U.S. Economic Growth

and the

Marine Transportation System

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About This Paper

This paper was sponsored by the Marine Transportation System National Advisory Committee (MTSNAC), Chuck Raymond, President and CEO of CSX Lines, MTSNAC Chair; Frank Sims, President, Ag Producers Services, Cargill, Inc., MTSNAC Vice Chair. Produced under the direction of Joseph Miniace, President, Pacific Maritime Association, Team Leader—MTSNAC Awareness Group. Principal author, John Martin, Martin Associates. Data and analysis contributed by Thomas A. Ward, JWD (Jordan Woodman Dobson), and Richard Fullenbaum and Paul Bingham, WEFA. Edited by Robert Dockendorff, Vice President—Communications and Research, Pacific Maritime Association, and Carol Lambos, Esq., counsel to the United States Maritime Alliance Limited.

The MTSNAC is a non-federal council that consists of 30 marine transportation systems stakeholders with diverse interests mandated to study and advise the Secretary of Transportation on issues relevant to the marine transportation system.

This document was prepared as a discussion paper and does not necessarily reflect the opinions of the member organizations of the MTSNAC or of the organizations that participated in its preparation.

U.S. Economic Growth and the Marine Transportation System

I. Introduction

The United States, as the world's largest trading nation, accounts for nearly 20 percent of the world's oceanborne trade. This trade moves through a network connecting oceans, lakes, rivers, canals, locks, and dams with 25,000 miles of navigable inland and coastal waterways, all part of the Marine Transportation System (MTS). The MTS serves waterborne commerce through 326 public and private ports hosting 1,912 commercial cargo handling facilities. The MTS encompasses the movement of passengers through an extensive ferry system, and it serves recreational boating, commercial fishing, the cruise ship industry, the military, ship building yards, and ship repair facilities.

Even though the MTS is a vital component in the total U.S. transportation system, the public, who tend to be more aware of highways, railroads, and air transportation, overlooks it.

Public awareness of the MTS is of paramount importance because tremendous demands will be placed on the already overburdened system during the next two decades. Foreign trade and domestic cargo are conservatively estimated to grow at an annual compounded rate of 3.3%. This growth in cargo tonnage will double the throughput that the MTS will be required to handle by 2020.

The MTS is crucial to the health of the national and global economies. Not only does the MTS play a vital role in generating jobs for millions of Americans, but the MTS also generates millions of jobs in the economies of our trading partners.

In order for the MTS to meet future demands in an effective, reliable, dependable, and efficient manner, a partnership comprised of the federal government, the private sector, public port authorities, state agencies, and organized labor must be formed and must work together to guarantee that the necessary infrastructure and systems are developed and implemented.

The future of the MTS must be addressed now. A breakdown in the MTS system would have dire economic consequences for the U.S. and for global trade. The American people expect and deserve a technologically advanced, dependable, reliable, safe, effective, efficient, accessible, environmentally responsible, and globally competitive Marine Transportation System.

II. Economic Value of the Marine Transportation System

The Marine Transportation System (MTS) handled nearly 2.3 billion tons of waterborne cargo in 1999, including 1.2 billion tons of international cargo and 1.1 billion tons of domestic cargo. International waterborne cargo volume has more than doubled over the last 30 years, averaging a 3% annual growth rate. This sustained growth in cargo and an increased dependence on the global marketplace means that an efficient MTS is vital to ensure the future competitiveness of the United States in delivering its agricultural, manufactured and raw materials exports to the international market.

The international and domestic cargo components of the MTS, the coastal ports, inland waterways and the intermodal connections, are not the only important segments. The MTS also includes 168 ferry systems operating throughout the United States that handle about 68 million passengers per year. These passenger transit systems are essential sectors of the local economies of regions in which they are located, such as the Puget Sound in the Pacific Northwest, New York / New Jersey, the San Francisco Bay Area, and Boston, and the ferry systems provide an environmentally sound alternative to increased vehicular transportation.

Commercial fishermen landed 4.6 million tons of fish at U.S. ports in 1999, supporting a vibrant fish processing and distribution industry in coastal areas of the United States, particularly in the Pacific Northwest, the Gulf Coast and New England. The fishing industry provides jobs to thousands of fishermen, fish processing plant workers, and fish wholesalers and distributors.

The leisure time and vacation industry also depend on the MTS. This is highlighted by the growing cruise ship business. In 1999, nearly 5.9 million passengers boarded cruise vessels at U.S. port facilities, an increase of nearly 2.3 million passengers since 1990. Over the last decade, the cruise ship business has grown at an average rate of 5.5% per year and represents an important growth component of the MTS.

Finally, the contributions of the MTS to the recreational industry is underscored by the growth in pleasure boating activities and the increase in the number of marinas and yacht clubs offering services to the public.

The MTS Generates Millions of Jobs and Supports Millions More

The Marine Transportation System directly and indirectly generated 2.5 million jobs in 1999. These jobs are created by the cargo and passengers moving through ports, by maritime services that support the cargo and passenger operations, and by recreational activities on the MTS.

In addition to the jobs generated directly by activity on the MTS, an additional 4.9 million jobs are generated by the production of the waterborne exports that move via the MTS.

A total of 7.4 million jobs were generated by and are related to the MTS in 1999, accounting for nearly 6% of total U.S. employment.

A. The Economic Contribution of the Coastal Seaports

In 1999, a total of 1.2 billion tons of foreign trade import and export cargo valued at $630.8 billion[1] moved through the coastal seaports, including the Great Lakes. The value of this cargo represents 6.6% of the $9.6 trillion Gross Domestic Product. The coastal seaports also handled 228 million tons of domestic cargo, and another 114 million tons were handled in Great Lakes ports.[2]

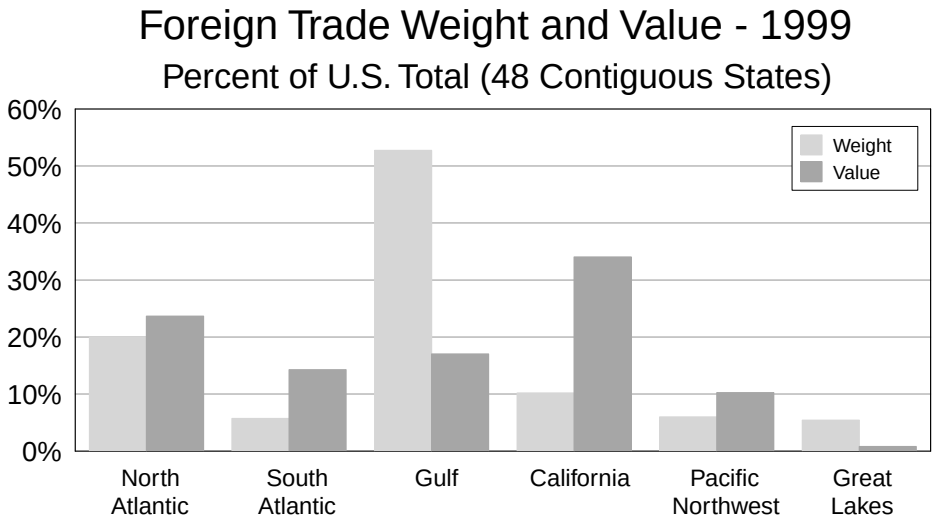
The handling of this cargo generated jobs, produced revenue to the firms providing marine support services, and generated local, state, and federal tax revenue. The handling of the cargo and the servicing of the ships that carry the cargo create jobs in diverse economic sectors. For example, when a ship enters a port, one or more tugboats may assist the vessel in maneuvering in the harbor while a harbor pilot comes on board to navigate the vessel through the approach channels. Steamship agents arrange for the needs of the ship and its crew while in port, including taking on supplies for the crew and vessel, arranging for tug and pilot services, and acting as the overall agent for the vessel owner. After the vessel has docked, stevedores and marine terminal operators arrange for the dockworkers to load and unload the ships. These dockworkers include members of the International Longshoremen's Association (ILA) working at East Coast, Gulf, and Great Lakes ports and members of the International Longshore and Warehouse Union (ILWU) working at West Coast ports. Local ship chandler firms provide supplies to the vessels, and local shipyards make repairs when needed. Other support industries include freight forwarders who arrange for further transport of the cargo, customhouse brokers who assist in clearing the import cargo, warehouses and distribution centers that are located off-dock where cargo can be stored and also processed, and government agencies that inspect cargo and provide safety and health inspections. Other firms provide maintenance and repair services to the trucks, cargo handling equipment, containers, and chassis serving the port.

The marine terminals serve as the intermodal connector where foreign trade changes transportation modes between land and water transit. Different types of cargo pass through different types of terminals. Cargo may be stored in warehouses, in grain elevators, in petroleum and chemical tanks, or in open storage areas such as those used for automobiles, steel structures and contain-

ers. Some perishable cargos such as frozen meats and poultry and fruits and vegetables, require temperature-controlled warehouses.

To measure the economic impact of foreign trade activity, Martin Associates[3] developed composite economic impact models for each coastal district. These composite economic impact models are derived from detailed economic data that Martin Associates developed for key ports in each district. More than 3,000 on-site and telephone surveys of members of the maritime communities served by the key ports support the models. The models measure the 1999 economic impact of cargo and vessel activity by coastal district: North Atlantic, South Atlantic, Gulf, North Pacific (Pacific Northwest), South Pacific (California), and Great Lakes.

Figure 1 - Foreign Trade Weight and Value by Coastal District



Source: U.S. Maritime Administration Office of Statistical and Economic Analysis Waterborne Databank

In 1999, the 1.2 billion tons of foreign trade handled in U.S. ports directly and indirectly employed 1,088,447 Americans who earned $43.8 billion in wages. This is an average of $40,220 per person, considerably above the national average of $29,386.[4] Businesses providing services to importers and exporters and services to vessel operators received $55.6 billion. Over $11 billion of federal tax revenues were collected and State and local governments, throughout the country, received $5.1 billion of tax revenue from these activities. Figure 2 summarizes the impact.

Figure 2 - Economic Impact of Foreign Trade in 1999

Jobs	
Direct	422,578
Induced	260,065
Indirect	405,805
Total	1,088,447
Personal Income (Billions of Dollars)	
Direct	$16.1
Induced	$16.2
Indirect	11.5
Total	$43.8
Business Revenue	$55.6
Federal Taxes	$11.1
State and Local Taxes	$5.1

Source: Martin Associates

i. Value of Coastal Seaports to Users

The MTS coastal ports system is vital to the movement of foreign trade, and the components of the coastal ports system are essential to the operation of the entire logistics system used by this nation's exporters and importers. The coastal ports system is the only economically feasible method for handling the export of raw materials, grains, most manufactured products and perishable cargoes. If the MTS component of the logistic system fails, not only are port industry jobs lost, but also the entire export-related economic sector suffers. For example, if the port system fails to provide an outlet for grain from the Midwest, the grain might either be moved into the domestic markets driving down the domestic price of grain and lowering the return to the nation's farmers, or the grain might be stored and possibly lost from both the domestic and foreign markets causing the farming economy to suffer even more severely.

The coastal ports system with its connections to the highway and rail system is vital to importers, including importers of retail consumer goods as well as importers of raw materials and manufactured products. Without the efficient port system and accompanying inland delivery system, imported consumer goods such as clothing, electronic goods, and seasonal fruit would not reach store shelves.

With respect to manufacturing activities, the growing reliance on "just-in-time" inventory underscores the need for an efficient port system to receive and to distribute imported manufacturing components.

In 1999, nearly $182 billion of export products were delivered to foreign markets through the Marine Transportation System. Not only did the delivery of these exports create jobs throughout the MTS, but also the production of these exports by the nation's farms, mines, and man-

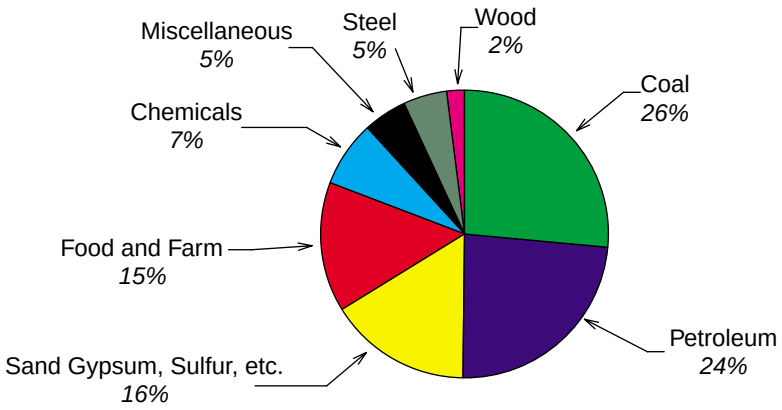
ufacturing facilities created jobs throughout the economy. To measure these impacts, a national input-output model of the U.S. economy, developed by WEFA, Inc.5, was used to translate the value of the waterborne exports into the number of jobs required to move them. In total, 4.9 million Americans are employed as the result of producing waterborne exports. Highlighting the value of the MTS to the nation's farmers is the fact that nearly 840,000 jobs are generated in the farming and food processing industry. In addition, 757,000 jobs are created in the nation's electronics and electronics equipment sector, and about 620,000 jobs in the country's automobile, farm equipment and transportation equipment manufacturing industry sector.

B. The Economic Contribution of Rivers and Inland Waterways

Domestic cargo moving on rivers and inland waterways totaled 631 million tons in 1999.[6]

The inland waterway system consists of a 12,000-mile network of navigable rivers and waterways augmented with locks and dams that have a replacement value of more than $125 billion. As shown in Figure 3, coal is the largest commodity moving on the system, accounting for 26% of the total tonnage, followed by petroleum products (24%), sand, gypsum, sulfur, etc. (16%) and food and farm products (15%).

Figure 3 - Cargo by Commodity Group Moving on the Rivers and Inland Waterways



Source: U.S. Army Corps of Engineers, 1999

The inland waterway system is vital for the transport of energy resources and agricultural products. Coal generates a large portion of the country's electricity, and the majority of waterside utilities in the Midwest and Southeast receive coal by barge transportation. Fifty-one percent of the nation's 600 oil refineries are located along the inland rivers and waterways and are served by barge. An estimated 82% of the nation's corn, 77% of the national production

of soybeans and 32% of the country's wheat are produced in ten Midwestern states that border the Illinois Waterway, the Mississippi, the Missouri, and the Ohio Rivers. In the states of Washington and Oregon, over $1 billion of grain, food and other products are transported on the Columbia-Snake River system.[7] Without an efficient inland waterways system, the nations' farmers could not compete in the global market place. If the grain and oil seed that now move on the Mississippi River were to be transported by rail, an additional 44,000 rail cars would be required.[8]

The importance of the inland waterways as a catalyst to job creation in the nations' heartland is underscored by the fact that nearly 800,000 jobs are supported by the nation's inland waterways cargo transportation services.[9]

i. A Microcosm of the Economic Value of the River System

The economic value of the 200 miles of waterways and river terminals along the Monongahela, Allegheny and Ohio River System that serve the Port of Pittsburgh demonstrates how critical the inland waterways system is to a regional economy. The cargo moving on the Monongahela, Allegheny and Ohio River System supports nearly 180,000 jobs and creates a payroll of $6.3 billion dollars. Of the 180,000 jobs, 18,400 are directly involved in the transport and handling of the cargo moving on the waterways, while 34,500 are employed by industrial users with facilties located along the river system. These industrial users include steel plants, chemical manufacturers, coalmines and power plants.[10] The balance of the jobs is supported in the local economy as the result of more than $6.8 billion of purchases by the water dependent industries and employees.

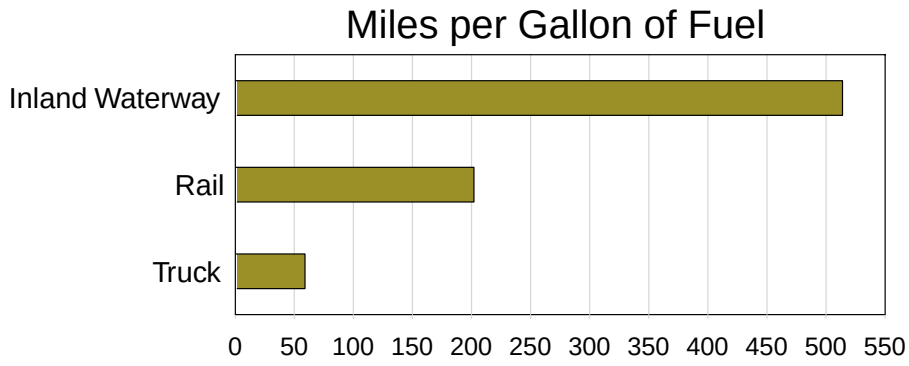
ii. Environmentally Friendly Water Transportation

Not only does the inland and intracoastal waterway system provide jobs, business revenue, and tax revenue to the nation's economy, but the inland waterways system provides an efficient and environmentally friendly method of transporting domestic cargo. Based on the Environmental Protection Agency analysis, towboats emit 35% to 60% fewer pollutants than do locomotives or trucks. Each barge load diverted from the river requires 58 more tractor-trailers on the nation's highways to move the same amount of goods. Similarly, each barge tow (15 barges) requires 870 more trucks. Another way to demonstrate the energy efficiency of barge transportation is to measure the number of miles that one ton of cargo can be moved for a gallon of fuel consumed by each mode of transportation.

As depicted in Figure 4, a barge can move one ton of cargo 514 miles per gallon of fuel compared to the railway system, which can move one

ton of cargo 202 miles per gallon of fuel. Trucks are the least energy efficient, moving one ton of cargo only 59 miles per gallon of fuel.[11]

Figure 4 - Relative Fuel Efficiency to Move One Ton of Cargo



Source: "Environmental Advantages of Inland Barge Transportation", U.S. Department of Transportation, Maritime Administration, August, 1994.

C. The Economic Value of the Nation's Passenger Ferry System

There are 168 ferry passenger vessel operating systems in the U.S. Of these, 72 are publicly supported and 96 are privately funded systems. Although ferry systems operate in 35 states, 44% of the total ferry systems are concentrated in California, Massachusetts, Louisiana, Michigan, New York and Washington. In 1998, these systems provided transportation for nearly 134 million passengers.[12]

Not only do these systems provide transportation for Americans and remove vehicles from the highways, hence minimizing environmental impacts, they also support jobs in the local economy. For example, in 1999, the largest ferry system operating in the United States, the Washington State Ferry System, directly employed 1,665 Seattle area residents, with an average salary (inclusive of benefits) of nearly $56,000 annually.[13]

D. The Economic Value of the Commercial Fishing Industry

Over the last decade the United States commercial fishing industry has been relatively stable, with commercial landings by U.S. fishermen averaging around 4.4 million tons. In 1999, 4.6 million tons of fish valued at $3.5 billion were landed at U.S. ports. The U.S. commercial fishing fleet consists of 26,000 commercial fishing vessels (over 5 net tons) documented with the federal government, and nearly 50,000 smaller fishing boats.[14] The registered fishing vessels range in size from factory processors that employ a crew of more than 100 crewmen to smaller boats that have fewer than five crewmen. Generally, it is assumed that the majority of the federally documented fleet has a crew of 3 to 4 fishermen; while state registered boats have one to two

fishermen. In addition, in 1999, 85,700 U.S. workers were employed with fish processors and wholesalers.[15] Overall, it is estimated that the U.S. commercial fishing industry contributed about $17 billion to the U.S. economy.

E. The Economic Value of Recreational Boating

The inland, coastal and intracoastal waterways of the MTS provide a valuable asset for recreational activities. In 1999, 78 million Americans participated in recreational boating and spent $23 million at the retail level for new and used boats, motors and engines, accessories and other marine related items and supplies. In 1999 Americans owned 16.8 million boats, which were served by 11,500 marinas, boatyards, yacht clubs and docominiums and parks.[16] This participation in recreational boating supports jobs, business income, and tax revenue throughout the United States.

Underscoring the impact of recreational boating to a local economy, a 1993 study of recreational boating in the State of Maryland measured the economic contribution of boating in Maryland waters at 18,000 jobs, $356 million in personal income, and $980 million of new economic activity to the state. The study further identified that 1 job is created for every 10.5 registered boats.[17] Applying this ratio, the 16.8 million registered recreational boats in the United States in 1999 would support about 160,000 jobs.

F. The Economic Value of the Cruise Ship Industry

The number of passengers embarking on cruises from U.S. ports has been increasing steadily over the last decade, reaching 5.9 million passengers in 1999. In response to this growing demand, the cruise industry has continued to expand its North American capacity, adding 18 ships to the North American fleet and bringing the size of the fleet to 149 ships in 1999. Cruise ship passenger activity at a port affects two sectors of a local economy in which the cruise port is berthed. These sectors are the:

- Maritime Service Sector
- Visitor Industry Sector

The Maritime Service Sector includes those firms that provide services to the cruise vessels while in port, such as:

- Chandlers and other local retailers and wholesalers that provide supplies and provisions to be used by passengers and crew, including suppliers of food, beverages, linen services, security
- Local advertising firms and travel agents
- Towing and pilot services that assist vessels in docking and undocking and navigating
- Ship repair yards
- Dockworkers involved in docking and undocking the vessel, as well as loading ship supplies

- Bunkering firms that provide fuel to the vessels
- Landside tours and other charters for the passengers
- Vessel crew stationed in the homeport

The Visitor Industry Sector consists of firms providing services to the passengers and crew of the cruise services. Included in this category are:

- Hotels and motels
- Restaurants/bars
- Retail goods
- Entertainment establishments such as movies, bowling, amusements, etc.
- Rental cars and cabs
- Airports and airlines moving the passengers to the cruise port

Each time a cruise vessel docks at a port, expenditures are made by the vessel operators and by the passengers in the above noted categories. These purchases, by both passengers and the vessel operators, generate jobs in the local and national economy. In 1999, it is estimated that the North American cruise industry created about 141,501 jobs throughout the U.S., of which 73,400 were in the core travel industry. The total economic contribution of the U.S. cruise industry in 1999 is estimated at $15.5 billion.[18]

III. Constraints to the Future Growth of the Marine Transportation System

The MTS has experienced significant historical growth. The MTS is critical to the national economy and creates 2.5 million jobs in industries providing the services to move the cargo and passenger traffic. The $182 billion of exports moving through the system supports more than 4.9 million jobs with the industry sectors producing the exports.

The marine transportation system is currently facing, and will face, increasing constraints to operational performance without significant investment in infrastructure and technology.

A. Constraints Facing the Coastal Ports

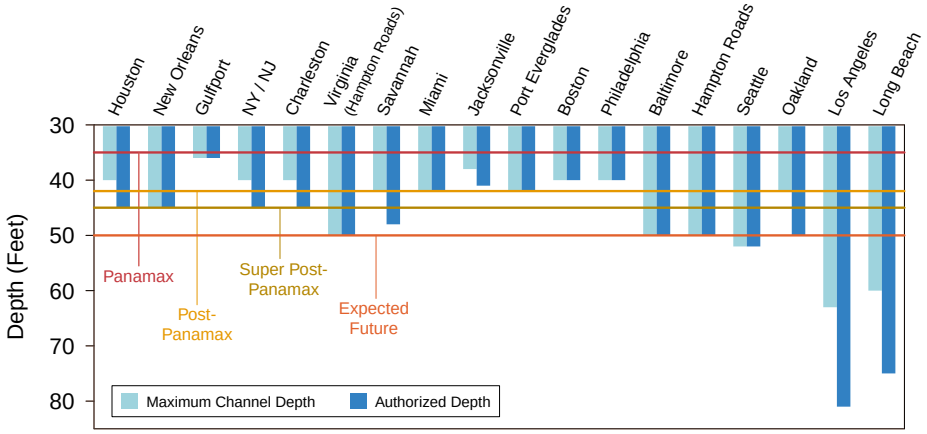
While the investment in the coastal port infrastructure has been and continues to be substantial, there are apparent constraints to the future performance of the coastal port portion of the MTS. The most significant potential constraints lie in the container-shipping sector. These constraints are as follows:

i. Channel and Harbor Depth

Prior to 1985, all container vessels were designed to be no larger than the maximum size permitted to pass through the locks in the Panama Canal. These ships, known as "Panamax", had a draft of no more than

39.5 feet, and were designed to carry up to 3,800 twenty-foot equivalent (TEU) containers. "Post-Panamax" ships are longer, wider, and deeper than Panamax ships, and hold many more containers. Currently container ships as large as 7,000 TEUs, with drafts up to 46 feet are being built. Container ships will continue to increase in size as the economics and technology of ship design allows. With the growth of these vessels, current channel and harbor depths at some of the nation's coastal ports will constrain these ports from being served by the larger vessels. Only 7 of the nation's ports currently have harbors with a water depth of 45 feet or more. As a result, the ports without such water depth and without plans for harbor and channel deepening will be excluded from handling the new generation of container ships. By limiting the ability of these ports to handle the larger vessels, the economic benefits of the ports will likewise be constrained. Figure 5, prepared by JWD (Jordan Woodman Dobson)19, identifies those ports that are draft constrained.

Figure 5 - Draft Constraints at Key Container Ports



Source: JWD (Jordan Woodman Dobson)

ii. Cargo Terminal Constraints

Increased trade will require increased investment in plant and equipment at the marine cargo terminal. The marine cargo terminals are in an escalating struggle with commercial developers to acquire waterfront property. The Ports of Los Angeles and Long Beach are currently building several new terminals in response to recent annual growth rates of 8% to 10%. These new terminals will become available over the next three to four years. After that, future development at these two busiest container ports in the U.S. will be severely constrained. Other Pacific Coast ports will face similar constraints. The picture on the Atlantic and Gulf Coasts is somewhat better. New York, Virginia, Charleston, Jacksonville, and Houston are among ports that have terminal expansion po-

tential, however, environmental impact issues may curtail development of some of the sites that have been identified by these ports.

B. Finding Solutions for Coastal Port System Constraints

One method to increase the capacity of land-constrained container cargo terminals is to increase the density of the terminals — simply stated, put more containers through a given acre of land. To do this, advanced emerging container terminal technologies must be adopted, advanced information systems instituted, and new infrastructure developed.

i. Automated Terminals

There has been substantial research into the automation of marine container terminals in Europe, Asia and Australia. Semi-automated terminals have been introduced in Rotterdam, Hong Kong, Southhampton, and Singapore, and they will soon come on line in Hamburg, Antwerp, Korea, and possibly Melbourne. The technology is still evolving, but it could be deployed to economic advantage in the U.S. This technology would increase the utilization of port land and improve port movement efficiency and productivity. However, institutional barriers, including long established work rules, will continue to deter implementation of this technology until the Industry comes to terms with dealing with the barriers.

ii. Integrated Terminal Management Systems

In parallel with the move to automate container terminals, there has been substantial research into improving the integration of marine terminal operations. It is now possible to have seamless, paperless tracking of all freight movements and transactions between parties. It is also possible to automate equipment assignments in the terminal and to optimize terminal operations in the face of complex, competing demands. It is important that labor and management hasten the implementation of these technologies.

iii. Port Traffic Coordination Systems

In an effort to manage and reduce road truck congestion, many ports worldwide have invested in port traffic coordination systems. Truckers are given port identification cards. Truck transactions are tied to the identification cards, and visits to the terminals are scheduled to reduce demand on roads, and to smooth out the demand on terminal facilities. These technologies are being implemented in some U.S. port areas on a private basis with support from local port authorities. Broader implementation could further reduce the environmental impacts of port op-

erations.

Complementing the advances in technological applications to enhance terminal capacity are similar systems designed to increase the efficiencies for terminal access by rail and truck. Such systems include:

a. On-Dock Intermodal Rail Yards

Intermodal rail yards have been included in the design of many marine container terminals since 1990, reflecting the rapid growth of trans-continental container movements. The use of these facilities reduces the demand on local highway and road infrastructure. However, commercial and physical constraints have deterred the full utilization of these facilities.

b. Off-Dock Intermodal Rail Yards

The alternative to multiple individual on-dock rail yards is common-user off-dock or near-dock intermodal rail yards. These facilities reduce demand on highways, but not on port-local roads. Smaller shipping lines are more comfortable using these off-dock facilities because of logistics systems that are more proportional to their needs.

c. The Inland "Dry" Port

It was postulated in a recent study that the demand on port property could be substantially reduced if containers were to be rapidly shuttled to and from nearby inland "dry" ports by high-speed shuttle trains. Receipt and delivery of containers would take place at these inland terminal facilities, reducing the demand on port-local road systems. Such a system would fundamentally change the logistics system of any port, but is not clear how the costs of such a change would be distributed. Port logistics are so complicated that no large port has yet committed to try this idea.

d. Dedicated Corridors

To optimize the movement of cargo by rail, the Ports of Los Angeles and Long Beach are jointly developing the Alameda Corridor Project. The Corridor will connect the ports' marine and intermodal terminals to the main Los Angeles rail yard via a dedicated, grade-separated, high-speed artery. As port traffic continues to increase, such corridors may become necessary in other major ports, but the investment required is immense.

iv. Information Systems Applications

Finally, the growth in information systems applications has and will continue to improve efficiencies in the coastal as well as inland port sectors

of the MTS. The growth of the "business-to-business" capabilities of the Internet has fostered greater integration of logistic operations. Success of this approach requires inexpensive, reliable, paperless freight handling, so that all aspects of goods transport can be arranged, tracked, and managed electronically.

Ports, shipping lines, truckers, freight forwarders, brokers, railroads, distributors, warehouses, and retailers are all investing in integrated data systems that support this activity. The federal government has also participated, through the development and fostering of Electronic Data Interchange tools for Customs and the like. There are still many breaks in the chain of electronic data, including restrictions on the use of automated data systems in many port facilities and continuing governmental requirements for some paper documents. Elimination of these breaks will allow freight to be handled more efficiently, reliably, and quickly, reducing the overall burden on port and hinterland transportation systems.

C. Constraints to the Inland Waterways System

The majority of the locks and lock chambers in place on the inland waterways are less than 1,000 feet in length. The U.S. Army Corps of Engineers reports that 15% of the locks are 1,000 to 1,200 feet long, 60% are 600-900 feet long, while 25% are less than 600 feet long. Furthermore, about 50% of the locks and dams are over 50 years of age and reaching the end of their economic life.

Not only is age and the need to replace these aging locks and dams a constraint on the ability of the inland waterways to handle cargo in the future, but the size of the locks limit the size of the tow that can pass through the lock system. A 1,200-foot lock can accommodate a tow consisting of 17 barges, while the older locks of 600 feet or less can only accommodate tows consisting of 8 barges. Since the majority of the tows on the inland waterways, especially the Mississippi River System, consist of 12 or more barges, the tows must be split in half in order to transit a 600-foot lock. The splitting of the barge tow results in an increase in transit time for cargo, and also creates queues of barges on the waterways waiting to enter the smaller and older lock systems.[20]

The inefficiency of the older lock and dam system results in direct costs to the barge operators as well as to the other users of the inland waterways system. The National Corn Growers Association reports that such lock delays on the Upper Mississippi River cost farmers an average of $94 million per year during the mid-1990's. The replacement of these older and smaller locks will be paramount in providing an efficient delivery system for the nation's agricultural exports to global markets. If lock improvements are not made, it is esti-

mated that by the year 2020, midwestern exporters of corn, soybeans and wheat will experience losses of $364 million annually due to the inability to compete effectively in the world markets.[21]

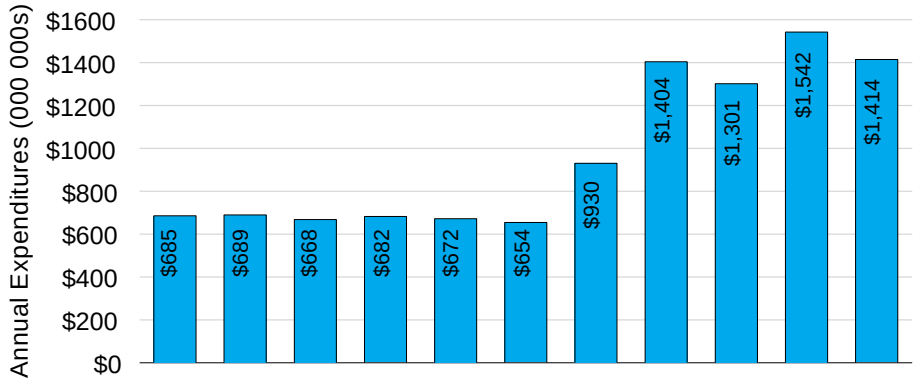
IV. The Supporting Infrastructure

This MTS economic engine did not develop without cost. The economic value of the investments in the various MTS sectors is described below.

A. Coastal Port Investment

Coastal port investments fall into two key categories: investments by public port agencies and investments by the federal government and investment by the private sector. Figure 6 shows how port capital investment has accelerated during the past five years. Public ports have invested almost $20 billion in port-related capital improvements since 1946. Ports have made almost one third of these expenditures between 1994 and 1998. These sustained high levels of investment highlight the public port industry's efforts to meet the nation's waterborne transportation needs.

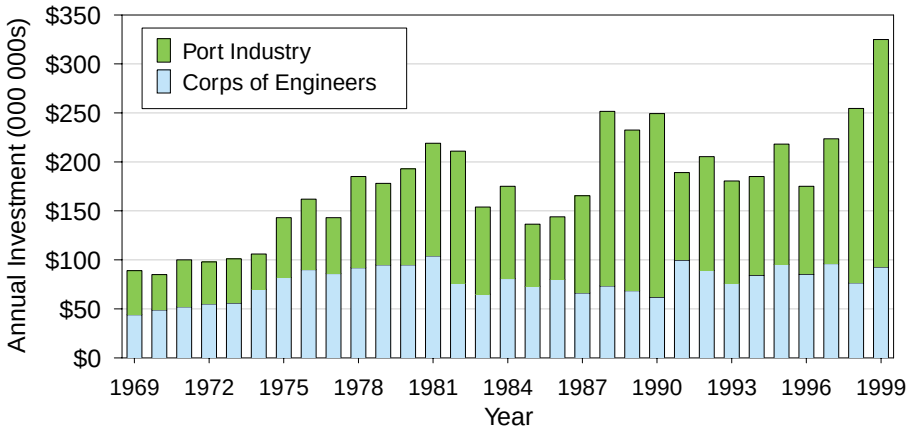
Figure 6 - Annual Investments by Ports



Source: MARAD/AAPA

Almost all of the federal government's investment in MTS infrastructure is in the form of dredging, either maintenance dredging or harbor deepening. Figure 7 shows the recent history of dredging investments in the nation's ports by the United States Corps of Engineers (USACE) and by the port sector. Note the increase in dredging investment following 1985, reflecting the introduction of Post-Panamax container ships. (The Post-Panamax vessels are too large to transit the Panama Canal and require harbor water depths of 40 ft. and greater). It is also important to note that USACE's level of investment has remained relatively constant, with the balance being absorbed by local port investment.

Figure 7 - Dredging Investment



Source: JWD (Jordan Woodman Dobson)

B. River and Inland Waterway Investment

The inland waterways consist of 12,000 miles of navigable waterways, supported by 191 lock systems and 237 lock chambers. These lock systems provide the essential infrastructure that allows the river traffic to "stair step" its way through the inland waterways system. The replacement cost of these locks and chambers is estimated by the U.S. Army Corps of Engineers to be in excess of $125 billion. Replacement of these locks will be a major capital expenditure in the years to come in order to accommodate the future traffic on the nation's inland waterways.

Overall, the United States Army Corps of Engineers' annual expenditures for operations, new construction, maintenance and repair on the inland waterways has averaged around $872 million between 1987 and 1994. However, spending has been reduced to around $700-$750 million annually since 1997.

V. The Future of the Marine Transportation System

WEFA, Inc. projects that international waterborne cargo will grow at an average annual compound rate of 3.3% through the year 2020, reaching 2.5 billion tons by the year 2020. Imports are projected to reach 1.7 billion tons, while exports are projected to grow to 0.8 billion tons. In the absence of capacity constraints within the coastal ports and the inland waterways system, this projected growth in foreign waterborne trade through coastal ports would generate more than 1.9 million jobs annually by the year 2020, $75.3 billion of wages, and contribute about $30 billion in tax revenue to local, state and federal governments. These impacts do not include the employment and economic activity that would be generated by the firms exporting and importing cargo. The export segment alone generated 4.9 million jobs in 1999.

If the MTS is to adequately handle the projected growth in cargo and the expected growth in other users of the system, the critical capacity issues at the coastal ports as well as on the inland waterways must be addressed. In order for the coastal ports and inland waterways to handle projected increased foreign trade the MTS partners must provide for and maintain deeper harbors, adopt new terminal technologies, and implement state of the art information systems. Without the modernization of the lock and dam system on the inland waterways, the expeditious delivery of increasing amounts of agricultural exports, energy products, and construction materials may not occur. If this is the result, cargo will be shifted from the waterways, creating additional strain on the nation's rail and highway system and further adding to the deterioration of the nation's environmental quality.

The development of the MTS has required billions of dollars of investment. If the system is to grow to meet future demand, a commitment must be made for further capital investment.

The needed infrastructure and technological investments will be achievable with a strong and committed partnership of the private sector, federal government and organized labor. Without such dedicated cooperation, the MTS cannot grow or even maintain its role as the economic engine supporting 6% of all employment in the nation.

The future of the MTS must be addressed now! The country must have a technologically advanced, dependable, reliable, safe, effective, efficient, assessable, environmentally responsible, and globally competitive Marine Transportation System.

Footnotes:

[1] United States Maritime Administration Office of Statistical and Economic Analysis Waterborne Data Bank.

[2] 1999 U.S. Army Corps of Engineers Navigational Data Center.

[3] Martin Associates, located in Lancaster, PA, was founded in 1986 by John Martin, PhD to provide personalized consulting services to the port and maritime industries.

[4] Based on the "National Compensation Survey: Occupational Wages in the United States, 1998", U.S. Department of Labor, Bureau of Labor Statistics, December 1999.

[5] WEFA, a subsidiary of the Primark Corporation, is one of the world's leading economic consulting firms. Founded in 1963 by Lawrence R. Klein, 1980 Nobel Laureate in Economics, Wharton Econometric Forecasting Associates (WEFA) offered independent forecasts for business planning and analysis.

[6] 1999 U.S. Army Corps of Engineers Navigational Data Center.

[7] Waterways Work: Navigation and Water Resource Programs Selected Information Sheets: "Importance to American Agriculture"; "The Importance of Ports and Waterways to America's Domestic and State Economies"; "Transporting Fuel Products: Fueling the Nation's Economic Engine"; Importance to America's Coal Industry", National Waterways Alliance.

[8] Waterways Work, Navigation and Water Resources Programs:" Importance to American Agriculture, National Waterways Alliance.

[9] "The Importance of the Inland and Intracoastal Waterways to State Economies", Mercer Management Consulting, 1995.

[10] "The Economic Impacts of Pennsylvania Ports, Prepared for Pennports", Martin Associates, 1998.

[11] "Environmental Advantages of Inland Barge Transportation", Division of Domestic Trade, Maritime Administration.

[12] "MTS Report to Congress", U.S. Department of Transportation, September 1999.

[13] " Economic Impact of the Port of Seattle", Prepared for the Port of Seattle, Martin Associates, September, 2000.

[14] "Fisheries of the United States, 1999", National Marine Fisheries Service, Office of Science and Technology, Fisheries Statistics and Economics Division, October 2000.

[15] "Fisheries of the United States, 1999", National Marine Fisheries Service, Office of Science and Technology, Fisheries Statistics and Economics Division, October 2000.

[16] National Marine Manufacturers Association.

[17] "Recreational Boating In Maryland", Maryland Sea Grant College Program, Publication Numbers UM-SG-MAP-95-02, 1993.

[18] "Contribution of the North American Cruise Industry to the U.S. Economy in 1999, An Analysis of the Industry's Economic Contribution to the U.S. National and State Economies", Submitted to the International Council of Cruise Lines, by WEFA, Inc. and Business Research and Economic Advisors, September 2000.

[19] JWD (Jordan Woodman Dobson) is a planning, architectural, and engineering firm that has provided port planning services since 1964.

[20] "Inland Waterway Navigation, Value to the Nation", U.S. Army Corps of Engineers.

[21] "Economic Benefits of Improving the Upper Mississippi and Illinois Rivers", National Corn Growers Association and Texas A&M.