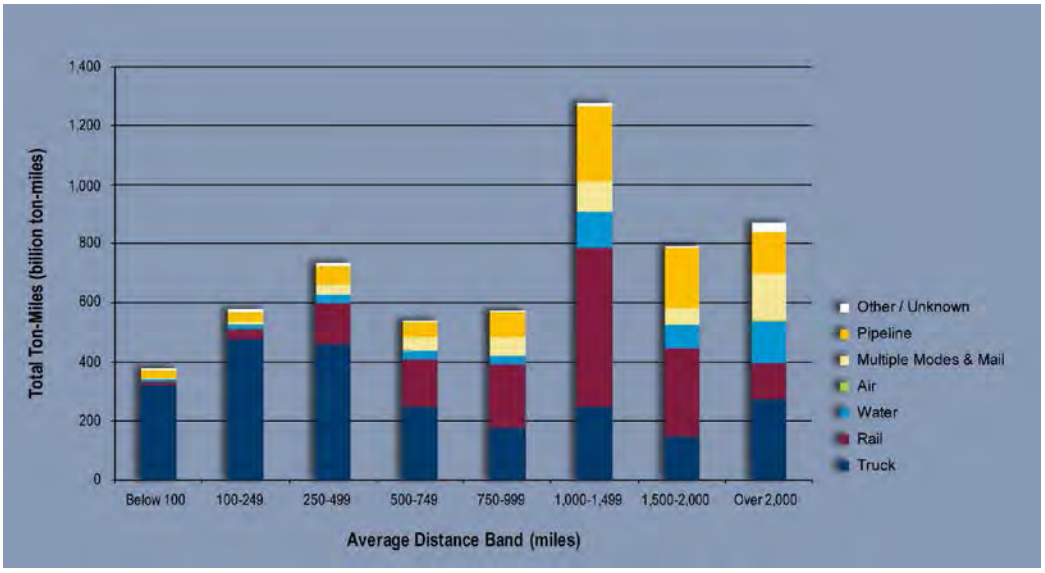


Figure 8. Total Freight Ton-Miles by Distance Band: 2007

Source: U.S. DOT's Freight Facts and Figures (2013)
Link: http://www.ops.fhwa.dot.gov/freight/freight_analysis/nat_freight_stats/docs/13factsfigures/pdfs/fff2013_highres.pdf

Highway Freight Projects

Federal funds are available for highway freight projects through FHWA programs such as the National Highway Performance Program (NHPP), the Surface Transportation Program (STP), and the Highway Safety Improvement Program (HSIP). However, State and local agencies may not consider multimodal solutions to transportation challenges due to statutory restrictions that largely limit funding eligibility to highway freight projects. Congestion Mitigation and Air Quality Improvement Program (CMAQ) funds can be used for other modes under some circumstances, but predominantly go to highway projects. Highway freight projects are also eligible for loans and loan guarantees under the Transportation Infrastructure Finance and Innovation Act (TIFIA) credit assistance program.

Although highways receive the majority of Federal transportation funding, there remain many more highway projects than there are funds to build them. Meritorious highway freight projects may go unfunded in favor of projects aimed at local passenger vehicle traffic. Alternatively, a less costly but undersized option to correct a freight problem may be selected because limited funding places a premium on projects with low upfront costs. A project may be designed for a 20-year project life rather than a longer period to reduce upfront costs, but this may lead to problems later on if the project cannot accommodate future growth.

At the start of 2015, the outlook for the HTF was that funding authority from it would lapse and it would become insolvent sometime in mid-2015 due to the lack of a new reauthorization bill that would provide multi-year funding authority and revenues. Short-term extensions of HTF funding authority (the most recent of which was signed by President Obama on July 31, 2015) subsequently extended funding authority until October 29, 2015. By transfers of General Fund monies to the HTF, this short-term extension deferred insolvency of the HTF until the fourth quarter of fiscal year 2016. However, the limited funds associated with these extensions, their continued restriction to principally highway projects, and their short-term and unpredictable availabilities reduce the likelihood of expanded use of HTF funding for freight projects. Some researchers believe that under this short-term and unpredictable approach to funding transportation, Federal funding available to freight-focused projects could largely disappear as other transportation projects use available revenues. Were this to occur, the willingness of States and localities to fund large-scale freight projects, pursue multimodal solutions to freight impediments, or even devote significant resources to planning for them could diminish.

Inland Waterway Freight Projects

In 1986, Congress provided that commercial traffic on inland waterways would be responsible for 50 percent of the capital costs of the features that make barge transportation possible on these waterways. Congress also provided that commercial users on inland waterways would pay the one-half share of capital costs through an excise tax on liquids used to power vessels transporting commercial cargo. The U.S. Treasury deposits an amount equivalent to the sums collected from this tax into the Inland Waterways Trust Fund. The General Fund of the Treasury pays 100 percent of the cost of operation and maintenance (O&M) on these waterways.

Almost half of the overall tonnage on the inland waterways passes through a lock and dam. Work on these structures is becoming more costly over time, due primarily to two factors—the condition of some of the components and cost increases in the broader economy. The U.S. Army Corps of Engineers (USACE) gives priority to the structures that support the most commercial traffic and invests heavily in their maintenance and periodic rehabilitation.

Over the past 20 years, the overall trend for total cargo on inland waterways has been flat or declining. They currently move six to seven percent of all domestic cargo in terms of ton-miles and several of these waterways support significant volumes of traffic. Continuing to provide the current level of service on these waterways is a priority, and involves a mixture of O&M and capital investment.

As a result of a long-term difference between receipts and spending, the balance in the Inland Waterways Trust Fund was nearly exhausted by 2009. The depletion of the fund was accelerated by the costs of ongoing construction of the three billion dollar Olmsted Locks and Dam project on the Ohio River. Congress's response included shifting significant costs from the users to the General Fund for certain capital investments (primarily under the American Reinvestment and Recovery Act of 2009, and the Water Resources Reform and Development Act (WRRDA) of 2014), reducing spending for other inland waterways capital investments, and increasing the rate of the inland waterways diesel fuel tax. However, a 2015 report by the National Academy of Sciences found that, while the amount of funding required to sustain reliable waterborne freight service on inland waterways is not clear, it is evident that total revenues after the increase in the fuel tax will not be sufficient to maintain these waterways.[8]

WRRDA includes several project delivery process reforms to the inland waterways. For example, USACE is taking steps to apply best management practices to speed project delivery and develop a portfolio of standard designs for inland navigation locks.

Port Freight Projects

Ports are by definition multimodal entities. Because existing transportation funding programs are largely modally based, funding traditional port projects can be complex and difficult. Funding for port and related infrastructure is also complicated because investments involve a shared responsibility and cover a wide range of landside and waterside components of ports. Landside facilities at ports are generally under the control of local port authorities or the private sector.

As new vessels that enter the world fleet increase in their average size (shipping lines have sought to increase vessel size as a way of reducing per container fuel, labor, and other costs), ports are making decisions as to whether—and if so, to what extent—they will invest in

[8] TRB Special Report 315: Funding and Managing the U.S. Inland Waterways System: What Policy Makers Need to Know, June 2015, p.66

landside infrastructure and channel improvements to attract these vessels. The average size container ship under order from shipyards today is 8,000 twenty-foot equivalent units (TEUs) of containers. This average size has been increasing in recent years (see Figure 9). A fully loaded container ship carrying 8,000 TEUs requires a berth depth of 42 or more feet, whereas a 13,000 TEU ship requires a draft of from 48 to 50 feet. Vessels of 18,000 or more TEUs are currently being delivered from world shipyards.

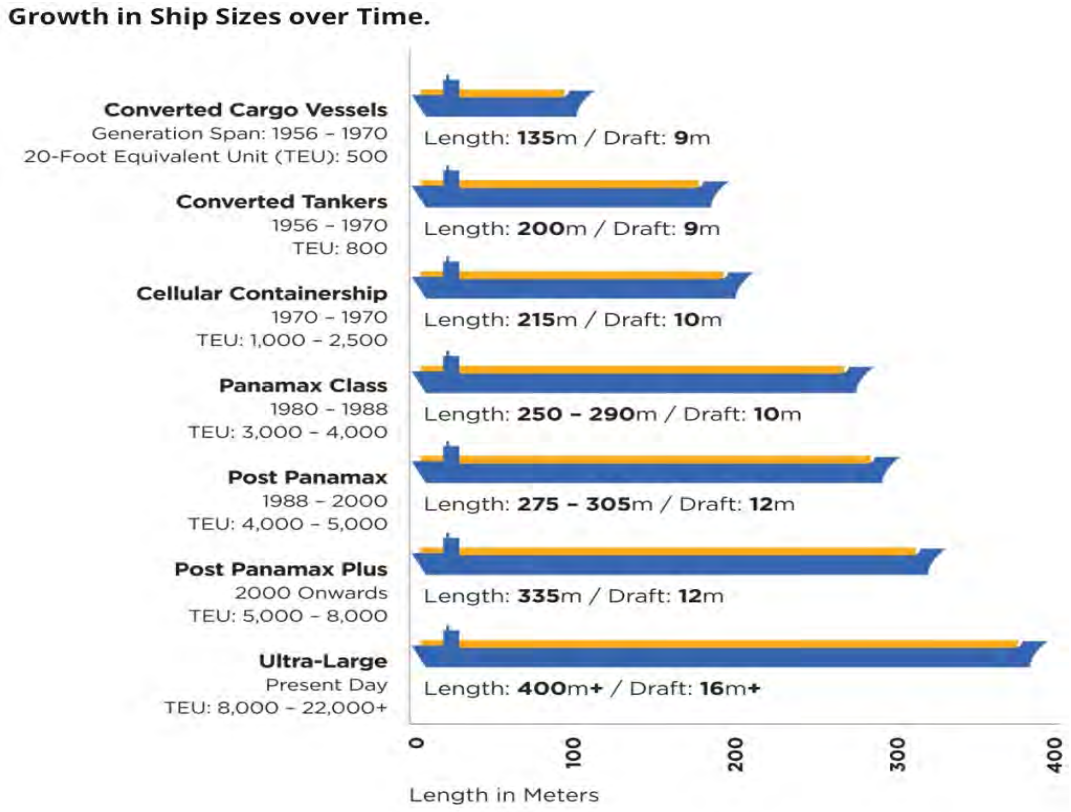


Figure 9. Growth in Ship Size over Time (Source: Beyond Traffic)

On the East Coast and along the Gulf of Mexico, many U.S. ports currently have channel depths of 45 feet or less. Many port authorities are working with USACE on studies or construction projects to widen or deepen their channels further. To accommodate the new very large container ships, a port may have to upsize some of its dock structures and create sufficient backland container yard capacity, in addition to deepening channels and berths. Currently, only four ports on the East Coast and four ports on the West Coast can accommodate vessels over 10,000 TEUs and no U.S. port can currently accommodate a fully loaded 18,000 TEU vessel. These container ships are among the biggest vessels in the world fleet; they can exceed 1,300 feet in length, 52 feet in draft, and 190 feet in beam. Larger vessels (e.g., 22,000 TEUs) are possible in the near future.

The Federal government has substantial responsibility for many waterside activities, including vessel safety. Generally, USACE pays the authorized Federal share of coastal port channel improvement projects (such as deepening or widening the main channel); these funds come

from the General Fund of the Treasury. The non-Federal project sponsor of the USACE project also pays a share of the deepening cost; generally this can vary from 10 to 50 percent of the cost, depending on the depth of the channel improvement. Federal spending for maintenance dredging of channels and related work is financed through the Harbor Maintenance Trust Fund (HMTF), which is funded by an ad valorem tax mostly on imports.[9] Generally, Congress appropriates these funds to USACE, which cover 100 percent of the cost of maintaining the authorized Federal portion of the main channels and associated features such as turning basins, dredged material disposal facilities (for the material excavated in maintenance dredging), and jetties.

At current funding levels for harbor maintenance and related work, many of our large ports have been able to handle their current levels of cargo. However, some carriers may encounter delays, may need to proceed more slowly due to hazards, light-load their vessels, or offload some cargo to smaller vessels. Depending on channel conditions, tankers or other vessels may encounter a delay in their arrival or departure time (e.g., until another ship has moved through that section of the channel or until high tide) or restrictions that reduce recommended vessel draft (which can affect how much cargo some ships can hold). Some carriers may choose to change their itineraries to bypass ports with such problems. Ultimately, as vessels in the world merchant fleet increase in average size, some ports will deepen or widen their channels to address these concerns.

Funding for landside port needs, such as equipment or facilities used to transfer goods from ships to another mode (e.g., rail, truck), is also complicated. Typically, port authorities earn monies from lease payments and usage fees made by private terminal operators, carriers, and other customers. Because customers may choose to use other ports if these fees are perceived as too high, however, it is difficult for ports to raise these fees to pay for long-term projects that do not have short-term benefits for clients and customers. Thus, it can be difficult for ports to build capacity in advance of actual congestion.

Prior to 2009, Federal participation in funding of landside port projects was limited, associated principally with the U.S. Department of Homeland Security's Port Security Grant Program, a small number of projects through the CMAQ program, and several U.S. Department of Commerce/National Oceanic and Atmospheric Administration subprograms that aid navigation. However, since 2009, the Administration and Congress have directed significant resources (almost $500 million) to ports, principally consisting of U.S. DOT's TIGER discretionary grants. Some port landside projects are also eligible for loans and loan guarantees under the TIFIA program. MAP-21 also expanded the eligibility of FHWA's STP to eligible infrastructure improvements located within the boundaries of port terminals. In practice, however, there have been only two TIFIA awards to ports for a bridge and a tunnel project. At this time, U.S. DOT is talking to port representatives and may expand TIFIA and STP usage for ports based on stakeholder feedback.

[9] In WRRDA, Congress took steps to increase funding from the HMTF by including annual targets. Actual appropriations from the HMTF must be made annually by Congress.

Efficient operations at most ports depend on access to road and rail infrastructure that is outside the port facility and is funded by both public and private sources. Highways and first- and last-mile connector roads are often eligible for funding through STP, CMAQ, and other highway funding programs. The condition of these roads and highways, while outside ports' jurisdictional control, has substantial implications for port productivity and competitiveness. Many ports also connect with the railroads through on-dock or near-dock rail. In most cases, these rail connections are owned and maintained by railroad companies. Because different actors control different funding sources, there is a clear challenge to coordinating the needs and actions of these parties.

Air Freight Projects

The Airports Council International-North America reports that there is virtually no shortage of air cargo infrastructure today; rather it appears that an overcapacity situation exists at many airports around the country. Individual air cargo operators may encounter delays or inefficiencies at certain airports as aircraft and technologies change. For example, new larger cargo planes like the Boeing 747-8 are too big to fit into existing positions used for loading and unloading planes at one major West Coast airport. These planes must park at an angle so that both the rear and forward loading doors can be opened. Angle parking takes up two plane positions, preventing another plane from being loaded concurrently. The Federal Aviation Administration (FAA) can provide Airport Improvement Program (AIP) grant funds to support the construction of runways, taxiways, and aprons used in part by freight aircraft. However, air cargo facility development is typically funded by private commercial interests, with supporting infrastructure generally funded by airport revenue. AIP funds cannot support facilities that are for the exclusive benefit of a single commercial operator.

Freight Railroad and Pipeline Projects

The nation's railroad and pipeline systems are built, maintained, operated, and funded by private companies, with some exceptions. From 1980 through 2013, American Class I freight railroads spent $550 billion of their own funds on the renewal, maintenance, and expansion of their infrastructure and equipment, representing more than 40 cents out of every rail revenue dollar. Because they are self-funding and must be responsive to stockholder interests, Class I freight railroads may resist using scarce capital funds to undertake projects that have significant public benefits but insufficient private benefits when faced with competing investments. Class II (regional) and Class III (short line) railroads, which are vital first- and last-mile links for American companies to the global marketplace, are often capital constrained and have a large backlog of projects needed to move current and future freight loads. Rail projects have been major recipients of TIGER funds since 2009, with $652 billion in grant awards to an array of projects, including major projects such as the Chicago Region Environmental and Transportation Efficiency Program (CREATE) in Chicago and Colton Crossing near Los Angeles, but reaching to many smaller projects as well, such as short line rail projects that provide critical connections between rural communities and major freight lines.

Even in the case of railroad and pipeline projects for which private benefits could be sufficient to justify purely private investment, funding can be difficult to arrange due to investment risk and uncertainty. Generally, pipelines can safely move crude oil and petroleum products at lower cost per ton-mile than other transportation modes if pipeline capacity is available. However, pipelines are expensive to build and cannot be moved once built, meaning that investors and the shippers (who must enter into long-term contracts to use the pipeline) must have confidence that future petroleum production and market demand are sufficient to guarantee long-term use of the infrastructure. In the current petroleum markets, subject to rapidly changing product prices and changing sources, this confidence can be difficult to establish in some cases. Railroads similarly face high risks from investments in track and equipment to accommodate energy markets, with coal and crude oil being particularly subject to changing volumes and routings in recent years.

B.3. Workforce Investment Challenges

Ensuring the nation has an adequate freight transportation workforce is a challenge for private sector transportation providers, as well as for State and local transportation agencies. For example, it is difficult to recruit and retain individuals with the right skill sets for different freight transportation jobs. Several factors exist that will affect the public and private sectors' ability to maintain an adequate freight transportation workforce, as described below.

Workforce Replacement

Large numbers of freight transportation employees will soon retire and need to be replaced. U.S. DOT estimates that half of U.S. transportation workers will be eligible to retire over the next 10 years. Almost 55 percent of the current transportation workforce is 45 years or older. Due primarily to projected retirement and high rates of turnover in some transportation jobs (particularly truck drivers), employers will need to hire and train a total of 4.6 million employees from 2012 to 2022, equal to one to one-and-a-half times the current workforce of four million (this total includes non-freight transportation workers). These jobs pay competitive wages and are critical to expanding opportunity more broadly across the entire workforce, beyond simple replacement needs.

High replacement needs will characterize all transportation employment sectors. As freight transportation agencies and companies recruit the next generation of employees, they should consider demographic changes in the workforce, adjust to changing perceptions of acceptable work environments among younger employees, and respond to changing knowledge/skills requirements. For example, in many cases automated systems may replace low-skill transportation and warehousing positions, creating a need for new skilled workers to develop, operate, and maintain those automated systems. Technologies that affect driving, vehicle maintenance, warehousing, and loading will affect professional development and employment needs.

Training and Expertise

It is projected that annual job openings are 68 percent larger than the number of students who are completing educational programs for selected transportation occupations. This highlights a significant skills gap that must be addressed to meet expected industry demand. Skilled transportation occupations, such as transportation engineering, aviation inspection, or heavy machine operation, require education and training such as that provided by Career and Technical Education (CTE) and Career Pathways programs. CTE programs, which begin in high school and continue into post-secondary education or apprenticeships, can provide foundational occupational training to prepare individuals for skilled jobs. Similarly, pre-apprenticeship programs for disadvantaged youth and adults can prepare lower-skilled and under-represented populations for entry into skilled positions.

Many public sector transportation agencies have started to focus more on freight transportation planning issues. This focus reflects both the importance of freight transportation to sustaining economic growth and quality of life, but also a growing emphasis on freight planning in Federal legislation, most recently as a result of MAP-21 incentives for States to establish State Freight Plans and State Freight Advisory Committees. As a result, there is a growing need for public sector employees who are equipped with more advanced freight planning skills. This is true at both the State and local levels, especially in urbanized areas that in many cases are principal freight generators within States.

MPOs are federally designated bodies for urbanized areas that contain 50,000 or more people that carry out transportation planning and allocate Federal/other transportation funding to support a region's transportation needs. According to a 2013 MPO Program Assessment survey conducted by FHWA, only 13 percent of MPOs had a dedicated or permanent duty staff person for freight transportation-related efforts. The survey also indicated that 56 percent of MPOs have organizational capacity to address freight as a collateral duty for one or more people on their staff. With growing Federal and State emphasis on freight planning, however, MPOs will need more freight skills and personnel to represent urban interests in the planning process. Similarly, the growing availability of freight data and models and the rapid emergence of new technologies make the need for skilled planners at the MPO and State levels even greater.

Our understanding of freight transportation needs continues to evolve, so it is difficult to determine what freight transportation training should address. At the same time, there is little design guidance for developing land around freight facilities or corridors and land-use planners in local governments are generally not taught about freight as part of their standard educational curriculum. Smaller MPOs and local government planning departments may have staffs of only a few people and may find it difficult to obtain budgets to specialize in areas such as freight. Lack of a dedicated source of freight funding could also reduce MPO demand for dedicated freight staff.

Recruitment and Retention

Recruitment and retention of employees are issues both for the public and private sectors. For example, both the public and private sectors have reported difficulties in identifying and attracting candidates with the needed skills and technical experience for a variety of jobs, including planning, operations, maintenance, or management jobs. Highly educated professional engineers and planners are in high demand among several industries and there is fierce competition for skilled professionals. At the same time, many public agencies are dealing with constrained budgets or other issues that undermine their ability to offer competitive compensation and employment terms. Recruiting and retaining travel demand modelers is particularly challenging. There are few people who have the expertise to conduct these types of technical analyses.

The private sector will need to address specific challenges related to recruiting and retaining sufficient numbers of truck drivers and highway construction workers. In fact, the American Trucking Association has identified driver shortages as one of the most critical issues facing the trucking industry. For instance, by 2022 heavy trucking jobs will account for one-third of all projected total job openings of the top 20 transportation occupations (see Figure 10). Filling these openings will be difficult: compensation may not be competitive with other occupations, and a life on the road may not appeal to potential applicants. Additionally, some Federal requirements (e.g., setting 21 as a minimum driver age) may limit the pool of potential employees.

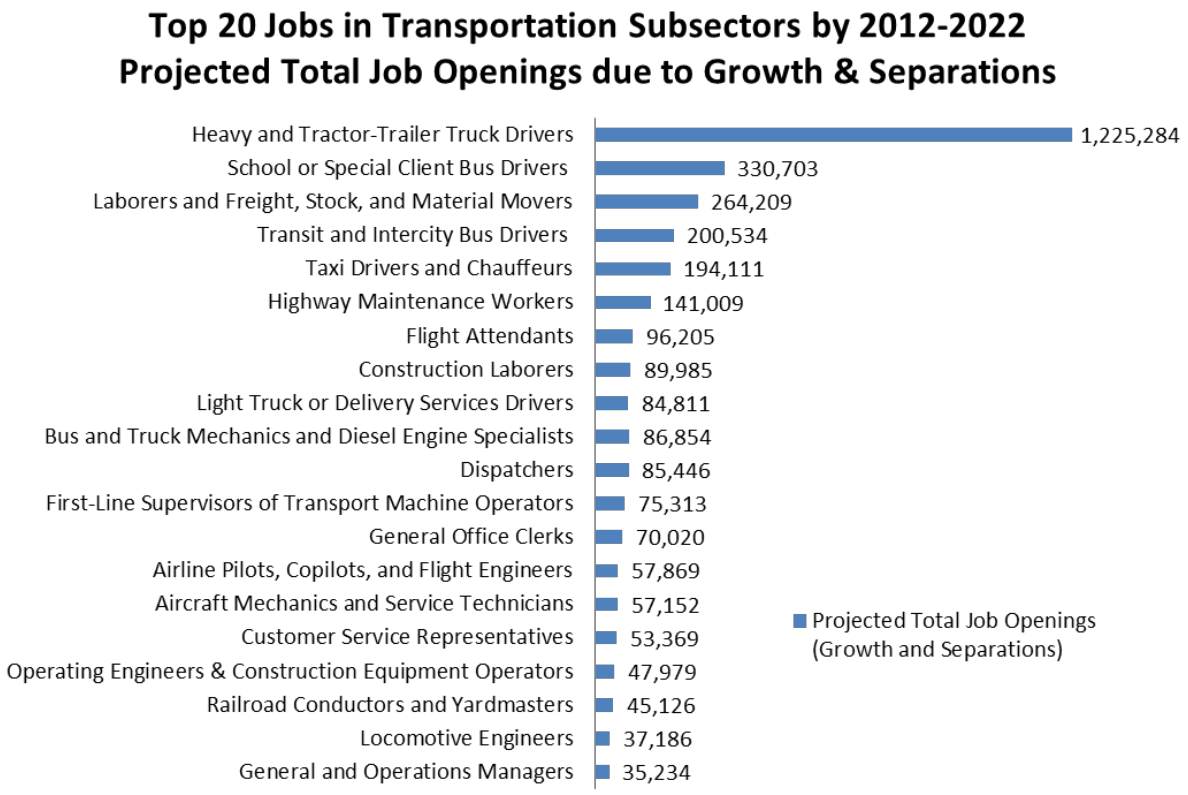


Figure 10. Top 20 Jobs in Transportation Subsectors by 2012-2022

Source: DOT, DOE, DOL. Strengthening Skills Training and Career Pathways across the Transportation Industry; Link: https://s3.amazonaws.com/PCRN/docs/Strengthening_Skills_Training_and_Career_Pathways_Across_Transportation_Industry_Data_Report.pdf

II. C. Difficulty of planning and implementing freight projects under our current governance structure

States, MPOs, and local governments are primarily responsible for the planning and management of our publicly owned freight transportation system, especially for highways, ports, and airports. Private sector parties largely plan and control investments in freight rail, pipeline, and some port and airport terminal projects. The Federal government has principal authority to plan and manage the inland waterways system, air traffic control system, and aids for navigation. These arrangements have gradually evolved over many decades and are formalized in existing laws, regulations, policies, institutions, business processes, and relationships.

This characteristically American approach to governance—a decentralized approach—has had many benefits, including great flexibility to identify and react to local needs. When it comes to freight transportation projects, however, it also presents a number of challenges. In general, freight projects have become more difficult to fund as planning has become more localized. Planning for freight projects has also become harder, involving the need to coordinate among more actors in the system and balance competing priorities. At the same time, there is growing

national recognition of the need to devote more resources to freight planning and implementation, as evidenced by MAP-21's attention to State freight planning and the large number of States that have completed such plans.[10]

Freight system planners and operators face several challenges in planning and implementing freight projects as part of a network of multiple freight modes, as described below.

The multiplicity of freight stakeholders makes freight planning and coordination difficult. Many participants are involved in maintaining and improving the movement of freight on our nation's transportation system. Included in the mix of participants are:

- More than 40 different U.S. government agencies, including nine organizations within the U.S. DOT
- 52 State DOTs (including those of the District of Columbia and Puerto Rico)
- Many other State agencies that influence transportation decisions, such as State environmental agencies, police/highway patrol agencies, or redevelopment authorities
- Regional and multistate coalitions, ranging from the Mississippi Valley Freight Coalition, to the National Center for Freight and Infrastructure Research and Education, to the Maine DOT Industrial Rail Access Program, to the Alameda Corridor project, to the Interstate 95 Corridor Coalition, among many others
- 342 MPOs
- Thousands of local governments, including counties, municipalities, townships, and special districts
- Hundreds of special transportation authorities such as port and airport authorities and single-purpose agencies such as toll authorities
- 566 Tribal governments
- Many thousands of private entities, including trucking and railroad companies, third- and fourth-party logistics companies, terminal operators, and a vast array of others

All of these participants have complex and varied roles, but no one organization is responsible for the entire freight transportation system (see Figure 11). Similarly, freight transportation projects are rarely maintained or championed by one organization. As a result, freight projects can lack powerful or clearly identified champions. Accountability for planning and executing projects can be vague, especially when responsibilities or jurisdictions (or both) overlap.

[10] FHWA conducted an analysis in late 2014 on how these State plans align with NFSP elements identified in MAP-21. Many ideas and findings from the State plans are reflected in this NFSP.

Agency	System Planning				Infrastructure Development, Operation, and Maintenance				Funding and Taxing				Regulation and Oversight			
	R	T	A	W	R	T	A	W	R	T	A	W	R	T	A	W
Federal																
Treasury/Customs											Y	Y	Y	Y	Y	Y
Federal Highway Administration		Y				Y			S	Y					Y	
Federal Aviation Administration			Y				Y				Y				Y	
Federal Railroad Administration													Y			
Maritime Administration				Y				Y								
Federal Motor Carrier Safety Administration														Y		
Transportation Security Administration					S	S	S	S					Y	Y	Y	Y
Environmental Protection Agency													Y	Y	Y	Y
U.S. Army Corps of Engineers				Y				Y								Y
Surface Transportation Board													Y			
State																
State Departments of Transportation	S	Y	S	S		Y				Y				Y		
State Environmental Protection Agencies														Y	Y	S
Regional/Local																
Port Authorities	S		Y	Y	S		Y	Y			Y	Y			Y	Y
Metropolitan Planning Organizations	Y	Y	Y	Y					S	S	S	S				
Local Government	S	S	S	S	S	S	S	S		S	S	S	Y	Y	S	S

R = Rail, T = Truck, A = Air, W = Waterborne, Y = Yes, S = Sometimes, Blank = No
Source: Adapted from Robins and Strauss-Wieder (2006), p. 3

Figure 11. Agency Roles and Responsibilities for the Freight Transportation System. (Source: *http://onlinepubs.trb.org/onlinepubs/ncfrp/ncfrp_rpt_023.pdf*)

All of these entities have different roles in the freight transportation planning process, different legal authorities, and, often, different objectives and concerns. For instance, while State DOTs and MPOs play a predominant role in planning public freight transportation infrastructure, local governments largely control land-use decisions that are critical to undertaking transportation projects or alleviating conflicting development patterns. The difficulty of coordinating among these participants has been frequently cited as a barrier to improved freight system performance, most recently by U.S. DOT's National Freight Advisory Committee.

Long-term trends have emphasized more decentralized decision-making. Decentralization, or devolution, of planning responsibilities has increased over the last 50 years for many reasons: the Federal government's requirement for the formation of MPOs; increased State requirements for local governments to engage in comprehensive planning for transportation, utilities, land use, recreation, and housing; environmental laws that give Federal agencies, State and local organizations, and citizens a much greater voice in the evaluation of transportation projects; and State and local government delegation of transportation planning and operating responsibilities to special authorities, such as airport, port, and turnpike authorities. Beginning in the late 1970s, Congress largely deregulated private sector transportation industries, contributing to their autonomy from governmental oversight and control to allow them to seek economically efficient strategies.

The complicating effects of decentralization on freight transportation planning are amplified because freight projects often affect large geographic areas**.** This brings even more local governments and special authorities into the planning process as compared to many passenger transportation projects. Cooperation and accountability can become problematic when

multiple entities must concur with a project for it to proceed. There is a clear need for improved skills, methods, models, and data to facilitate better coordination of activities.

Different types and levels of organizations will have different perspectives and needs that must be reconciled to assure that a project can go forward. Local governments, however, will often have the most critical and immediate concerns, since freight transportation infrastructure tends to have narrowly focused project costs and impacts that fall disproportionately on a few localities—as compared to project benefits that are enjoyed more generally over a wide region. Local decision-makers may not have an incentive to preserve or achieve wider network benefits if local costs and impacts of doing so are perceived to outweigh local benefits. This local focus raises the standard for community impact mitigation if local costs are perceived as disproportionate. Accordingly, achieving agreement among multiple jurisdictions and decision-makers is a time-consuming and complex process.

Local government control of land use and dependence on property taxes can challenge broader regional transportation objectives. To raise the revenue needed to finance school systems, maintain local infrastructure, provide services to citizens, and cover other expenses, most local governments rely on property taxes and, sometimes, sales and income taxes. The need for this revenue creates a strong incentive to maximize property tax receipts and other tax revenues, which in turn creates pressure to develop land according to its best local revenue-generating potential.

Industrial Land Preservation in the City of Baltimore, Maryland

In 2004, the city of Baltimore successfully implemented an innovative method to preserve remaining industrial land along its harbor from displacement by gentrification.

To do so, it established the Maritime Industrial Zoning Overlay District (MIZOD). Although not without controversy, the MIZOD has largely been successful. For example, one study concluded that a tax base benefit that could be gained by redeveloping waterfront industrial land as mixed-use was not substantial enough to make up for the lost economic benefits to the city from losing industrial land. However, another study has suggested that Baltimore, by preserving land in lower value freight uses, is bearing a disproportionate share of costs for benefits that fall to the regions surrounding Baltimore in the form of better freight service and employment. This research suggested that protective zoning would be more viable if a sharing formula were implemented to compensate localities such as Baltimore for losses in revenue associated with the protection of freight activities.

This process would have to be negotiated in most localities. State legislatures typically have not provided cities and counties with the authority to levy taxes or fees to help fund transportation investments. Alternatively, in case of projects with major national benefits, Federal funds or loans should be available to help offset costs borne unequally by local entities.

Re-zoning of industrial land to non-freight commercial use (e.g., offices, hotels, and restaurants) and certain residential uses (e.g., condominiums) will often increase the value of the land for tax purposes and put upward pressure on the price of adjacent industrial land. The recent growth in residential demand for affordable industrial land near urban waterfront and downtown locations has aggravated the pressure to re-zone.

Alternatively, expansion of freight-transportation-related services, perhaps in an effort to accommodate broader regional freight needs, can lower property values adjacent to a project because of noise, vibration, pollution, congestion, and general access issues. To community planners, urban goods movement may also trigger concerns about higher road maintenance costs, specialized enforcement requirements, noise, climate change, air pollution, and community health. Local governments must also be responsive to the desires of local businesses, civic associations, and local citizens who, also in the interest of property values and other concerns about adverse impacts of freight activity, often oppose freight projects.

At the same time, local governments must be concerned about sustaining employment for local citizens that is often associated with freight facilities, particularly jobs associated with ports and intermodal facilities. A recent study noted that finding a balance of zoning to promote, protect, and preserve freight facilities and corridors without depriving the local area of productive non-freight development opportunities can be challenging.[11] In some cases, regional revenue sharing may be needed to compensate localities for losses of revenue due to freight projects with regional benefit. Were they available, Federal funds could provide compensation for interstate benefits.

While the efficient accommodation of local concerns is an important issue, the balance of non-freight versus freight project land-use decisions has increasingly been unfavorable to freight uses at the local level in urban areas. Compact multiuse development patterns sometimes create street designs that cannot accommodate delivery of needed goods to a community. In other cases, important projects have been blocked or impeded. For instance, local and State political support for an important intermodal rail project serving the Port of Baltimore was withdrawn in 2014 due to strong community opposition to the expected increase in truck traffic and noise at the new facility. Although other options are being explored, the collapse of this project has major cost and efficiency implications for the port, the rail carrier, and shippers throughout the region and elsewhere throughout the rail network, because it will impede the ability of the port to transfer containers to double-stack rail cars.

Our system of governance complicates the national prioritization of freight projects. The current system of governance in the U.S. transportation sector makes it impractical to assemble a prioritized national list of freight transportation projects. Priorities among Federal, State, MPO, Tribal, local government, private, and other entities affected by freight and other transportation projects can vary substantially for valid reasons. Many freight projects are complex and can only be prioritized after careful evaluation of costs, benefits, and environmental impacts—studies that are often not undertaken unless funding for a project has been identified. Some States have produced State Freight Plans and State Rail Plans that identify priority projects, but these plans vary substantially from each other in detail and methodology. Some plans present many hundreds of freight projects and others very few. Long Range Transportation Plans (LRTPs), Transportation Improvement Programs, and State

[11] John J. Hentschel, et al. Charting the Future of Baltimore's Industrial Waterfront, January 2009, p. 70.

Transportation Improvement Programs should begin to reflect these freight-related plans, particularly those developed with support from State Freight Advisory Committees.

There has been an inability to target Federal funds to freight transportation projects. Although core responsibilities for transportation project planning and implementation will always reside at the State, MPO, local, and private levels, participation by the Federal government in these processes is essential to making progress toward a safer and more environmentally friendly, resilient, secure, reliable, and efficient freight transportation system that serves national goals. The Federal role must focus on ensuring that national interests and concerns are addressed by State, MPO, and local planning and in the operation of the freight transportation system. Federal participation is particularly important for cross-border freight movement with Canada and Mexico. It will also remain essential to improving freight safety and reducing adverse environmental and community impacts associated with freight operations. A dynamic regulatory framework at the Federal level is also needed to expedite the safe, efficient, and consistent deployment of new transportation technologies across the nation. Federal leadership in research and developing best practices will continue to yield important new tools for States and local governments that would otherwise be too expensive for any one State or smaller entity to fund.

A major limiting factor for the Federal role in meeting the above objectives has been an inability to target Federal funds to freight transportation projects. As noted above, Federal funding can be a significant factor in assisting States and local governments to undertake large or complex freight projects, particularly projects that have major interstate or national benefits that many of these governments would not otherwise be able—or necessarily willing—to fund. Receiving Federal funding for a project also assures that project will be subject to Federal provisions pertaining to environmental regulations designed to provide national benefits.

The public and private sectors often have competing priorities. Private sector engagement in public freight transportation planning is often limited; private transportation firms usually have different operational perspectives and objectives and rely on different funding sources than public sector agencies. For instance, rail carriers have a regional or national perspective that is much different from the narrow geographic focus of local planning agencies. Private freight companies may also find MPOs and other planners unfamiliar with freight operations and requirements and may lack the resources to educate them about these needs.

Private companies undertake many transportation projects on their own, motivated primarily by return on private invested capital as measured in monetary costs and receipts. As such, *public* benefits and costs associated with rail or other private sector freight projects, if they do not directly affect revenues and outlays, may not enter into private sector return-on-investment calculations. On the other hand, public sector investment decisions often are required to attempt to address *all* costs and benefits—public and private, monetary and otherwise, as well as equity considerations about who specifically experiences these benefits and costs.

Railroads and other private transportation companies borrow money at commercial rates and often with relatively short repayment timeframes. Therefore, their investments may favor projects that can be completed quickly and have near-term payoffs. Government transportation agencies, on the other hand, can borrow over longer terms and at tax-free rates. Because these agencies are required by statute to prepare LRTPs at least 20 years into the future, this enables them to consider investment payoffs over much longer timeframes.

State and local governments are often restricted from directly investing in private infrastructure such as rail projects; this may reduce the motivation of private interests to participate in public sector planning. Even when public funds are available for private projects that also have public benefits (such as through the Federal TIGER grant process or TIFIA loan guarantees), companies may not be interested in public money for a particular project because such money could trigger environmental review requirements, restrictions, or taxes. Thus, when coordination with public planners is required, private sector companies often prefer to discuss projects on a standalone, as-needed basis, as opposed to engaging in more comprehensive regional or statewide planning directed toward the achievement of broader goals. Private sector companies may also fear the potential release of business information to competitors through the planning process.

Given these impediments, it is important to note that there are promising examples of cooperation in public and private sector freight planning and project implementation, including in the Alameda Corridor, Heartland Corridor, and CREATE projects and through other freight projects funded or financed recently through the TIGER, TIFIA, and other programs. State Freight Advisory Committees offer new forums for public and private interaction. Strategies for funding, planning, and data sharing provided later in this Plan would promote continued progress in public and private sector freight cooperation.

Regulatory barriers pose challenges. Consistent standards and regulations applied at a national level provide freight vehicle operators and manufacturers with a degree of certainty in purchasing decisions and avoid the cost of designing for multiple different and possibly inconsistent State and local standards. U.S. DOT has the preeminent role in the regulation of safety of the freight transportation system, with safety in the maritime sector regulated by the U.S. Coast Guard (USCG), an agency within the Department of Homeland Security (DHS). DHS is charged with regulating the security of the freight system. As noted later in this Plan, the U.S. Environmental Protection Agency (EPA) regulates vehicles for emissions reductions and cooperates with U.S. DOT in the establishment of corporate average fuel economy standards for trucks and automobiles. In some cases, however, State and local requirements can vary with those of each other and with national standards, creating impediments to freight operations.

A common regulatory barrier identified in several State Freight Plans relates to truck size and weight regulations, including lack of uniformity of size and weight regulations across neighboring States. Larger trucks could potentially reduce the number of trucks needed to carry a given volume of freight. However, many regulatory reforms that could potentially lower

freight costs such as raising weight limits or allowing longer combination trucks on national highways have potential tradeoffs in terms of safety, security, wear and tear on infrastructure, and environmental impacts that must be evaluated carefully. MAP-21 mandated that U.S. DOT conduct a comprehensive study on this topic. U.S. DOT released the "Comprehensive Truck Size and Weight Study Technical Reports" in June 2015. U.S. DOT will issue a Report to Congress on the study by the end of 2015.

There are many challenges that impede project delivery. Within the complex and dynamic freight transportation environment, transportation planners must be able to identify priority needs and select from among many possible courses of action. Once decisions are made, agencies must be able to expeditiously and economically implement fixes and improvements. For these actions to occur, freight transportation planning and project implementation processes must be better coordinated. Planning, environmental review, design, and permitting requirements need to be considered jointly (rather than sequentially) to determine the best overall course of action. Projects need to be completed more efficiently using best practices once a course of action is decided.

For the great majority of transportation projects, the environmental review and permitting requirements required by the National Environmental Policy Act (NEPA) and other Federal environmental laws and regulations are accomplished effectively and efficiently. For large and complex infrastructure projects, however, diverse and often divergent sets of permit and decision-making responsibilities can lead to inefficiencies that extend the timeframe for the Federal permitting and review process. The timeframe to complete the environmental review and permitting process for some projects can be several years and is often cited as a reason for the long delay in delivering some projects. However, other factors such as securing financing, contract procurement, planning and building can also take time, sometimes leading to project durations of 15 years or more.

Long project delivery timeframes can be a significant impediment to correcting problems in and seizing new opportunities to improve the national freight transportation system. It also discourages the private sector from participating in such projects given its focus on nearer-term opportunities and payoffs.

Recognizing these challenges, the President has previously called for dramatic reductions in project delivery times. Since 2011, the Administration has taken a number of actions to expedite the environmental permitting and review process for major infrastructure projects. The President signed two directives designed to streamline the process using executive authority. These orders and resulting implementation plan resulted in expanded use of the Federal Infrastructure Permitting Dashboard. They have also resulted in an update for the interagency "Red Book" with guidance for field staff on synchronizing project review schedules to improve the efficiency and effectiveness of the environmental review and permitting for infrastructure projects.[12] However, the process is still challenging for freight projects, given the

[12] The Red Book is available at https://www.environment.fhwa.dot.gov/strmlng/RedBook_2015.asp.

multiplicity of stakeholders involved and the adverse environmental and community impacts often associated with freight movements.

Limitations in available data and methodologies constrain freight planning. State and local planners are often constrained by a lack of information about freight facilities, inventories, and movements, including the location and condition of those facilities. This is particularly true within urban areas: most cities do not know the number of commercial vehicles traveling on their streets or the commodities they are carrying. Similarly, maps showing the locations of freight routes and facilities are often inadequate or unavailable because assembling such maps has historically been a resource-intensive and expensive undertaking. Railroads and other private enterprises, which often have detailed maps of their facilities, may consider them proprietary information. Airports seeking to develop, redevelop, expand, or modernize their cargo facilities encounter incomplete and inconsistent air-cargo activity data, as well as a lack of generally accepted air-cargo planning standards and design guidelines.

The lack of information about freight routes, corridors, and facilities creates a number of serious obstacles to the planning and environmental review of urban and rural transportation systems and the land uses they support. Not knowing the location of freight facilities or truck and delivery vehicle activity on roadways, for instance, can lead local governments to make zoning, permitting, and variance decisions that place incompatible land uses (e.g., residential, recreational, or educational development) in proximity to freight activities. This can lead to restrictions on or displacement of freight activity. Similarly, the inability to pinpoint freight locations makes it difficult to identify communities that are adversely impacted by existing freight activities or freight routes. The lack of freight data also makes realistic modeling of urban freight flows very difficult for most MPOs. Finally, without information about current and expected future freight movements, new transportation facilities could be under-designed, poorly located, or otherwise insufficient for the accommodation of goods movement. Initiatives to reduce freight data limitations, including through vehicle-based location reporting, are described below and in the recommendations section of this Plan.

Traditional freight data sources are best suited for analyses of large geographic areas and are not well suited for use in localized analyses. Most data used in freight mapping, planning, and forecasting are gathered from sources that use surveys or activity reports, including the National Transportation Atlas Database (NTAD); the Commodity Flow Survey (CFS); the FAF; the Surface Transportation Board's Carload Waybill Sample; air carrier reports to U.S. DOT on the Bureau of Transportation Statistics' Form 41 financial schedules and other sources; the USACE Waterborne Commerce Statistics Database; U.S. Census data; and private sector sources that make use of government data. These government data resources generally do not provide the spatial detail needed for local planning efforts. The Carload Waybill Sample for railroads is an exception in that it can provide local-level information on rail freight movements. Similarly, the

Waterborne Commerce Statistics Database can provide sufficient data granularity for most local and regional planning needs involving water freight transportation.[13]

Perhaps the most widely used freight transportation data source in the U.S. is the FAF model maintained by FHWA and the Bureau of Transportation Statistics (BTS). The FAF is updated every five years to reflect the latest CFS data (interim revisions are made on a more frequent basis) and offers valuable insights into current and potential future national, interstate, and inter-county movements of freight; it is a well-managed and consistent data source. FAF version three (FAF3), which is the latest full version of FAF as of October 2015, provides current freight flows and forecasts of freight flows through the year 2040 as well as visualization and mapping tools. However, apart from the problem of data timeliness attributable to the five-year cycle of the CFS, FAF3 data are limited because the level of geography available is typically too highly aggregated for local planning efforts and do not depict seasonal, daily, or hourly variation. In addition, not all metropolitan areas are included as part of the FAF. Initial baseline estimates for the next version of FAF (version 4) were released in October 2015; additional components will be forthcoming over the next several months.

Data on smaller delivery vehicles, heavy truck movements on local roads, or short-distance heavy-truck movements are generally not available from the sources described above. For key issues such as port drayage, urban areas have often had to rely on anecdotal data on queue times or information based on driver surveys. In general, the deficiency of local, urban data creates a major impediment to identifying and resolving first- and last-mile freight congestion problems.

New data sources derived from vehicle movements. To conduct robust freight mapping, modeling, and model validation, planning agencies require freight data generated with greater frequency and accuracy and at more granular/localized levels than is available from the FAF. Fortunately, it is increasingly practical to obtain large amounts of current, minute-to-minute truck trip distribution and other data from unobtrusive global positioning system (GPS) subscription data services. The locations and times of GPS readings can be used (with some limitations) to determine truck-activity locations, land uses at those locations, the next land use served on a trip, the travel time and distance to the next stop, and temporal and seasonal changes in activity. GPS data can also be cross-referenced and validated against weigh-in-

[13] Data sources referenced here are available at the following websites:
NTAD: http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_atlas_database/index.html
CFS: http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/commodity_flow_survey/index.html
FAF: http://faf.ornl.gov/fafweb/Extraction0.aspx
Carload Waybill Sample: https://stb.dot.gov/stb/industry/econ_waybill.html
Waterborne Commerce Statistics Database:
http://www.iwr.usace.army.mil/About/TechnicalCenters/WCSCWaterborneCommerceStatisticsCenter.aspx

motion sensors and automatic traffic recorders to obtain much more information about the weight and types of vehicles being monitored.

FHWA's Freight Performance Measurement (FPM) program has used actual truck probe data from over 600,000 GPS-equipped trucks to measure freight highway congestion.[14] These trucks provide billions of position signals that FHWA analyzes to determine truck freight performance both for routine monitoring and for ad hoc analysis, such as when there is an incident that compromises vehicle movement along the highway network. FHWA has used these data routinely since 2002 and actively seeks to increase the number of probes in order to continuously improve available data. FHWA estimates that the number of probes represents approximately 30 percent of the truck population for the types of trucks typically captured in the probe data (Classes 6, 7, and 8). FPM data on truck freight performance can help planners, analysts, and decision-makers monitor congestion using measures of travel time reliability and speed for corridors, border crossings, urban areas, freight intermodal connections, and freight bottlenecks.

In addition to the FPM truck probe data, FHWA uses information from the FAF to provide insight on tonnage and volume flows that supplement FPM data and analyses. FHWA also produces a Freight Efficiency Index (FEI) that combines measures of speeds and travel time for intermodal locations, urban areas, bottlenecks, and border crossings; FHWA additionally monitors travel times for 25 key domestic freight corridors in the U.S.

In July 2013, FHWA announced the availability of the National Performance Management Research Data Set (NPMRDS). The NPMRDS combines FPM data with GPS probe vehicle-based travel-time data for passenger vehicles for all NHS facilities. The NPMRDS is intended to help meet the needs of transportation agencies to provide access to comprehensive and reliable datasets that can be broadly deployed to measure, manage, and improve the U.S. transportation system. Even prior to the NPMRDS, the FPM truck freight data had been used by numerous MPOs and State DOTs to conduct truck- and freight-related analyses. The NPMRDS is now available for free to States and MPOs.

Although the FPM and NPMRDS data represent a major step forward in making available more timely and accurate freight data to State and MPO planners, there remain significant limitations in freight data. NPMRDS data do not cover freight movements by rail, waterway, or air cargo transportation modes. The data are not commodity-specific—information that is very important to understanding the structure and freight needs of local industries. They do not directly capture freight movements by the large number of smaller vehicles, including single-unit trucks and vans that handle a large portion of local freight deliveries throughout metropolitan areas. Methods are needed to more easily track heavy trucks on non-NHS roads and small and independent truck and delivery vehicle movements throughout urban areas.

[14] Additional information on the FPM data program is available at http://ops.fhwa.dot.gov/freight/freight_analysis/perform_meas/.

These methods would facilitate better freight modeling, identification of problem areas, and performance measurement.

Travel demand models are currently inadequate for modeling urban freight movements. FAF3 and other models are useful in measuring interstate and intercity freight flows, but the ability to model freight movements within urban areas (which are the origins and destinations of most freight movements and where most of freight delay occurs) is currently limited. MPOs usually forecast future travel in their areas with the assistance of regional transportation models, also known as regional travel demand forecasting models or, simply, travel demand models. Typically, these are traditional, trip-based models known as four-step models. Some States make use of statewide travel demand models, but these models do not necessarily reach the level of route detail contained in MPO models.

Travel demand models have been developed primarily to forecast passenger movements on roadways and transit systems. An increasing number of MPOs are attempting to model freight and commercial vehicle travel often using models similar to those used for passenger vehicle modeling. These special applications of four-step models to freight transportation have significant shortcomings, including (but not limited to) the inability to address issues such as multiple freight transport modes; peaking characteristics for freight activity (which differ substantially from the passenger travel activity); impacts to adjacent communities; and the complex relationships between land uses and freight generation and attraction.

In addition, researchers have developed a significant number of specialized models for particular aspects of freight planning and forecasting. These models employ a variety of tools and techniques, including economic flow models, land-use and economic input-output analyses, commodity-based models, vehicle- or trip-based models, estimation routines, aggregate measures, and quick response procedures. However, these approaches do not accurately reflect the nature of supply chains and increasingly complex logistics practices in freight-dependent industries. Recent research concluded that the analytic tools and methods used by planning agencies to forecast freight demand are inadequate to deal with the scale and importance of freight transportation on our multimodal system and our economy.

In the long run, the goal for freight modeling should be to develop a full network-based freight forecasting model that incorporates all modes of freight transport and accurately reflects the various factors related to the supply and demand of freight infrastructure and services. The timeframe for developing such a model is uncertain and will depend on funding and other resource support. Until such time, planners could greatly benefit from a national effort to develop toolkits of the best available models and training on how to use them most effectively.

There is a need for greater use of asset management and economic tools. One of the greatest risks to the nation's freight transportation system is deterioration that comes from age and use. Providing for the maintenance and operation of the transportation system requires a wide range of tools and best practices and, of course, adequate funding to repair and replace infrastructure in a timely manner. Such tools enable transportation planners and managers to

identify and prioritize cost-effective actions to keep the system in a state of good repair and efficient operation.

Over the last two decades, an overall philosophy of best management practices has been developed under the theme of transportation asset management (TAM). Section 1103 of MAP-21 defines TAM to mean "a strategic and systematic process of operating, maintaining, and improving physical assets, with a focus on both engineering and economic analysis based upon quality information, to identify a structured sequence of maintenance, preservation, repair, rehabilitation, and replacement actions that will achieve and sustain a desired state of good repair over the lifecycle of the assets at minimum practicable cost." Using TAM methods and tools, preventive maintenance may be scheduled for a pavement, bridge, lock, or other structure to delay or prevent the development of more serious distress that would require pavement or structure replacement. Preventive actions can be less expensive to agencies and less disruptive to system users, particularly freight carriers who are typically among the first users who must be detoured around inadequately maintained facilities. Finally, TAM can be more expansively applied to the evaluation and implementation of a full range of potential new investments, including those related to safety, operations, environmental management, corridor management, and project/program delivery.

Even though the potential benefits of asset management practices are well understood, it has been a considerable challenge for transportation agencies to change existing practices to initiate, embrace, and ultimately integrate TAM methods and tools. The emergence of champion agencies using asset management principles has been limited to date, but the level of interest among State DOTs, Federal agencies, professional organizations, and the research community is increasing. Ultimately, the successful spread of best practices that incorporate asset management concepts through programs such as FHWA's Every Day Counts (EDC) will lead to more widespread use of TAM methods.

Freight movements are often associated with adverse environmental impacts. Increasing freight activity in urban areas could intensify the debate over land use and pollution. Without effective policies and regulations, growing freight movements will increase GHG and criteria pollutant emissions. Trucking, intermodal rail, waterborne transportation, and air cargo constitute significant sources of GHG emissions. Trucking accounts for about nine percent of all highway miles traveled, but it is the source of 20 percent of all transportation-sector GHG (see Figure 12). Freight on other modes accounts for an additional seven percent of transportation-sector GHG emissions.

Freight transportation is a source of air pollution that can be significant in large urban areas. Diesel exhaust is a source of criteria pollutants such as nitrogen oxide ($NO_{x)}$), particulate matter, and carbon monoxide emissions. Criteria pollutants adversely affect human health and the environment. Trucks, locomotives, vessels, and aircraft taxiing on the ground also emit volatile organic compounds that react with NO_x in the presence of sunlight to form ground-level ozone, which can have serious health effects and is regulated by the EPA as a criteria pollutant itself.

Trucking is the single largest national contributor to freight transportation-related air pollution. Compared to cars, heavy trucks emit larger amounts of toxic air pollutants. While trucks have made great strides in reducing emissions, the average diesel-fueled heavy truck emits more than twice as many hydrocarbons per mile and more than 15 times as much NO_x as the average passenger car. These emissions can impact human health, particularly in neighborhoods adjacent to heavily trafficked freight corridors.

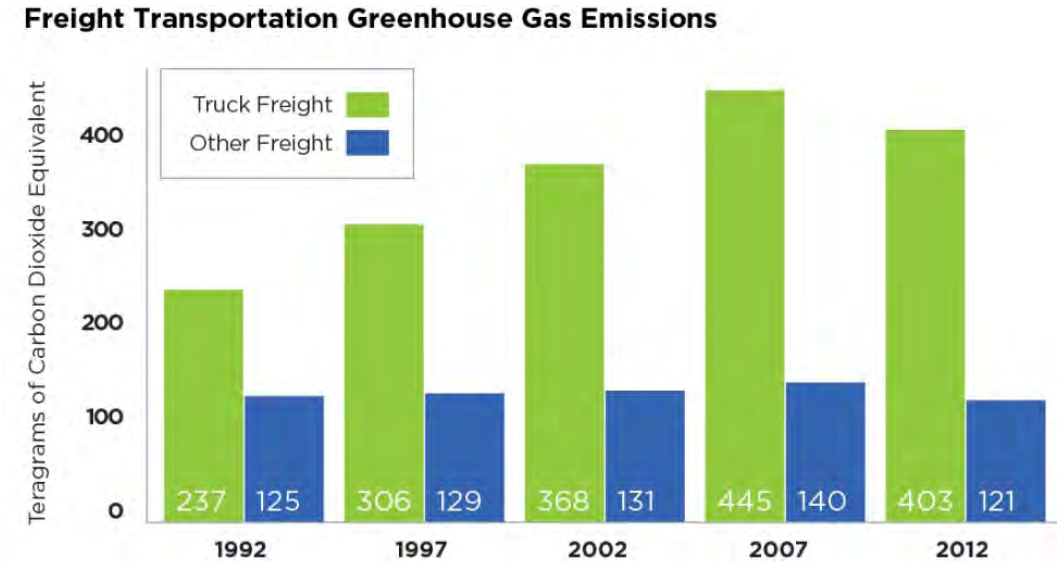


Figure 12. Freight Transportation Greenhouse Gas Emissions (Source: Beyond Traffic)

Resolving environmental and community-level impacts of freight projects can be contentious. Freight and freight-generating activities bring many economic benefits to a region. These benefits include employment associated with freight activity; income taxes for local, regional, and State governments; contributions to State and local economic growth; and lower costs for goods and services. At the same time, freight activities are also the source of adverse impacts on both the natural and built environments. These adverse impacts can be highly localized and might include freight vehicle and equipment emissions in proximity to residences and schools; facility and vehicle noise; light pollution; vibration; traffic congestion; water pollution; introduction of invasive species; damage to infrastructure; public safety issues; and visual and aesthetic concerns. These impacts often fall on disadvantaged communities located adjacent to industrial areas where housing is often more affordable.

U.S. DOT is committed to the principles of environmental justice, which include mitigating disproportionately high and adverse human health and environmental impacts, including social and economic impacts from freight activity. The costs and damage associated with adverse impacts of freight transportation on human populations and natural habitats, including endangered species, are sufficient reasons to take aggressive actions to mitigate these impacts. Mitigation of adverse impacts is also beneficial to the health of the freight system itself. Failure to address these impacts can lead to strong community opposition to freight projects and other difficulties in gaining permits for projects.

Federal laws and regulations seek to provide consistent standards across the nation and are often the most effective way to deal with adverse environmental and community impacts associated with freight.

In the area of environmental mitigation, EPA has a long and successful history for regulating vehicles for emissions reductions. Similarly, EPA and U.S. DOT have cooperated in establishing corporate average fuel economy standards for trucks and automobiles. Collectively, these efforts and additional efforts by some States and localities have led to remarkable reductions in emissions by freight vehicles over the last few decades, with immediate benefits for communities in proximity to freight activities. Through advancements in engine technology and fuel refinements, for instance, new diesel truck engines produce 98 percent fewer emissions of particulate matter and NO_x than similar engines manufactured before 1990. However, emission reduction benefits for communities in proximity to freight activities may be offset by future predicted increases in freight tonnage and traffic in these locations. While researchers have found that national fleet standards are among the most effective tools for reducing emissions, technological and operational strategies also play a key role.

FAA administers noise certification standards for aircraft. As technology has improved aircraft, noise levels have been reduced and FAA has required fixed-wing aircraft to meet more stringent noise standards over time. The new standards have allowed the overall fleet to become quieter, and aviation noise impacts on communities around airports have decreased overall. However, at some airports there have been increases in operations, flight procedure changes, and a shift to larger aircraft that continue to pose challenges. This is especially important given that express air-package services often operate during nighttime hours, when communities are particularly sensitive to noise.

State and local governments need to effectively coordinate. There are many areas where States and local governments have uncontested authority to restrict freight operations that adversely impact communities. These authorities include the implementation of restricted delivery hours (either in downtown areas or residential zones); designating truck routes; designating commercial loading zones or implementing parking restrictions; setting zoning requirements for the design of loading docks and off-street loading zones; and other actions. These governments can also introduce voluntary measures or technologies to provide real-time traffic and parking information, automated enforcement of parking or traffic regulations, toll collection, or automated access control. In many cases, these actions can do much to reduce local impacts, but they must be carefully designed and coordinated with actions by neighboring jurisdictions and authorities.

Failure to consider freight needs or to coordinate these needs among jurisdictions or to carefully navigate the impact of freight on neighborhoods, particularly lower-income communities, can result in unintended disruptions to freight movements and communities. Enhancing the safety and walkability of communities (e.g., by designing pedestrian-scale streets) may require careful planning to ensure access for larger freight vehicles. Situations in which local governments and special transportation authorities act independently of each other

can generate a complex operational and regulatory environment for freight carriers. This can lead to unavoidable encroachments by trucks into residential streets, such as when designated truck routes do not connect (or are marked inconsistently) from one jurisdictional boundary to another. Time-of-day delivery or other freight restrictions can affect the routing and scheduling of an entire shipment system. The role of a strong MPO, supported by effective outreach to the freight community, strong communication with affected jurisdictions and neighborhoods, good freight modeling and data, and incentives for jurisdictions to coordinate strategies, can do much to alleviate inefficiencies otherwise caused by different practices.

An effective way for local governments to mitigate adverse community impacts is to preclude them from occurring in the first place. At the local level, this can often be accomplished through informed land-use decisions and communication with the affected communities. If local land uses, including residential demographics, are well understood and mapped, placement of freight and non-freight facilities can be done with allowances for appropriate buffer zones and freight routes. This effort necessarily requires a look into the future. Planning today for the inclusion of future freight movement and its interaction with population growth in urban areas can lead to far fewer adverse impacts to local residents and the environment. As noted previously, however, local government decisions to re-zone land are often made without information about current freight activity and needs, much less future freight traffic flows or supply chain requirements. Gaining information of this type will in almost all cases require coordination with MPO, State, and national-level forecasts.

Our increasingly urbanized population poses challenges for first- and last-mile freight movements. Freight demand is expected to become more concentrated in large metropolitan areas where America's population is growing the fastest. Congestion in several metropolitan population centers is already severe and could become more extreme. Increasing freight demand in these densely populated areas will complicate first-mile movement of goods out of ports and manufacturing sites and last-mile movement of goods from freight hubs to their final destinations, which is often the least efficient portion of the supply chain for many goods. Increased population density and a changing urban landscape will require innovative approaches to last-mile delivery issues.

References to first- and last-mile freight movements can have different meanings depending on context. In some cases, such references are to highway intermodal connectors, which are roads that provide the connections between major rail, port, airport, and intermodal freight facilities and the NHS. The FHWA's officially designated network of NHS intermodal connectors accounts for less than one percent of total NHS mileage, but these roads are critical for the timely and reliable movement of freight. Alternatively, first- and last-mile freight movements may refer to networks of smaller roads that link major freight facilities to small producers, stores, and even residential areas where packages are delivered, or to short line railroads that link producers to mainline railroads. Whether at the intermodal connector or local levels, the condition and performance of first- and last-mile routes has important impacts on the efficiency of goods movement and therefore on the health of the economy.

Freight-related traffic can also contribute to delays and congested road conditions for passenger and emergency response vehicles. For example, highway-rail grade crossings can lead to lengthy delays in rural and urban areas. Traffic to and from ports and other major freight centers can increase traffic on local roads and affect neighboring communities through noise and air pollution. These issues may become more challenging as online shopping increases the portion of deliveries that are made directly to consumers' homes. The impacts of first- and last-mile freight movement are often of particular concern to communities located in proximity to freight activities. The challenge of delivering freight to dense urban areas will grow in importance as urban populations and deliveries increase.

II. D. Safety and security problems associated with freight movement and facilities

Safety

While the net benefit of new technologies should lead to a safer, more efficient, and secure transportation system, significant effort and resources will be required to address vulnerabilities raised by reliance on increasingly complex and interdependent transportation systems. Ensuring the safety, security, and resilience of these transportation systems will require a holistic consideration of security issues across the transportation enterprise, from systems engineering, to risk management by system administrators, to training and certification of system operators. Greater cooperation between national governments will also be essential in combatting breaches of security in transportation-related systems on a global basis. The sections below highlight key issues affecting the safety, security, and resilience of the nation's freight transportation system.

Trends over the last decades show impressive improvements in freight safety. There was a 27-percent increase in freight ton-miles for all surface modes between 1990 and 2011, but freight-related fatalities across all modes declined by 33 percent over that same period. However, there are still an array of safety issues that can arise from diverse sources such as interactions between roadway users; human and mechanical factors related to the vehicles in use; and types of commodity being carried. Furthermore, despite the downward trend in freight-related fatalities, freight still accounts for approximately 13 percent of all transportation fatalities. There were more than 4,500 freight transportation-related fatalities among all freight modes in 2013 (see Figure 13).

In 2013, 543 people died in incidents associated with freight rail, vessel, and pipeline operations. In 2013, 3,964 people were killed in crashes involving large trucks. Large trucks are less likely to be involved in crashes than passenger vehicles, but crashes involving trucks are more likely to be fatal. Approximately 88 percent of current fatalities in the freight transportation system are associated with crashes involving large trucks. It is important to note that the involvement of a freight vehicle or vessel in a fatal incident does not imply the vessel or vehicle caused the incident—in many cases (such as grade crossing collisions), the non-freight party is at fault.

Figure 13. Fatalities by Freight Transportation Mode: 1980, 1990, and 2000–2013 (Source: BTS)

	1980	1990	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Total transportation fatalities	**NA**	**47,483**	**44,463**	**45,020**	**45,292**	**45,121**	**45,028**	**45,641**	**45,061**	**43,347**	**39,542**	**35,978**	**35,034**	**34,568**	**35,699**	**34,509**
Total freight transportation fatalities	**7,489**	**6,461**	**6,079**	**5,897**	**5,768**	**5,773**	**5,992**	**5,991**	**5,851**	**5,551**	**4,484**	**3,611**	**4,286**	**4,340**	**4,462**	**4,507**
Freight as a share of total fatalities	**NA**	**13.6%**	**13.7%**	**13.1%**	**12.7%**	**12.8%**	**13.3%**	**13.1%**	**13.0%**	**12.8%**	**11.3%**	**10.0%**	**12.2%**	**12.6%**	**12.5%**	**13.1%**
Highway[1]	**5,971**	**5,272**	**5,282**	**5,111**	**4,939**	**4,989**	**5,195**	**5,213**	**5,027**	**4,822**	**3,821**	**3,050**	**3,686**	**3,781**	**3,944**	**3,964**
Large truck occupants	1,262	705	754	708	689	726	766	804	805	805	682	499	530	640	697	691
Others killed in crashes involving large trucks	4,709	4,567	4,528	4,403	4,250	4,263	4,429	4,409	4,222	4,017	3,139	2,551	3,156	3,141	3,247	3,273
Railroad	**1,365**	**1,095**	**717**	**729**	**725**	**683**	**690**	**682**	**723**	**635**	**575**	**481**	**519**	**497**	**478**	**509**
Train accidents	28	10	8	5	8	3	11	19	6	7	2	3	4	6	9	6
Highway-rail grade crossing[2]	821	624	353	326	288	262	299	289	295	252	220	166	187	189	169	156
Trespassers	426	426	328	373	399	395	355	349	411	354	330	291	309	280	286	322
Other incidents	90	35	28	25	30	23	25	25	11	22	23	21	19	22	14	25
Waterborne[3]	**134**	**85**	**42**	**50**	**92**	**89**	**84**	**80**	**82**	**78**	**80**	**67**	**62**	**50**	**30**	**25**
Freight	NA	NA	NA	NA	48	39	37	33	37	42	34	30	22	18	14	8
Industrial/ Other	NA	NA	NA	NA	44	50	47	47	45	36	46	37	40	32	16	17
Pipeline	**19**	**9**	**38**	**7**	**12**	**12**	**23**	**16**	**19**	**16**	**8**	**13**	**19**	**12**	**10**	**9**
Hazardous liquid pipeline	4	3	1	0	1	0	5	2	0	4	2	4	1	1	3	1
Gas pipeline	15	6	37	7	11	12	18	14	19	12	6	9	18	11	7	8

KEY: NA = not available.

[1] Large trucks have a gross vehicle weight rating at or above 10,000 pounds and include single-unit and combination trucks.

[2] *Highway-rail grade crossing* fatalities include freight train collisions with vehicles and people at all public and private highway-rail grade crossings.

[3] *Freight* includes barges, bulk carriers, general dry cargo ships, refrigerated cargo ships, roll-on/roll-off ships, tank ships, and towing ships. *Industrial/Other* includes fishing vessels, miscellaneous vessels, and offshore. Waterborne fatalities include only closed cases where vessels were involved in a marine casualty as of April 6, 2015. Open cases by year not included above: 2003 = 5, 2004 = 5, 2005 = 8, 2006 = 4, 2007 = 7, 2008 = 19, 2009 = 38, 2010 = 36, 2011 = 120, 2012 = 644, and 2013 = 727. Data prior to 2002 were tabulated using a different reporting system and are not directly comparable with later years.

NOTES: There are differences in definitions and reporting periods across modes due to regulatory and legal requirements.

SOURCES: Highway: U.S. Department of Transportation, National Highway Transportation Safety Administration, National Center for Statistics and Analysis, *Traffic Safety Facts, Large Trucks* and *Highlights* (annual issues). **Railroad:** U.S. Department of Transportation, Federal Railroad Administration, Office of Safety Analysis, available at http://safetydata.fra.dot.gov/officeofsafety/default.asp as of July 10, 2015. **Waterborne:** U.S. Department of Homeland Security, U.S. Coast Guard, Data Administration Division, *Marine Casualty and Pollution Data for Researchers* (April 6, 2015), available at homeport.uscg.gov as of July 2015. **Pipeline:** U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Office of Pipeline Safety, Accident and Incident Summary Statistics by Year, available at http://phmsa.dot.gov/pipeline as of March 2015.

Trucks carry the single largest share of the nation's freight, but even when adjusted for ton-miles of freight moved, the fatality rate associated with trucks is significantly higher than for other freight modes. A number of factors have accounted for fatalities and serious injuries associated with truck freight transportation, including driver fatigue, need for better traffic enforcement, insufficient public knowledge about sharing the road with trucks, inadequate maintenance of some heavy trucks, roadway characteristics such as sharp curves and narrow bridges, and the need for improved truck-safety technologies. Many trucking companies are working closely with government and labor representatives to address operator fatigue issues, instill a culture of safety among operators, and establish the use of performance-based risk management programs that can further improve safety records. In the long term, the introduction of connected vehicle and autonomous technologies in both trucks and cars should lead to further improvements in safety.

A critical area of safety is the need for truck parking, which is a national problem that exists at all hours of the day. U.S. DOT has led several analyses on truck parking challenges and supported several truck parking development initiatives, including capital projects and operational improvements through intelligent transportation systems (ITS). MAP-21 established Jason's Law, which requires U.S. DOT to analyze truck parking availability and to develop improved mechanisms for evaluating parking needs. U.S. DOT will also continue to work with public and private stakeholders to evaluate the truck parking challenges and identify solutions.

U.S. DOT agencies have implemented a number of important truck safety rules in recent years. For example, in December 2010, the Federal Motor Carrier Safety Administration (FMCSA), the principal agency charged with Federal oversight of truck and bus safety, introduced the Compliance, Safety, Accountability program, which includes a Safety Management System database of all carrier inspections and violations. This system provides FMCSA and its State partners with a better view into how well large commercial motor vehicle carriers and drivers are complying with safety rules and enables them to intervene earlier with those who are not. U.S. DOT will also strive to facilitate the nationwide adoption of new automated technologies that will help to reduce the role of human error, drugs and alcohol, as well as distraction when operating trucks and automobiles—sources of most truck-related and other on-road fatalities.

The rail safety record has been improving. Fatalities associated with freight rail operations as of 2013 are down more than 63 percent since 1980, 54 percent since 1990, and 29 percent since 2000. Fatalities related to grade crossing collisions are down sharply since 1980 and have fallen by 56 percent since 2000. Trespassing fatalities, which accounted for almost two-thirds of all freight rail-related fatalities in 2013, are down 24 percent since 1990, although most of the progress in this area occurred before 2000. The implementation of positive train control (PTC), continued improvements to highway-rail grade crossings, safer rail cars, and improved techniques to reduce trespassing on rail tracks should contribute to increasing safety in railroad operations.

As noted above, transportation of oil by rail has increased dramatically since 2008, when less than one percent of oil was transported by rail. Today, more than 10 percent of all crude oil is

shipped by rail. Even so, crude oil still accounts for less than two percent of all car loads moved by Class I railroads. Recent derailments of tank cars highlight rising safety and environmental risks associated with increasing transportation of oil by rail. As more oil has moved by rail, accidents involving oil spills have increased.

Safety incidents on the freight transportation system are generally low-frequency, but can be high-consequence events. For example, whereas freight train derailments resulting in loss of life are uncommon, they can result in significant losses of life if the cargo carried is flammable or toxic**.** The derailment of a train transporting 30,000 gallons of crude oil in Lac-Mégantic, Quebec, in July 2013 resulted in 47 fatalities and destroyed 30 buildings in the town center. As domestic oil production increases, the industry relies more heavily on rail for transporting oil, and the total number of accidents involving trains carrying oil is increasing as well, raising the possibility of a high-consequence event at some time in the future.

To reduce the risk to public safety from the hauling of oil, U.S. DOT issued a new rule (jointly announced with Canadian regulators) on May 1, 2015, for railroads hauling crude oil and ethanol. This rule requires trains to be equipped with new brake systems and sturdier tank cars be built for hauling oil, ethanol, and other flammable liquids. It also prescribes upgrades for an estimated 154,500 tank cars already carrying flammables.

The U.S. water transportation and pipeline modes collectively were associated with fewer than 40 fatalities in 2013. Fatalities of any volume are unacceptable, and there is the need to guard against rare but high-consequence events, such as the natural gas pipeline explosion that took place in San Bruno, CA in 2010, killing eight individuals or the loss of the container ship El Faro off the coast of the Bahamas on October 1, 2015. The Pipeline and Hazardous Materials Safety Administration (PHMSA) has initiated several programs and initiatives to reduce safety incidents involving pipelines, including its 811 – Call Before You Dig damage prevention program.

Unlike the surface modes, air cargo is carried by both cargo-only and passenger carriers, so it is appropriate to consider the safety record of all U.S. carriers operating under 14 Code of Federal Regulations (CFR) 121 (Part 121).[15] The safety record of all U.S. air carriers (both scheduled and unscheduled) operating under Part 121 has been good over the last decade. Since 2001, there have been relatively few Part 121 aviation fatalities, and in some years, there have been none (see Figure 14). The FAA has an extensive safety regulatory program. A recent example of a rulemaking related to cargo safety is the Transportation of Lithium Batteries final rule released by PHMSA, in close collaboration with the FAA. This rule better ensures that lithium cells and batteries are able to withstand normal transportation conditions and are packaged to reduce the possibility of damage that could lead to an unsafe situation.

[15] Roughly 15-20 percent of total domestic cargo revenue ton-miles are carried by passenger carriers. See http://www.transtats.bts.gov/freight.asp.

	Fatalities 2000 through 2014														
	For U.S. Air Carriers Operating Under 14 CFR 121, Scheduled and Nonscheduled Service (Airlines)														
	2000	2001*	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Aboard	92	525	0	21	14	20	49	1	1	51	2	0	0	9	0
Total	92	531	0	22	14	22	50	1	3	52	2	0	0	9	0
Source: NTSB															
Notes	2014 data are preliminary.														
	Since March 20, 1997, aircraft with 10 or more seats used in scheduled passenger service have been operated under 14 CFR 121.														
	Years followed by the symbol * are those in which an illegal act was responsible for an occurrence in this category. These acts, such as suicide, sabotage and terrorism are included in the totals for accidents and fatalities but are excluded for the purpose of accident rate computation.														

Figure 14. Fatalities 2000 through 2014 for U.S. Air Carriers Operating under 14 CFR 121

Security

The increasing interdependencies among the nation's physical and cyber infrastructures make our freight transportation system particularly vulnerable to human-engineered events of terrorism. Indeed, while many emerging technologies could have major safety and security benefits when applied to transportation, in some cases they could also create new vulnerabilities. The safe operation of the FAA's NextGen air traffic control system, PTC, autonomous vehicles, and ITS all depend on secure, reliable digital communication infrastructure and systems. Attacking a conventional train signal system requires actually being there in person; however, in theory, a transportation control system that is connected to the Internet can be attacked from anywhere in the world. For example, one teenager in Poland hacked into a tram system causing multiple derailments. Frequent hacks into highway dynamic message signs are another demonstration of the vulnerability of electronic systems. Preventing these attacks will be a major challenge for transportation agencies and companies.

There are also risks to a future where transportation services depend heavily on access to GPS technologies for operations. Disruptions to service can be created by weather events, jamming and spoofing by hackers, and excess system demand. The government agencies responsible for GPS and the transportation firms and agencies that depend on those systems will need to consider ways to mitigate the risks of service disruptions. This may require making decisions on how best to maintain legacy navigation systems and capabilities, and or/building redundancy.

Inherent cultural and institutional barriers exist that hinder the freight industry's willingness to report—and consequently its ability to solve—cybercrimes. U.S. ports are at particularly high risk of cybersecurity threats due to their roles as gateways into the country, the value of cargo they handle, and the amount of data they store regarding the content and location of that cargo. Additionally, because the nation's exports and imports are highly concentrated in a limited number of ports, they are higher-risk targets for acts of terror and sabotage. Cybercrime often goes unreported because:

- Realizing a cyberattack has occurred and assessing it takes time.

- Sharing information surrounding a cyberattack exposes critical soft spots in existing security coverage.
- Publicity surrounding a cyberattack may impact an entity's stock or business and increase the risk of a follow-up attack.

For example, hackers penetrated the Port of Antwerp in 2011. The attack was not noticed until 2012 and it was not widely reported in the media until 2013. In that instance, drug traffickers had recruited hackers to penetrate the port's computer system so that smugglers were able to move goods through the port and delete evidence that the cargo was there.

Additionally, increasing automation of vehicles, vessels, trains, and aircraft can result in diminishing ability and awareness among operators to respond to incidents when they occur. There have been several high-profile incidents where overreliance on automation features has led to safety failures. Greater information flows from on-board or independent systems can also create distractions that increase the risk of operator error. Finally, the increasing complexity of automated and interconnected systems may make it more difficult for those responsible for the safety and security of these systems to detect defects or vulnerabilities in advance of potentially harmful events. Even so, the benefits of advanced technologies appear well worth pursuing if prudent security measures are adopted. Deployments of advanced technologies such as automatic braking and lane-departure warning systems in trucks and automobiles are already yielding important safety benefits, and more safety and efficiency benefits are widely expected as the pace of automation accelerates.

In addressing existing and anticipated security vulnerabilities, it is important to ensure that the implementation of new security protocols does not exacerbate other issues affecting the efficiency of freight flows, particularly international trade. For example, the trucking industry has concerns regarding the time required to obtain or renew Transportation Worker Identification Credential (TWIC) cards necessary for drivers to have unescorted access to secure areas of port terminals, airports, and other transportation facilities. Maritime workers are also subject to TWIC requirements. The security threat assessments that are a condition of obtaining a TWIC, while implemented to make the transportation system more secure, often eliminate potential job candidates based on prior arrests, convictions, or other legal problems and consequently contribute to persistent workforce shortages. In some cases, these prior arrests or legal problems may not mean that an employee is a risk to national security. The security protocols surrounding workforce credentialing represent a significant barrier to intermodal transfers and cross-modal operations, particularly during this period of truck driver shortages.

Additionally, statutory requirements for screening 100 percent of U.S.-bound maritime containers before they are loaded aboard a ship would, if implemented, slow cargo movements, raise the cost of shipping, and favor major hubs or facilities that can achieve economies of scale in screening. In a May 5, 2014, letter to Congress, the DHS Secretary wrote that this "highly improbable, hugely expensive" mandate would hurt trade and is "not the best use of taxpayer resources to meet this country's port security and homeland security needs."

This issue remains unresolved. In developing security protocols, there is a significant need to achieve balance between preventing and mitigating security threats and ensuring the smooth and efficient movement of freight. New technologies and screening methods may make more efficient screening possible in the future.

Resilience

Resilience describes the ability of the transportation system to anticipate, prepare for, and adapt to changing conditions and to withstand, respond to, and recover from disruptions. High-impact disruptions can be caused by natural disasters, structural failures, or human-engineered events. Disruptions include isolated events, such as a hurricane or earthquake, as well as long-term climate impacts such as sea-level rise.

The U.S. freight transportation system is confronted with significant potential vulnerabilities and risks including:

- **Aging infrastructure:** The World Economic Forum recently rated the overall quality of our transportation infrastructure at 16th in the world, behind such countries as the Netherlands, Japan, France, Germany, Portugal, and Spain. Our ranking has fallen steadily over the past decade as the rest of the world has outpaced us in infrastructure spending as a share of GDP. One-quarter of the bridges in our road transportation system are either structurally deficient or functionally obsolete, which may require posting of vehicle weight or height limits that restrict truck use and concentrate freight vehicles on other congested corridors.

- **Increasing frequency and severity of weather events:** Extreme daily precipitation events are projected to occur more frequently across the nation for the latter part of this century—some climate change projections indicate these events could occur up to five times as often.

- **Escalating threats of climate change:** Future impacts of climate change, including more severe extreme weather, hotter average annual temperature, and sea-level rise will challenge the resilience of the transportation system, including highways, bridges, public transportation, ports, airports, and waterways. Investing in infrastructure that can accommodate these effects is challenging, however, because of a significant range of estimates about the severity, frequency, and timing of future adverse events, and the high cost of building structures to withstand extreme events.

- **Presence of major trading centers and freight hubs in coastal areas:** The location of major trading centers along sea coasts is of particular concern in light of sea-level increases associated with climate change and global warming. In such instances, vast areas of infrastructure are at major risk if sea levels rise rapidly over the next century.

- **Severe congestion:** By 2040, nearly 30,000 miles of our busiest highways could be clogged on a daily basis if no actions are taken to address traffic congestion. Today, truck congestion wastes $27 billion in time and fuel annually. Congestion is also experienced on freight rail, port, pipeline, and at locks in the inland waterway system. Without investment and new technologies this congestion is expected to become more severe.

- **Dependence on foreign companies for overseas trade:** Approximately 98 percent of U.S. overseas trade by weight is carried on foreign-flag vessels. This level of dependence on foreign companies renders the U.S. economy vulnerable to severe service disruptions during periods of geopolitical conflict or to decisions by foreign governments that affect their shipping policies.

The impacts of Superstorm Sandy, which made landfall over New York and New Jersey in October 2012 as a post-tropical cyclone, highlight the need for building the freight transportation system's resilience and robustness, particularly in light of more extreme hurricane events likely in the future as a result of global warming. The National Hurricane Center ranked Superstorm Sandy as the second-costliest tropical cyclone on record, with cost estimates of damage to New Jersey's transit, road, and bridge system totaling $2.9 billion and transportation infrastructure damage totaling $2.5 billion in New York. The storm caused another $5 billion in damage to the New York Metropolitan Transportation Authority. Impacts to the region's freight system included:

- **Rail impacts:** High water and downed trees across rail lines, coupled with commercial power outages, affected rail signals and the ability of customers to receive shipments for several days after the storm.

- **Air impacts:** There were significant impacts to all three major New York airports from Superstorm Sandy. Despite the extensive impacts, however, commercial operations were able to begin again just two days after the storm made landfall at John F. Kennedy International Airport and Newark Liberty International Airport. Due to more extensive flooding, commercial operations at LaGuardia Airport began three days after the storm made landfall.

- **Port impacts:** Marine terminals closed beginning 24 hours before the storm and remained closed until nearly a full week after the storm. Several port facilities, including container and oil terminals, did not resume full operations once waterways were open due to facility damage and loss of power.

- **Truck impacts:** With the exception of the Lincoln Tunnel, all bridges and tunnels providing access to New York City were closed due to the storm. Several roadways sustained significant flooding and remained closed for several days. With no subways or commuter trains running in the immediate aftermath of the storm, traffic gridlock in

New York City was widespread, particularly at major entry points and arteries, which also impeded freight movement.

These impacts affected the transportation of online and in-store holiday merchandise, food and perishable goods, and petroleum products throughout the region. They highlight the need for building the freight transportation system's resilience and robustness to withstand future and potentially more severe disruptions.

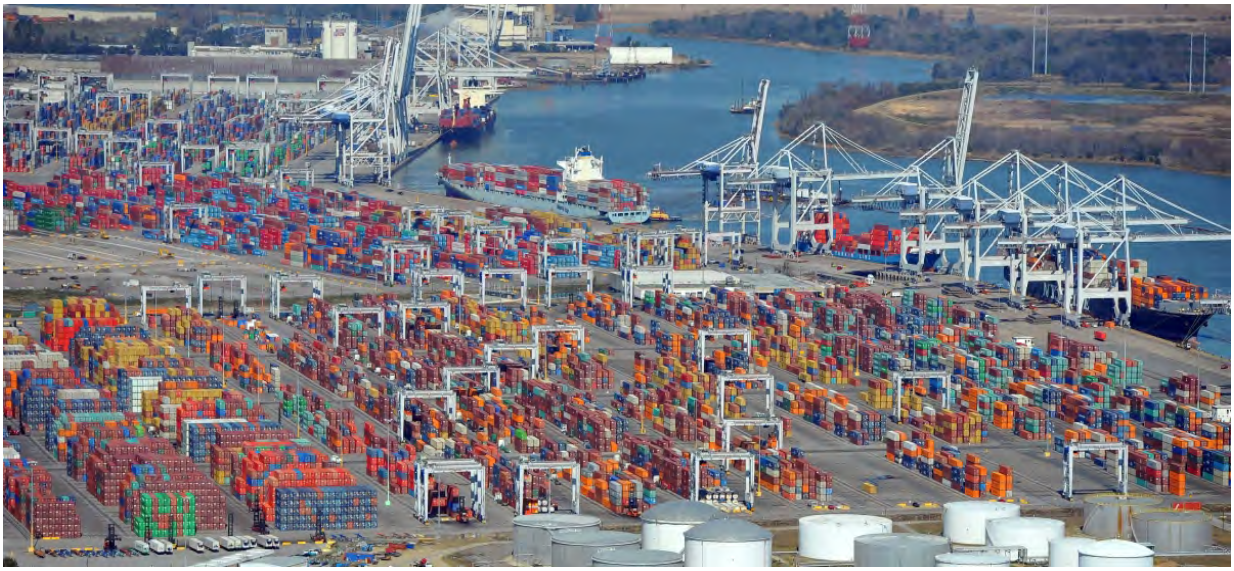
II. E. International trade and our freight transportation system

With advances in transportation, information, and communication technologies, our global economy is becoming increasingly interconnected. Growth in international trade has major implications for the freight system. Our ability to compete in a global economy depends on maintaining a world-class freight system.

***Our economy is becoming increasingly reliant on international trade*.** Over the past 30 years, international trade has increased at a much faster rate than overall economic growth. U.S. exports nearly doubled in value over the past decade. Total exports and imports of goods were valued at $3.9 trillion in 2013, as compared to the 2013 U.S. GDP of $16.7 trillion. In the next 30 years, it is reasonable to expect that imports and exports will continue to grow with major implications for America's ports, airports, border crossings, and the overall freight transportation system.

Economic expansion in developing countries in Asia, Africa, and Latin America is shifting world production and creating new trade patterns. International trade is growing in importance and putting increasing pressure on our ports, border crossings, airports, and intermodal facilities to efficiently move imports and exports to market. Major infrastructure investments, such as the widening of the Panama Canal and the rapid growth of deep-draft ports in Asia, are also affecting increasingly complex global supply chains and value chains.

Increasing international trade, changing trade patterns, and growing ship sizes will affect some of our ports. Shifting trade patterns will affect traffic levels in our largest coastal ports. The expansion of the Panama Canal and growth in manufacturing in South Asia and Africa may lead to increased and consolidated container traffic at some of the Gulf and East Coast ports, even as West Coast container traffic continues to grow as well. Panama Canal improvements may also increase traffic at some West Coast ports by enabling more efficient commerce between those ports and the Caribbean, and ports on the Atlantic coast of South America.



SHIPPING CONTAINERS AT THE PORT OF SAVANNAH, GEORGIA. THE PORT OF SAVANNAH IS HOME TO THE LARGEST SINGLE CONTAINER TERMINAL IN NORTH AMERICA. WITHOUT UPGRADES IN NEARBY TRANSPORTATION INFRASTRUCTURE, THE PORT'S EFFORTS TO MOVE MORE CARGO IN AND OUT WILL ONLY CONFRONT BOTTLENECKS IN THE SURROUNDING FREIGHT NETWORK. (SOURCE: HTTPS://WWW.TRANSPORTATION.GOV/FASTLANE/PORT-SAVANNAH-FREIGHT-CONNECTOR-AWAITS-FUNDING)

From 2006 to 2011, the number of calls to U.S. ports by the largest container ships (those with capacities of 5,000 TEUs or greater) increased by nearly 80 percent. These large container ships accounted for 27 percent of total container ship calls at U.S. ports in 2011, up from 17 percent in 2006. Larger container ships cost more to run on a per-ship basis, but are less expensive on a per-container basis when fully loaded. As a result, these ships will tend to favor ports that are able to more efficiently off-load and transfer large amounts of containers within their facilities in a short period of time.

Approximately 72 percent of freight tons in U.S. foreign trade moved by water in 2014. Deep-water ports on every coast handle this trade and are a vital link in our globalized economy. Ports along the Gulf Coast, such as South Louisiana, Houston, New Orleans, and Beaumont, handle much of the petroleum, gas, steel, coal, and grain entering and leaving the U.S. Three ports—Los Angeles, Long Beach, and New York/New Jersey—handle 49 percent of all foreign containerized trade entering and exiting the United States. In fact, 10 ports account for 65 percent of our nation’s containerized international trade. (See Figure 15.)

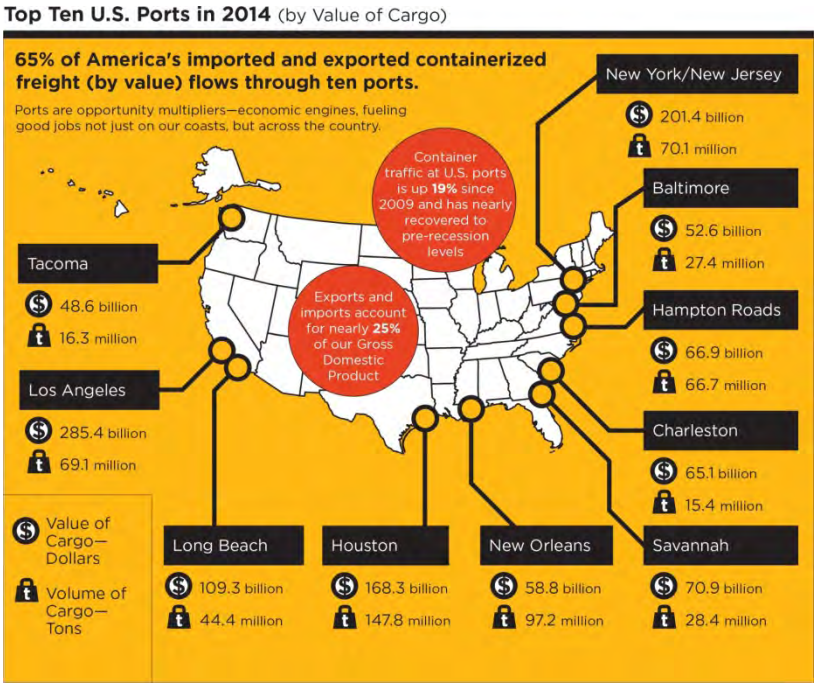


Figure 15. Top Ten U.S. Ports in 2014

(Source: Beyond Traffic)

The concentration of container traffic at these ports makes our international freight system vulnerable to disruption. If security incidents were to lead to heightened inspection requirements, they could further slow goods movement at ports of entry. Labor disputes and natural disasters also have the potential to impact operations at key ports and disrupt the national economy, as occurred at the U.S. West Coast ports in 2002 and 2015.[16] Many of the nation's large ports are modernizing their facilities to attract new-generation container ships such as by automating and expanding container yards, purchasing larger and more ship-to-shore cranes, improving their ability to transfer cargo across all modes (from ships to roads and

[16] In 2014, contract negotiations at U.S. West Coast ports for new six-year collective bargaining agreements between the International Longshore and Warehouse Union and the Pacific Maritime Association (which represents oceangoing shipping lines and the companies that load and unload cargo at terminals ports) were not concluded prior to the expiration of the predecessor contracts in July 1, 2014. Work continued at the West Coast ports without contracts, but subject to rising levels of port congestion as both sides continued to negotiate—the source of the congestion is disputed. By February 2015, weekend and holiday lockouts of many longshoremen followed, though major ports were not fully closed. A Federal mediator was unable to broker an agreement, leading the Obama administration to dispatch Labor Secretary Thomas Perez to oversee talks. This resulted in a resolution in February 2015. The disruptions at the West Coast ports caused major adverse consequences to shippers throughout the U.S. and the world, including to U.S. agriculture exports. In January 2015, the U.S. economy posted a 15 percent drop-off in year-over-year exports. The actual costs of the disruptions to the economy are still being tabulated.

rail connections, and vice versa), deepening channels and raising bridges. They are also implementing shared chassis pools, extending port gate hours, encouraging staggered container pickup times, and taking other steps to make better use of existing port capacity. Several of these ports have invested in intermodal connections, which are enabling them to better compete with other U.S. ports or with deep-water ports in neighboring and nearby countries.

Land border crossings are also facing rising commercial traffic and congestion resulting from increased trade. The North American Free Trade Agreement enabled burgeoning U.S. trade with Mexico and Canada (currently the nation's number three and number one trading partners, respectively) and led to increased traffic at border crossings. From 1995 to 2014, trade by land modes between the U.S. and Mexico more than quadrupled from approximately $100 billion to $440 billion per year. Most of this trade moves by truck, although the movement of international rail freight has also increased over this time period. In 2014, more than eight million loaded truck containers and two million loaded rail containers crossed our borders with Canada and Mexico. As a result of heavy traffic and limited infrastructure and staff capacity at border crossings, trucks and trains frequently face long waits.

TRUCKS QUEUING AT THE OTAY MESA-TIJUANA INTERNATIONAL BORDER CROSSING. CROSS-BORDER MOVEMENT OF GOODS AND PEOPLE IS VITAL TO THE NATIONAL AND NORTH AMERICAN ECONOMIES. HOWEVER, CONGESTION AT BORDERS CREATES DELAYS THAT RESULT IN INEFFICIENT GOODS MOVEMENT AS WELL AS ADVERSE ENVIRONMENTAL AND COMMUNITY IMPACTS. THE OTAY MESA-TIJUANA CROSSING IS A CARGO AND PASSENGER VEHICLE CROSSING BETWEEN THE U.S. AND MEXICO SOUTH OF SAN DIEGO, CALIFORNIA; IT IS THE LARGEST COMMERCIAL CROSSING ALONG THE CALIFORNIA/MEXICO BORDER. OVER THE LAST SEVERAL DECADES, THE CROSSING HAS EXPERIENCED INCREASED CONGESTION AND DELAYS. (SOURCE: HTTP://OPS.FHWA.DOT.GOV/PUBLICATIONS/FHWAHOP09032/ AND HTTP://OPS.FHWA.DOT.GOV/PUBLICATIONS/FHWAHOP10051/FHWAHOP10051.PDF)

II. F. New technologies affecting freight

The freight industry is undergoing a technological revolution as information and communications technologies are applied to optimize global supply chains. These technologies and business innovations are accelerating trends that have led to 30 years of declining logistics and transportation costs relative to GDP. Major trends in freight technology include:

- The use of enhanced logistics management systems to analyze demand and quickly adjust supply chains.

- Advances in automated vehicle, aircraft, and terminal technologies that could transform the freight industry.

- Technological advances that will lead to continued improvements in safety, emission reductions, and productivity.

Recent technological advances in data analysis systems, automatic vehicle and container identification systems, and satellite navigational systems will improve the efficiency of freight movement throughout the supply chain. These technologies will improve situational awareness, allowing for real-time decentralized access to location and operational data. Understanding where a package is at any given time (whether it is in the air, at port or airport, or on rail, water, or road) and when it is due to arrive allows for more efficient movement of freight across modes and through processing facilities.

Manufacturers and shippers are using enhanced data systems to access real-time information that allows them to analyze demand and adjust supply chains more quickly than ever before. The transition to just-in-time inventory systems (which move goods only as they are required for production or consumption) has contributed to leaner and more complex supply chains, allowing significant cost savings. Previously, companies held sufficient inventory for all scenarios. Just-in-time delivery coordinates supply and demand so that the chosen materials arrive when needed for use. Pull inventory systems can cut costs considerably for high-value goods, but depend on a constant and predictable flow of information and goods. Just-in-time supply chains may increase the frequency of shipments, particularly in congested urban areas, and increase focus on maintaining system reliability and efficiency.

Advances in information and communications technologies will improve data collection and analysis capabilities of logistics firms and freight planners, enabling faster and more accurate analysis of freight routes, travel times, and infrastructure capacity. Information of this type is often private but, if business sensitive components could be removed, it would be invaluable to public sector transportation planners in their efforts to identify and correct modal bottlenecks and first-and-last mile congestion. Safety will also improve by automating and expediting inspection processes, and by allowing for improved monitoring of security information.

Access to accurate and timely geospatial, oceanographic, and meteorological environmental information can also increase the safety and efficiency of marine operations. Many of the top U.S. ports listed in Figure 15 as well as other ports have partnered with the National Oceanic and Atmospheric Administration on installing real-time environmental information systems, also known as the Physical Oceanographic Real-Time System (PORTS®) to provide information about changing environmental conditions. This can affect the transport of cargo in and out of ports, and by having this information can increase both safety and efficiency of transport. For example, having an extended high-water event may reduce delays in bringing larger vessels into or out of port, while a low-water event, which could lead to vessel groundings, can be avoided by having real-time water level information. Other real-time information such as currents, waves, weather, bridge clearance, and visibility all aid in safe and efficient navigation. PORTS®

and the overall concept of supporting Precision Navigation by providing and forecasting highly accurate information on environmental conditions can reduce risk and increase efficiency of operations in increasingly highly congested ports that are increasingly constrained by wider, deeper "ultra large" tanker and container ships.

***Rapid advances in automated vehicle and terminal technologies may soon transform the freight industry*.** Autonomous vehicles will not suddenly appear on our roads, but automated features that promise to improve the safety and efficiency of freight movement are already being introduced. On trucks, these include sensor systems that combine adaptive speed control, automatic braking, lane-departure warning systems, and vehicle-to-vehicle communications. In time, autonomous trucks and cars that share information with each other stand to offer the potential of greatly increasing vehicle safety and throughput on existing infrastructure. Widespread deployment of autonomous freight vehicles would only occur after the safety of such vehicles has been thoroughly demonstrated.

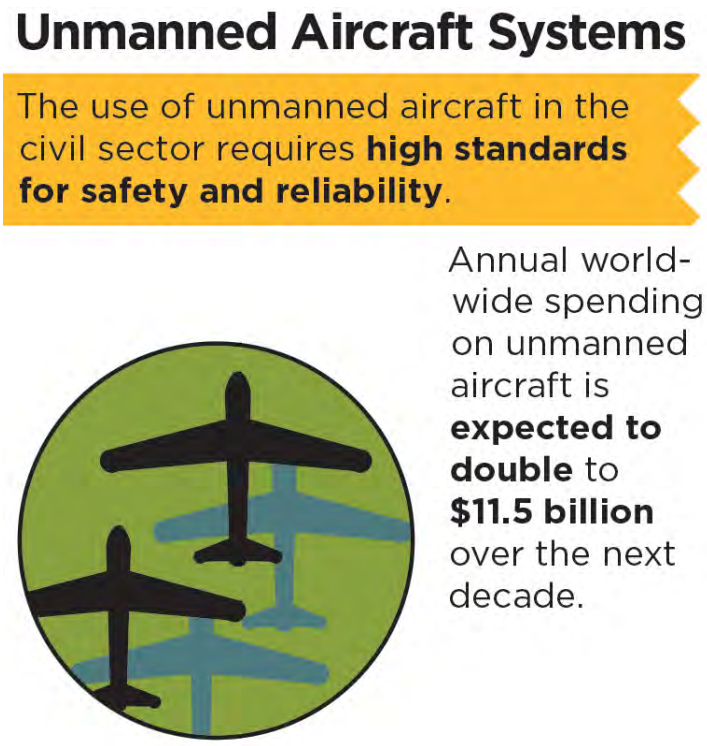
Railroads continue to invest in greater velocity and fluidity of their networks, including through the modernization and automation of rail intermodal yards and implementation of PTC and precision-dispatching technologies. By significantly lowering costs and delays associated with transferring containers between trains or between modes, these facilities will also make intermodal transportation on rail more price competitive with trucking, particularly over distances of less than 750 miles.

Marine vessel automation has been increasing efficiency and decreasing average crew size over the last several decades. It may be possible to operate newer and larger vessels with much smaller crews over the next few decades. While this reduces the costs of shipping freight, it could also mean that a ship's crew has less ability to quickly respond to incidents such as spills, groundings, and piracy. Ships could, however, eventually be piloted remotely with a small crew of technicians onboard in case of mechanical failure or for entering and departing ports.

Automation is already affecting ports. At major container ports around the world, the process of transferring containers from ships to docks, trucks, and trains is becoming highly automated, reducing reliance on human operators. Major American container ports will need to invest more in automation to compete; several major terminals are in the process of doing so.

Advanced automation will increase productivity in the freight industry and change the skills needed to work in freight. Technologies that affect driving, vehicle maintenance, warehousing, and loading will alter professional development needs, and employment levels—and will affect the average income for transportation workers. The labor required to load and unload vessels and freight vehicles has been decreasing since motorized equipment became available. With the advent of containerization and computers, even more cargo transfer functions have been automated across the modes. These trends continue to enhance the efficiency of cargo handling operations and are leading to changes in the skillsets needed from the workforce. Technological advances reduce the cost of shipping per unit and increase flexibility, while also providing the needed capacity expansion to handle larger vehicle and vessel sizes.

Unmanned aircraft systems may present both opportunities and risks. The private sector sees a wide range of potential uses for unmanned aircraft systems, including freight delivery. Google, Amazon, and DHL have been evaluating delivery of packages by unmanned aircraft for several years. Remotely piloted drone deliveries could be used to provide high-value and urgent cargo to remote and hard-to-reach locations within a decade. For example, unmanned aircraft deliveries could be used to deliver medical supplies to remote areas after a natural disaster. Delivery by unmanned aircraft in dense urban environments presents significantly greater security, safety, and privacy risks, and will likely take longer to develop.



(Source: Beyond Traffic)

New freight technologies will offer safety, environmental, and quality of life benefits for the public, as well as help increase the effective capacity of transportation infrastructure. PTC, for example, uses GPS and continuous data communications to enable direct control of train speed and distance from other trains. This control contributes not only to safety improvements (elimination of some human factor failures), but also the improvements in capacity and fuel efficiencies across all modes. For example, FAA's NextGen air traffic control system will continue to provide benefits to commercial aircraft operators, including dedicated air-cargo carriers. NextGen, as envisioned, will revamp the current system and result in shortened flight routes, reduced fuel burn, time-savings, fewer traffic delays, increased airspace capacity, and better-managed airspace.

Section II References

The references listed below supported development of content for Section II and/or are specifically mentioned in Section II. The references are listed in alphabetical order. This ordering does not necessarily correspond to when the references were used or mentioned in the NFSP's text. Not all materials consulted are listed here.

- Airports Council International-North America. 2014. "Chapter 4 - Air Cargo Facility Analysis," Air Cargo Guide. p. 7. (http://www.aci-na.org/content/air-cargo-guide)
- American Association of Port Authorities. 2012. U.S. Seaports, Private-Sector Partners Plan to Invest $46 Billion by 2017 in Port Infrastructure. June 18. (http://www.aapa-ports.org/Press/PRdetail.cfm?itemnumber=18583)
- American Association of Port Authorities. 2013. U.S. Waterborne Foreign Trade 2013 Port Ranking by Cargo Volume. December. (http://www.aapa-ports.org/Industry/content.cfm?ItemNumber=900)
- American Association of Port Authorities. 2014. Maritime Security. March.
- American Association of Port Authorities. 2015 U.S. Public Port Facts. (http://www.aapa-ports.org/Industry/content.cfm?ItemNumber=1032)
- American Association of State Highway and Transportation Officials. 2012. Freight Rail Bottom Line Report. p. 89.
- American Association of State Highway and Transportation Officials. 2004. Heavy Trucks Descriptions of Strategies. (http://safety.transportation.org/htmlguides/hvy_trks/description_of_strat.htm)
- American Association of State Highway and Transportation Officials. 2013. Waterborne Freight Transportation Bottom Line Report. June 3. pp. 5-8.
- American Highway Users Alliance. 2004. Unclogging America's Arteries, 2004.
- American Road and Transportation Builders Association. 2015. Looming Highway Trust Fund Crisis: Impact on State Transportation Programs. May 27. (http://www.artba.org/wp-content/uploads/2014/03/ARTBA-HTF-Uncertainty-Report-05-27-2015.pdf)
- American Transportation Research Institute. 2013. FPM Congestion Monitoring at 100 Freight Significant Highway Locations. July 08. (http://atri-online.org/2013/07/08/atri-100-freight-locations/)
- American Transportation Research Institute. 2013. Freight Performance Measures Analysis of Freight-Significant Highway Locations. July 08. (http://atri-online.org/2013/07/08/atri-100-freight-locations/)
- Association of American Railroads. 2013. Total Annual Spending: 2012 Data. pp. 6-8. (https://www.aar.org/Fact%20Sheets/Safety/2013-AAR_spending-graphic-fact-sheet.pdf)
- Association of American Railroads. 2014. Railroads and Coal. July. pp. 1, 6, 11.
- Bonney, Joseph. 2013. "Delays in TWIC Renewals Threaten Drayage Operations," Journal of Commerce. April 25.

- Bureau of Transportation Statistics. 2012. Commodity Flow Survey. (http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/commodity_flow_survey/index.html)
- Bureau of Transportation Statistics. 2014. Table 1-50: U.S. Ton-Miles of Freight (BTS Special Tabulation) (Millions). 2014. (http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_statistics/html/table_01_50.html)
- Bureau of Transportation Statistics. 2015. National Transportation Atlas Database. (http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_atlas_database/index.html)
- Bureau of Transportation Statistics. Sources of Aviation Data. (http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/subject_areas/airline_information/sources/index.html)
- Cadle Creek Consulting on behalf of Federal Railroad Administration. 2008. Rail Trespasser Fatalities: Developing Demographic Profiles. March.
- CalSTA-Caltrans. 2014. California Freight Mobility Plan. December. pp. 88, 190, 205-206, 211. (http://www.dot.ca.gov/hq/tpp/offices/ogm/california_freight_mobility_plan.html)
- Caltrans. 2014. "Appendix I-4: Trend Analysis: Cross-border Issues." California Freight Mobility Plan. pp. 2-3.
- Cambridge Systematics, Inc. 2005. An Initial Assessment of Freight Bottlenecks on Highways. Prepared for the Federal Highway Administration. October. pp. ES-2, 6-1, 6-2.
- Cambridge Systematics, Inc. 2007. Commission Briefing Paper 4L-03: Implications of Investments Targeted at Reducing Highway Passenger and Freight Bottlenecks. January 13.
- Cambridge Systematics, Inc. 2007. Commission Briefing Paper 4L-07: Implications of Investments Targeted at Reducing Rail, Rail/Highway, Rail/Port, Highway/Port, Rail/Barge, and Highway/Barge Freight Bottlenecks. March 13. (http://transportationfortomorrow.com/final_report/volume_3_html/technical_issues_papers/paper3e44.htm?name=4l_07)
- Cambridge Systematics, Inc. 2007. National Rail Freight Infrastructure Capacity and Investment Study. Prepared for the Association of American Railroads. September. pp. 3-1, 4-1 to 4-2.
- Center for Transportation Analysis. 2015. Freight Analysis Framework Data Tabulation Tool. Oak Ridge National Laboratory. (http://faf.ornl.gov/fafweb/Extraction0.aspx)
- Committee on Homeland Security, United Sates House of Representatives. 2007. "Testimony of Bethann Rooney." Homeland Security Failures: TWIC Examined, Full Hearing First Session. Serial No. 110-81. October 31.
- Congressional Research Service. 2014. U.S. Rail Transportation of Crude Oil. December 4. (https://www.fas.org/sgp/crs/misc/R43390.pdf)
- Cooper, Michael. 2014. Autonomous Freight Drones: A Revolution in Air Cargo? Chapman Freeborn, Corp. June 6. (http://www.chapman-freeborn.com/blog/autonomous-freight-drones-a-revolution-in-air-cargo/)

- Donath, Max, Daniel Murray, and Jeffrey Short. 2005. Homeland Security and the Trucking Industry. American Transportation Research Institute. July. p. 7.
- Doyle, William P. 2014. Commission Briefing on Mid-Atlantic and Northeast Port Congestion Forum. The Federal Maritime Commission Newsroom. November 13. (http://www.fmc.gov/news/default.aspx?ArticleId=2080)
- Energy Information Administration. 2014. 2% of natural gas pipeline capacity into the Northeast could be bidirectional by 2017. December. (http://www.eia.gov/todayinenergy/detail.cfm?id=19011#)
- Farrell, David J. Jr. 2007. "America's Marine Highway a/k/a Short Sea Shipping: A Win-Win Proposition," Benedict's Maritime Bulletin. Third/Fourth Quarter. p. 224.
- Federal Aviation Administration. 2014. Airports that Reported All-Cargo Landings in Calendar Year 2013. (http://www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/passenger/media/preliminary-cy13-cargo-airports.pdf)
- Federal Highway Administration. 2011. "Peak-Period Congestion on the National Highway System: 2011 Map." Freight Management and Operations. (http://www.ops.fhwa.dot.gov/freight/freight_analysis/nat_freight_stats/nhspperiodcong2011.htm)
- Federal Highway Administration. 2012. FHWA Freight and Land Use Handbook. pp. ES-1, 1-32. (http://www.ops.fhwa.dot.gov/publications/fhwahop12006/fhwahop12006.pdf)
- Federal Highway Administration. 2012. Highway Statistics, 2012, Table HM-10. (https://www.fhwa.dot.gov/policyinformation/statistics/2012/)
- Federal Highway Administration. 2012. Recurring Traffic Bottlenecks: A Primer. p. 3, 16-18.
- Federal Highway Administration. 2013. 2013 Conditions and Performance: Chapter Overviews, Chapter 8.
- Federal Highway Administration. 2013. Freight Facts and Figures 2013. pp. 3, 4, 63.
- Federal Highway Administration. 2013. Urban Freight Case Studies - New York City, Major Findings and Conclusions. (http://ops.fhwa.dot.gov/publications/fhwahop10019/majorfindings.htm)
- Federal Highway Administration. 2014 Draft Highway Primary Freight Network Maps and Tables. (http://ops.fhwa.dot.gov/freight/infrastructure/pfn/index.htm)
- Federal Highway Administration. 2014. Megaregions and Multi-Jurisdictional Planning. July 16. (http://www.fhwa.dot.gov/planning/megaregions/)
- Federal Highway Administration. 2015 "About FAF3."Freight Analysis Framework Version 3. September 30. (http://faf.ornl.gov/fafweb/Highlights.aspx)
- Federal Highway Administration. 2015 Congestion Mitigation and Air Quality Improvement Program (CMAQ). January 27. (http://www.fhwa.dot.gov/environment/air_quality/cmaq/)
- Federal Highway Administration. 2015. Railway-Highways Crossing (Section 130) Program. August 7. (http://safety.fhwa.dot.gov/xings/)
- Federal Highway Administration. 2015. Historical Monthly VMT Report. March 11. (http://www.fhwa.dot.gov/policyinformation/travel_monitoring/historicvmt.cfm)

- Federal Highway Administration. Transportation Infrastructure Finance and Innovation Act (TIFIA), Innovative Program Delivery. (http://www.fhwa.dot.gov/ipd/tifia/)
- Federal Motor Carrier Safety Administration. 2014. The Motor Carrier Safety Assistance Program 2011 Annual Report to Congress. A Report Pursuant to Section 31102(e) of Title 49 United States Code. November. p. 1.
- Federal Motor Carrier Safety Administration. How Does CSA Work. (https://csa.fmcsa.dot.gov/about/csa_how.aspx)
- Federal Railroad Administration. 2012. Railroad Infrastructure Trespassing Detection Systems in Pittsford, New York. DOT/FRA/ORD-06/03-1. November.
- Frittelli, John. 2015. CRS Insights: Rail Safety Efforts Miss Leading Cause of Fatalities. April 2. (IN10257)
- Government Accountability Office. 2013. GAO-13-198 TWIC Reader Pilot Review. pp. 1, 2.
- Government Accountability Office. 2014. Maritime Security: Progress and Challenges with Selected Port Security Programs. June. pp. 1, 17.
- Government Accountability Office. 2015. Transportation Safety: Federal Highway Administration Should Conduct Research to Determine Best Practices in Permitting Oversize Vehicles. GAO-15-236. February.
- Government Accountability Office. Draft Report on Freight Congestion SOF. pp. 7-8.
- Hartgen, David T. Ph.D., P.E., Fields, M. Gregory and San José, Elizabeth. 2013. 20th Annual Report on the Performance of State Highway Systems, Policy Study 406. July. p. 60.
- Hentschel, John J. et al. 2009. Charting the Future of Baltimore's Industrial Waterfront. Abell Foundation. January. p. 70.
- House Transportation & Infrastructure Committee. 2014. The Water Resources Reform and Development Act of 2014. pp. 12, 13, 14.
- ICF International, quoted by Hannah Northey. 2014. Energy Sector Needs Infrastructure, Truck Fleet Management. May 8.
- Illinois Department of Transportation. 2012. Draft Freight Mobility Plan. November. pp. 69, 110-119.
- INRIX. 2014. Traffic for Public Agencies: North America. (http://www.inrix.com/resources/traffic-for-public-agencies-na/)
- INRIX. 2014. Worst Corridors: Urban Mobility Scorecard Annual Report. Selected for the United States. (http://www.inrix.com/worst-corridors/)
- International Air Transport Association. 2015. Air Cargo–An Historical Perspective. p. 19.
- Journal of Commerce. 2014. Global Logistics Focus 2014 Special Report. Journal of Commerce, September 15. pp. 5A-10A.
- Lakshmanan, T.R. and Anderson, William P. 1999. Trade and Transportation Integration: Lessons from North American Experience. Center for Transportation Studies. Boston University. Boston, MA 02215. pp. 2, 14, 19, 21, 22, 23.
- Marine Link. 2014. AAPA Applauds Port Infrastructure Funding. January 17. (http://www.marinelink.com/news/infrastructure-applauds363145.aspx)

- Metaxatos, Paul and Sriraj, P.S. 2012. Advancing Pedestrian Safety at Rail Grade Crossings. Urban Transportation Center. University of Illinois at Chicago. Revised: November 2012.
- National Cooperative Freight Research Program. 2012. Report 14, Guidebook for Understanding Urban Goods Movement. p. 3.
- National Cooperative Freight Research Program. 2012. Report 16, Preserving and Protecting Freight Infrastructure and Routes. pp. 20, 24, 26, 40.
- National Cooperative Freight Research Program. 2013. Report 23, Synthesis of Freight Research in Urban Transportation Planning. pp. 2, 3, 4, 7, 14, 18, 49, 63, 65, 66, 67, 75, 78.
- National Cooperative Highway Research Program. 2007. Report 594, Guidebook for Integrating Freight into Transportation Planning and Project Selection Processes. (http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_594.pdf)
- National Cooperative Highway Research Program. "Scenario Planning for Freight Transportation Infrastructure Investment." Report 750, Strategic Issues Facing Transportation. p. 76. (http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_750v1.pdf)
- National Cooperative Highway Research Program. 2011. Report 685, Strategies to Attract and Retain a Capable Transportation Workforce. pp. 29-30.
- National Cooperative Highway Research Program. 2013. Synthesis 439, Use of Transportation Asset Management Principles in State Highway Agencies. p. 33.
- National Freight Advisory Committee. 2014. Final NFAC Recommendations Part I. April 29. p. 13.
- National Surface Transportation Policy and Revenue Study Commission. 2007. Transportation for Tomorrow. December. Vol II, pp. 3-11.
- National Traffic Safety Institute. 2015. Truck Safety Tips. (https://ntsi.com/quick-links/safety-articles/truck-safety/)
- Pipeline and Hazardous Materials Safety Administration. 2014. Federal/State Authorities: State Programs. (http://phmsa.dot.gov/portal/site/PHMSA/menuitem.6f23687cf7b00b0f22e4c6962d9c8789/?vgnextoid=ad1420072ebb9110VgnVCM1000009ed07898RCRD&vgnextchannel=a576ef80708c8110VgnVCM1000009ed07898RCRD&vgnextfmt=print)
- Pipeline and Hazardous Materials Safety Administration. Annual Report Mileage Summary Statistics. (http://www.phmsa.dot.gov/pipeline/library/datastatistics/pipelinemileagefacilities)
- Port of Tacoma. 2012. Emissions report shows significant maritime-related clean air progress for Puget Sound region. October 29. (http://portoftacoma.com/news-releases/2012-10-29/emissions-report-shows-significant-maritime-related-clean-air-progress)
- RAND Corporation. 2012. Characterizing Uncertain Sea Level Rise Projections to Support Investment Decisions. July. p. 11.
- RAND Corporation. 2014. Autonomous Vehicle Technology, a Guide for Policymakers.
- Rodrigue, Jean-Paul. 2014. The Geography of Transport Systems: The "Last Mile" in Inland Freight Distribution. (https://people.hofstra.edu/geotrans/eng/ch5en/conc5en/lastmile.html)
- Schneider, Keith. 2014. "Despite Delays and Billions in Overruns, Olmsted Locks and Dam Project Rolls On." Circle of Blue. September 17.

(http://www.circleofblue.org/waternews/2014/world/despite-delays-billions-overruns-olmsted-locks-dam-project-rolls/)

- Surface Transportation Board. Economic Data – Carload Waybill Sample. (https://stb.dot.gov/stb/industry/econ_waybill.html)
- Szakonyi, Mark. 2014. "Raising the Roof on Freight: Residents' fight against a CSX tunnel through the nation's capital is just part of a broader pushback on freight." Journal of Commerce. July 21. pp. 46-47.
- Szakonyi, Mark. 2014. "Water Resources Bill: What It Means for US Ports." Journal of Commerce. May 16.
- Taxpayers for Common Sense. 2014. Water Resources Reform and Development Act of 2014: Commentary and Analysis. May 19.
- Today's Trucking. 2013. Hours of Service: Canada/U.S. Comparison. April 19. (http://www.todaystrucking.com/hours-of-service-canada-us-comparison)
- Transportation Learning Center/Jobs for the Future. 2014. DRAFT Strengthening Skills Training and Career Pathways across the Transportation Industry. October 7. pp. 3, 14, 71, 73.
- Transportation Research Board. ACRP 03-24 Guidelines for Air Cargo Facility Planning and Development. (http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=3039)
- Transportation Research Board. 2015. Special Report 315: Funding and Managing the U.S. Inland Waterways System: What Policy Makers Need to Know. p.66.
- U.S. Committee on the Marine Transportation System. 2015. A Compendium of Federal Programs in the MTS. p. 7. (http://www.cmts.gov/downloads/Narrative_Compendium_MTS.pdf)
- United Nations Economic Commission for Europe. 2014. Diesel Engine Exhausts: Myths and Realities. p. 14.
- United States Army Corps of Engineers. 2010. IMTS Capital Projects Business Model Final Report, April 13. p. vii.
- United States Army Corps of Engineers. Navigation. (http://www.usace.army.mil/Missions/CivilWorks/Navigation.aspx)
- United States Army Corps of Engineers. Waterborne Commerce Statistics Center. (http://www.iwr.usace.army.mil/About/TechnicalCenters/WCSCWaterborneCommerceStatisticsCenter.aspx)
- United States Department of Agriculture. 2015. Transportation of U.S. Grains: A Modal Share Analysis, 1978- 2013. June. (http://www.ams.usda.gov/sites/default/files/media/ModalJune2015.pdf)
- United States Department of Energy. 2014 Memorandum regarding QER Public Stakeholder Meeting: Rail, Barge, and Truck Transportation. Quadrennial Energy Review Task Force Secretariat and Energy Policy and Systems Analysis Staff. Chicago, Illinois. August 8. p. 5.
- United States Department of Justice. 2014. Department of Justice Will Not Challenge Proposed Chassis Use Agreement. Press Release. September 22. (http://www.justice.gov/atr/public/press_releases/2014/308827.htm)

- United States Department of Transportation. 2014. Draft Freight Transportation Conditions and Performance Report. September.
- United States Department of Transportation. 2015. Build America Transportation Investment Center (BATIC). (http://www.transportation.gov/buildamerica)
- United States Department of Transportation. 2015. "Project to speed Port of Savannah freight connections waits for funding." Fastlane: The Official Blog of the U.S. DOT. February 17. (https://stage1.dot.gov/fastlane/port-savannah-freight-connector-awaits-funding)
- United States Department of Transportation. 2015. Beyond Traffic: US DOT's 30 Year Framework for the Future. pp. 17, 50, 57, 257-258, 297. (https://www.transportation.gov/sites/dot.gov/files/docs/Draft_Beyond_Traffic_Framework.pdf)
- United States Department of Transportation. 2015. Rule Summary: Enhanced Tank Standards and Operational Controls on High-Hazard Flammable Trains. May 1. (http://www.transportation.gov/mission/safety/rail-rule-summary)
- United States Department of Transportation. MAP-21, Sec. 1108. SURFACE TRANSPORTATION PROGRAM.
- United States Department of Transportation. SAFETEA-LU Sec. 1601.
- United States Department of Transportation. Transportation and Climate Change Clearinghouse. (http://climate.dot.gov/index.html)
- United States Environmental Protection Agency. 2002. Health Assessment Document for Diesel Engine Exhaust. EPA/600/8-90/057F.
- United States Maritime Administration. 2011. America's Marine Highway Report to Congress. April. p. 64.
- United States Maritime Administration. 2013. Panama Canal Expansion Study, Phase I Report: Developments in Trade and National and Global Economies. November. pp. 4-5, 37, 133.
- Washington State Department of Transportation. 2014. Washington State Freight Mobility Plan. October. pp. 73, 110. (http://www.wsdot.wa.gov/freight/freightmobilityplan.htm)
- Washington State Department of Transportation. 2015. Identifying the 'First and Last Mile Connector Routes.' (http://www.wsdot.wa.gov/freight/econcorridors)
- Western Organization of Resource Councils. 2014 Heavy Traffic Ahead. February. pp. 2, 21. (http://heavytrafficahead.org/pdf/Heavy-Traffic-Ahead-web.pdf)
- World Bank. 2009. Air Transport: Air Freight. August. (http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTTRANSPORT/EXTAIRTRANSPORT/0,,contentMDK:22502536~pagePK:210058~piPK:210062~theSitePK:515181,00.html)

Section III: Strategies

Across the freight transportation system, different types of bottlenecks disrupt or hinder the safe and efficient movement of goods:

- **Infrastructure bottlenecks** are physical locations (e.g., bridges, urban highway interchanges, border crossing facilities, at-grade railroad crossings, truck gates at ports) where the free flow of goods is disrupted. Infrastructure bottlenecks may be recurring, meaning they appear in the same place on a predictable schedule—such as rush-hour congestion that occurs each weekday along a particular segment of a road or highway. Infrastructure bottlenecks may also be non-recurring, meaning they appear on unpredictable schedules but are most likely to occur at specific locations—such as a particular section of a multilane highway subject to frequent crashes.

- **Institutional bottlenecks** prevent effective decision-making within transportation institutions, agencies, or organizations. Institutional bottlenecks hinder stakeholders' abilities to effectively plan, oversee, manage, or invest in the freight transportation system, thereby impeding the safe and efficient movement of goods. For example, some public sector transportation project review processes are not well aligned and could be better coordinated to expedite implementation of projects that specifically benefit goods movement. Institutional bottlenecks may also include incompatible trading partner regulations and standards governing freight system operations, which render cross-border trade inefficient.

- **Financial bottlenecks** present challenges to making adequate, strategic, and effective investments in the freight transportation system. For example, there is currently no Federal source of funding dedicated to multimodal freight projects; furthermore, freight projects do not always compete well for public funding resources that are already quite limited. Financial bottlenecks make it difficult to properly maintain the existing freight transportation system and ensure a robust system that adequately and safely serves the needs of future generations.

Addressing these bottlenecks requires close coordination, communication, and collaboration among the public and private sectors. The sections below detail strategies U.S. DOT is undertaking, or may consider undertaking in the future, in collaboration with other partners to address each type of bottleneck. U.S. DOT may be able to implement some of the future recommended strategies within existing statutory frameworks and using existing resources. Implementing other recommended strategies may require statutory changes, technological innovations, enhanced data, new partnerships, dedicated and adequate funding, or other types of resources.

MAP-21 National Freight Policy (NFP) Goals and U.S. DOT Performance Measures

The strategies listed in the sections below will help meet the goals established under MAP-21's NFP (see sidebar, right). This policy states in part that: "It is the policy of the United States to improve the condition and performance of the national freight network to ensure that the national freight network provides the foundation for the United States to compete in the global economy and achieve [its goals.]"

While individual strategies may focus on one mode, it is important for U.S. DOT to ensure that the Department as a whole takes a multimodal perspective to strategically advance a broad suite of strategies.

In addition to recommending strategies to address the three types of bottlenecks, U.S. DOT is proposing in this Plan a series of national performance objectives and performance measures (see Appendix B). These objectives and measures will ensure accountability of U.S. DOT if the recommended strategies listed in this Plan are implemented and funded. Except in cases where statutory authority already exists that directs States to participate in performance measurement (e.g., pavement and bridge performance, freight on interstates), the goals, objectives, and measures listed in this Plan are intended to inform progress at a national level and do not impose new requirements, restraints, or conditions on States, Tribal governments, MPOs, local governments, private sector companies, or other non-Federal entities.

MAP-21 NFP Goals

Goal 1: To invest in infrastructure improvements and to implement operational improvements that strengthen the contribution of the national freight network to the economic competitiveness of the United States; reduce congestion; and increase productivity, particularly for domestic industries and businesses that create high-value jobs.

Goal 2: To improve the safety, security, and resilience of freight transportation.

Goal 3: To improve the state of good repair of the national freight network.

Goal 4: To use advanced technology to improve the safety and efficiency of the national freight network.

Goal 5: To incorporate concepts of performance, innovation, competition, and accountability into the operation and maintenance of the national freight network.

Goal 6: To improve the economic efficiency of the national freight network.

Goal 7: To reduce the environmental impacts of freight movement on the national freight network.

U.S. DOT will review the recommended strategies included in this Plan with relevant Federal, State, Tribal, MPO, local government, and other stakeholders to ensure the strategies support comprehensive progress toward the NFP goals. U.S. DOT will modify the strategies as necessary to reflect stakeholders' feedback.

III. A. Strategies to Address Infrastructure Bottlenecks

Infrastructure bottlenecks cause problems for freight transportation in all transportation modes. This section summarizes existing strategies and tactics the U.S. DOT is undertaking, or could undertake, to address infrastructure bottlenecks (see Appendix C for relationship of strategies to MAP-21 national performance goals). This section also presents case studies to help illustrate successful implementation of specific strategies across the nation.

A.1. Reduce congestion to improve performance of the freight transportation system

The number of locations affected by congestion-related delays is increasing, reflected in congested rail and highway access to ports, border crossings, and other areas. This is especially true in many of the nation's urban areas, but this phenomenon is also occurring with increasing frequency in suburban and rural areas. Congestion impacts all users of the national transportation system through lost time and wasted fuel. These impacts are difficult for shippers and transportation companies to accommodate. Frequently, added costs are either absorbed by companies or else passed to the consumer. Furthermore, when goods do not reach the public and businesses on time, this places burdens on the nation's economic health and imperils future growth. Congestion can also lead to adverse safety, environmental, and other types of issues, as well as adverse community impacts.

A.1. Case Study Example:

Increasing Rail Capacity and Reliability through the Chicago Region Environmental and Transportation Efficiency Program in Illinois

CREATE is a $3.8 billion cooperative project involving U.S. DOT, Illinois DOT, Chicago DOT, six major North American freight rail carriers and two passenger rail carriers to resolve rail conflicts and increase rail capacity, speed, and reliability in the Chicago area.

CREATE separates freight and passenger trains at six key junctions and eliminates 25 road/rail grade crossings by creating overpasses or underpasses at rail intersections. Fifty miles of new track will link yards and create a second east-west route across the city, building redundancy into the overburdened system.

Established more than a decade ago, the program has completed close to half of the planned 70 projects throughout the region. So far the projects have helped to reduce the average time it takes to pass through the Chicago Rail Terminal from 48 hours to 32 hours.

--From Beyond Traffic, page 53

U.S. DOT has worked extensively to advance and implement strategies that reduce congestion across the entire transportation system including the freight system. There are many examples of these efforts. For example, U.S. DOT administers the TIGER program, which provides discretionary grants to transportation projects across the country, including highway, port, and railroad freight projects. Through the first six rounds, the TIGER program has awarded $1.13 billion to 72 projects that primarily improve freight movement near our ports and on our rails. This figure does not include hundreds of millions more in roadway improvements that benefit the movement of freight by truck.

U.S. DOT's ITS Joint Program Office (JPO) supports a number of initiatives designed to use ITS technologies to mitigate congestion and help vehicle operators avoid areas experiencing congestion. For example, the ITS JPO Smart Roadside Initiative, which is coordinated by multiple modal administrations within U.S. DOT, supports using various types of wireless technologies to seamlessly share data between commercial vehicles moving at highway speeds and infrastructure. This initiative will help facilitate the mobility of commercial vehicles, enabling them to move more quickly through roadside inspections, avoid hindering other types of highway traffic, and expedite movement of goods overall. The ITS JPO also awards grants to communities across the nation to assist them in congestion reduction strategies.

U.S. DOT identifies and shares noteworthy congestion mitigation practices and examples from across the nation as part of its Congestion Reduction Toolbox.[17] Many of the practices and examples included in this toolbox relate to freight movement. There are many other U.S. DOT programs that seek to reduce vehicular traffic congestion, including transit projects that also have important benefits for freight transportation, although freight may not be the primary justification for such programs.

As part of the FPM program described in Section II, FHWA uses actual truck probe data from over 600,000 GPS-equipped trucks to measure freight highway congestion. These trucks provide billions of position signals that FHWA analyzes to determine truck freight performance, both for routine monitoring and for ad hoc analysis to understand truck movements and impacts, such as when there is an incident that compromises the highway network. This information helps to identify areas of greatest need for investments or other actions and has supported State and local transportation decision-makers to more effectively program funding to address freight bottlenecks.

Some tactics that U.S. DOT can implement to reduce congestion and improve the freight transportation system's performance include:

- **Work with private sector stakeholders and other partners to make strategic investments in technology research that support congestion mitigation and help facilitate overall freight flows**. As part of this, U.S. DOT should help prioritize solutions that will have the most significant impact on relieving congestion. For example, carriers, freight forwarders, and importers currently use an electronic manifest (e-Manifest) system to electronically transmit advance commercial information to Canadian and U.S. Customs and Border Protection (CBP), but this system currently does not process empty loads. Enabling e-Manifest to process empty loads could help streamline and speed processing of freight across borders to ease congestion in these areas.

- **Expedite development and deployment of existing programs or initiatives that seek to relieve congestion and reduce freight delays**. For example, NextGen is a wide-ranging

[17] Available at http://www.fhwa.dot.gov/congestion/toolbox/.

FAA initiative to transform the air transportation system through a combination of technology, procedures, training, and policies. NextGen involves upgrading from the earlier ground-based radar navigation system to satellite-based navigation technology. This will greatly improve the precision of air traffic control operations and allow planes to fly more direct routes and closer together, saving fuel and reducing delays.

- **Identify and share best practices relating to the use of low-cost measures to alleviate traffic congestion; encourage adoption or implementation of these measures where and when appropriate.** These low-cost measures, which can be implemented on urban highways, navigation locks, or other facilities, may be particularly important given that there are limited resources for making large-scale transportation capacity improvements. They can also be useful in alleviating congestion until such time as the potential of automated technologies to increase throughput and improve reliability on existing infrastructure capacity is better understood.

- **Identify and share best practices for utilizing existing capacities of all modes to increase efficiencies and alleviate congestion; encourage adoption or implementation of these practices where and when appropriate**. For example, FHWA is piloting research efforts to test off-hours delivery of goods in urban areas that have experienced growing or recurring congestion issues. The Maritime Administration (MARAD) implemented the Marine Highway Program to expand use of the inland rivers and coastal and intracoastal waterways to transport freight and mitigate landside congestion, among other objectives. The Federal government can work with private sector partners and others to explore and encourage utilization of the nation's marine highways as a congestion relief strategy.

U.S. DOT will work with its State and local partners to implement the above tactics for this strategy by incentivizing interdisciplinary, multimodal collaboration with public and private sector stakeholders.

A.2. Improve the safety, security, and resilience of the freight transportation system

Ensuring the safety, security, and resilience of freight transportation is of paramount concern to U.S. DOT. In addition to protecting human life, a safe, secure, and resilient freight transportation system is less prone to disruptions caused by crashes or infrastructure failures caused by natural and manmade disasters. These and other types of disruptions slow the flow of goods across the supply chain and may create new safety or security issues. The Department as a whole is already undertaking many different types of efforts to improve and address safety, security, and resilience for the freight transportation system. Some examples of efforts that seek to make regulatory changes are listed below:

- **FMCSA has implemented new regulations to address concerns about driver fatigue** (research shows that truck driver fatigue is one of the most common factors in semi-truck accidents and fatalities). FMCSA is also evaluating and considering potential

development of a "Beyond Compliance" program. This program would recognize and reward carriers that voluntarily adopt safety requirements exceeding those in current regulations. FMCSA expects that, if implemented, this program could help improve commercial motor vehicle safety by reducing the number and severity of crashes.

- **Final Rule issued on electronic stability control systems for heavy vehicles.** In June 2015, the National Highway Traffic Safety Administration (NHTSA) issued a final rule to require full-stability systems on truck tractors and certain buses with a gross vehicle weight rating of greater than 26,000 pounds. This type of system will protect against both rollovers and loss-of-control incidents such as jackknifes, potentially preventing from 1,424 to 1,759 crashes, 505 to 649 injuries, and 40 to 49 fatalities per year.[18]

- **U.S. DOT is working to address truck parking needs.** In response to the requirements of MAP-21 Section 1401 (Jason's Law), U.S. DOT is working with public and private stakeholders to better identify truck parking needs and implement solutions to enable truck drivers to rest safely. On August 21, 2015, FHWA released the "Jason's Law Truck Parking Survey Results and Comparative Analysis," a national survey of truck parking needs. This survey found that most States report having truck parking shortages occurring at all times of the day on every day of the week. On the same date, U.S. DOT also announced the formation of a National Coalition on Truck Parking through which States and other stakeholders will participate in a dialogue to develop an action plan for truck parking solutions.[19]

- **Final Rule issued on enhanced tank car standards and operational controls for High-Hazard Flammable Trains (HHFT).** In May 2015, PHMSA released its final rule governing the transportation of flammable liquids by rail (primarily crude oil and ethanol) on HHFT. The rule stipulates that new tank cars constructed after October 1, 2015, must meet design and performance requirements for a new U.S. DOT-specified class, the DOT-117. Older tank car designs must be replaced within specified timelines. Crude unit trains of 70 or more cars operating faster than 30 mph must feature electronically controlled pneumatic braking systems. Speed limitations and other provisions also apply. This rule will greatly increase the safety of crude oil shipments by rail.[20]

Other ongoing efforts are focusing on stakeholder coordination and communication to improve freight transportation safety and security, such as:

[18] U.S. DOT/NHTSA, Final Rule: Federal Motor Vehicle Safety Standards; Electronic Stability Control Systems for Heavy Vehicles, 80 FR 36049, June 23, 2015.
[19] U.S. DOT Press Release, USDOT 'Jason's Law' Survey Reaffirms Nationwide Truck Parking Needs, August 21, 2015.
[20] Rule Summary: Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains. Additional information available at: http://www.transportation.gov/mission/safety/rail-rule-summary

- **U.S. DOT will engage with DHS partners to align credentialing and inspection requirements**, particularly with regard to ports and marine vessels, to ensure consistency and the secure, seamless, and unimpeded movement of freight between modes.

- **Fund Operation Lifesaver**, a national nonprofit organization that administers a public education program about grade-crossing safety and prevention of trespassing along rail lines. This organization seeks to educate the public about the potential dangers of trespassing along railroad rights-of-way.

- **Advance resilience strategies**. The U.S. DOT 2014 Climate Adaptation Plan (CAP) lists actions the Department will take to integrate consideration of climate impacts and adaptation into its planning, operations, policies, and programs. Through the CAP, U.S. DOT seeks to ensure transportation infrastructure, services, and operations remain effective in current and future climate conditions. U.S. DOT will also work to include climate variability and change impact considerations in asset management systems and ensure that transportation plans and projects address potential climate impacts to protect Federal investments.

There are additional initiatives or strategies that U.S. DOT could implement to address the safety, security, and resilience of the freight transportation system. Some examples are listed below:

- **Identify and share lessons learned relating to railroad safety mitigation**; for instance, explore the efficacy of using surveillance equipment linked to automatic warnings to reduce trespassing incidents and associated fatalities.

- **Consider implementation of new regulations to replace and improve outdated rules relating to freight vehicle operating safety,** particularly where new regulations might facilitate efforts to deploy autonomous or automatic technologies that would improve safety and efficiency of freight delivery.

- **Identify and promote strategies that support more resilient supply chains**. Seek legislative authority to require that infrastructure vulnerability and resilience assessment be part of State and MPO long-range planning. U.S. DOT should also require States and MPOs to consider whether proposed projects improve the resilience and reliability of the transportation system.

A.3. Facilitate intermodal connectivity

Almost all consumer goods travel on trucks for at least one component of their journey. However, moving goods from point of production to consumer often requires the use of two or more different freight transportation modes. For example, many consumer goods are produced overseas; these goods must then be transported by ship or plane to a port or airport, respectively. From there, goods must travel by rail, truck, water or a combination of modes to reach the consumer. Materials moved at some point by pipeline may also require the use of trucks, barges, or railcars for some components of their journeys. Intermodal connectivity is critical to ensure the safe, resilient, and efficient flow of freight movement across the overall freight transportation system.

A.3. Case Study Example:
Improving the Port of Seattle in Washington

Our nation's economy depends on the efficiency of port facilities to keep goods moving in and out of the country. However, growth in international trade and the expanding size and capacity of containerships will lead to greater congestion at America's seaports and intermodal facilities. American port authorities are taking steps to prepare for expected increases in demand. For example, the Port of Seattle, which recently formed a Seaport Alliance with the Port of Tacoma, received a $20 million TIGER grant from the U.S. DOT to make strategic investments that will help Seattle maintain its competitiveness with American and Canadian ports.

Seattle/Tacoma is a key stop on the trade corridor between East Asia and the United States. Although the port handles roughly 5,000 containers per day, its facilities are in need of repair. In light of this fact, the port plans to use the TIGER grant funding to strengthen an aging dock and extend a dock crane rail. These improvements will increase the port's capacity and efficiency while allowing it to accommodate two post-Panamax size vessels at the same time. The port will also use the TIGER grant to construct a new truck ramp with more direct access to the port's intermodal yard. Together, these investments will improve safety conditions, speed up the intermodal transfer of goods, and relieve highway congestion in and around the port.

-- From Beyond Traffic, page 261

The passage of the Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991 highlighted the importance of intermodal connectors to the overall transportation system and economy. ISTEA made intermodal connectors an important part of Federal transportation policy and emphasized the critical nature of intermodalism. Subsequent surface transportation reauthorization legislation has continued to encourage an intermodal, and also multimodal, system for passenger and freight transportation.

In the past, U.S. DOT has facilitated intermodal connectivity through efforts that assess, categorize, and collect data on intermodal links and how freight traffic moves through them. The resulting analyses and/or databases can be used by freight stakeholders to make more informed decisions about where, when, and how to invest in freight transportation infrastructure or plan/implement projects that benefit goods movement. For example, FHWA has completed studies on NHS connectors that lead to major intermodal terminals. These studies have sought to evaluate the condition of NHS connectors, identify needed

improvements, and recommend strategies to improve intermodal connectivity. Some of these studies have been developed in response to Congressional requests. U.S. DOT has also convened government and industry freight stakeholders in different types of forums to explore options for improving intermodal connectivity. There is particular interest in gaining more public agency access to the vast quantities of private data on freight movements in a manner that also protects proprietary information.

To improve and facilitate intermodal connectivity, U.S. DOT can consider implementing the following tactics:

- **Encourage the use of existing resources to support intermodal solutions**. For example, the Federal Railroad Administration's (FRA) Railroad Rehabilitation & Improvement Financing (RRIF) program seeks to support railroads in improving or modernizing intermodal and rail equipment/facilities and developing new facilities. U.S. DOT is considering ways to promote the RRIF program to improve rail connections between ports and landside transportation infrastructure. This would require working closely with private sector stakeholders. As another example, U.S. DOT is exploring how to encourage States to optimize the use of STP funds to better support projects that improve connectivity between ports and landside transportation infrastructure, including projects within port boundaries. TIGER grants and loans and credit assistance provided by the TIFIA program can already be used to support public freight rail projects, private projects that benefit highway users, and intermodal freight transfer facilities.

- **Review and evaluate the condition of existing intermodal connectors**. FHWA has already undertaken several studies to assess intermodal connectors on the NHS and identify needed improvements. A new study on freight intermodal connectors will be completed in late 2015 or early 2016.

A.4. Identify major trade gateways and multimodal national freight networks/corridors

To develop a sound and effective national freight strategy, it is important for U.S. DOT to identify freight facilities, networks, and trade gateways that are critical for freight movement across the nation.

U.S. DOT has engaged in efforts to address these needs. For example, MAP-21 Section 1115 required U.S. DOT to identify a national freight network of highways, of which a Primary Freight Network (PFN) of 27,000 centerline miles of highway would form the core.[21]

[21] On November 19, 2013, U.S. DOT published a draft PFN in the Federal Register to comply with this requirement. In developing this network and reviewing the resulting public comments, however, U.S. DOT determined that efforts to incorporate all of the criteria required of the PFN by MAP-21 did not yield a network that could comprehensively represent the most critical elements of national freight system of the United States. Among other factors, the effort to link qualifying PFN segments to achieve a contiguous network, and to ensure sufficient

For this Plan, U.S. DOT has assembled a draft Multimodal Freight Network (MFN) map that includes the highest volume freight routes and facilities of the nation's various freight modes.[22]

The draft MFN map is shown in Figure 16. Detailed maps, also viewable by freight mode, are available at the NFSP website and in Appendix D of this Plan. The draft MFN consists of approximately 65,000 miles of highways, including the entire Interstate System, the strategic highway network (STRAHNET), key intermodal connectors, and connections between draft MFN segments and major border crossings. The rail component consists of 49,900 miles of the highest volume Class I rail routes (6 percent of these route miles are on Class II and III railroads) and the full strategic rail corridor network (STRACNET). The waterways in the draft MFN map include U.S. DOT's America's Marine Highway routes. These overlap the principal inland waterways (managed by USACE) on which moves the majority of commercial waterborne domestic traffic, and also include coastal deep water domestic cargo routes (including routes to non-contiguous States and U.S. territories), Great Lakes domestic routes, and connections to the St. Lawrence Seaway. The draft MFN further includes 78 ports that collectively handle 90 percent of the nation's waterborne container and bulk cargo movements; 56 airports that handle approximately 90 percent of the nation's air cargo; and the 75 largest highway-rail intermodal transfer facilities by volume. Mapping of the most important components of the nation's pipeline system and their connections to other freight modes is still pending.

connections to Mexico and Canada, would require the designation of many thousands of miles beyond the 27,000 centerline miles allowed by MAP-21. More importantly, the draft PFN did not show non-truck freight modes including rail, water and pipeline, which play an essential role in long-distance movements of freight.

[22] U.S. DOT believes that a viable plan for the national freight system cannot be limited to one freight mode and has included all freight modes in the NFSP. The guidance in MAP-21 (23 USC 167(f)) requires the NFSP to include major trade gateways and national freight corridors and does not exclude the inclusion of freight modes other than highways, nor does it put mileage caps on specific modes.

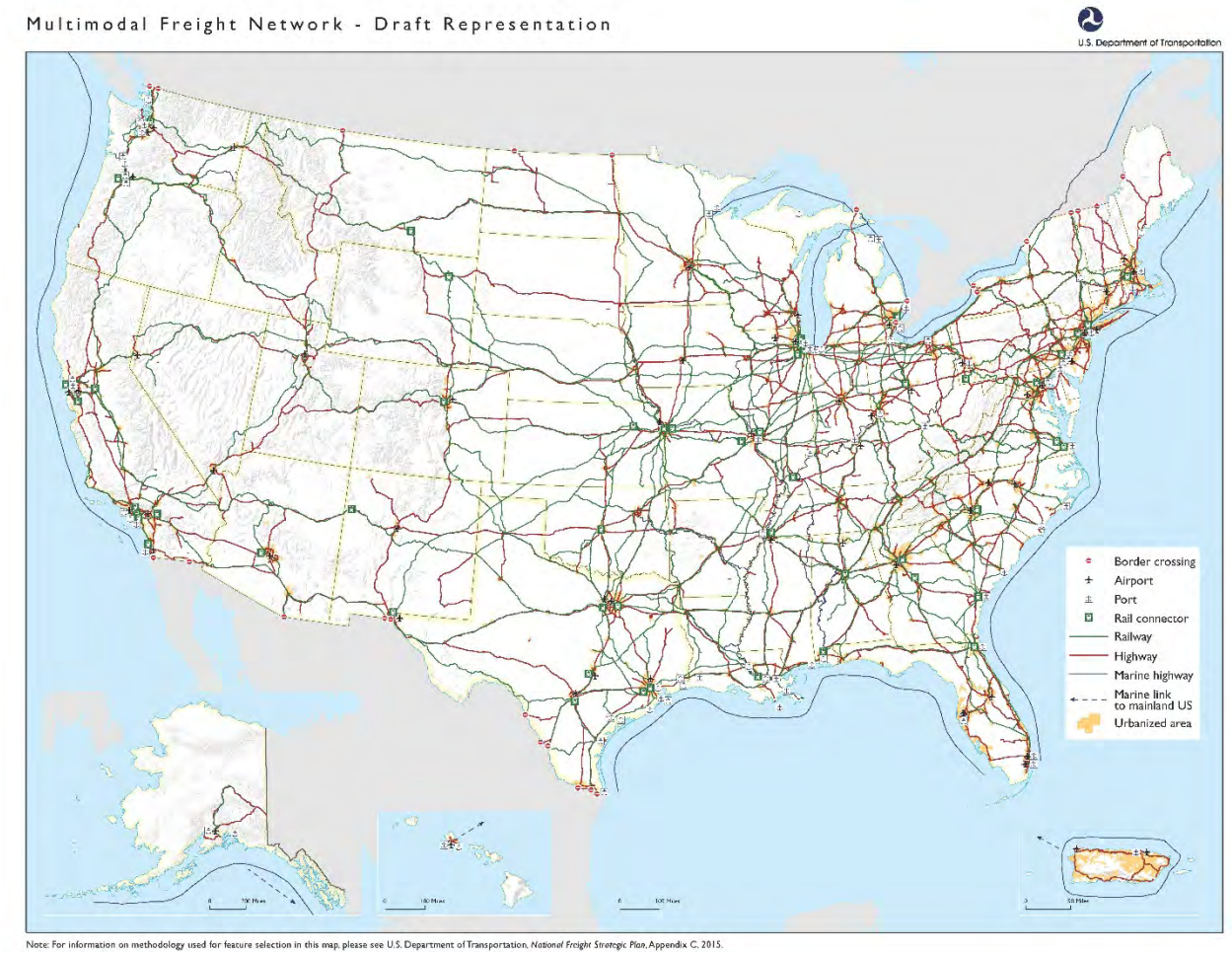


Figure 16. Draft MFN Map.

The purpose of the draft MFN map to inform planners and the public about where major freight flows occur and where special attention to freight issues may be most warranted. Many important freight opportunities, however, will occur off of the MFN routes, including in first- and last-mile links in urban and rural areas. As such, U.S. DOT does not intend that a project's placement on an MFN route or facility would provide it exclusive or preferred access to freight funding, or that a project not on an MFN route would be ineligible for freight funding. Eligibility of a freight project for funding assistance should be based on its ability to improve freight flows across the network in a cost-effective manner.

To facilitate the movement of freight through trade gateways and the international freight networks which connect to the gateways, U.S. DOT should:

- **Work closely with cooperating Federal agencies, State, and local governments, and international partners, as well as private sector stakeholders, to coordinate strategies and investments for major trade gateways and other important freight routes and facilities both on and off the MFN.** U.S. DOT should continue to engage strong border infrastructure planning with border States through its border working groups with

Canada and Mexico. It should also continue to coordinate closely with cooperating U.S. border stakeholder agencies, including the State Department, DHS, and the Department of Commerce (U.S. DOC), though the interagency Border Infrastructure Prioritization Council to ensure that freight system needs are considered. New sources of freight traffic data, improved public-private cooperation in State Freight Plans and State Freight Advisory Committees, enhanced freight transportation models and project evaluation techniques, and dedicated multimodal freight funding sources (discussed later in this Plan) will greatly assist in this effort.

- **Engage with foreign trading partners to harmonize regulations and standards** that affect the safety and efficiency of international freight carrier movements. U.S. DOT is engaged in Regulatory Cooperation Councils with Canada and Mexico and conducts similar exchanges with many international trading partners throughout the world.

- **Continue to pursue Open Skies civil aviation agreements.** Modern and liberal international air service agreements between two or more nations enable expanded passenger and freight options by reducing government involvement in commercial airline decisions about routes, capacity, and pricing. The U.S. has pursued Open Skies agreements with international partners since 1992 and there are now well over 100 agreements in place.

A.5. Mitigate impacts of freight projects/movements on communities

Over the last several decades, Congress and U.S. DOT have placed a growing emphasis on improving the nation's transportation systems while reducing adverse consequences of transportation on communities and the environment. Unless mitigated, adverse community impacts associated with freight movements can affect public health outcomes and reduce the quality of life for people living adjacent to freight facilities. Freight-related activities can potentially have adverse impacts to a community's air and water quality, noise levels, access to healthcare facilities, and livability. These communities are often comprised of low-income and minority populations that are more vulnerable to adverse impacts. Community opposition to effects can lead to restrictions on freight movements and also block new freight projects from being implemented unless the needs of communities are carefully addressed in the planning and design processes. U.S. DOT is addressing these concerns by incorporating specific frameworks that take into account the needs of communities and surroundings as transportation infrastructure is developed (e.g. Context Sensitive Solutions), among other efforts.

Other initiatives implemented by U.S. DOT and its Federal partners—including EPA, U.S. Department of Energy (DOE), and USACE—focus on reducing diesel exhaust emissions associated with heavy-duty vehicles and noise impacts associated with transportation in general, including freight transportation. U.S. DOT also supports efforts to lessen the impacts of freight activities through issuance of grants and loans to reduce air pollution, reduce traffic congestion, and mitigate other adverse freight impacts. U.S. DOT institutional strategies

discussed later in this section will also aid in the identification and mitigation of community impacts. Some specific examples of these recent and current initiatives include:

- **With support from U.S. DOT, EPA has been working for more than two decades to regulate and ensure the successful implementation of a comprehensive suite of cleaner standards for diesel fuel and new diesel engines for all mobile sources**. In February 2014, the President directed EPA and U.S. DOT/NHTSA to set the next round of fuel efficiency and GHG standards for medium- and heavy-duty vehicles by March 2016. Reduced consumption of fuel results in reduced emissions and decreased impact on the environment and communities. On June 19, 2015, EPA and U.S. DOT/NHTSA proposed a rule that would reduce truck carbon dioxide emissions up to 24 percent and cut fuel consumption by 1.8 billion barrels over the lifetime of the trucks sold under the rule.

- **FAA continues to work to reduce the environmental impact of aviation on communities.** FAA's Continuous Lower Energy, Emissions, and Noise Program helps reduce energy use, emissions, and noise from aircraft through airframe and engine technology development in partnership with industry. In addition, FAA issues noise certification standards to ensure the latest available noise reduction technology is incorporated into new aircraft designs. Also, FAA programs such as the Noise Compatibility Program and Voluntary Airport Low Emissions Program help airports achieve goals of reducing environmental impacts and aligning airport passenger and freight services to meet the needs and values of the local community, among others.

- **U.S. DOT, DOE, and EPA support a substantial number of programs intended to reduce mobile source diesel emissions.** These programs utilize market mechanisms, incentives, and partnerships to improve the energy and environmental efficiency of the legacy vehicle fleet. EPA programs such as the National Clean Diesel Campaign and SmartWay® program have proven to reduce criteria pollutants and GHG emissions for over a decade. SmartWay® leverages the business case for fuel savings and corporate citizenship to incentivize partners. It has been fully adopted in Canada and is rapidly moving to incorporate Mexico for a unified North American program. The Clean Cities program is operated by DOT and DOE to expedite the conversion of vehicle fleets to more efficient engines and cleaner

A.5. Case Study Example: Mitigating Adverse Impacts of Truck Movements in the City of Arroyo Grande, California

The City of Arroyo Grande, a small city with nearly 16,000 residents on California's Central Coast, illustrates how a municipal truck route network should be coordinated with neighboring jurisdictions to avoid areas containing sensitive land uses.

The City includes language in the circulation element of its General Plan that seeks to keep truck movements away from residential areas. The plan states "Truck routes should coordinate with County and adjoining cities designated routes and avoid traversing residential areas." (CT3-4.1)

-- From FHWA Freight and Land Use Handbook, pages 2-13

fuels, thereby reducing impacts on communities and the environment. Continued success of these programs will depend on the provision of adequate funding to these programs. There is also a need for improved coordination among programs to reduce overlap and fragmentation.

- **U.S. DOT provides support through the CMAQ Program** to fund projects such as diesel retrofits that can significantly reduce emissions from freight transportation. MAP-21 extended CMAQ eligibility to establish electric vehicle charging stations and natural gas vehicle refueling stations.

- **Promote multimodal freight planning and operations strategies that offer important opportunities to improve environmental sustainability and reduce community impacts of freight transportation.** In some cases, the use of alternative freight modes can reduce environmental impacts or enable routings that avoid proximity to residences and schools. For example, the America's Marine Highway initiative, which seeks to shift container and trailer movements from congested landside corridors to water, can lessen the impact of freight movements on neighborhoods in gateway port cities.

- **Deploy low-emission technologies for U.S. DOT-funded freight project construction and operation.** U.S. DOT will seek to ensure that all projects receiving U.S. DOT funds will deploy clean technologies that meet or exceed established standards to accommodate our nation's freight transportation needs while protecting public health and the environment. DOT will work with EPA to promote early adoption of the following EPA equipment specifications into relevant environmental documents for projects:
    - ***On-Highway Vehicles:*** On-highway vehicles servicing freight infrastructure sites should meet, or exceed EPA exhaust emissions standards for model year 2010 and newer heavy-duty on-highway compression-ignition engines (e.g., drayage

trucks, long-haul trucks, refuse haulers, shuttle buses, etc.), as well as NHTSA's fuel economy and GHG emissions standards for heavy-duty vehicles.[23]

- ***Nonroad Vehicles & Equipment*:** Nonroad vehicles and equipment servicing freight infrastructure sites should meet, or exceed EPA Tier 4 exhaust emissions standards for heavy-duty nonroad compression-ignition engines (e.g., nonroad trucks, construction equipment, cargo handlers, etc.).[24]
- ***Locomotives:*** Locomotives servicing freight infrastructure sites should meet, or exceed EPA Tier 4 exhaust emissions standards for line-haul and switch locomotive engines.[25]
- ***Marine Vessels:*** Marine vessels servicing freight infrastructure sites should meet, or exceed the latest EPA exhaust emissions standards for marine compression-ignition engines (i.e., Tier 4 for Category 1 & 2 vessels, and Tier 3 for Category 3 vessels).[26]
- ***Low-Emission Freight Equipment Exemptions*:** The equipment specifications outlined above should be met unless: 1) a piece of specialized equipment is not available for purchase or lease within the U.S.; or 2) the relevant project contractor has been awarded funds to retrofit existing

A.5. Case Study Example: Implementing an Off-Hours Delivery Pilot Program in New York City

Trucks and commercial vehicles both contribute to and suffer from congestion on New York City's streets. This congestion leads to costs as stores pass on to consumers the expenses of wasted time, lost revenue, missed deliveries, and parking tickets. The New York City DOT worked with Rensselaer Polytechnic Institute and a group of stakeholders and research partners to implement an Off-Hours Truck Delivery Pilot program, funded by U.S. DOT, which ran from late 2009 through 2010.

As part of this pilot program, 20 participants agreed to shift their delivery windows to between 7:00 pm and 6:00 am. Receivers found that fewer deliveries during normal business hours allowed them to focus more on their customers and that their staff were more productive because they waited less for deliveries. Carriers found that their trucks could make more deliveries in the same amount of time; they saved money on fuel costs; they could use a smaller fleet by balancing daytime and nighttime deliveries; and found legal parking more readily available. Their drivers reported feeling safer and less stressed.

Due to the success of this pilot, the New York City DOT is now seeking additional carriers and receivers who are interested in pursuing off-hour deliveries.

-- Adapted from http://www.nyc.gov/html/dot/html/motorist/offhoursdelivery.shtml

[23] http://www.epa.gov/otaq/standards/heavy-duty/hdci-exhaust.htm
[24] http://www.epa.gov/otaq/standards/nonroad/nonroadci.htm
[25] http://www.epa.gov/otaq/standards/nonroad/locomotives.htm
[26] http://www.epa.gov/otaq/marine.htm and http://www.epa.gov/otaq/oceanvessels.htm

equipment or purchase/lease new equipment, but the funds are not yet available.

- ***Advanced Technology Demonstration & Deployment:*** Freight infrastructure project proponents should be encouraged to demonstrate and deploy heavy-duty technologies that exceed the latest EPA emission performance standards for the freight equipment categories that are relevant for a given project (e.g., plug-in hybrid-electric vehicles, battery-electric vehicles, fuel cell electric vehicles, advanced technology locomotives, and marine vessels, etc.).

U.S. DOT could also implement additional strategies that would require further action, such as making changes to statutory language, authorizing dedicated sources of freight funding, and developing new requirements for stakeholder involvement in freight planning. For example:

- **Change statutory language to protect communities.** NFP goals in MAP-21 do not explicitly mention reducing adverse community impacts of freight operations. Additionally, many Federal grant programs do not identify community impact mitigation as eligible projects, except if they occur as incidental to building or reconstructing a capacity project. U.S. DOT has included language in GROW AMERICA to add the reduction, elimination, or reversal of adverse community impacts as an NFP goal and to enable certain Federal multimodal freight funds proposed in GROW AMERICA to be used for standalone projects to mitigate community impacts caused by freight movement.

A.6. Case Study Example:
Electronic Freight Manifest System (EFM)

ITS applications such as EFM are receiving a lot of public and private investment in an effort to close the gap between freight demand and capacity. In operational tests at the Chicago O'Hare International Airport and New York City-JFK International Airport, EFM reduced the time spent on processing manifests and transferring loads from one mode to another by 56 percent to 100 percent. Furthermore, processing drivers at air cargo facilities was two to four times faster than the manual, paper-based system. The time saved resulted in estimated cost savings per shipment of $1.50 to $3.50, depending on the kind of business. On top of the economic benefits, the EFM system enhanced security through the use of biometrics and smart cards to document and control access to cargo.

-- From Freight Transportation Improvements and the Economy, pages 1 - 2

A.6. Support research and promote adoption of new technologies and best practices

Technology applications and the identification/sharing of best practices play extremely important roles ensuring the safe and efficient movement of goods. There are enormous opportunities to conduct research on technology and best practices, as well as apply, deploy, and assess technologies, for the purpose of addressing, mitigating, or improving infrastructure bottlenecks. U.S. DOT has made important contributions to advancing technology research, deployment, and best practice research for transportation as a whole, and freight

transportation specifically. Some examples of recent U.S. DOT efforts in this area include the following:

- **FHWA's EDC program** has been highly effective in identifying and deploying innovations aimed at shortening project delivery, enhancing the safety of our roadways, and protecting the environment. EDC has helped agencies overcome technical, institutional, political, economic, and other barriers in adopting and implementing new technologies. FHWA will work with other U.S. DOT operating administrations to expand EDC to support selected innovations for freight modes other than highways, including rail, water, ports, pipelines, and airports, as well as intermodal transfer facilities.

- **FHWA, FRA, FAA, MARAD, the Office of the Secretary of Transportation (OST), and other U.S. DOT operating administrations** are funding research on technologies and operational approaches to increase operational efficiency and improve multimodal connectivity of national freight networks, among other objectives. U.S. DOT has also engaged in an ongoing effort to facilitate adoption of new and better methods for operational approaches. A more complete discussion of these initiatives is available in U.S. DOT's Research, Development, and Technology Strategic Plan Fiscal Year 2013 – 2018.[27] Future research efforts could also assess maximum achievable emission reduction and petroleum conservation goals associated with strategies to increase freight efficiency.

Strategies that U.S. DOT could implement in the future relating to technology research, technology transfer/deployment, and best practices research include:

- **Authorize the creation of the Fixing and Accelerating Surface Transportation (FAST) program.** Under this program, which is proposed in GROW AMERICA, U.S. DOT would award funds to States, Tribes, or MPOs to incentivize the adoption of bold, innovative strategies and best practices. Multimodal freight projects would be eligible for FAST although they would compete with other, non-freight transportation projects. The program would have a significant long-term impact. Projects eligible for FAST funding would include the following features: innovative financing; enhanced analytical tools in investment decision-making; design, procurement, and purchasing methods that improve project delivery; operating practices and technologies that increase the efficient use of transportation system capacity; practices that improve safety; best practices to integrate transportation planning and investment decisions with other land-use and economic development decisions; regulations and practices to improve the environment and reduce adverse community impacts; and improvements to regional governance and planning capacity with strengthened local and stakeholder input.

[27] U.S. DOT's Research, Development, and Technology Strategic Plan Fiscal Year 2013 – 2018 is available at https://www.rita.dot.gov/rdt/sites/rita.dot.gov.rdt/files/rdt_strategic_plan_2013.pdf

- **Increase funding for the U.S. DOT's Research, Technology, and Education programs.** This will advance research and innovations and help ensure that decision-makers at all levels will have access to enriched data, analysis and cutting-edge technologies, and the people and tools to make them work. Additional funding for university transportation research should be enabled by allowing State DOTs to provide matching funds from all Federal-aid sources, U.S. DOT operating administrations to provide matching funds, and other Federal funding sources to match funds for University Transportation Center (UTC) grants.

- **Include freight applications of ITS and automated vehicle applications as part of statutory missions for current U.S. DOT research programs.** This would help enhance the nation's freight system and support freight policy goals by facilitating heavy-duty vehicle demonstration activities and accelerating adoption of ITS applications in freight operations. It would also facilitate adoption and acceleration of automated vehicle development and deployment in all modes of surface transportation.

- **Re-establish the successful, multimodal National Cooperative Freight Research Program**, which has been a critical source of information for assembling this Plan, State Freight Plans, and other freight transportation initiatives.

III. B. Strategies to Address Institutional Bottlenecks

Institutional bottlenecks make it difficult to plan, prioritize, implement, and fund freight projects. For example, U.S. DOT, State DOTs, transit agencies, MPOs, and all other recipients of Federal transportation funds have processes in place to plan for, review, permit, and implement transportation projects. There are also processes in place to mitigate the negative effects of projects on the environment, cultural resources, and communities, among other things. When these processes are not well coordinated or when they are overly complex, they can slow or hinder the delivery of transportation projects.

This section summarizes existing strategies and tactics the U.S. DOT is undertaking, or could undertake, to address institutional bottlenecks (see Appendix C for relationship of strategies to MAP-21 national performance goals). This section also presents case studies to help illustrate successful implementation of specific strategies.

B.1. Streamline project planning, review, permitting, and approvals

U.S. DOT has implemented a number of improvements that help streamline project planning, review, permitting, and approval processes to accelerate project delivery, reduce costs, and ensure efficient and effective planning, design, engineering, construction, and financing of transportation projects. Many of these practices are shared through programs such as EDC (as described earlier in this Plan) and other initiatives as detailed below. U.S. DOT also works with USACE, EPA, and other agencies to implement environmental and permitting reforms, including those associated with WRRDA.

U.S. DOT has funded, encouraged, and shared research on analytic tools and best practices for streamlining project selection and design, contracting, and construction to expedite transportation project delivery, including:

Leverage current research. U.S. DOT is applying Strategic Highway Research Program 2 (SHRP2), National Cooperative Freight Research Program, and FHWA research to support improved freight transportation modeling, cost-benefit analysis, life-cycle cost analysis, and other project selection process tools useful for transportation asset management. U.S. DOT will also continue to fund research though the TRB and other forums to create better asset management and economic analysis tools, as well as address obstacles that have hindered use of existing tools, including lack of data. Improved data and tools will facilitate both near- and long-term planning, enabling more expeditious evaluations of projects and the better consideration of modal alternatives in LRTPs.

- **Identify and share best practices, resources, and develop research on freight planning, performance measurement, and project delivery to assist States and MPOs in identifying and implementing freight improvements.** For example, FHWA provides significant outreach, training, and awareness through its resources for freight planning and project delivery. FHWA also makes NPMRDS data available to States and MPOs to support their freight performance measurement programs. FHWA is also actively

working with State, MPO, and private sector stakeholders to develop new approaches to evaluate and measure freight movement. FHWA plans to release a Freight Performance Measurement primer in 2016.

- **Accelerate project reviews and permitting.** In September 2015, the White House issued guidance requiring agencies to report schedule and environmental metrics on a Permitting Dashboard for all major infrastructure projects. The Dashboard, first created in 2012 to highlight a smaller set of nationally significant projects, is hosted by U.S. DOT. It has now been updated to make it easier to find information about major infrastructure projects as they progress through the Federal environmental permitting and review process. At the same time, U.S. DOT, USACE, USCG, and four other agencies released an update to the handbook titled "Synchronizing Environmental Reviews for Transportation and Other Infrastructure Projects" (better known as the "Red Book") and updated the Federal Infrastructure Permitting Dashboard.[28]

B.1. Case Study Example:
National Gateway Clearance Initiative

The National Gateway Clearance Initiative aims to reduce highway congestion in the Midwest and Mid-Atlantic regions by shifting long-haul freight transportation from the regions' roads onto double-stacked trains. These trains can carry essentially twice as many containers as can container-on-flatcar trains without increasing the length or frequency of trains and at much lower cost per container.

Partners in the initiative included State DOTs; State environmental, preservation, and resource agencies; local municipalities; and CSX Transportation. They made use of the effective coordination of freight priorities, issues, and solutions in the NEPA process in order to reach their goal.

The partners identified 40 overpasses and tunnels in Maryland, Ohio, Pennsylvania, and West Virginia that were too low to accommodate double-stacked intermodal cars. In addition, State Historic Preservation Offices had designated many railroad bridges, tunnels, and track segments along the project corridor as historic properties. Because of these designations, the project proponents sought to limit impacts to the historic structures along the route.

Project proponents identified 10 historic tunnels along the route that required modification to accommodate double-stacked freight trains. Through the NEPA alternatives analysis process, the project proponents determined that historically sensitive modifications were not structurally viable for three of the tunnels in Somerset County, Pennsylvania. Therefore, the only viable alternative available to project proponents was to open-cut the tunnels, which would affect the historic character of the facility.

To mitigate these planned impacts, the project proponents agreed to thoroughly document the preexisting structures and create a website with historic information about the freight corridor. Throughout the NEPA process, project proponents engaged freight stakeholders to consider freight priorities along with historic preservation concerns.

-- From Considering Freight Priorities in the NEPA Process

[28] U.S. DOT, OMB-CEQ Released Guidance on Infrastructure Permitting; Federal Infrastructure Permitting Dashboard Updated, September 22, 2015, https://www.permits.performance.gov/about/news/omb-ceq-released-guidance-infrastructure-permitting-Federal-infrastructure-permitting.

Future strategies to advance expedited transportation planning and project delivery are outlined below. Many of these strategies will require legislative authority.

- **Support StrongPorts.** In light of the increasing need for port infrastructure to keep pace with demand, MARAD's StrongPorts Program helps ports modernize their infrastructure by providing planning expertise and technical assistance to U.S. port authorities (both public and private).

- **Reduce fragmentation of metropolitan planning.** The efficacy of freight and other transportation planning by MPOs is often undermined by the presence of multiple MPOs in a given urban area. Statutory authority could be established to prevent governors from forming new MPOs within metropolitan areas already served by an existing MPO. Where multiple MPOs already exist within one metropolitan area, they should be required to develop a single Transportation Improvement Program, LRTP, and performance targets for the region. Governors should be required to justify maintaining multiple MPOs within a metropolitan area.

- **Incentivize the establishment of State Freight Advisory Committees and the development of State Freight Plans.** U.S. DOT should work with Congress to statutorily create much stronger incentives for inclusive and comprehensive freight planning by making State eligibility for dedicated Federal freight funding (see Section III.C below) contingent on the establishment of qualifying State Freight Advisory Committees and State Freight Plans. An inclusive freight planning process, with participation from the private sector and all levels of State and local government, will lead to better project selection and reduce the likelihood of disagreements and delays at later stages of project development and implementation. Qualifying plans and committees would meet the following criteria:

  - State Freight Plans must be certified by the Secretary, provide 10-year outlooks that must be updated every five years, be multimodal and comprehensive for both short-term tactical and long-range strategic freight planning activities and investments by the State, prioritize projects, and contain a freight investment plan showing funding sources.

  - State Freight Advisory Committees must have representation by public and private sector freight stakeholders, including qualified representatives from MPOs, special authorities such as port authorities, and all modes of freight transportation active in the State. The committee must participate in the development of the State Freight Plan, including the freight investment plan, and also approve these plans.

- **Create an Interagency Infrastructure Permitting Improvement Center (IIPIC).** Many freight projects must go through extensive permitting and environmental review. Through the IIPIC, as proposed in GROW AMERICA, U.S. DOT is seeking to reduce infrastructure project delivery timelines – improving the effectiveness and efficiency of

integrating environmental planning and permitting processes – and improve outcomes for communities and the environment.[29] Until this initiative is authorized and funded, U.S. DOT has established an Interagency Infrastructure Permitting Improvement Team that will, to the extent existing budgetary and personnel resources allow, implement the first phase of the IIPIC Implementation Plan.

- **Establish ability to make multimodal Categorical Exclusions (CEs).** Amend the language from Section 1314 of MAP-21 to allow any U.S. DOT operating administration (OA) to use the CE of another OA so long as certain requirements (including those under NEPA and the OAs' NEPA implementing procedures) are met and appropriate oversight is provided. Allowing sharing of CEs would eliminate the need for an OA to develop an Environmental Assessment for a project that could qualify for a CE if funded by another OA. This would provide for greater flexibility while retaining necessary environmental protections.

B.2. Facilitate multijurisdictional, multimodal collaboration, and solutions

Because freight transcends local, regional, State boundaries, and international borders, it is critical for State and local agencies to participate in multijurisdictional collaboration as part of freight planning, programming, and policy making. This is particularly true for projects that affect international trade flows—flows that are in many cases multimodal and require multimodal solutions. In support of the National Export Initiative and in anticipation of growing international trade, GROW AMERICA proposes funding and planning provisions to encourage more cooperative approaches to resolving border crossing and port congestion issues. The strategies below target both international and domestic freight flows. They also include initiatives for partnerships between U.S. DOT and public sector agencies across all levels of government as well as with the private sector. Such partnerships enable the U.S. DOT to realize efficiencies and leverage existing resources and initiatives of its partner agencies.

Current initiatives to facilitate collaboration include:

- **Convene regular meetings of the Freight Policy Council (FPC).** U.S. DOT plans to continue to convene regular meetings of the FPC and ensure coordinated actions by its component organizations. The Secretary of Transportation established the FPC in 2012 to focus U.S. DOT's efforts to improve the condition and performance of the national freight network. It is chaired by the Deputy Secretary of Transportation and includes U.S. DOT leadership from highways, railroads, ports, and airports, as well as economic and policy experts. FPC meetings have already contributed greatly to developing a more coherent, multimodal approach to freight transportation at U.S. DOT, including in the production of this Plan, the draft MFN map contained in this Plan, and in other joint freight exercises occurring among the U.S. DOT OAs.

[29] The IIPIC would support the ongoing implementation of Executive Order 13604, "Improving Performance of Federal Permitting and Review of Infrastructure Projects," and the "Implementation Plan for the Presidential Memorandum on Modernizing Infrastructure Permitting" released by the Interagency Infrastructure Steering Committee on May 14, 2014. Administrative support will be provided by OST.

- **Encourage coordination and interaction among all participants in State freight planning.** U.S. DOT strongly encourages States to establish State Freight Advisory Committees as part of the process to develop and/or update State Freight Plans.

B.2. Case Study Example:
Trans-Tennessee Railroad

The Trans-Tennessee Railroad would create a direct rail corridor between Knoxville, Nashville, and Memphis. The project will require coordination between multiple local, State, and Federal government agencies, private transportation interests, trade and industry organizations, and public/citizen involvement to fully evaluate the various development alternatives. Multijurisdictional coordination of government agencies is especially important in a project such as this to ensure that the Trans-Tennessee Railroad is integrated into a seamless, regional freight transportation network. Relationships between public and private entities will also be important, as large sections of the route may be owned or operated by different rail interests. A number of agreements must be made with private entities to move the construction and operation phases forward.

-- From Meeting the Transportation Challenges of the 21st Century: Intermodal Opportunities in the Appalachian Region – Intermodal Case Studies, pages 2-10

- **Maintain and coordinate among national-level freight transportation advisory committees.** U.S. DOT will work with all relevant Federal advisory committees in the development of policies and programs that affect the freight transportation system, including the National Freight Advisory Committee (coordinated by OST); the Marine Transportation System National Advisory Council (coordinated by MARAD); the Railroad-Shipper Transportation Advisory Committee (coordinated by STB); the Rail Energy Transportation Advisory Committee (coordinated by STB); and the Motor Carrier Safety Advisory Committee (coordinated by FMCSA). U.S. DOT will also consult with advisory committees supported by other agencies, including but not limited to: the National Environmental Justice Advisory Committee (coordinated by EPA); Clean Air Act Advisory Committee (coordinated by EPA); the Advisory Committee on Commercial Operations of Customs and Border Protection (coordinated by U.S. CBP); and the Advisory Committee on Supply Chain Competitiveness (coordinated by U.S. DOC).

- **Support innovative solutions to port congestion.** U.S. DOT will work with the Federal Maritime Commission, other government agencies, port authorities, and the freight transportation community to identify and implement innovative solutions to recent and future congestion problems, such as the shared chassis use agreement for the Ports of Los Angeles and Long Beach. Other examples include deploying the Freight Advanced Traveler Information Systems (FRATIS) and providing funding and loan support for projects such as the Alameda Corridor in California.

- **Cooperate with North American freight planning stakeholders.** Under the bilateral High Level Economic Dialogue with Mexico, the Beyond the Border Initiative with Canada, and the North American Leaders Summit agenda, U.S. DOT is working bilaterally and trilaterally with its North American counterparts to ensure that respective freight planning efforts are based as closely as possible on the same planning data and analysis, and are implemented with cross-knowledge of respective plans. This is being implemented through peer exchanges on technical best practices, through collaboration under the North American Transportation Statistics Interchange, and through FHWA's and OST's implementation of a North American Freight and Passenger Scenario study with Canadian and Mexican participation, to be completed in early 2016.

In addition to the above initiatives, U.S. DOT could also pursue the following approaches to further institutionalize a culture of multimodalism and collaboration:

- **Codify a multimodal NFP.** Clarify in statutory language that the NFP, freight network, National Freight Strategic Plan and freight performance data – established by MAP-21 as highway-centric – be multimodal.

- **Incentivize regional, multistate, and multimodal freight planning.** Make the development of a regional freight investment plan, in cooperation with at least one other State or relevant entities in Canada or Mexico, a requirement for State eligibility to receive additional dedicated formula freight funds under a program that may be established in future legislation (see Section III.C), and require that such funding be assigned to the highest priority projects identified in the freight plans. Extend freight funding eligibility to projects of any mode that facilitate trade at sea and river ports, airports, and freight transportation-related facilities at international border crossings, with an emphasis on multimodal solutions (see Section III.C)

B.3. Improve coordination between public and private sectors

Facilitating partnerships between public sector agencies and private organizations is essential to identify and respond to critical freight system needs and to achieve the best outcomes of the planning process. Example strategies include developing formal data-sharing agreements, identifying policies that facilitate trade flows, and establishing forums where private stakeholders can provide input into the public transportation planning process.

U.S. DOT is currently addressing these needs by encouraging coordination and interaction among all participants in State freight planning. For example, U.S. DOT encourages States to establish State Freight Advisory Committees as part of the process to develop and/or update State Freight Plans.

Current and future strategies could include the following:

B.3. Case Study Example: Atlanta Regional Commission

The Atlanta Regional Commission (ARC), which is the MPO for the Atlanta region, hosted a two-day peer exchange on megaregion freight planning with the Metro Atlanta Chamber of Commerce and the Georgia Tech Center for Quality Growth and Regional Development in November 2013. Participants included peer MPOs from across the country, private sector logistics companies, university researchers, Federal agencies, and State and local governments. Many key themes for megaregion planning emerged from the peer exchange, including the importance of economic competitiveness, establishing governance without new government, flexible megaregion boundaries, and alternative transportation modes. The peer exchange was part of the FHWA/FTA Transportation Planning Capacity Building Program.

-- From Megaregions Freight Movement Peer Exchange

- **Evaluate freight movement from a user perspective.** Private shippers evaluate their supply chains from an end-to-end perspective and use private and proprietary data to maximize efficiency and reduce costs. FHWA is working with private sector representatives to develop opportunities to use private sector data in aggregated ways to estimate freight fluidity. This would help to identify areas in a multimodal network that would benefit from system performance improvements and could also assist with identifying economic development opportunities. FHWA has convened a stakeholder group of governmental and private entities, including public and private representatives from all freight modes, to design a research path forward, with two planning workshops completed in 2014 and one set for December 2015 that will lead toward implementation of an analytical system that can better assess freight fluidities.

- **Incentivize full private sector participation in freight planning.** Facilitate cooperation between public and private sector interests by providing public-private partnerships access to Federal financing arranged through BATIC (see Section III.C). As discussed earlier in this Plan, U.S. DOT is also seeking authority to require that State Freight Advisory Committees must have private sector representation from all freight modes active in the State. Participants should include qualified representatives of shippers,

carriers, freight-related associations, and the freight industry workforce, in addition to representation by State DOTs, MPOs, and local governments.

- **Enable single window for exports and imports.** U.S. DOT will cooperate with DHS and other Federal agencies to support interagency goals established for the National Export Initiative, including the design and implementation of a virtual "Single Window" for imports and exports to save businesses time and money by streamlining reporting requirements and processes, and improve compliance.

B.4. Ensure availability of better data and freight transportation models

Improvements in data collection, information sharing, freight tools, and analytic methods can help the public sector better understand freight trends and to make more informed decisions that may affect the freight system. Current initiatives to ensure improved accessibility to better data and models include:

- **Develop and release the FAF version 4 (FAF4).** As discussed earlier in this Plan, the FAF is the most widely-used, publicly accessible freight transportation data source in the U.S. It provides current freight flows and forecasts of freight flows through the year 2040, as well as visualization and mapping tools. In 2015, FHWA and BTS will jointly develop and release the FAF4 model that includes updated 2012 CFS data.[30] In the interim, U.S. DOT is providing access to provisional 2013 data through a FAF3.5 release. FAF4 will provide information for 132 domestic regions, representing 9 additional regions than what was included in FAF3. The FAF enables planners to examine potential future freight flows in 5-year increments for more

B.4. Case Study Example: Alameda Corridor

The Los Angeles/Long Beach metropolitan area is the major gateway for goods imported from Asia. As a result, a significant amount of freight transverses the metropolitan area from the Ports of Los Angeles and Long Beach and Los Angeles International Airport to inland locations. This movement pattern has resulted in congestion where the modes transverse several confliction points as they complete their intermodal moves.

In 1997, the public and private sectors came together to alleviate some of the major rail-street confliction points. The three Class I railroads implemented a container fee to pay the debt service on a TIFIA loan to build a trench along Alameda Street between Long Beach and the downtown Los Angeles rail yards. This Alameda Corridor consolidated rail lines below grade level, eliminating 180 grade crossings, freeing up surface street passenger and freight truck traffic, reducing emissions, and increasing train speeds between the ports and downtown. The project successfully alleviated congestion from this portion of the network. The success of the Alameda Corridor and its benefits to the entire region provided the momentum for regional partnerships on freight issues in one of the most institutionally complex settings in the country.

From: NCFRP Report 33, p. 135, http://onlinepubs.trb.org/onlinepubs/ncfrp/ncfrp_rpt_033.pdf

[30] Initial baseline estimates for FAF4 were released in October 2015; additional components of FAF4 will be forthcoming over the next several months.

than 25 years into the future, helping them to more effectively identify and size appropriate investments for future needs.

- **Improve access to NHS freight data.** As discussed earlier in this Plan, U.S. DOT will continue to deploy newer and more advanced freight data resources to the planning community, such as NPMRDS data, which are available to State and MPO planners on a monthly basis at no cost and allow them to gain a more comprehensive understanding of truck and automobile activity and congestion.

- **Develop automated wait time data collection methods at border crossings.** FHWA, in coordination with State DOTs and U.S. Customs and Border Protection, has initiated pilot projects to develop automated wait time data collection methods at select border crossings into Mexico and Canada. Accurate and standardized information on wait times is important to transportation providers and shippers, and to agencies who must evaluate wait times when deciding on staffing levels for border facilities. FHWA is also providing NPMRDS data for routes crossing the Canadian and Mexican borders with the U.S.

There are many additional activities that could advance the quality and availability of data, such as:

- **Enhance GPS probe data to improve freight transportation planning.** U.S. DOT could work with the planning and research communities to expand the utility of GPS probe data for freight planning and modeling through the following initiatives:
    - Develop partnerships and data-sharing options to improve access for States and MPOs to truck probe data for use in more granular analyses, including local street-level truck probe data to study freight movements. This could support mapping and planning of first- and last-mile connectors and delivery networks.
    - Advance research to develop new, multimodal data sources such as use of big data or transactional data to support freight analysis for all modes.
    - Develop new approaches to use and conflate data to provide comprehensive information (such as through the combination of probe data with dimensional/weight data) to reveal movements of different vehicle types, locations of freight activity by vehicle type, and durations of visits to major freight facilities (including seaports, inland ports, and intermodal rail facilities).

- **Support and fund development of improved freight travel demand toolkits, models, and investment tools.** U.S. DOT is committed to accomplishing the freight modeling objectives specified in the SHRP2 Capacity 20 (C20) RW-2 Freight Demand Modeling and Data Improvement Strategic Plan, including the near-term development of a robust freight forecasting toolkit. U.S. DOT is also proposing to amend the Transportation Investment Data and Planning Tools program (23 USC 167(h)) to explicitly include the development of freight forecasting models and investment evaluation tools. Improved models, investment evaluation tools, and data will greatly enhance the ability of

planners and decision-makers to anticipate and resolve freight transportation challenges in the most cost-effective manner. Statutorily establish a Performance Management Data Support Program to promote the use of improved tools and models to measure performance and assist States and MPOs in carrying out analyses using vehicle probe data on rail, truck, vehicle and marine vessel traffic.

- **Enhance U.S. DOT's authority to collect intermodal freight data.** Give BTS authority to assemble intermodal freight movement data under the Intermodal Transportation Data Program (49 USC 6303) including mandatory response authority for freight data. Authorize the director of BTS to establish a port performance statistics program, as proposed in GROW AMERICA, to provide nationally consistent measures of performance of the nation's maritime ports. This authority will assure that the Department can assemble critical data that cannot be collected through GPS probe or voluntary measures identified in this section.

In the long run, these strategies could enable full network-based forecasting of all modes of freight transport that would reflect the various factors related to the supply and demand of freight infrastructure and services. The timeframe for developing such a model is uncertain and will depend on funding and other resource support. More immediate progress can be realized through the development of freight forecasting toolkits supported by granular, standardized data and training programs.

Obtaining even this more moderate vision will still be a major challenge. There are very few freight modeling and data university research centers, freight planning consultants, and freight data providers, which limits both the development and use of tools and data and the opportunity to innovate. Progress would require participation and cooperation among all parties, with strong Federal engagement and funding.

B.5. Develop the next generation freight transportation workforce

U.S. DOT currently works with the U.S. Department of Labor (U.S. DOL) and U.S. Department of Education to support development of the transportation workforce. Principal responsibilities for workforce development reside at U.S. DOL. U.S. DOT does, however, sponsor a significant amount of training directly and is implementing new initiatives aimed at establishing a more robust transportation workforce. Steps need to be taken within the transportation sector to improve employee retention and thereby reduce the need to recruit or train replacement drivers. There are many opportunities to expand on the training and workforce initiatives identified in this section. U.S. DOT is open to working with U.S. DOL and the U.S. Department of Education as well as interested State, local, academic, and industry stakeholders on these possibilities.

A comprehensive listing of programs affecting workforce development is beyond the scope of this Plan. The following initiatives are representative of recent U.S. DOT efforts to improve workforce training:

- **Develop freight skills among planning agency staff.** U.S. DOT will continue its long-standing and successful program to support the production of a growing body of resources and guidance for conducting freight planning, aimed specifically at State DOTs, MPOs, and local governments.

- **Recruit veterans.** On November 21, 2011, President Obama signed the "Vow to Hire Heroes Act" into law, which includes tax credits for businesses that hire veterans. Military veterans are a promising source of transportation industry hires. Schools are actively seeking veterans who may be able to use their educational benefits to obtain commercial driver's license training. Trucking, rail, maritime, and other transportation services are currently recruiting significant numbers of veterans.

- **Support the U.S. Merchant Marine Maritime Academy and the State Maritime Academies.** MARAD operates the U.S. Merchant Marine Academy at Kings Point, New York. MARAD also provides training vessels and other support to the six State maritime academies. These academies provide four-year undergraduate programs and their graduates qualify for unlimited horsepower/tonnage license endorsements. These academies collectively graduate over 700 USCG-credentialed deck officers and engineers annually.

B.5. Case Study Example:
Maryland Department of Transportation

Maryland's Statewide Freight Plan provides a comprehensive picture of goods movement in the State, establishes the importance of freight for economic growth and development, and provides a foundation for a multimodal, integrated set of policies and plans for the State's freight system. To monitor the effectiveness of various strategies and adjust strategic decisions based on results, the Maryland Department of Transportation (MDOT) and its Office of Freight and Multimodalism developed a set of freight performance measures. With technical assistance from FHWA, MDOT conducted a peer exchange with participants from its Freight Intermodal Advisory Committee and freight plan implementation work groups, including peers from other State DOTs that had already implemented freight performance measures.

MDOT has made progress on a number of action items since the peer exchange:

- MDOT identified significant highway and rail freight corridors and used that information to begin development of system mapping to assist in identifying freight-related project needs within the State.
- When developing specific freight-related projects, MDOT has engaged with various stakeholders to provide freight reliability insights.
- MDOT has established a process to allow for a flexible and sustainable freight performance measurement system.

-- From Maryland DOT Conducts Peer Exchange on Freight Performance Measures

- **Support the FHWA Surface Transportation Workforce Centers Network.** FHWA has established the Surface Transportation Workforce Centers Network to consist of five Regional Surface Transportation Workforce Centers. The centers will

engage/facilitate partnerships with State DOTs, State Departments of Education, industry, and other public and private stakeholders throughout the transportation, education, labor, and workforce communities. Center efforts will address workforce development activities at the 6-12 grade levels, technical schools and community colleges, universities, post graduate programs, and will also facilitate professional development opportunities for incumbent transportation workers.

Two other examples of existing resources that successfully disseminate professional capacity building resources include FHWA's Office of Freight Management and Operations' Talking Freight webinar series (part of a broader Freight Professional Development Program) as well as its freight planning website.[31]

Future workforce development initiatives may include the following:

- **Improve freight planning skills.** Amend the UTC Program (49 USC 5505) to address critical workforce needs and educate the next generation of transportation leaders in a multidisciplinary fashion.

- **Promote the President's Ladders of Opportunity Initiative.** In September 2014, the Federal Transit Administration (FTA) announced the Innovative Public Transportation Workforce Development Program Ladders of Opportunity Initiative. Although limited to public transit workforce development, experience with this program could provide information on similar ways to build and maintain the nation's future freight transportation workforce.

- **Enhance State authority for workforce development.** Amend 23 USC Section 140(b) to require State DOTs to develop a workforce plan that identifies immediate and anticipated demographic and workforce gaps; steps to collaborate with State agencies that manage education and labor programs; and measures to assess program outcomes. Establish incentive programs that encourage States to use some of their NHPP or STP funds for workforce development by providing up to twice the funding in an incentive match. Make up to 20 States eligible to receive incentive funding in support of existing On-Job-Training/Supportive Services without the obligation of STP or NHPP funds.[32]

[31] The website is available at http://www.fhwa.dot.gov/planning/freight_planning/.
[32] GROW AMERICA, Section 1208 Workforce Development.

III. C. Strategies to Address Financial Bottlenecks

Investment in the nation's multimodal freight system has failed to keep up with aging infrastructure and growing freight demand. The result is less reliable, more expensive freight movement. Ultimately, this makes goods more costly for consumers and puts American producers and manufacturers at a disadvantage in the global economy. A key challenge is how to adequately finance freight transportation improvements to enhance the efficiency of freight transportation while delivering public benefits.

The Federal government is already taking steps to advance innovative transportation finance strategies and encourage public-private partnerships. For example, the President recently signed a Presidential Memorandum to launch the Build America Investment Initiative. The Administration established the Build America Transportation Investment Center (BATIC), housed at U.S. DOT, to serve as a one-stop shop for State and local governments, public and private developers, and private investors seeking to utilize innovative financing strategies for transportation infrastructure projects, including freight transportation projects.

GROW AMERICA contains provisions that, if passed, would make significant investments in the nation's freight transportation system. Specifically, GROW AMERICA provides $18 billion through grant programs over six years for targeted investments that would improve the movement of freight. This funding would be limited to transportation projects that clearly contribute to improving freight transportation. These provisions would help address the fact that freight projects are disadvantaged in the current transportation planning process and do not compete well with non-freight projects for limited public resources.

This section summarizes potential future strategies to address financial bottlenecks (see Appendix C for relationship of strategies to MAP-21 national performance goals). This section also provides case studies to help illustrate successful implementation of specific strategies.

C.1. Enhance existing freight funding sources

U.S. DOT could implement the following strategies that would help enhance existing freight funding sources:

- **Use existing grant programs to support freight.** National competitive grant programs can also be used to support multimodal freight projects. TIGER has provided funding for a full range of freight planning and infrastructure projects, including port projects, intermodal highway and rail projects and ground access to airport freight facilities. TIFIA can also provide Federal credit assistance in the form of direct loans, loan guarantees, and standby lines of credit to surface freight projects, including publicly owned freight facilities; intermodal freight transfer facilities; and certain port projects. U.S. DOT can also make direct loans and loan guarantees to rail freight projects through the RRIF program. BATIC is showing positive results in linking promising freight projects to available grant and loan programs, including to TIFIA. Assistance provided from these

programs leverages additional capital from non-Federal governmental and private sources. In addition, other agencies may have funding opportunities that could benefit freight systems, including Diesel Emissions Reduction Act grants at EPA.

- **Expand toll-financing eligibility.** Seek statutory authority to mainstream two existing pilot-tolling programs, giving States additional flexibility to apply for authority to toll existing interstate highways in order to make improvements or to manage congestion. These requests would be subject to approval by the Secretary of Transportation based on specific criteria that will be published for comment in the Federal Register. Toll financing could be used to expand capacity at significant highway bottlenecks that impede freight movements. Increased tolling of highway infrastructure could both help to control peak demand, thereby improving travel reliability, and pay for needed capacity improvements. However, it is unlikely that facility-specific user fees would, by themselves, be sufficient to pay for expanded capacity. Increased use of pricing on interstates could also divert traffic to less efficient routes resulting in increased congestion and wear and tear on local roadways.

C.2. Develop new freight funding sources

U.S. DOT could seek statutory authority to implement the following strategy to help develop new freight funding sources:

- **Develop a new Federal funding program under Title 49 USC dedicated to multimodal freight projects.** By providing a substantial, predictable funding source, a Federal multimodal freight program could permit State and local planners to address some of the problems caused by historic public underinvestment in the nation's transportation system (including the freight system). A source of substantial dedicated freight funding would make it easier to reach compromises and to resolve disputes over extra-jurisdictional and public benefits and costs. GROW AMERICA proposed two such programs, one funded by formula to States (but subject to eligibility requirements) and the other funded by discretionary Federal grants to States, territories, local governments, MPOs, public transportation authorities (including port authorities), Tribal governments, and groups of these entities.

The availability of long-term funds dedicated to freight projects would provide assurance that major freight transportation projects could be funded. Similarly, providing multimodal eligibility for these funds would assure that the best overall modal or intermodal solutions to freight movement can be vetted and funded. Federal funds could be used to cover the costs of projects or project features that generate public benefits, such as reduced emissions or improved safety, as well as extra-jurisdictional benefits, thereby reducing State and local reasons to avoid, undersize, or defer critical freight projects due to concerns about funding equity. Accordingly, these funds would contribute to the completion of more projects with national-level benefits. Such large projects could include improved road and rail access to gateway ports, relief to major freight bottlenecks along interstates and national rail lines landside infrastructure on ports and airports, facilities to accommodate freight at border crossings, and investments that facilitate multimodal cargo transfer. Finally, the presence of Federal funds helps assure the broad range of environmental, community, and other planning requirements associated with the use of such funds would

C.1 and C.2 Case Study Example: Identifying Funding and Financing Opportunities through the North Carolina Maritime Strategy

In 2011, the North Carolina governor created a logistics task force to develop the North Carolina Maritime Strategy to assess the State's maritime assets and the improvements needed to ensure that the State remains competitive. Development of the strategy entails collaboration of freight transportation, economic development, and community partners to identify the investments and policies that will have the greatest impact on the State's economy through the improvement of maritime gateways and trade corridors. Part of this process will require the assessment of potential funding and financing strategies that will be most effective at advancing these improvements.

The State looked at the following Federal programs and opportunities: 1) Federal Emergency Management Agency/Homeland Security; 2) Potential for related programs such as U.S. Department of Agriculture and Military; 3) FHWA Surface Transportation Program, 4) RRIF and Capital Grants for Rail Line Relocation Projects from FRA; 5) TIFIA; 6) Grant Anticipation Revenue Vehicles bonds; and 7) Tax-Exempt Financing of Highway Projects and Rail-Truck Transfer Facilities.

North Carolina also looked at State and local funding options including State infrastructure banks; tax exemptions; dedicated State funding sources; special development districts; and local option fuel, sales, or property taxes. Finally, the State also considered various opportunities for private investment, including direct investment by railroads, user fees, sale/leaseback of rail assets, and public-private partnerships.

-- From North Carolina Maritime Strategy, Overview of Potential Funding and Financing Strategies for North Carolina's Port Projects

apply (under the expedited review and permitting processes recommended elsewhere in this Plan).

Federal multimodal freight transportation funding that is substantial, continuing, flexible, and reliable is essential to address financial bottlenecks. This funding must be specifically dedicated to freight transportation projects and should augment, rather than replace, existing funding sources. Similarly, it cannot be redirected from existing Federal transportation funding programs because these resources are already insufficient to meet current needs.

Section III References

The references listed below supported development of content for Section III and/or are specifically mentioned in Section III. The references are listed in alphabetical order. This ordering does not necessarily correspond to when the references were used or mentioned in the NFSP's text. Not all materials consulted are listed here.

- 40 CFR 1502.3. 2012. Environmental Impact Statement: Statutory Requirements for statements. July 1.
- Agrawal, Asha Weinstein and Dill, Jennifer. 2009. Paving the Way: Recruiting Students into the Transportation Professions. Mineta Transportation Institute. June. p. 1.
- Airport Cooperative Research Program. 2009. Synthesis 14, Airport System Planning Practices. pp. 6, 26, 54.
- American Association of Port Authorities. 2012. U.S. Seaports, Private-Sector Partners Plan to Invest $46 Billion By 2017 in Port Infrastructure. June 18. (http://www.aapa-ports.org/Press/PRdetail.cfm?itemnumber=18583)
- American Association of State Highway and Transportation Officials. 2013. Waterborne Freight Transportation: Meeting the Challenges. June. pp. viii, 6-21.
- American Transportation Research Institute. 2013. Freight Performance Measures Analysis of Freight-Significant Highway Locations. July 08.
- Benfield, Kaid. 2012. "The Limits of Metropolitan Planning Organizations." CityLab. April 30. (http://www.citylab.com/politics/2012/04/limits-metropolitan-planning-organizations/1878/)
- Bondareff, Joan M. and Scontras, Katherine V. 2012. "Strategic Seaports," Maritime Reporter. December (http://www.blankrome.com/index.cfm?contentID=37&itemID=2959)
- CalSTA-Caltrans. 2014. California Freight Mobility Plan, P3s in Freight. p. 1.
- CalSTA-Caltrans. 2014. California Freight Mobility Plan. December. pp. 38, 54.
- Caltrans. 2011. Third Report to the California Legislature Pursuant to Section 820.1 of the California Streets and Highways Code. January 1. pp. 1, 3, 12.
- Caltrans. 2014. "Chapter 3-1, Native American Freight Connections." California Freight Mobility Plan. p. 5.
- Cambridge Systematics, Inc. 2007. Commission Briefing Paper 4L-03: Implications of Investments Targeted at Reducing Highway Passenger and Freight Bottlenecks. January 13. pp. 2, 7.
- Cambridge Systematics, Inc. 2007. Commission Briefing Paper 4L-07: Implications of Investments Targeted at Reducing Rail, Rail/Highway, Rail/Port, Highway/Port, Rail/Barge, and Highway/Barge Freight Bottlenecks. March 13. (http://transportationfortomorrow.com/final_report/volume_3_html/technical_issues_papers/paper3e44.htm?name=4l_07)
- Cambridge Systematics, Inc. 2007. National Rail Freight Infrastructure Capacity and Investment Study. Prepared for the Association of American Railroads. September. pp. ES-1, 2.
- Center for Neighborhood Technology. 2013. Cargo-Oriented Development (COD): Concept and Opportunity. September.

- Center for Neighborhood Technology. 2014. Cargo-Oriented Development. July 29. (http://www.cnt.org/category/cargo-oriented-development-2/)
- Congressional Research Service. 2011. Accelerating Highway and Transit Project Delivery. Summary. pp. 10-11, 13, 19-20, 26.
- Council on Environmental Quality, Executive Office of the President. 2007. A Citizen's Guide to the NEPA.
- Critelli, Mike. 2008. Infrastructure Finance. April 13. (http://www.mikecritelli.com/2008/04/13/infrastructure-finance/)
- Cumberland County, NJ. 2013. Cumberland County Transportation Plan. March.
- Envision Freight. Case Study: Baltimore Maritime Industrial Zoning Overlay District. p.7. (http://www.envisionfreight.com/issues/pdf/MIZOD_case_study.pdf)
- Federal Aviation Administration. "Airport Sustainability." Airports. (http://www.faa.gov/airports/environmental/sustainability/)
- Federal Highway Administration. "Congestion Reduction Toolbox." Focus on Congestion Relief. (http://www.fhwa.dot.gov/congestion/toolbox/)
- Federal Highway Administration. 2004. ACTION: SEP-15 Application Process. October 14. (http://www.fhwa.dot.gov/programadmin/contracts/101404.cfm)
- Federal Highway Administration. 2012. About Every Day Counts. May 18. (https://www.fhwa.dot.gov/everydaycounts/about/)
- Federal Highway Administration. 2012. FHWA Freight and Land Use Handbook. pp.1-21. (http://www.ops.fhwa.dot.gov/publications/fhwahop12006/fhwahop12006.pdf)
- Federal Highway Administration. 2012. MAP-21, Sections 1201 and 1202 Statewide/Nonmetropolitan and Metropolitan Planning Questions & Answers. September 25. (https://www.fhwa.dot.gov/map21/qandas/qaplanning.cfm)
- Federal Highway Administration. 2013. National Performance Management Research Data Set (NPMRDS) Technical Frequently Asked Questions. December. (http://www.ops.fhwa.dot.gov/freight/freight_analysis/perform_meas/vpds/npmrdsfaqs.htm)
- Federal Highway Administration. 2014. Megaregions and Multi-Jurisdictional Planning. July 16. (http://www.fhwa.dot.gov/planning/megaregions/)
- Federal Highway Administration. 2015. 2015 Red Book: Synchronizing Environmental Reviews for Transportation and Other Infrastructure Projects. September. (https://www.environment.fhwa.dot.gov/strmlng/RedBook_2015.asp)
- Federal Highway Administration. Eco-Logical. (http://www.environment.fhwa.dot.gov/ecological/eco_entry.asp)
- Federal Highway Administration. FHWA's Sustainable Highways Initiative and Self-Evaluation Tool.
- Federal Highway Administration. Financing Freight Improvements. (http://ops.fhwa.dot.gov/freight/publications/freightfinancing/sect2.htm)
- Federal Highway Administration. MAP-21 - Moving Ahead for Progress in the 21st Century. Environment, Planning, and Realty. (https://www.fhwa.dot.gov/map21/qandas/index.cfm)

- Federal Highway Administration. Planning and Environmental Linkages Website. (http://www.environment.fhwa.dot.gov/integ/index.asp)
- Federal Highway Administration. Resiliency Order 5520, Transportation System Preparedness and Resilience to Climate Change and Extreme Weather Events. (http://www.fhwa.dot.gov/legsregs/directives/orders/5520.cfm)
- Federal Highway Administration. Shortening Project Delivery Toolkit. (http://environment.fhwa.dot.gov/integ/pel_quest_equiv_tn.asp#ft2)
- Federal Highway Administration. Special Experimental Projects No. 14 - Alternative Contracting (formerly Innovative Contracting). (http://www.fhwa.dot.gov/programadmin/contracts/sep_a.cfm#s1)
- Federal Motor Carrier Safety Administration. 2014. 79 FR 17656, Electronic Logging Devices; Hours of Service Supporting Documents. June 26. (http://www.regulations.gov/#!documentDetail;D=FMCSA-2010-0167-0972)
- Federal Motor Carrier Safety Administration. 2015. Hours of Service. October 1. (http://www.fmcsa.dot.gov/regulations/hours-of-service)
- Federal Railroad Administration. 2010. Draft National Rail Plan. Dec 7. p. 71.
- Federal Railroad Administration. 2013. State Rail Plan Guidance. September. pp. 4-6.
- Federal Register. Asset Management Plan. MAP-21. (https://www.federalregister.gov/regulations/2125-AF57/asset-management-plan-map-21-)
- Federal Transit Authority. 2014. Innovative Public Transportation Workforce Development Program (Ladders of Opportunity Initiative). Federal Register. September 5. (https://www.federalregister.gov/articles/2014/09/05/2014-21155/innovative-public-transportation-workforce-development-program-ladders-of-opportunity-initiative)
- Government Accountability Office. 2015. Transportation Safety: Federal Highway Administration Should Conduct Research to Determine Best Practices in Permitting Oversize Vehicles. GAO-15-236. February.
- Green Highway Partnership. 2014. Fact Sheet. (http://www.greenhighwayspartnership.org/media/GHPFS01COLLABORATINGFORSUCCESS.pdf)
- HDR Engineering, Inc. 2013. U.S. Inland Waterway Modernization: A Reconnaissance Study Prepared for the Iowa Department of Transportation. April. p. 41.
- Illinois Dept. of Transportation, Iowa Dept. of Transportation, Minnesota Dept. of Transportation, Missouri Dept. of Transportation, Wisconsin Dept. of Transportation. 2014. M-35: Waterway of the Saints. Application for Marine Highway Corridor Designation to Maritime Administration Division of U.S. DOT. February 14. (http://www.idot.illinois.gov/assets/uploads/files/transportation-system/pamphlets-&-brochures/freight-council/m-35%20corridor%20app%205%20states%20final%20feb10%20with%20documents.pdf)
- IMTS Capital Investment Strategy Team. 2010. Inland Marine Transportation Systems (IMTS) Capital Projects Business Model. Final Report, Revision 1. April 13. p. vii.
- JOC. 2014. DHS to Congress. 100 Percent Container Scanning 'Highly Improbable.' May 16. (http://www.joc.com/regulation-policy/transportation-regulations/us-transportation-

regulations/dhs-congress-100-percent-container-scanning-%E2%80%98highly-improbable%E2%80%99_20140516.html).

- Kaiser, Edward J. and Godschalk, David R. 1995. "Twentieth Century Land Use Planning." Journal of the American Planning Association. Vol. 61, Issue 3. pp. 365-385.
- Lewis M. Branscomb, Lewis M. et al. 2010. Rail Transportation of TIH: Policy Responses to the Safety and Security Externality. Belfer Center Discussion Paper #2010-01. Harvard Kennedy School, February. pp. 3, 5-7, 62, 65. (http://belfercenter.ksg.harvard.edu/files/Rail-Transportation-of-Toxic-Inhalation-Hazards-Final.pdf)
- Logistics News. 2009. Should Rail "Bottleneck" Segment Pricing Finally be Revised? April 6. (http://www.scdigest.com/assets/On_Target/09-04-06-1.php)
- Minnesota Department of Transportation. 2014. Using Truck GPS Data for Freight Performance Analysis in the Twin Cities Metro Area. March. Executive Summary, p. 6.
- Montgomery County, MD Government. 2014. Montgomery County Community Toolkit for the Mid-County communities of Aspen Hill, Brookeville, Capital View, Derwood, Forest Glen, Glenmont, Kemp Mill, Kensington, Layhill, Norbeck, Olney, Sandy Spring, Upper Rock Creek, and Wheaton. August. (http://www.montgomerycountymd.gov/midcounty/Resources/Files/Mid-countyToolkit2014.pdf)
- National Cooperative Freight Research Program. 2010. Report 8, Freight-Demand Modeling to Support Public-Sector Decision Making. pp. 3, 11.
- National Cooperative Freight Research Program. 2011. Report 11 Truck Drayage Productivity Guide. Foreword.
- National Cooperative Freight Research Program. 2012. Report 16, Preserving and Protecting Freight Infrastructure and Routes. pp. 7, 23-24, 36.
- National Cooperative Freight Research Program. 2013. Report 23, Synthesis of Freight Research in Urban Transportation Planning. pp. 2, 12, 46, 58, 63-65, 69.
- National Cooperative Freight Research Program. 2015. Report 33, Improving Freight System Performance in Metropolitan Areas: A Planning Guide. p. 135. (http://onlinepubs.trb.org/onlinepubs/ncfrp/ncfrp_rpt_033.pdf)
- National Cooperative Highway Research Program. "Scenario Planning for Freight Transportation Infrastructure Investment." Report 750, Strategic Issues Facing Transportation. pp. 4-5. (http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_750v1.pdf)
- National Cooperative Highway Research Program. 2007. Rep. 586, Rail Freight Solutions to Roadway Congestion: Final Report and Guidebook. p. 24.
- National Cooperative Highway Research Program. 2008. Synthesis 384, Forecasting Metropolitan Commercial and Freight Travel. p. 1.
- National Cooperative Highway Research Program. 2010. Synthesis 406, Advanced Practices in Travel Forecasting. p. 3.
- National Cooperative Highway Research Program. 2011. Report 685, Strategies to Attract and Retain a Capable Transportation Workforce. pp. 1-2.
- National Cooperative Highway Research Program. 2013. Synthesis 439, Use of Transportation Asset Management Principles in State Highway Agencies. p. 33.

- National Freight Advisory Committee. 2014. Final NFAC Recommendations Part I. April 29. pp. 7-8, 22, 25.
- National Highway Transportation Safety Administration. 2015. Final Rule: Federal Motor Vehicle Safety Standards; Electronic Stability Control Systems for Heavy Vehicles. 80 FR 36049. June 23.
- New York City Department of Transportation. 2015. Off-Hour Delivery Program. (http://www.nyc.gov/html/dot/html/motorist/offhoursdelivery.shtml)
- Newsom, Mary. 2009. "The Naked City: Sane planning? Not for transportation." The Charlotte Observer. July 1. (http://marynewsom.blogspot.com/2009/07/sane-planning-not-for-transportation.html)
- Orski, Ken. June 6, 2014 Newsletter.
- Pike, John. 2012. Strategic Rail Corridor Network (STRACNET). October 1. (http://www.globalsecurity.org/military/facility/stracnet.htm)
- Plant, Jeremy. 2007. Handbook of Transportation Policy and Administration. CRC Press. pp. 137, 140, 175-176.
- Pointon, Mark. Envisioning and Implementing Viable Initiatives for the Inland Marine Transportation System Inland Waterways Trust Fund.
- Rand Corporation. 2009. Adding Resilience to the Freight System in Statewide and Metropolitan Transportation Plans: Developing a Conceptual Approach. Prepared for American Association of State Highway and Transportation Officials Standing Committee on Planning. June. pp. 16-19, 24.
- Scheer, Brenda. 2012. The Utah Model: Lessons for Regional Planning. Brookings Mountain West. December. p. 12.
- Short, Jeffrey et al. 2010. Identifying and Using Low-Cost and Quickly Implementable Ways to Address Freight-System Mobility Constraints, NCFRP Report 7. p. 78-79, 82-83, 86.
- Steering Committee on Federal Infrastructure Permitting and Review Process Improvement. 2014. Implementation Plan for the Presidential Memorandum on Modernizing Infrastructure Permitting. May. p. 3.
- Strategic Highway Research Program. 2010. Strategies for Improving the Project Agreement Process Between Highway Agencies and Railroads. Report S2-R16-RR-1. p. 18.
- Strategic Highway Research Program. 2013. Report S2-C20-RR-1, Freight Demand Modeling and Data Improvement. pp. 1, 4-7, 13-14, 22, 27, 30-32, 39, 43.
- Surface Transportation Board. 2013. PUBLIC USE WAYBILL FILE 247-byte Record Data Element Descriptions.
- The Council of State Governments, Rural Transportation Needs, CAPITOL research: Transportation, January 2011, p. 4-5, http://knowledgecenter.csg.org/kc/system/files/Rural_Transportation_Needs.pdf.
- The PM Group. 2014. Port Planning and Investment Toolkit Funding Strategy Module. Prepared for the American Association of Port Authorities and U.S. DOT. October. p. 1.
- The White House. 2012. Executive Order -- Improving Performance of Federal Permitting and Review of Infrastructure Projects. March 22. (http://www.whitehouse.gov/the-press-office/2012/03/22/executive-order-improving-performance-federal-permitting-and-review-infr)

- The White House. 2014. FACT SHEET: Building a 21st Century Infrastructure: Increasing Public and Private Collaboration with the Build America Investment Initiative. July 17. (http://www.whitehouse.gov/the-press-office/2014/07/17/fact-sheet-building-21st-century-infrastructure-increasing-public-and-pr)
- The White House. 2014. FACT SHEET: Opportunity For All: Improving the Fuel Efficiency of American Trucks – Bolstering Energy Security, Cutting Carbon Pollution, Saving Money and Supporting Manufacturing Innovation. February 18.
- Transportation Learning Center/Jobs for the Future. 2014. DRAFT Strengthening Skills Training and Career Pathways across the Transportation Industry. October 7. pp. 3, 70.
- Transportation Research Board. ACRP 03-24 Guidelines for Air Cargo Facility Planning and Development. (http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=3039)
- United States Army Corps of Engineers. 2013. AIS Analysis Tools. July.
- United States Department of Energy. 2014. National Clean Fleets Partnership. DOE/GO-102014-4312. September.
- United States Department of Energy. Alternative Fuels Data Center, National Clean Diesel Campaign (NCDC). (http://www.afdc.energy.gov/laws/389)
- United States Department of Homeland Security. 2010. Transportation Systems Sector-Specific Plan: An Annex to the National Infrastructure Protection Plan. pp. I, 12, 91-98.
- United States Department of Interior, Bureau of Indian Affairs. 2014. Indian Entities Recognized and Eligible to Receive Services from the United States Bureau of Indian Affairs. Federal Register. Vol. 79, No. 19. January 29.
- United States Department of Transportation. 2013. Research, Development, and Technology Strategic Plan Fiscal Year 2013–2018. September. p. 35-37.
- United States Department of Transportation. 2014. U.S. Department of Transportation Climate Adaptation Plan: Ensuring Transportation Infrastructure and System Resilience. (https://www.transportation.gov/sites/dot.dev/files/docs/DOT%20Adaptation%20Plan.pdf)
- United States Department of Transportation. 2015. 'Jason's Law' Survey Reaffirms Nationwide Truck Parking Needs. Press Release. August 21.
- United States Department of Transportation. 2015. Beyond Traffic: US DOT's 30 Year Framework for the Future. pp. 53, 64-65, 258, 261.
- United States Department of Transportation. 2015. GROW AMERICA Act. Sections 1101, 1202, 8102, 1210, 2101, 8104, 1401, 8105, 9201, 9102, 9407, 7004, 1403, 1208, 5401, 1007.
- United States Department of Transportation. 2015. OMB-CEQ Released Guidance on Infrastructure Permitting; Federal Infrastructure Permitting Dashboard Updated. September 22. (https://www.permits.performance.gov/about/news/omb-ceq-released-guidance-infrastructure-permitting-federalFederal-infrastructure-permitting)
- United States Department of Transportation. 2015. Rule Summary: Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains. May 1. (http://www.transportation.gov/mission/safety/rail-rule-summary)
- United States Environmental Protection Agency. 2004. SmartWay Transport Overview. (http://www.epa.gov/smartway/about/documents/basics/420f14006.pdf)

- (DOE) United States Department of Energy. 2014 Clean Cities Building Partnerships to Cut Petroleum Use in Transportation. August. (http://www.afdc.energy.gov/uploads/publication/clean_cities_overview.pdf)
- United States Government Accountability Office. 2004. Surface Transportation: Many Factors Affect Investment Decisions. GAO-04-744. June. pp. 29, 31-32.
- United States Government Accountability Office. 2008. FREIGHT TRANSPORTATION: National Policy and Strategies Can Help Improve Freight Mobility. GAO-08-287. January. p. 7.
- United States Government Accountability Office. 2009. Metropolitan Planning Organizations: Options Exist to Enhance Transportation Planning Capacity and Federal Oversight. GAO-09-868. September. pp. 1, 5, 8, 18.
- United States Government Accountability Office. 2012. DIESEL POLLUTION: Fragmented Federal Programs That Reduce Mobile Source Emissions Could Be Improved. GAO-12-261. February.
- United States Government Accountability Office. 2014. Freight Transportation: Developing National Strategy Would Benefit from Added Focus on Community Congestion Impacts. GAO-14-740. September 26. p. 9.
- United States Government Accountability Office. 2014. Statement of Fact, State Highway Reviews. September 22. p. 2.
- Victoria Transport Policy Institute. 2014. TDM Encyclopedia, Evaluating Transportation Resilience, Evaluating The Transportation System's Ability To Accommodate Diverse, Variable and Unexpected Demands With Minimal Risk. April. (http://www.vtpi.org/tdm/tdm88.htm)
- Washington State Freight Advisory Committee. 2014. Washington State Freight Trends & Policy Recommendations. May 7. pp. 2, 3, 5. (http://www.fmsib.wa.gov/fac/20140602-FINALComplete%20Folio_for%20printer5-7-14.pdf)

Section IV: Appendices

Appendix A. MAP-21 Section 1115

SEC. 1115. NATIONAL FREIGHT POLICY.
(a) IN GENERAL.—Chapter 1 of title 23, United States Code, is amended by adding at the end the following:
‘‘§ 167. National freight policy
‘‘(a) IN GENERAL.—It is the policy of the United States to improve the condition and performance of the national freight network to ensure that the national freight network provides the foundation for the United States to compete in the global economy and achieve each goal described in subsection (b).
‘‘(b) GOALS.—The goals of the national freight policy are—
‘‘(1) to invest in infrastructure improvements and to implement operational improvements that—
‘‘(A) strengthen the contribution of the national freight network to the economic competitiveness of the United States;
‘‘(B) reduce congestion; and
‘‘(C) increase productivity, particularly for domestic industries and businesses that create high-value jobs;
‘‘(2) to improve the safety, security, and resilience of freight transportation;
‘‘(3) to improve the state of good repair of the national freight network;
‘‘(4) to use advanced technology to improve the safety and efficiency of the national freight network;
‘‘(5) to incorporate concepts of performance, innovation, competition, and accountability into the operation and maintenance of the national freight network; and
‘‘(6) to improve the economic efficiency of the national freight network.
‘‘(7) to reduce the environmental impacts of freight movement on the national freight network;
‘‘(c) ESTABLISHMENT OF A NATIONAL FREIGHT NETWORK.—
‘‘(1) IN GENERAL.—The Secretary shall establish a national freight network in accordance with this section to assist States in strategically directing resources toward improved system performance for efficient movement of freight on highways, including national highway system, freight intermodal connectors and aerotropolis transportation systems.
‘‘(2) NETWORK COMPONENTS.—The national freight network shall consist of—
‘‘(A) the primary freight network, as designated by the Secretary under subsection (d) (referred to in this section as the ‘primary freight network’) as most critical to the movement of freight;
‘‘(B) the portions of the Interstate System not designated as part of the primary freight network; and
‘‘(C) critical rural freight corridors established under subsection (e).
‘‘(d) DESIGNATION OF PRIMARY FREIGHT NETWORK.—
‘‘(1) INITIAL DESIGNATION OF PRIMARY FREIGHT NETWORK.—
‘‘(A) DESIGNATION.—Not later than 1 year after the date of enactment of this section, the Secretary shall designate a primary freight network—
‘‘(i) based on an inventory of national freight volume conducted by the Administrator of the Federal Highway Administration, in consultation with stakeholders, including system users, transport providers, and States; and
‘‘(ii) that shall be comprised of not more than 27,000 centerline miles of existing roadways that are most critical to the movement of freight.
‘‘(B) FACTORS FOR DESIGNATION.—In designating the primary freight network, the Secretary shall consider—
‘‘(i) the origins and destinations of freight movement in the United States;
‘‘(ii) the total freight tonnage and value of freight moved by highways;

‘‘(iii) the percentage of annual average daily truck traffic in the annual average daily traffic on principal arterials;
‘‘(iv) the annual average daily truck traffic on principal arterials;
‘‘(v) land and maritime ports of entry;
‘‘(vi) access to energy exploration, development, installation, or production areas;
‘‘(vii) population centers; and
‘‘(viii) network connectivity.
‘‘(2) ADDITIONAL MILES ON PRIMARY FREIGHT NETWORK.— In addition to the miles initially designated under paragraph
(1), the Secretary may increase the number of miles designated as part of the primary freight network by not more than 3,000 additional centerline miles of roadways (which may include existing or planned roads) critical to future efficient movement of goods on the primary freight network.
‘‘(3) REDESIGNATION OF PRIMARY FREIGHT NETWORK.—Effective beginning 10 years after the designation of the primary freight network and every 10 years thereafter, using the designation factors described in paragraph (1), the Secretary shall redesignate the primary freight network (including additional mileage described in paragraph (2)).
‘‘(e) CRITICAL RURAL FREIGHT CORRIDORS.—A State may designate a road within the borders of the State as a critical rural freight corridor if the road—
‘‘(1) is a rural principal arterial roadway and has a minimum of 25 percent of the annual average daily traffic of the road measured in passenger vehicle equivalent units from trucks (FHWA vehicle class 8 to 13);
‘‘(2) provides access to energy exploration, development, installation, or production areas;
‘‘(3) connects the primary freight network, a roadway described in paragraph (1) or (2), or Interstate System to facilities that handle more than—
‘‘(A) 50,000 20-foot equivalent units per year; or
‘‘(B) 500,000 tons per year of bulk commodities.
‘‘(f) NATIONAL FREIGHT STRATEGIC PLAN.—
‘‘(1) INITIAL DEVELOPMENT OF NATIONAL FREIGHT STRATEGIC PLAN.—Not later than 3 years after the date of enactment of this section, the Secretary shall, in consultation with State departments of transportation and other appropriate public and private transportation stakeholders, develop and post on the Department of Transportation public website a national freight strategic plan that shall include—
‘‘(A) an assessment of the condition and performance of the national freight network;
‘‘(B) an identification of highway bottlenecks on the national freight network that create significant freight congestion problems, based on a quantitative methodology developed by the Secretary, which shall, at a minimum, include—
‘‘(i) information from the Freight Analysis Network of the Federal Highway Administration; and
‘‘(ii) to the maximum extent practicable, an estimate of the cost of addressing each bottleneck and any operational improvements that could be implemented;
‘‘(C) forecasts of freight volumes for the 20-year period beginning in the year during which the plan is issued;
‘‘(D) an identification of major trade gateways and national freight corridors that connect major population centers, trade gateways, and other major freight generators for current and forecasted traffic and freight volumes, the identification of which shall be revised, as appropriate, in subsequent plans;
‘‘(E) an assessment of statutory, regulatory, technological, institutional, financial, and other barriers to improved freight transportation performance (including opportunities for overcoming the barriers);
‘‘(F) an identification of routes providing access to energy exploration, development, installation, or production areas;
‘‘(G) best practices for improving the performance of the national freight network;
‘‘(H) best practices to mitigate the impacts of freight movement on communities;
‘‘(I) a process for addressing multistate projects and encouraging jurisdictions to collaborate; and

‘‘(J) strategies to improve freight intermodal connectivity.

MAP-21 Freight Provisions

‘‘(2) UPDATES TO NATIONAL FREIGHT STRATEGIC PLAN.—Not later than 5 years after the date of completion of the first national freight strategic plan under paragraph (1), and every 5 years thereafter, the Secretary shall update and repost on the Department of Transportation public website a revised national freight strategic plan.

‘‘(g) FREIGHT TRANSPORTATION CONDITIONS AND PERFORMANCE REPORTS.—Not later than

2 years after the date of enactment of this section, and biennially thereafter, the Secretary shall prepare a report that contains a description of the conditions and performance of the national freight network in the United States.

‘‘(h) TRANSPORTATION INVESTMENT DATA AND PLANNING TOOLS.—

‘‘(1) IN GENERAL.—Not later than 1 year after the date of enactment of this section, the Secretary shall—

‘‘(A) begin development of new tools and improvement of existing tools or improve existing tools to support an outcome-oriented, performance-based approach to evaluate proposed freight-related and other transportation projects, including—

‘‘(i) methodologies for systematic analysis of benefits and costs;

‘‘(ii) tools for ensuring that the evaluation of freight-related and other transportation projects could consider safety, economic competitiveness, environmental sustainability, and system condition in the project selection process; and

‘‘(iii) other elements to assist in effective transportation planning;

‘‘(B) identify transportation-related model data elements to support a broad range of evaluation methods and techniques to assist in making transportation investment decisions; and

‘‘(C) at a minimum, in consultation with other relevant Federal agencies, consider any improvements to existing freight flow data collection efforts that could reduce identified freight data gaps and deficiencies and help improve forecasts of freight transportation demand.

‘‘(2) CONSULTATION.—The Secretary shall consult with Federal, State, and other stakeholders to develop, improve, and implement the tools and collect the data in paragraph (1).

‘‘(i) DEFINITION OF AEROTROPOLIS TRANSPORTATION SYSTEM.— In this section, the term ‘aerotropolis transportation system’ means a planned and coordinated multimodal freight and passenger transportation network that, as determined by the Secretary, provides efficient, cost-effective, sustainable, and intermodal connectivity to a defined region of economic significance centered around a major airport.’’.

(b) CONFORMING AMENDMENT.—The analysis for chapter 1 of title 23, United States Code, is amended by adding at the end the following:

‘‘167. National freight program.’’.

Appendix B. MAP-21 National Policy Goals with U.S. DOT-Recommended Performance Objectives and Measures

MAP-21 National Policy Goal[33]	Performance Objectives	Performance Measure
1. Invest in infrastructure improvements and implement operational improvements that strengthen the contribution of the national freight network to the economic competitiveness of the United States; reduce congestion; and increase productivity, particularly for domestic industries and businesses that create high-value jobs.	• Reduce freight transportation delay time and schedule variability on the nation's primary freight system, defined as the MFN, by at least 10 percent per decade through 2045 relative to levels for 2015 for each freight transportation mode. Delay reductions will result from improvements to infrastructure, new technologies, regulations, expansion of multimodal capacity and connectivity, and other actions that reduce freight bottlenecks and first-mile/last-mile congestion.	• Hours of freight transportation delay over all segments of the MFN, measured as the cumulative additional time required for all freight vehicles to travel the distance of a segment relative to a specified minimum speed threshold (e.g., speed limit, track design speed), for each transportation mode for which such data are available. • Unreliability of freight travel times over the MFN, measured by the ratio of 95th percentile freight speed to 50th percentile freight speed, for each transportation mode for which such data are available.
2. Improve the safety, security, and resilience of freight transportation.	*Safety* • Reduce freight-related fatalities and serious injuries at the national level associated with freight transportation by 50 percent by 2025 and to approach zero by 2035 by facilitating the development and application of safer technologies and practices, best practice design in freight infrastructure, and pursuit of cost-beneficial safety regulations. This goal would apply to all freight transportation on and off the MFN. • State transportation safety plans (e.g., Commercial Vehicle Safety Plans, Strategic Highway Safety Plans, and State	*Safety* • Freight-related fatalities per freight vehicle miles traveled (VMT), serious injuries per freight VMT; number of fatalities, and number of serious injuries for each freight mode. Actual metrics for highway freight-related safety will be influenced by the requirements of the Final Rule on the "National Performance Management Measures; Highway Safety Improvement Program." • Certification by U.S. DOT that State safety plans and safety performance measures and goals are in compliance with regulations.

[33] See Appendix C for information on how the strategies in Section III link to MAP-21 NFP goals and objectives.

MAP-21 National Policy Goal[33]	Performance Objectives	Performance Measure
	Highway Safety Plans) are in compliance with regulatory requirements. *Security* • All States, MPOs, and Tribal and local governments are in compliance with Transportation Security Administration (TSA) and U.S. Coast Guard (USCG) requirements that are specified in transportation Sector-Specific Plan (SSP) from 2015 onward. U.S. DOT is not the lead agency for transportation security and cannot set specific performance objectives within the SSP or other plans. *Resilience* • The transportation components of all State Emergency Operations Plans (EOPs) comply with Federal Emergency Management Agency (FEMA) requirements for resilience planning, including that all DOTs and MPOs have formal mechanisms in place to coordinate their resilience efforts, from 2017 onward. U.S. DOT is not the lead agency for transportation resilience and cannot set specific performance objectives for resilience. However, U.S. DOT is examining ways to incorporate best practices in transportation planning to ensure that projects are hardened against both short and long-term climate change impacts, such as rising sea levels.	*Security* • TSA/USCG certifications that States, MPOs, and Tribal and local governments are compliance. *Resilience* • FEMA certifies that compliant EOPs are in place.

MAP-21 National Policy Goal[33]	Performance Objectives	Performance Measure
3. Improve the state of good repair of the national freight network.	• By 2025, at least 95 percent of all roads, railways, waterways, pipelines, and ports (channels, docks, and roadways) included in the MFN are in "fair" or better condition (to the extent that measures of condition are available). At least 60 percent of system is at least in "good" condition. By 2035, all roads, railways, waterways, pipelines and ports (channels, docks, and roadways) included in the MFN are in "fair" or better condition (to the extent that measures of condition are available). At least 70 percent of system is at least in "good" condition.	• Measures of condition will vary by asset and freight mode, including existing FHWA pavement and bridge measures (as modified by rulemaking under Section 1203 of MAP-21); industry rail condition ratings; USACE ratings of locks and dams; etc.
	• In accordance with Section 1106 of MAP-21, each State must have a developed a risk-based asset management plan for NHS pavements and bridges to improve or preserve the condition of the assets and the performance of the transportation system. Compliance must be reached within a period to be specified when the Final Rule on Asset Management Plan is issued. Asset management plans that include other asset classes are strongly encouraged.	• The number of States that have developed NHS asset management plans using a U.S. DOT-certified process. .
4. Use advanced technology to improve the safety and efficiency of the national freight network.	• 100 percent of public agencies managing freight routes on the NHS will expand existing ITS technologies or will deploy new ITS technology on these routes by 2025 to improve safety and efficiency of freight movement.	• Responses by States to the national ITS Deployment Tracking survey conducted every three years by the U.S. DOT ITS JPO.
	• All States that submit State Freight Plans after the enactment of MAP-21 will provide evidence in the plans of their consideration of innovative technologies and operational strategies, including ITS, that improve the safety and efficiency of freight movement, as required under Section 1118 of MAP-21.	• The number of State Freight Plans submitted after the enactment of MAP-21 that provide evidence of consideration of innovative technologies and operational strategies, including ITS, that improve the safety and efficiency of freight movement.
5. Incorporate concepts of performance, innovation, competition, and accountability into the	• The Secretary will produce a biennial Freight Transportation Conditions and Performance Report, required under USC 23 167(g), that contains a description of the conditions and	• Issuance of Freight Transportation Condition and Performance Report.

MAP-21 National Policy Goal[33]	Performance Objectives	Performance Measure
operation and maintenance of the national freight network.	performance of the MFN, as well as all metrics described in Section II of this plan. • In accordance with rulemakings issued under Section 1203 of MAP-21, all States will establish targets for required performance measures. Targets must be established in accordance with schedules established in the rulemakings and must be updated periodically. States will report to U.S. DOT on progress in achieving targets according to specified schedules. • In accordance with Section 1106 of MAP-21, all States will produce risk-based asset management plans for NHS pavements and bridges to improve or preserve the condition of the assets and the performance of the transportation system (described above for state of good repair).	• The number of States that have fully complied with the target setting and reporting requirements in Sections 1203 of MAP-21.. • The number of States that have fully complied with the NHS asset management requirements of Section 1106 of MAP-21.

MAP-21 National Policy Goal[33]	Performance Objectives	Performance Measure
6. Improve the economic efficiency of the national freight network.	• A sponsor of a project from any freight transportation mode (or combinations of modes) seeking Federal discretionary funds for that project should show that the project's combined benefits to the nation exceed its total costs, to the extent that the Federal government can require such information from the sponsor and the project is not statutorily required. Projects with benefits that exceed costs would promote economic efficiency. • The average time to deliver large projects should be reduced by 33 percent from 2012 levels by 2025 and by 50 percent from 2012 levels by 2035 through the use of best planning, environmental review, contracting, and construction practices, so that States and local agencies can be more responsive to identified freight transportation needs.	• Number and percentage of complete benefit-cost analyses for projects seeking Federal discretionary funds, for which the Federal government can require such information, with public and non-jurisdictional benefits and costs clearly identified and commensurate with public funding. • Number of months to move from project proposal to the opening of the project for use in freight movement, with particular focus on the time required to complete Federal environmental and permitting requirements.
7. Reduce the environmental impacts of freight movement on the national freight network.	• Reduce NO_x and PM-10 criteria emissions from all domestic surface and waterborne freight transportation by at least 40 percent by 2025 and by 70 percent by 2035 compared to 2012 levels, through new standards for cleaner and more fuel efficient trucks, trains, vessels, support for new technologies and alternative fuels, and emphasizing multimodal transportation solutions. • Continued improvements in engine technologies, including the use of new fuels (such as natural gas or hydrogen) and vehicles built from lighter materials, should reduce fuel consumption and emissions from all forms of freight vehicles. • Reduce the number of people exposed to significant aircraft noise by 2018 to less than 300,000 people.	• Total tons of criteria emissions by emission type, as measured by EPA in the National Emissions Inventory. • Total tons of GHG emissions produced by freight transportation activity as measured by EPA in its Inventory of U.S. GHG Emissions and Sinks. • Significant noise is defined as Day-Night Average Sound level 65 decibels or greater

Appendix C. Relationship of Strategies in Section III to MAP-21 NFP Goals

MAP-21's NFP established seven goals for the national freight network (see Appendix A for complete language of MAP-21's NFP). Section III of this Plan identified three different types of bottlenecks (infrastructure, institutional, and financial) that disrupt or hinder the safe and efficient movement of goods, as well as strategies to help address or mitigate these bottlenecks. The bottlenecks outlined in this Plan do not necessarily align directly with MAP-21's NFP goals but do relate to them in important ways. The tables below list each type of bottleneck and associated strategies as presented in this Plan, along with the NFP goals that relate most closely to these strategies.

A. Infrastructure Bottleneck Strategies and Relationship to MAP-21 NFP Goals

Infrastructure Bottleneck Strategy	Relationship to MAP-21 NFP Goals
A.1. Reduce congestion to improve performance of the freight transportation system	Goal #1, Goal #4, Goal #6
A.2. Improve the safety, security, and resilience of the freight transportation system	Goal #2, Goal #3
A.3. Facilitate intermodal connectivity	Goal #1, Goal #4, Goal #6, Goal #7
A.4. Identify major trade gateways and multimodal national freight networks/corridors	Goal #1, Goal #5, Goal #6
A.5. Mitigate impacts of freight projects/movements on communities	Goal #1, Goal #7
A.6. Support research and promote adoption of new technologies and best practices	All Goals

B. Institutional Bottlenecks Strategy and Relationship to MAP-21 NFP Goals

Institutional Bottlenecks Strategy	Relationship to MAP-21 NFP Goals
B.1. Streamline project planning, review, permitting, and approvals	All Goals
B.2. Facilitate multijurisdictional, multimodal collaboration and solutions	All Goals
B.3. Improve coordination between public and private sectors	All Goals
B.4. Ensure availability of better data and freight transportation models	All Goals
B.5. Develop the next generation freight transportation workforce	All Goals

C. Financial Bottlenecks Strategy and Relationship to MAP-21 NFP Goals

Financial Bottleneck Strategy	Relationship to MAP-21 NFP Goals
C.1. Enhance existing freight funding sources	All Goals
C.2. Develop new freight funding sources	All Goals

Appendix D. Draft MFN Map

Section 1115 of MAP-21 requires as part of the NFSP that the Secretary identify major trade gateways and national freight corridors that connect major population centers, as well as other major freight generators for current and forecasted traffic and freight volumes. Section 1115 also requires that the identification of these major trade gateways, national freight corridors, and major freight generators be revised, as appropriate, in subsequent plans (23 USC 167(f)(1)(D)). Separately, Section 1115 also creates a statutory requirement that U.S. DOT develop a National Freight Network (NFN) limited to highways, which consists of a PFN and other elements (23 USC 167(c)).

On November 19, 2013, U.S. DOT/FHWA published a draft PFN in the Federal Register to comply with 23 USC 167(c). In developing this network and reviewing the resulting public comments, U.S. DOT determined that efforts to incorporate all of the criteria specified in the statute did not yield a network that could comprehensively represent the most critical elements of a U.S. national freight system. Among other factors, the effort to link qualifying PFN segments to achieve a contiguous network and ensure sufficient connections to Mexico and Canada would require designating thousands of miles beyond the 27,000 centerline miles allowed by MAP-21. In addition, the data available to show truck volumes do not accurately reflect intercity movements of freight. Furthermore, non-truck freight modes, including rail, water and pipeline, play a major role in long-distance movements of freight, particularly for distances exceeding 500 miles. Collectively, freight movement on these modes (as measured by tonnage) exceeds that for trucks for distances beyond 500 miles. Non-truck freight modes are vital to an integrated freight network and to ensuring the health of the U.S. economy. A Federal Register notice on the PFN developed under 23 USC 167(c), which describes other limitations of the PFN, will be accessible through the NFSP website at http://www.transportation.gov/freight. Because U.S. DOT believes that a viable plan for the national freight system cannot be limited to one freight mode, it is including multiple freight modes in the NFSP and has assembled a draft MFN map that includes the highest volume freight routes and facilities. U.S. DOT proposes that it will periodically augment the draft MFN map, once finalized, to reflect changing and emerging freight routes and facilities, including critical rural and urban freight connectors, through a process incorporating public involvement.

The purpose of the draft MFN map is to inform planners and the public about where major freight flows occur and where special attention to freight issues may be most warranted. U.S. DOT notes, however, that many important freight opportunities will occur off of the MFN routes, including in first-/last-mile links in urban and rural areas. Important freight projects not on an MFN route will in some cases yield greater net benefits to the nation than projects on the MFN. As such, U.S. DOT does not intend that a project's placement on an MFN route would provide it exclusive or preferred access to freight funding, or similarly, that a project not on an MFN route would not be eligible for freight funding. If Congress were to stipulate in future legislation that freight projects on the MFN would receive exclusive or preferred access to freight funding, U.S. DOT would revisit the draft MFN map and, in consultation with Federal, State, regional, local, and other agencies, revise it to include new or different routes and

locations. The merits of a freight project for funding assistance should be based on its ability to cost-effectively improve freight flows regardless of whether or not it is located on the MFN map.

The following text describes the process by which U.S. DOT assembled the draft MFN map provided in this NFSP. The development of the draft MFN map is described separately by freight mode for clarity, but U.S. DOT operating administrations worked together closely to establish criteria for selecting facilities that appear on the map. The draft MFN map can be viewed either as an integrated network or in modal layers (see the NFSP website at http://www.transportation.gov/freight).

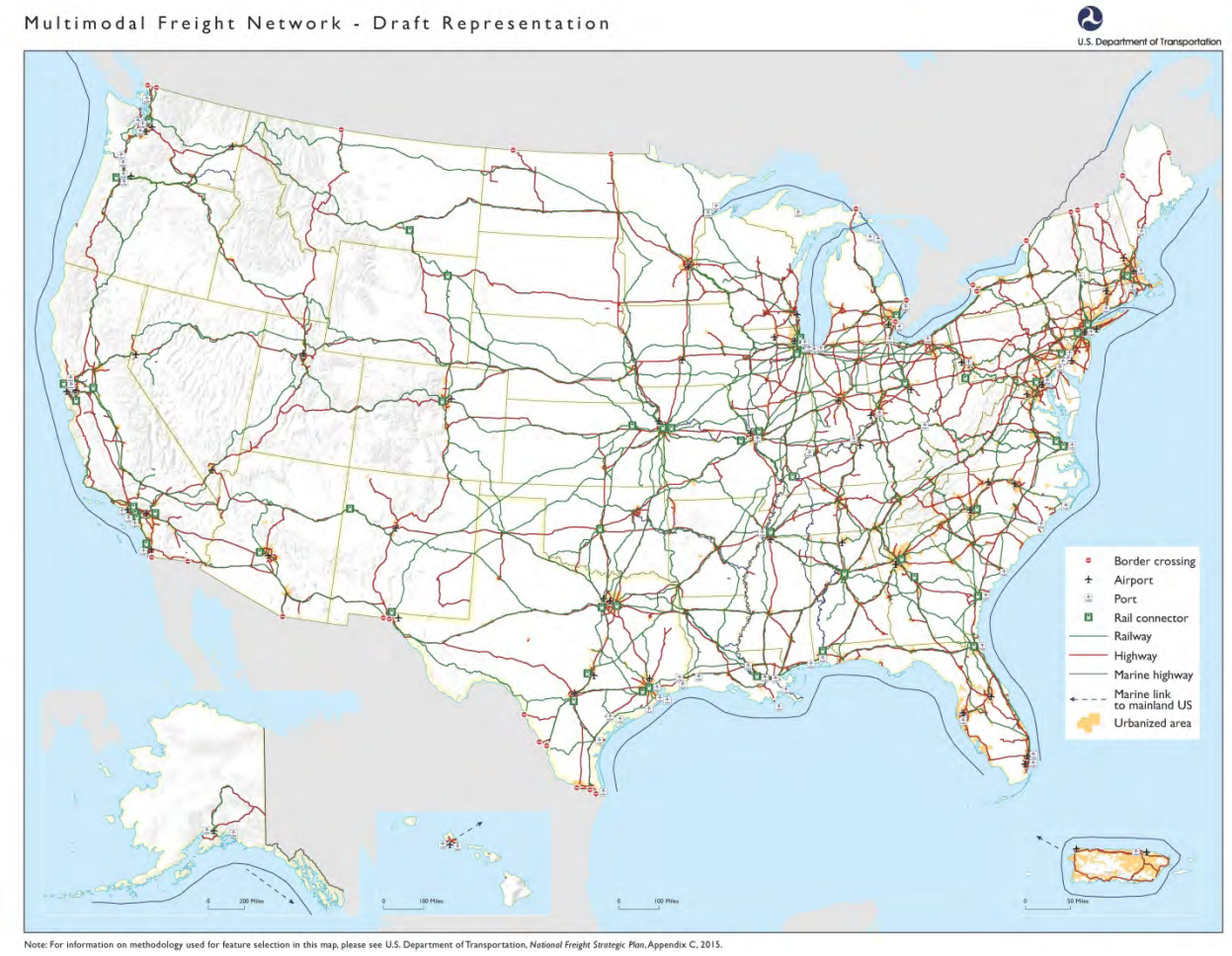


Figure C1. Combined Draft MFN Map

Highway MFN Map: FHWA developed a draft highway MFN map using the set of criteria listed below and from lessons learned during the initial designation of the PFN, particularly from comments submitted on the draft PFN by State, local, regional, and Federal stakeholders as well as the private sector. Below is a list of the criteria and steps FHWA used to develop the draft highway MFN:

- **Interstate System:** Include all of the Interstate System.
- **Average Annual Daily Truck Traffic (AADTT):** Include non-interstate routes that carry a daily average of at least 3,000 trucks and have proximate land use or connectivity demonstrating

indicators of national significance. This threshold is a natural break based on research related to the draft highway PFN and public feedback on the PFN.

- **Intermodal Connectors:** Include all NHS freight intermodal connectors (roads).
- **STRAHNET Connectors:** Include all STRAHNET connectors (approximately 1,860 miles). These highway routes link over 200 important military installations and ports to the STRAHNET.
- **Border Crossings:** Include border crossings carrying an annual average of at least 75,000 trucks.
- **Network Connectivity:** Include segments for network connectivity to connect MFN road segments based on data-driven factors including the following: thresholds of AADTT, value or tonnage carried on the MFN segments being linked; lack of a likely other alternative in the non-highway modes; connection to other modal facilities such as a port, airport, rail facility, or known freight generator; or connection to border crossings as identified above. Connections to border crossings were informed by an assessment of truck flows using truck probe data.

Collectively, the highway freight system identified from applying these criteria consists of approximately 65,000 centerline miles of road, accounting for just over 28 percent of the mileage of the NHS and only 1.6 percent of the nation's total road system.

Railroads: FRA used the 2013 Carload Waybill Sample and the designated STRACNET[34] coded within the FRA network to determine the rail components of the draft MFN map. Based on the waybill sample, FRA developed the following three categories of rail service for potential inclusion in the MFN:

- Intermodal rail traffic, which includes trailer on flatcar, container on flatcar, and rail double stack.
- Bulk shipments, which FRA defined to include all non-intermodal moves that consisted of 50 cars or more of the same commodity on the same waybill.
- General merchandise shipments, which include moves that are not intermodal and did not meet the bulk traffic criteria.

All intermodal rail routes are included in the MFN. For bulk and general merchandise shipments, FRA allocated the waybill data into three volume tiers and relied on the natural breaks in the volume data to determine those parts of the network that had the greatest volumes. FRA removed those lines on the network with the lowest tier of tons for bulk and general merchandise. All Strategic Rail Corridor Network (STRACNET) lines are included in the draft rail MFN map.

The rail component of the draft MFN map consists of 49,900 route miles, representing 35 percent of the nation's route miles. Of this, approximately 94 percent belongs to Class I railroads, with the balance belonging to Class II and III railroads. Collectively the rail routes on the draft MFN map account for 60 percent of all rail freight traffic as measured by tons of freight.

Rail Connection Locations: Rail yards represent important intermodal points in the MFN, as they are typically locations where rail and truck cargoes are interchanged. The FRA used the 2013 Surface

[34] The STRACNET is the strategic rail corridor network and defense connector lines, which are maintained by the Military Surface Deployment and Distribution Command Transportation Engineering Agency.

Transportation Board Carload Waybill Sample to determine which rail connectors should be identified within the draft MFN map. Specifically, there are two columns within the waybill sample for the origin and destination of a rail shipment based on the Standard Point Location Code (SPLC).[35] Based on the SPLC, the top 25 intermodal locations and the top 50 bulk locations were selected. Since there were origination and termination duplicates (the same SPLC) and duplication among two commodities, the number of unique locations was reduced to 53. Next, FRA combined the SPLCs with a Centralized Station Master file to identify the name of the rail stations at these locations. The rail station names were used in conjunction with Census Point files to determine the location of the rail connectors and intermodal connectors. These locations capture a majority of the freight shipped over the rail system.

Pipelines: The U.S. pipeline network is vast, with over 2.66 million miles of pipelines (including natural gas gathering and transmission pipelines) dedicated to the movement of natural gas and petroleum liquids as of 2013. Of this total, 192,000 miles are dedicated to petroleum liquids (crude oil and products) transmission. Mapping this pipeline system or identifying its most important components raises security concerns; moreover, contrary to other freight modes (which carry all types of freight), only a limited number of product types are carried by pipeline (although in very large quantities). Accordingly, while acknowledging the great importance of the nation's pipeline system, the locations of key pipeline routes are not included in the draft MFN map in this Plan. Figure C2 below, however, shows a simplified map of this system, although it does not reflect the density of this system in locations such as west Texas, the Texas-Louisiana Gulf, and others.

[35] The SPLCs are nine-digit numeric codes that pinpoint unique geographic locations of rail and motor carrier points in North America. FRA aggregated origins and destinations of rail shipments using the first five digits that appear in the SPLC codes (which together identify State, county, and city).

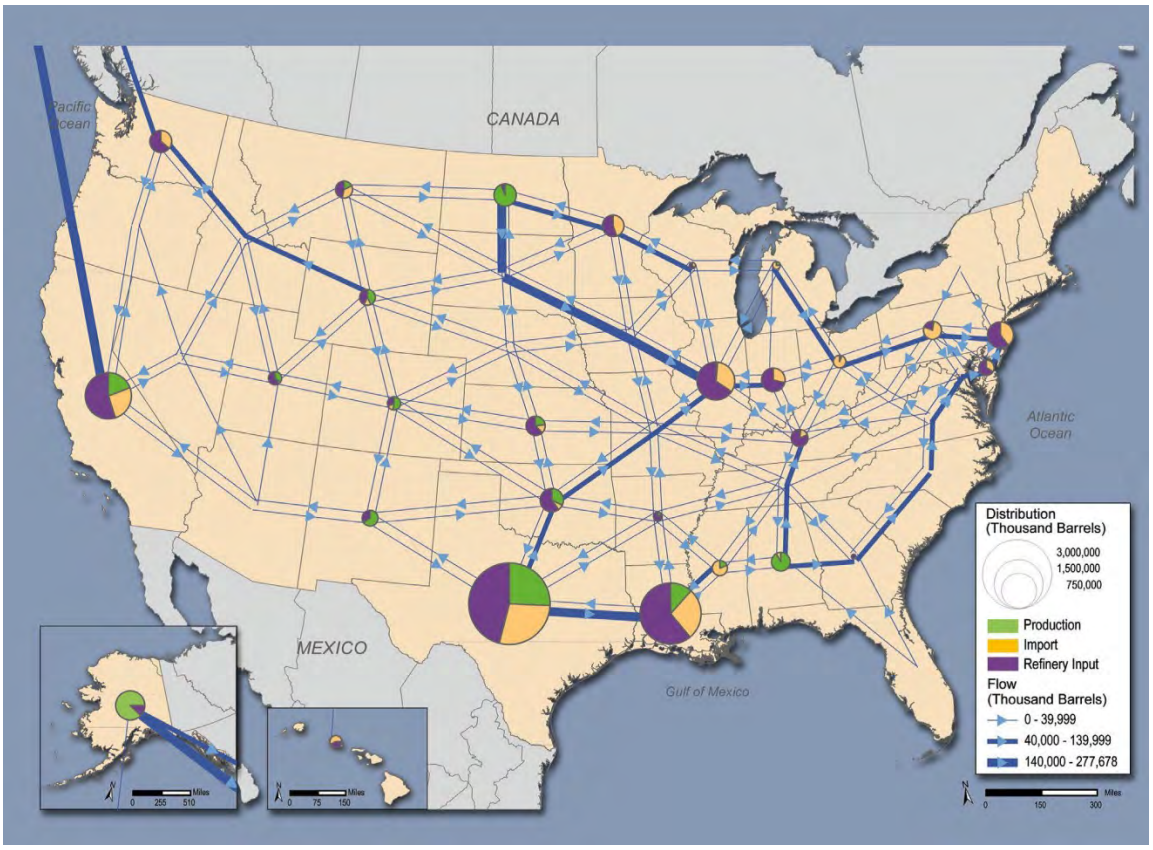


Figure C2. Interstate Movements of Crude Oil and Petroleum Products by Pipeline: 2011
(Source: U.S. DOT's Freight Facts and Figures (2013): Link: http://www.ops.fhwa.dot.gov/freight/freight_analysis/nat_freight_stats/docs/13factsfigures/pdfs/fff2013_highres.pdf)

Waterways: The waterways associated with U.S. DOT's America's Marine Highway routes represent the core elements of the domestic water transportation portion of the draft MFN map. These also include principal inland waterways (which USACE manages) on which moves the majority of commercial waterborne domestic traffic as measured by tons (chiefly bulk cargoes). The significant inland waterways include the main stem of the Ohio River, the Mississippi, and the Illinois Waterway, as well as the Columbia River, and the Gulf Coast Intracoastal Waterways. Some routes on the system (e.g., M35, M29) are lightly utilized but have been identified as significant due to their potential as an alternative to a landside route. Also included in the draft MFN map are coast water routes along which U.S. domestic freight is moved, routes spanning the Great Lakes, and routes connecting to the St. Lawrence Seaway.

Marine Ports: The United States is served by some 360 commercial ports that provide approximately 3,200 cargo and passenger handling facilities, according to USCG. Ports are locations where major intermodal transfer of cargo occurs. The ports included in the draft MFN map consist of those handling the largest volumes of freight in one or more of three categories: containerized; dry and break bulk; and liquid bulk. The top ports within each category are those that cumulatively accounted for approximately 90 percent of total 2013 U.S. tonnage in that category. The volume of each port was assessed using the

2013 USACE Waterborne Commerce Data. Containerized freight consists of all freight identified in the dataset as being transported in shipping containers. The liquid bulk freight consists of all freight carried by tankers or tank-barges. The dry and break bulk freight consists of all freight that was not identified as either containerized or liquid bulk.

The 17 largest container ports handled 90 percent of the total U.S. waterborne container volume, while the 74 largest dry and break bulk ports and 38 largest liquid bulk ports handled 90 percent of the waterborne U.S. dry and break bulk and liquid bulk volumes, respectively. Many ports are among the largest locations in more than one of the three freight categories, so the full list of top ports is comprised of 78 ports. The locations and names of these ports are listed on the draft MFN available on the NFSP website at http://www.transportation.gov/freight.

Airports: The U.S. is served by approximately 500 commercial airports that handle virtually all of the nation's landed weight of air cargo, but also by many thousands more general aviation airports that can accommodate critical small freight deliveries. Of the commercial service airports, most of the air cargo is handled by the largest airports, both in the form of dedicated air cargo flights and belly cargo in the holds of passenger aircraft. To determine which airports are most prominent in handling air cargo, FAA evaluated the following categories to identify those that capture approximately 90 percent of landed cargo weight in the national airspace system:

- Top 50 airports based on cargo landed weight as reported by BTS.
- Top 50 airports based on all-cargo aircraft landed weight (as utilized in administering the Airport Improvement Program (AIP) Cargo Entitlement Program).

Funds from the AIP Cargo Entitlement Program are apportioned based on estimated landed aircraft weight for all-cargo operations only. Reporting of this data is not required, though airports with significant air cargo activity do so to be eligible for certain AIP funds. BTS data, on the other hand, capture landed weight from required DOT Form 41, Schedules T-100 (U.S. carriers) and T-100(f) [foreign carrier reporting. The BTS data capture both all-cargo and belly-cargo weight.

Based on analysis of the data for international and domestic operations in 2013, 50 airports account for 89.4 percent of all reported landed cargo weight (including cargo carried on all-cargo aircraft and passenger aircraft) in the U.S. Including airports from the top 50 all-cargo aircraft list (i.e., those identified from the AIP eligibility list) that do not show up on the top 50 list for combined air cargo (as compiled from BTS data) adds six additional airports to the list of top 50 air cargo airports. In total, these 56 airports account for approximately 90 percent by weight of the nation's landed air cargo.