Waterborne Freight Transportation

Bottom Line Report

June 2013

American Association of State Highway and Transportation Officials
AASHTO
The Voice of Transportation

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Foreword

The AASHTO *Waterborne Freight Transportation Bottom Line Report* presents a comprehensive overview of the United States marine transportation system. It documents the importance of the MTS—ports on three coasts, the Great Lakes, and the inland waterways—to the strength and competitiveness of the nation's economy. The report details the challenges the system faces; and it offers options to increase investment and better manage the MTS.

The report attempts to answer the following questions:

- What is the marine transportation system?
- Why is the marine transportation system important?
- What are the threats to the continued performance of the marine transportation system?
- What are the alternatives to address these challenges?

AASHTO commissioned the *Waterborne Freight Transportation Bottom Line Report* because the navigable waterways in 38 of the 50 states provide substantial economic benefits to the entire United States. State departments of transportation recognize the significant role the nation's marine transportation assets play in terms of freight mobility as well as recognize that adverse effects for highways should waterborne freight be diverted.

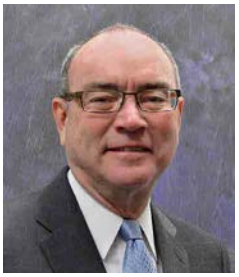
As important as it is to understand how the marine transportation system works, it is equally necessary to understand the consequences of a marine transportation system that *does not* work.

Decisions made by the private sector, the federal government, and AASHTO members will determine how the national marine transportation system can reach its optimal potential as a premier mode of freight transportation in the coming decades. The time for action is now.

Along with highways, freight railroad networks, and airborne cargo, the marine transportation system is a part of an overall national freight transportation system that must work together to ensure the United States remains a global economic leader.

AASHTO is pleased to offer this report for the use of those who are committed to ensuring the United States has the best transportation system in the world.

Sean T. Connaughton
Secretary of Transportation
Commonwealth of Virginia
Chair, AASHTO Standing
Committee on Water Transportation



Bud Wright
Executive Director
AASHTO

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This report is the result of the efforts of many people. It was initiated by the AASHTO Standing Committee on Water Transportation (SCOWT), which is chaired by Sean T. Connaughton, Secretary of Transportation for the Commonwealth of Virginia. Secretary Connaughton provided the leadership and determination that made the report possible and guaranteed its quality. At critical junctures, SCOWT's Vice-Chair Sharon Balfour, Marine and Rail Administrator for the Louisiana Department of Transportation and Development, contributed her energy, enthusiasm, and wide experience to the process.

In addition, many other SCOWT members commented on drafts of the report and provided material that is included. SCOWT member states demonstrated their belief in the importance of this report through funding commitments that provided necessary resources.

The report was prepared under a contract with Cambridge Systematics, Inc., by a consulting team led by Alan Meyers, Principal.

A number of knowledgeable professionals were consulted, including representatives of the United States Army Corps of Engineers; United States Department of Transportation and its Federal Highway, Rail, and Maritime Administrations; the American Association of Port Authorities; and the National Waterways Conference, who provided valuable advice and input on the scope and direction of the investigation. Their contributions are much appreciated but they should not be held responsible for any of the report's findings or action alternatives.

Executive Summary

From the initial settlement of North America, through colonization and expansion, and to the present day, where and how we live has been determined in large part by waterborne transportation. Today, the United States relies on its Marine Transportation System, or MTS, for access to global markets and global products, and for domestic goods movement as an alternative to congested surface transportation.

The MTS includes facilities on three coasts, the Great Lakes, and the Inland Waterways; it serves every state, either directly by water or indirectly via highway and rail connections; and it supports trillions of dollars in U.S. economic activity annually. The MTS evolved as a decentralized system comprised of many different stakeholders and responsible entities, with funding coming from a variety of public and private sources.

By many measures, the MTS is a great success; it has recovered from the recent recession and is handling near-record freight volumes. But looking forward, the MTS faces critical challenges: decades of insufficient system maintenance, which have left many parts of the MTS inoperable or on the brink of failure; excessive delays in navigation project delivery; inadequate and unpredictable funding for critically needed MTS improvements; lack of a national strategy to ensure the MTS provides the greatest benefit to the nation as a whole; and the fact that there is no locus of responsibility for the well-being of the MTS, and its failure or success.

To promote discussion and action, the American Association of State Highway and Transportation Officials (AASHTO) commissioned this *Waterborne Freight Transportation* report. The report describes the nature, extent, and critical role of the MTS, and offers a number of findings and conclusions for consideration, and possibly adoption, by AASHTO and others.

The main finding is this: with respect to waterborne freight, "business as usual" will lead to unacceptable further declines in MTS condition and performance, and to significant lost opportunities for our nation's economy. A renewed national commitment to the MTS is urgently required, along with corresponding changes in how to plan for and fund the MTS. Options for change include: 1) federal legislation to achieve full state-of-good-repair for MTS waterways, guarantee full utilization of funds collected for MTS improvements, and significantly improve the cost, speed, and reliability of MTS project delivery; 2) a new Office of Multimodal Freight, under the Secretary of Transportation, empowered and directed to eliminate the current balkanization of MTS planning, funding, and project delivery responsibilities, and advance sound planning and project implementation; and 3) promotion of best practices in MTS planning and investment at the state, regional, and local levels.

Water has been, and remains, a fundamental driving force in shaping the physical and economic development of the United States. Inland rivers and coastal routes were the continent's primary transportation corridors, long before there were roads. Later, improved harbors and canals were the nation's first improved freight corridors. Settlement patterns and industrial development naturally followed the coasts and waterways, because they provided access to marine resources and offered the only economically viable means of moving goods. Our first cities were port cities.

With advancing industry and technology and the rise of transcontinental railroads, the critical role of waterways did not diminish: rather, it took on a different and enhanced importance. Railroads built new connections between coastal and inland waterways, promoting the growth of interior cities and fueling America's industrial revolution. Later as the U.S. highway network developed, population and production centers moved off the waterways but did not lose their need for waterborne transportation. Truck-only local services, combined rail-truck long-haul services, and advanced logistics practices evolved to ensure these growing inland markets remained connected to the water.

Today, America's Marine Transportation System (MTS) remains a critical element of our domestic transportation infrastructure and our primary gateway for global trade. The MTS includes navigable waterways and public and private ports on three coasts (Atlantic, Pacific, and Gulf), the Great Lakes, and inland waterways. It also includes, by extension, the use of inland highway and rail connections that connect ports with inland markets, ensuring access to the water for shippers and receivers in all 50 states. The MTS includes 8,197 cargo-handling docks, 179 ports handling more than 250,000 tons annually, and 52 ports handling containers.

Table ES-1. MTS Volume and Value, 2011

	Domestic	International			Grand Total
		Import	Export	Subtotal	
Tons (millions)	887.9	869.1	610.4	1,479.6	2,367.5
Loaded TEUs (millions)	2.0	17.1	11.7	28.8	30.1
Value ($ billions)	151.4	1,066.0	473.1	1,539.2	1,690.6

Sources: U.S. Army Corps of Engineers (tons and TEUs) and U.S. DOT Freight Analysis Framework-3 (value).

In 2011, the MTS handled more than 2.3 billion tons of cargo—the equivalent of over 100 million fully-loaded five-axle combination trucks, which would stretch more than 1 million miles if parked end-to-end. The MTS carried more than 1.4 billion short tons of international cargo worth more than $1.5 trillion dollars; this represents more than 99 percent of U.S. trade tonnage outside of North America. The MTS handled 43 percent of our trade value with all nations, and 69 percent of our trade tonnage with all nations. The MTS also carried almost 900 million tons of domestic cargo worth more than $150 billion dollars.

The MTS handles raw materials and intermediate products such as petroleum, fuel, agricultural products, building materials, metals and ores, and chemicals; as well as finished products such as automobiles, electronics, machinery, clothing, furniture, and food. Much of our international trade in higher-value finished products is accommodated by intermodal shipping containers, seamlessly exchanged between ships, rail cars, and truck chassis. In 2011, the MTS carried more than 30 million loaded TEUs (20-foot equivalent units) of containerized traffic. Domestic trade is heavily focused on non-containerized commodities—grains, fuels, etc.—in bulk form, but there is increased attention to possibilities for domestic container trade on the coastal and inland waterways. Projections suggest that by 2040, total MTS tonnage will double, while container traffic will grow between three and four times.

The MTS is so fundamental to the U.S. economy, so embedded in the chain of domestic and global production and consumption, that without the MTS the economies of every state and the nation would be structurally different. While the full value of the MTS has yet to be quantified, recent studies have examined its major components:

- **Great Lakes.** "Great Lakes–St. Lawrence Seaway shipping is one of the key drivers of the U.S. and Canadian economies. The industry creates 227,000 jobs in the two countries, and produces business revenues of $35 billion… It also supports the economic health of North America's industrial heartland and a consumer market of more than 100 million people. To keep their businesses running, U.S. and Canadian electric utilities, steel mills, construction companies, mining companies, manufacturers, and farmers all depend on the 164 million metric tons of cargo delivered by Great Lakes vessels every year. These cargoes become the automobiles North Americans drive, the office buildings they work in, the energy that heats their homes, the salt that keeps roads safe, and the food they put on the dinner table. Marine transportation on the Great Lakes–Seaway System provides $3.6 billion (U.S.D) in annual transportation cost savings compared to the next least expensive all-land transportation alternative. This enhances the global competitiveness of North American products and industries and keeps the cost of consumer goods down."[1]

- **Inland Waterways.** "In 2006, Ohio River Basin commercial navigation users saved $3.1 billion by using the Ohio River System (ORS) waterway to ship coal, steel, chemicals and other commodities by barge. For the entire U.S. inland river system, using an estimated $10–$12 per ton shipper savings, national transportation shipper savings would be in the neighborhood of $7.0 billion… A University of Tennessee Center for Transportation Research study found that barge navigation on the ORS navigable channel contributed a total of $497 billion in sales and 80,000 annual jobs to the nation's economy. This $497 billion in sales, discounted over 44 years at 3 percent, yields an annual $20.5 billion (of this, $3.1 billion is shipper savings, leaving $17.4 billion for the annual economic impact)."[2]

- **Deep Water and Coastal Ports.** "[Deep water] public ports contribute significant benefits to local and regional economies, including generating business development and job opportunities. Commercial port activities in 2007 created employment opportunities for more than 13.3 million Americans, including nearly 12 million who were employed in exporter/importer-related businesses and support industries throughout the U.S. Business activities related to waterborne commerce contributed approximately $3.15 trillion overall to the U.S. economy, and those same businesses paid nearly $212.5 billion in Federal, state, and local taxes. Seaport activities alone in 2007 accounted for $31.2 billion in Federal, state, and local tax revenues."[3]

1 *The Economic Impacts of the Great Lakes–St. Lawrence Seaway System*. Martin Associates; October 18, 2011.

2 *Toward a Full Accounting of the Beneficiaries of Navigable Waterways.* University of Tennessee Center for Transportation Research, January 2011.

3 *The Local and Regional Economic Impacts of the U.S. Deepwater Port System, 2007*. Martin Associates; June 6, 2008.

Table ES-2. Summary of Available MTS Economic Impact Estimates

	Jobs (Direct, Indirect, Induced)	Annual Impacts (Billions of Dollars)		
		Wages	Revenues	Transport Savings
Great Lakes (U.S.) (2011)	128,227	9.7	18.1	2.0
Ohio River System (2011)	80,000	–	17.4	3.1
Other Inland Waterways (2011)	–	–	–	3.9
Deep Water and Coastal (2007)	1,325,531	95.3	100.1	–
U.S. Importers and Exporters (2007)	11,995,102	554.2	3,055.4	–

Sources: Martin Associates, University of Tennessee Center for Transportation Research.

Freight movement over the MTS provides other important benefits—reductions in highway congestion, transportation costs, rail system congestion, fuel consumption, and air emissions—worth billions of dollars annually to the U.S. economy. Other extremely valuable benefits of the MTS include, but are not limited to: military mobilization and resupply; passenger transportation; commercial fishing; shipbuilding; vessel repair, maintenance, and servicing; construction and salvage; offshore oil and gas exploration; offshore pipeline and telecommunications system construction and maintenance; law enforcement; incident management and environmental/emergency response; marine research; hydropower; municipal water; irrigation water; flood control; and recreational fishing and boating.

The basic shape of the MTS was initially defined by the location of protected, deep natural harbors and reliably navigable inland waterways. Over the years, these first-generation assets have been improved, new deepwater ports and terminals have been constructed, and new waterway mileage has been added to the system. But unlike the U.S. highway system, which largely emerged as the result of coordinated planning and close partnership between federal and state governments, the MTS has evolved without larger-scale coordinated policy and planning.

- The federal government—acting principally through the U.S. Army Corps of Engineers—has been primarily responsible for constructing and maintaining a set of federally-authorized navigation channels. Corps appropriations for navigation projects have, over the past decade, averaged $1.5 to $2 billion per year.[4] Costs for deep-draft improvements are typically shared with local sponsors.

- Multi-state authorities, state agencies, regional authorities, and local governments have built marine terminals, often in direct competition with neighbors. Private industries have also built their own marine terminals, typically to accommodate the movement of bulk materials. A survey by the American Association of Port Authorities found that U.S. ports and their partners plan to invest $46 billion in MTS infrastructure by 2017.[5]

- Local, regional, and state planners, recognizing the economic benefits of port operations as well as their potential impacts on transportation systems, communities, and the environment, have

4 *U.S. Port and Inland Waterways Modernization: Preparing for Post-Panamax Vessels.* U.S. Army Corps of Engineers; June 20, 2010.

5 http://www.aapa-ports.org/Press/PRdetail.cfm?itemnumber=18583.

provided landside connections and made land use decisions affecting port development and expansion.

- Railroads have developed lines and services to connect marine terminals with inland and cross-country markets. The railroads compete with each other, but they also cooperate with each other and the public sector on projects of mutual benefit (such as Southern California's Alameda Corridor and Chicago's CREATE).
- Ocean and waterway carriers select ports of call based on the particular port arrangements (location, accessibility, vessel size capacity, terminal operating cost structure, etc.) that allow them to profit from the customer services they provide.
- Freight shippers and receivers have developed privately-owned logistics infrastructure—warehouse/distribution centers, manufacturing/processing plants, etc.—either at ports or at inland locations connected to ports via rail and/or truck.

The common theme in MTS development has been market opportunism, from both the private and public sectors. Ports and related infrastructure and services develop and evolve independently, to capture, maintain, and grow specific market niches. There is no "master plan" for the MTS; each port, stakeholder, and region pursues its own business mission. The result is that the MTS is, as some have described it, a "collection of competitors."

Overlaid on this competitive structure is a significant federal role. The maintenance and improvement of federal waterways is the responsibility of the U.S. Army Corps of Engineers (Corps). The work of the Corps is funded from the Harbor Maintenance Trust Fund (supported by an ad valorem fee on imports and domestic traffic), the Inland Waterways Trust Fund (supported by a fuel tax on inland waterway traffic), annual general fund appropriations, and cost-sharing with local sponsors. Needed highway connections, and in some cases support for rail connections, are generally provided by state and regional governments through the allocation of federal and non-federally sourced transportation funds. Major MTS projects require extensive environmental studies and regulatory approvals at the federal, state, and local levels. While the MTS is not planned at the federal level, the competitive aspirations of ports and stakeholders may be significantly facilitated, limited, or managed by the availability of project funding and approvals at the federal level.

Other types of collaboration are essential. Traditionally, ports work closely not only with their Corps Districts, but also with their local and regional and state governments, their railroads, and other stakeholders. Ports often work together on projects and issues of mutual interest. In recent years, there have been efforts to bring together the full range of public and private sector stakeholders through the Committee on the Marine Transportation System (CMTS) and the MTS National Advisory Committee (MTSNAC).

The MTS has been fundamental to the economic success of the nation. It has been highly adaptable and responsive to changing market conditions and needs; it has given producers in every state efficient access to global markets; it has provided consumers in every state with efficient access to global products; and it has dramatically reduced the nation's surface transportation costs and ton-mileage. But the very success of the MTS has masked serious underlying structural problems. In recent years—with growing demand, rising transportation and project development costs, increased

attention to environmental issues, and stronger global competition, these structural problems have become more evident. If left unaddressed, they pose critical threats to the long-term health of the MTS and the nation as a whole.

- **Basic waterway maintenance needs are not being met.** The U.S. Army Corps of Engineers is responsible, among other things, for maintaining federal navigation channels at authorized navigable depths. For years, appropriated funding for the Corps' annual work programs has fallen far short of requested and required amounts, resulting in a critical backlog of unfunded maintenance dredging projects and a significant amount of waterway system mileage operating at less than authorized depths. Failure to maintain authorized waterway depths means lighter vessel loadings and increased shipping costs; in the most extreme cases, some shallow-draft waterways have become completely inoperable. A recent study by the Texas Transportation Institute found that losing just one foot of navigable depth from the Houston ship channel results in added costs of around $375 million per year.[6] Similarly, the Corps faces a critical backlog of projects to modernize antiquated locks and dams. The MTS includes 238 lock chambers with an average age of 58 years; out-of-service times are increasing every year, costing U.S. shippers millions in delays, light-loaded vessels, and other costs. According to a recent report by the American Society of Civil Engineers, in 2010, delays on the inland waterway system cost users $33 billion, while insufficient harbor depths cost users around $7 billion.[7]

- **Needed navigation projects are often delayed for years, even decades**. Project studies can take many years, even spanning decades, before reaching conclusions and allowing projects to advance. And even after being authorized, federal funding may never materialize. A decentralized MTS responds well to market-based opportunities at the local and regional level—but does not deliver projects efficiently because regulatory and funding authority is balkanized across dozens of stakeholders and multiple levels of government. Critically needed projects tend to advance sluggishly, and in some cases do not advance at all.

- **Funding for critical MTS expansion needs is inadequate and uncertain.** Normal maintenance and limited expansion of terminals, landside access infrastructure, and vessel berths is typically accomplished through a combination of port revenues, state and regional contributions, and private participation. But major navigation projects generally require special funding arrangements: revenue bonds, significant state and regional funding, and federal support. However, appropriations for the Corps for both construction and maintenance projects have consistently fallen far short of the levels needed to implement authorized projects and adequately maintain the system. As a result, huge work backlogs have accumulated, and in the absence of action the backlog will only continue to grow. In light of the massive funding shortfalls for federal navigation construction and maintenance projects, improving the reliability and quantity of federal funding available for these purposes is absolutely essential.

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6 "Measuring the Economic Effect of a Lack of Maintenance Dredging of Ship Channels." Paper submittal to the 93rd Annual Transportation Research Board Meeting by James Kruse and Annie Protopapas of the Texas Transportation Institute.

7 *Failure to Act: The Economic Impact of Current Investment Trends in Airports, Inland Waterways, and Marine Ports Infrastructure.* American Society of Civil Engineers, September 2012. Analysis by EDR Group, Inc.

- **National investments in the MTS are not being effectively targeted to meet national needs and provide national benefits.** The nation as a whole derives benefit from the MTS, and it is reasonable to expect that national investments should be clearly tied to the achievement of national benefits. Yet port and MTS planning at the national level is, apart from national defense issues, non-existent. Ports, regions, and railroads pursue MTS improvements independently, to fulfill their own local or regional or business missions. Federal studies and investments are responsive to local requests, but are not targeted to maximize MTS benefits for the nation as a whole. What the nation needs from its MTS, and what it should expect from its MTS investments, has not been defined.

- **Responsibility for the well-being of the MTS and accountability for its failure or success is widely diffused.** Underlying each of these problems—inattention to basic maintenance, inadequate funding, inefficient program delivery, and inattention to the national interest as a whole—is the fact that there is no locus of responsibility for its well-being, its vitality, its future, and for ensuring the nation receives the best possible return from its investments in the MTS.

Embracing business as usual will inevitably lead to significant further declines in MTS condition and performance, and to lost opportunities for our transportation system and economy. Those who consider these outcomes to be unacceptable must argue that a renewed national commitment to our MTS is urgently required, along with corresponding changes in how to plan and fund the MTS.

MTS stakeholders would agree that decisive and positive action now will yield unprecedented benefits. With recovery underway, global trade is again nearing record levels. Following national policy direction, many states are setting explicit goals to dramatically increase their export business as a means of balancing trade and growing their economies. With growing highway congestion, waterborne transportation becomes an even more attractive transportation alternative. Waterborne trade and transportation will be cornerstones of the 21st century economy.

However, there is not a solid consensus among all MTS stakeholders on the best way to proceed. Therefore, to promote discussion and action, AASHTO developed this first-ever *Waterborne Freight Transportation* report. The report describes the nature, extent, and critical role of the MTS, and offers the following alternatives for action:

1. **Pass federal legislation to improve the reliability of MTS funding and achieve full state-of-good-repair for MTS waterways by the year 2020.**

    a. Congress should direct the U.S. Army Corps of Engineers to prepare a comprehensive inventory and plan to address the nation's deferred navigation system maintenance needs—locks and dams, inland waterways, Great Lakes channels, and coastal port channels—by the year 2020. The plan should specify the funding requirements and processes, and as part of its direction, Congress should make clear its intent to fully fund the identified need. This plan could be adopted as part of the Water Resources Development Act (WRDA) or in parallel.

    b. The administration's decision to "fast track" a number of critical Corps projects was encouraging.[8] As a follow-up, Congress and the administration should advance a new Water Re-

8 July 19, 2010. The "We Can't Wait" initiative addresses Corps projects at the ports of Savannah, New York/New Jersey, Miami, Jacksonville, and Charleston.

sources Development Act, featuring comparable attention to fast-tracking and streamlined project delivery. The new WRDA should include an update of the Corps' benefit-cost evaluation methods, which are currently tonnage-dependent, to allow for consideration of a broader range of local, regional, and national benefits. The new WRDA should also identify full funding strategies for authorized projects, based on trust fund proceeds, anticipated general fund appropriations, and new funding sources.

c. Legislation should advance to require full utilization of Harbor Maintenance Tax (HMT) funds, and to exclude domestic container traffic from the HMT as a means of promoting domestic "Marine Highway" services.

2. **Establish a new Office of Multimodal Freight, under the Secretary of Transportation, that would have as one of its responsibilities elimination of the balkanization of MTS planning, funding, and project delivery.**

   a. The Secretary of Transportation should act to create a new Office of Intermodal Freight within the U.S. Department of Transportation. The mission for the new Office would be to promote efficient freight movement via all modes, including water, and to promote the health of all freight transportation systems, including the MTS. The Office would be empowered to cooperate with and coordinate the actions of the multiple federal agencies responsible for MTS planning and project delivery, and to receive guidance from the full range of public and private MTS stakeholders. To be clear, the intent is not to federalize MTS planning—rather, it is to ensure that MTS improvements identified and implemented at the local, regional, and state levels have an effective champion at the federal level, providing what some have called "stewardship of the whole."

   b. Upon establishment, the new Office should act to identify, evaluate, and promote proposals for increased MTS funding and improved funding reliability. A full range of possibilities, such as taxes, user fees, federal solutions, local approaches, and private contributions should be examined.

   c. Upon establishment, the new Office should immediately act to provide guidance to national freight planning activities required under MAP-21 surface transportation program legislation. This guidance should include: enhanced stakeholder coordination, building on prior CMTS and MTSNAC activities; creation of a system map and classification of MTS facilities, analogous to the National Highway System and the National Freight Network (consisting of highways) required under MAP-21; preparation of a formal *MTS Condition and Performance Report,* comparable to the report prepared for the National Highway System; preparation of a comprehensive Economic Impact report addressing the benefit of the MTS to the nation, and the costs to the nation of failing to maintain and expand it; a comprehensive approach to environmental analysis and mitigation strategies to facilitate MTS improvements; and preparation of a long-range vision plan for national MTS development and investment to meet national transportation and economic development objectives.

3. **Identify and promote "best practices" for MTS planning and investment at the state, regional, and local levels**. The MTS is not a federal system—it is a shared responsibility of private stakeholders and public partners at all levels of government. States have an important role in the

planning, improvement, and operation of the MTS. Today, each state addresses MTS issues and investments according to its own practices, needs, and resources. To accomplish this objective, "state of the practice" guidance should be developed by AASHTO and provided to state, regional, and local MTS stakeholders. "Fast track" guidance should be developed immediately to assist states in developing waterborne freight performance measures and MTS project recommendations for inclusion in MAP-21-compliant state freight planning activities, as input to the National Freight Strategy.

Table ES-3. Summary of Action Alternatives

Issues	Action Alternatives
Basic waterway maintenance needs are not being met.	Direct the Army Corps to develop a plan to address the nation's MTS maintenance backlog, and ensure funding to eliminate the backlog by the year 2020.
Needed projects are often delayed for years, even decades.	Develop and adopt new Water Resources Development Act, focusing on upgraded project benefit-cost analysis and project-delivery streamlining.
Funding for critical MTS expansion needs is inadequate and uncertain.	Pass legislation requiring full utilization of HMT funds, with HMT exemptions for domestic Marine Highway services.
National investments in the MTS are not targeted to national needs and national benefits.	Establish new Office of Multimodal Freight, empowered to coordinate and advance MTS planning and projects: – Improved MTS funding strategies – Stakeholder coordination – Map and classification of MTS facilities – MTS Condition and Performance Report – MTS Economic Impact evaluation – Environmental Analysis and Mitigation strategy – Long-range national MTS vision
No locus of responsibility for the well-being of the MTS and accountable for its failure or success.	Promote best practice guidance for state, regional, and local MTS planning and investment, including "fast track" guidance for MAP-21 input and compliance.

All of the world's industrial economies understand a simple fact: efficient transportation means lower costs and greater reliability for freight shippers and receivers, so that goods can be produced and purchased less expensively, which translates directly into a stronger competitive position in the global marketplace. Western Europe has been a highly integrated maritime economy for centuries, and developed along river and canal connections; today, their inland waterways serve much the same purpose as the U.S. rail system. Asian ports, following dramatic growth in the economies of Japan, Korea, and most recently, China, now dominate the list of the world's largest container ports. Expanding economies in India and Brazil are being served by major port expansion programs ($60 billion in India and $17 billion in Brazil, according to the American Association of Port Authorities).[9] Closer to home, Canada and Mexico have invested in marine terminals and rail connections that compete directly with U.S. ports for overseas trade, even as they provide better opportunities for increased waterborne trade within North America itself.

The United States has enjoyed a long period of unchallenged global economic dominance, during which it could afford to develop and fund the MTS on an incremental, piecemeal basis, without the benefit of firm funding commitments and an overarching national strategy. That time is ending. The nation faces great challenges but also great opportunities; and how effectively those challenges are met will define, to a significant degree, the economic future of the nation.

9 http://www.aapa-ports.org/Press/PRdetail.cfm?itemnumber=18583

1.0 Water Shaped the Nation

Throughout world history, access to navigable bodies of water has driven human settlement. In North America, waterways originally used for commerce and travel by Native Americans later determined the physical and economic development of the United States. With the rise of multi-modal transportation and logistics chains, the fact that every American, and every American industry, continues to remain dependent on water is sometimes obscured. As a starting point for a larger consideration of the MTS, it's worth thinking about how waterborne freight shaped the growth of the nation, and what it means for continued growth in the future.

■ 1.1 Waterborne Freight in the Age of Sail

At the time of the American Revolution, it cost as much to move a ton of goods 30 miles inland as to move it across the Atlantic.[10] Given that waterborne transportation was the only commercially viable means of transporting passengers and freight over significant distances, the colonial economies of the 18th century were built around natural harbors and easily navigable rivers. Natural and artificial waterways served as the nation's first superhighways. The most successful cities in the early United States grew around natural harbors such as New York, Baltimore, and Charleston, along the Great Lakes, and on navigable inland rivers like the Columbia, Ohio, Missouri, and Mississippi.

Much of the interior of the United States is not directly accessible by water, and the nation's first major transportation infrastructure projects were waterway improvements—not only improvements to harbors and piers, but also an extensive system of canals. The establishment by Thomas Jefferson of the U.S. Army Corps of Engineers in 1802 was a key development in creating a national transportation strategy for the early United States. New York's Erie Canal helped make New York City a preeminent trading and financial services port. By 1851, a network of 36 canals served New England, the Mid-Atlantic, the Midwest, and other regions.[11]

With the Louisiana Purchase and the opening of the American west, historic colonial ports grew and new international gateway ports emerged along the Atlantic, Gulf, and Pacific coasts.

10 McPherson, J. M. *The Battle Cry of Freedom: The Civil War Era.* Oxford University Press, New York and Oxford, 1988, p. 11.

11 Waugh, Jr., R. G. "Canal Development in Early America." Board of Engineers for Rivers and Harbors, Fort Belvoir, Virginia. From the U.S. Army Corps of Engineers *History of the Commercial Waterways and Ports of the United States,* Volume 1.

Coastal ports were America's first cities:

Source: Bureau of the Census data.

Figure 1-1. Top 18 U.S. Cities by Population Rank (1800)

By the mid-1800s, major international gateway seaports were established on three coasts:

Source: Bureau of the Census data.

Figure 1-2. Tonnage Entered through U.S. Ports (1853)

■ 1.2 Waterborne Freight in the Age of Rail

When the railroads emerged in the mid-19th century, they functioned as steel tributaries to the existing waterways and connected the vast interior of the country to ports. East–west rail routes were built that complemented the north–south river system—creating the nation's first integrated freight network. Rather than replacing waterways, railroads allowed the waterways to become even more productive as agricultural and industrial goods were consolidated at river ports and barged to seaports. Urban and industrial centers grew at major inland rail hubs, most of which were located at the confluence of railroads and navigable waterways. This early multimodal linking of barge and rail technology fueled America's industrial revolution.

Through 1900, all of the top 20 U.S. cities by population were located on navigable water. But unlike 1800, when all 20 were on the Atlantic, by 1900 only eight were on the Atlantic or its tributaries. Five were on the Great Lakes; six were on the Ohio or Mississippi rivers; and one was on the Pacific. These inland cities were not only important ports, but also critical rail hubs.

Great Lakes and river port cities emerged with railroads:

Source: Bureau of the Census data.

Figure 1-3. Top 20 U.S. Cities by Population Rank in the Rail Era (1900)

■ 1.3 Waterborne Freight in the Age of Trucking and Intermodalism

The development of truck and highway technologies in the early 20th century freed business and industry again, this time from the need to locate near rail lines and terminals. An east–west and north–south Interstate highway grid was built to connect cities and regional economies. Production and consumption centers migrated outward from city centers, taking advantage of inexpensive land made newly accessible by the trucking and highway systems. Following the widespread adoption of trucks, trucking quickly became the dominant freight mode for serving local and regional markets, as well as a competitive mode for serving long-haul markets.

With the maturation of the nation's surface transportation network—marked by completion of the interstate highway system and deregulation of the nation's freight railroads—the next wave of freight innovation and productivity came from the intelligent use of a steel box. The intermodal shipping container is a steel box of standard dimensions, with specially designed corners called "twistlocks" that allow it to be lifted and transferred between ships, railcars, and truck chassis. Previously, marine cargo that could not be shipped in bulk form was mostly moved in small units (bags, pallets, etc.) and stevedored by hand. The container allowed cargo of all kinds to be moved in larger units, by efficient machines, over longer distances, with lower costs and greater security and reliability. Moreover, it allowed cargo to move among and between modes with a minimum of cost, allowing for the use of complex multimodal logistics chains, across state lines, national borders,

and oceans. Products moved through our ports over increasingly long distances inland, sometimes entirely across the country, via rail, truck, or both.

Non-Maritime Cities Emerged with Trucking and Intermodalism

Source: Bureau of the Census data.

Figure 1-4. Top 20 U.S. Cities by Population Rank in the 2010 Census

In 1960, nine of the top ten U.S. cities by population were served by local ports. However, efficient truck and rail connections between U.S. ports and inland markets helped support the rapid growth of non-port cities and urbanized areas. By 2010, only six of the top ten cities, and 11 of the top 20, were served by local ports. These non-port cities still ship and receive marine cargo; but they do it via trucking or combined truck–rail services, often via a complex system of intermediate handling (intermodal transfer facilities, warehouse/distribution, etc.). The same pattern is true when considering Metropolitan Statistical Areas rather than cities. Metropolitan areas like Atlanta, El Paso, and Washington DC–Northern Virginia–Maryland depend on truck and truck-rail services as their marine gateways.

■ 1.4 The Next Era of Waterborne Freight

With respect to waterborne freight, looking backward is easier than looking forward. Prior to their emergence, few could have foreseen the transformative impact that the canal system or the transcontinental railroad, the interstate highway system, or the intermodal shipping container would have on U.S. commerce. But it seems likely we have already entered another era, one in which our infrastructure is largely in place, and largely fixed as to dimension by geography or land use.

In such an era, the challenges of waterborne freight will need to be met less by new building, and more by getting the most from the assets we already have: through operational improvements (information systems, equipment, logistics, productivity, etc.), bottleneck elimination (especially inadequate navigation channels), and selected physical improvements (terminal expansion projects, highway and rail corridor improvements, etc.). Increasingly, investment decisions will need to be supported by plausible, accepted performance metrics that demonstrate economic, transportation, and environmental benefits. We will need to make the best possible case for MTS investments, against a backdrop of increasing land use pressures, environmental concerns, and public funding constraints.

Waterborne trade and transportation have driven the nation's economy since its founding. With near-record activity and prospects for strong continued growth, waterborne freight transportation will continue to shape the nation's economy. Today, every state participates in the global trade economy, and every state is a stakeholder in the success of the waterborne freight system, whether it is served directly by its own ports or indirectly by trucking and rail from other states. Over time, and with the development of inland population centers, waterborne freight transportation and landside transportation have become a single functional system. Problems in any part of the system—gateway ports, inland waterways, critical highway corridors, and critical rail corridors—affect the entire system. If we succeed in meeting the challenges of waterborne freight, we will support the continued vitality of our port cities as well as the inland markets that depend on ports. If we do not, then it is not only port communities that are at risk—it is the nation as a whole.

2.0 MTS Assets

■ 2.1 Definition of the Marine Transportation System

Historically, the nation's marine transportation system, or MTS, consisted of its deepwater harbors and rivers, along with the piers and docks that lined them. Over time, the system expanded to include canals and river ports that integrated railroad operations and trucking operations, and to incorporate global logistics chains. The Marine Transportation System National Advisory Council (MTSNAC) and the Committee on the Marine Transportation System (CMTS)[12] define the MTS as follows:

MTSNAC/CMTS Definition of the MTS

The Marine Transportation System, or MTS, consists of waterways, ports, and intermodal landside connections that allow the various modes of transportation to move people and goods to, from, and on the water. The MTS includes the following:

- *25,000 miles of navigable channels;*
- *239 locks at 193 locations;*
- *Great Lakes;*
- *St. Lawrence Seaway;*
- *Over 3,700 marine terminals;*
- *Numerous recreational marinas;*
- *Over 174,000 miles of rail connecting all 48 contiguous states, as well as Canada and Mexico;*
- *Over 45,000 miles of interstate highway, supported by over 115,000 miles of other roadways; and*
- *Over 1,400 designated intermodal connections.*

Figure 2-1. MTSNAC/CMTS Definition of the MTS

This definition can be expressed as a slightly different formulation, in which the MTS is comprised of three sets of related infrastructure elements:

- MTS Ports and Terminals—This consists of "on the ground" assets—the ports, terminals, docks, piers, and other structures and facilities accommodate the transfer of freight and passengers between vessels and land.
- MTS Waterways—This consists of "in the water" assets—navigation channels, harbors and bays, turning basins, anchorages, rivers, open water travel lanes, etc.—and associated locks, dams, and other marine structures.

12 MTSNAC is "a chartered, non-federal body whose purpose is to advise the Secretary of Transportation on MTS issues" (source: www.mtsnac.org). The parallel public-sector involvement is the Committee on the Marine Transportation System, or CMTS. Formation of the CMTS was directed by the U.S. Ocean Action Plan, issued December 17, 2004.

- MTS Surface Transportation Connectors and Corridors—Similar to the National Highway System intermodal connectors, MTS connectors include "last mile" highway, rail, and pipeline connectors. MTS corridors, however, can extend hundreds and even thousands of miles across the country, and coastal ports with inland and coastal cities.

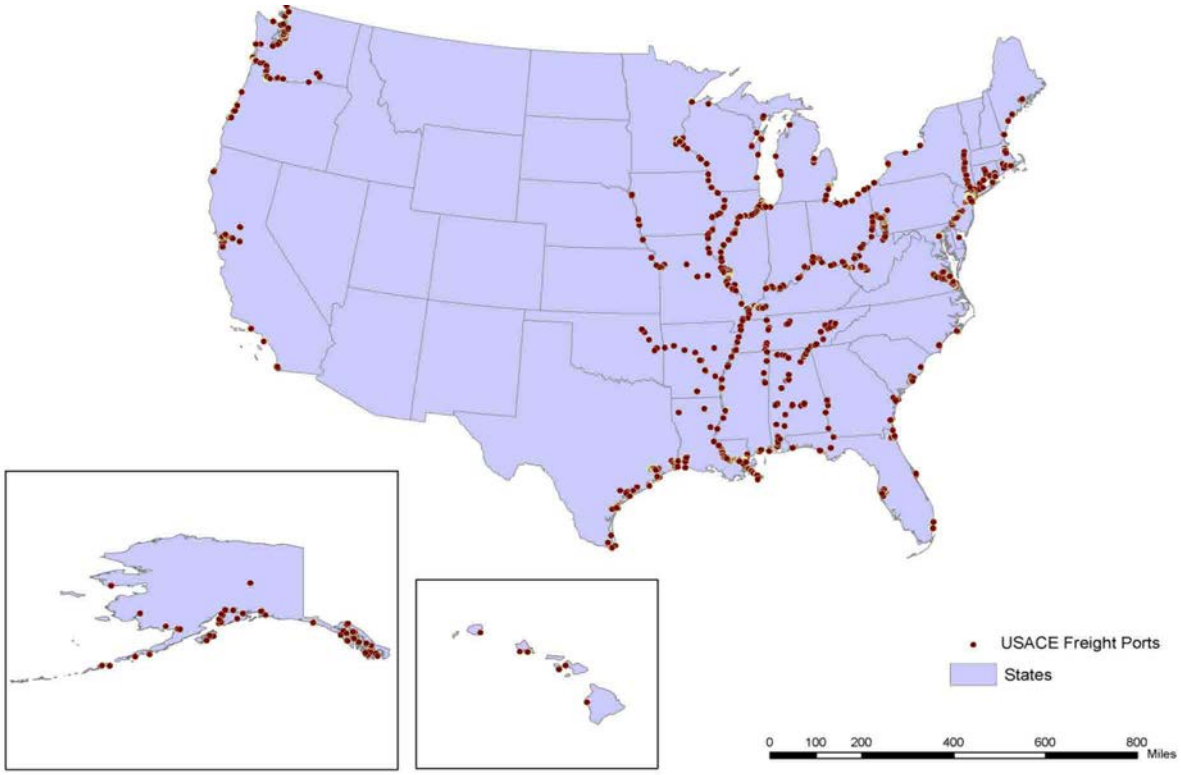
■ 2.2 MTS Ports and Terminals

The MTS waterways serve nearly 8,200 separate commercial cargo-handling docks. These include public facilities (owned and managed by state, regional, and local port departments and authorities), as well as private facilities (common-user terminals and dedicated facilities). According to the American Association of Port Authorities (AAPA), there are 126 public seaport agencies with jurisdiction over 185 ports. These docks and ports are widely distributed over the Atlantic, Pacific, Gulf, Great Lakes, and Inland Waterways.

Table 2-1. Geographic Distribution of MTS Cargo-Handling Docks (2011)

Location	Foreign Only	Foreign and Domestic	Domestic Only	Total
Atlantic	33	560	1,193	1,786
Pacific	24	571	1,101	1,696
Gulf	17	559	1,560	2,136
Great Lakes	3	246	402	651
Inland	0	0	1,928	1,928
Total	**77**	**1,936**	**6,184**	**8,197**

Source: U.S. Army Corps of Engineers.



Source: U.S. Army Corps of Engineers Facilities Database.

Figure 2-2. Commercial MTS Cargo Facilities

On a tonnage basis, the top three U.S. ports (South Louisiana, Houston, and New York/New Jersey) account for 26 percent of all MTS tonnage. In 2011, 53 ports handled in excess of ten million tons of waterborne cargo.

Table 2-2. Leading U.S. Ports by Tonnage (2011)

Rank	Port	2011 Tons (millions)
1	South Louisiana, LA	246.5
2	Houston, TX	237.8
3	New York, NY and NJ	139.2
4	Long Beach, CA	80.3
5	New Orleans, LA	77.2
6	Beaumont, TX	73.7
7	Corpus Christi, TX	70.5
8	Los Angeles, CA	65.0
9	Huntington, WV—Tristate	58.6
10	Baton Rouge, LA	57.9

Source: U.S. Army Corps of Engineers, Waterborne Commerce of the United States.

Our leading tonnage ports tend to specialize in heavy commodities—like petroleum, chemicals, coal, sand and gravel, grain, etc.—handled in bulk form. But they also handle many other types of

commodities. Different commodities require different types of vessels, marine terminals, and vessel-to-shore transfer operations.

Table 2-3. Vessel/Terminal Types, Transfer Methods, and Commodities

Vessel/Terminal Types	Transfer Methods	Typical Commodities
Liquid Bulk	Liquid material, not packaged, transferred via pipeline	Crude or refined petroleum, chemicals, edible oils, etc.
Dry Bulk	Dry material, not packaged, transferred via conveyor, hopper, etc.	Coal, petroleum coke, salt, sand, gravel, bulk cement, bulk grain, etc.
Breakbulk	Unitized or packaged freight, lifted via shoreside cranes or ship's gear	Lumber, steel, clay, stone, cement, grain or other foods, etc. handled on pallets or in large sacks
Neo Bulk		Logs, steel rolls, or other large/heavy items handled as individual units
Project Cargo		Unusually large or heavy items such as generators, wind turbines, etc.
Roll on–Roll off	Units driven on and off vessels	Autos, trucks, construction equipment, boats on trailers, etc.
Container	Usually lifted via specialized shoreside cranes, but sometimes by ship's gear	Any packaged or unitized commodity shipped within an international shipping container; especially well-suited for high-value, time-sensitive cargo (consumer goods, food products, etc.), but also used for other commodities (cotton, waste paper, automobiles, etc.) which could be moved as break bulk or roll on–roll off.

Sources: Clockwise from top left: Liquid Bulk Vessel and Terminal, Port of Grays Harbor, Washington, http://www.portofgraysharbor.com/terminals/terminal2LiquidBulk.php; Dry Bulk Vessel and Terminal, Duluth-Seaway Port Authority, http://www.duluthport.com/uploads/large/img_port_overview7.jpg; Container Vessel and Terminal, Norfolk International Terminal, http://www.flickr.com/photos/hamptonroadspartnership/4556209571/; Neo-Bulk Vessel and Terminal, Port of New Orleans, http://www.aapa-ports.org/Industry/PhotoGalleryDetail.cfm?itemnumber=17079; Ro-Ro Terminal, Port of Davisville, Rhode Island, http://www.quonset.com/transportation/transportation-overview/

Figure 2-3. Examples of Different Marine Cargo Handling Types and Terminals

Container activity tends to be concentrated at a limited number of ports, due to the expense of developing and maintaining container facilities, the need for extensive inland transportation connections and logistics facilities (such as warehouse/distribution networks), and other factors. Container ports also tend to be located at or near major population centers, where high-value goods are most likely to be consumed or produced. In 2011, 27 U.S. ports handled in excess of 100,000 total TEUs.

Table 2-4. Leading U.S. Ports by Total TEUs (Loads + Empties) (2011)

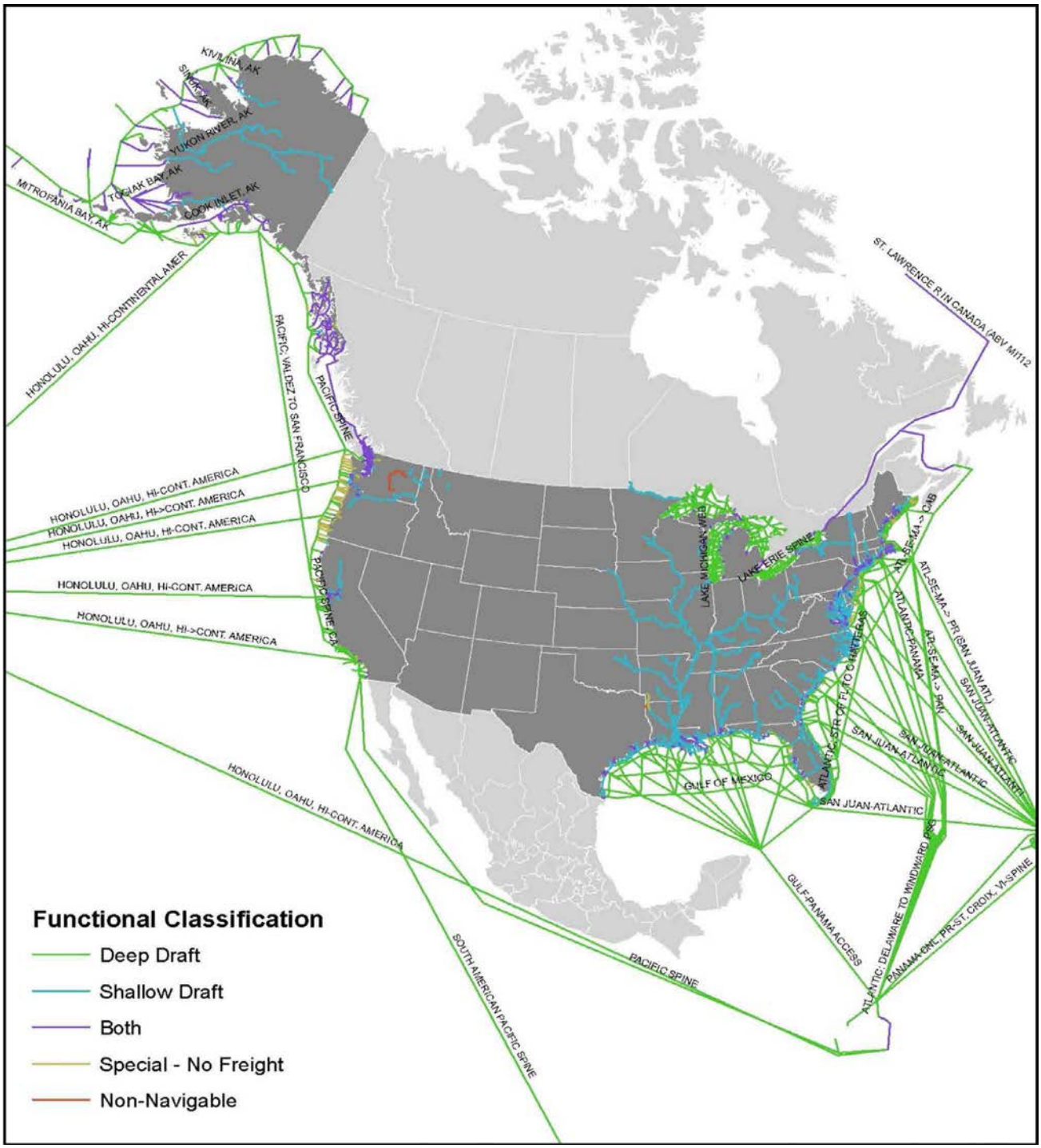
Rank	Port	2011 Total TEUs
1	Los Angeles, CA	7,940,511
2	Long Beach, CA	6,061,091
3	New York, NY and NJ	5,503,485
4	Savannah, GA	2,944,678
5	Oakland, CA	2,342,504
6	Seattle, WA	2,033,535
7	Hampton Roads, VA	1,918,029
8	Houston, TX	1,866,450
9	Tacoma, WA	1,485,617
10	San Juan, PR	1,484,595
11	Charleston, SC	1,381,352
12	Honolulu, HI	938,821
13	Miami, FL	906,607
14	Jacksonville, FL	899,258
15	Port Everglades, FL	880,999

Source: American Association of Port Authorities.

■ 2.3 MTS Waterways

MTS waterways include harbors, harbor channels, bays, sea lanes, lake lanes, rivers, canals, and basins (for turning, anchoring, etc.). They also are found in a variety of configurations and depths ranging from shallow draft (defined by the Army Corps as 12 feet or less) to deep draft (up to 50 feet or more).

Based on the U.S. Army Corps of Engineers National Waterway Network (NWN) database, the physical extent of the MTS within the territorial United States is over 62,000 miles. This includes open water miles within the United States, such as mileage across the Great Lakes and along the ocean coasts. A total of 41 states are directly served by commercially navigable waterways. These waterways are vital to many U.S. industries, not only for the domestic movement of freight (which would otherwise require truck or train transport), but also for moving freight to and from international ports, whether directly (via international vessel) or indirectly (via barge to a U.S. coastal seaport and subsequent transfer to international vessel). For many industries, the Great Lakes and inland rivers are the most cost-effective gateway to international markets.



Source: U.S. Army Corps of Engineers National Waterway Network.

Figure 2-4. Location and Draft of MTS Waterways

Table 2-5. Typology of MTS Waterways

Type	Description
Great Lakes	9,292 total system miles. Includes lakes Superior, Michigan, Huron, Erie, and Ontario, their connecting waterways, and the St. Lawrence Seaway. Great Lakes waterways are mostly deep draft.
Shallow Draft Inland and Intracoastal Waterways	29.382 total system miles. Includes shallow-draft (12 feet or less) segments of rivers, inland waterways, and intra-coastal waterways. Ports on these waterways accommodate barges and other limited-draft vessels. Leading subsystems include the Mississippi River and its tributaries; the Gulf of Mexico (including the Gulf Intracoastal Waterway, Black Warrior, and Tombigbee rivers, Tennessee–Tombigbee waterway, et al.); the Atlantic Intracoastal Waterway; and the Columbia River system.
Deep Draft Coastal and Rivers	23,670 total system miles. Includes deep-draft (more than 12 feet) international trade lanes to and from ports on the Pacific, Atlantic, and Gulf of Mexico coasts; also includes coastwise trade lanes outside of the intra-coastal waterways; also includes deep-draft segments of rivers and inland waterways.

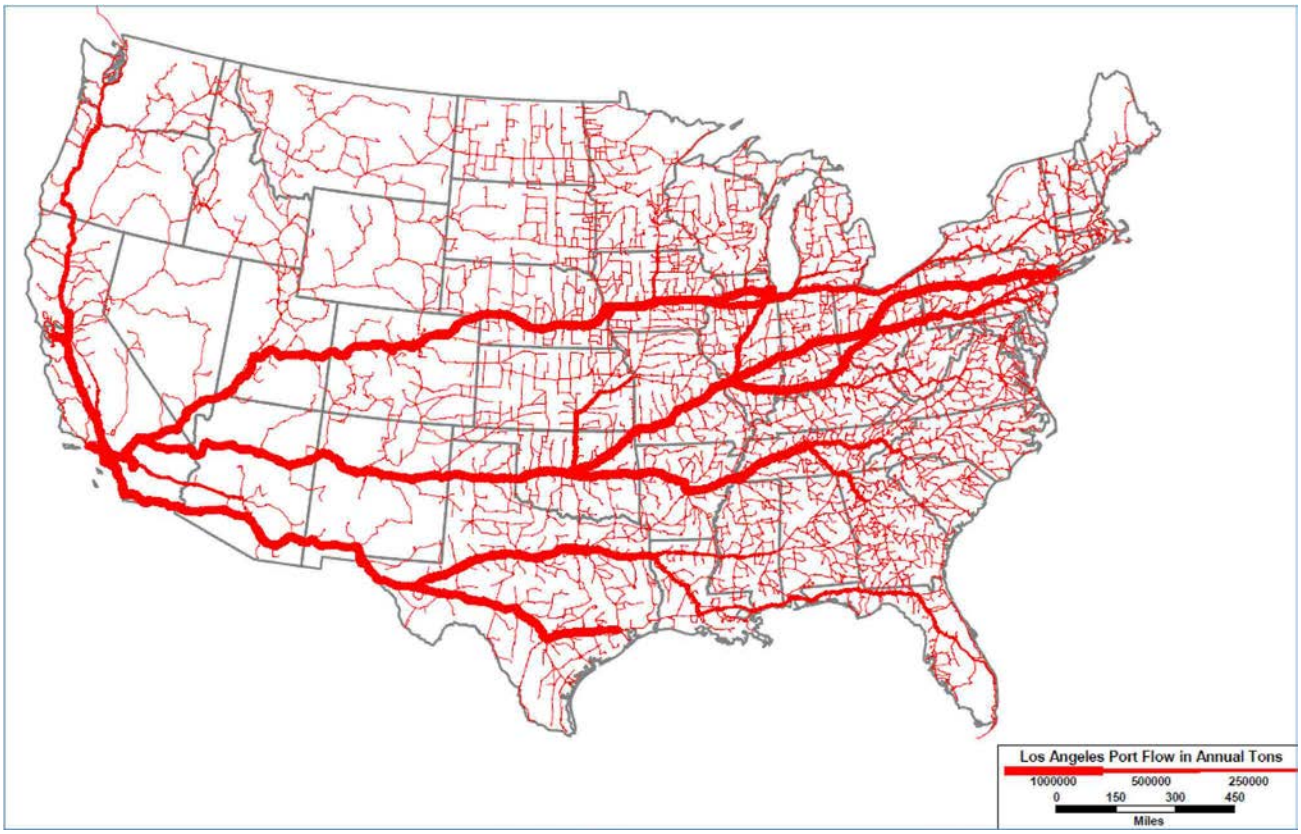
Source: U.S. ACE National Waterway Network and Navigation Data Center.

■ 2.4 MTS Surface Transportation Connectors

The nation's inland transportation network consists of over 141,000 road miles of freight rail lines connecting all 48 contiguous states, as well as Canada and Mexico; over 45,000 miles of interstate highway, supported by over 115,000 miles of other roadways; and over 1,400 designated intermodal connections. Ports depend on these railroads and highways, as well as coastal and inland waterways, to collect and distribute waterborne freight. A few ports utilize pipelines for inland collection and distribution, and are not dependent on the condition of other MTS surface transportation connectors. However, most ports are highly dependent on the condition and availability of highway, rail, and water connections.

The contribution of ports to local highway traffic is an important issue in many communities. Experience suggests that in most urbanized regions, port-related trucks represent a low share of total truck traffic and vehicle miles traveled. However, port-related trucks tend to be concentrated, and highly visible, on a limited number of key corridors, where their impacts may be problematic.

Some ports handle mostly local or regional cargo, while others handle a high percentage of cargo bound for remote, or "hinterland" regions. Local and regional cargo mostly moves by truck, since trucks are generally more efficient at short distances and provide door-to-door service to almost all freight shippers and receivers. At longer distances, typically beyond 400 to 600 miles, intermodal rail becomes increasingly more competitive and can be used as a substitute for long-haul trucking. Most container ports offer intermodal rail connections to inland markets, and some ports—such as Los Angeles/Long Beach—may send 50 percent or more of their containers inland by rail. Other ports receive or ship significant quantities of liquid and dry bulk commodities in long "unit trains" (where all the railcars carry the same commodity) or in "mixed carload" trains (with a mix of different commodities and railcar types).



Source: Analysis of Freight Analysis Framework-3 import/export flow data.

Figure 2-5. Inland Truck Flows to/from Ports of Los Angeles and Long Beach

Many regions are exploring options to make intermodal rail service more competitive at shorter distances. Non-intermodal rail can be competitive at short distances for heavy commodities that are not time-sensitive.

Alternatively, barges can be used as feeders and distributors for short-haul movements within port districts, as well as long-haul movements on coastal and inland waterways. Barges have long proven to be a cost-effective alternative to rail and truck for non-containerized cargo. In recent years, the U.S. DOT Maritime Administration "Marine Highway"program has promoted container on barge services, and has sponsored pilot studies of service development (Marine-5, Marine-95, Marine-55) paralleling U.S. interstate highways.

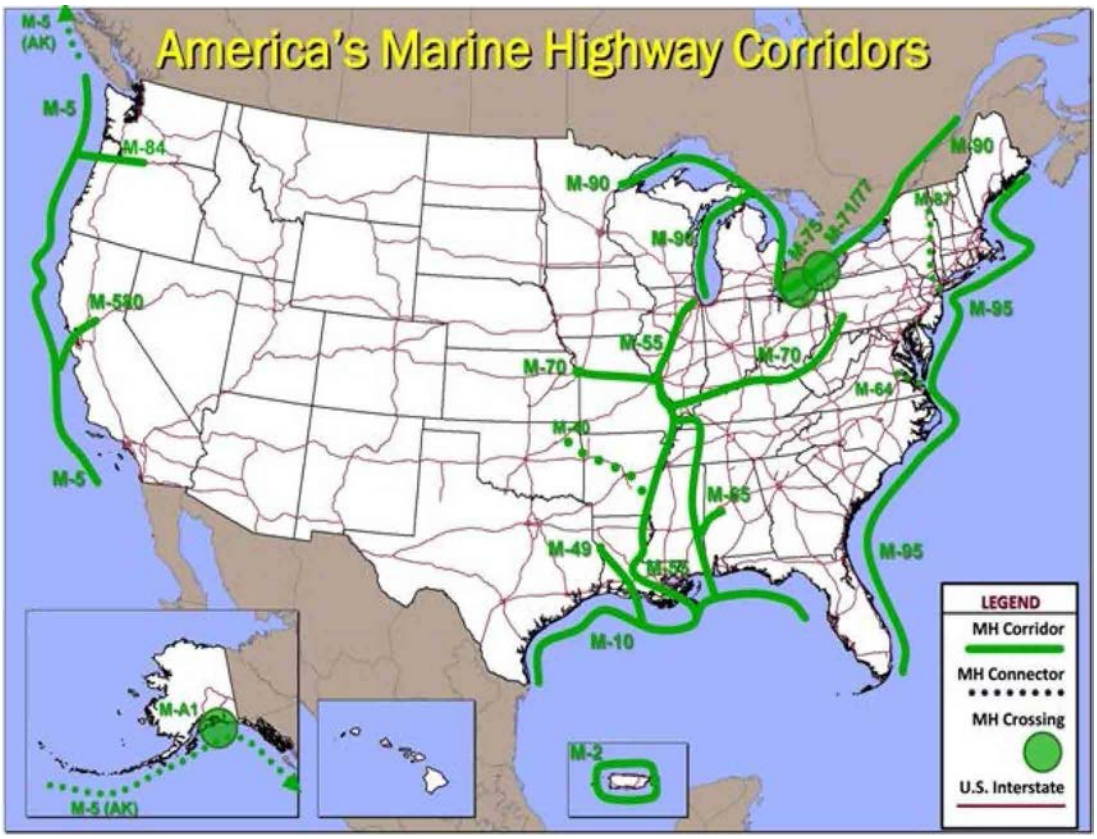


Figure 2-6. MARAD-Designated Marine Highway Corridors

■ 2.5 The MTS and Global Vessel Routings

The MTS offers a wide choice of ports and terminals to operators of international and domestic freight-carrying vessels. Those operators choose which port(s) to call at based on a number of factors, including reliability, speed, cost, safety, security, value-added service, and contribution to overall profitability and other business objectives.

Ocean carriers have a choice of routes around the globe—they can go around Cape Horn in Africa or the Cape of Good Hope in South America, or through the Suez Canal (linking the Mediterranean and Red Seas via a sea-level channel since 1869), or through the Panama Canal (linking the Pacific and Atlantic Oceans via an above sea-level route since 1914). And once cargo reaches the United States, there are many ways to get it from a gateway port to its ultimate destination. Asian cargo, for example, moves to the United States via each of these methods:

- By ship to the U.S. West Coast, which has ports that can accommodate the very large containership being used in Asian services, then inland by truck to local and regional markets or inland by rail "landbridge" to Midwest and East Coast markets.
- By ship to the U.S. East Coast via the Suez Canal. Suez can physically accommodate the largest container ships in service, but U.S. East Coast container ports cannot. From China, Suez is slower

than either landbridge or the Panama Canal, but becomes increasingly competitive from India and other Asian ports west of China.

- By ship to the U.S. East Coast via the Panama Canal. Currently, the Panama Canal is a principal bottleneck in the world's container trade system. Its dimensions limit passage to ships generally not more than 39 feet in depth and 13 containers across—known as "Panamax" dimensions. Historically, this was sufficient, but over the past 10 to 15 years, much of the new containership capacity coming into service has been in "post-Panamax" sizes. Panama is now widening the canal to accommodate next-generation "mega-containerships," which will allow larger ships to move between China and U.S. East Coast and Gulf Coast ports.
- By feeder vessel. Panama's ports, as well as numerous ports in the Caribbean, accommodate "transload" activity, where cargo is discharged from a large ship and transferred immediately to smaller vessels for the last leg of the marine trip. Even if U.S.-bound cargo leaves China on a very large vessel, a given U.S. port might receive that cargo on a much smaller vessel.

Trades with Europe, the Middle East and Africa, South America, Central America, the Caribbean, Mexico, and Canada are all accommodated by combinations of Atlantic, Pacific, and Gulf routings, some involving the Panama or Suez Canals. The specific trade routes utilized by carriers, and the vessels they deploy on those routes, are matched to the capabilities and the limitations of infrastructure at either end of the trip. Therefore, MTS facilities, needs, and opportunities must be viewed within the context of global markets and operational requirements.

3.0 MTS Performance

■ 3.1 MTS Volume and Value

In 2011, the MTS handled more than 2.3 billion tons of cargo—the equivalent of over 100 million fully-loaded 5-axle combination trucks, which would stretch more than 1 million miles if parked end-to-end. The MTS carried more than 1.4 billion short tons of international cargo worth more than $1.5 trillion dollars; this represents more than 99 percent of U.S. trade tonnage outside of North America. The MTS handled 43 percent of our trade value with all nations, and 69 percent of our trade tonnage with all nations. The MTS also carried almost 900 million tons of domestic cargo worth more than $150 billion dollars.

Table 3-1. MTS Volume and Value (2011)

	Domestic	International			Grand Total
		Import	Export	Subtotal	
Tons (millions)	887.9	869.1	610.4	1,479.6	2,367.5
Loaded TEUs (millions)	2.0	17.1	11.7	28.8	30.1
Value ($ billions)	151.4	1,066.0	473.1	1,539.2	1,690.6

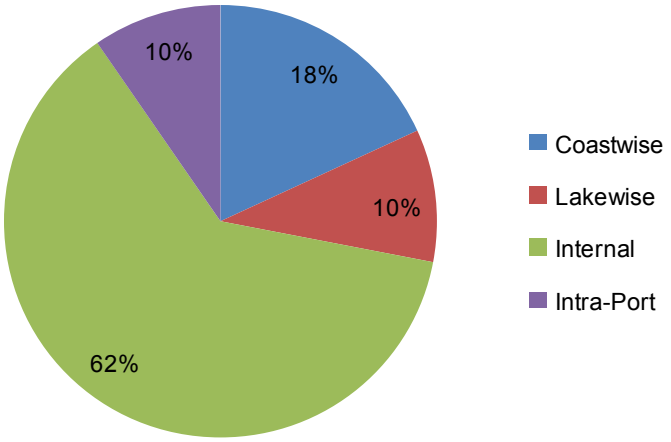
Sources: U.S. Army Corps of Engineers (tons and TEUs) and U.S. DOT Freight Analysis Framework-3 (value).

■ 3.2 MTS Commodities and Trades

Domestic

Domestic traffic is handled along four sub-systems of the MTS:

- "Coastwise" trade occurs along the coastlines (Atlantic, Pacific, and Gulf);
- "Lakewise" trade occurs on the Great Lakes/St. Lawrence Seaway system;
- "Internal" trade represents traffic on the inland rivers and waterways; and
- "Intra-port" trade is activity within a port district or territory.



Source: U.S. Army Corps of Engineers.

Figure 3-1. MTS Domestic Freight Tonnage by Sub-System (2011)

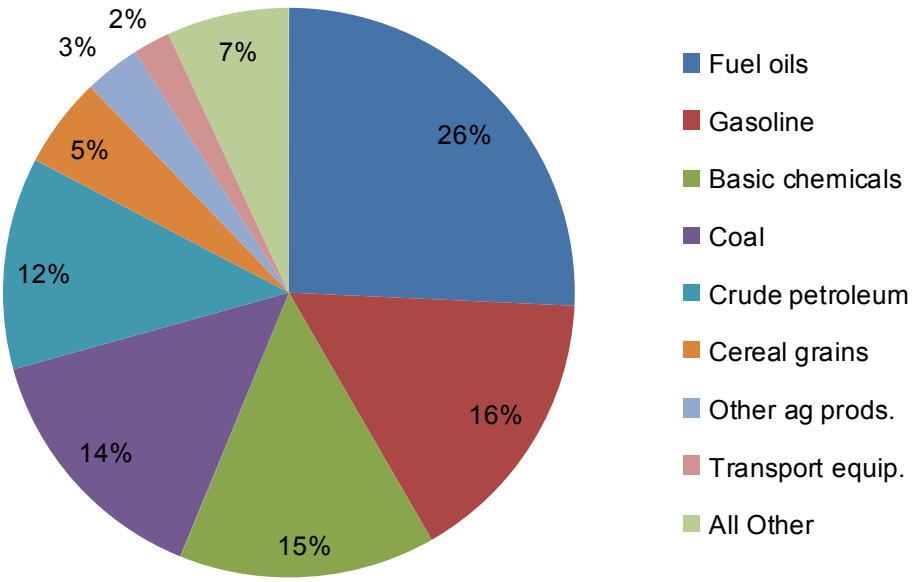
Each of these sub-systems tends to specialize in handling certain commodities. Coastwise and intra-port trades focus heavily on petroleum products and crude petroleum. Lakewise trade focuses primarily on dry bulk: iron ore, sand/gravel/stone, and coal. Internal trade is the most diversified, handling coal, petroleum products, farm products, sand/gravel/stone, chemicals, and manufactured goods. Intra-port trade handles mostly petroleum, along with other liquid and dry bulk for local distribution.

Table 3-2. MTS Domestic Freight Tonnage by Commodity (2011)

Coastwise Tons	**161.0**	**Internal Tons**	**553.6**
Petroleum Products	52%	Coal	31%
Crude Petroleum	19%	Petroleum Products	20%
All Manufactured Equipment	8%	Food and Farm Products	13%
Chemical and Related Products	7%	Sand, Gravel, and Stone	10%
Coal	5%	Chemical and Related Products	9%
Sand, Gravel, and Stone	3%	Crude Petroleum	5%
Food and Farm Products	3%	Primary Manufactured Goods	4%
All Other	2%	All Other	7%
Lakewise Tons	**87.9**	**Intra-Port Tons**	**85.4**
Iron Ore and Scrap	47%	Petroleum Products	54%
Sand, Gravel, and Stone	24%	Coal	13%
Coal	21%	Chemical and Related Products	12%
Primary Manufactured Goods	3%	Sand, Gravel, and Stone	8%
All Other	4%	All Other	12%

Source: U.S. Army Corps of Engineers.

Based on value, the eight leading commodities—fuel oils, gasoline, basic chemicals, coal, crude petroleum, cereal grains, other agricultural products, and transportation equipment—comprised 93 percent of the value of domestic MTS traffic.

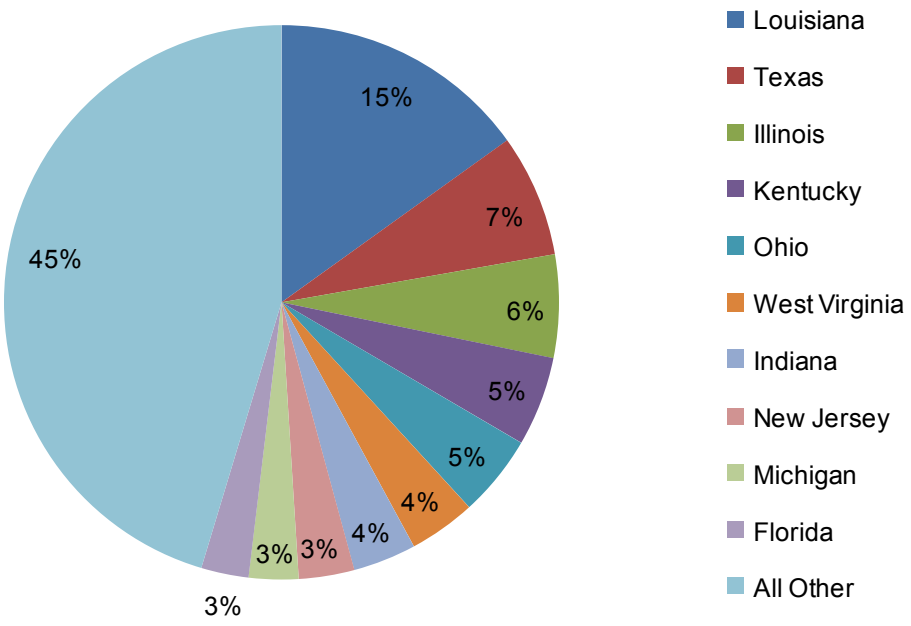


Source: FHWA Freight Analysis Framework-3.

Figure 3-2. MTS Domestic Freight Value by Commodity (2011)

As previously noted, the entire United States has access to the import and export capability of the MTS, either directly via coastal seaports or indirectly via a range of domestic transportation modes, including water. According to the U.S. DOT Freight Analysis Framework-3 data for year 2011, the "domestic leg" of international waterborne trips represented around 143 million tons of domestic waterborne traffic, worth around $49 billion dollars.

In 2011, 27 states and territories handled in excess of 10 million tons of domestic waterborne cargo—the equivalent of 500,000 fully-loaded tractor trailers. The top 10 states handled around 55 percent of all domestic tonnage.



Source: U.S. Army Corps of Engineers.

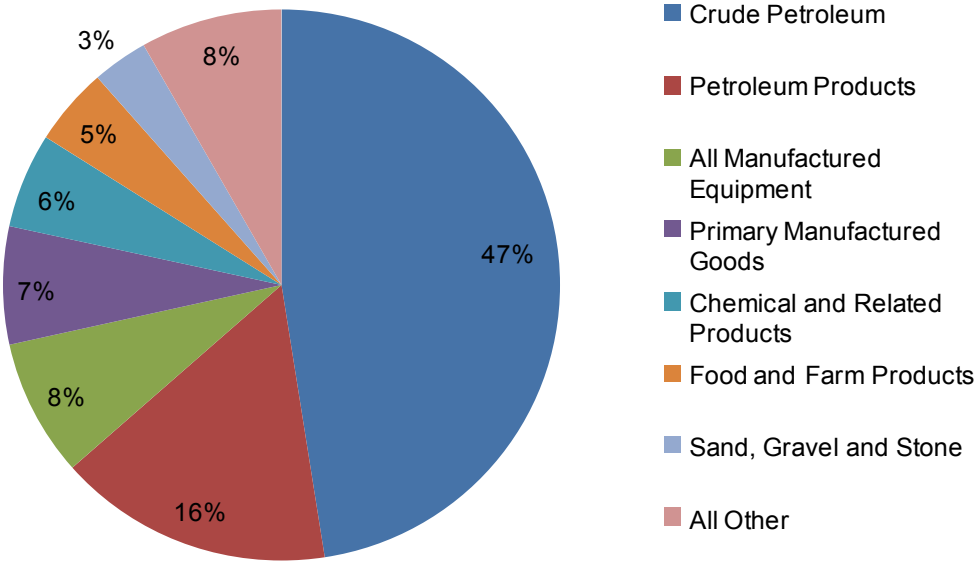
Figure 3-3. MTS Domestic Freight Tonnage by State (2011)

International

International waterborne trade occurs in two directions: outbound or export, and inbound or import. Overall, the U.S. imports significantly more tonnage and value by water than it exports. However, the imbalance is due primarily to petroleum, manufactured products, and metals, which are in high demand and are primarily imported. However, in other commodity groups, such as food and farm products, coal, forest products, and iron ore, the United States is a net exporter to global markets.

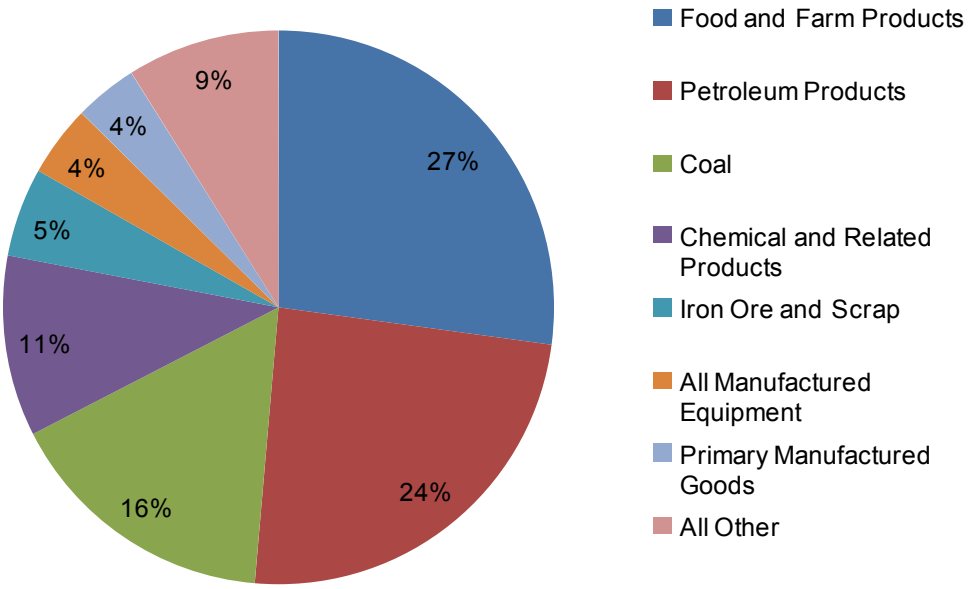
The data suggests that national and state strategies that aim to improve our trade balance can focus on three key opportunities: reducing our dependence on imported crude petroleum; building on our proven global competitiveness in markets like food and farm products, chemicals, plastics, and coal; and "reshoring" the manufacturing of high-value equipment and goods to the United States.

With respect to value, the eight leading commodity groups—machinery, crude petroleum, motorized vehicles, electronics, textiles and leather, plastics and rubber, basic chemicals, and fuel oils—comprise around 62 percent of all MTS international trade.



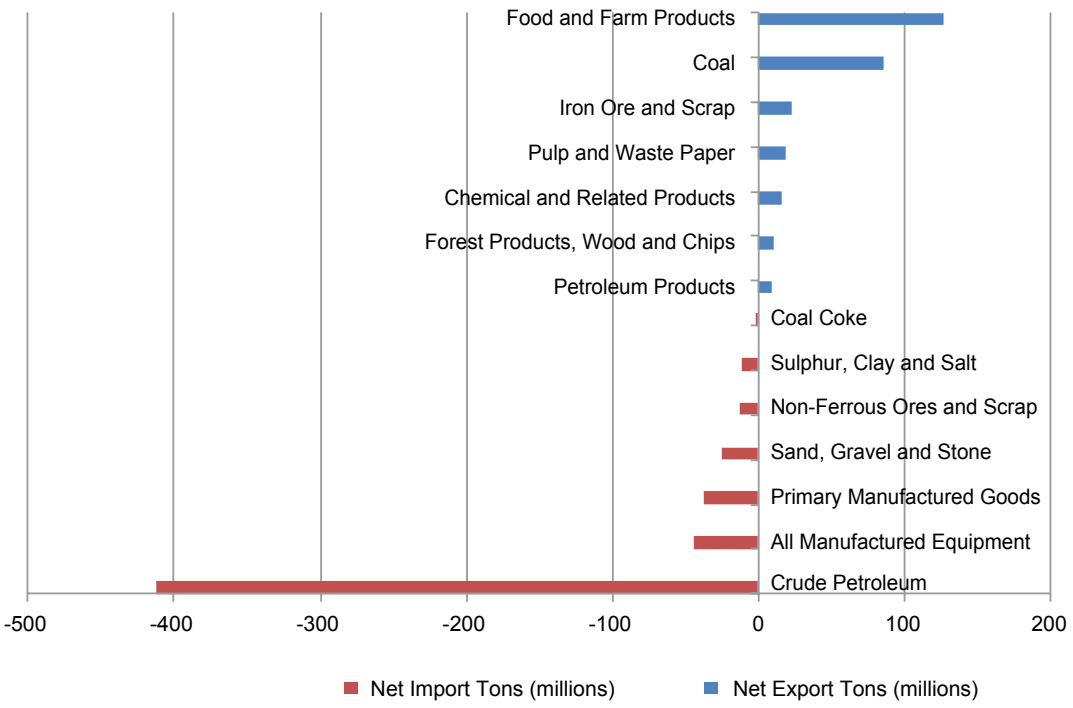
Source: U.S. Army Corps of Engineers.

Figure 3-4. MTS Import Freight Tonnage by Commodity (2011)



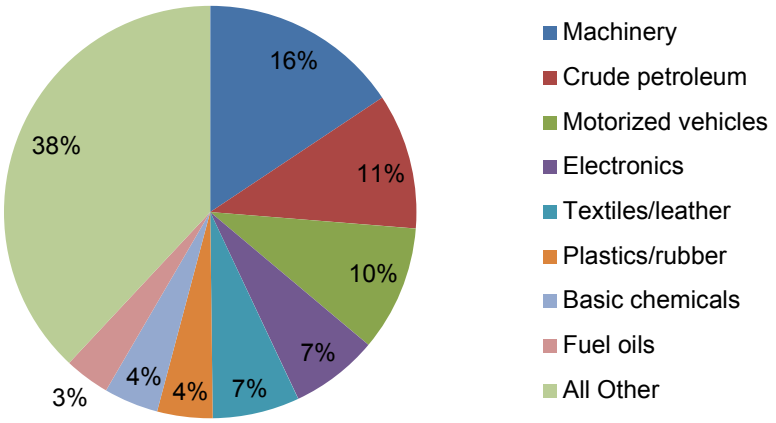
Source: U.S. Army Corps of Engineers.

Figure 3-5. MTS Export Freight Tonnage by Commodity (2011)



Source: U.S. Army Corps of Engineers.

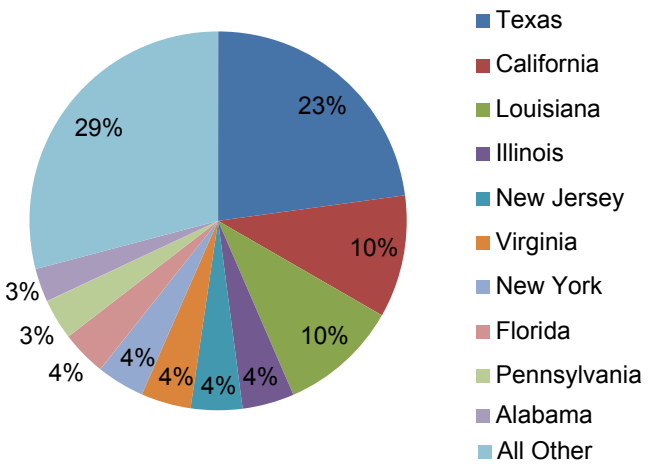
Figure 3-6. Net MTS Import and Export Tonnage by Commodity (2011)



Source: FHWA Freight Analysis Framework-3.

Figure 3-7. MTS International Freight Value by Commodity (2011)

Looking at the origin and destination states for international waterborne tonnage—as opposed to the gateway port—50 percent of tonnage has an origin or destination in Texas, California, Louisiana, Illinois, and New Jersey.



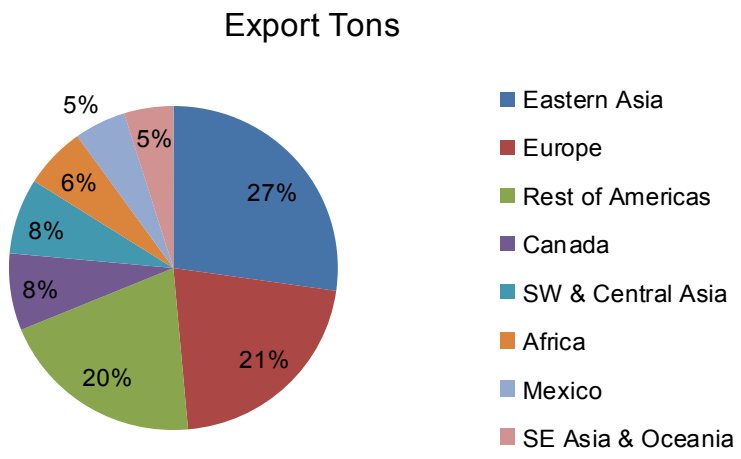
Source: U.S. DOT Freight Analysis Framework-3.

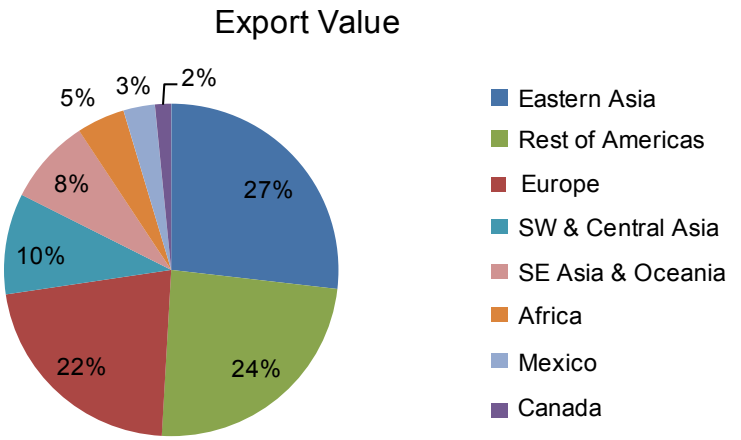
Figure 3-8. MTS International Freight Tonnage by State (2011)

Globally, it is useful to consider our trading partners in terms of regional blocs, and to differentiate tonnage metrics (which reflect mostly bulk commodity trades) and value metrics (which reflect mostly high-value consumer goods and industrial materials).

Looking first at exports, the tonnage and value metrics tell a similar story. Our three leading trade partner regions are Eastern Asia (including China, Taiwan, Japan, and Korea); Europe; and rest of the Americas (including Central and South America and the Caribbean).

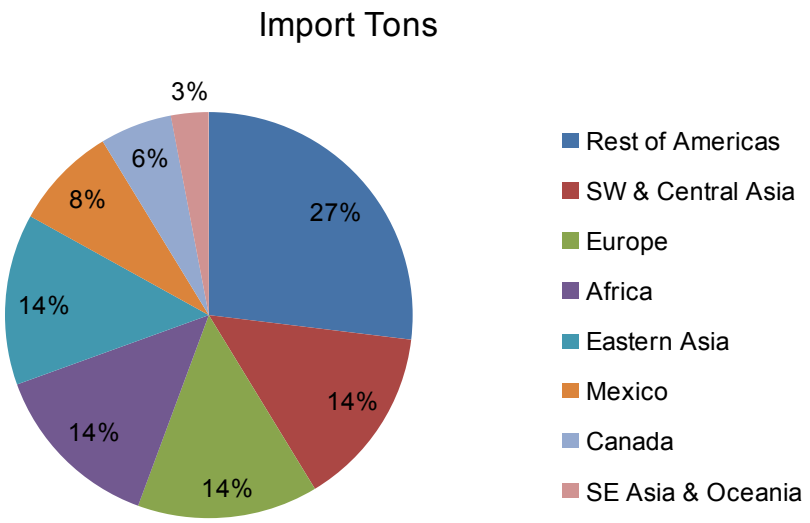
By contrast, when looking at imports, the tonnage and value data tell different stories. On a tonnage basis, the leading partner region is the rest of the Americas, reflecting substantial import volumes of petroleum and other bulk products. The next four leading partner regions—Southwest and Central Asia, Europe, Africa, and Eastern Asia—are roughly equivalent. However, imports from Eastern Asia are focused on high-value manufactured and consumer goods, and as a result Eastern Asia accounts for 42 percent of total import value.

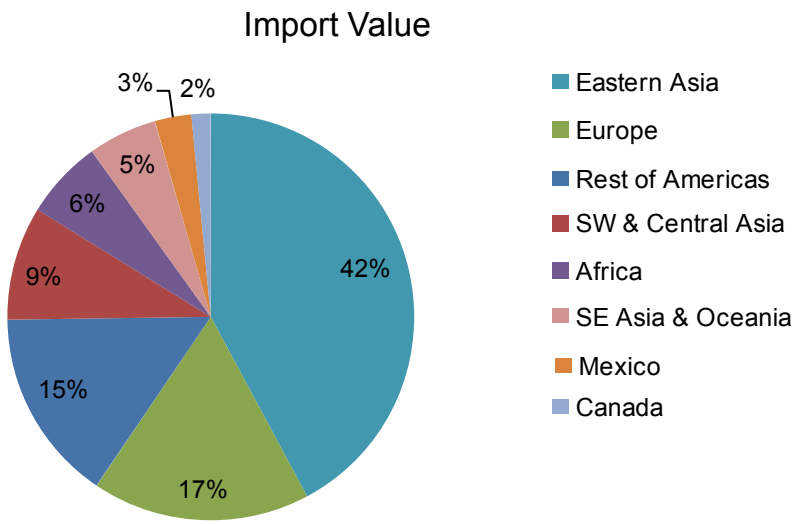




Source: U.S. DOT Freight Analysis Framework-3.

Figure 3-9. MTS Export Tons and Value by Trade Region (2011)





Source: U.S. DOT Freight Analysis Framework-3.

Figure 3-10. MTS Import Tons and Value by Trade Region (2011)

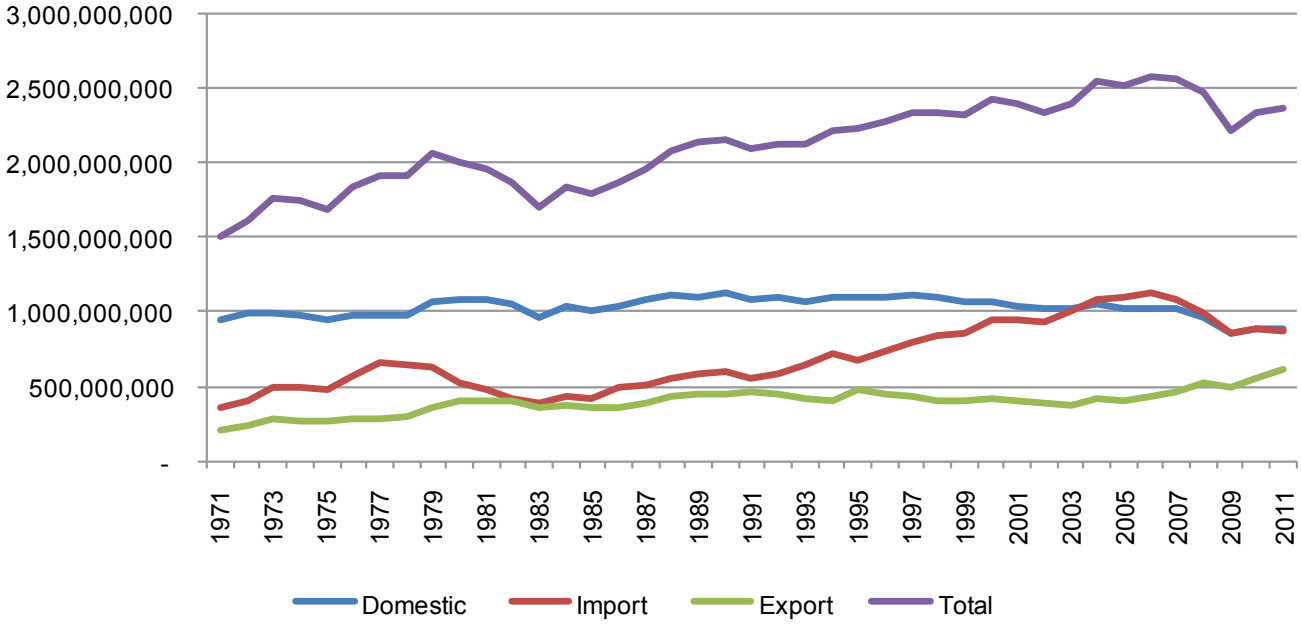
■ 3.3 Historic Trends

Since 1971, domestic tonnage has been relatively flat. The recession of the late 70s–early 80s had relatively little effect. However, the recent recession was followed by reduced domestic tonnage, which reached a low of 857 million tons in 2009, and 888 million tons in 2011. Volumes have not recovered to 1971 levels.

Import tonnage, however, is at near record levels. Import tonnage has clearly been the fastest-growing component of MTS activity, rising from 360 million tons in 1971 to 869 million tons in 2011, and

reaching a peak of 1.13 billion tons in 2006. However, it has also been the most volatile—we see significant declines during the two recessionary periods following 1979 and 2007, followed by gradual recoveries.

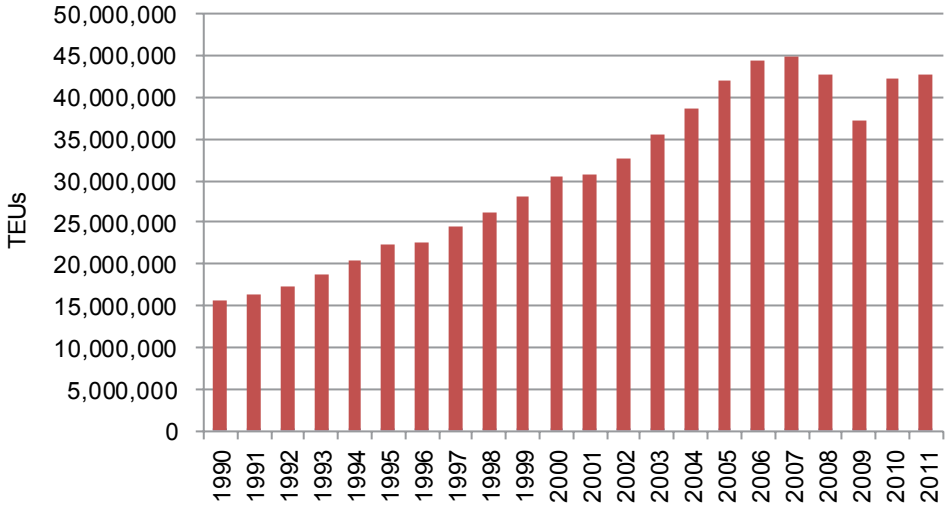
But the biggest story may be export tonnage, which reached a record 610 million tons in 2011. The gap between import and export tonnage has narrowed to levels not seen since the mid-1990s. Unlike import volumes, export volumes have grown at a relatively steady pace, without dramatic peaks and valleys. Interestingly, export volumes actually grew in the two recessionary periods following 1979 and 2007, roughly coincident with declines in the value of the U.S. dollar against world currencies.



Source: U.S. Army Corps of Engineers.

Figure 3-11. MTS Tonnage (1971–2010)

One of the most dramatic metrics of the recent recession was the decline in U.S. container traffic. Since the early 1980s, container volumes had always grown, and prior to 2007 nearly every forecast anticipated this trend would continue unabated. As it turns out, the container decline closely mirrors the drop in total MTS import tonnage; and that drop, in turn, closely mirrors the previous drop in MTS import tonnage following 1979. We should view the recent decline in container activity as a reflection of cyclic economic activity, and not as a message that the importance of containerization is diminishing. Container volumes increased slightly from 2010 (42,189,521 TEUs) to 2011 (42,733,316 TEUs), and show signs of resuming a more typical growth trajectory.

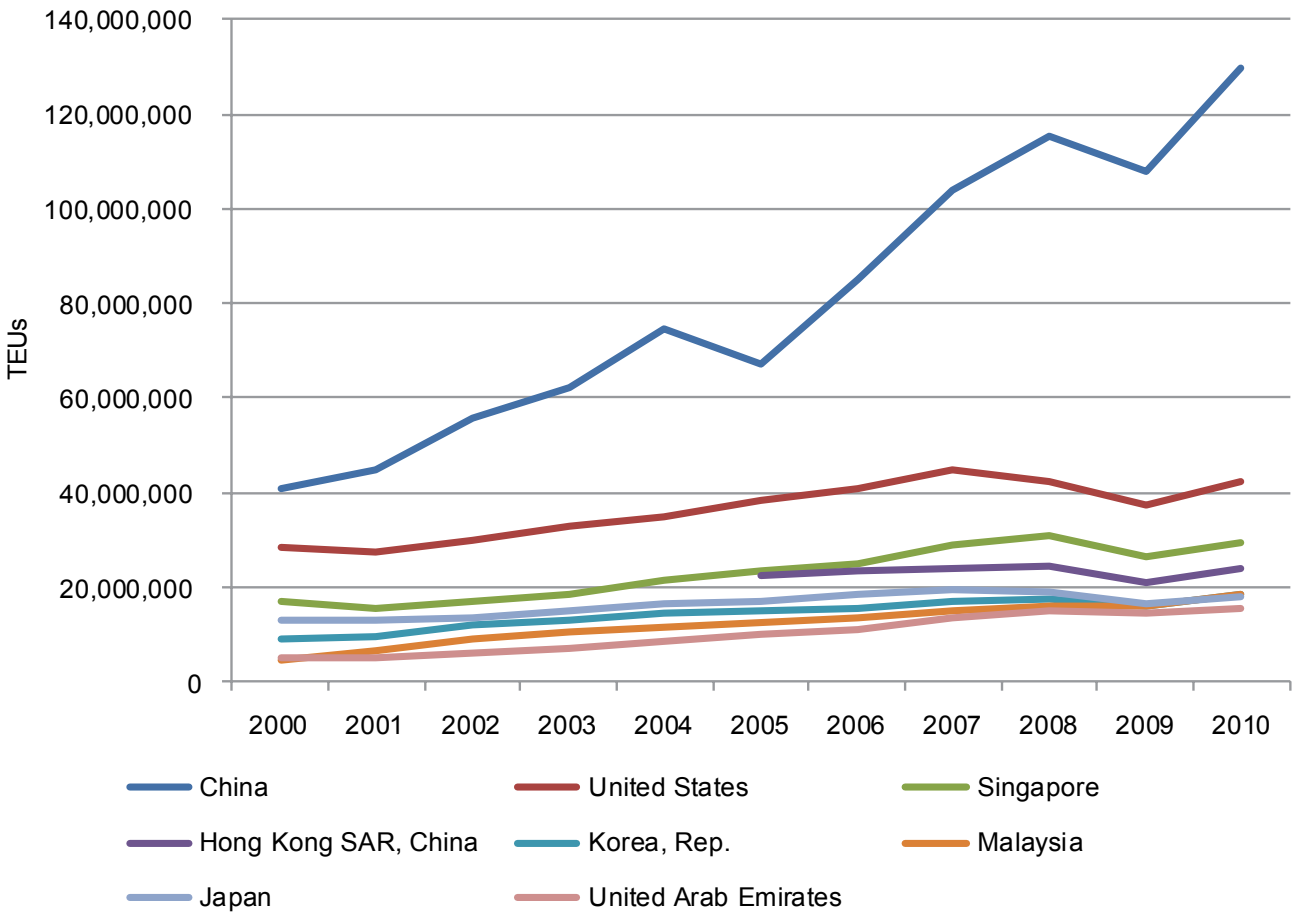


Source: American Association of Port Authorities for all years except 2010; World Bank for year 2010.

Figure 3-12. U.S. Container Traffic (1990–2011)

In 2000, the United States ranked second among world nations in TEUs handled, behind China but ahead of every other industrialized nation. Between 2000 and 2010, some countries—particularly Malaysia, United Arab Emirates, India, and Brazil—saw fairly rapid growth. But in 2010, the United States still ranked second among world nations, and by a significant margin.

However, the big story during this period was China. China started the decade as the world leader, with 41 million TEUs. By 2010, it more than tripled its volume—an incredible rate of growth—to nearly 130 million TEUs, roughly three times the container volume of the United States.



Source: World Bank.

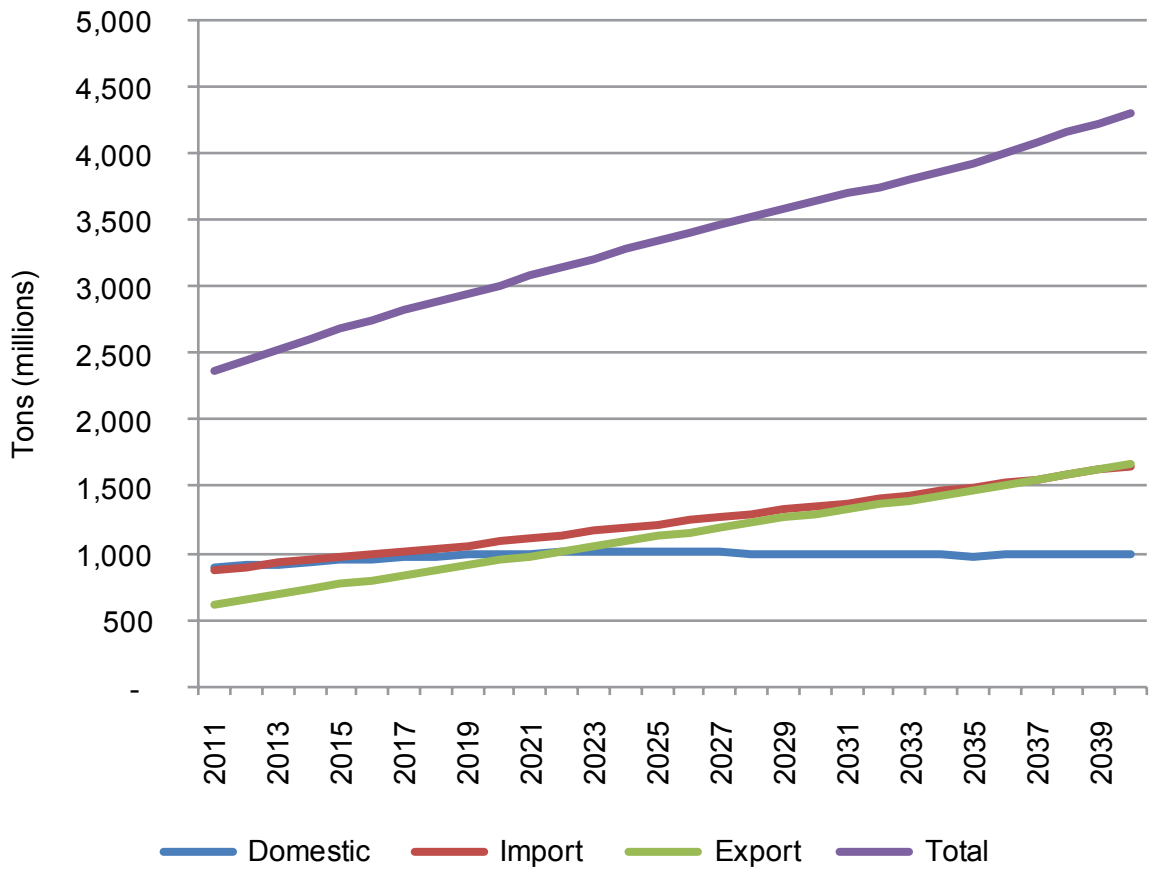
Figure 3-13. TEU Trade for Selected Countries (2000–2010)

■ 3.4 Future Forecasts

Tonnage

The U.S. DOT Freight Analysis Framework-3, recently updated to provisional base year 2011, includes waterborne trade tonnage forecasts to the year 2040. Unfortunately, the FAF-3 tonnage totals do not conform precisely to the U.S. Army Corps of Engineers tonnage totals. The recommended approach is to extract FAF-3 growth rates and apply these growth rates to the Army Corps tonnages.

For the period 2011–2040, the overall FAF-3 compound annual growth rates (CAGR) are: 0.4 percent for domestic tonnage, 2.2 percent for import tonnage, and 3.5 percent for export tonnage. At these rates, total tonnage roughly doubles, export tonnage grows to equal import tonnage, and domestic tonnage remains relatively flat. In 2040, domestic tonnage reaches 990 million tons (approximately the same volume as 1971), import tonnage reaches 1,653 million tons, export tonnage reaches 1,667 million tons, and total tonnage reaches 4,310 million tons. The MTS will need to handle twice as much total tonnage as it does today.



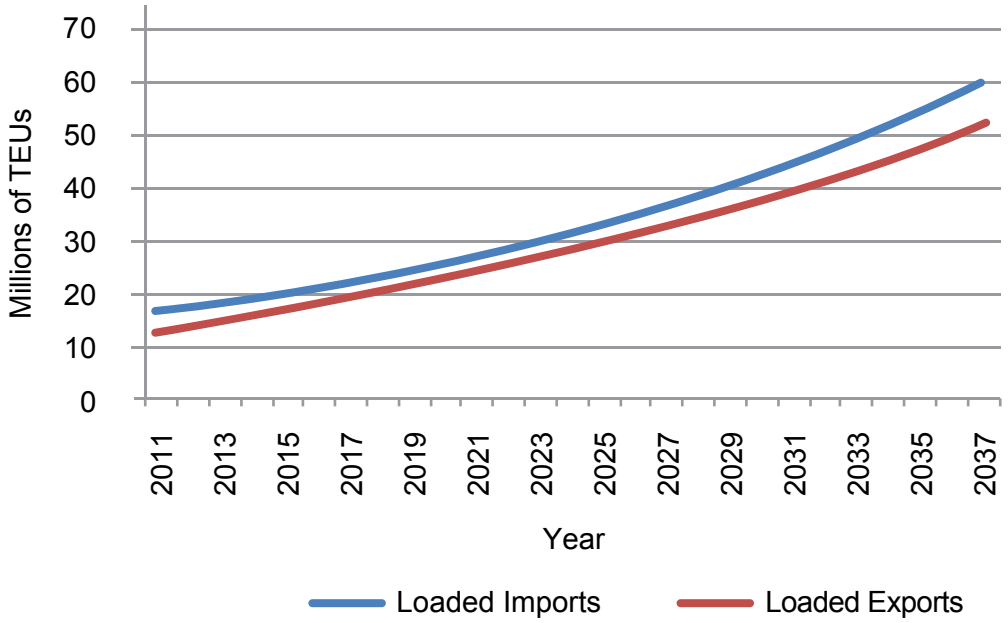
Source: FAF-3 Forecast Growth Rates for 5-year incremental periods through 2040, applied to year 2011 Army Corps of Engineers reported MTS tonnage.

Figure 3-14 MTS Tonnage Projections Through 2040

Containers

A national container forecast developed by IHS Global Insight was published in a recent report by the U.S. Army Corps of Engineers.[13] In this forecast, covering the period 2011 to 2037, loaded import TEUs grow to 60 million (around 5 percent per year growth), and loaded export TEUs grow to 52 million (around 5.5 percent per year growth). Overall, loaded import and export TEUs are projected to grow to 112 million TEUs, more than three and one-half times current volumes.

13 *U.S. Port and Inland Waterways Modernization: Preparing for Post-Panamax Vessels.* Institute for Water Resources, U.S. Army Corps of Engineers, June 20, 2012.



Source: IHS Global Insight

Figure 3-15. MTS Import and Export TEU Projections Through 2037

The challenge for any container forecast is: what to do about empty containers? Due to imbalances in commodity-trade lanes, ownership of equipment, and other factors, containers often move loaded in one direction but empty in the other. In 2011, the MTS handled 30.1 million loaded TEUs (import, export, and domestic) and around 42.7 million total TEUs—so 70 percent of the containers handled were loaded, and 30 percent were empty. Empty containers cost everyone money—they utilize vessel space, terminal space, offsite storage depot space, and labor time, without generating revenues from paying customers—so there are strong incentives to minimize the number of empties. Even so, the imbalance remains.

Projecting the IHS forecast to 2040 results in an estimate of 130 million loaded TEUs. If the current ratio of loaded to total TEUs (70 percent) remains the same, the MTS would need to handle 186 million total—more than four times the current volume. It is likely that the imbalance will be reduced over time, but by how much and when cannot be predicted. For planning purposes, it is reasonable to assume that the MTS will need to handle between 130 million and 186 million total TEUs by 2040, representing a three-fold to four-fold increase in container traffic.

4.0 MTS Benefits

■ 4.1 Overview

The MTS has been a huge success story for the United States and today, it is more important than ever to America's economy, its transportation system, its environment, and its quality of life. Every ton of international cargo on the nation's waterways serves the economic and transportation needs of American producers and consumers; every ton of domestic cargo on the nation's waterways is one less ton that must be accommodated by surface transportation modes. Key areas of benefit include:

- Trade in critical commodities;
- Economic impacts for industry and the public at large;
- Reduction in domestic highway and rail system congestion;
- Avoided environmental impacts;
- Military mobility; and
- A wide range of non-freight benefits.

■ 4.2 Trade in Critical Commodities

More than 90 percent of global trade tonnage is carried by ship.[14] In many parts of the world, waterborne commerce remains the only viable means of international trade. Any country that does not actively pursue waterborne commerce greatly diminishes its ability to trade with a large percentage of the global population. Maritime trade is by far the lowest cost and most efficient way to deliver goods around the world. As the world's population grows larger and more resource constrained, it is likely to become even more dependent on maritime transportation.

As previously mentioned, in 2011 the MTS handled 43 percent of our trade value with all nations, and 69 percent of our trade tonnage with all nations, worth more than $1.5 trillion dollars. Excluding Canada and Mexico, which can be served by transborder trucking and rail, the MTS handles more than 99 percent of U.S. trade tonnage with other countries.

For a wide variety of U.S. export commodities—coal, grain, fuel, and other agricultural products, water is the primary means of reaching global markets. Water handles more than 50 percent of export tonnage for eight of the nation's top 10 export commodities, including 90 percent of our coal and related products, 91 percent of our cereal grains, 100 percent of our fuel oils, 82 percent of our other agricultural products, and 81 percent of our basic chemicals. Water handles more than 44 percent of export value for five of the nation's top ten export commodities, including motor vehicles, plastics and rubber, basic chemicals, chemical products, and coal; it also handles a significant share of machinery, our highest-value export commodity.

14 http://www.acpa-ports.net/industry/industry.html.

Table 4-1. MTS Share of U.S. Export Tons and Value (2011)

		Total Tons, All Modes (mil)	MTS Share
1	Coal-n.e.c.	129.6	80%
2	Cereal grains	93.9	91%
3	Coal	93.9	100%
4	Fuel oils	67.0	100%
5	Metallic ores	64.7	21%
6	Other agricultural products	52.8	82%
7	Waste/scrap	52.5	100%
8	Basic chemicals	45.0	81%
9	Plastics/rubber	32.9	48%
10	Animal feed	31.0	80%
		Total Value, All Modes ($bil)	**MTS Share**
1	Machinery	241.1	24%
2	Electronics	121.6	12%
3	Motorized vehicles	103.3	48%
4	Plastics/rubber	76.0	46%
5	Misc. mfg. prods.	67.6	9%
6	Precision instruments	67.0	10%
7	Transport equipment	66.3	9%
8	Basic chemicals	54.6	70%
9	Chemical products	49.0	44%
10	Coal-n.e.c.	35.2	62%

Source: Freight Analysis Framework-3.

Table 4-2. MTS Share of U.S. Import Tons and Value (2011)

		Total Tons, All Modes (mil)	MTS Share
1	Crude petroleum	481.4	78%
2	Coal-n.e.c.	211.3	31%
3	Fuel oils	67.0	100%
4	Fertilizers	49.5	57%
5	Base metals	41.3	68%
6	Nonmetal mineral products	41.3	85%
7	Machinery	38.8	62%
8	Gasoline	38.4	100%
9	Basic chemicals	37.0	66%
10	Other foodstuffs	33.8	74%
		Total Value, All Modes ($bil)	**MTS Share**
1	Machinery	510.2	36%
2	Electronics	285.6	32%
3	Crude petroleum	205.5	79%
4	Motorized vehicles	186.9	55%
5	Textiles/leather	127.9	75%
6	Misc. mfg. prods.	94.3	36%
7	Live animals/fish	88.9	1%
8	Coal-n.e.c.	82.4	36%
9	Pharmaceuticals	64.3	12%
10	Basic chemicals	61.1	45%

Source: Freight Analysis Framework-3.

Water is the primary means of bringing crude petroleum to U.S. industries and consumers, and is also critical for our national supplies of fuel oils, fertilizers, base metals, mineral products, machinery, gasoline, chemicals, and other foodstuffs. Water handles more than 50 percent of tonnage for nine of the nation's top ten import commodities. By value, water handles around one-third or more of export value for seven of the nation's top import commodities—including machinery, electronics, petroleum, motor vehicles, textiles/leather, manufactured products, coal, and chemicals.

■ 4.3 Economic Benefit

A Transportation Research Board Special Report[15] summarizes the economic function and critical importance of the MTS:

> "Much of the freight transported within the United States, and the vast majority of that moved in international commerce, uses the nation's marine transportation system (MTS). The system is varied and immense. It consists of thousands of miles of navigable chan-

15 "The Marine Transportation System and the Federal Role: Measuring Performance, Targeting Improvement." *TRB Special Report 279.*

nels, hundreds of port complexes, and thousands of terminals located along the nation's lake, river, and coastal waterways. It involves tens of thousands of shippers and carriers, who operate a wide range of vessels from this country and abroad, from river barges to the largest oceangoing vessels. Manufactured goods are brought into and shipped out of the country in standardized marine containers transported by the thousands in vessels that regularly cross the oceans. Commodities essential to the economy and daily lives of Americans, such as minerals, building materials, energy, and farm products are moved in bulk across the country and to and from other regions of the world on the rivers, lakes, and oceans. The waterways are connected to the nation's other modes of transportation, such as highways, railroads, and pipelines. Together they form a vast freight system that has become integrated with the production process itself. The performance of the MTS affects the location of businesses, their operations and practices, and the demand for the goods and materials they produce—and ultimately, the productivity and competitiveness of U.S. producers and the prices paid by U.S. consumers."

The MTS is so fundamental to the U.S. economy, so embedded in the chain of domestic and global production and consumption, that without the MTS the economies of every state and the nation would be structurally different. While the full value of the MTS has yet to be quantified, recent studies have examined its major components:

- **Great Lakes.** "Great Lakes—St. Lawrence Seaway shipping is one of the key drivers of the United States and Canadian economies. The industry creates 227,000 jobs in the two countries, and produces business revenues of $35 billion. Additionally, shipping in the region contributes $4.6 billion in federal, state/provincial, and local taxes every year. It also supports the economic health of North America's industrial heartland and a consumer market of more than 100 million people. To keep their businesses running, U.S. and Canadian electric utilities, steel mills, construction companies, mining companies, manufacturers, and farmers all depend on the 164 million metric tons of cargo delivered by Great Lakes vessels every year. These cargoes become the automobiles North Americans drive, the office buildings they work in, the energy that heats their homes, the salt that keeps roads safe, and the food they put on the dinner table. Marine transportation on the Great Lakes–Seaway System provides $3.6 billion (U.S.D) in annual transportation cost savings compared to the next least expensive all-land transportation alternative. This enhances the global competitiveness of North American products and industries and keeps the cost of consumer goods down."[16]

- **Inland Waterways.** "In 2006, Ohio River Basin commercial navigation users saved $3.1 billion by using the Ohio River System (ORS) waterway to ship coal, steel, chemicals and other commodities by barge. For the entire U.S. inland river system, using an estimated $10-$12 per ton shipper savings, national transportation shipper savings would be in the neighborhood of $7.0 billion… A University of Tennessee Center for Transportation Research study found that barge navigation on the ORS navigable channel contributed a total of $497 billion in sales and 80,000 annual jobs to the nation's economy. This $497 billion in sales, discounted over 44 years at 3 percent, yields

16 *Economic Impacts of the Great Lakes–St. Lawrence Seaway System*. Martin Associates; October 18, 2011.

an annual $20.5 billion (of this, $3.1 billion is shipper savings, leaving $17.4 billion for the annual economic impact)."[17]

- **Deep Water and Coastal Ports.**"[Deep water] public ports contribute significant benefits to local and regional economies, including generating business development and job opportunities. Commercial port activities in 2007 created employment opportunities for more than 13.3 million Americans, including nearly 12 million who were employed in exporter/importer-related businesses and support industries throughout the United States. Business activities related to waterborne commerce contributed approximately $3.15 trillion overall to the U.S. economy, and those same businesses paid nearly $212.5 billion in Federal, state, and local taxes. Seaport activities alone in 2007 accounted for $31.2 billion in Federal, state, and local tax revenues."[18]

The waterborne transportation system is worth far more than the sum of transportation savings it provides ($9 billion per year) or the amount of business revenue it supports (more than $3 trillion per year). Without waterborne transportation, there would be no way to efficiently import petroleum; and even short-term interruptions in the nation's petroleum supply would have huge negative effects, not only on petroleum-dependent businesses, but also throughout the economy as a whole. After Hurricane Katrina, the Mississippi River closed for navigation, temporarily shutting down the export of U.S. grain through Louisiana ports; fortunately the river was quickly reopened before there were longterm damaging effects. There are countless other ways in which waterborne freight transportation is an irreplaceable piece of the nation's economic infrastructure.

Table 4-3. Summary of Available MTS Economic Impact Estimates

	Jobs (Direct, Indirect, Induced)	Annual Impacts (in Billions of Dollars)		
		Wages	Revenues	Transport Savings
Great Lakes (U.S.) (2011)	128,227	9.7	18.1	2.0
Ohio River System (2011)	80,000	-	17.4	3.1
Other Inland Waterways (2011)	-	-	-	3.9
Deep Water and Coastal (2007)	1,325,531	95.3	100.1	-
U.S. Importers and Exporters (2007)	11,995,102	554.2	3,055.4	-

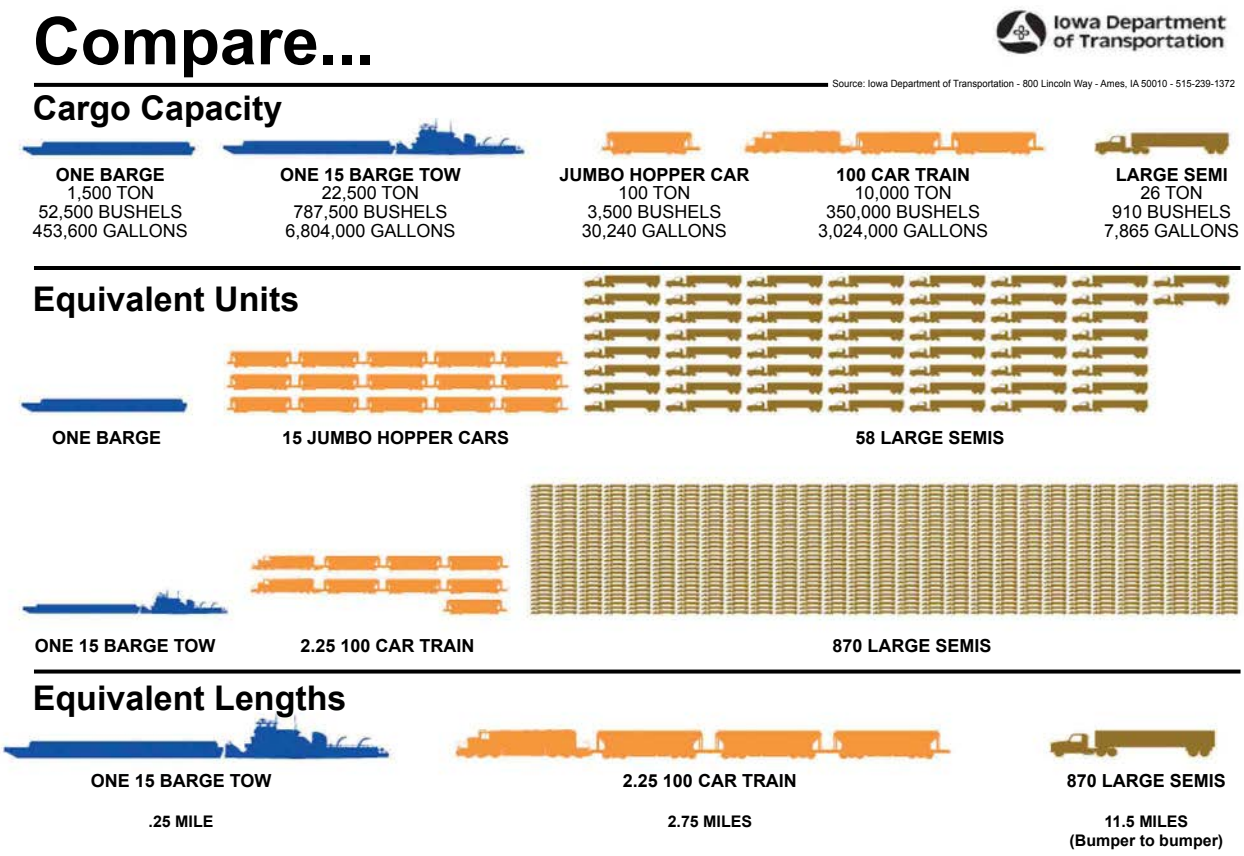
Sources: Martin Associates, University of Tennessee Center for Transportation Research.

■ 4.4 Reduced Highway and Rail System Congestion

Each ship or barge tow provides capacity equivalent to many trucks or railcars. For example, one 15-barge tow handles as much non-containerized freight as 225 railcars (equivalent to a train nearly 3 miles long), or 870 combination trucks (equivalent to a line nearly 12 miles long).

17 *Toward a Full Accounting of the Beneficiaries of Navigable Waterways*. University of Tennessee Center for Transportation Research, January 2011.

18 *The Local and Regional Economic Impacts of the U.S. Deepwater Port System, 2007*. Martin Associates; June 6, 2008.



Source: Iowa DOT

Figure 4-1. Vessel Capacity Equivalents

For the year 2011, the MTS handled 887.9 million tons of domestic freight, with an average haul distance of 563.5 miles per trip, for a total of 500 billion ton-miles.[19] If all this tonnage was handled by 20-ton trucks, it would require nearly 45 million long-haul truck trips per year. Lined up end to end, these trucks would stretch nearly 500,000 miles.

Currently, the nation's primary truck routes experience significant congestion in major urbanized areas, but except for a limited number of intercity corridors, most of the network outside of urbanized areas is uncongested. With growing truck movement, growing background traffic, and limited opportunities to expand intercity highway capacity, the picture by 2040 is stark and unsettling. Almost every major urban center will experience significant truck congestion, and a majority of high-freight volume intercity corridors—including almost every segment east of the Mississippi—will experience significant peak-period congestion.

19 Ton and ton-mileage data is sourced from the U.S. Army Corps of Engineers, and represents tonnage handled times average length of haul. One ton-mile is equivalent to two tons moving one-half mile, or one-half ton moving two miles, etc.

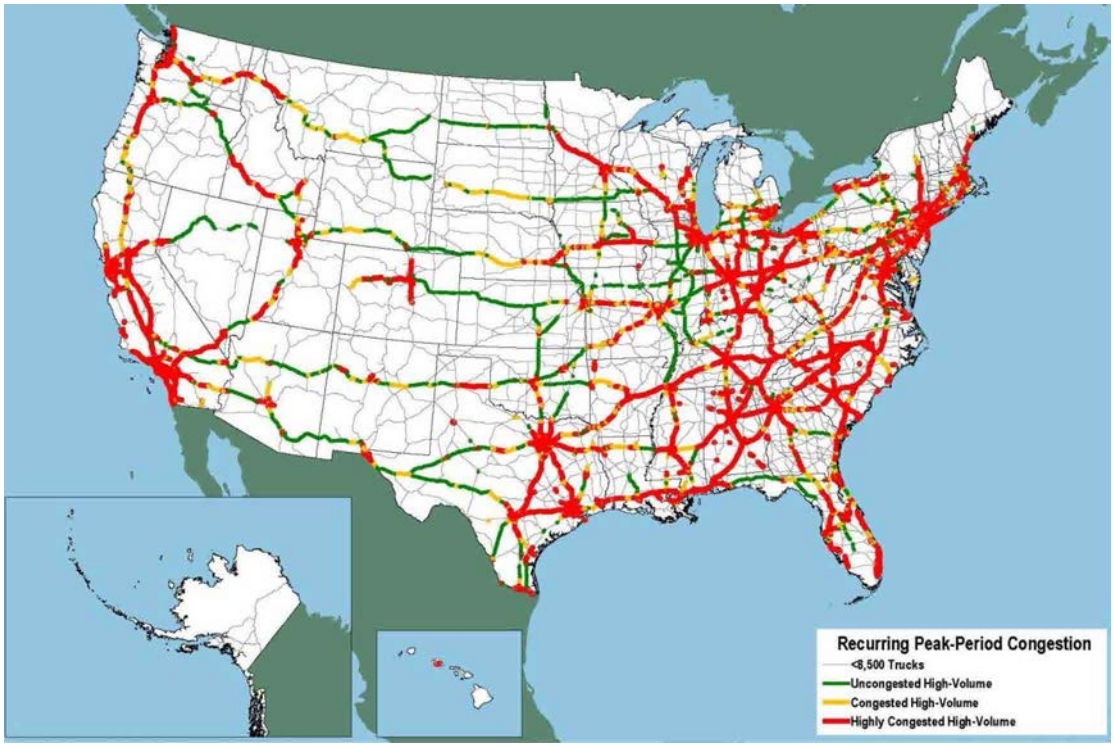


Figure 4-2. Projected Truck Network Congestion (2040)

Freight shippers and receivers make modal decisions based on well-documented factors: reliability, speed, cost, safety, security, and value-added or special handling considerations. As highways become increasingly more congested, shippers and receivers will naturally seek alternative modes. The rapid growth of rail intermodal services—which are, in large part, a cooperative partnership of the trucking and rail industries—is likely to continue. North American railroads invest billions annually to maintain and expand their systems, and except for a limited number of chokepoints the system is operating within capacity. However, like the highways, the rail system is projected to experience significant congestion by the year 2040, unless major improvements are made. Perhaps all required improvements will be made; but if they are not, the railroads can be expected to ration capacity based on market demand.

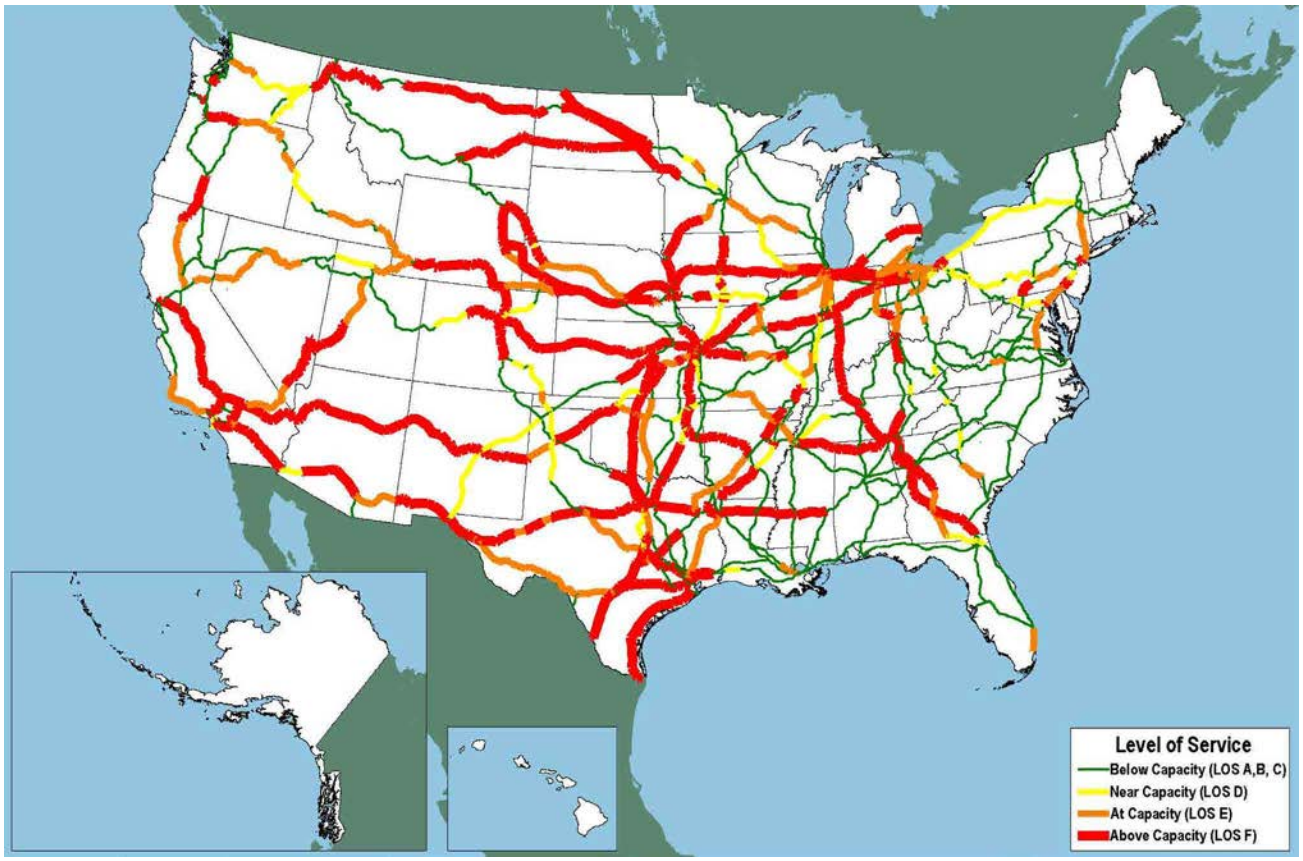


Figure 4-3. Projected Freight Rail Network Congestion (2040)

After building the nation's rail network and highway systems to supplement our waterways, we find ourselves returning to water as a means to relieve pressures on those systems. In some cases, MTS capacity and utilization improvements will be essential due to constraints on highway and rail systems. In other cases, MTS capacity and utilization improvements may simply offer greater benefit at lower cost than investments in other modes. Consideration of MTS benefits and opportunities within highway and rail planning processes at the local, regional, state, and federal levels is essential to identifying and implementing these opportunities. One example is the U.S. DOT Maritime Administration's Marine Highway initiative, which focuses on increased container-on-barge services.

As discussed in Section 3, econometric forecasts suggest that domestic waterway traffic will remain relatively flat through 2040. However, those forecasts do not take into account the user experience. It is possible, if not likely, that rising congestion and cost on other modes will lead users to a greater consideration of MTS alternatives. Public policy decisions to support domestic waterborne transportation are likely to be important in capturing these opportunities.

■ 4.5 Avoided Environmental Impacts

Some of the most significant benefits afforded by waterborne freight movement are environmental. This may seem strange to those who are aware of the environmental controversies and conflicts associated with operations and expansion plans at the nation's biggest container ports. It is true that large seaports tend to concentrate freight activity at one point, where vessels and trucks and trains converge, along with associated air emissions, highway congestion, rail grade crossing activity, noise, vibration, light, and so on; and that these effects must be mitigated. Furthermore, it is true that port improvement projects often involve channel and berth deepening, landfill, land redevelopment, highway and rail capacity improvements, and other actions generating significant environmental impacts that must be mitigated.

In return for these "point" impacts, we derive substantial and worthwhile systemwide benefits. Water transportation helps reduce fuel consumption and emissions because water on average moves more freight with less fuel consumption and emissions than any other mode. An article from the February 25, 2008 *New Yorker* magazine noted:

> "Last year, a study of the global wine trade found that it is actually more 'green' for New Yorkers to drink wine from Bordeaux, which is shipped by sea, than wine from California, sent by truck … The study found that 'the efficiencies' of [ocean] shipping push a green line all the way to Columbus, Ohio, the point where a wine from Bordeaux and Napa has the same carbon intensity."

A series of studies by the Texas Transportation Institute has quantified the fuel consumption and emissions factors for inland waterways, rail, and trucking. On each measure, water is superior to other modes.

Table 4-4. Fuel Consumption and Emissions Factors

	Fuel Efficiency (Ton-Miles/Gallon)	Emissions (Grams/Thousand Ton-Miles)				
		Volatile Organic Compounds	Carbon Monoxide	Nitrogen Oxide	Particulate Matter	Carbon Dioxide
Waterways	616	14	43	274	8	16,410
Railroad	478	18	56	354	10	21,140
Truck	150	100	370	1,450	60	171,830

Source: A Modal Comparison of Domestic Freight Transportation Effects on the General Public, Texas Transportation Institute, Amended February 2012.

Based on 502.8 billion ton-miles of domestic freight and 103.4 billion ton-miles of international freight (coastal and St. Lawrence seaway traffic) moving on the MTS in 2010—figures extremely close to 2011 totals—the impacts from water transportation and the equivalent impacts of moving the same ton-mileage by truck and rail can be calculated.

Table 4-5. Environmental Impacts of Moving MTS Ton-Mileage via Other Modes (2010)

	Fuel Consumption (Millions of Gallons)	Emissions (Thousands of Metric Tons)				
		Volatile Organic Compounds	Carbon Monoxide	Nitrogen Oxide	Particulate Matter	Carbon Dioxide
Actual MTS	984	9	26	166	5	9,948
If by Rail	1,268	11	34	214	6	12,815
If by Truck	4,041	61	224	879	36	104,163

If the MTS had not been available in 2010, and its ton-mileage had moved entirely by truck—a worst-case environmental scenario—it would have increased fuel consumption by 3 billion gallons and increased CO_2 emissions by 94 million tons. Alternatively, if MTS ton-mileage had moved entirely by rail—a best-case environmental scenario—it would have increased fuel consumption by 284 million gallons and increased CO_2 emissions by 2.9 million tons.

These added fuel consumption and emissions effects can be monetized using factors suggested by U.S. DOT under its Transportation Investments Generating Economic Recovery (TIGER) competitive grant program. Using TIGER factors for year 2007, inflated to year 2010, the added environmental cost to the nation of moving 2010 MTS domestic freight by alternative modes would be $863 million by rail and $16.8 billion by truck.

In practice, if there was no MTS, commodity trades would be very different, and direct replacement of water transportation by other modes would not be possible or desirable in all cases. This analysis should be taken as a theoretical exercise only. Nevertheless, it clearly demonstrates that the MTS provides very significant environmental benefits, year over year, for the nation as a whole.

■ 4.6 Other MTS Benefits

Although not addressed in this report, we would note that the Marine Transportation System accommodates other critical functions: military mobilization and resupply; passenger transportation (many passenger vessels also carry freight, as “carry on” loads or in the form of trucks); commercial fishing; shipbuilding; vessel repair, maintenance, and servicing; construction and salvage; offshore oil and gas exploration; offshore pipeline and telecommunications system construction and maintenance; law enforcement; incident management and environmental/emergency response; marine research; hydropower; municipal water; irrigation water; flood control; and recreational fishing and boating. Waterborne freight and these other uses must coexist as “good neighbors.”

5.0 MTS Planning and Funding

■ 5.1 Stakeholders and Roles

The basic shape of the MTS was initially defined by the location of protected, deep natural harbors and reliably navigable inland waterways. Over the years, these first-generation assets have been improved, new deepwater ports and terminals have been constructed, and new waterway mileage has been added to the system. But unlike the U.S. highway system, which largely emerged as the result of coordinated planning and close partnership between federal and state governments, the MTS has evolved without larger-scale coordinated planning. Parts of the system are federally owned and managed; but much of it is owned and operated by local, regional, and state entities, and by private-sector carriers and customers.

The common theme in MTS development has been market opportunism, from both the private and public sectors. Ports and related infrastructure and services develop and evolve independently, to capture, maintain, and grow specific market niches. There is no "master plan" for the MTS; each port, stakeholder, and region pursues its own organizational or business mission. The result is that the MTS is, as some have described it, a "collection of competitors."

- The federal government—acting principally through the U.S. Army Corps of Engineers—has been primarily responsible for constructing and maintaining a set of federally authorized navigation channels. Corps appropriations for navigation projects have, over the past decade, averaged $1.5 to $2 billion per year.[20] Costs for deep-draft improvements are typically shared with local sponsors.
- Multistate authorities, state agencies, regional authorities, and local governments have built marine terminals, often in direct competition with neighbors; private industries have also built their own marine terminals, typically to accommodate the movement of bulk materials. A survey by the American Association of Port Authorities found that U.S. ports and their partners plan to invest $46 billion in MTS infrastructure by 2017.[21]
- Local, regional, and state planners, recognizing the economic benefits of port operations as well as their potential impacts on transportation systems, communities, and the environment, have provided landside connections and made land use decisions affecting port development and expansion.
- Railroads have developed lines and services to connect marine terminals with inland and cross-country markets. The railroads compete with each other, but they also cooperate with each other and the public sector on projects of mutual benefit (such as Southern California's Alameda Corridor and Chicago's CREATE).

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20 *U.S. Port and Inland Waterways Modernization: Preparing for Post-Panamax Vessels.* U.S. Army Corps of Engineers; June 20, 2010.

21 http://www.aapa-ports.org/Press/PRdetail.cfm?itemnumber=18583

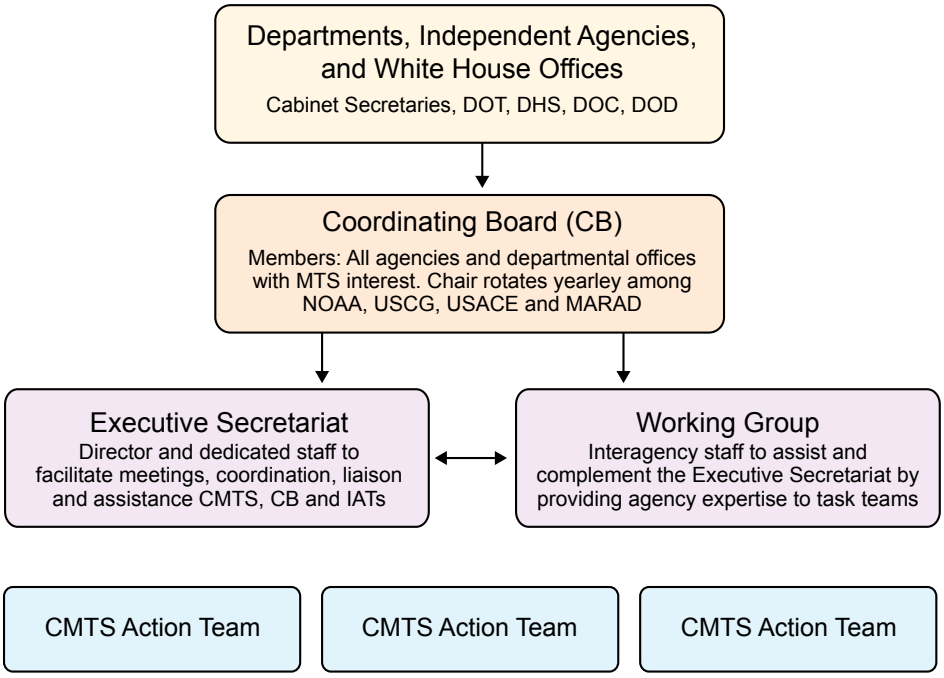
- Ocean and waterway carriers select ports of call based on the particular port arrangements (location, accessibility, vessel size capacity, terminal operating cost structure, etc.) that allow them to profit from the customer services they provide.
- Freight shippers and receivers have developed privately owned logistics infrastructure—warehouse/distribution centers, manufacturing/processing plants, etc.—either at ports or at inland locations connected to ports via rail and/or truck.

■ 5.2 Federal Roles

Overlaid on this competitive structure are significant federal roles. The maintenance and improvement of federal waterways is the responsibility of the U.S. Army Corps of Engineers. Their work is funded from the Harbor Maintenance Trust Fund (supported by an ad valorem fee on imports and domestic traffic), the Inland Waterways Trust Fund (supported by a fuel tax on inland waterway traffic), annual general fund appropriations, and cost-sharing with local sponsors. Needed highway connections, and in some cases support for rail connections, are generally provided by state and regional governments through the allocation of federal and non-federally sourced transportation funds. Major MTS projects require extensive environmental studies and regulatory approvals at the federal, state, and local levels. So, while the MTS is not planned at the federal level, the competitive aspirations of ports and stakeholders may be significantly facilitated, limited, or managed by the availability of project funding and approvals at the federal level.

MTS Regulation and Policy

Federal responsibilities for MTS include not only marine commerce, but also a wide array of other functions and missions: commerce and economic development, revenue collection, environmental protection and resource management, flood control and water supply, military use, national security and law enforcement, energy, research, recreation and public safety, international relations, etc. As a result, federal MTS regulation and policy functions are dispersed among many different agencies and offices. The Committee on the Marine Transportation System (CMTS), originally formed in 2004, is currently developing a comprehensive index of federal MTS regulatory and policy roles and responsibilities.



Source: http://www.cmts.gov/About/Organization.aspx.

Figure 5-1. Organizational Structure of the CMTS

Navigation Project Planning

Under the Commerce Clause of the Constitution, Congress is given the power to "regulate Commerce with foreign Nations, and among the several states, and with the Indian tribes." As noted by the American Association of Port Authorities:[22]

> *"Since 1789, Congress has authorized and funded activities to ensure free and open access of the nation's waterways to navigation. The General Survey Act of 1824 established the U.S. Army Corps of Engineers as the agency responsible for the Nation's navigation system."*

Since 1824, the U.S. Army Corps of Engineers has had primary responsibility for maintaining and improving the nation's waterways and its locks and dams. Today, in addition to channels and locks and dams, the Corps is responsible for a large and diverse set of program activities, including flood control and shore protection, wetlands restoration, hydroelectric power, recreational use development, etc. The Corps does not build or develop seaports or terminals, or maintain vessel berths, or provide connecting landside infrastructure—those MTS elements are provided by other parties, under a broad partnership between all levels of government and the public and private sectors.

Except for smaller projects, including navigation projects of less than $4 million, which can be funded under Continuing Authorities provisions, Corps projects must be authorized by Congress. Authorizations typically are provided through the Water Resources Development Act, or WRDA.

22 http://www.aapa-ports.org/Issues/content.cfm?ItemNumber=1007.

The first WRDA was adopted in 1974, and the most recent was adopted in 2007. WRDA does not actually appropriate or commit funding, but it does authorize projects and program activities, along with providing policy and fiscal guidance. WRDA is supposed to be updated every two years, but rarely is, and alternative mechanisms may be used to authorize projects in interim years. Detailed technical studies performed by the Corps (Reconnaissance, Feasibility, and Environmental Impact) are instrumental in determining which projects are submitted to Congress for authorization.

From the set of authorized navigation projects and other mission-related projects, the Corps formulates Annual Work Plans and Civil Works Budgets, which spell out investigations, construction activities, operations and maintenance, and other activities. Funding for Corps navigation program activities is provided through the annual Energy and Water Development appropriations bill. For FY2012, the Corps' budget request was more than $4.6 billion dollars.

Over the years, the federal government has developed very specific processes for determining whether navigation projects are included in authorization requests and, if authorized, whether they are included in annual Corps Work Programs. For construction projects, this generally involves the following steps:

- Local sponsors must initiate and request Corps studies.
- The Corps must conduct studies (Reconnaissance, Feasibility, Environment Impact) and make appropriate determinations of national economic development benefits to advance an alternative.
- Responsible agencies must review and approve the Corps Final Report and Environmental Impact Statement.
- Congress must authorize the project.
- The President's budget must fund the project, based on identified national priorities.

The process co-mingles technical, political, and budgetary considerations at different points. The preparation of studies is highly structured, but many of the key factors—the rules that define national benefits and priorities, the specific projects to be authorized, the balance between navigation and other missions, and the overall level of funding available for the Corps Work Program—can vary from year to year.

Table 5-1. Construction Project Planning and Implementation Process

Simplified Description (Abridged and Adapted from Corps Publications)	
1. Problem Perception	Local community (i.e., people, businesses) and/or local government perceive or experience water and related land resource problems (i.e., flooding, shore erosion, navigation restrictions, etc.).
2. Request for Federal Action	Local officials talk to Corps about available Federal programs [and] contact congressional delegation if study authorization required. Member of Congress requests study authorization through Public Works Committees. Committee resolution adopted if report was previously prepared on water problems area. Legislation, which may be proposed by the President, is normally required if no Corps report exists.
3. Study and Report Preparation	Funds to complete and report a 12- to 18-month Reconnaissance Study are included in President's budget [and] annual Energy and Water Development Appropriations Act. If study continues beyond Reconnaissance phase, local sponsor must agree to share cost of Feasibility phase. (Subsequent Feasibility Study and Environmental Impact Statement are) conducted under the U.S. Water Resources Council's Economic and Environmental Principles and Guidelines (under which the Corps may select a plan for recommendation or decide to take no action. The alternative plan with the greatest net economic benefits consistent with protecting the nation's environment is normally selected.)
4. Report Review and Approval	Final EIS is filed with Environmental Protection Agency (EPA) and made available to public. Proposed report of Chief of Engineers and Final EIS are sent to heads of Federal agencies and governors of affected states for comment. Office of Management and Budget (OMB) comments on [Final] report as it relates to President's programs. Assistant Secretary of the Army (Civil Works) transmits Chief of Engineers' report to Congress. Funds are included in President's budget and Congress acts on each item in appropriations bill.
5. Congressional Authorization	Chief of Engineers' reports are referred to Committee on Public Works and Transportation in House and Committee on Environment and Public Works in Senate. Civil Works projects are normally authorized by Water Resources Development Act (Omnibus Bill) following committee hearings. Occasionally, Corps proposal is authorized by separate legislation or as part of another bill.
6. Project Implementation	New projects are included in President's budget based on national priorities and anticipated completion of design and plans and specifications so that construction contract can be awarded. Budget recommendations are based on evidence of support by state and ability and willingness of non-Federal sponsors to provide their share of project cost. Congress appropriates Federal share of funds for new starts; normally, this occurs in annual Energy and Water Development Appropriations Act. Funds are in President's annual budget for the Federal share of the project; appropriations are required to continue design and implementation. Construction is managed by Corps, but done by private contractors.

Source: This table has been abridged and adapted from the original Corps source material.

Similarly, the definition of operations and maintenance expenditures in a given year reflects a combination of technical, political, and budgetary considerations. According to a report by the Congressional Research Service:[23]

> "Since 2006, Administration budget criteria prioritize harbor funding using multiple performance-based metrics; the most significant metric is commercial tonnage at a harbor. The commercial tons metric is used as a rough proxy for evaluating economic return from O&M investments … Other secondary and tertiary factors considered include safety (e.g., harbor of refuge), national priorities (e.g., support of defense and energy facilities), and public transport and subsistence (e.g., harbors serving isolated communities)."

Navigation Project Funding

The 1986 WRDA implemented significant changes to how the nation pays for navigation system maintenance and improvements:

- Prior to 1986, the federal government funded 100 percent of navigation channel maintenance and improvement costs. WRDA established a program of federal cost-sharing for navigation channel improvement projects, shifting some of the burden to ports and their host regions and states. Currently, there is a sliding scale for federal cost-share percentages—below 45 feet, construction is 65 percent federal and maintenance is 100 percent federal; above 45 feet, construction is 40 percent federal and incremental maintenance above 45 feet is 50 percent federal.

23 *Army Corps Fiscal Challenges: Frequently Asked Questions.* Congressional Research Service, August 18, 2011.

- WRDA also established a new revenue source—the Harbor Maintenance Tax, or HMT—as a mechanism to help fund the federal government's share of costs. The HMT is a tax on the value of domestic and import cargo moving through coastal ports. (The application of HMT to exports was subsequently struck down by the courts.) It is levied on the cargo owner and collected by U.S. Customs (for international trade) and on an honor system (for domestic trade). Collections and any unspent balances accrue in the Harbor Maintenance Trust Fund (HMTF).

Currently, the primary means of funding Corps work program activities are general fund appropriations; transfers from the HMTF; transfers from the Inland Waterway Trust Fund, which accumulates fuel tax collections from operators along 12,000 miles of inland waterways[24]; and special recreation user fees.

Table 5-2 Army Corps of Engineers FY 2012 Funding Sources

Funding Source	Request ($ Millions)
General Fund	3,753
Harbor Maintenance Trust Fund (HMTF)	758
Inland Waterway Trust Fund (IWTF)	77
Special Recreation User Fees	43
Total	4,631

Source: http://www.usace.army.mil/Portals/2/docs/civilworks/press_book/budget2012.pdf.

For the Corps' FY 2012 budget of $4.6 billion, roughly one-third of the funding is associated with navigation projects, roughly one-third is associated with flood risk management, and the remainder is associated with other Corps missions (ecosystem restoration, environmental stewardship, site remediation, hydropower, recreation, water supply, regulation, emergency management, etc.). According to AAPA, Federal spending for maintenance dredging of navigation channels averages about $500 million annually.

Note that transfers from the two navigation-oriented trust funds (HMTF and IWTF) totaled slightly over $800 million, compared to a total navigation projects cost of roughly $1.6 billion. The difference is made up primarily from the General Fund.

Surface Transportation Funding

Federal fuel tax receipts are used to fund surface transportation improvement projects. Surface transportation funds flow down to states and regional Metropolitan Planning Organizations, who are responsible for programming the funds and delivering projects. Traditionally, surface transportation funding was dedicated to highway projects, but over the years, funding eligibility has expanded. The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) established definitions for "intermodal connectors" as a critical component of the national highway system (NHS). Many of the critical surface transportation links to MTS ports and terminals are formally defined as intermodal connectors. Every state has intermodal connectors, although not every state has MTS-related intermodal connectors.

24 Also known as "fuel taxed inland waterways."

Over the past two decades, federal funds programmed at the state and local levels have supported billions of dollars in improvements to interstate highways, state and local roads, grade crossings, rail realignments, and other projects that have directly benefited the nation's ports and the MTS as a whole. Funds under the CMAQ (Congestion Mitigation and Air Quality) program have even been used for container-on-barge services.

The most recent surface transportation authorizing legislation (Moving Ahead for Progress in the 21st Century, or MAP-21) continues to recognize the importance of intermodal connectors. MAP-21 provides for $43.7 billion in total funding over FY 2013 and 2014. While MAP-21 does not provide a set-aside funding category for intermodal connectors, or for freight movement generally, it does provide increased federal matching funds for freight improvement projects that are part of State Freight Plans. It also advances the process of national freight planning, by establishing a National Freight Network (consisting initially only of highways), encouraging State Freight Plans and local freight advisory boards, and promoting national dialogue.

Discretionary Grant Funding

The American Recovery and Reinvestment Act of 2009 (ARRA) established a discretionary grant program known as TIGER (short for Transportation Investments Generating Economic Recovery). Project applications were developed by local sponsors and were required to include detailed evaluation of transportation benefits, economic impacts, project costs, implementation readiness, and other factors. To date, there have been four rounds of TIGER grant awards, totaling around $3.1 billion dollars, to around 220 projects. The program was highly competitive; under TIGER I alone, there were 1,400 applications for 51 awards. Many different types of projects have received awards, and the MTS has been one of the beneficiaries.

Table 5-3. Recent TIGER Awards for MTS Projects

Program	Awarded To	Project	Amount ($ Millions)
TIGER III (2011)	South Jersey Port Corporation	Rail bridge rehabilitation	18.5
	Port of New Orleans	Railyard construction	16.7
	West Virginia Port Authority	Inland port intermodal terminal	12.0
	Jacksonville Port Authority	Intermodal container transfer facility	10.0
	Port of Long Beach	Rail access improvements	17.0
TIGER IV (2012)	City of Bayonne, NJ	On-dock intermodal railyard	11.4
	Alabama State Port Authority	On-dock intermodal rail and connecting bridge	12.0
	West Memphis, Arkansas	Improved bulk rail service to river port	11.0
	Tulsa Port of Catoosa	Dock, crane, and rail improvements	6.4
	Brownsville Navigation District	Dock and rail improvements	12.0
	Port of Corpus Christi	Rail access improvements	10.0
	Port of Oakland	Rail access improvements	15.0
	Port of Lewiston, Idaho	Dock improvements	1.3

Coordination and Collaboration

For the most part, the MTS consists of a set of independent elements—navigable waterways, ports and terminals, highway and rail connections, and related logistics facilities—developed and operated to fulfill separate public missions or achieve separate business objectives. The federal government does not decide where to locate ports, or how to develop and expand them, or what types of freight or vessels to move through them, or how to configure their highway and rail access. Its MTS responsibilities are focused on the waterways, and on the provision of surface transportation and discretionary grant funding for non-waterway projects.

MTS waterway projects are advanced mostly on a case-by-case basis, responding to urgent need (in the case of maintenance) or economic opportunity (in the case of deepening proposals). Planning for improvements to coastal waterways, which involve connecting a port or set of ports to open water, focuses on what is needed to accomplish that specific improvement; although typically, these planning studies consider potential effects related to other nearby ports. Planning for inland river systems tends to be more comprehensive and geographically broad because these are systems that are functionally interconnected over hundreds or even thousands (in the case of the Mississippi River system) of miles. Planning and management for the St. Lawrence Seaway is coordinated by the St. Lawrence Seaway Development Corporation and its Canadian counterpart. There is no national "master plan" map for the MTS waterway system—planning is locally and regionally driven, or subsystem-based.

Ports (and their host regions and states) work very closely with their Corps Districts, federal regulatory and enforcement agencies (Homeland Security, et al.), and federal transportation agencies (Maritime Administration Gateway Offices, Federal Highway Administration, Federal Railroad Administration) on federal issues that concern them directly. In recent years, the federal government has made greater efforts to bring together stakeholders at a national level through the Committee on the Marine Transportation System (CMTS) and the MTS National Advisory Committee (MTSNAC). And the U.S. DOT Maritime Administration has promoted initiatives such as the "Marine Highway"

(domestic container movement over inland and coastal waterways) to a broad range of stakeholders. These broader cooperative efforts recognize the need for improved communication and coordination among federal agencies, and between federal agencies and other MTS stakeholders.

■ 5.3 State and Regional Roles

In some states, port authorities are state agencies.[25] Port planning by these agencies therefore represents state-level planning. State port authorities typically do not plan for private ports, and may not include all public ports in their states; nor do they typically plan for MTS connecting infrastructure (highways, railroads, logistics facilities) far beyond the gates of their terminals.

States and regional Metropolitan Planning Organizations prepare near-term and long-range plans for transportation system investments. These plans are used to allocate federal surface transportation funding, along with state, regional, and local funding. Many states and regions that host ports have implemented significant highway and rail improvements, both "last mile" connectors and major inland trade corridors; however, there is no requirement that they do so, and port projects must compete with other needs for limited funding.

Historically, freight-rail improvements have been planned, funded, and implemented by the private railroads, to meet private business objectives. As described more fully in AASHTO's *Freight-Rail Bottom Line Report*, this is changing. The public sector is recognizing there may be, under appropriate circumstances, significant public benefits associated with private rail improvements, and is acting as a partner in planning and funding these improvements. Southern California's Alameda Consolidated Transportation Corridor, which links the Ports of LA and Long Beach to the national rail system, was funded through a combination of rail revenues from a per-unit surcharge, bonds supported by these revenues, contributions from the ports, a substantial federal loan, and other local and regional government funds.

State and regional funding also plays a major role in MTS waterway maintenance and improvements. Channel deepening projects (which require a local match to federal funds) and berth maintenance projects (which are not a federal responsibility) may be funded by a port, a region, or a state. States and regions may also elect to fund 100 percent of deepening projects, in advance of anticipated (but not guaranteed) federal funds to speed up the completion of projects, as in the case of the Port of Miami 50' deepening and South Carolina's $300 million investment to deepen beyond 45' at the Port of Charleston.

A few states, like Florida and Louisiana, prepare statewide port plans. Many others consider seaports within the context of statewide multimodal system plans and/or statewide freight plans. These types of plans are highly useful, because they are able to address both public and private ports, as well as surface transportation infrastructure, as interconnected and interdependent systems.

25 State Port Authorities are found in Georgia, Maine, Maryland, Massachusetts, New Hampshire, North Carolina, Puerto Rico, South Carolina, Virginia, Alabama, Mississippi, and Indiana.

■ 5.4 Ports

The most important element of MTS infrastructure is the individual port or port authority, which controls where and how cargo is moved to and from the water. As previously noted, ports may be privately owned and operated, as facilities serving a single user or available to multiple users and customers. Or ports may be publicly owned and operated, by state port authorities, bi-state port authorities (like the Port Authority of New York and New Jersey), regional or local port authorities, county governments, or city governments. The sizes, missions, and governing structures of U.S. seaports vart widely depending on location, commodity type, and other conditions.

Private ports do their own planning and investing as necessary to serve their business needs. Public port authorities, in approaching planning and investment, also think mostly like entrepreneurs—they are interested in projects that grow their business and their revenues, and to the extent possible generate a profit—but they also act as economic development agents for their states and host regions, helping support their regional businesses and employment base.

Ports typically have to pay for maintenance and improvement of a wide variety of infrastructure elements: local share of channel maintenance and deepening, berth maintenance and deepening, and wharf and terminal construction; they also may pay for terminal improvements (gates, storage buildings, and other structures) and terminal equipment (wharf cranes, forklifts, and other yard equipment). AAPA reports that "local port authorities have spent over $16.8 billion since World War II and expect to spend more than $9 billion annually to construct and maintain the landside facilities over the next five years."[26]

Ports derive operating revenues from a variety of sources, including fees and (in the case of "landlord" ports) terminal leases. But port expenditure needs are typically larger than the amount that can be funded from operating revenues, so they also depend on supplemental revenue sources—bonds, loans, grants (from local, regional, and state governments, in some cases supported by tax proceeds), and other sources. A comprehensive survey by the AAPA of public port expenditures revealed that roughly half of total expenditures in 2003 were covered by internal port revenues.[27]

Each port is an independent entity, with its own sets of challenges and opportunities, answerable to its own authority. In most cases, planning for each port proceeds independently, although ports can and do plan cooperatively around projects or issues in their common interest.[28] However, cooperation is not as common as competition. Multistate authorities, state agencies, regional authorities, and local governments often build marine terminals in direct competition with other neighboring or regional ports. Attraction of market share from competitors is a key business concern, and the potential loss of market share to competitors—whether domestic, Canadian, or Mexican—is a critical driver of lease arrangements with carriers, port fee structures, and other business decisions.[29]

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26 http://aapa.files.cms-plus.com/2012%20AAPA%20Port%20Infrastructure%20Spending%20Survey%20Summary.pdf

27 Source: Maritime Administration.

28 One example is the Alameda Consolidated Transportation Corridor, which was a joint effort of the Ports of Long Beach and Los Angeles; another is the cooperation of Florida's 14 independent deepwater ports through the Florida Ports Council, which addresses issues of collective interest.

29 The "elasticity" of port demand—its sensitivity to port costs, and willingness to move from one port to another—is a hotly debated issue. Several studies for West Coast ports have shown high degrees of elasticity in response to potential

■ 5.5 Carriers

Vessel operators and carriers on the oceans, rivers, and Great Lakes play a critical role in the MTS. They decide which ports to call at, what commodities and volumes to carry, when to call, and—in some cases—what inland transportation modes will be used.

Ports have many different types of customers. For some ports, it is a single user or set of users, who control large blocks of waterborne traffic, and determine the actions and services of carriers. But for many other ports, the carrier is the primary customer, the entity that decides whether or not to bring freight to a port. Carrier decisions are typically based on fundamental competitive principles: they will prefer to call at ports that offer them the appropriate mix of reliability, cost, speed, security and safety, and value-added services. Ports create services for the marketplace; for the most part, carriers are the consumers at which those services are aimed.

Ocean carriers have been known to play ports against each other as part of business negotiations, seeking the most favorable terms in exchange for bringing freight to a port. Like all competitive business situations, this has good and bad effects. The good effect is it forces ports to provide efficient, well-priced services, which enables carriers in turn to provide efficient, well-priced services to the freight shippers and receivers that fill their vessels. The bad effect is it can force ports into speculative construction and expansion, and the provision of excess capacity, in an effort to be more attractive than the competition. The overall system achieves efficiencies, but at the expense of inefficiencies in port infrastructure and development. Some analysts argue the good effects, in terms of systemwide benefits, outweigh the bad; others argue that the nation should focus more on "rational" port investment that minimizes public costs, and shifts more of the burden to carriers and users.

Some ports are entirely water-to-facility, water-to-pipeline, or water-to-truck, and railroads are not a significant consideration. However, for many if not most ports, railroad service is a critical issue. The nation's railroad network was largely in place by the early 1900s and few major mainlines have been constructed since then; what railroads have done is consolidate operations, rationalize infrastructure and services, and build new connectors and terminals.[30] Some of their most significant investments have been to serve U.S. marine container trades: new intermodal terminals on both coasts, new access corridors, new "inland port" facilities to serve hinterland markets, and new projects to eliminate bottlenecks in the cross-country intermodal network. Bulk rail service, especially for commodities like coal and aggregate exports, is essential for many U.S. ports. Rail companies are for-profit businesses; in most cases their interests are aligned with their ports, but not always. Many ports want to offer competitive rail access (by more than one railroad) to their major terminals; this allows carriers the opportunity to negotiate better prices. The railroads, in turn, argue that the cost of duplicate infrastructure, labor, and equipment, along with reduced volumes for each serving railroad, actually increases rail service costs, unless the daily volumes are very high. This continues to be an ongoing discussion at many ports.

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fees on container handling. The Corps considers port shares and diversion effects in its analysis of proposed deepening projects and feasible alternatives.

30 U.S. freight railroads invested $25 billion of their own funds for rail system and infrastructure improvements in 2012. Private railroad infrastructure investments have exceeded $500 billion since 1980. Source: *Association of American Railroads SmartBrief*, October 2, 2012.

■ 5.6 System Users

At its heart, the MTS is a set of transportation assets and resources placed at the disposal of system users. It is a tool kit for building transportation logistics chains across the nation, and across the world.

The coordinated, intelligent use of this tool kit is left to the individual user—the shipper, receiver, or logistics provider—who stitches together an optimum strategy for moving goods from one point to another at the desired levels of reliability, cost, speed, safety, and security. One month, the preferred route from St. Louis to Tokyo may be via long-distance train and the Port of Long Beach; another month, it might be a barge tow down the Mississippi River to the Port of New Orleans and a deep-draft vessel through the Panama Canal; another month, it might be a truck to Chicago and a vessel trip through the Great Lakes, St. Lawrence River, and Suez Canal.

We can therefore argue that the MTS is not so much a "system" as it is a set of consumer choices: it becomes a system when, and only when, its users make it operate that way, through shipping decisions that tie together disparate, independent MTS elements to provide seamless freight transportation services. Following this logic, if the overall goal of the MTS is to meet the needs of users, its planning and implementation must continue to be focused on providing the best possible choices for its users.

6.0 MTS Challenges

■ 6.1 Overview

The MTS has been, by any objective measure, fundamental to the success of the nation. It has been highly adaptable and responsive to changing market conditions and needs; it has given producers in every state efficient access to global markets; it has provided consumers in every state with efficient access to global products; and it has dramatically reduced the nation's surface transportation costs and ton-mileage. But the very success of the MTS has masked serious underlying structural problems. In recent years, with growing demand, rising transportation and project development costs, increased attention to environmental issues, and stronger global competition, these structural problems have become more evident. If left unaddressed, they pose critical threats to the long-term health of the MTS and the nation as a whole. The challenges can be summarized as follows:

- Basic waterway maintenance needs are not being met;
- Needed navigation projects are often delayed for years, even decades;
- Federal funding for critical MTS expansion needs is inadequate and uncertain;
- National investments in the MTS are not being effectively targeted to meet national needs and provide national benefits; and
- No single entity or party is responsible for the well-being of the MTS, or accountable for its failure or success.

■ 6.2 Inadequate Maintenance of Commercial Waterways

As discussed in Section 5, the U.S. Army Corps of Engineers is responsible for maintaining federal navigation channels at authorized navigable depths. For years, appropriated funding for the Corps' annual work programs has fallen far short of requested and required amounts, resulting in a critical backlog of unfunded maintenance projects. Compounding this failing, neither the Corps nor any other agency has been able to produce a comprehensive inventory and accounting of the magnitude of the navigation projects backlog. All we have to work with is partial and anecdotal information; but even from that information, it is evident that the navigation backlog is well into the billions of dollars, and that it could be growing by a billion or more dollars every year.

Size of the Maintenance Backlog

Regarding the accumulation of new maintenance backlog every year:

- From the Congressional Research Service: "No current estimate of the entire operations and maintenance (O&M) backlog is available. Although ARRA funding reduced the O&M backlog,

additional work needed for Corps facilities is reportedly significant. For instance, the funding provided in the FY2012 budget request for the Corps coastal navigation O&M was $2.2 billion below the potential work identified during the Corps budgeting process."[31]

- From the American Association of Port Authorities: "Today, America's Federal navigation channels have available their authorized dimensions (depths and widths) less than 35 percent of the time … The annual need for maintenance dredging [is] in the range of $1.3 to $1.6 billion, according to the Army Corps of Engineers … However, over the past five years, annual expenditures for channel maintenance have averaged less than $800 million … leaving users with inadequately maintained channels."[32]
- From the Journal of Commerce: "The Inland Waterways Trust Fund, which is driven by fuel taxes, expends about $84 million annually, and with Federal assistance, the annual budget for the system comes to about $175 million. That's about $205 million short of what the Waterways Council, a river operators trade group, says is needed to maintain the system."[33]

Regarding the size of the total maintenance backlog accrued to date:

- From the American Society of Civil Engineers: "A total of 90 percent of locks and dams on the U.S. inland waterway system experienced some type of unscheduled delay in 2009. According to the U.S. Army Corps of Engineers, maintaining existing levels of unscheduled delays on inland waterways, and not further exacerbating delays, will require almost $13 billion in cumulative investment needs by 2020…Current funding levels can support only $7 billion by 2020…Roughly 27 percent of these needs entail the construction of new lock and dam facilities, and 73 percent are estimated for the rehabilitation of current facilities."[34]
- From the U.S. Army Corps of Engineers Rock Island District: "The Mississippi Valley Division Regional Backlog of Maintenance is valued at around $1.2B with close to 400 identified items (2010 values). Rock Island District's portion of the list includes 183 items with an approximate total value of $725M; or more than 60 percent of the Regional total."[35]
- From the Michigan Department of Transportation: [Looking at the Great Lakes] the U.S. Maritime Administration found U.S. flag vessel operators estimate 75 percent of cargos they carried in the past five years have been reduced in volume due to inadequate water depth at either the loading or discharge port or in the connecting channels (St. Mary's, St. Clair, and Detroit rivers)… It is estimated that it will cost more than $200 million just to restore the Great Lakes navigation system to project depth …

31 *Army Corps Fiscal Challenges: Frequently Asked Questions.* Congressional Research Service, August 18, 2011, page 13.

32 Testimony of Kurt Nagle, AAPA President and CEO, submitted to the House Ways and Means Committee, February 1, 2012.

33 *Legislators Lock in on Waterways Plan. Journal of Commerce.* Online, October 3, 2012.

34 *Failure to Act: The Economic Impact of Current Investment Trends in Airports, Inland Waterways, and Marine Ports Infrastructure.* American Society of Civil Engineers; September 2012. Analysis by EDR Group, Inc.

35 http://www2.mvr.usace.army.mil/projects/dsp_factsheet.cfm?ProjID=F59D2E51-A71C-990C-95ED99F6C88F23CA.

Impact of the Maintenance Backlog

The consequences of unfulfilled maintenance needs include: reduced depths and dimensions of coastal, Great Lakes, and inland navigable waterways; increased "down time" for locks and dams; increased risk of catastrophic structural failures; and increased costs (from "light loading" of vessels, from service delays to vessels, and from the use of more expensive surface transportation modes when navigation is not possible) for U.S. freight shippers and receivers.

Perhaps most critically, the average age of lock and dam structures on federal waterways is nearly 60 years. Some modern barge configurations cannot fit through antiquated structures designed for smaller tows. Many states have identified unmet lock and dam maintenance needs as being among their most critical concerns.

Again, we do not have a comprehensive tabulation of the costs to the nation from unfulfilled maintenance needs, but there have been many different studies that point to annual costs well into the billions of dollars. For example:

- From the American Society of Civil Engineers: "[In 2009 there were] over 19,000 hours of scheduled and unscheduled service interruptions [and] nearly 156,000 total hours of delays due to these interruptions … Delays are estimated to have imposed $33 billion in costs on U.S. products in 2010 … Additional costs for traded products due to shallow harbors are estimated to have been about $7 billion in 2010 ($3.8 billion in added import costs, and $3.3 billion in export costs)."[36]
- A recent study by the Texas Transportation Institute found that losing just one foot of navigable depth from just one MTS waterway (the Houston ship channel) would result in added costs of around $375 million per year.[37] Multiplied over the entire MTS, one can see how this figure easily reaches into the billions.

Meeting the Challenge

These costs are incurred every year by the nation's freight shippers and receivers because of our nation's inattention to basic MTS maintenance needs. Despite repeated calls from industry, from ports, and from states, and despite clear warnings from the Corps itself, the federal government has not acted to gain a comprehensive understanding of the issue and the need, and has consistently failed to provide sufficient funds to address the need.

To meet this challenge, a conclusive accounting of the extent of the federal navigation projects maintenance backlog, the costs of that backlog to the nation, and a firm federal commitment to alleviating the backlog by the year 2020, should be an immediate national priority.

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36 *Failure to Act: The Economic Impact of Current Investment Trends in Airports, Inland Waterways, and Marine Ports Infrastructure.* American Society of Civil Engineers; September 2012. Analysis by EDR Group, Inc.

37 *Measuring the Economic Effect of a Lack of Maintenance Dredging of Ship Channels.* Paper submittal to the 93rd Annual Transportation Research Board Meeting by James Kruse and Annie Protopapas of the Texas Transportation Institute.

■ 6.3 Inefficient Navigation Project Delivery

Just as MTS maintenance has not been a federal priority, so too has navigation improvement project delivery not been a federal priority. Project studies can take many years, even spanning decades, before reaching conclusions and allowing projects to advance. And even after being authorized, federal funding may never materialize. A decentralized MTS excels at seeking out and attempting to respond to market-based opportunities at the local and regional level—but it does a worse job of actually delivering projects, because regulatory and funding authority is balkanized across dozens of stakeholders and multiple levels of government. Even critically needed projects tend to advance sluggishly, and in some cases do not advance at all.

Backlog of Unfunded Projects

To illustrate the magnitude of the problem, one can start with the Corps' navigation project construction backlog. As with the maintenance backlog, there is no conclusive accounting of the Corps' construction backlog. Probably the best available estimate is from a recent study by the Congressional Research Service,[38] which is worth citing at length:

38 *Army Corps Fiscal Challenges: Frequently Asked Questions.* Congressional Research Service, August 18, 2011, pp. 13–14.

"There is no authoritative list of the projects in the backlog that is publically available. Estimates of the Corps backlog vary widely, depending on which project categories are included (e.g., no funding, partially funded but not complete, only active projects). Congress requested in §2027 of Water Resources Development Act 2007 a fiscal transparency report, which would have expanded the publically available information. The study was never funded in the President's budget or by congressional appropriations, and no significant work has been performed on it."

"Recent Corps estimates put the total construction backlog for projects at more than $62 billion. The "active" backlog of $60 billion includes approximately $22 billion in activities that have been included in the President's budget but have yet to be completed, as well as more than $38 billion for other "active" projects which have yet to be included in the budget. Additionally, there is $2 billion in authorized construction projects which are no longer active or have been deferred by non-Federal sponsors."

"The Corps construction backlog includes not only activities authorized by Congress but also dam safety and other rehabilitation and repair projects that may not require congressional authorization. Aging infrastructure investments are included in the $60 billion estimate if they have been the subject of a Corps study, but at many Corps facilities these needs have not been studied. This is why the total construction backlog estimate is more than $62 billion."

"How significant of an issue the Corps backlog is depends on whether it is viewed as a 'needs' versus a 'wants' backlog, and whether it represents unmet non-Federal expectations and unaddressed water resources problems. Although backlogs are not new to the Corps, some of the current concern is that since 1986 non-Federal project sponsors significantly share in the costs of most Corps projects, and many sponsors are frustrated by the lack of certainty on when their cost-shared projects will be completed and the benefits forthcoming. Another concern is that the backlog results in inefficient funding levels for many projects and in added pressure for congressionally directed spending."

"There are multiple factors contributing to backlog growth. First, authorizations have outpaced appropriations in recent years. Between 1986 and 2010, Congress authorized new Corps projects at a rate that significantly exceeded appropriations; in 2010 dollars, the annual rate of authorizations was roughly $3.0 billion and the rate of appropriations for new construction was roughly $1.8 billion … Second, aging infrastructure also is requiring more financial investments. A growing percentage of the Corps annual appropriations is going toward operation and maintenance or major rehabilitation of existing infrastructure activities as the agency's infrastructure ages, which means fewer funds are available for construction of new projects … Third, the increase in the cost to construct water infrastructure projects increased rapidly in the mid-2000s, in part because of the rises in cost of construction materials and fuels. A project authorized in Water Resources Development Act of 2000 for $100 million dollars cost $145 million by 2010..."

The share of the backlog associated with navigation projects is unknown. Around one-third of the Corps' 2012 budget was for navigation projects; if the same percentage holds true for the construction backlog, it would be a figure of around $20 billion or more.

Budget Process and Decision Criteria

With project authorizations substantially outpacing funding, and with maintenance expenditures for aging infrastructure consuming an increasing share of the budget (even while failing to keep pace with maintenance needs), the Corps budgeting process becomes an annual exercise in triage, with the Corps, the Office of Management and Budget, and other involved agencies identifying projects to be advanced on an annual basis. Authorized projects may be delayed for years, with no certainty as to when they will be advanced and delivered.

Many ports and states have expressed strong disagreement with the metrics used to determine which projects—both construction and maintenance—are included in the Corps' annual work program. For example, the Corps assigns low-tonnage commercial waterways a low priority for maintenance dredging, without consideration of economic impacts or other local effects. As noted by state departments of transportation in Louisiana and Pennsylvania:

> *"The performance measure (ton-miles) used by the Corps to determine whether dredging a waterway is economically justified does not take into account all the benefits that the waterway provides. [For example] the coastal waterways in Louisiana service the offshore oil and gas industry and the commercial fishing industry, as well as recreational vessels."*

In 2010, the federal government released its Updated Principles and Guidelines for Water and Land-Related Resources Implementation Studies. These guidelines are important because they determine how water resource development projects are evaluated by the Corps and other federal agencies, and may impact how constrained navigation project funding is allocated. The updated principles are significantly broader than their predecessors. As summarized by the Administration:[39]

> *"Federal water planning has been guided by a process that has remained largely unchanged for over 25 years. The first set of "Principles and Standards" was issued in September 1973 to guide the preparation of river basin plans and to evaluate Federal water projects. Following a few attempts to revise those initial standards, the current principles and guidelines went into effect in March 1983… The revised Principles and Standards include…"*
>
> "Achieving Co-Equal Goals: *The Administration's proposal reiterates that Federal water resources planning and development should both protect and restore the environment and improve the economic well-being of the nation for present and future generations. While the 1983 standards emphasized economic development alone, the new approach calls for development of water resources projects based on sound science that maximize net national economic, environmental, and social benefits."*
>
> "Considering Monetary and Nonmonetary Benefits*: The revised Principles and Standards shift away from the earlier approach to project selection. Specifically, this revised version will consider both monetary and nonmonetary benefits to justify and select a project that has the greatest net benefits—regardless of whether those benefits are monetary or nonmonetary.*

39 http://www.whitehouse.gov/administration/eop/ceq/initiatives/PandG.

However, the exact decision criteria and "ground rules" arising from this guidance have yet to be determined, meaning there is continued uncertainty about what projects will be advanced, when, and why.

Corps Feasibility and Environmental Studies

Even before navigation projects get to the stage where they are eligible to receive federal funding, they must advance through Corps feasibility and environmental studies. Many ports and states have expressed concern that these studies are excessively expensive and time-consuming, especially with respect to investigations of economic benefit, dredged material disposal, and environmental impact mitigation strategies. For example, a study to deepen Savannah River was authorized in the 1999 WRDA, but the Corps' General Reevaluation Report (GRR) and Environmental Impact Statement (EIS) were not completed until August 2012. The Corps, in working closely with local sponsors, is well aware of their concerns:[40]

> *"Improving feasibility study execution is one of the four pillars of Modernization of the Corps Planning Program and a key element of the broader Civil Works Transformation underway at the U.S. Corps of Engineers. On February 8, 2012, Major General Walsh, the Deputy Commanding General of Civil and Emergency Operations issued a memo for conducting feasibility studies to produce more efficient, effective, and quality decision documents and introduced a "3x3x3" rule for all feasibility studies that have not had an Feasibility Scoping Meeting by Dec 2011. The 3x3x3 rule is that all feasibility studies should be completed within a target of 18 months—but no more than three years, at a cost of no more than $3 million, utilizing 3 levels of vertical team coordination, and of a "reasonable" report size."*

AAPA, which represents deep-draft interests, has recommended additional measures that would allow Corps studies to be funded by non-federal partners, eliminate the Reconnaissance Report phase of the Corps study process, and other changes.

The Waterways are Vital for the Economy, Energy, Efficiency, and Environment Act of 2012 (WAVE-4) introduced in Congress in March of 2012 and supported by the Waterways Council, Inc., also called for Corps process reform: improved cost estimation, peer review, user representation, long-range capital budgeting, regular progress reporting, and "objective national project-selection prioritization criteria."

Meeting the Challenge

Virtually every state offering input to this report expressed frustration with the amount of effort involved in advancing projects, the uncertainty that funding might actually materialize for those projects, and the general sense that MTS waterway improvements are undervalued by policy-makers. As summed up by the Louisiana Department of Transportation:

40 http://planning.usace.army.mil/toolbox/smart.cfm.

> *"Each and every Corps project must meet stringent guidelines and be economically justified. Then, Congress must individually authorize each project. After a project is authorized, Congress has to fund it through the appropriation process. No other infrastructure project funded by the Government goes through as much scrutiny. This system is broken and needs fixing. If the importance of water transportation is realized, then funding to maintain the waterway system should not be a budget fight each year."*

To meet the challenge, a two-fold process is required. First, funding streams must be increased and made more reliable; potential strategies to achieve this are discussed in Section 6.4. Second, federal legislation must improve Corps program delivery. The administration has decided to "fast track" a number of critical Corps projects was encouraging.[41] As a follow-up, Congress and the administration should advance a new Water Resources Development Act, featuring comparable attention to fast-tracking and streamlined project delivery, along with the codification of improved funding strategies.

■ 6.4 Uncertain Federal Funding

Normal maintenance and limited expansion of terminals, landside access infrastructure, and vessel berths is typically accomplished through a combination of port revenues, state and regional contributions, and private participation. But major navigation projects generally require special funding arrangements: revenue bonds, significant state and regional funding, and federal support. However, appropriations for the Corps for both construction and maintenance projects have consistently fallen far short of the levels needed to implement authorized projects and adequately maintain the system. As a result, huge work backlogs have accumulated, and in the absence of action the backlog will only continue to grow. In light of the massive funding shortfalls for federal navigation construction and maintenance projects, improving the reliability and quantity of federal funding available for these purposes is absolutely essential.

Harbor Maintenance Trust Fund

It has become routine practice for the government to collect funds through the Harbor Maintenance Tax (HMT) and then fail to fully appropriate them for navigation improvements. As a result, HMT funds continue to accrue in the Harbor Maintenance Trust Fund. Based on annual collections of around $1.5 billion and annual expenditures of around $800 million, the fund is expected to have a surplus of nearly $7 billion dollars by FY 2013.

AAPA has stated that full expenditure of annual HMT collections would be generally sufficient to address the annual navigation maintenance needs of ports from which HMT is collected.[42] There have been numerous legislative initiatives aimed at requiring the full expenditure of annual HMT receipts. Most recently, the federal surface transportation reauthorization bill (MAP-21) calls on the

41 July 19, 2010. The "We Can't Wait" initiative addresses Corps projects at the ports of Savannah, New York/New Jersey, Miami, Jacksonville, and Charleston.

42 AAPA has also called for increased Federal cost-sharing of navigation projects between 45 feet and 53 feet, which could also increase annual maintenance costs. However, deeper channels will support more traffic and higher HMT receipts, so it may still be the case that annual HMT receipts will be adequate for annual maintenance needs.

administration to request full appropriation of HMT funds, but it stops short of actually requiring full appropriation.

There have also been initiatives to exempt domestic waterborne containerized traffic from the HMT, as a means of promoting "Marine Highway" services. Only a small share of coastwise container movements fall into this category, so their exclusion would have a negligible impact on HMT receipts, but a potentially significant effect on the competitiveness and viability of these services.

While full annual expenditure of HMT receipts could be sufficient to address annual navigation maintenance needs for non-Inland Waterway ports, additional expenditures of accrued HMTF balance would be needed to address the maintenance backlog, as well as the construction backlog. Again, without actually knowing the size of the maintenance and construction backlogs, we can only speculate that meeting these backlogs would almost certainly exhaust the HMTF balance and also require additional funding from other sources. And this does not even consider the substantial additional investments that will be needed in the nation's deep draft ports for navigation projects not yet authorized. Clearly, while the HMTF is an important and valuable mechanism, it is not a "full funding" solution.

Inland Waterway Trust Fund (IWTF)

Unlike the HMTF, balances in the IWTF have been declining. In FY 2001, the fund had a balance of around $400 million; in FY 2011, the balance was roughly $50 million. Much of the declining balance is associated with the high cost of the Olmsted Locks and Dam project on the Ohio River, which was started in 1998 and will continue through 2024.

Annual IWTF receipts are not sufficient to fund annual maintenance costs. To help reduce the gap, the Inland Waterways Users Board is recommending an annual maintenance expenditure target of $380 million dollars, based on $84 million per year in current IWTF expenditures, $175 million in current non-IWTF federal contributions, and $205 million in new proceeds from an increase in the fuel tax rate.[43] Additionally, WAVE-4 called for changes to federal cost-sharing for inland waterway projects, including provisions that projects less than $100 million will be funded exclusively from the general fund (without IWTF proceeds) while larger projects (except dams) will be funded 50 percent from the general fund and 50 percent from IWTF proceeds.

These proposals may ultimately prove sufficient for annual inland waterway maintenance needs, but they will clearly not address the maintenance backlog, the construction backlog, or future authorized construction projects. Additional funding will be needed.

Estimates of the Future Public Sector Funding Gap

We do not have reliable information on the costs of the nation's MTS maintenance or construction backlogs. Nor do we have any reliable information on the costs of the nation's future MTS construction and maintenance needs. For sound financial planning, these are crippling deficiencies.

43 Alternatively, the Administration has proposed a two-tiered user fee structure on top of the existing inland waterway fuel tax.

Nevertheless, the American Society of Civil Engineers (ASCE) has attempted to estimate the future public sector funding gap for the MTS. Their findings represent an important first approximation and a valuable jumping-off point for further discussion and research. Looking ahead, the estimated public funding shortfall averages more than $1.6 billion per year through the year 2040. Underscoring the critical need to meet this shortfall, the ASCE report further finds:[44]

> *"With an additional investment of $15.8 billion between now and 2020, the United States can protect: $270 billion in U.S. exports; $697 billion in GDP; 738,000 jobs annually; [and] $872 billion in personal income, or $770 per year for households."*

Table 6-1. Estimated Public Capital Investment Gap, Inland Waterways, and Marine Ports in Billions of 2010 Dollars

	Estimated Need	Estimated Funding	Unfunded
2012-2020 Inland Waterways	12.7	7.2	-5.5
Marine	17.6	7.2	-10.4
TOTAL	30.2	14.4	-15.8
2021-2040 Inland Waterways	28.2	16.0	-12.2
Marine	33.5	16.0	-17.5
TOTAL	61.7	32.0	-29.7
TOTAL 2012-2040	**92.0**	**46.4**	**-45.6**

Source: Reproduced from Failure to Act: the Economic Impact of Current Investment Trends in Airports, Inland Waterways, and Marine Ports Infrastructure, American Society of Civil Engineers; September 2012. Analysis by EDR Group, Inc.

Meeting the Challenge

With maintenance and construction backlogs accruing, easily demonstrated deficiencies in existing "dedicated" funding mechanisms (HMTF and IWTF), continued heavy reliance on unpredictable appropriations from the general fund, and substantial future funding gaps on the horizon, consideration of alternative funding proposals is a timely topic.

Improvements to marine navigation are far from the only infrastructure funding needs the federal government must address. Surface transportation improvements for the nation's interstate and state highway networks are also critically necessary. However, the primary source of funding for those projects—the federal excise tax on gasoline—is not keeping pace with the maintenance backlog states are finding increasing difficulty in financing. The outcome of the highway infrastructure financing debate will no doubt have significant implications for the MTS.

Moreover, navigation improvements are not the only public sector funding needs. Surface transportation improvements are critically needed, yet the primary source of funding for those projects—the federal fuel tax—is not keeping pace with needs. A similar debate is underway about the future of surface transportation funding, and the outcome of that debate will have significant implications for the MTS.

44 *"Failure to Act: The Economic Impact of Current Investment Trends in Airports, Inland Waterways, and Marine Ports Infrastructure."* American Society of Civil Engineers, September 13, 2012.

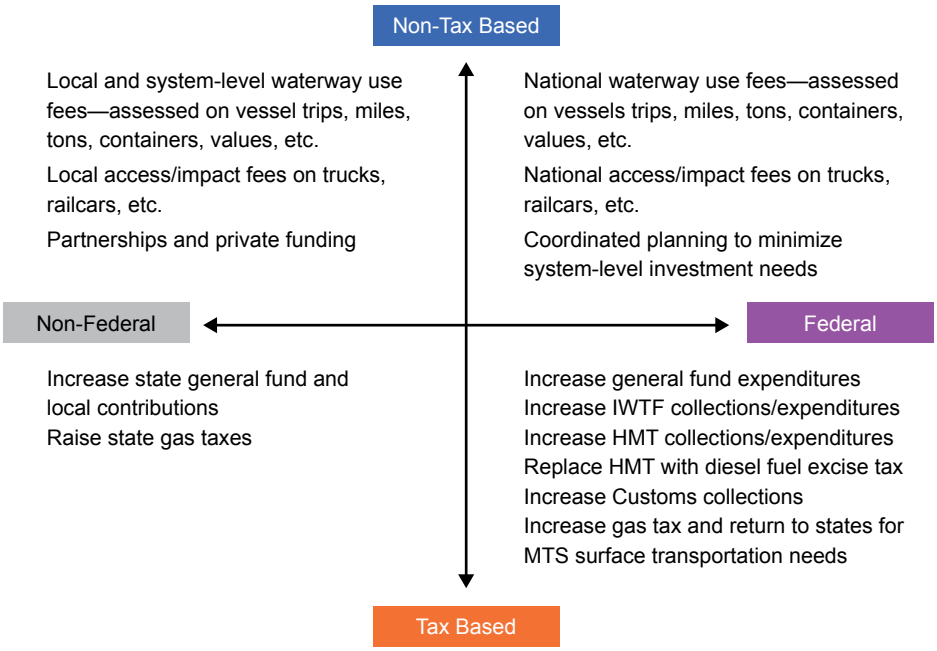


Figure 6-1. Range of Potential Funding Approaches for MTS Projects

Different analysts, ports, regions, states, and agencies have very different views on the best funding approaches. If no consensus emerges, we run the risk of doing nothing, digging a deeper financial hole, and putting the MTS at tremendous risk. The initial steps in the process are for MTS stakeholders to agree on the need for dialog, and for responsible federal leadership to drive the process to a successful conclusion.

■ 6.5 Inattention to National Needs and Benefits

The nation as a whole derives benefit from the MTS, and it is reasonable to expect that national investments should be clearly tied to the achievement of national benefits. Yet port and MTS planning at the national level is, apart from national defense issues, nonexistent. Ports, regions, and railroads pursue MTS improvements independently, primarily to fulfill their own local, regional, or business missions, supported by federal investments on a case-by-case basis. While this process clearly creates substantial national benefit, key questions—what does the nation most need from its MTS, and what should it expect in return for its MTS investments—have not been addressed.

Customer Needs

Waterborne freight transportation is a customer service. It is offered by private waterborne transportation providers, operating over public waterways, moving through marine terminals whose ownership and operation is typically a public–private partnership, connecting with private truckers operating over public roadways and (mostly) private railroads operating over (mostly) private systems. To the extent that this arrangement offers customers (freight shippers and logistics planners)

the right service at the right price, it will be successful. Therefore, MTS planning must be mindful of the needs of its customers, and like a business, it must adapt to changing customer needs.

Historically, water specialized in relatively low-value, high-weight commodities, where unit transportation costs were the primary factor and speed and reliability were less important. For some customers, these are still the primary concerns; but with containerization and intermodalism, what many customers need from waterborne freight transportation has completely changed. Recent surveys of ocean shippers generally come up with the same list of factors, more or less in this order: reliability (on-time delivery), cost, speed, safety and security, and visibility (knowing where the freight is at all times).

Wal-Mart helped pioneer the dominant retail business model for the 21st century, and is completely dependent on the reliability of complex global and intermodal logistics chains. It is based on just a few key premises: 1) using information at the point of sale to "tell" the warehouse what to send to the store, which "tells" the manufacturers what to produce while keeping inventory to a minimum, and 2) relying on efficient, reliable, low-cost delivery from manufacturer to warehouse to store via integrated global and domestic intermodal transportation systems, where volume purchasing keeps costs to as low as possible. UPS, FedEx, and other major shippers have developed carefully integrated intermodal logistics chains that similarly depend on freight being in the right place at exactly the right time.

To the extent the MTS can meet these customer needs, it will be successful. But changes in business practice, combined with emerging planning and policy issues, are straining the ability of the MTS to deliver the needed performance today; and it will need to adapt dramatically to deliver the needed performance in coming decades.

Waterway Modernization and Improvement

The first dedicated containership entered service in 1956, and since then, containerships have steadily increased in capacity and size. For years, the limit was the size of a vessel that could pass through the Panama Canal, known as "Panamax"—around 4,000 TEUs, 39 feet draft, and 13 containers across—but in the 1990s, a new generation of larger "Post-Panamax" vessels came into wide use. Today, ship size continues to increase, with "Mega Containerships" more than 1,300 feet in length, 22 or more containers across, requiring 50-foot deep channels and berths and 180 feet or more "air draft" (clearance from high water to lowest overhead obstruction). Decisions to buy and deploy these ever-larger container ships are the responsibility of the ocean carriers; it then falls to port owners to determine whether to accommodate their design requirements, and to the public sector to determine whether to fund the associated costs of channel improvements.

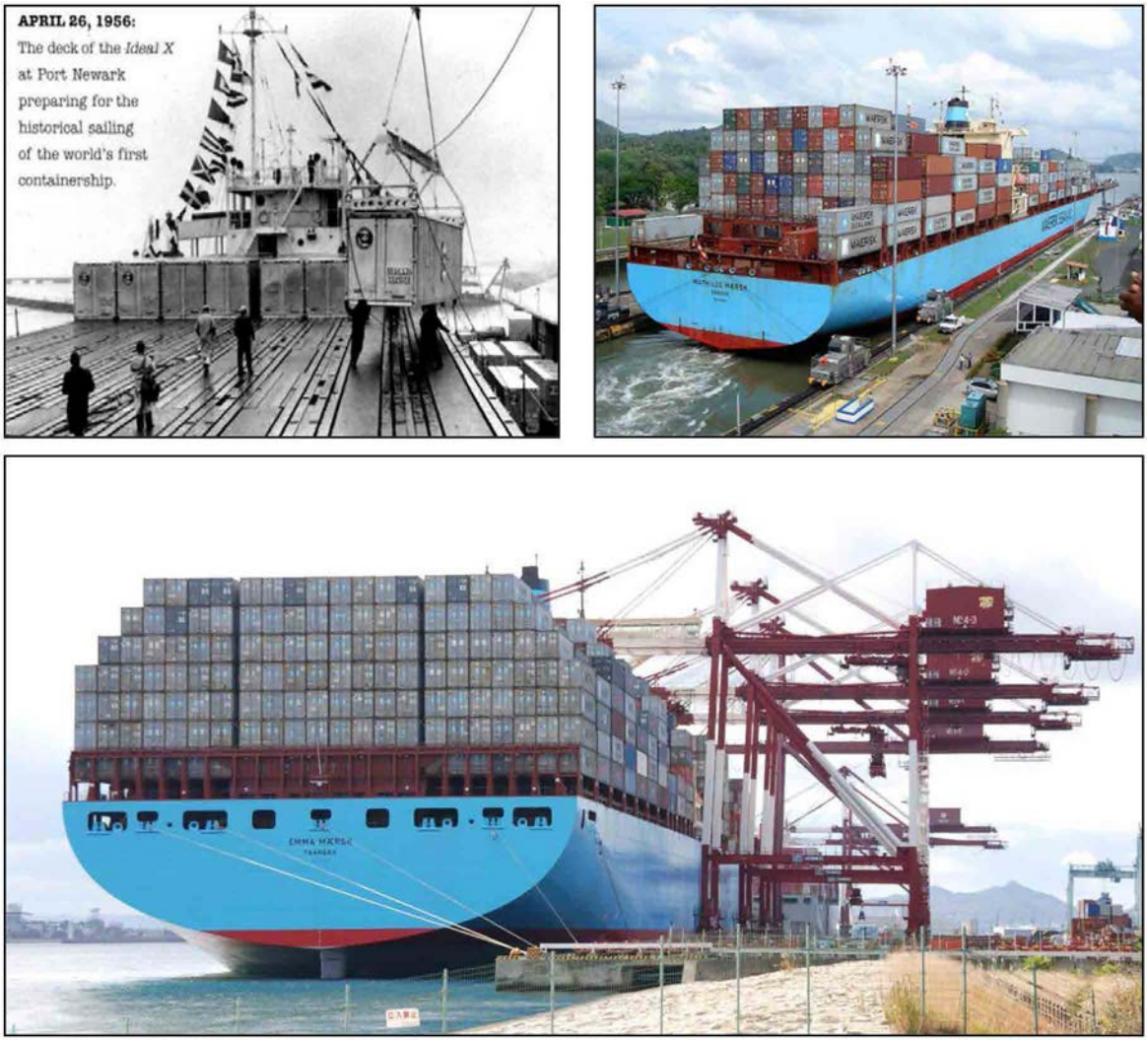
Because ports compete to attract business, the ports that can offer deep channels without incurring excessively high dredging costs have a competitive advantage in attracting large containerships. (Liquid bulk tankers also have seen increases in size and ports offering deep water have comparable advantages for this traffic.) The largest containerships entering service today generally require water depths around 50 feet. Today, there are only four U.S. container ports that provide channels and container berths this deep (Baltimore, Los Angeles, Long Beach, and Port of Virginia). New York/New Jersey has been authorized and funded to initiate its 50-foot deepening project; Miami

has also been authorized for a 50-foot deepening project, and Florida has advanced funding rather than waiting for federal appropriations. The Corps recently released its Final Report for Savannah recommending deepening to 47 feet. Other ports—Jacksonville, Everglades, Philadelphia, Charleston, etc.—have deepening studies underway. Pennsylvania DOT observes:

> *"[At the] Port of Philadelphia—the main channel dredging of the Delaware River is still an issue. Without deepening the channel to 45 feet, the Port of Philadelphia will not compete in the global marketplace…[the state] will suffer a severe economic hit and lose many of its maritime-related employment. Additionally, the expansion of the Port of Philadelphia is contingent upon the dredging project for the beneficial reuse of the fill to marginalize additional berths, but also to attract one or two ocean carriers for private investment and expansion."*

The need for deeper ports has been well-documented by the Corps in its recent report entitled "U.S. Port and Inland Waterway Modernization: Preparing for Post-Panamax Vessels" (June 20, 2012). One of the critical and often-overlooked findings is that as the largest ships load-center at the deepest ports, it pushes the next-largest ships to the next-deepest ports, creating a "cascade" effect. Changes in the world vessel fleet therefore affect all U.S. container ports, not just the ports competing for mega-ships.

Given the substantial capital and maintenance cost of maintaining deeper channels, some ports have determined that their best business strategy is to remain at 45 feet or lower. Average dredging costs for all material, as collected by the U.S. Army Corps of Engineers for FY 2011 was $5.80/CY. The average cost per cubic yard of "new work" dredging, including channel deepening and widening projects, is typically more than three times the cost of routine "maintenance" dredging. There are a limited number of dredge vessels available to be used by the Corps. However, since the 1970s, the vast majority of maintenance dredging in the United States has been performed by industrial parties rather than directly by the Corps.



Clockwise from top left: the first commercial containership (58 TEUs); a "Panamax" Containership in the Panama Canal (3900 TEUs); a "Post-Panamax" Mega-Ship (>8000 TEUs).

Figure 6-2. Evolution of the Containership

Another consequence of larger vessels both cargo and passengers is the need for more "air draft." Air draft is the unobstructed area between high water and an overhead clearance. Several ports like Charleston, Savannah, etc., have recently rebuilt low-clearance bridges to accommodate larger vessels, and other regions (like New York/New Jersey, where the Bayonne Bridge restricts vessel heights in the Kill van Kull) are facing major costs for bridge improvement projects. Like navigation channel improvements, these costs accrue primarily to the public sector.

Finally, the use of 30-barge tows is now best practice on the inland waterways, compared to historical 15-barge tows. Many of our locks are only capable of handling 15-barge tows; tows larger than 15 must be broken apart and reassembled after lock passage, creating delay and expense for carriers. Inland waterway modernization must be heavily focused on the accommodation of these larger tows.

Terminal Maintenance and Capacity

Marine terminals require ongoing and continuous expenditures for maintenance and operations in order to function and preserve their cargo handling capacity. The major elements of on-terminal maintenance expenses include:

- Maintenance dredging of berths (the water alongside the wharf is not typically not part of a federal navigation channel, but must still be dredged);
- Strengthening and repair of wharf structures (where vessels tie up to unload and load);
- Repair and replacement of terminal equipment (wharf cranes, yard cranes, forklifts, material conveyor systems, etc., used to move cargo between vessels, terminal storage areas, and landside collection/distribution modes);
- Maintenance and repair of terminal storage (paving open yard areas, patching and replacing sheds, and tanks and silos, etc.);
- Maintaining support areas (for maintenance, repair, and storage of terminal equipment, container chassis, etc.);
- Maintaining gates (for secured access and for processing inbound and outbound vehicles);
- Maintaining on-dock rail infrastructure and support areas, for rail-served terminals; and
- Maintaining information systems (for vessel scheduling, allocation of storage and equipment, gate processing, security, and other functions).

Some maintenance and operations expenses are predictable based on known costs and asset life cycles. Other expenses are unpredictable and can be dramatic, as in the case of damage to the ports of Gulfport, New Orleans, Fourchon, et al. from Hurricane Katrina. Simply covering maintenance costs can be a significant challenge, especially with the rapidly escalating cost of building materials such as steel and cement.

Strategies to meet capacity shortfalls are routinely performed by many ports, and the knowledge base is fairly well established. Either you expand physically, or improve efficiency, or both. Over the past 20 years, as landfilling has become increasingly problematic and land development opportunities more constrained, U.S. container terminals have made tremendous strides to increase their operating efficiency by utilizing:

- Dense-stacked storage;
- Advanced container cranes and terminal equipment;
- Dwell-time reduction;
- Information systems for planning and tracking the storage of containers;
- Advanced terminal gates and extended operating hours; and
- Automated security inspection and “weigh-in-motion” systems.

Private capitalization and development of ports and terminals has been a key trend over the past 20 years throughout the world, and has successfully funded dramatic expansion of the world's marine transportation capacity. However, while many U.S. bulk terminals (petroleum, coal, cement, etc.) and some breakbulk terminals (lumber, steel, paper, etc.) are privately owned, few U.S. container ports were privately owned until recently. Today, we have container terminals that are owned by investment banks and pension funds, and APM Terminals (the parent company of Maersk Lines, the world's largest container carrier) has constructed private container terminals in Mobile and Hampton Roads. Potentially, the private sector could be a major partner in upgrading U.S. port infrastructure. But there are significant hurdles to overcome, not the least of which is the perception that foreign investments in U.S. ports means losing control of U.S. ports. There was much concern when Dubai Ports announced its plans to purchase P&O Ports, which operates terminals in Miami, Tampa, and elsewhere in the United States. To effectively access foreign port development capital, the United States will need a balanced approach to foreign investment: one that recognizes legitimate issues of security and risk, but also recognizes that foreign investors in U.S. infrastructure will have as much interest in protecting that infrastructure as anyone else.

Fifty years ago the standard shipping container which is now ubiquitous was virtually unknown. Twenty years ago, real-time collection and distribution of commercial logistics data over shared information systems was a dream. Technology is moving fast; things the next generation will understand as givens, we have not even conceived of yet. New fuels, different vessel and vehicle designs, different landside infrastructure, different information systems, and different markets are all coming, sooner or later; and our MTS ports and terminals will need to be positioned, as far as possible, to take best advantage.

Carrier Routing Decisions

While some ports are prepared for anticipated future demand, many ports must accommodate more and/or different international and domestic waterborne cargo. Again, we are looking at a system that in year 2040 will be asked to accommodate roughly three times as much container traffic, and around one and one-half times as much total tonnage, as it does today.

The locations of the most critical shortfalls will depend in part on carrier decisions. In deciding how to route cargo, ocean carriers distinguish between "captive" cargo and "discretionary" cargo. Captive cargo has to go through a specific port of call, due to specialized handling needs or business relationships. Discretionary cargo can be routed through different ports, and ports often compete for this business. Carrier strategies for routing discretionary cargo can have major impacts, positive or negative, on the activity of a given port.

- One of the key trends is for containerships to call at fewer ports within a given "port range" (Pacific, Atlantic, Gulf). This is partly due to mergers, consolidations, alliances, and "slot sharing" agreements among container lines. For carriers using mega-containerships, it is due to the fact that few U.S. ports currently can accommodate them. Even if many port choices were available, the best use of these vessels is to keep them moving between U.S. and foreign ports, not between one U.S. port and another.

- The second factor is the maturation of global hub and spoke/transshipment strategies for container services, where small vessels serve smaller markets, large vessels serve major origin-destination points, and the two systems meet at transshipment ports. Some of the world's busiest ports, like Hong Kong and Singapore, are major transshipment centers. Some U.S. demand is met through transshipment ports like Freeport (Bahamas) and Kingston (Jamaica), and there is much discussion of whether other transshipment ports in Mexico, Canada, or the Caribbean might be developed in support of or as alternatives to mega-ship capable U.S. ports.
- The third factor is port diversification. This does not mean calling at more ports within a port range, but it does mean splitting U.S. bound cargo between ports in multiple port ranges. Over the past few years, we have seen port strikes on the West Coast, temporary meltdowns of the cross-country intermodal rail landbridge, ports closed by hurricanes, and other disruptions. Modern trade logistics requires reliability and minimum risk of disruption; increasingly, shippers and their carriers are spreading their risks by using different ports on the Atlantic, Pacific, and/or Gulf coasts.
- The fourth factor is Panama Canal expansion. Canal expansion will make it easier for more and larger Asian ships to use Gulf and Atlantic ports, further supporting diversification. However, analysts disagree over the net effect. Vessels continue to increase in size, and the very largest ships coming into service are likely to continue calling at U.S. West Coast ports, with inland connections via rail; under this scenario, the Panama Canal will see an increase in traffic from very large (but not the largest) vessels and there will be increased calls at deep-draft U.S. ports, but not necessarily at the expense of West Coast traffic.

Where carriers have a choice among various good options, certain factors create advantages for ports: deep water (allowing for a wider range of vessel choices); ample storage; productive labor; good surface transportation connections; use of best available technology; and (especially) an attractive cost structure. Shallow water, limited storage, non-optimal labor, congested transportation connections, community and environmental conflicts, and high land or operating costs all work against attracting carriers. Ports are especially sensitive to differential costs, such as unevenly applied user fees or local surcharges, which could tend to drive business to other competing ports. The ports of Halifax, Montreal, Vancouver, and Prince Rupert already are non-U.S. options; some see new port expansions at Prince Rupert, British Columbia, and Lazaro Cardenas, Mexico as threats, while others see them as potentially useful relievers.

Surface Transportation

A percentage of cargo that is received by ports and terminals by water is processed or consumed onsite. Many power plants and petroleum refining operations fall into this category. Another small category of cargo is transshipped (removed from one vessel and placed on another without leaving the yard), surface transportation capacity is mandatory.

Nationally, over the past several decades, our highway and railroad networks have been asked to handle significantly more traffic, both freight and, with very little growth in the amount of surface transportation system mileage. The result, not surprisingly, has been the emergence of critical chokepoints and bottlenecks. While the overall performance of the landside access system is gen-

erally considered good, some ports—specially major container ports in urbanized regions—are reporting significant congestion. Even if these ports do nothing more than handle today's levels of cargo, the growth of their surrounding regions will increase traffic and decrease the efficiency of their landside intermodal connections, unless improvements are implemented. The question of how U.S. ports will handle substantially increased levels of traffic—and, in particular, how our largest container ports, in highly congested urbanized areas, will handle a tripling of traffic through the year 2040—has no ready answer, and needs to be addressed urgently.

Trucking is especially critical to ports because most of what moves to and from ports does so by truck. Almost every major metropolitan area suffers from significant peak-hour congestion on its interstate and major state highways. In some cases, the congestion stretches the length and breadth of the metropolitan area becoming, in effect, a corridor-level blockage.

The Federal Highway Administration has identified truck bottlenecks on the interstate highway system based on present-day travel time delays actually experienced by trucks (as collected and reported by on-board transponders). Many of these bottlenecks directly impact movements to and from some of our largest ports. Absent major improvements or major changes in passenger or freight travel patterns, these bottlenecks will worsen and new ones will emerge.

Over the past 20 years, many metropolitan areas have seen the development of vast port-serving warehouse and distribution hubs, where full, 40-foot import containers are "stripped" and then "stuffed" into longer, 53-foot domestic containers or truck vans. These warehouse and distribution hubs, rather than locating at the port, prefer to locate in more outlying areas, where land is cheaper and roads less congested. Some have dubbed this "freight sprawl." The effect of freight sprawl has been to increase the amount of truck VMT associated with handling containers, and further expose truck and highway problems affecting the MTS.

Additionally, truckers operating over our highways face a growing list of difficult issues, including:

- Effects of urban congestion on travel time and reliability;
- Steep rises in the price of diesel fuel and dramatically increased operating costs;
- Higher customer costs, in many cases reflecting fuel surcharges;
- Limited availability of suitable truck routes, particularly for oversize/overweight or hazardous materials;
- In-terminal delays absorbed "on the clock" when dropping off or picking up cargo;
- Limited availability and location of overnight parking on major corridors;
- Periodic driver shortages; and
- Uncertainty about credentialing and security programs.

The performance of the nation's rail system is not as well understood as the performance of its highways, but a study for the Association of American Railroads developed highway-type level of service metrics and found a number of corridors projected to perform at unacceptable levels without significant improvements. Many of these unacceptable corridors serve major MTS centers.

Historically, railroads moved bulk cargos to and from ports, and for coal and other bulk products, this relationship is fundamentally unchanged. However, since the 1980s, ports and ocean carriers have increasingly partnered with railroads to develop fast, efficient, and reliable container transportation networks linking the U.S. West Coast, Midwest, and East Coast. What has emerged over the past 20 years is the use of rail as the "last leg" in the waterborne container import chain with import containers moving from West Coast ports to Midwest and East Coast cities via rail "landbridge" services. The New York/New Jersey region actually receives about as many import containers through its railyards as it does through its marine terminals.

In response to new market pressures and opportunities, the U.S. railroad industry has evolved dramatically over the past 30 years:

- Railroads now market high-speed, scheduled, premium intermodal services for high-value goods. Intermodal is a major success story for the railroads, and now generates around one-third of rail freight revenues. Increasingly, non-intermodal services also are also scheduled, rather than being run on a "tonnage" basis.
- There are significant efforts to upgrade both east–west and north–south (including Mexico) intermodal corridors. Although track mileage has not expanded, at a system-level, higher-density lines have been upgraded with new track, sidings, and control systems.
- Railroads have invested heavily in major new intermodal yards for transferring cargo between truck and rail, and also have partnered with ports in the development of new on- and near-dock facilities.
- Railroads and their public-sector partners are promoting Intermodal Logistics Centers. These are large planned developments combining rail service, highway access, and industrial development opportunities; sometimes, these also are referred to as "freight villages." For the railroads, they offer the chance to build a critical mass of demand that will support attractive rail service; for the users, they offer the opportunity for competitive transportation service by rail and truck, and for efficient connections to the MTS.
- Railroads have tended to shed lower volume and less profitable lines in order to concentrate resources on higher density, higher value lines. This has negatively affected certain types of shippers, particularly smaller unit merchandise and bulk commodity shippers. For affected shippers, their linkage to the MTS by rail has been reduced.

Safety and Security

Marine safety and security programs have been in place for years, and the number of incidents at U.S. ports has been extremely low. Nevertheless, following 9/11, there was a significantly increased focus on safety and security. Port security grants were made, new requirements were imposed for securing facilities and managing access and inspecting cargo, new technologies (x-ray, radiation detection, etc.) have been deployed, and new federal programs have been developed to increase safety and security across international supply chains. Everyone involved with the MTS wants safe and secure commerce—ports and their tenant businesses as much as anyone, since this is where and how they make their living—but there are concerns about security costs and uncertainty about

how security requirements will evolve into the future. Government and industry have been working closely to develop programs that balance the need for security with the need for MTS efficiency, but the future of these programs is far from clear.

Environment

Environmental restrictions and pressures can significantly delay or even kill vital MTS improvements, such as channel maintenance and deepening, terminal development, and landside access improvements.

Nearly every AASHTO member state who contributed to this report cited the uncertainty and cost of environmental impact studies, environmental mitigation, and dredged material disposal as critical impediments to their MTS projects. Almost all asked for a stronger federal role in setting fair, consistently applied ground rules. The states do not want to evade or reduce their responsibilities, they simply want to know what they are so they can plan accordingly.

As ports have expanded and communities have built hard against their fence lines, as port trucks have increased and tried to work their way through fast-growing metropolitan congestion, and as ocean and waterway protections have been strengthened, communities have looked far more critically at the impacts of their ports. In California and elsewhere, legislation (actual or proposed) has focused on requiring ports to manage or reduce their environmental impacts. Many ports are now acting proactively in an effort to promote solutions before solutions are thrust upon them. Many years ago, the Ports of Los Angeles and Long Beach established a "mitigation bank" to restore thousands of acres of wetlands in exchange for permission to dredge channels and create landfills. Today, these ports have implemented programs requiring truckers serving the port to utilize vehicles with EPA certified 2007 or newer engines. Many other ports are following suit by encouraging truckers to scrap old trucks and purchase cleaner engines. Some terminals are installing systems that will allow ships to "cold iron" (operate from shoreside electric power) while at berth. Several ports have articulated comprehensive "Green Port" strategies.

According to the U.S. DOT study, *Potential Impacts of Climate Variability and Change on Transportation Systems and Infrastructure—Gulf Coast Study*, significant portions of the MTS are at potential near- and long-term risk from the effects of changes in temperature, precipitation, frequency and severity of major storm events, and relative sea-level rise (due to the combined effects of rising sea levels and subsidence of coastal lands). MTS facilities are especially at risk, because they live at the water's edge, where the effects of climate change and variability are most pronounced. Some ports already have seen major drops in the water levels of their channels; others, like New Orleans and Gulfport (from Katrina) and Lake Charles (from Rita), have suffered the catastrophic impacts of wind and water damage. At a larger level, climate effects could affect the production of agricultural goods and the demand for energy and other commodities. Understanding and adequately preparing for climate change and variability is a critically important issue for every state, and for every MTS stakeholder.

State Roles

States have a critical role to play, as partners with their ports, the trucking and railroad industries, and with other levels of government, to protect and grow MTS benefits.

State concerns are not limited to coastal ports. Many of the states that are hardest-hit by the lack of MTS funding and other pressures are states that depend on the inland waterways and the Great Lakes. Any authorized but unfunded or underfunded MTS waterway project, coastal, inland, or Great Lakes, could be considered a bottleneck. Any highway or rail link providing an unacceptable level of service to MTS ports and terminals could be considered a bottleneck. States can support their ports, and their trucking and railroad industries, in improving the performance of MTS surface transportation connectors in a variety of ways.

Some states contribute directly to MTS waterway improvement projects and port and terminal improvement projects on an as-needed basis; others have established set-aside funds, where their ports can apply for funding. Funding can address modernization, capacity enhancement, environmental initiatives, and other areas.

States can also program transportation funds for critical port-serving highway and rail connectors—a more traditional role for state DOTs—and can also partner with ports, railroads, and truckers to implement innovative surface transportation strategies such as:

- **Truck-Only Haul Roads.** Serving ports (like the Tchoupitoulas Corridor in New Orleans) and truck-only corridors (possibly tolled).
- **Truck Information and Management Technology.** Los Angeles/Long Beach and other ports have web-based truck appointment systems in place, and this approach is gaining wider acceptance. Appointment systems can help reduce queuing at terminal gates and allow terminals to better match in-terminal equipment availability (necessary to transfer containers between storage stacks and truck chassis) with truck volumes.
- **Off-Peak Gate Operations.** Many bulk terminals operate 24 hours a day and most container terminals will operate "inside the gate" activities whenever a ship is at berth. Historically, container terminals have operated their gates more or less during daylight hours—when the companies at the other end of a port truck trip tend to be open—but in recent years, many container terminals have offered extended gate hours with the hope not only of improving terminal throughput but also decreasing the impact of drayage on the surface transportation network. Most extended gate experiments have failed due to lack of trucker interest. The Los Angeles/Long Beach "Pier Pass" program is probably the most successful; the program imposes surcharges on peak-period gate moves, and uses the proceeds to pay the differential labor costs of after-hours gate labor.
- **Chassis Pools.** Until recently in the United States, container truck chassis were owned by the shipping lines and terminals. In 2012, APL was the last major carrier to abandon the carrier-owned chassis model. The carrier-provided model had become increasingly untenable given that carriers did not have sufficient incentive to ensure that chassis were in roadworthy condition, so if a trucker arrives at the terminal to pick up a load, he also might have to stop and swap out his chassis. This wasted the trucker's time and the terminal's space. Some ports, such as Virginia Port Authority (VPA), have implemented chassis pools (common ownership of chassis for port-serving trucks) and they report that it is working extremely well.

- **Virtual Ports.** Systems that allow functions that usually occur at a terminal—dropping off or picking up a chassis or an empty container, for example—to occur directly between two parties, under the management and control of an information exchange system.
- **Direct Rail Service.** On- or near-dock rail terminals, which reduces off-terminal drayage.
- **Dedicated Rail Corridors.** In the late 1980s, planners in Southern California and the ports of Long Beach and Los Angeles started drafting concepts for what became the Alameda Consolidated Transportation Corridor, which combined operations from three separate rail routes into a single fully grade-separated transportation corridor, using funds combined from many sources. Many states are exploring public-private partnerships to develop and upgrade rail corridors, and some of these will provide improved connections to MTS ports and terminals.
- **Short-Haul or "Shuttle" Train Services.** Rail can be very efficient at short distances for "unit train" commodities (where all the cars and commodities are the same), but it is less efficient at short distances for intermodal services due to higher handling costs. Some states are looking at opportunities and requirements to make short-haul rail movement a more viable option to move freight to and from their ports.
- **Inland Ports.** Inland ports have long been discussed as a way to build more port capacity without expanding port facilities. The idea is to find an inland property and create a transportation umbilical to the port itself, allowing the inland site to function as overflow storage and remote collection/distribution. Today, there are several inland ports in operation; the earliest recognized examples is the Virginia Inland Port (VIP), a 35-acre facility located at Front Royal, Virginia, several hundred miles from the Virginia Port Authority facilities at Hampton Roads.
- **Marine Highway Alternatives to Surface Transportation.** Short-haul movement of bulk goods already is responsible for keeping a tremendous number of trucks off the highways in places like New York, and analysts repeatedly argue that the Marine Highway could meet additional short- and long-haul transportation needs currently met by truck. Coastal barges and inland river container-on-barge services are starting to gain traction, but progress has been incremental. One issue, as previously noted, is the cost associated with the imposition of the Harbor Maintenance Tax; another issue often cited by operators is the requirement to use U.S.-built vessels imposed by the "Jones Act." The U.S. DOT issued an official designation of the Marine Highway Corridors in 2010; however many potential Marine Highway services are not yet economically competitive with existing modes. But as highway performance deteriorates and trucking costs rise, Marine Highway options should become an increasingly attractive.

Risk Factors

What happens the MTS fails to meet current needs and emerging challenges? Nobody really knows. Certainly the nation loses some of its ability to engage effectively in international trade, harming U.S. producers, who rely on access to export markets, and U.S. consumers of essential goods like petroleum, etc. The ability to move domestic goods by water is lost, further stressing surface transportation systems. Some of the transportation burden is shifted to more costly and less environmentally friendly modes of transportation. Some or all of the vital benefits of the MTS such as trade, economic impact, transportation, and environment will be lost. These effects can and should be

further quantified through research, so that policy-makers have a full understanding of their decisions regarding the MTS.

Meeting the Challenge

The strength of the MTS is in the diversity of its stakeholders, who both compete and cooperate. Yet their combined actions may not always yield the best possible results for the nation. We simply do not know what these stakeholders will do, how they will react, or what they will consider most important as they pursue their independent missions.

For the MTS to grow and prosper, this report finds that it is imperative to develop comprehensive, national-level MTS guidance that will focus and coordinate federal, state, local, and private-sector efforts towards common goals and a common good, and derive the greatest possible transportation, economic, and environmental benefit from MTS resources at the least possible cost.

This is an effort to “nationalize” but not "federalize" the MTS, by defining higher-level goals and principles, developing the basic data framework for sound planning, and establishing clear performance goals. The effort is not to direct MTS investments, “pick winners,” or enshrine proscriptive plans. Rather, it must be to provide all MTS stakeholders with a clearer path to making their best possible contributions to the nation as a whole, and to provide the nation with a mechanism for understanding the value of the MTS and maximizing the benefit of its investments. A National MTS Master Plan is not necessary, but a national MTS vision and a national MTS strategy—backed up by the necessary commitments to funding and action—is long overdue.

■ 6.6 Lack of Stewardship

Underlying each of the MTS challenges discussed above—inattention to basic maintenance, inadequate funding, inefficient program delivery, and inattention to the national interest as a whole—is the fact that there is no locus of responsibility in charge of the MTS. No single entity is responsible for ensuring that the nation receives the best possible return from its investments in the MTS.

This report suggests that the appropriate location for this responsibility would be under the Secretary of Transportation, in a new Office of Multimodal Freight. From this position, the Office could coordinate internally among the various DOT offices, and externally with the Corps and other federal agencies, states, regions, ports, and private sector stakeholders. The Office would be charged with convening and coordinating stakeholder input, developing data and vision-level planning and guidance, securing funding, and driving successful outcomes. The Office could, for example:

- Identify, evaluate, and promote proposals for increased MTS funding and improved funding reliability;
- Provide guidance to national freight planning activities required under MAP-21 surface transportation program legislation;
- Improve stakeholder coordination, building on prior CMTS and MTSNAC activities;

- Create an MTS system map and classification of MTS facilities, analogous to the National Highway System and the National Freight Network required under MAP-21;
- Prepare a formal MTS Condition and Performance Report, comparable to the report prepared for the National Highway System;
- Prepare a comprehensive Economic Impact report addressing the benefit of the MTS to the nation, and the costs to the nation failing to maintain and expand it;
- Develop a comprehensive approach to environmental analysis and mitigation strategies to facilitate MTS improvements; and
- Prepare a long-range stakeholder-driven vision plan for national MTS development and investment to meet national transportation and economic development objectives.

7.0 Action Alternatives

The list of MTS accomplishments and benefits is impressive. The list of MTS challenges that must be overcome to ensure these benefits into the future is daunting.

Based on a review of current conditions, historical trends, and future projections, the main findings of this report are as follows:

1. Embracing business as usual will inevitably lead to significant further declines in MTS condition and performance, and to lost opportunities for our transportation system and economy.
2. Those who consider these outcomes to be unacceptable must argue that a renewed national commitment to our MTS is urgently required, along with corresponding changes in how we plan and fund the MTS.

Most MTS stakeholders agree that decisive and positive action now will yield unprecedented benefits. With recovery underway, global trade is again nearing record levels. Following national policy direction, many states are setting explicit goals to dramatically increase their export business as a means of balancing trade and growing their economies. With growing highway congestion, waterborne transportation becomes an even more attractive transportation alternative. Waterborne trade and transportation will be cornerstones of the 21st century economy.

However, there is not a firm and clear consensus among all MTS stakeholders on the best way to proceed. To promote discussion and action, this report proposes the following action alternatives:

1. **Pass federal legislation to improve the reliability of MTS funding and achieve full state-of-good-repair for MTS waterways by the year 2020.**
   a. Congress should direct the U.S. Army Corps of Engineers to prepare a comprehensive inventory and plan to address the nation's deferred navigation system maintenance needs —locks and dams, inland waterways, Great Lakes channels, and coastal port channels—by the year 2020. The plan should specify the funding requirements and processes, and as part of its direction, Congress should make clear its intent to fully fund the identified need. This plan could be adopted as part of the Water Resources Development Act (WRDA) or in parallel.
   b. The administration's recent decision to "fast track" a number of critical Corps projects was encouraging.[45] As a follow-up, Congress and the administration should advance a new Water Resources Development Act, featuring comparable attention to fast-tracking and streamlined project delivery. The new WRDA should include an update of the Corps' benefit–cost evaluation methods, which are currently tonnage-dependent, to allow for consideration of a broader range of local, regional, and national benefits. The new WRDA should also identify full funding strategies for authorized projects, based on trust fund proceeds, anticipated general fund appropriations, and new funding sources.

45 July 19, 2010. The "We Can't Wait" initiative addresses Corps projects at the ports of Savannah, New York/New Jersey, Miami, Jacksonville, and Charleston.

c. Legislation should be advanced to require full utilization of HMT funds, and to exclude domestic container traffic from the HMT as a means of promoting domestic "Marine Highway" services.

2. **Establish a new Office of Multimodal Freight, under the Secretary of Transportation, charged with and empowered to eliminate the balkanization of MTS planning, funding, and project delivery.**

   a. The Secretary of Transportation should act to create a new Office of Intermodal Freight within the U.S. Department of Transportation. The mission for the new Office would be to promote efficient freight movement via all modes, including water, and to promote the health of all freight transportation systems, including the MTS. The Office would be empowered to cooperate with and coordinate the actions of the multiple federal agencies responsible for MTS planning and project delivery, and to receive guidance from the full range of public and private MTS stakeholders. To be clear, the intent is not to federalize MTS planning; rather, it is to ensure that MTS improvements identified and implemented at the local, regional, and state levels have an effective champion at the federal level, providing what some have called "stewardship of the whole."

   b. Upon establishment, the new Office should act to identify, evaluate, and promote proposals for increased MTS funding and improved funding reliability. A full range of possibilities, including taxes, user fees, federal solutions, local approaches, and private contributions should be examined.

   c. Upon establishment, the new Office should act to provide guidance to national freight planning activities required under MAP-21 surface transportation program legislation. This guidance should include: enhanced stakeholder coordination, building on prior CMTS and MTSNAC activities; creation of a system map and classification of MTS facilities, analogous to the National Highway System and the National Freight Network (consisting of highways) required under MAP-21; preparation of a formal MTS *Condition and Performance Report*, comparable to the report prepared for the National Highway System; preparation of a comprehensive Economic Impact report addressing the benefit of the MTS to the nation, and the costs to the nation of failing to maintain and expand it; a comprehensive approach to environmental analysis and mitigation strategies to facilitate MTS improvements; and preparation of a long-range vision plan for national MTS development and investment to meet national transportation and economic development objectives.

3. **Identify and promote "best practices" for MTS planning and investment at the state, regional, and local levels.** The MTS is not a federal system—it is a shared responsibility of private stakeholders and public partners at all levels of government. States have an important role in the planning, improvement, and operation of the MTS. Today, each state addresses MTS issues and investments according to its own practices, needs, and resources. To accomplish this objective, "state of the practice" guidance should be developed by AASHTO and provided to state, regional, and local MTS stakeholders. "Fast track" guidance should be developed immediately to assist states in developing waterborne freight performance measures and MTS project recommendations for inclusion in MAP-21-compliant state freight planning activities, as input to the National Freight Strategy.

Table 7-1. Summary of Action Alternatives

Issues	Action Alternatives
Basic waterway maintenance needs are not being met.	Direct the Army Corps to develop a plan to address the nation's MTS maintenance backlog, and ensure funding to eliminate the backlog by the year 2020.
Needed projects are often delayed for years, even decades.	Develop and adopt new Water Resources Development Act, focusing on upgraded project benefit-cost analysis and project-delivery streamlining.
Funding for critical MTS expansion needs is inadequate and uncertain.	Pass legislation requiring full utilization of HMT funds, with HMT exemptions for domestic Marine Highway services.
National investments in the MTS are not targeted to national needs and national benefits.	Establish new Office of Multimodal Freight, empowered to coordinate and advance MTS planning and projects: – Improved MTS funding strategies – Stakeholder coordination – Map and classification of MTS facilities – MTS Condition and Performance Report – MTS Economic Impact evaluation – Environmental Analysis and Mitigation strategy – Long-range national MTS vision
No locus of responsibility for the well-being of the MTS and accountable for its failure or success.	Promote best practice guidance for state, regional, and local MTS planning and investment, including "fast track" guidance for MAP-21 input and compliance.

All of the world's industrial economies understand a simple fact: efficient transportation means lower costs and greater reliability for freight shippers and receivers, which means that goods can be produced and purchased less expensively, which translates directly into a stronger competitive position in the global marketplace. Western Europe has been a highly integrated maritime economy for centuries, and developed along river and canal connections. Today, their inland waterways serve much the same purpose as the U.S. rail system. Asian ports, following dramatic growth in the economies of Japan, Korea, and most recently China, now dominate the list of the world's largest container ports. Expanding economies in India and Brazil are being served by major port expansion programs ($60 billion in India and $17 billion in Brazil, according to the American Association of Port Authorities).[46] Closer to home, Canada and Mexico have invested in marine terminals and rail connections that compete directly with U.S. ports for overseas trade, even as they provide better opportunities for increased waterborne trade within North America itself.

The United States has enjoyed a long period of unchallenged global economic dominance, during which we could afford to develop and fund our MTS on an incremental, piecemeal basis, without the benefit of firm funding commitments and an overarching national strategy. That time is ending. The nation faces great challenges but also great opportunities; and how effectively those challenges are met will define, to a significant degree, its economic future.

46 http://www.aapa-ports.org/Press/PRdetail.cfm?itemnumber=18583.

Appendix

Fig. 1. - The Canals of Early America (1786-1851).

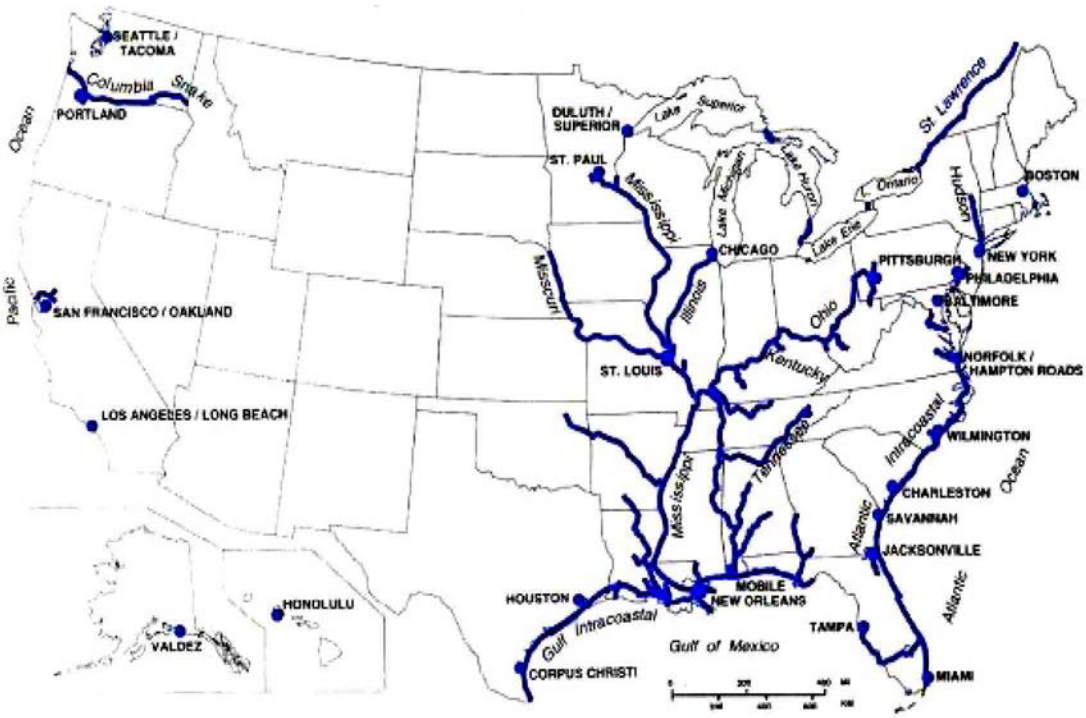
LEGEND

1 Cumberland & Oxford
2 Middlesex
3 Blackstone
4 New Haven & Northhampton
5 Delaware & Hudson
6 Champlain
7 Erie
8 Black River
9 Oswego
10 Cayuga-Seneca
11 Chenango
12 Chemung
13 Genesee Valley
14 Morris
15 Delaware & Raritan
16 Delaware Division
17 Lehigh Navigation
18 Schuylkill Navigation
19 Susquehanna & Tidewater
20 Penn. State Canal
21 Chesapeake & Delaware
22 Chesapeake & Ohio
23 James River & Kanawha
24 Dismal Swamp
25 Santee & Cooper
26 Carondelet
27 Ohio & Penn.
28 Sandy & Beaver
29 Muskingum
30 Ohio & Erie
31 Hocking
32 Miami & Erie
33 Whitewater
34 Wabash & Erie
35 Louisville & Portland
36 Illinois & Michigan

Source: Waugh, Jr., Richard G., "Canal Development in Early America," Board of Engineers for Rivers and Harbors, Fort Belvoir, Virginia 22060.

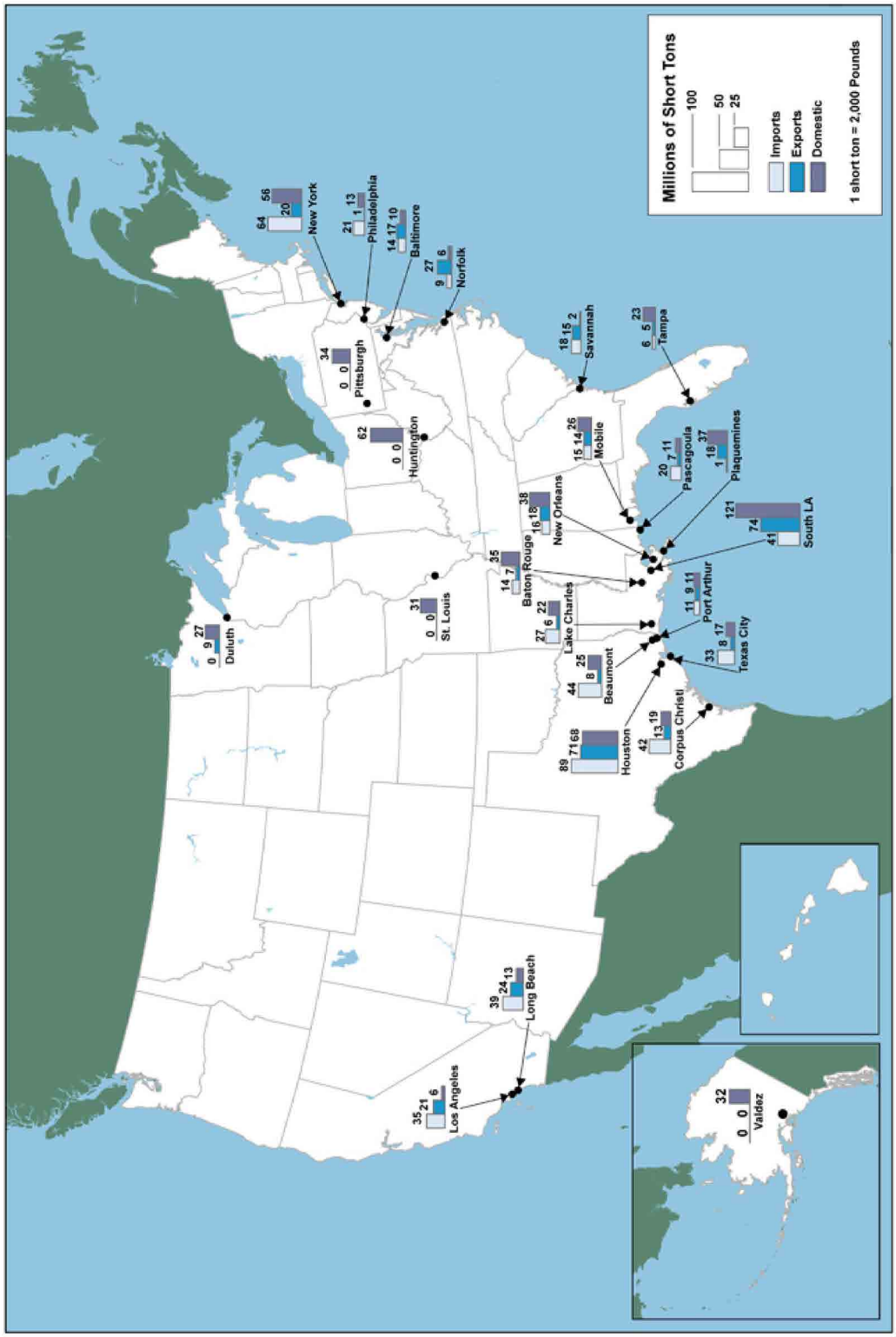
Source: History of the Commercial Waterways and Ports of the United States, Volume 1, U.S. ACE.

Figure A-1. The U.S. Canal System Through 1851



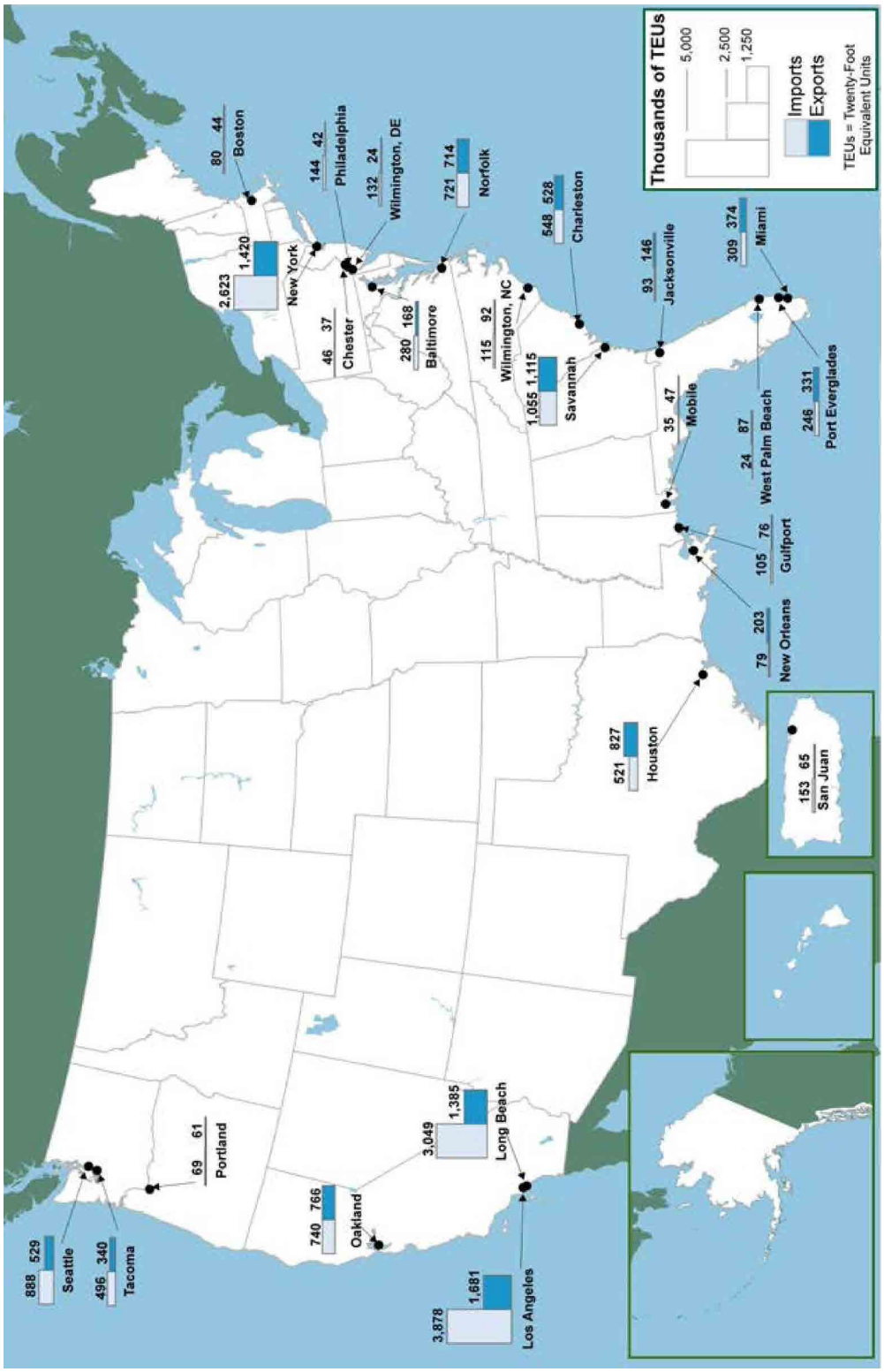
Source: National Strategy for the MTS. Committee on the MTS, 2008.

Figure A-2. Locations of Inland and Coastal MTS Waterways



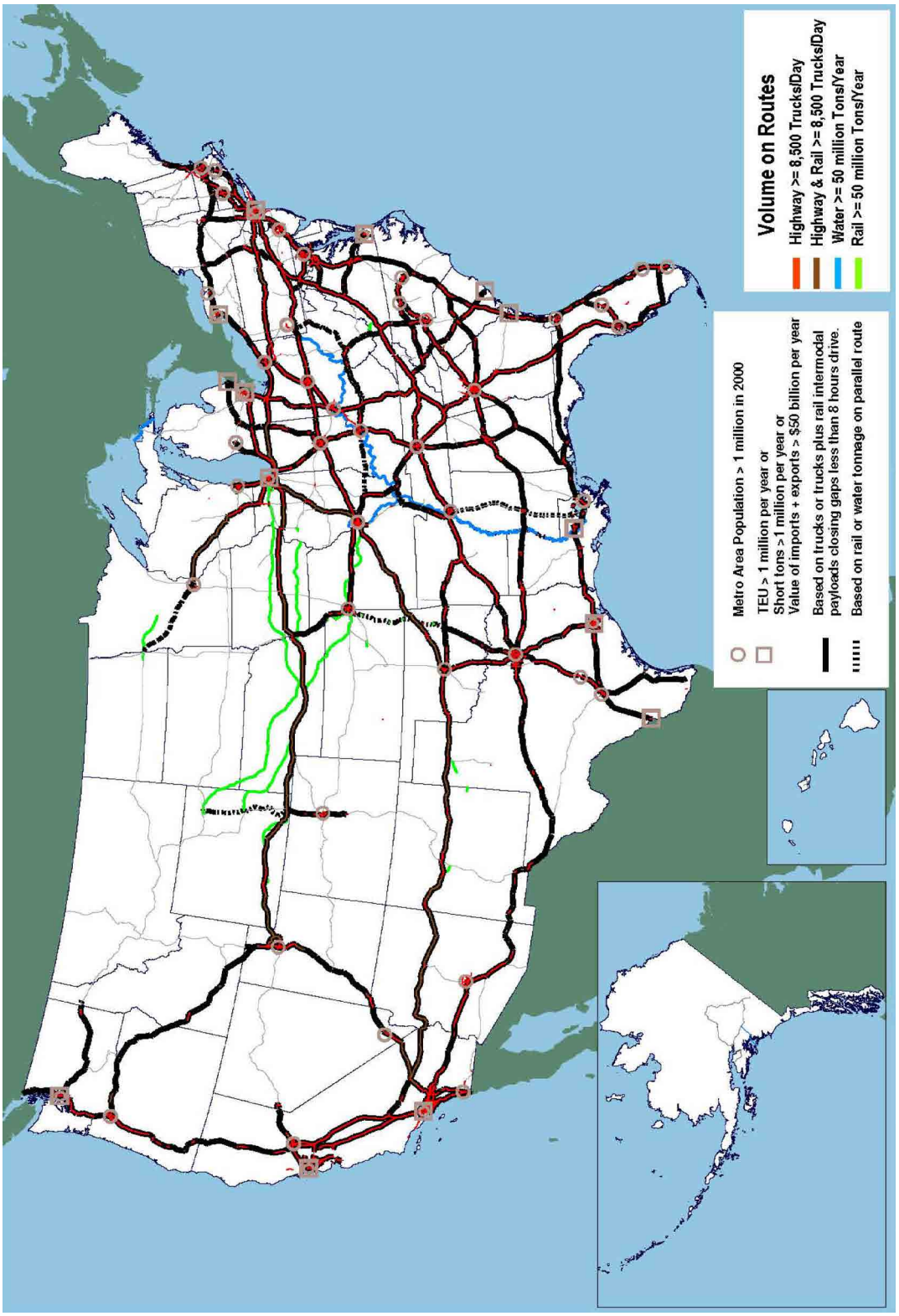
Source: FHWA Office of Freight Management.

Figure A-3. Top 25 Ports by Tonnage 2010



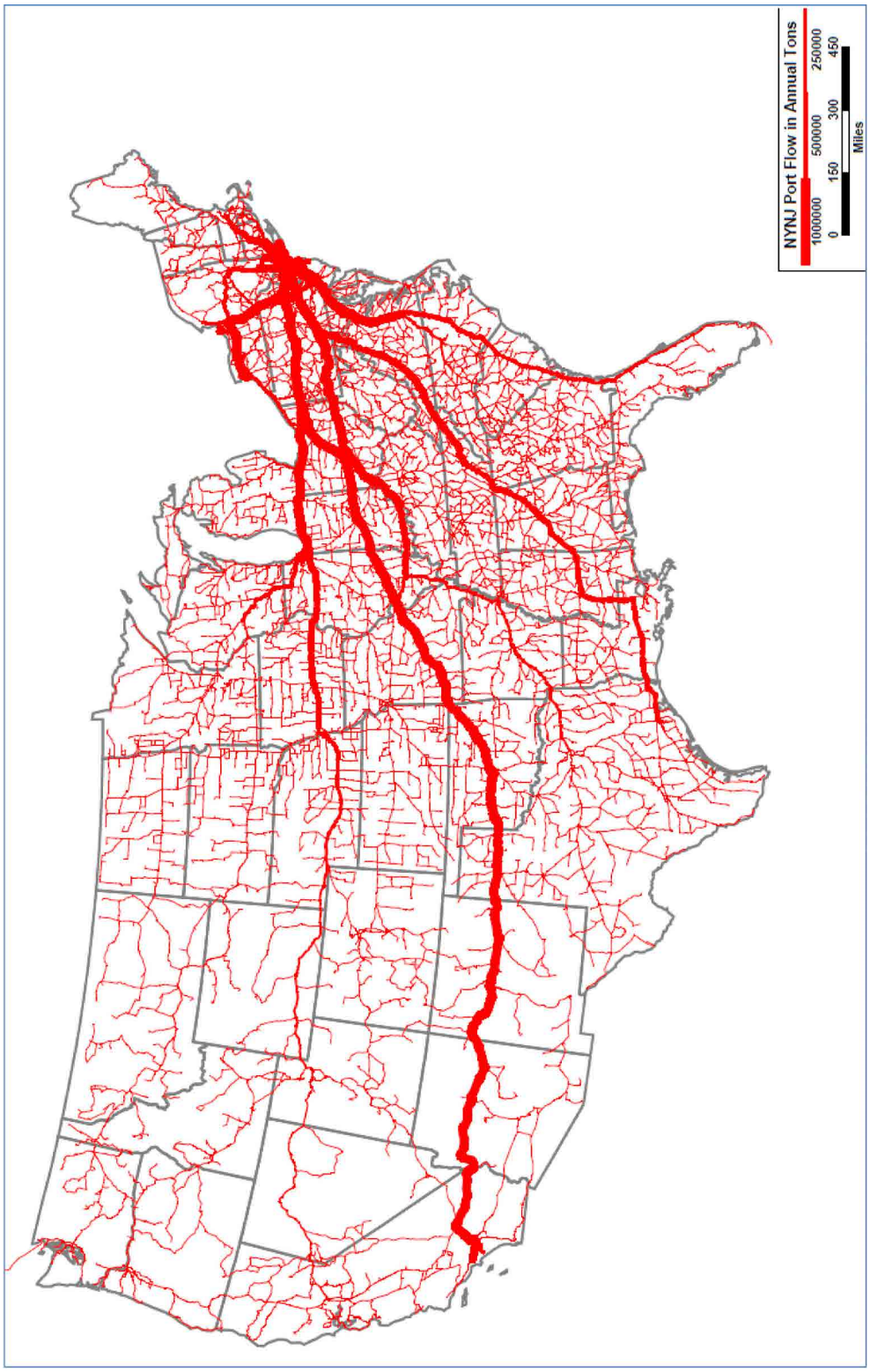
Source: FHWA Office of Freight Management.

Figure A-4. Top 25 Ports by Int'l Loaded TEUs 2010



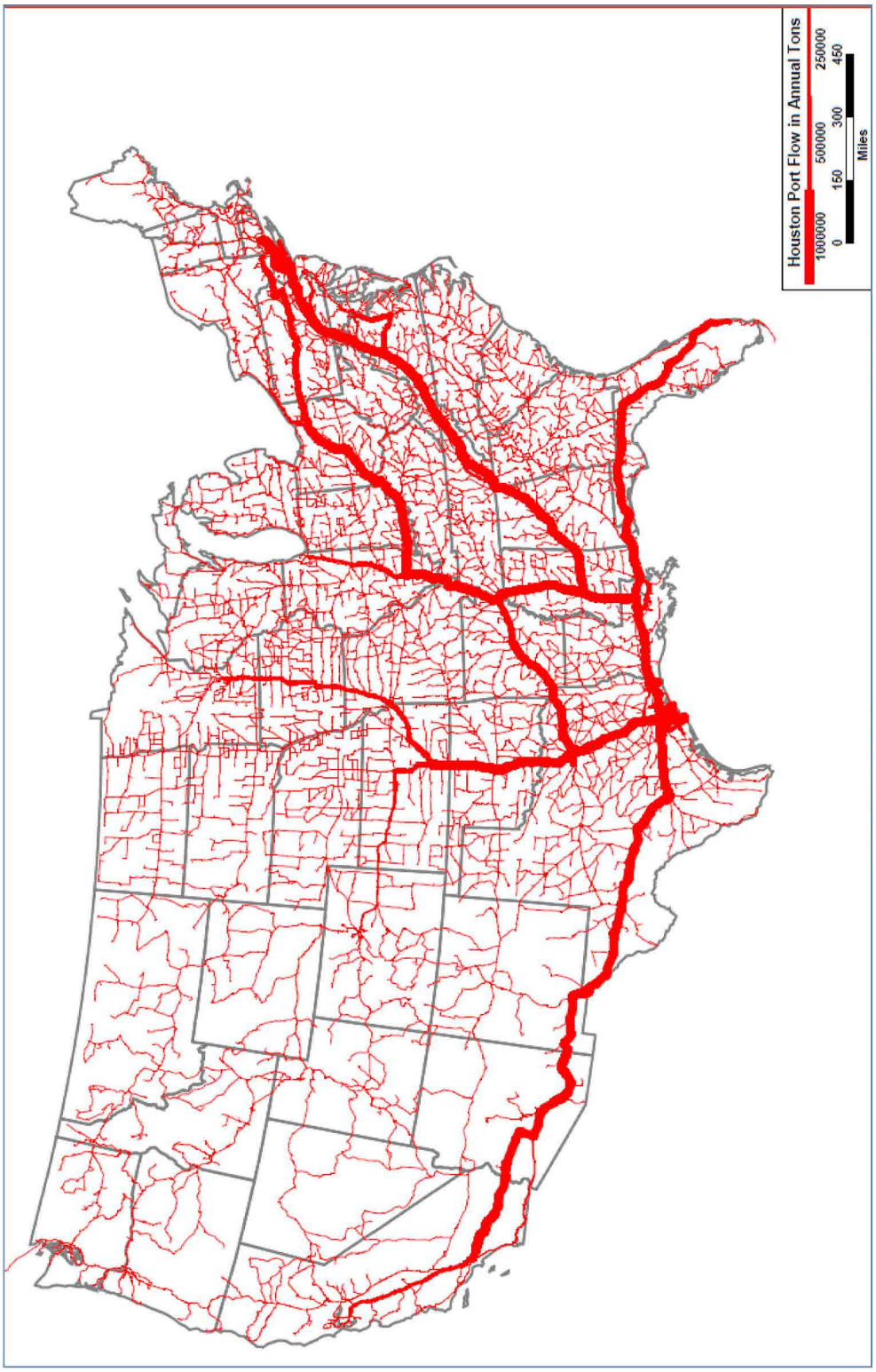
Source: FHWA Office of Freight Manageme

Figure A-5. Major Freight Corridors



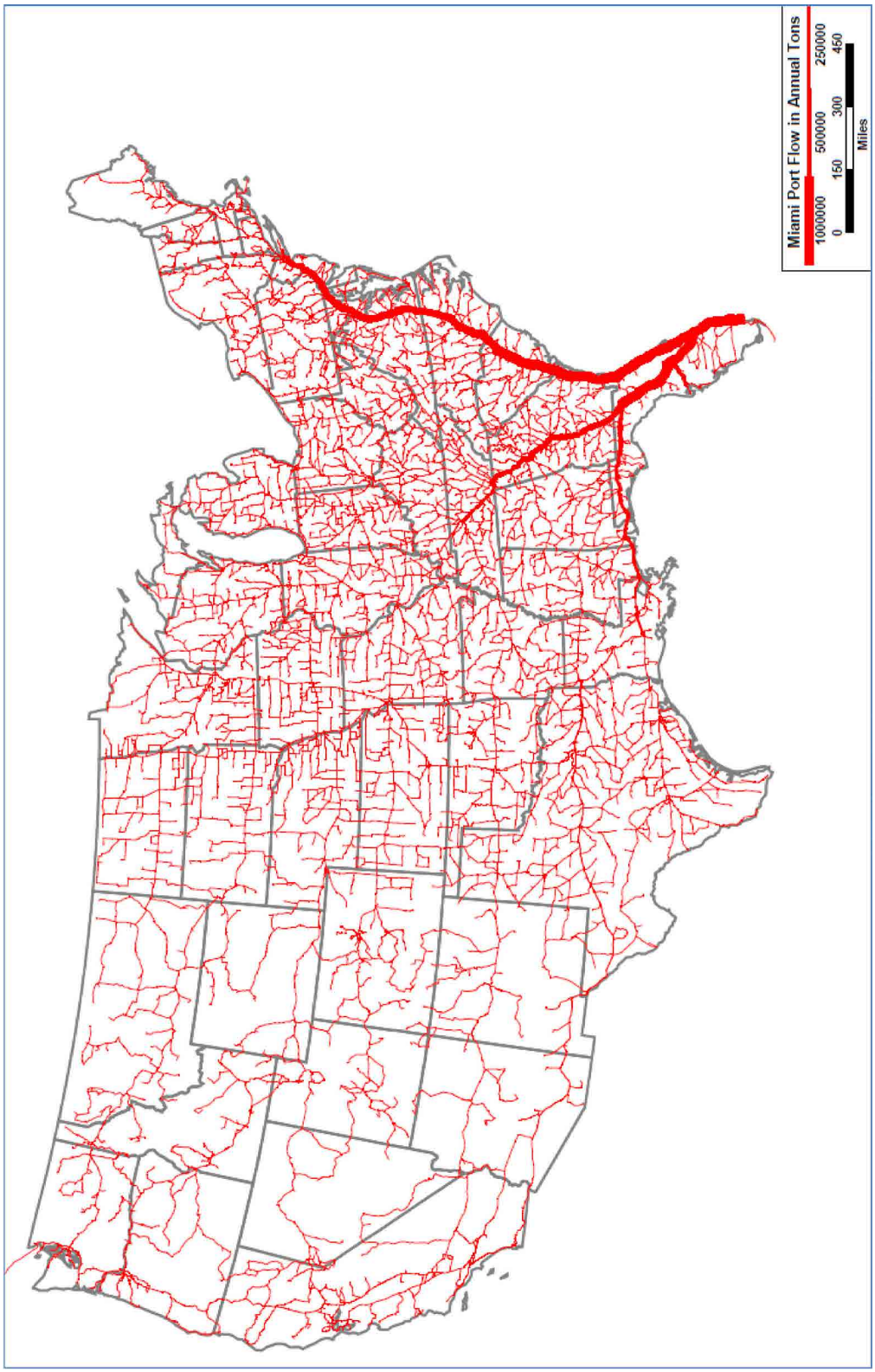
Source: Analysis of Freight Analysis Framework-3 import/export flow data.

Figure A-6. Inland Truck Flows of Port of NY/NJ Tonnage



Source: Analysis of Freight Analysis Framework-3 import/export flow data.

Figure A-7. Inland Truck Flows of Port of Houston Tonnage

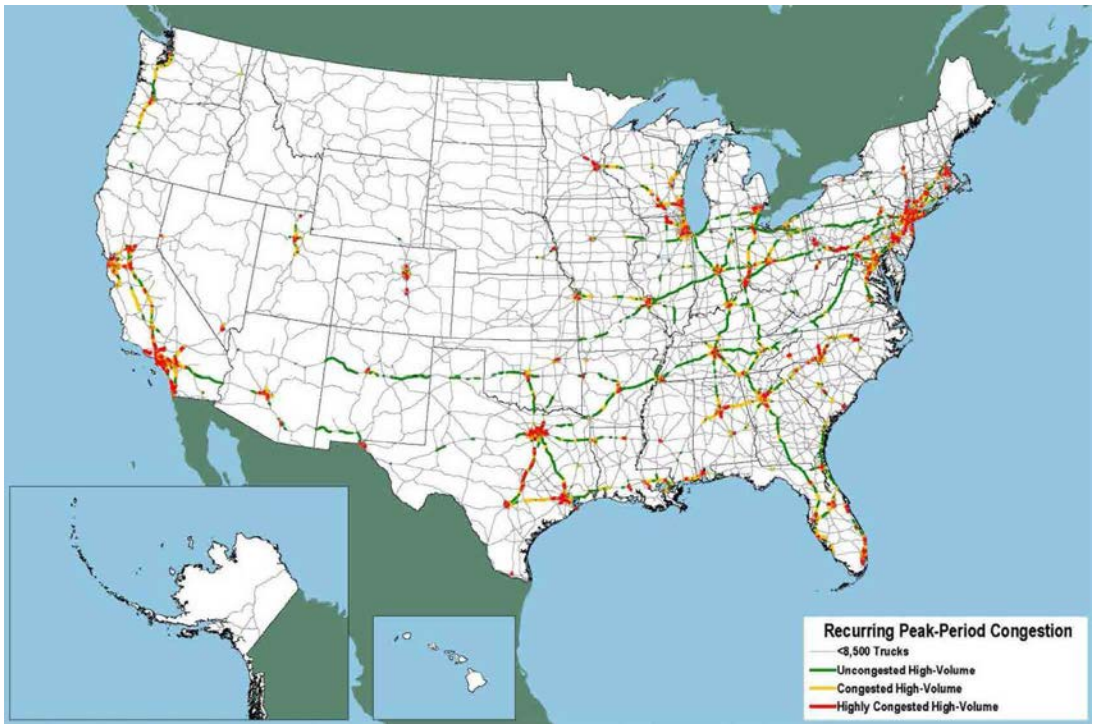


Source: Analysis of Freight Analysis Framework-3 import/export flow data.

Figure A-8. Inland Truck Flows of Port of Miami/Everglades Tonnage

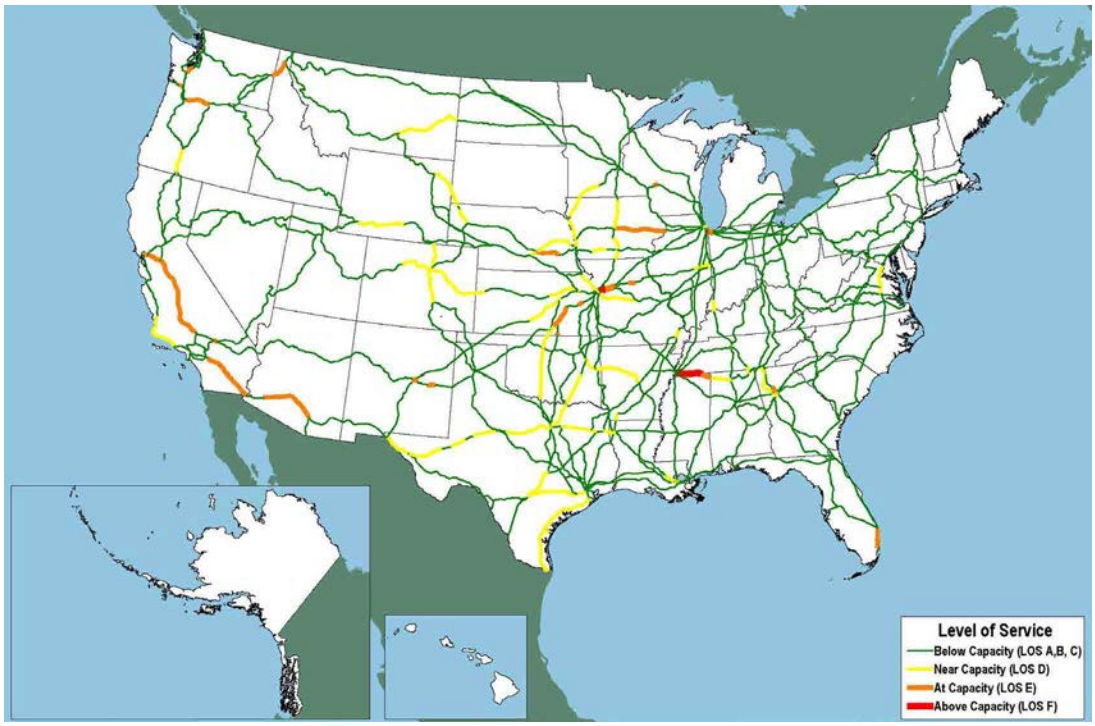
Source: http://www.cma-cgm.com.

Figure A-9. Examples of Multi-Port Vessel Services via Suez and Panama



Source: FHWA Office of Freight Management.

Figure A-10. U.S. Truck Network Congestion 2007



Source: FHWA Office of Freight Management.

Figure A-11. U.S. Rail Network Congestion 2007

Table A-1. Environmental Costs of Shifting MTS Ton-Mileage to Alternative Modes 2010

	Fuel (Gallons)	Emissions (Metric Tons)				Total
		Volatile Organic Compounds	Nitrogen Oxide	Particulate Matter	Carbon Dioxide	
Truck increase versus MTS	3,057,242,424	52,059	712,679	31,550	94,215,604	
Rail increase versus MTS	284,109,928	2,472	48,041	1,392	2,867,326	
2010 Value per Gallon	$ 0.40					
2010 Value per Metric Ton		$ 1,346	$ 5,487	$ 300,228	$ 22.51	
Added Cost if by Truck	$1,228,245,310	$70,080,088	$3,910,269,504	$9,472,089,054	$2,120,452,186	$16,801,136,141
Added Cost if by Rail	$114,140,993	$3,327,860	$263,589,383	$417,867,547	$64,533,129	$863,458,911

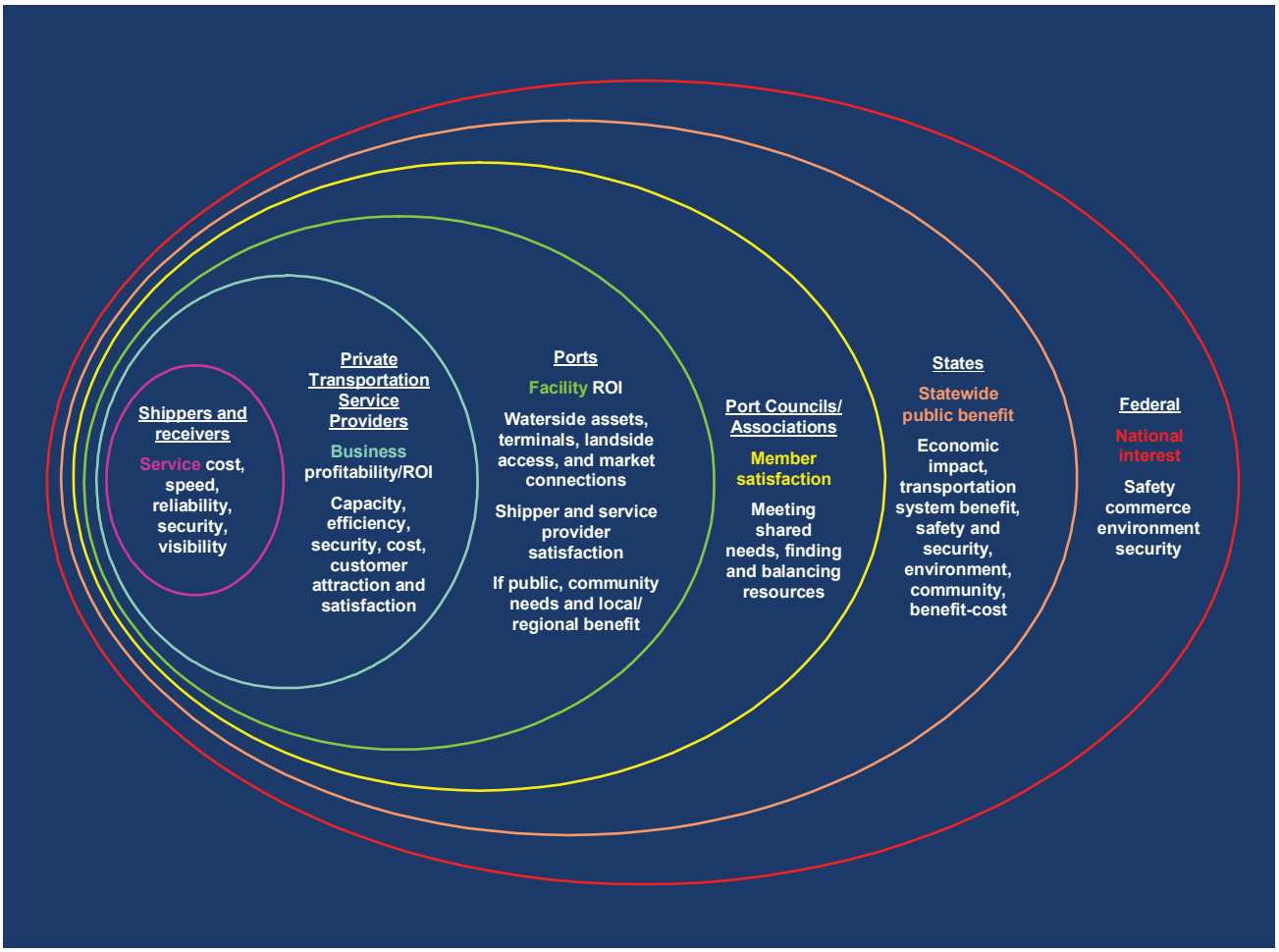


Figure A-12. MTS Stakeholders

Table A-2. Provisions of the 2007 Water Resources Development Act

Title	Authorized Funding ($ Mil)	Major Provisions
Title I – Water Resources Projects	3,500	Authorized 46 new navigation projects for which required Corps reports have been completed, including major projects in 23 states addressing navigation improvements, flood protection, and environmental improvements. Authorized funding of navigation channel deepening for Miami, Corpus Christi, and Hampton Roads.
Title II – General Provisions	400	Included 47 nonproject-specific provisions, relating to program guidance.
Title III – Project-Related Provisions	3,100	Raised authorization limits for 20 currently authorized projects, and deauthorized all or part of 46 projects.
Title IV – Studies	157	Authorized, modified, or directed 87 project or location-specific studies and 14 programmatic or regional studies.
Title V – Miscellaneous	4,500	Authorized new projects and programs and modifies existing projects and programs. Directed Corps to expedite projects and studies. Added or amended projects for environmental infrastructure improvements.
Title VI – Florida Everglades	95	Provided modifications and direction in carrying out the Florida Everglades restoration program.
Title VII – Louisiana Coastal Area	5,800	Authorized funding for multiple projects, programs, and studies, including flood protection and environmental restoration.
Title VIII – Upper Mississippi and Illinois Waterway System	4,000	Authorized funding for improvements to the Upper Mississippi River and Illinois Waterway System, including nearly $2 billion for new locks and $1.7 billion in environmental restoration.
Title IX – National Levee Safety Program	120	Authorized funding for a National Levee Safety Program.
Total	22,000	

Source: Adapted from Dredging Contractors of America information paper.

Table A-3. Army Corps of Engineers FY 2012 Budget Request

Expenditure Category	Request ($ Millions)
Investigations	104
Construction	1,480
Operations and Maintenance	2,314
Regulatory Program	196
Flood Control, Mississippi River and Tributaries	210
Expenses	185
Flood Control and Coastal Emergencies	27
Site Remediation	109
Other	6
Total	**4,631**

Source: http://www.usace.army.mil/Portals/2/docs/civilworks/press_book/budget2012.pdf

No country has capitalized on the container revolution like China. In 1979, China represented less than one percent of global trade; in 2010 it dominated global maritime trade with 130 million TEUs. At the time of China's emergence into the global trading system, the technologies that drove mass containerization were just beginning to surface. In 1980, total global container trade was equal to 13.5 million TEUs—the size of a second tier Chinese container port today.[a] By comprehending the true potential of containerization and supersizing investment in key export hubs through centralized planning, China built the necessary infrastructure for rapid, massive expansion of an export-oriented manufacturing economy.

Expanding export capacity has been a central focus for China for at least the last three five-year plans. For the 11th five-year plan 2006-2010, investment in ports was equivalent to 350 billion renminbi (RMB), or around 55 billion dollars. The current five-year plan (2011-2015) was issued in March 2011 and is the first to be developed after the global economic crisis. By comparison to the plans issued in the last decade, the current plan is more inward looking, aimed directly at improving domestic consumption and quality of life with a less overt focus on trade promotion. Nevertheless, the plan calls for an increase of 440 port berths through 2015. This includes the expansion of coal capacity by 310 million tons, crude oil capacity by 100 million tons, iron ore capacity by 390 million tons, and container capacity by 58 million TEUs.

China has also recently implemented favorable tax treatment at the Port of Shanghai in what is referred to as the Shanghai Yangshan Free Trade Port. Businesses registered in the free trade zone enjoy a number of tax advantages.[b] Given its rising wage rates, China is now looking more at quality rather than quantity of trade by focusing on products with higher value-added.

East Asia's aggressive maritime expansion shows no signs of abating. According to the Journal of Commerce:

> *"The port of Singapore's container facilities will benefit from an investment of S$3.5 billion (U.S. $2.85 billion) over the next decade as PSA Singapore Terminals continues to boost capacity. Phases three and four of its Pasir Panjang Terminal development will add 15 new berths and nearly 19,700 feet of quay at drafts of up to 59 feet, taking total port capacity to more than 50 million 20-foot-equivalent units per year by 2020, up from capacity of 35 million TEUs now. PSA said the new development phases will feature an automated container yard equipped with proprietary planning and operation systems, and unmanned, rail mounted gantry cranes. Last year, Singapore was the world's second busiest container hub after Shanghai, handling almost 30 million TEU."*[c]

a http://www.unescap.org/ttdw/publications/tfs_pubs/pub_2398/pub_2398_ch3.pdf.
b http://www.beneschlaw.com/Transportation--Logistics-Under-Chinas-12th-Five-Year-Plan-01-17-2012/.
c Source: Journal of Commerce Daily Newswire, October 3, 2012.

Figure A-13. Port Planning in China: Central Planning Model

Mexico's pursuit of import substitution (the policy of favoring domestic production over imports) for many decades from the 1930s through the 1980s significantly degraded its prospects for international maritime trade, except for petroleum exports. At the time that the North American Free Trade Agreement was signed in 1993, Mexico was severely limited in its ability to trade with the rest of the world not only by its tariff structure but also by its transportation infrastructure. Its nationalized railway system was functionally obsolete and carried a small amount of cargo prior to privatization in the mid-1990s.

The port system, under the public port agency Puertos Mexicanos, similarly functioned at a very low level with no prospect of substantial improvement. The opening up of Mexican terminals to private concessions has allowed for rapid improvement in the capacity of terminals and an increase in total traffic from 1.1 million TEUs in 1999 to 3.7 million TEUs in 2010.[a] Mexico's port system was fundamentally reorganized in 1993 with the passage of the Ports Law which created independent port administrations (APIs) that function as landlords while outsourcing operational control.[b] The goal of the reform was to increase competition for cargo between ports and allow the port administrations to offer concessions to private operators. This has led to a substantial reduction in federal subsidization of ports. Chinese investment has poured into the Mexican port system in recent years, particular for the new Pacific Coast hub of Lazaro Cardenas, which is an emerging competitor for West Coast Asian container trade.

a http://aapa.files.cms-plus.com/Statistics/MEXICAN%20PORT%20CONTAINER%20TRAFFIC%201999%20-%202010.pdf.

b Loftus-Otway et al. "An Evaluation of Mexican Transportation Planning, Finance, Implementation and Construction Processes", Center for Transportation Research, University of Texas at Austin October 2009.

Figure A-14. Port Planning in Mexico. Privatization Model

Table A-4. Port Planning in Brazil. Privatization with Central Planning

Brazil has developed a hybrid approach to port development, in which the federal government plays a central role, but the goal of federal government actions is to implement and manage a largely privatized system.

	Public use terminals	Private use terminals
Implementation	Obligatory public bidding process	Authorized by public authority
Period	Up to 50 years (including extension) Obligation to render services in a continuous manner	No limit set, limited to original type of service authorized Possibility of interruption of authorization in acordance with legal terms
Installations	Revert at end of contract	Do not revert at end of contract
Services	Open to all Rates charged are subject to supervision	Not open to all Serves owner exclusively (own cargo) or mixed (own cargo, complemented with third-party cargo) Possibility of selecting users and cargo
Manpower	Hired via OGMO	No hiring restrictions
Regulated by ANTAq	Resolution 55/2002 – Norm for concession of port areas and installations Consolidates and standardizes conditions within concession contracts	Resolution 517/2005 – Norm for construction and operation of private terminals Required to supply necessary installations and equipment to meet own cargo needs

Source: Reproduced from presentation by Augusto Wagner Padilha Martins, Vice-Minister of Ports, April 23, 2010.
See http://www.brazilcouncil.org/sites/default/files/100423_martinspresentation.pdf

Canada has enacted major reform and restructuring of its national port system in recent years. Canada's major ports (18 Port Authorities known as the National Ports System) have a legal designation under as Canada Port Authorities (CPAs). Canada Port Authorities were created by an Act of Parliament in 1998 under the Canada Marine Act (CMA), providing an overall governance structure for the management of Port Authorities while retaining local governance and control.[a]

> *"The National Marine Policy states, in part, that CPAs be given a high degree of autonomy and the ability to manage their assets in a commercial manner. The CPAs have the power to set fee schedules, negotiate commercial leases and contracts and to borrow funds from commercial lenders, within the limits set out in their Letters Patent."*[b]

The key elements of the new structure include: 1) requiring these new Authorities to be fully 'commercial' and completely 'self-sufficient' with no further funding from the Government of Canada; 2) setting strict borrowing limits for Port Authorities with operations funded solely from the CPA's stream of revenues with no ability to pledge assets to borrow; and 3) requiring Port Authorities to provide a portion of their gross revenues to the Government of Canada's general revenue fund.[c] It should be noted there are many other smaller ports outside of the 18 major CPA ports.

a http://www.acpa-ports.net/industry/industry.html.
b http://www.acpa-ports.net/advocacy/pdfs/Issue.Paper.2.pdf.
c http://www.acpa-ports.net/industry/industry.html.

Figure A-15. Port Planning in Canada. National Authority Model

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444 N Capitol Street, NW
Suite 249
Washington, DC 20001
2022-624-8182
transportaation.org

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