

CHAPTER 13: SUPPORTING MARINE COMMERCE AND TRANSPORTATION

Marine commerce and transportation are vital to the nation's economy and security. The waterborne movement of cargo and passengers requires an efficient marine transportation system that is smoothly connected to the nation's inland highway and rail infrastructure to meet current and future demands. In addition, improving the nation's marine transportation system depends on improved interagency coordination including between marine transportation and other important ocean and coastal activities, enhanced emergency preparedness and security at the nation's ports, and improved strategic planning to ensure that increased levels of marine commerce are managed in the most effective, safe, secure, and environmentally responsible manner possible.

CONNECTING PEOPLE, PLACES, AND PRODUCTS

Value of the Marine Transportation System

The U.S. marine transportation system is the nation's link to global commerce and an essential and growing component of the national economy. The movement of manufacturing jobs from the United States to overseas, the nation's dependence on raw materials from other countries, global competition to provide high-quality goods at competitive prices, and consumer demand have combined to increase the nation's dependence on the import of foreign materials and goods. At the same time, increasing affluence in foreign nations, coupled with worldwide population growth, has stimulated international demand for U.S. agricultural and manufactured products.

The world's oceans and inland waterways are the highways of choice for the global movement of this vast international trade. As the world's largest trading nation, the United States imports and exports more merchandise than any other country and has one of the most extensive marine transportation systems in the world (Table 13.1).¹ U.S. marine import-export trade accounts for nearly 7 percent of the nation's gross domestic product.² Domestically, coastal and inland marine trade amounts to roughly one billion tons of cargo, worth more than \$220 billion a year.³

Table 13.1. The Leading Role of the United States in International Trade
In 2000, the United States led the world in the value of trade conducted. U.S. trade accounted for 19 percent of total world imports and 12 percent of total world exports of merchandise.

Rank in 2000	Exporters	Value (Billions of current U.S. Dollars)	Percent	Rank in 2000	Importers	Value (Billions of current U.S. Dollars)	Percent
1	United States	781	12.3	1	United States	1,258	18.9
2	Germany	552	8.7	2	Germany	503	7.5
3	Japan	479	7.5	3	Japan	380	5.7
4	France	298	4.7	4	United Kingdom	337	5.1
5	United Kingdom	284	4.5	5	France	305	4.6
6	Canada	277	4.3	6	Canada	245	3.7
7	China	249	3.9	7	Italy	236	3.5
8	Italy	238	3.7	8	China	225	3.4
9	Netherlands	213	3.3	9	Hong Kong	214	3.2
10	Hong Kong	202	3.2	10	Netherlands	198	3

Source: U.S. Department of Transportation, Bureau of Transportation. *International Trade Statistics, 2001*. [http://www/wto.org/english/res_e/statis_e/its2001_e/i05.xls](http://www.wto.org/english/res_e/statis_e/its2001_e/i05.xls) (Accessed June, 2002).

The U.S. marine transportation system is a complex public-private sector partnership with many participants. It is an aggregation of state, territorial, local, and privately-owned facilities wherein federal, state, territorial, and local governments participate in management, financing, and operation. The system is a highly complex and interconnected mix of waterways, ports and terminals, water-based and land-based intermodal connections, vessels, vehicles, equipment, personnel, support service industries, and users. This system provides a number of services, including: supporting the waterborne movement of foreign and domestic cargo; moving passengers and vehicles through numerous ferry systems; serving recreational boating, commercial fishing vessels, and cruise liners; and generating millions of jobs for Americans and for the nation's international trading partners. The U.S. marine transportation system also plays an important national security role as a point of entry for foreign shipments and a conduit for the movement of military equipment, supplies, and personnel to and from overseas locations.

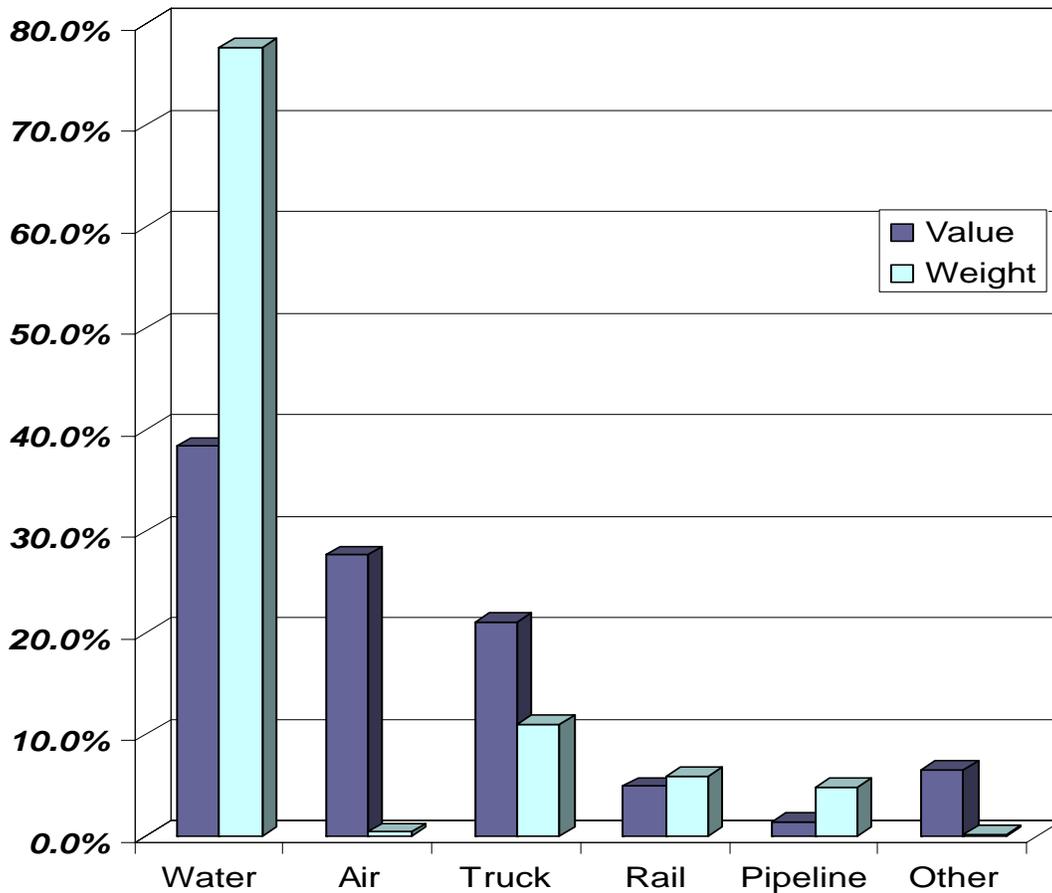
Components of the Marine Transportation System

Each element of marine transportation is a complex system within itself and is closely linked with all the other components. More detailed information about the U.S. marine commerce and transportation sectors is provided in Appendix 5.

Ports

The nation's marine, Great Lakes, and inland ports are critical components of the overall transportation infrastructure (Figure 13.2). Their efficiency and capacity are essential to U.S. importers, exporters, consumers, and domestic suppliers. The majority of U.S. international marine commerce flows through a relatively small number of ports that have the capacity to accommodate large vessels. Out of a total of 326 ports nationwide, 10 of them handle 85 percent of all containerized ship-borne cargo, with the ports of Los Angeles and Long Beach accounting for nearly 40 percent of all such cargo.⁴ Ports in Hawaii, Alaska, and the five U.S. trust territories and commonwealths play a special role because they are the primary economically viable link for the movement of commodities to and from these areas.

Figure 13.2. Ports Are the Primary Gateway for International Trade

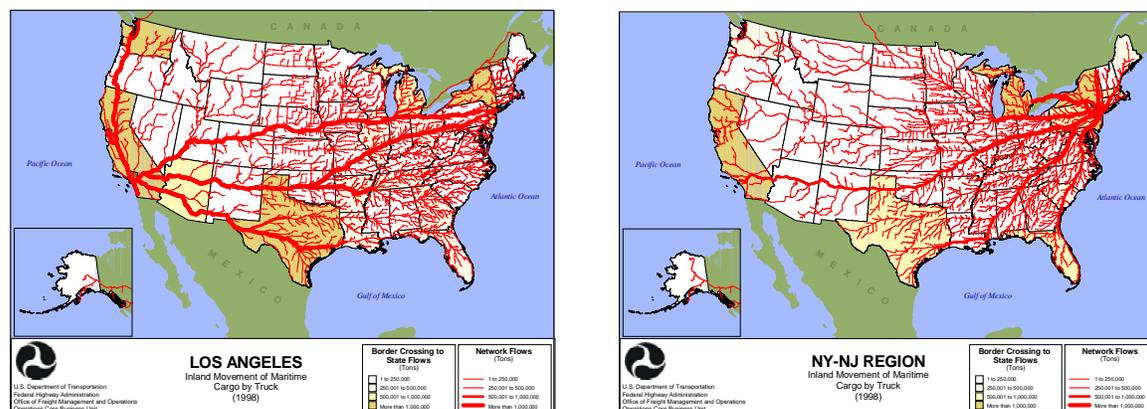


In 2001, U.S. ports were the major portal through which international trade entered and left the country. Marine commerce accounted for 78 percent of total U.S. international trade by weight (1,643 million tons) and 38 percent by value (\$718 billion).

Source: U.S. Department of Transportation, Bureau of Transportation Statistics. *U.S. International Trade and Freight Transportation Trends*. Washington, DC, U.S. Government Printing Office. 2003.

With international and domestic marine cargo projected to double over the next twenty years, a key issue will be the ability of the nation’s intermodal transportation system—its waterways, railways, highways, and airports—to move cargo into and out of U.S. ports (Figure 13.3). Some of the nation’s larger ports are already facing significant obstacles to moving cargo due to inadequate intermodal connections, particularly connections between ports and highways. Complicating this situation is the potentially competing demands being placed on the nation’s ports and waterways by passenger ferries, cruise liners, fishing vessels and recreational boating. With the possible exception of fishing vessels, all other marine sectors are expected to continue to show significant growth.

Figure 13.3. Goods Traveling through U.S. Ports are Transported Nationwide



Highways are major arteries for the flow of international freight throughout the United States. As seen in these two maps, the ports of Los Angeles/Long Beach and New York and New Jersey are hubs for the distribution and collection of truck cargo traveling throughout the nation.

Source: U.S. Department of Transportation, Federal Highway Administration. *Freight Analysis Framework*.

<<http://www.ops.fhwa.dot.gov/freight/Ports%20and%20Border%20Crossings/By%20State.htm>> (Accessed January, 2004).

Vessels

Ships entering and leaving U.S. ports include a mix of foreign and U.S.-registered vessels, and a broad variety of vessel types and sizes ranging from large container ships, tankers, and bulk carriers, to medium-sized barges, passenger ferries and cruise liners, and smaller fishing and recreational boats. As the number and size of vessels increase, additional pressures will be placed on the nation's ports and waterways. (For a discussion of issues related to vessel safety and environmental protection, see Chapter 16.)

The vast majority of international trade is carried out using foreign-registered and foreign-crewed vessels that can be operated at considerably lower cost than U.S.-registered vessels crewed by U.S. merchant mariners. The top twenty international merchant fleet nations operate more than 28,000 vessels worldwide. While the United States is ranked fourteenth, its share of the international fleet is only 454 vessels, or about 1 percent of the total. In contrast, the domestic U.S. marine fleet numbers more than 30,000 tugboats, towboats, and barges.⁵ The domestic fleet is protected from foreign competition in U.S. waters by the Merchant Marine Act, more commonly known as the Jones Act.

As international marine commerce has grown, ships have grown in size to accommodate increased amounts of cargo. The container ships of the 1960s could carry only a few hundred containers (commonly measured in 20-foot equivalent units, or TEUs). Today, 5,000 TEU vessels are quite common, and the largest container vessels can carry more than 8,000 TEUs, requiring navigation channels up to 50 feet deep. Bulk cargo ships are also increasing in size. For example, ultra-large crude oil carriers, known as super tankers, are approaching lengths of 1,500 feet and widths of 300 feet, requiring channels deeper than 90 feet.⁶

The U.S. marine transportation system also moves millions of passengers every year on cruise liners and ferries. The cruise industry has experienced constant growth worldwide since 1980. Globally, there were more than nine million cruise passengers with a little more than 70 percent, or 6.4 million passengers, embarking from U.S. ports in 2002 (Chapter 16, Figure 16.1), and 176 U.S. and foreign flag cruise ships operated in the North American cruise industry.⁷ This annual growth rate of just over 8 percent is expected to increase as the demand for cruise vacations grows.

The 168 U.S. passenger ferries, operating in thirty-five states, transported nearly ninety million people for work, leisure, and other purposes in 1999.⁸ Continued population growth in coastal metropolitan areas, coupled with increased vehicle traffic on the nation's highway systems, makes commuter passenger-vehicle ferries attractive transportation options for the future in selected areas. The U.S. passenger ferry industry has shown consistent growth, largely because coastal municipalities and states have invested in ferry systems to ease highway congestion.

Shipbuilding and Repair

Shipbuilding in the United States has historically been considered a strategic industry, supporting both military and commercial interests. Despite this important domestic role, the U.S. shipbuilding and repair industry is in serious decline. Employment is about 50 percent of what it was in the early 1980s, and companies have had to consolidate to survive.

Currently, the U.S. shipbuilding and repair industry consists of about 250 private companies and five publicly owned and operated repair yards.⁹ In 2002, the United States had only twenty-four major commercial shipbuilding yards capable of building vessels over 122 meters in length, and only nine of these were actively building ships.¹⁰ Combined, they accounted for only about 1.5 percent of total world ship tonnage on order that year.¹¹ Much of the U.S. commercial shipbuilding and repair industry works in niche markets, building and repairing mid-sized vessels including ferries, offshore oil and gas supply boats, research and patrol boats, small to mid-size container ships, tugboats, towboats, barges, fishing boats, luxury yachts, and U.S. military vessels. Although high operating costs prevent the U.S. shipbuilding and repair industry from being competitive internationally, the Jones Act insulates the U.S. industry from foreign competition on contracts related to the U.S. domestic and military fleets.

Navigational Aids

Aids to navigation—including buoys, warning lights, maps and charts, hydrographic and environmental data, and communications, positioning, and control systems—are essential to the protection of life and property and the enhancement of marine efficiency, especially as the number of larger and faster vessels visiting U.S. ports increases. Particularly important are recent advances in highly accurate and dependable navigation technology that have revolutionized safe marine passage, including harbor approaches and entrances, and avoidance of shallow water, bottom obstacles, and other vessels. Today's satellite-based global positioning system enables a wide range of mariners to plot a course within a few yards of their actual position. In addition, the National Oceanic and Atmospheric Administration (NOAA) has developed a suite of electronic navigational charts that incorporate global positioning information with high-accuracy data, such as real-time tide and current display capabilities for major U.S. ports and harbors. These charts are especially useful to mariners in meeting real-time navigation requirements to avoid collisions and groundings and in determining the best delivery routes.

Harbors, Channels, and Waterways

The nation's network of harbors, channels, and intracoastal and inland waterways is a vital component of both the U.S. marine transportation system and the overall U.S. intermodal infrastructure. In addition to providing corridors for international trade, this network links U.S. inland ports with coastal and Great Lakes ports, enabling the waterborne movement of domestic cargo, much of which is destined for the international market.

Dredging harbors, channels, and waterways to maintain and increase water depth and to widen and lengthen channels to accommodate wider and deeper-draft ships is critical for the successful operation of the nation's

ports. In 2001, the federal government spent \$868 million on dredging projects to maintain and deepen the nation's harbors and channels.¹² (See Chapter 12 for a discussion of the complex issues associated with dredging and other sediment management projects.)

Personnel

The U.S. marine transportation system requires a highly skilled and diverse workforce to handle increasingly computerized equipment and vessels, sophisticated electronic navigational aids, and new port technology for the movement of cargo. The U.S. Merchant Marine Academy, the six state-operated marine academies, and other marine education and training facilities in the United States offer training that covers virtually all facets of the U.S. marine transportation system, including at-sea ship operations, port management, marine business, marine facilities and environmental engineering, and marine safety and environmental protection. As the U.S. system becomes more complex, training requirements will increase. In this area as in many others, the nation should be positioned to meet the demand for the highly skilled workforce of the future.

POSITIONING THE U.S. MARINE TRANSPORTATION SYSTEM FOR THE FUTURE

For the nation's marine transportation system to meet current and future demands, ongoing maintenance, improvement, and expansion will be required. A key prerequisite for a robust system is better coordination, planning, decision making and allocation of resources at the federal level. In particular it will be essential to enhance the connections between this system and other modes of transportation, such as highways, railways, and airports. At the same time, in moving toward an ecosystem-based management approach, planning for the movement of cargo and passengers should be coordinated with the management of many other ocean and coastal uses and activities, and with efforts to protect the marine environment.

Federal Roles

Within the federal government, responsibility for marine commerce and transportation is spread among numerous agencies, primarily the U.S. Department of Transportation (DOT), U.S. Coast Guard, U.S. Army Corps of Engineers, NOAA, U.S. Customs Service, and U.S. Environmental Protection Agency. These agencies have many roles, including vessel traffic management, national security, marine safety, waterway maintenance, environmental protection, and customs.

In 2004, a National Research Council (NRC) report concluded that federal responsibilities for the marine transportation system are highly dispersed, decentralized, and poorly coordinated and do not mesh well with the structure and function of such system.¹³ Unlike the highway system, which is primarily the responsibility of DOT's Federal Highway Administration, and the U.S. aviation system, which is the responsibility of DOT's Federal Aviation Administration, the marine transportation system does not have a clearly defined lead federal agency. Statutory, regulatory, and policy differences among federal agencies with roles in marine transportation lead to fragmentation, competition, and in some cases, an inability to work collaboratively due to conflicting mandates. The NRC report was based on an analytical framework that examined four key federal interests: safety, security, commerce, and environmental protection. Federal policy makers can use this framework to identify critical needs within the system and target efforts to meet those needs most efficiently.

National leadership and support will be needed to achieve better integration within the federal government, better links with the rest of the nation's transportation infrastructure, and coordination between marine transportation and other important ocean and coastal uses and activities. The logical agency to assume this responsibility, as it does for the highway, aviation, and railway systems, is DOT.

Recommendation 13-1. Congress should designate the U.S. Department of Transportation (DOT) as the lead federal agency for planning and oversight of the marine transportation system and DOT

should submit regular reports on the condition and future needs of the system. The National Ocean Council should identify overlapping functions in other federal agencies and make recommendations concerning the advisability of transferring those functions to DOT.

Even with one clearly mandated lead federal agency, coordination will be needed among the federal and non-federal participants in the marine transportation system, given the significance of domestic and international trade to the nation and the complexity of the components that make up the system. In an effort to address this, eighteen federal agencies with responsibilities for various aspects of the U.S. marine transportation system signed a memorandum of understanding in 2000 that created the Interagency Committee for the Marine Transportation System.¹⁴

Federal Members of the Interagency Committee for the Marine Transportation System

U.S. Coast Guard	Federal Highway Administration
Maritime Administration	Federal Transit Administration
U.S. Army Corps of Engineers	Bureau of Transportation Statistics
National Oceanic and Atmospheric Administration	Research and Special Programs Administration
U.S. Navy	U.S. Air Force
U.S. Environmental Protection Agency	St. Lawrence Seaway Development Corp.
National Geospatial-Intelligence Agency	U.S. Department of Agriculture
U.S. Customs Service	Minerals Management Service
Federal Railroad Administration	Bureau of Export Administration

The committee's goal is to enhance information exchange among the member agencies; its safety, security, and environmental subcommittees also serve as forums for the resolution of shared issues. However, the ability of the committee to engage in more substantive policy or budgetary planning is very limited. To become more effective, the responsibility and accountability of the committee will need to be elevated.

Recommendation 13–2. Congress should codify the Interagency Committee for the Marine Transportation System and place it under the oversight of the National Ocean Council.

The Committee should:

- *be chaired by the U.S. Department of Transportation.*
- *improve coordination among all participants in the U.S. marine transportation system.*
- *promote the integration of marine transportation with other modes of transportation and with other ocean and coastal uses and activities.*
- *recommend strategies and plans for: better informing the public of the importance of marine commerce and transportation; devising alternate funding scenarios to meet short- and long-term demands on the marine transportation system; matching federal revenues derived from marine transportation with funding needs to maintain and improve the system; and delineating short- and long-term priorities.*

Because marine transportation involves many actors outside the federal government, the Marine Transportation System National Advisory Council was created to serve as a forum for coordination among nonfederal participants in the marine transportation system and a venue for providing input to the federal government on important national issues.

Nonfederal Member Organizations of the Marine Transportation System National Advisory Council

American Association of Port Authorities	National Association of Regional Councils
American Great Lakes Ports Association	National Association of Waterfront Employers
American Maritime Congress	National Governors Association
American Pilots' Association	National Industrial Transportation League
American Trucking Associations	National Mining Association
Association of Metropolitan Planning Organizations	National Waterways Conference
Boat Owners Association of the U.S. (BOAT US)	North American Export Grain Assoc., Inc.
Chamber of Shipping of America	Pacific Maritime Association
Conference of Minority Transportation Officials	Passenger Vessel Association
Inland Rivers, Ports and Terminals, Inc.	Shipbuilders Council of America
International Longshore and Warehouse Union	The Ocean Conservancy
International Longshoreman's Association	U.S. Chamber of Commerce
INTERTANKO	U.S. Exporters Competitive Maritime Council
Maritime Security Council	United States Maritime Alliance, Ltd. (USMX)
MIT Center for Transportation Studies	World Shipping Council

This nonfederal advisory council should be maintained and have direct advisory links to the National Ocean Council as well as to DOT where its charter resides. This body could be very helpful in improving collaborations between coastal management programs and the transportation planning and priority setting process.

Links to the National Transportation Infrastructure

An important step in allowing the U.S. marine transportation system to grow, while minimizing increased congestion, delays, and costs to U.S. businesses and consumers, is to improve the movement of cargo into and out of ports. Existing intermodal connections are inadequate to meet the expected increase in foreign and domestic trade. The nation's transportation infrastructure is largely an agglomeration of competing transportation modes, each focusing on its own priorities. While this approach has produced an extensive infrastructure, a national strategy is needed to enhance the connections among these modes, including the nation's ports, and ensure greater overall effectiveness.

Recommendation 13–3. The U.S. Department of Transportation should draft a new national freight transportation strategy to support continued growth of the nation's economy and international and domestic trade. This strategy should improve the links between the marine transportation system and other components of the transportation infrastructure, including highways, railways, and airports. Based on the new strategy, investments should be directed toward planning and implementation of intermodal projects of national significance.

In developing the national freight transportation strategy, DOT should emphasize strategic planning with states, regions, and the public sector as is already being carried out for the U.S. highway system.

The movement of cargo by inland and coastal waterways, known as short sea shipping, is an emerging mode of transporting cargo. Significant increases in short sea shipping between U.S. ports would help to alleviate highway and landside port congestion by decreasing the volume of truck and railway cargo entering and leaving U.S. ports. It would also serve to bolster the U.S. shipbuilding industry and the U.S. Merchant Marine as demand increased for U.S. port-to-port conveyance.

Recommendation 13-4. The U.S. Department of Transportation should conduct a thorough analysis and assessment of the potential societal and economic benefits of increased short sea shipping.

Information Needs

Planning for the future of the U.S. marine transportation system requires accurate and timely information, including estimates of the volume of current and future cargo transportation, their origins and destinations, and the capacity of the various transportation modes. Such information is essential to understand the strengths and weaknesses of the current system and the challenges and opportunities for improving its effectiveness. Transportation planners and coastal managers also need better information to improve connections between marine and landside transportation systems and to improve the overall management of the wide range of interrelated ocean and coastal uses and activities that includes the marine transportation system.

Recommendation 13-5. The U.S. Department of Transportation (DOT), working with other appropriate entities, should establish a national data collection, research, and analysis program to provide a comprehensive picture of freight flows in the United States and to enhance the performance of the nation's intermodal transportation system. DOT should periodically assess and prioritize the nation's future needs for ports and intermodal transportation capacity to fulfill the needs of the nation's expected future growth in marine commerce.

The freight information collection program should include:

- *economic models that project trade and traffic growth and determine the impacts of growth on U.S. ports and waterways and the inland infrastructures connected to them.*
- *models and guides to identify bottlenecks and capacity shortfalls.*
- *consistent, nationally accepted definitions and protocols for measuring capacity.*
- *innovative trade and transportation data collection technology and research to fill critical data gaps.*
- *assessment of the social and economic ramifications of marine transportation investments as compared to other transportation investments.*

Emergency Preparedness

Natural disasters, labor disputes, terrorist attacks, ship collisions, spills of hazardous materials, and many other human and naturally caused events can disrupt the flow of marine cargo and passenger services, causing severe economic and social ramifications nationally and internationally. Diminished port capacity might also affect vital military operations. A strategic scenario of a terrorist event conducted in 2002 demonstrated the potential for \$60 billion in losses in the case of a twelve-day closure of all ports in the nation.¹⁵

Labor disputes can also present significant interruptions in port operations. A ten-day lockout of workers at twenty-nine West Coast ports in October 2002 caused an estimated \$15.6 billion in losses to the national economy, and demonstrated the cascading consequences of a major port shutdown.¹⁶

Port Security

In the wake of the September 11, 2001 attacks, a major challenge has arisen to increase security at the nation's ports, including enhanced control of the six million imported containers and many hazardous cargo tank ships that move through U.S. ports annually. The U.S. Department of Homeland Security is coordinating extensive efforts to address port security, including the development of a National Maritime Transportation Security Plan, area-based security plans, and requirements for certain vessels and port facilities to conduct security threat assessments, develop security plans, designate security officers, perform drills, and take appropriate preventive measures.

Ship Collisions and Groundings

Ship collisions, groundings, and other types of underwater obstructions in and near ports can cause port closures, particularly when safe navigation is impeded. Cleanup operations in response to spills associated with such incidents may complicate the restoration of traffic flow. Further constraining the ability to plan for and respond to such problems is the lack of adequate salvage capabilities nationwide.

Natural Disasters

There are many historical examples of natural disasters—such as hurricanes, earthquakes, tsunamis, and droughts—affecting safe navigation and port operations. A 1994 tropical rainfall in Houston, Texas, caused the closure of the Houston Ship Channel for several days due to flooding, dangerous currents, pipeline breaks and fires, shoaling, and channel obstructions. Similarly, in September 2003, Hurricane Isabel forced closures and limited operations at major ports and shipping channels along the mid-Atlantic coast over the period of a week.

Escalating traffic flow combined with the increased potential for emergency port closures call for enhanced emergency preparedness and improved contingency planning for U.S. ports.

Recommendation 13–6. In developing a national freight transportation strategy, the U.S. Department of Transportation should work closely with the U.S. Department of Homeland Security and the Federal Emergency Management Agency to incorporate port security and other emergency preparedness requirements. The strategy should focus on preventing threats to national security and port operations and on response and recovery practices that limit the impacts of such events, including an assessment of the availability of alternative port capacity.

¹ National Chamber Foundation. *Trade and Transportation: A Study of North American Port and Intermodal Systems*. Washington, DC: U.S. Chamber of Commerce, 2003.

² Marine Transportation System National Advisory Council. *U.S. Economic Growth and the Marine Transportation System*. Washington, DC: U.S. Department of Transportation, December 18, 2000.

³ The Transportation Institute. "Industry Profile." <www.trans-inst.org/ind_profile.html> Accessed October 30, 2003.

⁴ U.S. Department of Transportation. *U.S. International Trade and Freight Transportation Trends*. Washington, DC, 2003.

⁵ U.S. Department of Transportation. *Maritime Trade and Transportation, 2002*. Washington, DC: U.S. Government Printing Office, 2002.

⁶ Hofstra University. <<http://people.hofstra.edu/geotrans/eng/ch5en/appl5en/tankers.html>> Accessed December 10, 2003.

⁷ Business Research and Economics Advisors. *The Contribution of the North American Cruise Industry to the U.S. Economy in 2002*. Arlington, VA: International Council of Cruise Lines, 2003.

⁸ U.S. Department of Transportation, Bureau of Transportation Statistics. *Transportation Statistics Annual Report 2000*. Washington, DC: U.S. Government Printing Office, 2001.

⁹ U.S. Department of Commerce. *National Security Assessment of the U.S. Shipbuilding and Repair Industry*. Washington, DC: U.S. Government Printing Office, 2001.

¹⁰ U.S. Department of Transportation, Maritime Administration. *Report of Survey of U.S. Shipbuilding and Repair Facilities*. Washington, DC: U.S. Government Printing Office, 2003.

¹¹ Ibid.

¹² U.S. Army Corps of Engineers. "Corps Dredging Facts." <www.iwr.usace.army.mil/ndc/factcard/fc02/fcdidu1.htm> Accessed October 30, 2003.

¹³ National Research Council. *The Marine Transportation System and the Federal Role*. Washington, DC: National Academy Press, 2004.

¹⁴ U.S. Department of Transportation. "Inter-agency Committee on the MTS." <<http://www.dot.gov/mts/>> Accessed October 30, 2003.

¹⁵ Booz, Allen, Hamilton. *Port Security War Game—Implications for U.S. Supply Chains*. Washington, DC, 2003.

¹⁶ Martin Associates. *Impact of the West Coast Port Shutdown*. Lancaster, PA: Pacific Maritime Association, March 10, 2003.