

Southwest Region University Transportation Center

**Economic Changes Facing Ports and Factors
Affecting Port Competitiveness**



PB99-121303

SWUTC/98/472840-00047-1

REPRODUCED BY: **NTIS**
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National Technical Information Service
Springfield, Virginia 22161



**Center for Transportation Training and Research
Texas Southern University
3100 Cleburne Avenue
Houston, Texas 77004**

1. Report No. SWUTC/98/472840-00047-1		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle Economic Changes Facing Ports and Factors Affecting Port Competitiveness				5. Report Date October 1988	
				6. Performing Organization Code	
7. Author(s) Ronald Goodwin and Guy Hampton				8. Performing Organization Report No. 472840-00047-1	
9. Performing Organization Name and Address Center for Transportation Training and Research Texas Southern University 3100 Cleburne Avenue Houston, TX 77004				10. Work Unit No. (TRAIS)	
				11. Contract or Grant No. DTOS88-G-0006	
12. Sponsoring Agency Name and Address Southwest Region University Transportation Center Texas Transportation Institute The Texas A&M University System College Station, Texas 77843-3135				13. Type of Report and Period Covered	
				14. Sponsoring Agency Code	
15. Supplementary Notes Supported by a grant from the U.S. Department of Transportation, University Transportation Centers Program					
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17. Key Words Container Vessels, Mega Ports, Port Competitiveness			18. Distribution Statement No Restrictions. This document is available to the public through NTIS: National Technical Information Service 5285 Port Royal Road Springfield, Virginia 22161		
19. Security Classif.(of this report) Unclassified		20. Security Classif.(of this page) Unclassified		21. No. of Pages 67	22. Price

**ECONOMIC CHANGES FACING PORTS AND FACTORS
AFFECTING PORT COMPETITIVENESS**

Ronald Goodwin

and

Guy Hampton

Research Report SWUTC/98/472840-00047-1

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**Southwest Region University Transportation Center
Center for Transportation Training and Research
Texas Southern University
3100 Cleburne
Houston, TX 77004**

October 1998

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ACKNOWLEDGMENT

Support was provided by a grant from the U.S. Department of Transportation, University Transportation Centers Program to the Southwest Region University Transportation Center.

ABSTRACT

This is a study conducted to assess characteristics of modern US ports and their abilities to adapt and accommodate constantly increasing changes and functions. Among the challenges ports face are larger vessels and berths, deeper port drafts, new and more expensive technologically advanced cranes and equipment, and the ability to move massive amounts of containers in or out of ports in a short span of time. In addition, ports face environmental, land and funding issues. On occasion, federal or state agencies create issues resulting in the ports not being as efficient as they could or should. This paper attempts to address those issues and make some recommendations. Five major US ports are studied, all of which are modern, facilitate huge traffic volumes, and are poised to function as the ports of the future. The five ports studied here are the Port of New York & New Jersey, Port of Houston, Port of Long Beach, Port of Los Angeles, and the Port of Virginia.

EXECUTIVE SUMMARY

Seaports are increasingly getting larger and volumes are steadily growing for ocean borne trade. Sea trade (import and export goods) is the lifeblood of most regional economies and is responsible for growth and development in many areas closest to huge bodies of water. Just as economic dynamics are causing industries to merge and consolidate to achieve greater operational efficiencies, so too are the ocean carriers feeling such pressure of consolidation. Steamship lines and other ocean borne carriers are buying their competition or merging themselves and are eliminating many stops and consolidating others. With the increases in business and trade volumes, vessels necessary to move the commodities have also gotten bigger and have been redesigned to carry constantly changing types of cargo. Increasingly, Post Panamax vessels (ships too large to traverse the Panama Canal Zone) are being utilized for containerized cargo and many of these huge vessels are not able to dock at the traditional ports. The Post Panamax vessels allow shippers and steamship lines to move greater volumes of containers on a single vessel.

The new vessels of choice are capable of carrying 4,000 to 6,000 twenty-foot equivalent container units (TEU). The increased capacity allows operators to realize greater operational efficiencies, and has to a great extent, encouraged vessel sharing between operators, and caused the elimination of many shallow draft port of calls as they are unable to accommodate the larger vessels. As this process has evolved, which is akin to the air industry “hub and spoke” method, so-called “mega-ports” or “load centers” in both the port and rail industries are coming into existence. In the shipping industry, only

those ports which are willing to offer the minimal 45-foot drafts, have the necessary physical and equipment infrastructure, and those having political and legislative supports, who realize the wave of future port direction will survive as mega-ports. Others will exist as minor ports or serve as alternatives to the mega-ports.

Future ports that desire to service the next generation of sea-going vessels will have to modify existing operations to become deep-draft ports (minimum of 50 feet deep) with all the accompanying conveniences and multimodal connections. All others will be relegated to marginal use and secondary status among port operations. Deep draft ports will offer ready highway access and on-dock rail and terminal facilities, and will be the rule rather than the exception. The majority of the bigger ports today do not offer direct rail service; arrangement is made to shuttle by truck to the rail facilities or from the rail facility to the port.

Currently, only three U.S. ports have 50-foot draft depths, they are Los Angeles/Long Beach, the Port of Virginia at Norfolk and the Port of Seattle---which offer the nations deepest drafts of 50-70-foot depth.¹ Other major ports have done feasibility studies on deepening their ports or have projects in the works to accomplish this 50-foot goal. They include Houston, New Orleans, Oakland and the Port of New York & New Jersey.

Only a few U.S. ports will achieve "load-center/mega-port" status. Those ports located at major cities and currently doing large volumes of business will continue to do so while developing to the next level. These ports are current in their operations and are primed for developing trends. Located at these facilities are deep-drafts, large

¹Vickerman, M. John, "Port Financing Strategies," Ports and the Intermodal Challenge in the Face of Reduced Resources, Jan. 13, 1997.

technologically advanced cranes and equipment handling components, ample labor, available rail and highway connections and other infrastructure resources. Economics and access will be the main determinants of the load-center/mega-port status.

Smaller ports will continue to operate in their current capacities, while some will see business grow to previously unseen volumes. This will be due primarily because marine volumes are growing so rapidly and will continue into the foreseeable future. Large vessels will call on these ports, but the mega-vessels and larger future generation vessels will not. The small and intermediate ports will serve as feeder-hubs to the load-center/mega-port terminals in the hub-and-spoke mode.

A question all port authorities must ask is, "are port upgrades worth the costs and efforts to enlarge?" In many instances the answer is a resounding "no". Why? Because port upgrades are extremely expensive with dredging, property acquisition, cranes and yard equipment investment, establishment of track and rail components and other infrastructure requirements. Many port facilities users are unwilling to or cannot afford to pay the high costs of port operations. Government is expected to provide funding and resources in many instances, and is sometimes unwilling to make the financial commitments necessary.

Having an expanded, bigger and busier port also results in increased traffic congestion, rail tie-ups, and more trucks on the roads increasing pollution while making an adverse environmental impact. Most communities are willing to accept adverse conditions associated with port growth when the economics of jobs creation, associated

industry growth and other ancillary benefits, such as stature and recognition, are considered.

What effects, advantages, and benefits does port expansion bring to a community and its general area? Ports achieving mega-port status will have to invest in new state-of-the-art cranes, additional yard operations equipment, and additional storage space to accommodate the influx of more containers, and in some instances, numerous more containers, considering the capacities of the mega-ships. Whether a mega-ship is arriving at a port or departing, the ability to move huge amounts of containers must be available by truck and by rail. As these vessels move in and out, they will place a tremendous burden on the host facility and its surrounding area in moving huge traffic volumes quickly. Because of its vast size, the mega-ship will not need to make as many port calls as many of the ships today are required to do to maintain adequate levels of economic efficiency.

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INTRODUCTION AND BACKGROUND

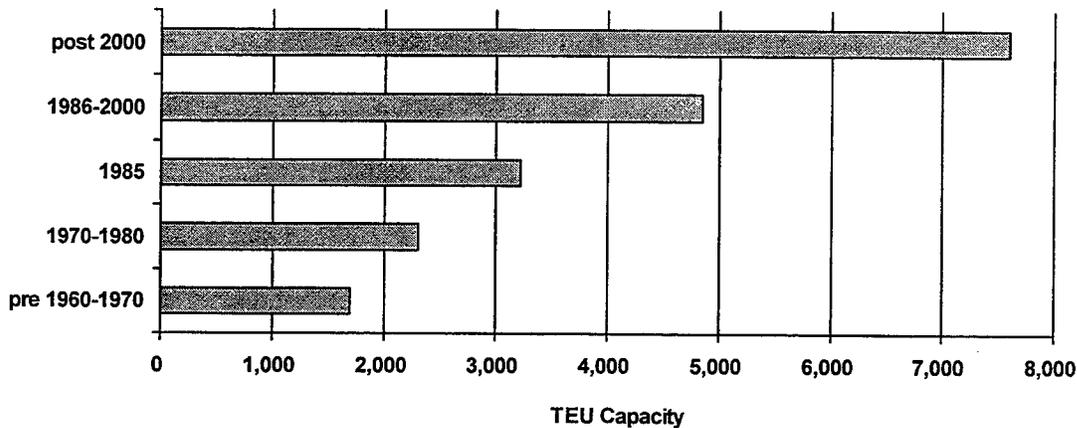
Seaports are increasingly getting larger and volumes are steadily growing for ocean borne trade. Sea trade (import and export goods) is the lifeblood of most regional economies and is responsible for growth and development in many areas closest to huge bodies of water. Growth within port cities happens to a much greater extent than to areas further inland. New York City and Los Angeles, and their surrounding vicinities are prime examples of this. At America's inception the port cities were the quickest to develop because of their strategic port locations. These areas are located where vessels have traditionally dis-embarked bringing both people and goods to the area.

Just as economic dynamics are causing industries to merge and consolidate to achieve greater operational efficiencies, so too are the ocean carriers feeling such pressure. Steamship lines and other ocean borne carriers are buying their competition or merging themselves and are eliminating many stops and consolidating others. With the increases in business and trade volumes, vessels necessary to move the commodities have also gotten bigger and have been redesigned to carry constantly changing types of cargo. Increasingly, Post Panamax vessels (ships too large to traverse the Panama Canal Zone) are being utilized for containerized cargo and many of these huge vessels are not able to dock at the traditional ports. The Post Panamax vessels allow shippers and steamship lines to move greater volumes of containers on a single vessel.

The new vessels of choice are capable of carrying 4000 to 6000 twenty-foot equivalent container units (TEU).¹ (A TEU is the marine measurement of containers in twenty-foot equivalents. Thusly, a forty-foot container would measure as two (2) twenty-

foot containers). These larger vessels in some instances carry twice the volumes of their predecessors. Container ships have increased in TEU capacity since the 1st generation was introduced prior to 1960. There was a 26 percent increase in TEU capacity between the 1st generation (pre 1960 to 1970) and the 2nd generation (1970-1980). An increase was also experienced between the 2nd generation and the 3rd generation (1985) of 28 percent. Between the 3rd generation and 4th generation (1986-2000) the percent increase reached 33 percent. Experts anticipate the 5th generation container ship will be able to accommodate TEU capacities of at least 7,598, a 36 percent increase from the 4th generation container ships (figure 1). The future requirements for these “mega ships” are in figure 2. Experts also predict that containerized shipping will carry cargo totaling nearly 350 million TEUs by the year 2004 (figure 3).

Figure 1
The Evolution of Container Ship Capacity



Source: Vickerman, Zachary, and Miller, 1997

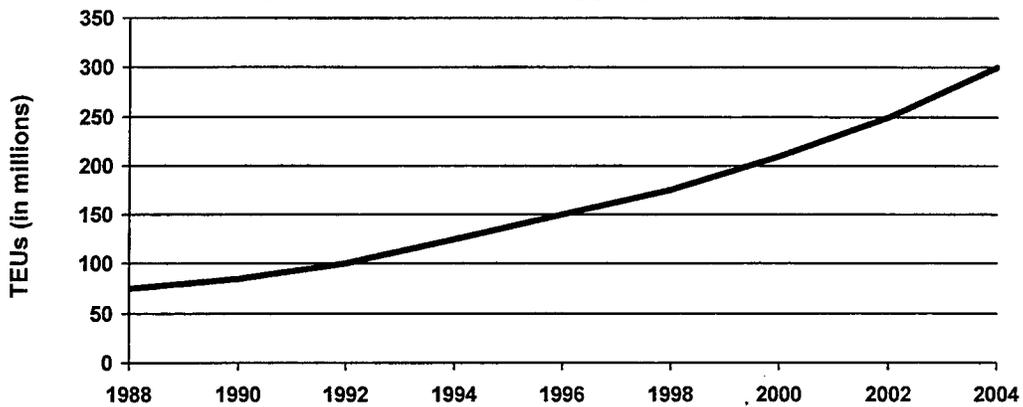
¹O'Leary, Pamela, Corey, Jay, Transportation Acronym Guide, November 1994, p. 34.

Figure 2
Future Requirements for Mega Container Vessels

- High cargo volumes
- Long transit distances with few port calls
- Sophisticated cargo planning and tracking information systems
- highly efficient port terminals with significant intermodal capabilities

Source: Vickerman, Zachary, and Miller, 1994

Figure 3
Projected Containerized Shipping Trends, 1988-2004



Source: Vickerman, Zachary, and Miller
(Containerisation International Yearbook, 1995)

To accommodate the bigger vessels requiring drafts² of 37 to 45 feet many ports have resorted to dredging.³ In the United States, only a few ports are capable of handling the largest container vessels which carry up to 6000 TEU and require a 47-foot draft. Those ports are located at Long Beach/Los Angeles, the Port of Virginia at Norfolk, and the Port of Seattle. These ports have depths/drafts of 50 feet. The Port of Houston will be able to handle these larger vessels in 1998 at its Bay Port Terminal---according to Charlie Jenkins,⁴ operations manager at the Barbours Cut terminal outside Houston. The Bayport terminal will have a 50-foot draft. Other ports are also looking at methods of creating greater capacities to handle the larger vessels.

Dredging and landfill are expensive propositions and many ports do not have the financial resources at their disposal to handle such ventures. According to the Port Authority of New York and New Jersey, the governor's joint dredging plan "calls for \$130 million in Port Authority funds to be provided for dredging and dredged material disposal projects, including decontamination, pollution control, beneficial reuse of dredged material and construction of sub-aqueous pits as disposal facilities." Also, in New Jersey, the Port of New Jersey Revitalization, Dredging, Environmental Cleanup, Lake Restoration, and Delaware Bay Area Economic Development Bond Act of 1996 provided \$205 million toward dredging and dredged material disposal facilities. All states do not actively promote and seek funding for their ports putting them at a competitive disadvantage.

²O'Leary, Pamela; Jay Corey, Transportation Expressions, Nov. 1994, p. 86.

³Ibid., p. 87. The act of *dredging* is to clean, deepen or widen with a machine equipped with scooping or suction devices used in deepening harbors and waterways and in underwater mining. A *draft* is the depth of water a vessel draws, loaded or unloaded.

⁴Jenkins, Charlie, "Telephone Interview", Port of Houston Authority, Houston, Texas, Sept. 17, 1997.

The Port of Houston, one of the ports highlighted in this report, provides a case in point. The ports in Texas fall under the jurisdiction of the Texas Department of Transportation (TXDOT) and many port directors feel TXDOT is unresponsive to port issues. "Texas ports are in direct competition with the ports of Louisiana, Alabama, and Mississippi. The State of Texas, unlike other states, does not provide funding for the ports along its coast. The State of Louisiana provides funding for its ports to develop new projects; this supplemental funding creates a competitive advantage for the Louisiana ports in attracting businesses. Moreover, the Port of New Orleans, Houston's main competitor in the Gulf of Mexico, has \$100 million from the state committed to its capital-improvement program." ⁵

Because of these types of disadvantages many Texas ports officials feel TXDOT should use state resources to aid in acquiring ISTEA money for all ports. The Intermodal Surface Transportation Efficiency Act of 1991 or "ISTEA" makes available financial assistance for local intermodal projects. Subsequent to project approval, however, a proposed project's impact on the surrounding infrastructure is considered.⁶

Figure 4 illustrates the new conditional constraints that have been imposed on ports. Environmentally, seaports face an array of regulatory and access issues where needed expansions are required. Regulations governing wetlands sometimes will restrict ports' ability to reconfigure their terminals and improve landside access routes. A 1992 DOT report stated that "roughly one-quarter of port officials report that wetland regulations usually or always impede development of access improvements, and one-third more reported that

⁵Boske, Leigh B.; Harrison, Robert, "Legislation Affecting Texas Ports", The Texas Seaport and Inland Waterway Systems, 1995, p.141.

⁶Ibid. P. 131. The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), policy goals are to "...develop a National Intermodal Transportation System that is economically efficient and environmentally sound, provides the foundation for the Nation to compete in the global economy and will move people and

they sometimes impede development.”⁷ Dredged material was used in the past to fill waterfront land and provide additional space for terminal development, but this practice is hindered by federal and state policies to protect wetlands from further development.

At issue also are restrictions on access corridor hours of operation as a result of neighborhood opposition to noise and traffic in the past and there are concerns about air quality. Remediation of this issue has included proposals to reduce truck hours of operation during peak traffic periods. Meeting federal and state air quality standards will confound all growing ports as they attempt to expand while also adhering to a plethora of environmental constraints. Studies have indicated infrastructure problems facing ports generally fall under two categories. These problems are growing traffic congestion on the major truck routes that serve their terminals and rail lines serving the terminals have many at-grade crossings of local streets. Traffic congestion increases transport costs and vehicular emissions that degrade air quality, and highly efficient trains that serve the ports can tie up traffic on local streets. Also, many container ports do not have bridge or tunnel clearances large enough to accommodate the most productive double-stack trains. Oftentimes, port officials do not have the authority or capability to correct these problems.

“Land use, environmental, and institutional impediments make difficult the resolutions of these problems. In addition, the authority for making improvements often resides with local, state, and federal transportation agencies, rather than the ports themselves. Such projects must compete with many other demands for funds, and they are not always rated as highly as other local priorities.”⁸

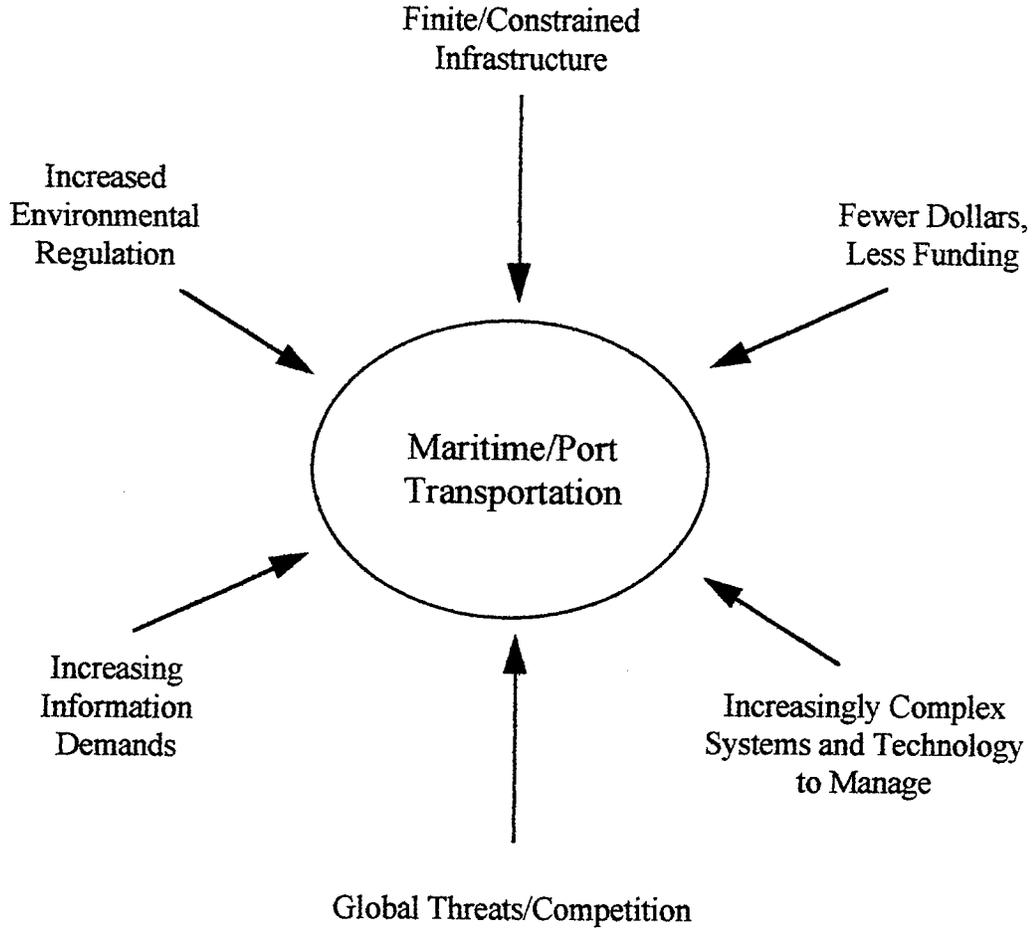
goods in an energy efficient manner.”

⁷ U.S. Department of Transportation, Landside Access to U.S. Ports, March 1992, p. ES.4.

⁸Ibid. pES.3.

How these constraints impact operating procedures with the advent of newer, larger vessels and equipment will dictate whether or not ports will find it necessary to upgrade to a mega-port/load center status. This study will focus on five (5) of the largest U.S. ports, their size, volumes of through-put (traffic in and out), and the economic and environmental concerns of those communities and seek to define the term "mega-port." The ports of focus are the ports of Houston, the Port of Virginia at Norfolk, The Port of New York & New Jersey, Los Angeles, and the Port of Long Beach, CA.

Figure 4



Source: Vickerman, Zachary, and Miller, 1995

THE PORT OF HOUSTON AUTHORITY

The Port of Houston had its beginning in 1909 due to an act of the Texas Legislature. In that year, Harris county voters approved the port as the Harris County Houston Ship Channel Navigation District. The Texas Legislature changed the name in 1971 to the Port of Houston Authority. The Port of Houston Authority is an autonomous governmental entity and acquired expanded powers for fire and safety protection along the 50-mile Houston Ship Channel during the 1971 Legislature.

The Houston Ship Channel actually began in 1837 when a steamship first journeyed up Buffalo Bayou. Since then the Houston Ship Channel has been a catalyst for Harris County growth.

The Port of Houston is a 25-mile-long complex of diverse public and private facilities along the Houston Ship Channel, just a few hours-sailing times from the Gulf of Mexico. Houston's port leads the nation in foreign waterborne commerce and is one of the world's ten busiest ports.

A board of seven commissioners appointed by the officials of local governments located along the Houston Ship Channel governs the port. These commissioners serve without pay and are appointed for two-year terms, which are staggered so that three to four commissioners are up for re-appointment each year.

The Port of Houston Authority owns 43 general cargo wharves,⁹ six container wharves, five liquid bulk wharves and five dry bulk wharves available for public hire. These facilities include the Turning Basin, the Houston Public Elevator, Woodhouse Terminal, the

⁹The American Heritage Dictionary, 1991, P. 1375. Wharves are the plural of wharf. Wharf: landing places of

Bulk Materials Handling Plant, Fentress Bracewell Barbours Cut Container Terminal, Jacintoport Terminal and Care Terminal. The Port Authority operates the Malcolm Balbridge Foreign Trade Zone.¹⁰ The authority's facilities handle approximately 15 percent of the cargo moving through the port.¹¹

The Port of Houston Authority has access to rail services at the port owned, but Union Pacific RR operated, Intermodal Ramp at the Barbours cut terminal approximately 2 miles from the main port on a private port road shared by Sealand Corporation, truckers and other port users. This rail facility is being upgraded to increase its usefulness and is scheduled for completion in 1998. The facility will expand from the current two working tracks and 250 parking slots to four working tracks and 750 parking slots. The new and improved rail facility will be a boon to port business.

Activity at the Port generates 53,000 direct jobs and 143,000 indirect jobs.¹² Residents of Harris County hold more than 80 percent of jobs generated at these terminals. Five and one-half billion dollars in revenue is generated by businesses providing services at the marine terminals on the channel, excluding the value of cargo shipped through the public and private marine terminals. Projections are that the Port of Houston will continue to be an important factor as north-south trade expands.¹³ The Port and Houston in general, look to

pier where ships may tie up and load or unload.

¹⁰Bureau of Transportation Statistics, "Transportation Expressions," Nov. 1994. Foreign Trade Zone: An isolated area, attached to a port, where facilities for dockage and unloading are provided, and where foreign merchandise may be stored or manipulated pending sale or reshipment without limitation as to time and without compliance with the customs laws and regulations relating to the entry of merchandise. Most such privileges are equally available at other regular ports or entry by arrangement with U.S. Customs Bureau.

¹¹1996 Facts About the Port of Houston, The Port Authority of Houston, 1996.

¹²The Port of Houston Authority, "The Houston Ship Channel," <http://www.vannevar.com/port_of_houston/lores/overview/po.htm>, 1997, Sept. 3.

¹³Port Overview, The Port of

become major forces once the North American Free Trade Agreement (NAFTA)¹⁴ is in full effect. NAFTA was agreed to by the Governments of Canada, Mexico and the United States of America and became effective on January 1, 1994. The agreement created the makings of a continent-wide free trade zone, which will come into complete effect over a ten-year period.

In 1995 5,500 ships and 50,000 barges visited the Port. The local petrochemical complex is the largest in the nation and second largest worldwide. The Port of Houston is a primary factor that has helped propel Houston as a center of international trade.¹⁵ Additionally, over 200 steamship lines offer service between Houston and 250 ports around the world.

The Port of Houston is ranked second in the United States in foreign waterborne commerce, second in total tonnage, and eighth in the world. During 1995, 144 million tons of cargo moved through the Port of Houston. General cargo moving across Port Authority docks for 1995 totaled more than 19.8 million tons. Located just a few hours-sailing time from the Gulf of Mexico, the Port of Houston is a 25-mile-long complex of diversified public and private facilities. In 1995, 5,535 vessel calls were recorded at the Port, while 1996

Houston, <http://www.vannevar.com/port_of_houston/lores/overview/po.htm>(1997, Sept. 3).

¹⁴NAFTA: A Brief History, <<http://www.customs.ustreas.gov/imp-exp/nafta/history.htm>> (1998, Jan. 13). North American Free Trade Agreement (NAFTA): A Brief History: On January 1, 1994 the North American Free Trade Agreement entered into force. One of the main objectives of the Agreement is the elimination of tariffs between Canada, Mexico and the United States on "qualifying" goods by the year 1998 for originating goods from Canada and for originating goods from Mexico by the year 2008. It also strives to promote fair competition, increase investment in the territories, protect and enforce intellectual property rights, and establish a framework for further cooperation between the countries.

¹⁵Port Overview, The Port of Houston, <http://www.vannevar.com/port_of_houston/lores/overview/po.htm>

numbers increased to 5,764, an increase of 4.13%. Following are more Port of Houston Authority facts and figures:

- Tonnage handled during 1995 was an estimated 135.2 million tons and for 1996 estimated at 150.0 million tons.
- 1995 TEUs were 705,367 for a total of 6.0 million tons.
- 1996 TEUs were 794,481 TEUs for a total of 6.5 million tons.
- In 1995 the port processed 80.6 million tons of foreign goods valued at \$33.2 billion and in 1996, total foreign goods equaled 86.5 million tons valued at \$34.1 billion.¹⁶

Houston is the petroleum capital of the United States, home to a \$15 billion petrochemical complex, the largest in the nation and second largest worldwide.¹⁷ Consequently, petroleum and petroleum products are the leading commodities handled by the Port in tonnage. Petroleum and petroleum products lead in both export and import commodities handled by the Port. Other export commodities handled by the Port in large quantities include organic chemicals, cereal and cereal preparations, plastics, and inorganic chemicals. Leading imports include crude fertilizers and crude minerals, organic chemicals, iron and steel, and articles of iron and steel.

Another component of the Port of Houston authority is Galveston Bay, an irregularly shaped, shallow body of water. Galveston Bay is approximately 30 miles long in a general north-northeast and south-southwest direction, about 17 miles in width at its widest part and generally about 7 to 9 feet deep.

¹⁶The Port of Houston Authority, "1995 & 1996 Facts about the Port of Houston," Sept. 22, 1997.

¹⁷The Port of Houston Authority, "The Port's Present",
<[Http://www.vannevar.com/port_of_houston/lores/overview/po.htm](http://www.vannevar.com/port_of_houston/lores/overview/po.htm)>, 1997, Oct. 23.

Red Fish Bar, a chain of shoals separate the Bay at its mid point. The northward part of Red Fish Bay is referred to as the "Upper Bay" and the southward part is designated the "Lower Bay." The northeastern end of the Upper Bay is called Trinity Bay. Ship channels to Houston, Galveston, Texas City and Port Bolivar extend from Bolivar Roads in the southern part of Galveston Bay. From the Gulf of Mexico, deep draft vessels enter Galveston Bay between Bolivar Peninsula to the northeast and Galveston Island to the south. This entrance is called Galveston Harbor and extends from deep water in the Gulf of Mexico through the pass formed by the jetties¹⁸ extending from Galveston Island and Bolivar Peninsula to Bolivar Roads, the deep-water area between Bolivar Roads, the deep-water area between Bolivar Point and Pelican Island Fort Point.¹⁹

The Apalachee Bay, Florida, to Brownsville, Texas, section of the Gulf Intracoastal Waterway extends through the lower part of Galveston Bay. This route follows a dredged channel inshore along Bolivar Peninsula, through Bolivar-Roads, and joins Galveston Channel at its East End. From the west-end of Galveston Channel, the route passes through the lower part of Galveston Bay and continues through West Bay. An alternate route of the Intracoastal Waterway crosses the Houston Ship and Texas City channels and passes through the northern end of Pelican Island.

Plans are in place to enhance the Houston Ship Channel, which will increase capacity and allow access to larger vessels. President Clinton, in October 1996, signed into law the Water Resources Development Act of 1996, which paved the way for widening and deepening the Houston Ship Channel. Plans call for deepening the channel from 40 to 45

¹⁸The American Heritage Dictionary, 1991, p. 688. Jetty or Jetties: A pier or other structure projecting into a body of water to influence the current or tide or protect a harbor or shoreline.

¹⁹The Port of Houston Authority, "Port Overview,"

feet and widening it from 400 to 520 feet. A combination of local voter-approved bonds and federal funds will be used to finance the improvements.

The Port of Houston Authority is committed to maintaining a clean and balanced environment, while also working to develop industry. The Port of Houston Authority works to assure its facilities are in compliance with environmental regulations. Some of the Port of Houston Authority's environmental projects have included using dredge materials in a beneficial manner and for better management of dredge material disposal sites.

The Port's proposed modernization plan to deepen and widen the Ship Channel was drafted with the preservation of Galveston Bay in mind. The Port Authority developed the plan in concert with a coalition of state and federal resource agencies. Teams focused on finding solutions and the coalition secured input from environmental and bay interest groups in the development of the plan. Their strategy was guided by three principles: One, dredge material was to be regarded as a resource; two, only environmentally acceptable methods would be used for dredged disposal; and three, the plan was to result in a long-term "net positive environmental effect" on Galveston Bay. Therefore, the material from the channel bottom will see new life as bird islands, marshes and boater destinations in an environmentally improved Galveston Bay.

Houston's weather is another factor affecting the Port's activities. Usually fair to excellent temperatures moderated by winds from the Gulf of Mexico result in mild winters and warm summer nights. The climate of Houston does not lend itself to extremes in any direction, although heavy rain can sometimes result in street flooding. Houston experiences freezing temperatures an average of seven days per year.

<http://www.vannevar.com/port_of_houston/lores/overview/po.htm>, (1997, Oct. 15).

In essence the Port of Houston functions as one of the busiest ports in the world and has the capacity to continue as such. The Port offers a variety of services, an abundance of inter-related jobs, and a nearby Petro-Chemical complex, which is one of the largest in the world, and has worked to meld environment and industry as complimentary rather than adversarial. With quick access to the Gulf of Mexico along with the project to deepen and widen the Houston Ship Channel to accommodate bigger new generation vessels, the Port of Houston will continue functioning as one of the world's premiere ports. The Port of Houston will no doubt achieve Mega-port status. A capsule summary of the current state (1996 data) of the Port of Houston is as follows:

- Handled 794,481 TEUs in 1996 for a total of 6.5 million tons
- 25-mile-long complex of diverse public and private facilities along the Houston Ship Channel
- Main U.S. port located on the Gulf of Mexico
- Main depth 42-feet
- 5000 Vessels call on the Port each year
- Port generates \$5.5 billion annually
- Directly affects 33,000 jobs, and indirectly affects an estimated 163,000
- Linked by vast network of interstate highways and rail lines
- Foreign Trade Zone*

*** The Foreign Trade Zone is an isolated area, attached to a port, where facilities for dockage and unloading are provided, and where foreign merchandise may be stored or manipulated pending sale or reshipment without limitation as to time and without compliance with the customs or merchandise. Such privileges are equally**

**available at other regular ports of entry by arrangement
with U.S. Customs Bureau.**

THE PORT OF VIRGINIA

The Port of Virginia is a deep-water port having wide channels with great proximity to the open ocean. The Port is owned and operated by the Virginia Port Authority for the Commonwealth of Virginia.²⁰ English colonists first landed on the coast of Virginia over 400 years ago, thusly laying the foundation for trade and port development throughout the United States of America.

Until 1982 the general cargo terminals in the Hampton Roads harbor formerly existed as five separate, competing ports. At that time the Virginia General Assembly mandated that the ports would unify under the direction of the Virginia Port Authority, and its non-stock, non-profit operating affiliate, Virginia International Terminals, Inc.

The consolidation was the right combination for the differing ports resulting in over 400 percent growth in port volume in twelve years. The combined Virginia Port Authority consists of four separate facilities, which include:

- Newport News Marine Terminal (NNMT)
- Portsmouth Marine Terminal (PMT)
- Virginia Inland Port (VIP)
- Norfolk International Terminals (NIT).

²⁰The American Heritage Dictionary, Second College Edition, 1991, p. 299.

Commonwealth: (1) the official title of some U.S. states, including Kentucky, Virginia, Massachusetts, and Pennsylvania. (2) A nation or state governed by the people: republic.

VIRGINIA INLAND PORT (VIP)

The VIP is a 161-acre facility with direct rail access and 17,820 feet of rail track footage. Operated as an intermodal container transfer facility (ICTF), VIP provides an interface between truck and rail for the transport of ocean-going containers to and from the Port of Virginia. This facility is just west of Washington, DC in Front Royal, Virginia, and some 220 miles inland of the Port of Virginia.

NEWPORT NEWS MARINE TERMINAL (NNMT)

NNMT consists of 140.64 acres, has direct rail access with 42,720 feet of rail track footage. The NNMT has a channel depth of 45-feet which allows it to accommodate many of the larger vessels. This facility allows ship to rail and rail to ship loading in addition to RO-RO capability and has a passenger cruise terminal.

NORFOLK INTERNATIONAL TERMINALS (NIT)

The NIT is the largest of the Virginia Port Authority run facilities encompassing 811 acres with a berthing depth of 50 feet. This facility has direct rail access with rail track footage of 89,300 feet. This terminal has RO-RO capability, container storage for 23,930 TEU, and covered pier storage of 1,460,000 square feet. The terminal has 300 acres for expansion which will double its cargo handling capacity.

PORTSMOUTH MARINE TERMINAL (PMT)

PMT is a 219 -acre terminal with direct rail access and rail track footage of 20,100 feet. This terminal has a channel depth of 45 feet. This is the VPA's second largest terminal with respect to containership and berth space. RO-RO and breakbulk cargo as well as shipside rail services are also handled at the facility. The Virginia Port Authority does not issue breakdowns of facilities data because of competitive reasons.²¹

...

Virginia's ports have grown rapidly from the sixth to the second largest on the U.S. East Coast, and is beaten only by the Port of New York and New Jersey. Depths and drafts of 50-feet at the Port of Virginia bode well for its future. The deepest drafts at the Port of New York and New Jersey are 42-feet. The 50-foot depths and wide channels at the Port of Virginia allow access to the larger new generation containerships and their tremendous cargo capacities. Other heavy cargoes, which are handled with ease through the port, include coal, machinery, steel and rubber. The deep drafts are even more appealing combined with the fact that 95 percent of the world's containership lines call on the Port of Virginia.

In 1996 general cargo volume moving through Virginia Ports increased over one-half million tons, or 6.1 percent over 1995. Total volume in 1996 reached 9.7 million tons, with container volume increasing 8.5 percent to over 9 million tons and 1.2 million TEU's. As containerized volumes increased, breakbulk cargoes declined in 1996 by 20 percent. Business moving through the Port generates over \$342 million in state and local taxes and provides port or port related jobs to 120,417 workers.

The Port of Virginia is especially proud of its *dual-hoist cranes*, designed by port engineers. These are the world's fastest cranes, developed to handle fifty percent more containers than the industry average. The Port operates four of these cranes and owns the patent to the design. This crane called the *KONE* super-crane has a capacity of 40 long-tons (LT).

To create space while also relieving congestion, the Port uses an advanced chassis stacking system. With this operation, twelve acres of chassis are stacked on a one-acre site. As with all ports, space is always at a premium and the Port of Virginia uses innovation and technology to enhance what it has.

Technologies implemented by the Port include linking its marine terminals with U.S. customs via computer, resulting in eighty percent of all cargo automatically cleared through customs before it docks. Cargo movement is tracked using advanced, hand held yard computers. This technology speeds total dock movement and results in greater yard integrity--less lost equipment, quicker turn times and better damage tracking of equipment.

Virginia Port Authority officials are forward thinking in their plans to address the challenges of the future. Dredging and port expansion are always keys when looking toward the future of any port. After having been prevented from entering into discussions on locating a possible fourth marine terminal on Craney Island since 1991, the General Assembly, in 1996, passed legislation allowing possible examination of future development on the eastern side of Craney Island.

Craney Island would not only exist as a possible fourth port, but would also help in maintaining the Port's channels. Dredged materials out of the Hampton Roads' channels

²¹Mausteller, M.B., Sr., Chairman, "State of the Port Address, Virginia Port Authority Board Meeting," The

would be disposed on Craney Island. Craney Island is considered cost effective and has been approved by the U.S. Army Corps of Engineers to continue this role through the year 2050.

The VPA 2010 Plan is the Port of Virginia Authority's guideline to the future. With this "plan" a consultant team was directed to adhere to two major criteria in producing the VPA 2010 Plan:

- Existing port-wide cargo-handling capability must be maximized prior to development of any new or improved facilities.
- The plan must be market-driven, emphasizing recommendations that reflect a balance between forecasted growth and cargo throughput capability.²²

The findings of the study forecast a possible 250 percent increase in containerized cargo by the year 2010, of which intermodal volume will increase 300 percent. Breakbulk cargo could increase by up to 200 percent.²³ To attract the more than 16 million tons of general cargo forecasted for Virginia Ports by the year 2010, the plan identified more than \$334.8 million in significant improvements to existing facilities and construction of new facilities in order to accommodate the potential cargo growth.

Expanded intermodal rail access was recommended for all Virginia Port Authority terminals with a focus for expansion of NIT. Other recommendations included allowing multiple rail carriers access to all VPA facilities. Another was the effect of vessel sharing agreements. The study found that partners in vessel sharing agreements maximize space by filling one ship to capacity with one or more carriers' cargo rather than each partner sailing

Port of Virginia 1996 Business Results, Jan. 28, 1997.

²²Vickerman, Zachary, Miller, Virginia Port Authority 2010 Plan, June 15, 1995.

different ships not loaded to capacity. Carriers in these agreements may reduce the number of calls to a port or quit calling on certain ports altogether.

The Port of Virginia offers a variety of services, has deep ports, and has planned well for its future growth and relevance. This Port is eminently prepared to become one of the mega-ports of the future as shipping lines consolidate, ship sizes increase, and port calls decrease. The following is a capsule summary of the Port of Virginia:

- 120,417 Port and port related jobs
- Generated \$342 million in state and local taxes
- CSX & Norfolk Southern rail service
- On-dock rail service
- 1996 TEU's handled: 1.2 million
- Volume 500,000 tons
- 50-foot depth draft facility
- Future considerations:
 - *2010 plan, attract 16 million tons of general cargo to Virginia ports by 2010*
 - *Identify \$348 million in improvement to existing and future facilities.*

²³Ibid.

PORT OF NEW YORK & NEW JERSEY

The Port of New York and New Jersey was established in 1979 with congressional bill H.R. 4943, "granting the consent of congress to the compact between the States of New York and New Jersey providing for the coordination, facilitation, promotion, preservation, and protection of trade and commerce in and through the Port of New York (through) the financing and effectuation of industrial development projects."²⁴ The bill was approved on December 18, 1979. Prior to this bill, the Port of New York and the Port of New Jersey had functioned separately.

The Port of New York and New Jersey is located in the center of the largest regional market in the country, offering same day access to more than 17 million consumers.²⁵ As the premiere port on the Eastern seaboard, The Port of New York and New Jersey serves as a major gateway for the movement of imports and exports and is a generator of jobs and other economic activity for the region. The Port Authority of New York and New Jersey operates the regions major marine, air and interstate transportation centers.

The Port of New York & New Jersey features seven marine terminals fully supported by the latest in computerized cargo tracking systems to service ships within 24 hours. The Port's handling capabilities include containers, dry/liquid/breakbulk, automobiles, or specialized/project cargo. Deep-water terminals are modern and include 75 berths, 30,000 linear feet (9000 meters) in berth space, and 48 container cranes. More than 80 million additional consumers in the Midwest and Canada are provided second day access through the

²⁴United States, Congress, House Committee on the Judiciary, "Port Authority of New York and New Jersey, House report - 96th Congress, 1st session, session: no. 96-507, Oct. 10, 1979.

²⁵The Port of New York and New Jersey, "Fact Sheet", June 1996.

Port's intermodal links. Over 10,000 trucking companies serve the port helping to facilitate this huge distribution network.

The Port features 12 intermodal rail terminals, including the Express-Rail on-dock facility at the Elizabeth-Port Authority Marine Terminal. With over 80 steamship lines calling at the Port, there were more than 4500 calls at the Port in 1995. The large container ships calling on the port carry an average of 4,000 TEU's. The Port has 750 miles of waterfront in the New York/New Jersey region.

Fiscal 1995 trade statistics for the Port of New York and New Jersey:

General Cargo Tonnage.....	14.6 million long tons
TEU's:.....	2.26 million
Vehicle Imports and Exports.....	401,180
General Cargo Exports.....	5 million long tons
General Cargo Imports.....	9.5 million tons
Total Bulk and General Cargo.....	44.9 million long tons.

Port Economic Impact:

Total Monetary Impact.....	\$19 billion
Wages and Salaries.....	\$6.2 billion
Business Income.....	\$2.3 billion
Income and Sales Tax Generated.....	\$510.0 million
Jobs (direct and indirect).....	166,500
Share of Gross Regional Product.....	33 percent
Share of Regional Employment.....	1.6 percent.

At the Port of New York & New Jersey the seven available terminals offer unequalled service, variety and accessibility. This section will profile each while showcasing their size, services offered and areas of specialization. These terminals include:

Specialized Facilities.

- Intermodal Network.
- Port Newark/Elizabeth.
- Vehicle Terminals.
- Global Marine/Howland Hook.
- Brooklyn Facilities.

SPECIALIZED FACILITIES

The Port of New York & New Jersey is technologically modern and has all types of facilities to physically satisfy its users needs. Some of the diverse services offering specialization in cargo movement are:

- U.S. Customs Bonded Warehouses.
- U.S. Department of Agriculture-Approved Inspection Facilities.
- Bonded Container Freight Stations.
- U.S. Customs Examination Sites.
- Foreign-Trade Zone Designation.

With over 6.5 million square feet of warehousing and distribution space, the marine facilities are equipped to accommodate any type cargo regardless of how it is shipped or configured. Nearly 30 public warehouse operators are affiliated with the Port and they offer climate controlled environment as well as stacking up to 35 feet high. Most warehouse

operators offer client-customized computer systems for accurate and timely order processing, inventories, lot histories, communications and inquiries.

Foreign Trade Zone (FTZ) No. 49 is a major asset offered by the Port. Established in 1979, FTZ No. 49 enables clients to manage cost savings through the deferral, reduction or even elimination of US Customs duties and excise taxes. Another advantage of this FTZ is enabling shipments to get processed quickly and moved to locations throughout the United States and Canada, via a vast transportation network of highway, rail and air routes. FTZ No. 49 has an economic impact of \$2 billion in cargo handled and \$200 million in wages. FTZ No. 49 is linked at five of the Port run facilities. The FTZ is a definite benefit saving time and increasing the convenience of the port.

Other "Specialized Cargo Services" include ample facilities for facilitating breakbulk, liquid and dry bulk cargo. Over 780 acres port-wide are dedicated to the handling of breakbulk cargo, and each year approximately 30 million long tons of bulk are moved through the Port.

The Port of New York & New Jersey offers mobile, floating cranes, which can handle from 100 to 1000 tons. Also offered are berths with heavy gauge rail tracks and wide turning capability for transferring loads between vessel and rail cars, access to outdoor or covered staging areas for various assembly.

Pharmaceutical and perishable cargo is accommodated through the Port's network of reefer²⁶ container cargo handling capabilities. These include chassis equipped with generator sets (power supply), temperature maintenance and repair, and pre-trip inspections.

²⁶O'Leary, Pamela, Corey, Jay, "Transportation Expressions," U.S. Department of Transportation, Bureau of Transportation Statistics, May-Oct.... 1994, p. 229.

REEFER: Refrigerated truck or trailer designed for hauling perishables.

INTERMODAL NETWORK

The Port of New York & New Jersey is the most comprehensive in the United States in linking all phases of intermodalism with quick integration and easy accessibility. These modes include road, rail, air and water.

The proximity of the ports to several interstate highways allows the thousands of trucking companies that serve the port to move cargo on and off terminals and to and from distribution centers quickly and efficiently. A paperless cargo movement system to help facilitate goods will be enhanced through ACES, (Automated Cargo Expediting Systems), for electronic cargo management and communications, and Sea Link, a truck driver identification system that speeds processing.

The Port of New York & New Jersey is composed of 14 intermodal rail transfer terminals, including both on-dock and near-dock facilities. Offered are more double-stack trains with quicker long distance overland shipping than all other East Coast ports combined. An enhancement to these features is the recently opened and completed "ExpressRail" permanent on-dock intermodal rail terminal located at the Elizabeth-Port Authority Marine Terminal. This terminal links the port with key inland markets in the Midwest and New England as well as eastern and western Canada.

The Port Authority of New York & New Jersey operates three major airports - Newark International, John F. Kennedy and LaGuardia - which together handle over 26% of all international air cargo shipments in the U.S., more than any other airport system in the world. These airports' proximity to marine terminals makes them ideally positioned for establishing sea/air-shipping links. Two major feeder barge operations serve the port,

connecting it to markets as far north as Portland, Maine, and as far south as Norfolk, Virginia. Combined, these operators move more than 150,000 containers up and down the East coast annually. The barge service accommodates both dry and reefer containers.

PORT NEWARK/ELIZABETH MARINE TERMINAL

The Port Newark/Elizabeth Marine Terminal complex at the Port of New York & New Jersey is the largest and most comprehensive collection of maritime cargo handling facilities on the East Coast of North America. Located on the Eastern Shore of Newark Bay in Essex and Union counties in New Jersey, the 2,100-acre complex offers a full range of maritime commerce activities. Services offered include major container handling terminals, automobile processing and storage facilities, liquid and solid bulk terminals, breakbulk facilities, warehousing and distribution buildings, trucking firms, an on-dock rail terminal, and other services.

This terminal consists of five container terminals with more than 17,000 linear feet of containership berth space. In addition there is more than 19,000 linear feet of berth space for non-containerized cargo. Five million square feet of warehousing and distribution space, including centralized U.S. Customs Examination Stations is also available in the terminal. Though operated as a single terminal, the facility is separated as two distinct components. They are the 930-acre, 40 foot depth, Port Newark Marine Terminal and the 1,254-acre, 40 foot depth, Elizabeth-Port Authority Marine Terminal.

The Port Newark Marine Terminal is a multi-purpose cargo center housing two containership facilities: Maersk Line and Universal Terminal. The Maersk facility has a 764-foot-long berth and 61-acre terminal. The Universal Terminal is 100 acres and has 3,668

feet of berthing space. Port Newark also contains a 125,000-square-foot refrigerated storage space, a high-tech copper rod production plant, and a bulk liquid handling facility for the warehousing of refined and edible grades of fats and oil.

Elizabeth-Port Authority Marine Terminal is dubbed "America's Containership Capital." This complex operates three fully equipped containership terminals, 16 distribution buildings with more than 2 million square feet of space and additional terminal buildings. This complex houses two major tenants; they are Sea-Land Service and Maher Terminals Inc.

The Sea-Land facility contains 232 acres and includes 4,519 feet of wharf. Maher Terminals Inc., is the port's largest terminal operator with facilities at both Port Newark and the Elizabeth-Port Authority Marine Terminal. The two Maher terminals encompass 453 acres with a total of 7,350 feet of berthing space. Conrail and Canadian Pacific provided daily double-stack rail service allowing for expeditious intermodal service connections to and from the port linking Midwest and Canadian markets. The whole of the Port Newark/Elizabeth is designated as Foreign Trade Zone (FTZ) No. 49.

AUTOMOBILE/VEHICLE PROCESSING & TERMINALS

The Port of New York & New Jersey features five vehicle processors, which occupy a total of more than 430 port acres. Vehicle processing activity is centered at two facilities: the Port Authority's Auto Marine Terminal (AMT), with a 32 foot berth depth covering 143 acres with 1800 linear feet of berth space and the Port Newark/Elizabeth Auto Terminals/Processors occupying 300 acres with a berth depth of 35 feet and 3500 Linear of berth space.

In 1995, the Port of New York & New Jersey handled 401,000-vehicles approximately 292,000 imports and 109,000 exports. Offered at the vehicle processing centers are a host of services including RO-RO,²⁷ vehicular logistics, some assembly and processing, and specialized rail carrier service.

GLOBAL MARINE/HOWLAND HOOK

The Global Marine Terminal consists of 100 acres, with 1800 feet of ship berth and a dock berth of 40 feet. This terminal handles containers, RO-RO and has heavy lift capability. Close proximity to New Jersey rail yards is one of its greatest assets.

Howland Hook Marine Terminal has one of the highest volume cargo capacities of any Port of New York & New Jersey facility. With a dock depth of 42 feet, Howland Hook along with Red Hook, is the port facility capable of accommodating larger vessels more so than any of the others. The facility encompasses 187 acres and has a ship berth of 2,500 feet. On-dock rail connection exists within this terminal along with 200,000 square feet of warehousing facilities.

BROOKLYN FACILITIES

The Brooklyn Facilities encompass three distinct entities: Red Hook Container Terminal, South Brooklyn Marine Terminal, and Brooklyn Marine Terminal, Piers 6-8. The Red Hook Container Terminal and Brooklyn Marine Terminal are actually jointed, though operated separately.

²⁷Ibid. p. 237.

Roll On/Roll Off or Ro-Ro: A simplified cargo handling system whereby cargo is driven on and off specially designed vessels under its own power.

Brooklyn Marine Terminal, Piers 6-8 consists of 10 acres, has a dock depth of 32 feet and a ship berth of 5880 feet. Its primary cargo is of the breakbulk type. South Brooklyn Marine Terminal is a 110-acre facility. The depth of the dock is 27 feet and the ship berth is 6,135 feet. This facility handles RO-RO and breakbulk cargo, and has shed space of 600,000 square feet

Red Hook Container Terminal has dock depth of 35 feet, consists of 80 acres, and has ship berth length of 2080 feet for containerships and 3410 for breakbulk vessels. This terminal is more diverse than the other Brooklyn facility in that it offers near dock rail connection, and offers some of the most up to date facilities in the Port of New York & New Jersey.

The depth of all the Port facilities ranges between 27-feet and 42-feet. None of these depths is capable of accommodating the new generation containerships that carry 4500-6000 TEU's and require depths of 47-feet. Dredging is required in order to handle larger vessels and the Port of New York & New Jersey has moved aggressively in this direction. In 1996 several plans were agreed to and acted upon. The "Governors' Joint Dredging Plan" calling for \$130 million in Port Authority funds to be provided for dredging and dredged material disposal projects, including decontamination, pollution control, beneficial reuse of dredged material and construction of sub-aqueous pits as disposal facilities. Voters in both states overwhelmingly approved the New Jersey/New York Bond Issues. The bond issues will provide funding for dredging and dredging related projects in the two states. In New Jersey, the "Port of New Jersey Revitalization, Dredging, Environmental Cleanup, Lake Restoration, and Delaware Bay Area Economic Development Bond Act of 1996" provided \$205 million toward dredging and dredged material disposal facilities. In New York, the "Clean Water,

Clean Air Bond Act" provides \$25 million toward "brown field" restoration projects; project, which could use dredged material as a remediation soil.²⁸

Through the bond issue and dredging of the port, the Port of New York & New Jersey is able to grow and expand. Already serving as the premiere East Coast port, this port will function as one of the future mega-ports. The following is a capsule summary of the Port of New York & New Jersey:

- Wages and salaries \$6.2 billion
- 166,500 jobs direct and indirect
- 1995 TEU's handled: 2.26 million
- Total cargo handled 44.9 million long tons
- Vehicle import and export 400,000 annually
- Foreign Trade Zone
- 5 separate major terminals, depth 32-42 feet channel drafts
- 4500 vessel calls yearly
- 12 intermodal rail terminals including on-dock
- Same day access to 17-million consumers
- 2nd day access to 80-million consumers

²⁸Port Authority of New York and New Jersey, April 1996.

PORT OF LOS ANGELES

Los Angeles is the second busiest port in America to its cross-town neighbor Long Beach. Aside from being the United States of America's (U.S) two busiest ports, the activities generated at these ports financially impact the whole of America directly or indirectly. Large volumes of goods are shipped by rail from across the country either going to or departing from the Los Angeles/Long Beach ports. Despite their proximity, the Ports of Los Angeles and Long Beach operate as separate entities.

The Port of Los Angeles was founded in 1907 with the establishment of the Los Angeles Board of Harbor Commissioners. This facility consists of 7500 acres, 4400 is water and the remaining 3100 acres is land. There are 29 cargo terminals, all of which are major facilities. These include: 11 liquid bulk, 6 container bulk, 4 dry bulk, three (3) automobile, three (3) omni, and two (2) neobulk/breakbulk terminals.

The Port is served by 80 shipping lines with 2692 vessel arrivals in 1995 and 2608 arrivals in 1996. Cargo tonnage for 1995 was 74.7 million metric revenue tons, while 1996 saw a decrease to 68.6 million metric revenue tons. Container volumes were 2.49 million TEUs for 1996 and 2.64 million TEUs for 1995. Most of these volumes both inbound and outbound were with the fast growing Asian Pacific countries and China.

The Port of Los Angeles business component is varied and diverse. Other major business handled include, cruise lines and automobiles. Seven cruise lines operate out of the Port with traffic volumes of 725,970 passengers in 1995 and 945,180 passengers in 1996. Automobile volumes were 357,099 in 1995 and 304,977 in 1996.

Following is a brief summary of sources and figures for the Port of Los Angeles and their effects:

Trading Partners (top five, in short tons, calendar year 1995):²⁹

Japan (7.4 million tons worth \$23.5 billion)

Taiwan (3.4 million tons worth \$11.3 billion)

China (2.6 million tons worth \$11.5. billion)

South Korea (2.3 million tons worth \$3 billion)

Thailand (872,000 tons worth \$3.5 billion)

Imports (top five, in short tons, calendar year 1995):

Iron and steel shapes (1.3 million tons)

Petroleum oils, (million tons)

Peroxides (537,000 tons)

Crude petroleum (513,000 tons)

Bananas and Plantains (506,000 tons)

Exports (top five, in short tons, calendar year 1995):

Coal (2.6 million tons)

Iron and steel scrap (1.2 million tons)

Petroleum coke (960,000 tons)

Waste paper (920,000 tons)

Petroleum oils (815,000 tons)

²⁹Port of Los Angeles: Facts and Figures, Los Angeles Port Authority, <<http://www.portla.com/facts.htm>> 1997, September 3).

Cargo Value:

\$74.2 billion (Calendar year 1995)

\$73.4 billion (Calendar year 1994).

The port directly employs 670 personnel, with an additional 4000 members of three (3) locals of the International Longshoremen's & Warehousemen's Union (ILWU) who work the vessels and man the docks. The Port is responsible for 1,000,600 jobs nationwide. In the five county Southern California region of Los Angeles, Orange, Ventura, Riverside and San Bernardino, 247,000 or (1 out of every 27) is directly related to the Port.

In wages the port is tied to \$1 out of every \$23 in Southern California or \$8.2 billion. Tax revenue generated by the port is \$1.3 billion in Southern California. The Port of Los Angeles obviously has a huge economic effect on the most populous region of the U.S. It appears the Port's most valuable by-product of its financial strength and economic vision is the creation of employment opportunities.

The Port of Los Angeles is actively planning and developing for future growth. Scheduled for completion in 1998 is development of the Terminal Island Container Transfer Facility (TICTF). This facility will provide rail connections to existing container terminals and other cargo facilities on Terminal Island. The 47-acre facility will allow cargo containers to be unloaded from ships and placed directly on railcars for immediate national and international distribution.

This \$20 million rail center is in response to the increasing demand from shippers and shipping lines for on-dock, multi-user intermodal capability. Promising faster and more

efficient transfer of containerized cargo traffic between ship and rail, TICTF will provide enormous economic benefits to both container shippers and carriers.

The TICTF will comprise 8300 feet of loading dock with working rail track to accommodate 56 double-stack railcars. Projected annual capacity of 150,000 lifts (to take on or off railcar), with seven trains expected weekly. The TICTF and related projects will help the Port to better facilitate business volumes projected to double during the next two decades. The Port of Los Angeles has planned well and is steadily developing resources to meet its future needs.

PORT OF LONG BEACH, CALIFORNIA

The Port of Long Beach is the busiest seaport in the United States. During 1996, the port moved the equivalent of 3,067,334 twenty-foot cargo containers (TEUs), an increase of 7.9% from the previous year. The total volume of all forms of cargo increased 8.8% from 1995 to 99.4 million-metric revenue tons in 1996. On a global scale, the Port of Long Beach is ranked seventh in volume of cargo handled. Even though operated separately, combined with "World Port Los Angeles", which is the nation's second busiest port, they are ranked number three in the world.

Though the port offers a variety of services, including dry bulk, break bulk and neo-bulk, petroleum and liquid bulk, containerized cargoes are predominant.³⁰ The port is well suited to handle all type cargoes efficiently and safely.

Port of Long Beach is virtually man-made and contained in six square miles. It is the primary cargo gateway to the pacific, as it has been for nearly two decades. The port covers nearly 2,300 acres of land for container and other cargo-handling operations.

The port is self-sufficient. Under the state's Tidelands Laws, "the port must earn its revenues from activities related to commerce, navigation, recreation and fisheries, and must spend its money on the same." Revenues are earned through dockage and wharfage fees assessed to its customers. Dockage fees are based upon the length of ships and the length of

³⁰O'Leary, Pamela; Corey, Jay, Transportation Expressions, Nov. 1994, P. 36,37

Bulk Cargo: Cargo not packaged or broken into smaller units. Bulk cargo is either dry (grain) or liquid (petroleum) and cannot be counted. Also, cargo that is unbound as loaded and carried aboard ship; it is without mark or count, in a loose un-packaged form, and has homogeneous characteristics.

Break-Bulk: Packages of hazardous materials that are handled individually, palletized, or unitized for purposes of transportation as opposed to bulk and containerized freight.

Dry Bulk Cargo: Cargo which may be loose, granular, free-flowing or solid, such as grain, coal, and ore, and is shipped in bulk rather than in package form. Specially designed dry bulk terminals usually handle dry bulk

their stays in a terminal. Wharfage fees are charged against the cargo that crosses the wharves. Despite receiving no tax support, the port generates billions of dollars in revenue for private businesses and government entities. The port generates \$20 billion in direct and indirect business revenues, \$4 billion in wages and \$800 million in state and local taxes. The port also reimburses the city's general fund for city services used to support harbor operations.³¹

Even though no tax revenue is available for operations and expansions, since 1994, the port has spent \$603.4 million on property purchases for new terminals and transportation improvements. Current capital projects slated for completion before the end of the decade exceed \$1.4 billion.

Combined, the Port of Long Beach and Los Angeles expect to double their volume by the year 2020.³² Trade through the Ports is expected to generate more than one million jobs by that date. Toward that end, Port staff are constantly renovating and improving terminals, docks and roadways, and striving to incorporate the latest technological advances to accommodate their customer's future needs.

When no land is available for new projects, new land is created by the dredge-and-fill method. With this method, dredged material or spoil is used to create new and useful land. This is a very expensive process, but officials feel the expense is necessary in order to remain on the cutting edge of trade leadership.

Pier J, the world's largest earthen pier when built a quarter century ago, was expanded by 147 acres in 1990. That expansion provided more room for container handling and six

cargo.

³¹Fact Sheet, "About the Port of Long Beach", The Port of Long Beach, 1997.

³²Ibid.

more container-berths. Also, the Port of Long Beach is served by "Foreign Trade Zone #50," a facility which allows importers to package or modify imported products while deferring or avoiding import duties.

As the number and size of berths and business volumes have grown, so too have size of vessels docking at the port. Previous vessels were considered large if they carried 1500-3000 twenty-foot equivalent units (TEU), but those vessels coming on line today carry 3500-5500 more (TEU). The Port of Long Beach with its deep draft and focus on the fast growing and busy Pacific-rim Asian countries is the industry leader. Eighty percent of the Port's business either originates or terminates in those countries.

The Port of Long Beach is well prepared to handle these huge vessels which require a 47-foot draft. The port has 50-foot drafts, with its deep-water berths within three miles of the open sea. Reached via a 76-foot-deep main channel, the deep drafts also enable huge tankers in the 265,000-ton class to discharge their shiploads of Alaskan oil.

In 1987, the Port of Long Beach adopted the San Pedro Bay ports *2020 Plan*, which called for new cargo terminals, roads and rail yards on 1200 acres of landfill in the Long Beach harbor. The 2020 Plan has served as the primary long-range planning document for the Port of Long Beach. Since the release of the 2020 Plan, forecasts of future cargo movements through the San Pedro Bay ports have been updated which suggests different numbers and types of terminals may be needed. Cargo handling capacity has been updated to include recently completed terminals and emphasis has been placed upon projects that use existing land more efficiently, in order to minimize the need for major landfills.

Development opportunities not considered in the 2020 plan have been identified. A number of minor landfill projects appear feasible, and it may even be possible to redevelop a

large portion of the U.S. Navy property in the Port of Long Beach. The port has been increasingly concerned with non-cargo uses, and has prepared land use plans for ancillary uses, oil operations commercial and recreational uses, previously not addressed in the 2020 Plan.

The Port of Long Beach has also prepared the *Facilities-Master-Plan* to ensure that long range planning for the port reflects these new studies and policies. It serves as a companion to the 2020 Plan, and offers a comprehensive strategy for the siting and development of Port of Long Beach facilities into the 21st century. This plan focuses on potential development projects and general patterns of land use within the port. It incorporates the latest cargo forecasts and capacity estimates, explores a wide range of minimum landfill development options and addresses both cargo and non-cargo land uses.

As the Port of Long Beach has grown and developed, so too has its need to adapt and diversify to handle the ever-increasing volumes of traffic. Long Beach is the first southern California port to offer dockside rail, which is available at four of its seven container facilities. Dockside rail helps to move cargo between vessels and trains for efficient distribution to markets east, while at the same time removing unnecessary trucks from area freeways.

Approximately 50% of all boxes being off loaded in Long Beach now go on double-stack unit trains, destined for the U.S. Midwest, Gulf Coast and eastern seaboard. Other containers are served by the Intermodal Container Transfer Facility (ICTF), only four miles from the docks. This was a former Southern Pacific railroad (SP) facility now owned by the Union Pacific (UP) which bought out SP in September 1996. With the consolidation of UP

and SP, major rail links have been reduced to two. Long Beach is linked to the intercontinental rail network by UP and Burlington Northern-Santa Fe (BNSF).

Through use of technology, having access to a huge rail network, and with deep harbors with proximity to the ocean, the Port of Long Beach appears ready to maintain its status as the pre-eminent U.S. port well into the future. With visionary management and foresight, the Port of Long Beach has planned well for continued growth and prosperity through its *2020 Plan* and *Facilities-Master-Plan*. The Port of Long Beach is a true mega-port now, and its status will continue well into the future. Some pertinent facts about the port include the following:

- Largest and busiest U.S.A. port in volume
- 50-feet depth draft
- Capable of handling the largest vessels currently sailing
- Served by two (2) major railroads
- On-dock rail service
- Primary gateway to Pacific Rim Asian countries
- Foreign Trade Zone
- Port generates \$27 billion business revenue
- \$6.7 billion in wages, \$960 millions in taxes
- TEU's handled 1996: 3,067,334, for 99.4 million metric tons
- Combined with the Port of Los Angeles, the ports directly affects 500,000 jobs in a five county region

PORT FINANCIAL AND INFRASTRUCTURE ISSUES

It appears the major issues facing the Load Center/Mega-ports of the future are space constrictions and capacities, berthing depths, congestion, safety, and the available financing needed to confront these issues. The Load Center/Mega-port concept is akin to the airport hub and spoke system whereby people or goods are shuttled from smaller outlying facilities to the centers for re-distribution in greater volumes. Of these, the ability to handle and facilitate 5000+ TEU vessels quickly and efficiently is most prominent. In the same vein one cannot overlook the issue of financing port expansion and improvements.

HOUSTON/GALVESTON CHANNEL PROJECT

According to the Galveston District of the US Army Corps of Engineers (USCE), the deepening of the Houston and Galveston channels to 45 feet and widening to 530 feet is expected to be completed sometime between 2003-2004 at a cost of \$396 million. The Houston Ship Channel project has been in development since 1967. Factors warranting expansion of the Port of Houston include having the largest petrochemical complex in the US. The port leads the nation in chemical exports and is ranked sixth in the world, and is the largest in foreign commerce and second largest in total tonnage in the US.

A USCE public notice indicates that of its \$396 million channel enlargement plan, some \$242 million is for navigation improvements, \$30 million for environmental restoration and \$125 million for obstruction removal and to dredge berthing areas. Thereafter, maintaining project dimensions (removing shoal material from the channel) will cost \$13.7 million annually. USCE studies show that the recommended improvements would produce

annual benefits of \$85.7 million. Additionally, the Port of Houston would want to become a Load Center/Mega-port. By dredging its channel to 45-feet, Houston would go a long way toward achieving that goal. Where project funding will come from is not certain. The Galveston District has joined with other USCE offices in communicating with local project sponsors and governmental agencies regarding means for reducing the federal budget. Galveston District Engineer Colonel Robert B. Gatlin notes that the purpose of the review is to develop options for reducing the corps' participation in existing civil works missions and non-defense support activities. "Deficit reduction is a pressing national need," he says.³³

BIG SHIPS, SAFETY, MANEUVERABILITY

The busiest containerport in the US is the Port of Long Beach and the second busiest is the next door at the Port of Los Angeles. Each Year almost 6000 deep-draft vessel call on the Long Beach-Los Angeles ports. These vessels include 800 tankers and thousands of containerships carrying up to 6 million TEUs. In addition there is passenger cruise vessel traffic, auto carrier traffic, ferries to Catalina Island and more than 200,000 recreational vessels operating there.

At these busy ports the Coast Guard works with the private sector in a partnership arrangement. Port officials say the Coast Guard has been supportive and involved in commerce at the ports. By working through Harbor Safety Committee, a local group of safety experts from the port, shipping and government sectors, the Coast Guard has helped to develop an overall vision for the harbor. The Coast Guard is designated "captain for the port authority" which allows it to fine vessel master's companies or even take away their

³³ "Houston Channel Project Moves with Glacial Speed," Chemical Marketing Reporter, June 5, 1995.

privileges of entering the port. The Coast Guard actively inspects vessels and issues and enforces violations where warranted.

According to Vern Hall, deputy executive director of development at the Port of Los Angeles, the approach channel and turning basin at the Pier 300/400 complex are much wider than channels built in years past. He said “local conditions were recreated in modern simulator at the Merchant Marine Academy in King’s Point, New York, and port staff and pilots went through exercises to determine what the navigation requirements would be at the new complex.” The feedback from these navigation experts was used in the design of the terminal complex and its approaches. The exercises gave officials the confidence that big ships could easily and safely transit the channels, turn and berth.³⁴

Maersk Line Inc., a Danish steamship line, operates some of the largest containerships currently in usage. These vessels have 6000+ TEU capacity and ply the European and Asian routes. Maersk has no plans to use the vessel for US trade, but ports must be prepared if it does. Other large container vessels of this size call on the US West Coast (Long Beach, Los Angeles and Seattle). If the trend toward larger ships continues, ports must be able to welcome them to their docks. According to the American Association of Port Authorities (AAPA), 6,000-7,000 TEU vessels have drafts of 42-45 feet. However, ports that are authorized to handle drafts of 45 feet are few and far between. With over 90% of volume traveling into the US moving by ship, the current system is an issue that must be dealt with by the entire transportation industry. The Port of New York/New Jersey gained authorization to deepen its 40-foot channel. It hopes to start building in 1999 and expects its new 45-foot channel to handle 6,000 TEUs. The port estimates that if all trends continue, by 2025, 25%

of its volume will be transported on 6,000-TEU or larger vessels.

Major US port depths

<u>Port</u>	<u>Depth (in feet)</u>
New York/New Jersey	32-42
Kill van Kull	35 (deepening to 45)
Philadelphia	40
Savannah	38
Miami	38
New Orleans	45
Houston	40 (deepening to 45)
Los Angeles	45
Long Beach	50
Seattle	40-72
Oakland	35 (deepening to 50)
Port of Virginia	50

According to AAPA officials, “Failure to deepen will result in missed business opportunities. Vessels don’t even have a choice if the port is not deep enough.”³⁵ Conventional wisdom says that once lines retire their older ships, larger ships will be used on additional routes. Port of New York and New Jersey officials predict that by the year 2025, 25% of its volume will be transported on 6,000-TEU or larger vessels.

U.S. carriers and shipbuilders believe the construction and safety standards they must adhere to give foreign flag-vessels an advantage over domestic shippers. Ships built for service under the U.S. flag must meet a variety of standards that often are more stringent than

³⁴ Mongelluzzo, Bill, “Big Ships Create Big Problems,” *Journal of Commerce*, April 11, 1996.

those imposed by the International Maritime Organization. U.S. shipbuilders and carriers have told congress they want ship construction and safety standards reduced to the same level as those governing foreign countries. At a May 15, 1997 House Coast Guard Subcommittee hearing on commercial vessel safety, many complaints and recommendations were lodged in support of strengthening the domestic shipping industry.

Joseph J. Cox, vice president of the U.S. Chamber of Shipping stated, "It is simply not supportable to require a U.S. ship to meet a standard which a foreign sister ship need not meet. If our competitors, who carry 95 percent of the cargo into the country, do not meet a requirement, there is no justification for imposing that requirement on U.S. ships." ³⁶ The more stringent construction standards make it costly for companies to place the U.S. flag on ships built for foreign registries.

Ninety percent of the cargo entering or leaving the U.S. travels on foreign-flag vessels. U.S. ports received 7,500 foreign-flag vessels in 1996, including 126 passenger vessels, 1,470 oil tankers, and 5,775 cargo vessels. Of those ships that were identified as being substandard or were detained in 1995, 34% didn't return to the U.S., according to the Coast Guard. Maritime unions have pressed the Coast Guard to require U.S. pilots to guide foreign-flag vessels into ports and to improve the English speaking capability of mariners operating in U.S. waters.

DOMESTIC FREIGHT CARRIAGE

The face of domestic freight carriage is expected to change dramatically in the next

³⁵ Gourley, Colleen, "From Sea to Shining Sea," Distribution, February 1997.

³⁶ Barnes, David, Traffic World, "Foreign vs U.S. Rules, May 26, 1997.

ten years with intermodal seeing a significant increase. ATA Foundation of the American Trucking Associations has sponsored a report, U.S. Freight Transportation Forecast to 2006, which was prepared by Standard & Poors DRI, an economic forecasting firm. Among its projections is that intermodal rail and air cargo shipments will take a big chunk out of the trucking industry's overwhelming dominance of the nation's freight traffic in the next decade. This will happen because of changes in the nature of cargo as the economy expands.

The relative growth of general freight, which is smaller and of a higher value than bulk freight, coupled with an increase in the length of the average haul, will drive the shift. Air freight and intermodal rail will make up 7% of total U.S. freight shipments in the year 2006, compared with 4.5 % in 1996. Trucking's share will decline from 82.3% to 81.5% of the total freight market over the 10-year period. The railroads' share, outside the intermodal sector, will also shrink. The market share for the trucking industry will continue to drop, with for-hire carriers overtaking the private fleets as businesses farm out more work currently done by their in-house truck fleets, DRI predicted. Common carriers' proportion will rise from 49.6% to 54.7%, as for-hire shipments rise 3.3% a year, nearly three times the growth of private trucking. The report predicts a sharp rise in commercial transportation over the coming decade, with revenues increasing 30%--a 2.7% annual rate--from \$420 billion to \$548 billion. The report reflects primary shipments---the first leg of a freight movement. The volume of primary freight shipments is forecast to rise 21% over the decade, a 2% yearly rate, from 10.9 billion tons to 13.2 billion tons. For trucking, primary shipment revenues are expected to jump from \$345 billion in 1996 to \$400 billion in 2001 and \$446 billion in 2006. The continuing trend toward a service-driven economy will have a key impact on the nature

of the freight industry over the next decade, with smaller items taking a large share,³⁷ according to the report.

³⁷ Snyder, Charles A., Commercial Carrier Journal, "Rail and Air Carriers expected to take Freight from Truckers," February 12, 1998.

CONCLUSION

In conclusion, a mega-port is defined as a port which can accommodate containership vessels which carry 4000 to 5000 + TEU's by today's standard (1997). This size port requires a channel draft of 40-46-feet for safe and efficient operation. To accommodate these large vessels also requires dock space to unload the containers as well as requiring good rail and highway access to facilitate or turn these huge volumes of containers.

Projections suggest vessels of the future (due by year 2000) will carry 6000-8000 TEU's and will require 50+ foot-deep draft channels and will demand total restructuring of most port infrastructures. Attendant factors such as bigger and faster cranes, better communication and tracking systems as well as increased through-put and port flexibility will be required of those ports which will compete for business in the future. Recognizing the wave of the future, carriers are urged to "buy big," based on the facts; a fully loaded 6000 TEU capacity vessel costs 21 percent less to operate per TEU than does a 4000 TEU capacity vessel.³⁸

Dredging and infrastructure improvement is expensive but necessary, propositions for all port authorities to consider, but some will make the needed changes while others will languish.³⁹ Dredging is an on-going maintenance issue at all ports because of sediment, and disposal becomes an issue because five to seven percent are from seriously polluted soils. At present, only a small percentage of the top ten U.S. container ports, which combined

³⁸Porter, Janet, "Ocean carriers told to buy big or lose money," The Journal of Commerce, Dec. 10, 1996, p. 4C.

³⁹"Dredging progress in 1996," Port Authority of New York & New Jersey, April 1996.

Governors' Joint Dredging Plan, calls for \$130 million in Port Authority funds to be provided for dredging and dredged material disposal projects, including decontamination, pollution control, beneficial reuse of dredged material and construction of sub aqueous pits as disposal facilities.

handle about 80% of the container traffic, have depths that can accommodate the megavessels. Those ports willing to develop to accommodate the mega-ships will ultimately serve as the ports of tomorrow.

The port of the future will be considered "load centers."⁴⁰ The "load centers" will consist central terminal facilities for the gathering of and dissemination of freight---serving as large scale dispatching centers. On the Texas Gulf Coast, Houston is more likely than other ports in this region to get this designation. This is because of its current operations and infrastructure, vast rail network, abundant labor resources, an extensive highway system, close proximity to Mexico and other regions of the U.S., and because of the plans set forth for its current and future growth.

While the port complexes grow ever bigger, so too do the intermodal rail centers. Both rail centers and port terminals are evolving, becoming more diverse, complex and technical. As these centers have grown in size, the numbers of facilities in operation has diminished. In the future, fewer rail and port facilities will handle ever-increasing volumes of business.

Currently, only five Class I railroads exist with the possibility of one of the five, (ConRail), being split and merged into the two big eastern railroads, the Norfolk Southern and CSX Corporation.⁴¹ There are two rail giants west of the Mississippi River, the Burlington Northern Santa Fe (BNSF) and Union Pacific (which merged with Southern Pacific in September 1996, becoming the nations largest railroad).

⁴⁰Vickerman, John M., "Port Financing Strategies," Ports and the Intermodal Challenge in the Face of Reduced Resources, Jan. 13, 1997.

⁴¹Weber, Joseph, "Highballing toward two big railroads," Business Week, March 17, 1997, p. 32.

As these entities merge, facilities offering similar services are consolidated resulting in fewer alternatives and less competition. The water carriers are becoming "load centers" and are more and more regionalized where the larger ports will serve as primary ports of entry and departure. This mode in rail and vessel service is akin to the airline "hub and spoke" method where passengers are hubbed to a central or regional airport from airports where passenger volume is not great enough to fill planes for specific destinations. Consolidating passengers at the central or regional airports allows the airlines to fly full destination specific planes often, which like the railroad and water-carriers results in economies of scales, infrastructure savings and service.

Plans call for the Port of Houston Authority to develop a 1000-acre facility at Bayport, which will become the Port's main terminal.⁴² The Bayport Terminal will have 50-foot channel drafts and a major rail facility will be a part of the complex. After the Bayport complex is built and becomes functional, the Barbours Cut terminal will continue operations, but will handle many of the smaller vessels and new business that the Port Authority generates. Though the Bayport terminal will have 50-foot channel depths, which will accommodate vessels of 4000-6000 TEU's, provisions will have to be made to accommodate the 6000-8000 TEU vessels which are the next generation containerships.

With the increase in size of vessels, vessel operators have resorted to *vessel sharing agreements* (VSA) called "shipping alliances."⁴³ First permitted in 1985 under U.S. regulations, VSA's are now becoming more the rule than the exception. In 1985 there were

⁴²Jenkins, Charlie, Interview and Port tour, Port of Houston Authority, Nov. 7, 1997.

⁴³Vickerman, M. John, "Port Financing Strategies," Ports and the Intermodal Challenge in the Face of Reduced Resources, Jan. 13, 1997.

56 VSA arrangements and by 1994 the number had increased to 143.⁴⁴ The shipping lines are sharing container and chassis equipment, as well as sharing of vessels, which is helping to fill the ever-larger containerships. Even while sharing assets, these companies continue to operate as separate companies.

Many of the steamship lines are merging. In the past ten years, only two U.S. steamship lines existed (American President Line and Sealand Service). Neptune Orient Line (NOL) of Singapore, completed on November 13, 1997 bought American President Line. Sealand service which has a sharing agreement with many lines including Maersk (a Danish line), is expected to be bought by Maersk. It appears that port business in the U.S. is a vibrant growth industry, but vessel operators plying the earth's seas are becoming increasingly non-American in ownership.

Back to the issue of future port operators and those which will become major players and which ports will become of marginal usage, deep-draft ports (minimal 50-feet) with all the accompanying conveniences will become the primary ports. These areas, along with deep drafts, will offer ready highway access and on-dock rail and terminal facilities will be the rule rather than the exception. The majority of the bigger ports today do not offer direct rail service; arrangement is made to shuttle by truck to the rail facilities or from the rail facility to the port.

Currently, only three U.S. ports have 50-foot draft depths, they are Los Angeles/Long Beach, the Port of Virginia at Norfolk and the Port of Seattle---which offers the nations deepest drafts of 50-70-foot depth.⁴⁵ Other major ports have done feasibility studies on

⁴⁴Journal of Commerce, May 1995.

⁴⁵Vickerman, M. John, "Port Financing Strategies," Ports and the Intermodal Challenge in the Face of Reduced Resources, Jan. 13, 1997.

deepening their ports or have projects in the works to accomplish this 50-foot goal. They include Houston, New Orleans, Oakland and the Port of New York & New Jersey.

Only a few U.S. ports will achieve "load-center/mega-port" status. Those ports located at major cities and currently doing large volumes of business will continue to do so while developing to the next level. These ports are current in their operations and are primed for developing trends. Located at these facilities are deep-drafts, large technologically advanced cranes and equipment handling components, ample labor, available rail and highway connections and other infrastructure resources. Economics and access will be the main determinants of the load-center/mega-port status.

Smaller ports will continue to operate in their current capacities while some will see business grow to previously unseen volumes. This will be due primarily because marine volumes are growing so rapidly and will continue into the foreseeable future. Large vessels will call on these ports, but the mega-vessels and larger future generation vessels will not. The small and intermediate ports will serve as feeder-hubs to the load-center/mega-port terminals in the hub-and-spoke mode.

A question all port authorities must ask is, "are port upgrades worth the costs and efforts to enlarge?" In many instances the answer is a resounding "no." Why? Because port upgrades are extremely expensive with dredging, property acquisition, cranes and yard equipment investment, establishment of track and rail components and other infrastructure requirements. Many port facilities users are unwilling to or cannot afford to pay the high

costs of port operations. Government is expected to provide funding and resources in many instances, and is sometimes unwilling to make the financial commitments necessary.⁴⁶

Having an expanded, bigger and busier port also results in increased traffic congestion, rail tie-ups, and more trucks on the roads increasing pollution while making an adverse environmental impact. Most communities are willing to accept adverse conditions associated with port growth when the economics of jobs creation, associated industry growth and other ancillary benefits, such as stature and recognition, are considered.

What effects, advantages, and benefits does port expansion bring to a community and its general area? Ports achieving mega-port status will have to invest in new state-of-the-art cranes, additional yard operations equipment, and additional storage space to accommodate the influx of more containers, and in some instances, numerous more containers, considering the capacities of the mega-ships. Whether a mega-ship is arriving at a port or departing, the ability to move huge amounts of containers must be available by truck and by rail. As these vessels move in and out, they will place a tremendous burden on the host facility and its surrounding area in moving huge traffic volumes quickly. The mega-ship will make the least port calls possible with its purpose being to constantly load, disembark or sail, therefore keeping the vessel economically viable.

Dredging and disposal of dredged materials is another factor affecting port expansion. Where dredged disposal materials will end up is a community concern as well as an ongoing issue with environmentalists. The Port of Houston Authority is one of the port leaders where the issue of ecology is concerned. In considering the environment, the port's strategy was guided by three principles: "One, dredge material was to be regarded as a resource; two, only

⁴⁶Boske, Ph.D., The Texas Seaport and Inland Waterway System, 1995, p. 141.

environmentally acceptable methods would be used for dredged disposal; and three, the plan was to result in a long-term net positive environmental effect on Galveston Bay. Thus, the material from the channel bottom will see new life as bird islands, marshes and boater destinations in an environmentally improved Galveston Bay."⁴⁷ In summary, ports will need Adequate yard facilities to handle large volumes quickly, including the following factors to be considered a mega port:

- Personnel
- Chassis
- Yard hustlers
- Maintenance and Services
- Storage capacity
- Minimum 50-foot channel drafts
- Ability to accommodate 5000+ TEU vessels efficiently for both inbound and outbound traffic
- High capacity road structure to handle both heavy port and street traffic
- High capacity modern cranes capable of working multiple lifts

⁴⁷The Port of Houston Authority, <http://www.vannevar.com/port_of_houston/lores/overview/env.htm> (1997, October 23).

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