Commission Briefing Paper 4B-01

Implications of International Trade and Port Capacity for Freight Transportation

Prepared by: Global Insight, Inc.
Date: January 11, 2007

Introduction

This paper is part of a series of briefing papers to be prepared for the National Surface Transportation Policy and Revenue Study Commission authorized in Section 1909 of SAFETEA-LU. The papers are intended to synthesize the state-of-the-practice consensus on the issues that are relevant to the Commission's charge outlined in Section 1909, and will serve as background material in developing the analyses to be presented in the final report of the Commission.

This paper presents information on the growing impact of international trade on the US economy, and the collateral impact of this shift on transportation infrastructure. As a significant element of trade infrastructure is the condition and efficiency of U.S. ports, this paper also addresses the ability of the Maritime industry and U.S. ports to accommodate this increase in trade volume, and how capacity constraints could foment shifts in trade routing, activity, and use of the US domestic network.

Background and Key Findings

The growth in international trade has strained the country's domestic transportation system, especially those parts such as the highway system and the rail system that were not developed over the last 50 years to support rapid globalization of freight movement in the country. The seaports have borne the largest impact from this lack of capacity development, as trade, in volume terms, is primarily handled through a limited number of gateway seaports, located mostly in congested urban areas.

- International merchandise trade is growing faster than overall freight transportation
- A increasing share of the domestic freight system is serving international trade shipments
- U.S. port capacity and productivity is not increasing as fast as trade volumes
- Constrained U.S. port capacity leads to development of alternative ports, both inside and outside the US.

Staff Comments

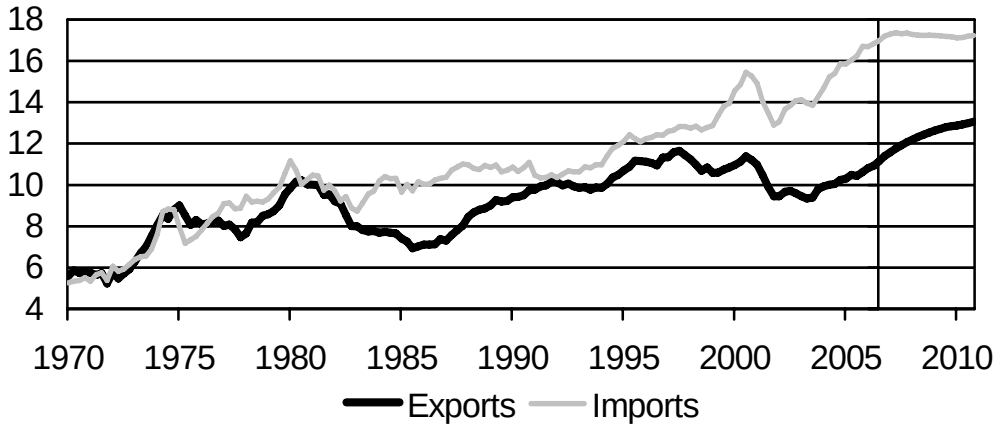
This commission briefing paper is one of several that examine trends and consequences of commodity flows. Paper 01 reviews trends in international trade and trading partners. Paper 02 estimates shifts of trade through West Coast ports to East Coast ports if trading partners change. Paper 03 investigates the role of Canadian and Mexican ports in handling U.S. foreign trade. Paper 09 considers the role of short sea shipping in foreign and domestic trade. Paper 10 outlines forecasts of future commodity flows by geography and mode, and Paper 06 describes economic forecasts that underlie the commodity flow predictions. Forecasts presented in these papers are based on common methods, but in some cases use different years, commodity classification systems, and geography.

Growing Role of Trade in the U.S. Economy

The economy of the United States is increasingly linked to the rest of the world through international trade. Since 1970 the U.S. economy has seen imports, measured against the value of Gross Domestic Product, triple and exports double. An increasingly liberalized global market for many products has expanded opportunities for U.S. producers to sell their products overseas while U.S. consumers and businesses have been able to take advantage of lower production costs available overseas, importing products and components at low prices. The upward trend in foreign trade's share of the economy is projected to continue, linking an increasing number of U.S. jobs and business activity to international trade. Though the path of growth in share for imports and exports has diverged at times, [due to relative economic performance of our trade partners, the U.S. dollar exchange rate, and world commodity prices] the long-term trends are unmistakable. The increasing dependence on trade in the U.S. economy makes facilitation of trade more important each year as a greater share of our economy becomes at risk from trade disruption.

The greater role of trade in the U.S. economy also means that policy decisions affecting trade facilitation on the part of our trade partners can affect a greater proportion of our economy. Foreign policy, especially trade policy, as well as foreign infrastructure capacity and performance, are therefore increasing in importance to the performance of the U.S. economy. The proportion of traffic on the U.S. transportation system that facilitates international trade to and from the country's borders therefore takes on increasing importance for the whole economy.

U.S. Exports and Imports as Percent of GDP



Source: US BEA through October 2006; Global Insight, Inc. forecast to 2010

U.S. Industry Sector Mix of the Economy

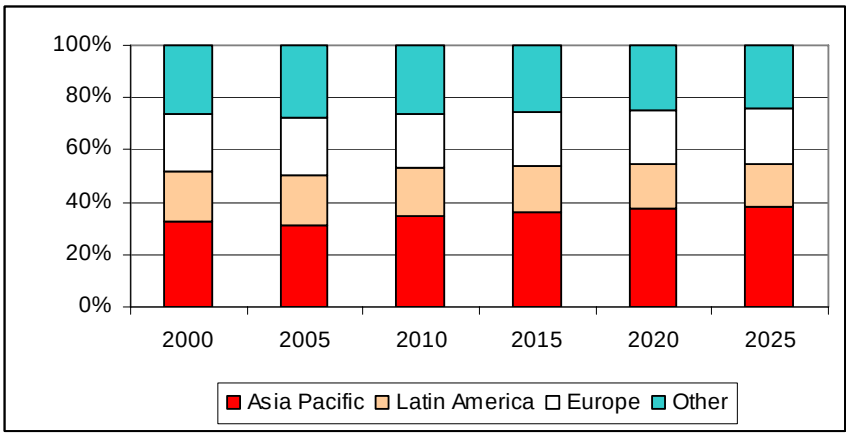
Increased trade is linked to the sectoral shifts within the U.S. economy as the services sector has increased in importance for job creation and output in comparison with manufacturing, agriculture and mining. This shift reflects the high level of economic development of the country and is a continuation of trends that trace back more than a century. As agriculture gave way to manufacturing, now manufacturing has given way to service sectors as the source of greatest job growth within the economy. Agricultural, mining and manufacturing productivity gains have also boosted the value of output significantly in comparison with the labor input

required, meaning much less labor has been required for these sectors. The U.S. is still a huge producer (and consumer) of bulk commodities such as coal, petroleum, ores and crops but with much less of the workforce required for their production. Due to productivity improvements, the U.S. maintains a substantial base of advanced manufacturing, especially in sectors with a high technology element such as pharmaceuticals, aircraft, and motor vehicles. Manufacturing still provides over ten percent of total employment and the total tonnage of manufactured products produced continues to increase. The manufacturing that has shifted to other countries is a result of the combination of factors that have enabled companies to use the comparative advantages in production of specific goods outside the U.S. to supply the U.S. market. Key to "offshoring" has been use of lower cost labor for mass assembly. Lower costs of production, combined with efficient and low-cost long-distance transport have helped dampen inflation in many sectors of the U.S. economy. The lower cost of imported goods also benefited those U.S. manufacturers who use imported components. Increasing linkages between supplier companies across borders has also resulted in substantial trade of components within individual industries before the point of final assembly.

Shifting Importance of U.S. Trade Partners

The patterns of countries with whom the U.S. is trading is evolving with the traditional trading partners in Western Europe supplanted by growth in trade with Japan, Canada, Mexico and the Asian 'newly' developed economies of Southeast Asia and Korea, followed today by fast growth in trade with China. Trade with oil producing countries has also increased as oil imports, measured in value, have increased rapidly due to the run-up in oil prices in the last few years. The distribution of trade in bulk resource commodities such as oil, coal and grain is following developments in production and consumption among our trade partners. As examples, as Mexican oil production declines with oil fields maturing, the U.S. will increasingly rely on other foreign oil exporters to replace that supply while U.S. grain exports to Asia will increase as those economies become wealthier and can afford to consume more meat from animals fed U.S. grain.

U.S. Merchandise Trade by Partner Region, 2000-2025



Source: US ITC through 2005; Global Insight, Inc. forecast to 2025

The growing number of countries agreeing to bilateral Free Trade Agreements with the U.S. has enlarged the geographic scope of U.S. trade well beyond our trade with Canada and Mexico, America's NAFTA trading partners. The expansion in the number of countries who are members of the World Trade Organization (WTO) has also liberalized access to more international

markets for the U.S. China's accession to the WTO 2001 is one of the contributing factors to the dramatic increase in U.S. – China trade over the last five years. With other developing countries in line for accession to the WTO, additional markets will see trade liberalized, further expanding trade opportunities for the U.S.

Freight Transportation Implications

For nearly all U.S. international merchandise trade, the distance the shipment must travel from its origin to its destination is longer than shipments of the same products between domestic producers and consumers of the same goods. Especially for trade with major overseas U.S. trade partners in Asia and Europe, typical shipment distances are long and every shipment must transit a border crossing gateway.[1] The geography of the international freight transportation gateways is tied to the development of the country with many cities having grown up around sea ports, which provided many advantages over 100 years ago but today provides challenges to operations sharing dense urban areas with many neighbors.

Top 20 U.S. International Freight Gateways, Value

	Ranked By Value of Shipments: 2005	*(Billions of U.S. dollars)*		
2005 Rank	**Gateway Name**	**Total Trade**	**Exports**	**Imports**
1	John F. Kennedy International Airport, NY (air)	134.9	59.3	75.6
2	Los Angeles, CA (water)	134.3	18.4	116.0
3	Detroit, MI (land)	130.5	68.8	61.7
4	New York and New Jersey, NY/NJ (water)	130.4	26.2	104.2
5	Long Beach, CA (water)	124.6	21.2	103.4
6	Laredo, TX (land)	93.7	40.9	52.8
7	Houston, TX (water)	86.1	33.8	52.3
8	Chicago, IL (air)	73.4	29.1	44.3
9	Los Angeles International Airport, CA (air)	72.9	36.5	36.4
10	Buffalo-Niagara Falls, NY (land)	70.5	32.5	38.0
11	Port Huron, MI (land)	68.2	23.6	44.6
12	San Francisco International Airport, CA (air)	57.2	25.2	32.0
13	Charleston, SC (water)	52.4	15.9	36.5
14	El Paso, TX (land)	43.0	18.9	24.1
15	Norfolk, VA (water)	39.6	15.0	24.5
16	Baltimore, MD (water)	35.6	8.6	27.0
17	Dallas-Fort Worth, TX (air)	35.1	15.4	19.7
18	Seattle, WA (water)	35.0	7.7	27.3
19	Anchorage, AK (air)	34.7	8.7	26.0
20	Tacoma, WA (water)	33.8	5.0	28.7
	Top 20 Gateways	**1,485.9**	**510.8**	**975.0**
	Top 20, % of total	57.7%	56.5%	58.4%
	Total, All Gateways	**2,575.3**	**904.4**	**1,670.9**

Source: U.S. RITA/Bureau of Transportation Statistics, Dec. 2006

The impact of growth in trade has affected all modes of transportation. The top 20 significant U.S. freight gateways, measured by the value of shipments in 2005, serve all modes of transportation and are located around the country's borders.

[1] Border crossing gateways include seaports and airports as well as road and rail border crossings.

The geographic and modal distribution of these gateways are evidence of the importance that all border regions and all transport modes play in facilitating the nation's trade.

In weight terms however, the top international gateways are all maritime ports, reflecting the importance of ocean transportation of bulk commodities, especially for energy and agriculture commodities. Domestic cargo activity at these ports is often correlated to international cargo tonnage, especially at sea ports also served by the inland waterways or coastal transport where domestic marine transport is linked to the foreign trade. Therefore the international bulk cargo at these ports should be understood as dependent on the domestic marine system as well as the rail, highway and pipeline networks serving the ports.

Top 20 U.S. International Freight Gateways, Tonnage

	Ranked by Foreign Tons	*(Thousand Short Tons)*				
2004 Rank	Port Name	Grand Total	Total Foreign	Foreign Inbound	Foreign Outbound	Domestic
1	Houston, TX	202,047	137,537	97,713	39,823	64,511
2	Port of S. Louisiana, LA	224,187	104,771	40,087	64,683	119,417
3	Port of New York and NJ	152,378	82,200	70,749	11,451	70,178
4	Beaumont, TX	91,698	70,874	65,316	5,558	20,824
5	Long Beach, CA	79,708	62,515	44,620	17,896	17,193
6	Corpus Christi, TX	78,925	53,795	44,990	8,805	25,130
7	Texas City, TX	68,283	50,806	46,385	4,421	17,477
8	Los Angeles, CA	51,363	43,872	32,420	11,452	7,491
9	New Orleans, LA	78,085	40,423	24,135	16,288	37,662
10	Baltimore, MD	47,399	32,780	24,950	7,830	14,619
11	Lake Charles, LA	54,768	31,693	27,036	4,657	23,075
12	Mobile, AL	56,212	29,318	19,916	9,402	26,894
13	Freeport, TX	33,908	28,138	25,157	2,981	5,770
14	Portland, ME	29,709	27,834	27,615	219	1,875
15	Norfolk, VA	34,166	26,192	8,572	17,620	7,974
16	Savannah, GA	28,177	26,078	16,535	9,544	2,098
17	Pascagoula, MS	34,100	23,410	19,476	3,933	10,690
18	Baton Rouge, LA	57,083	21,939	18,156	3,783	35,144
19	Philadelphia, PA	35,220	21,437	21,123	314	13,782
20	Charleston, SC	24,739	20,816	14,643	6,173	3,923

Source: U.S. Army Corps of Engineers, Waterborne Commerce of the U.S., Calendar Year 2004, Part 5

There are a few other implications from international trade growth for freight transportation that are important to note here. One is that international freight transportation does not exist completely separately from international passenger transport. In addition to use of belly space on passenger airliners, growing trade is correlated with more international passenger travel as business travel increases between individuals working for companies engaged in international trade. Another implication is that the U.S. freight system is increasingly sensitive to disruptions in the international trade network, whether those disruptions occur in the U.S. or elsewhere.

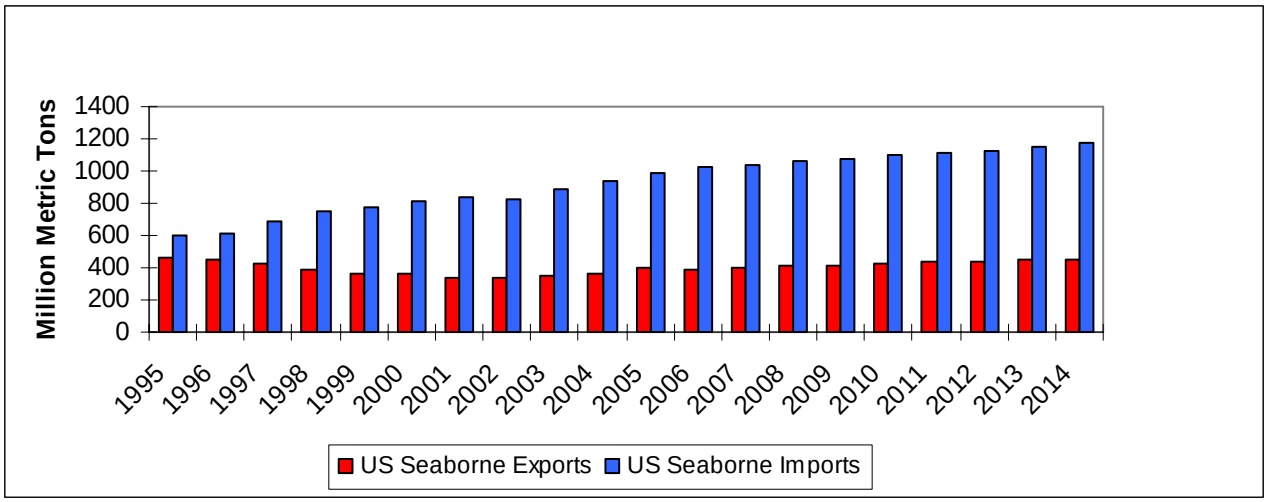
Maritime / Ports Share of International Freight Transportation

Maritime transport carries by far the largest tonnage of all transport modes in the country. This is not surprising since it is the most cost efficient mode for moving high-volume bulk goods where there is access to navigable waterways. While the growth in demand for high-volume

bulk goods such as petroleum, coal, ore, grain and chemicals has been and is forecast to be outpaced by growth in manufactured goods, the base of traffic in bulk goods and the growth in international maritime trade maintains the country's dependence on maritime transport for the foreseeable future. According to the FHWA's Freight Analysis Framework, the waterborne share of total tonnage declines slightly from 2002 to 2035 while total waterborne tonnage almost doubles to 2.2 billion tons, due mostly to growth in international trade. Consequently the country remains very dependent on the maritime transportation system for freight transportation.

Within maritime transport, import and export shipments are the source of most growth in tonnage, and they are expected to continue to increase their importance as a proportion of waterborne tonnage. Together imports and export tonnage is expected to almost double between 2000 and 2035, increasing at a compound average annual growth rate of 1.9%. The relative slow pace of total international maritime tonnage growth reflects the continued importance of the slower-growing but high-volume bulk goods as opposed to the faster growing but lighter weight containerized goods.

U.S. Maritime International Trade Growth 1995-2014, Million Metric Tons



Source: FHWA Freight Analysis Framework, 2006

The challenges that significant trade growth presents are evidenced at the San Pedro Bay ports of Los Angeles and Long Beach. These ports have become the largest border gateway complex in the country [in terms of value] following the growth of U.S. maritime trade with Asia. These two neighbor ports, when combined, rank first in 2005 value of trade handled at $258.9 Billion dollars.[2] On just the import side, these ports rank first and third when considered even individually, in 2005 value of trade handled. (The ports of New York and New Jersey rank second for import value.) With the forecast doubling of maritime trade demand, the country's maritime throughput capacity needs expansion or significant disruption to trade and the economy may occur. The demand for maritime transportation also provides significant challenges to the country on the land side for access to and capacity to serve ports.

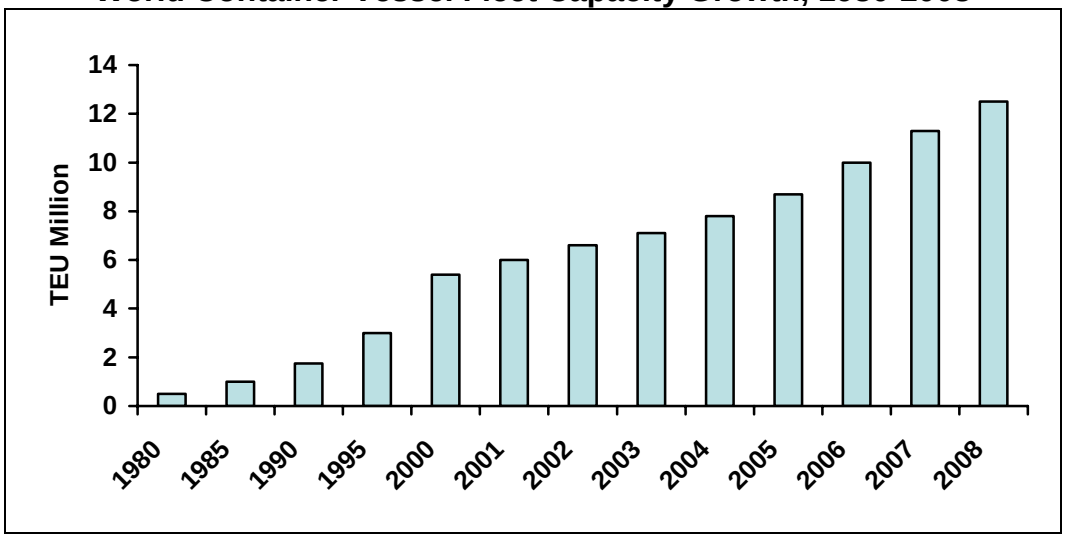
[2] Separately, Los Angeles and Long Beach are #2 and #5 respectively on the list of top 20 gateways.

Primary risks to the maritime network's ability to provide competitive service with increasing demand are threefold: (1) fleet capacity, (2) port throughput capacity and (3) inland transport throughput.

Fleet Capacity, Characteristics and Use

The composition of the world cargo vessel fleet is continuing to evolve with higher technology vessels that provide improved reliability, safety and efficiency. Today, most cargo ships (and cruise ships) serving U.S. international routes are built, crewed and owned overseas. U.S. domestic waterborne transportation is covered by the Jones Act which requires U.S. built, U.S. crewed and U.S. owned vessels. In addition to the vessels serving the Alaska, Hawaii, Puerto Rico and U.S. Virgin Islands maritime shipping routes, the domestic fleet includes the tug and barge fleets of the inland waterways, the laker fleet on the Great Lakes, lightering tanker vessels and coastwise and short sea shipping vessels[3]. The separate domestic and international vessel fleets mean that the companies and shipyards that provide the vessel capacity for most U.S. international trade are located overseas, especially in Europe and in Asia. World standards setting organizations and international agreements are therefore essential to the U.S. being able to influence the maritime fleet serving the nation.

World Container Vessel Fleet Capacity Growth, 1980-2008



Note: Capacity measured in twenty-foot equivalent units (TEU). Source: Howe Robinson

The share of the world oceangoing cargo vessel fleet made up of container ships is increasing, reflecting a greater proportion of trade moving in containers. Almost one thousand new containerships are being built or are on order in the world's shipyards providing a backlog running into 2010[4], with total world fleet capacity projected to grow at a compound average annual rate of 9.6% from 2000 to 2008, resulting in doubling of capacity from 2000 to 2007.[5]

[3] U.S. short sea shipping and inland waterway transport are addressed in detail in paper IV-B-09, Driving Factors and Potential Impacts of Future Increases in Short Sea/Inland Waterway's Share of Total Freight Movements.

[4] Research from Howe Robinson & Company Ltd. shipbrokers, October, 2006.

[5] ibid.

Many of the new container ships are larger than previous generation vessels to take advantage of economies of scale that reduce unit shipping costs for the containers. Many of these ships are larger than will fit through the current Panama Canal locks and are big enough to strain the channel, birth and bridge height capacity of many U.S. ports.[6] The average service life of container ships is about twenty-five years, which means the composition of the overall world fleet supply changes relatively slowly (compared with, for example, the domestic truck tractor fleet.) However, the deployment of vessels in the world fleet typically changes over their lives, with the largest ships first being used on long-haul, high density trade lanes such as Asia – Europe and Asia – North America West Coast. As ships age, they are replaced with newer, larger vessels on the same routes. The original ships are redeployed to other routes (e.g. South America – North America), in turn replacing smaller vessels redeployed to even smaller routes (e.g. intra-Caribbean). At each stage, the average vessel size calling the ports serving those routes has increased, putting pressure on the ports to handle larger dimension container ships, with more cargo onboard.

Port Capacity

The capacity at some U.S. coastal ports, like the capacity of other parts of the transportation system, is being consumed by increased international traffic volumes, even as ports are making huge investments in infrastructure expansion. Particularly for those ports handling international containerized trade, additions to throughput capacity are being steadily absorbed by growth in traffic that outpaces capacity expansion.[7] There is also competition between different types of cargo handling facilities for available space at existing ports, causing some shifts between ports in the mix of commodities handled. And while no single port capacity metric can capture the dynamics of productivity for all ports, the clear evidence indicates that unused capacity is dwindling. The development and plans for new ports and terminals around North America is another indication of the growth pressures on existing sea port capacity.

Operating practices at ports and related intermodal terminals and networks are being optimized to increase port throughput capacity to minimize needs for new land for terminals and additional vessel berths. As elsewhere in the transportation system, capacity constraints appear first only at peak times, which for the sea ports are during the busiest part of the year for shipping in the late summer and fall. Congestion that occurred during the fall of 2004 at the Los Angeles and Long Beach container ports has led to improvements in institutional and operating practices at those ports, many of which are now also in use at other ports. Expanded operating hours for truck gates accompanied by peak time charges has alleviated some of the immediate pressure on these ports. Other steps taken include adoption of 'virtual' container yards and reservation systems to eliminate queues of drayage trucks and increases in use of on-dock intermodal rail yards to eliminate the need for some truck drays. The tradition of "free time" for use of terminal space and equipment is fast changing with demurrage charges increasing to provide the incentives to improve equipment velocity and utilization rates. Other ports are adopting port-wide container chassis pools to reduce the chassis fleet size and the ground storage space needed.

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[6] Panama and Suez Canal developments are addressed in paper IV-B-2, Implications if Future Changes in Primary Trading Partners Result in Shifts of Shipping Traffic From West Coast Ports to East Coast Ports.

[7] The U.S. Chamber of Commerce in their study "Trade and Transportation, A Study of North American Port and Intermodal Systems" in March 2003 estimated that U.S. container port capacity would be used up within seven years.

With most of the nation's largest maritime ports located in already-crowded urban areas, the competition for space to devote to maritime cargo handling as opposed to other desirable uses can be strong. As cargo volumes grow to serve the demands from the growing U.S. population and the economy, the operational requirements of growing ports frequently generate increasing resistance to further port expansion. The environmental impacts of port operations can be significant, with externalities concentrated on the local communities near the ports while benefits are distributed around the country. This situation is increasing costs for expansion at some existing ports which may accelerate the development of new North American coastal ports far from North American population centers. New Canadian and Mexican container port developments are examples of how some of the forecast additional trade volume may be accommodated, though with obvious impacts on the use of the inland system to carry this trade to and from its final U.S. origin or destination.

Inland Freight System Capacity

The expansion of ports has also contributed to highway and rail capacity issues outside the gates. As trade volumes increase, the inland network connections become ever more critical to their successful and productive operation. The failure of inland rail, truck and inland waterway systems that connect to seaports to keep pace with the growth in maritime volumes can lead to inefficiencies at best and complete collapse of operations in the worst case. The severe Southern California container port congestion suffered towards the end of 2004 was due in part to the inability of the rail system to handle the growth in intermodal traffic as well as problems handling the surge of container cargo that arrived aboard large vessels. In years with flooding or drought or lock failures on the inland waterways, there have also been problems shipping the desired volumes of commodities to market so the challenges to the transportation network affect both bulk and high velocity intermodal freight. And whenever there is a disruption to one mode of transport, the other modes see a surge in demand that is often not able to be absorbed satisfactorily, yet is not permanent so no investment is induced to build reserve capacity for such events.

The Class I railroads handling international intermodal container traffic are investing in expanded capacity, including development of new intermodal rail yards dedicated to international containers and expanding railroad container car fleets to optimize train length for international container sizes. However, most of the private capacity improvement decisions are made, as one would expect, to serve the companies that make them, not the system as a whole. Though there is a trend towards more capacity expansion through public-private partnerships where public funds can pay for the public benefits of private system expansion, further integration of intermodal infrastructure and operations is needed so that investments in one part of the system do not result in stranded assets elsewhere, because another segment in the system did not keep up with capacity demands.

CONSOLIDATED COMMENTS FROM MEMBERS OF THE BLUE RIBBON PANEL OF TRANSPORTATION EXPERTS - PAPER 4B-01

One reviewer commented as follows:

The paper could include more discuss of the environmental consequences of international trade on local communities in California. Stronger federal action is needed to address the localized impact of global trade. The paper does not include recommendations on how federal policy could limit the local environmental impact of trade.

Another reviewer commented as follows:

The paper suggested that lack of rail capacity is the cause of port congestion. In fact, the railroads are investing in expanded capacity throughout their systems with strategically targeted investments to ensure maximum operational benefits and at the same time be assured of sufficient rates of return. Federal tax credits for investment in track and other rail infrastructure could help enhance the nation's rail network.

Another reviewer commented as follows:

On Page 3, the next-to-last line states: "U.S. grain exports to Asia will increase..." This may be less likely if ethanol production continues to consume increasing portions of the U.S. corn crop.

On Page 9, the last paragraph states: "[M]ost of the [Class I] private capacity improvement decisions are made, as one would expect, to serve the companies that make them, not the system as a whole. ... [F]urther integration of intermodal infrastructure and operations is needed so that investments in one part of the system do not result in stranded assets elsewhere, because another segment...did not keep up with capacity demands." While coordination and planning are necessary and beneficial, investment decisions should not depend on a public determination of what will benefit the public most. As written, this statement could be taken as at least partially rejecting current practice in which companies and individuals pursue their own rational interests (through investments in this case), which then benefits others and economies as a whole. Today, the seamless U.S. (and North American) freight rail system is considered the most cost-effective in the world and the standard that other freight systems wish to emulate.