

# Commission Briefing Paper 4M-03

## Assessment of Integration of U.S. Surface Transportation Infrastructure with Global Trends

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### 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 a number of key global trends which significantly impact demands on surface transportation infrastructure, demonstrating significant gaps or shortfalls in U.S. investments.

### Background and Key Findings

Significant investment in the transportation infrastructure of other nations and the resulting ability of the international community to support a substantial increase in global trade require that the United States increase the capacity, efficiency, and reliability of its surface transportation infrastructure, if the American economy is to remain productive and competitive.

The most important global trends affecting U.S. transportation are the following:

- China's astounding export growth facilitated by massive investment by the Chinese in ports and other surface transport infrastructure will greatly increase overall demands on U.S. surface transportation infrastructure.
- The Panama Canal to accommodate larger ships is developing a new 3<sup>rd</sup> lock and is increasing capacity elsewhere in the canal system. As a result, more containers from Asia (and to a lesser extent the west coast of South America) will travel to the U.S. via East Coast and Gulf Coast ports, necessitating increased port investments in new capacity and development of new port facilities in those areas<sup>1</sup>.
- Movement of goods between Canada, Mexico, and the U.S. will continue to grow as a result of the North American Free Trade Agreement (NAFTA), and the development of West Coast ports in Canada and Mexico supported by major rail investments (to accommodate for China-North America trade).
- The world's container ships are becoming larger. For the U.S., larger ships entail new container handling equipment, deeper channel dredging, and larger overall berthing capacity.

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<sup>1</sup> The aforementioned transfer of trade may reduce containerized trade traffic to the West Coast ports (and subsequently on cross-country rail). The magnitude of 'redistribution' would vary, depending on the 'level of transfer' and 'future increases in overall trade volumes (as per China).' Potentially, these two countervailing forces are likely to negate each other; and result in West Coast ports continuing at or even slightly above capacity.

## Trends in Global and Domestic Trade

Worldwide trade volumes have grown at several times the rate of combined world GDP, and will continue to grow at around twice the rate of world output over the next twenty years (Global Insight 2006; PB Consult 2006). According to the U.S Chamber of Commerce (2003), the U.S accounts for approximately 20% (1 billion metric tons) of the annual world ocean-borne trade. International trade accounts for \$2 trillion or almost 27% of the entire Gross Domestic Product - as compared to 9% in 1960. U.S major trade partners (by value) are Canada, China, and Mexico (U.S Census Bureau 2006).

By 2020 U.S domestic freight tonnage will increase by 57 percent and import-export tonnage will increase by nearly 100 percent; of the total domestic freight tonnage highways would account for 78%, rail 16%, and coastal shipping 6% (AASHTO 2003). According to AASHTO (2003), by 2020 highways would have to accommodate an extra 6,600 million tons of freight (an increase of 62%), and freight rail would have to accommodate an extra 888 million tons (an increase of 44%). Though international cargo moves through 116 U.S ports, 85% of trade flows through ten ports - i.e. five West Coast Ports (Los Angeles/Long Beach port complex, Oakland, and the Puget Sound ports of Tacoma and Seattle) and five East and Gulf Coast ports (New York, Charleston, Savannah, Norfolk, and Houston). In view of the projected growth in freight tonnage over the next 20 years, an investment of \$175 billion to \$195 billion is needed in order for freight rail to simply maintain its current share of freight tonnage and \$ 205 billion to \$ 225 billion to increase its market share (AASHTO 2003).

Despite these staggering growth projections, significant capacity to the U.S freight transportation system (which includes ports, rail, trucking, and intermodal freight hubs) is not being added quickly enough, and thus is becoming increasingly congested. In fact a recent study by the U.S Chamber of Commerce (2003) concludes that the U.S port and intermodal freight transportation system is now operating at its maximum capacity; and if any component of the system were to breakdown, more than one-fourth of the national economy will be crippled.

Broadly categorized, there are *four* global trends that will affect the volume and geographic distribution of demand on U.S surface freight transportation infrastructure, including ports, railroads, highways, and intermodal systems. These global trends include:

- The growth in the Chinese manufacturing sector and the corresponding growth in U.S imports from China;
- Panama Canal expansion, resulting in increased container trade volumes to the East Coast and Gulf Coast;
- Increased growth in cross border trade between U.S, Mexico, and Canada, including not only country to country goods flows but also international container volumes; and
- Changes in maritime industry practices, such as the trend towards larger container ships.

## Growth in Chinese Imports

China accounts for 70% of total Pacific cargo flows; imports to North America are growing at 18% per year in value and 12% per year in the number of containers; and container volumes are projected to increase from 60 million 20-foot equivalent units (TEUs) to over 100 million TEUs by 2010 (TranSystems 2006). In fact, as Stalk and Waddell (2006) aptly state, "Freight demand on the North American West Coast has been growing at a rate equivalent to one Port of Vancouver per year."

Global manufacturing is now centered in China. A number of analysts have suggested some shift in the location of manufacturing from China to Southeast and Southern Asia - Vietnam, Cambodia, India, and Bangladesh (AAPA Finance Seminar 2006). These shifts will be gradual and will not have a major impact on Chinese dominance for many decades. To the extent the shift occurs it will be more favorable to all water routings via the Suez Canal directly to the U.S East Coast.

China's export-led expansion has been rapidly accelerated by massive levels of public and private investment; particularly in its transportation infrastructure (Global Insight 2006b).<sup>2</sup> Total infrastructure investment in China is reported to be about 14% of GDP, more than any other country (World Bank 2006; Economist 2006; ADB 2002). In contrast, U.S non-defense spending in infrastructure is less than 3% of GDP (GAO 2006)<sup>3</sup>. While Chinese economic data are subject to some question, there is little doubt that the Chinese push in transportation infrastructure is large and growing. Investment in Chinese container ports has led this infrastructure expansion, because of its immediate connection to trade. Chinese ports are now among the most cost efficient, in part because the Government encourages competition among its ports, hires efficient western port operators, and is not bound by as many labor agreements. China is now also focusing on its inland transportation network, with massive planned investment in roads, railroads, and intermodal facilities, again with a focus on serving its export sector needs. For example, China's Ministry of Railways recently signed a major agreement with BNSF to assist in intermodal rail development in China. The program will cost some \$240 billion by 2020, and will include on-dock and near-dock intermodal yards at ports; the Chinese Ministry would construct 18 mega-intermodal terminals, including 7 at major sea ports, and 40 smaller inland terminals. Furthermore, China has planned to build approximately 100 new container-loading berths, each with a lift capacity of about half a million TEU per year (Progressive Railroading 2005). In comparison, no more than five new berths are planned in the West Coast of North America (Stalk and Waddell 2006).

The consequence of the Chinese boom for the U.S economy and its transport infrastructure requirements is profound. Two major trade lanes currently serve the U.S-China container trade: direct trans-Pacific maritime routings to Pacific ports (mainly the port of LA/Long Beach) for regional distribution, and intermodal "land bridge" rail service to Midwest and East Coast destinations; and "all water" service via the Panama Canal, to US East Coast and Gulf Coast destinations. A third trade lane – the all-water routing via the Suez Canal – is not yet a major path for Chinese imports to the U.S.

Currently, the major port of entry for Chinese/East Asian imports to the U.S is the Port of Los Angeles/Long Beach (LA/LB). Because it is faster, the land bridge intermodal rail routing carries higher value added cargo to the Midwest and East Coast, while lower value added cargoes tend to select the less costly, but longer, travel time routing through the Panama Canal. Approximately 60% of imported goods to the Chicago region currently come through the Port of LA/LB (Secretary of Transportation and FHWA 2002).

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<sup>2</sup> Other contributing factors include China's entry into the WTO, and China's exchange rate.

<sup>3</sup> Figure cited is combined Federal, state and local infrastructure spending (does not include private infrastructure investment, which is a relatively small share).

This relatively efficient Asia-US trade route pattern is threatened in the future because the Port of LA/LB is almost at its maximum throughput capacity, and the potential for expansion of that capacity is very limited. At the same time, the all water services via the Panama Canal are equally threatened by the capacity limitations facing that facility. The Canal is highly capacity constrained, both in terms of volume and, more importantly, in ship size. “Post Panamax” vessels – ships carrying more than 5000 TEU – cannot traverse the Canal. Although the nominal capacity of a Panamax vessel transiting the Canal is 5000 TEU, the shallow draft and mandatory loading patterns required by limited sightlines effectively limits the capacity to between 3500 and 4000 TEU. Without major improvements to the Canal, a much greater share of maritime imports from East Asia to the U.S East Coast will seek alternatives, such as reverse direction (and longer) all-water routings via the Suez Canal, or all water Pacific routings to new or improved container terminals in Canada and Mexico (discussed below). As discussed in the next section, the expansion of the Panama Canal is well on the way to reality, with important consequences for U.S transportation infrastructure requirements (particularly for Ports in the East and Gulf Coasts). The Canadian and Mexican port projects and associated increases in volumes moving through those ports may happen in any event, as a consequence of the capacity constraints on the West Coast, even with the Canal expansion.

### **Panama Canal Expansion**

The Panama Canal 3<sup>rd</sup> Lock Expansion Project (and other capacity improvements), when completed, will greatly increase the Canal’s overall throughput capacity, and also allow for Post-Panamax shipping. The 3<sup>rd</sup> Lane Locks Project was recently approved by Panamanian voters, and the project appears to be financially feasible. With the 3<sup>rd</sup> locks in place in 2015, all-water routings to the US East and Gulf Coasts become much more practical and far more economical than at present. According to the Panama Canal Authority (2006), by 2025 the proposed expansion would induce a net increase in total tonnage of 178 million tons. In anticipation of the potential increase in tonnage, several key U.S. ports (Georgia, Massachusetts, Houston, Miami, New Orleans, South Carolina, New York, New Jersey, and Virginia) have already entered into strategic partnerships with the Panama Canal Authority. Moreover, several major U.S. East/Gulf Coast ports have begun to invest in infrastructure to handle post-Panamax vessels (Exhibit 1).

#### **Exhibit 1. Investments in Main U.S. East/Gulf Coast Ports**

Port	Capacity (M. TEU)		Investment (millions)	Improvements
	Current	Future		
NY/NJ	4.60	6.20	\$ 1,700	Channel deepening to 15.24m of draft, additional space, 4 Post-Panamax cranes
Savannah, GA	2.41	4.37	\$ 707	640m dock length, storage area, Post-Panamax cranes, deepening to 14.6m
Charleston, SC	2.00	4.00	\$ 823	Construction of new terminal, 4 Super Post-Panamax cranes, yard equipment
Norfolk, VA	2.40	10.22	\$ 2,756	APM terminal will be complete by July 2007, channel dredging from 15.2m to 16.8, 29 Post-Panamax cranes, inland port, long term construction of Craney Island terminal (2017-2032)
Houston, TX	n/a	n/a	n/a	1) The new Bayport Terminal will accommodate about 300,000 TEUs (will triple the capacity); 2) Texas City International Terminal, an intermodal terminal being jointly developed by the City of Texas City and Stevedoring Services of America; 3) La Quinta Trade Gateway, a container terminal being developed by the Port of Corpus Christi to compete with, or offer congestion relief from, existing container terminals in Texas and other Gulf states.
Mobile, AL	n/a	n/a	n/a	Choctow Point Container Terminal - under construction
Jacksonville, FL	n/a	n/a	n/a	Dames Point MOL Container Terminal - under construction
Wilmington, NC				North Carolina International Port - proposed

Source: Ports Authority 2006 as referenced by ACP; Cambridge Systematics 2006; World Shipping Council 2006

### Increased Growth in Cross Border Trade

As noted earlier, Canada and Mexico are two of the top three U.S trade partners. According to the U.S Bureau of Transportation Statistics (2006), surface trade with Canada and Mexico was valued at over \$633 billion dollars in 2004 - approximately an 87% increase from 1994 (pre-NAFTA). Movement of goods between Canada, Mexico, and the U.S will continue to grow as a result of (1) the North American Free Trade Agreement (NAFTA), and (2) the development of West Coast ports in Canada and Mexico supported by major rail investments in both the countries in accommodating China-North America trade, and other forces of economic and political integration between the U.S., Canada, and Mexico<sup>4</sup>.

The implementation of NAFTA has significantly increased cross border trade between Canada, Mexico, and the U.S, thereby adding stress to the U.S surface transportation system - i.e. inducing freight oriented bottlenecks on U.S rail, highway, and intermodal systems. According to NCHRP Report 20-24 (2006), NAFTA has induced an estimated 30,000 additional truck crossings per-day in the four southwest border states of Arizona, California, New Mexico, and Texas.

To facilitate observed and potential NAFTA induced growth in freight, governmental agencies, businesses, metropolitan areas, and other groups have joined forces to promote bi- or tri- national multimodal transport networks - i.e. North American Trade Corridors. According to the North American Forum on Integration (2006) these include:

- *The Pacific Corridor* in the South - connects major cities along the Pacific coast to two major ports of entry San Diego/Tijuana, one of the most congested crossing points, and Calexico/Mexicali, where there is a high concentration of maquiladoras. In the north, the Corridor links Washington State and British Columbia. Two other initiatives are also under consideration: the north-west corridor linking

<sup>4</sup> Maquiladora facilities along the US Mexican border have diminished in recent years, but greater integration with the larger Mexican economy is still an ongoing trend.

Western Canada with the trade flows of NAFTA, and the Alaska Railroad connection, project, aiming to facilitate land-based access to Alaska.

- *The Central Western Corridor* - links Chihuahua in Mexico to Denver, Colorado, via the “Paso del Norte”, the ports of entry of El Paso/Ciudad Juarez between Chihuahua and Texas, and Santa Teresa in New Mexico. Plans are to continue this route to Great Falls, where the corridor could join up with Canamex, a planned four-lane highway extending from Mexico City to Edmonton, Alberta, in Canada.
- *The Central Eastern Corridor* - includes two corridors: 1) extending to the lower Rio Grande valley in Texas, through Indianapolis, Indiana and Memphis, Tennessee, and 2) a corridor which runs through the U.S Great Plains (North Dakota, South Dakota, Nebraska, Kansas, Oklahoma and Texas) and Canadian Praries (Saskatchewan, Manitoba and Alberta).
- *The Atlantic Corridor* includes four corridors: 1) Canada-U.S. East Coast (on highway I-95); 2) Champlain-Hudson corridor (between Québec and New York); 3) the Appalachian corridor (New York State to northern Mississippi); and (4) Gulf of Mexico (linking Mexican states of Coahuila, Nuevo León and Tamaulipas to the entire north-eastern part of the continent).

The U.S. portions of these Corridors involve major new investments to add North-South elements to what is essentially an East-West legacy highway (and to some extent also rail) network.

### **U.S and Canada**

Canada remains the largest trading partner of the United States with substantially increasing volumes of trade between the two nations over the last decade, since the adoption of NAFTA. This trend will continue and is likely to accelerate. Despite this substantial growth in trade, as well as new and ever more stringent security requirements at our border crossings, the U.S. has not made sufficient capital investments or operational improvements to assure efficient movements of people and goods between the two countries, particularly at those border crossings which bear the largest portion of this traffic (e.g., Blue Water Bridge at Port Huron, Michigan-Sarnia, Ontario; Ambassador Bridge at Detroit, Michigan-Windsor, Ontario; Peace Bridge connecting Buffalo, New York to Fort Erie, Ontario; Pacific Highway, Surrey, British Columbia-Blaine, Washington; and others). A study by U.S DOT in 2003 found the current border management system and trade policies cost the American and Canadian economies an estimated \$7.52 to \$13.2 billion (US). Some existing constraints, as outlined by Volpe Center (2000) include: (1) funneling of the vast majority of the traffic through a few border crossings; (2) inability of the border facilities to handle intermodal interchange of equipment and containers, contributing to modal imbalance in favor of all-highway movements; and (3) lack of uniform truck size and weight standards. There do not seem to be a widely accepted studies, which comprehensively quantify the investments required to alleviate these constraints. One approximation by the Coalition for America's Gateways and Trade Corridors (2006) estimates investment needs to exceed \$ 25 billion (this estimate was based on a very limited survey of Border and Corridor needs, and as such, a comprehensive survey would result in a much larger estimate).

### **U.S and Mexico**

As with Canada, U.S-Mexican border crossing volumes have skyrocketed in response to NAFTA. Crossing points such as Laredo, Texas and Baja, California have seen very substantial increases in crossing delays. Mexico-U.S. border crossing delay (especially due to new security concerns) is becoming a major economic concern. For example, according to SANDAG (2006) freight delays at the U.S – Mexico border crossings in San Diego are estimated to cost U.S businesses \$1.3 billion per year, and costing the Mexican economy \$2.2 billion per year in lost sales, jobs, and productivity. As such, it is evident that more transportation investment is

required by U.S. border states and other federal agencies, such as the Department of Homeland Security, to alleviate the aforementioned delays.

### **Mexican and Canadian Port Developments**

In the future, cross border trade volumes (both truck and rail) between Mexico, Canada, and the U.S. are likely to be compounded by the development of two major Mexican ports along the Pacific -- the Ports of Lazaro Cardenas and Punta Colonet -- as well as the Port of Prince Rupert in Canada. These ports are bidding to increase their market share of U.S.-Asian container trade, and they are likely to be successful, given the capacity constraints facing U.S. west coast ports and the relatively “clean” slate that these other ports face in terms of expandability.

- Port of Lazaro Cardenas will be able to accommodate Post-Panamax traffic, reach the U.S. border in 36 hours (i.e. only 200 miles further than LA routing, and is served by the Mexican railroad TFM, which is now majority owned by Kansas City Southern Railroad (KCSM), which has a direct link to U.S. railroad network. The 2,661-mile KCSM operates the primary rail route in northern and central Mexico, linking Mexico City and Monterrey with Laredo, Texas, where more than 50 percent of the U.S.-Mexico trade crosses the border (Kansas City Southern 2006).
- The deepwater port of Punta Colonet, estimated to cost \$ 2 billion is under development with strong government support in a region with thousands of landside acres (80 miles south of Ensenada). Currently UP is looking at a new rail link to existing lines in Yuma.
- Port of Prince Rupert, located 500 miles north of Vancouver would become the deepest harbor in North America with year-round ice-free access, with access to the Western terminus of CN Rail (North America's only continuous, single operator transcontinental railway).

To accommodate and also in response to this increased cross border trade activity, investment in transport infrastructure in Mexico is accelerating, led by an opening up of the Mexican economy to permit foreign investment in transportation infrastructure. Investments in new toll roads (sometimes with direct port links), the Mexican railroad system, and Mexican ports have stimulated cross border trade, and placed major demands on the border crossing facilities themselves, as well as NAFTA Corridor highways and rail facilities within the US -- especially in Texas and California. As noted previously, the purchase of the Mexican Railroad TFM by Kansas City Southern has stimulated at least one novel initiative within the United States -- the development of the Kansas City “SmartPort”, a major intermodal rail connection served by KCS, where containers and other cargo are transshipped and inland customs and security clearances are permitted.

As a result of these increased trade and transport linkages, stimulated by infrastructure investments outside of the U.S., cross border facilities are increasingly strained, and investments will be required in the U.S. (coordinated with investments in Canada and Mexico) to reduce these bottlenecks. Several major corridor initiatives have already been described. Additional investments that are early in the planning stages, but that may be undertaken in response to increased cross border trade include:

- Completion of the Trans-Texas Corridor, a major highway and rail corridor, as well as other NAFTA Corridor linkages (as described before).
- Development of “all-freight” corridors, including truck only lanes, either tolled or free.
- Improved border crossing facilities, including more efficient customs clearance and security clearance systems.
- New freight-only border crossings, such as those being considered in East Otay Mesa, near San Diego.
- Inland container terminal facilities (inland ports), where border crossing delays can be circumvented by allowing containers and other goods to move in bond to inland facilities, for customs and security

clearance, and distribution. Kansas City SmartPort is the prime example of this, although other metropolitan areas have studied such facilities, including Oklahoma City, Wichita, KS, and other locations.

Over time, these push and pull factors will combine to direct a greater share of maritime trade to the U.S East Coast and Gulf Coast, as well as to Mexican – U.S border crossings (and to a lesser extent, Canada – U.S. border crossings), as some U.S import cargoes will move via the Pacific to Mexico and Canada, and thereafter into the U.S via land border crossings. U.S port authorities and State DOTs along the East Coast, states with major border crossings, and the U.S. freight system in general will need to adjust to these shifting patterns.

### **Border Security**

In a post 9/11 world, security of the freight transportation system has become an important policy consideration - i.e. reducing freight system vulnerability to terrorist attacks while keeping commerce moving. As cross border (and port) volumes increase, the challenge of security mounts. When implementing the necessary security measures/policies (both at border crossings and at sea-ports) it is important to implement policies and strategies that would ensure a steady flow of commerce, thereby ensuring productivity and reliability. If such considerations are not part of the security planning process, then delays would ensue, which would be detrimental to U.S businesses; especially for firms whose 'just-in-time' supply chain operations rely heavily on predictability and reliability. Increased global coordination, building on the current Container Security Initiative of U.S. Customs and Border Protection, is clearly required. The primary challenge will be to identify funding mechanisms that will provide for an equitable sharing of the costs of these programs.

### **Changes in Maritime Industry Practices**

Changes in global shipping practices and technologies, often stimulated by national port development and shipping industry policies in other countries, have and will continue to accelerate the trends in world trade introduced previously, which in turn will further strain, but also shape, U.S port and intermodal infrastructure requirements.

The world's container ships are becoming larger - from Ideal X ships in 1960s (capacity 1,700 TEU) to Super Post Panamax ships in 2005 (capacity 8,600 TEU). Even larger ships are coming on line, including about 140 ships between 8,000 and 9,000 TEU and forty 9,000 + TEU ships that are on order (Institute of Shipping Economics and Logistics 2005). Indeed, several such ships, including two Maersk ships greater than 8,000 TEU are already in service; the largest active ship is now 9,600 TEU, and several ships larger than 12,000 TEU have been designed (Lloyd's). The trend toward larger ships reflects the economies of scale in container shipping from large ship – i.e., the transport cost per TEU falls dramatically as ships become larger, and container handling equipment becomes more effective and well adapted to handling the requirements of the largest container ships.

Clearly, the trend toward much larger ships is one of the primary reasons for the Panama Canal 3<sup>rd</sup> Lane Locks Project. Moreover, the larger ships place substantial burdens on ports worldwide. In the U.S, where the system of ports is largely established, larger ships mean new container handling equipment, deeper channel dredging, and larger overall berthing capacity. They also put pressure on the availability of frequent and high speed landside connections, and on available storage space for containers and for empties. Such investments are paramount in order for the U.S to remain cost competitive, and for its ports to continue to maintain market share.

While the U.S is not likely to become a major ship building country, the countries that dominate global ship building are, not surprisingly, the major maritime countries with very large export driven economies such as Japan, South Korea, China and the European Union. The China State Shipbuilding Corporation (CSSC) and China Shipbuilding Industry Corp (CSIC), the conglomerates in charge of most of the country's shipyards, plan to reach the summit of world shipbuilding by 2015 - overtaking Asian shipbuilding rivals Korea and Japan. In fact, during the past few years, China's overall share in the world shipbuilding market has jumped almost three-fold at 16.5% compared to just 5.2% in 2003 (OECD; DNV UK).

As such, effective "alliances" between ship building interests and carriers will continue to give rise to larger ship sizes, as the market for new ships is expanded and liner profits increase. At some point, it is expected that maximum super ships of 15,000 TEUs will become a significant portion of the world container fleet. The "replacement cycle" of current U.S port infrastructure – especially container handling equipment – may be getting much shorter as larger ships come on line at an increasing pace.

### **Integrating Global Trends in Developing Investment Strategy: The Panama Canal**

PB's own experience in working with the Panama Canal Authority (ACP) suggests how global trends can and should be incorporated into developing an investment strategy for America's goods movement infrastructure. Like the ACP, it is necessary for U.S. port and transportation planning officials to undertake a far-reaching analysis of international markets, in order to quantify projected demands upon American ports and related facilities, and on the Nation's surface transportation system.

In the case of the Panama Canal, the existing capacity and operational efficiency of the key elements of the infrastructure were assessed. A 20-year Master Plan was developed, in order to optimize the utilization and, where appropriate, the expansion of facilities, in light of projected market demand trends. As this would be the Canal Authority's first major undertaking fully independent from the US, a high importance was placed on "right-sizing" the facility investment, to not only ensure that current users were not overburdened with excess fees for unneeded capacity, but also allow for future additional expansion in the most cost-effective way.

The early project feasibility studies focused very heavily on the water consumption issues related to an expanded Canal, with almost no attention paid to the demand side of the transportation network. This narrow focus, which was engineering-based, constrained the Authority in obtaining the necessary support for the proposed investment, and created a complex set of externality issues that frankly would have been irresolvable. However, under PB's guidance, the ACP shifted its perception of the Canal from a "water" issue to one focused on "transportation" and began developing a multi-dimensional Master Plan covering all of the aspects of the Canal's future, including its overall environmental footprint and its place in the global economy. With this renewed strategy, ACP was able to identify global demand trends that would have a profound effect on future Canal operations. The ACP's planning was carried out in the context of trends alluded to earlier in this paper:

- The rapid rate of globalization and shift in manufacturing to low cost locations such as China, Cambodia, Vietnam - i.e. Panama potentially being the link between a high consumer region (East Coast, U.S.) and a high producer region (Asia);
- Shipper logistics requirements for the aforementioned growth in demand;

- The world's container ships were getting much larger; as such, vessels that were too big to fit through the present Canal (on account of their dimensions) were using Canal competitor routes (all water routes - Suez, Cape Horn, and Cape of Good Hope -- or intermodal routes - from Asia to the West Coast of the U.S. connecting to the U.S. national rail system)

Based on these global trends, an expansion plan was proposed and the financial, environmental and operational implications were established and then translated into a capital investment plan and financial model, which included the establishment of investment priorities and the assessment of the benefits of these investments (including the costs of mitigating their environmental and community impacts and a full analysis of all of the associated risks). In October 22, 2006 78% of Panamanians voted "Yes" in a national referendum on the Panama Canal expansion.

The ACP's greater market focus (as opposed to a focus on managing physical infrastructure) has further led the ACP to plan more responsively to the demands of its customers and world partners. For example, the ACP came to better understand that changing global logistics patterns have caused a shift in focus from the traditional measures of time and cost to ones much more associated with reliability and certainty. In addition, the ACP has itself come to recognize the importance of global partnerships, and has sought to develop such partnerships, both public and private. In fact, the support of its customers for a totally user-fee based expansion investment plan was considered key to the political support the project ultimately garnered.

### **Policy Implications/Initiatives**

As described, current trends in international trade (supplemented by infrastructure investments in China, Panama, Mexico, and Canada) would significantly increase the overall volume of containerized trade to the U.S. In addition to this general increase in goods movement, specific changes point toward 1) a substantial shift of container traffic to East and Gulf Coast ports<sup>5</sup>; 2) an even greater acceleration of cross border traffic; and 3) increasingly large container ships.

To facilitate changing global trade and infrastructure investment trends, various recommendations have been made, some of which are listed below:

- Expansion and reform of our current Federal-State system for financing goods movement infrastructure. The current system is not friendly to the type of multi-state regional or national scope investments needed to respond to global forces. Currently, individual states, especially border and coastal, have to meet the costs, while the benefits are much more widely distributed
- A focus on freight investments to minimize increases in truck traffic. The rapid growth in truck traffic will greatly increase traffic congestion – especially in urban areas -- and highway maintenance costs:
  - More funding for intermodal goods movement infrastructure – better long haul intermodal (container) transport services, including extension of the Alameda Corridor concept to other locations, elimination of impediments to double stack service such as bridge height issues in and around New York, and throughout the northeast corridor, and improved intermodal rail and road connections. Much greater attention is needed to relieve bottlenecks to port landside linkages, such as I-95, the Chicago and Houston rail bottlenecks, and the systems serving most of the Port of New York.
  - Development of “freight only” highway corridors.
  - New modal alternatives such as development of Short Sea shipping options, and reviewing current regulatory requirements.

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<sup>5</sup> The Suez routing will become more important as some manufacturing shifts from China toward Southeast Asia and South Asia. In that case, demands on East Coast and Gulf Coast ports will further increase.

- Movement toward a coordinated, national system of port and inland transportation infrastructure development in the U.S – from a piecemeal system to a national ports policy in which ports complement each other. Focus should be placed on specialization - improvements to the existing mega container ports on each Coast, with complementary development of feeder services, bulk ports, and niche market ports, such as the Port of Baltimore, which has developed as the major U.S Roll-on Roll-off port.
- Better coordination of US-Mexican and US-Canadian rail and border crossing facilities, and improvements to inland transportation networks serving the border crossings.
- Rational investments in inland ports and container distribution facilities.
- Increases in the overall levels of U.S. transportation investment funding, which is lagging when compared with China, South Korea, Taiwan, Singapore, and OECD. These countries are more open to global sources of infrastructure investment, from equity investors such as Macquarie, to global port investors/developers, etc.
- More rapid adoption and development of new technologies (e.g., for enhanced freight tracking and security), and where new technologies are being introduced, faster development of uniform technology standards.

## Bibliography

- AAPA Finance Seminar, Vickerman, John, "Industry Trends: What Does the Future Hold" <http://aapa.files.cms-plus.com/SeminarPresentations/06%5FFinance%5FVickerman.pdf>, 2006
- AASHTO, "Transportation Invest in America: Freight-Rail Bottom Line Report" January 2003
- Asian Development Bank, "PRC: Strengthening Public Investment Policy in China, Final Report, 2002.
- Bureau of Transportation Statistics, "National Transportation Statistics: Table 1-54" 2006
- Cambridge Systematics, "Effects of the Panama Canal Expansion on Texas Ports and Highway Corridors (Executive Summary)" prepared for Texas Department of Transportation, October 2006.
- Coalition for America's Gateways and Trade Corridors, "America's Freight is America's Future: Succeeding Through Borders and Corridors," 2006
- Economist, "Dim Sums", Nov. 2, 2006.
- EDRG, "<http://www.edrgroup.com/northeastborder/>" 2006
- GAO, "U.S. Infrastructure: Funding Trends and Federal Agencies' Investment Estimates," July, 2001
- Global Insight, World Trade Service, 2006;
- Global Insight, Ben Hacket, "Trends in China-U.S. Trade Growth", January, 2006b.
- Institute of Shipping Economics and Logistics, "Shipping Statistics and Market Review", 2005.
- Kansas City Southern, "<http://www.kcsi.com/corporate/kcsm.html>" 2006
- Lloyd's Register, July 6, 2000.
- North American Forum on Integration, "<http://finanafi.org/eng/integ/corridors.asp?langue=eng&menu=integ#ouest>" 2006
- NCHRP Project 20-24(52), "Future Options for the National System of Interstate and Defense Highways: Technical Memorandum Task 4 - Demographic, Economic, and Travel Demand Projections" June 2006
- Panama Canal Authority (ACP), "Proposal for the Extension of the Panama Canal: Third Set of Locks Project." April 2006
- PB Consult Inc, Laurie Mahon and Ira Hirschman, "In the Center of a Sea Change", Presented to Transporte Internacional – Los Angeles 2006 March 2, 2006.
- Progressive Railroading, "Chinese Intermodal Firm Tours BNSF's Intermodal Facilities", Sept. 27, 2005
- TranSystems, "[http://www.transystems.com/industry\\_view.asp?industry\\_id=8](http://www.transystems.com/industry_view.asp?industry_id=8)" 2006
- SANDAG, "Economic Impacts of Wait Times at the San Diego-Baja California Border – Final Report", January 19, 2006.

Secretary of Transportation and FHWA Office of Freight Management and Operations "Southern California Freight Management Case Study," January 2002

Stalk, George and Kevin Waddell, "The China Rip Tide: Threat or Opportunity?" Boston Consulting Group, June 2006

U.S. Census Bureau, Foreign Trade Statistics, 2006.

U.S Chamber of Commerce, "Trade and Transportation: A Study of North American Port and Intermodal Systems" March 2003.

Volpe Center, National Science and Technology Council, "Partnership to Promote Enhanced Freight Movement at International Border Gateways: A Strategic Plan," 2000

<http://www.volpe.dot.gov/infosrc/strtplns/nstc/brdrgtwy/index.html#toc>

World Bank, China – China Data and Statistics

World Shipping Council, "Panama Canal Expansion Position Paper," May 2000

## **CONSOLIDATED COMMENTS FROM MEMBERS OF THE BLUE RIBBON PANEL OF TRANSPORTATION EXPERTS - PAPER 4M-03**

One reviewer commented as follows:

On page 3, the paper states: "In fact a recent study by the U.S. Chamber of Commerce (2003) concludes that the U.S. port and intermodal freight transportation system is now operating at its maximum capacity; and if any component of the system were to break down, more than one-fourth of the national economy will be crippled." This is a bit of an overstatement. The Chamber document actually states, "This study concludes that the U.S. port and intermodal freight transportation system is now being operated in many areas at the limits of its maximum capacity."

On page 4, the paper states: "...China's Ministry of Railways recently signed a major agreement with BNSF to assist in intermodal rail development in China. The program will cost some \$240 billion by 2020, and will include on-dock and near-dock intermodal yards at ports..." These sentences need to be clarified. The \$240 billion refers to the totality of China's intermodal development, which is very different from the BNSF agreement. According to press reports, the BNSF agreement simply provides for an exchange of best practices in railway management, operations, logistics and technology.

On page 7, the paper states: "...and is served by the Mexican railroad TFM." TFM no longer exists. It is now the Kansas City Southern de Mexico, S. de R.L. de C.V.