Race-to-the-Top: East and Gulf Coast Ports Prepare for a Post-Panamax World

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Abstract

In spite of the decrease in global trade during the 2008 recession, economic forecasters call for significantly increased trade in 2012 and beyond. Global Insight, a consulting firm offering economic and financial forecasting and analysis, predicts container trade volumes to double by 2020. Overlapping with the anticipated uptick in trade is the expansion of the Panama Canal, a vital link in the transportation of far eastern goods to and from the United States. The expansion project is scheduled for completion in 2014.

Kurt Nagle, president of the American Association of Port Authorities, and David Matsuda, maritime administrator for the United States Department of Transportation, have both labeled the Panama Canal expansion project as a "game-changer" for seaports in the United States. The true effects of the canal’s expansion will not be definitively known for years to come. Such uncertainty has not reduced the anticipation of economic benefits to a number of East and Gulf Coast ports.

A number of southeastern ports are preparing for an increase in shipments following the completion of the expansion project. The prospect for increased cargo being shipped to East and Gulf Coast ports, and consequently away from West Coast ports, has generated an assortment of activity at numerous ports, as each prepares for an increase in both cargo volume and the size of incoming vessels.

This research is divided into four parts that examine the potential effects that the expansion of the Panama Canal may have on East and Gulf Coast ports. Part I results from a literature review on the strategic role played by ports in the United States. Specifics of the Panama Canal expansion are also detailed in Part I, including a discussion of factors propelling the expansion effort. Part II contains a comparative analysis of varying methods of shipping; primarily, the focus is on comparing all-water versus intermodal transportation alternatives. Part III includes the results of a survey of East and Gulf Coast ports. The survey focused on port improvement projects that are directly attributable to the Panama Canal expansion. Part IV concludes the paper with a future forecast of the maritime shipping industry.
Part I: Introduction

History of the Canal

The Panama Canal opened in 1914 following 34 years of construction and a cost of $639 million (CanagaRetna, 2010). Nearly 50 miles long, the canal bisects the nation of Panama, providing vessels with the ability to travel with relative ease between the Pacific and Atlantic Oceans. Since it’s opening, the canal has provided a major boost to global trade.

Proposals for expanding the canal began in the 1930s (Fountain, 2011). However there was no real progress for the next six or seven decades. The Carter-Torrijos Treaty, signed by President Jimmy Carter in 1977, set the stage for a transfer of ownership of the canal from the United States to the Republic of Panama before the end of the century. This transfer of ownership was finalized in 1999.

The period leading up to and following Panama’s complete control over the canal coincided with a remarkable rise in globalization. A major factor in globalization was the increasing role China played in global trade. The growing number of vessels traversing the canal, coupled with increasing blockages and delays, resulted in new calls for expansion.

The decision to expand the Panama Canal was approved by the government of Panama in a referendum in late October 2006. In September 2007, preliminary work on

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1 Historically, delays were so extensive that, at times, it was common for vessels to wait upwards of 10 days, at a cost of tens of thousands of dollars per day, to transit the canal during the high season.

2 Only approximately 42% of the Panamanian population turned out for the vote. Of this, 31% of the Panamanian electorate voted in favor of the canal expansion while roughly 10% voted against it (Jackson, 2007).
the expansion project began with an estimated cost of $5.25 billion.³

Expansion of the Panama Canal

The expansion of the Panama Canal is expected to bring more imports directly to East and Gulf Coast markets. This expectation has resulted in increased competition between East and West Coast ports. West Coast ports are the closest entry points for Asian cargo.⁴ However, congestion and capacity constraints are forcing shippers to diversify their routes.

Approximately 70% of the Asian cargo that arrives via West Coast ports is destined for markets east of the Rocky Mountains (Johnson, 2008). Upon arrival, the cargo is transported, predominantly by rail, to Midwestern markets. Though such an “intermodal” transportation system may appear efficient, employing an all-water route via the Panama Canal when shipping goods from Asia to the East Coast costs less and takes only one-half day longer (depending on the East Coast port)(Johnson, 2008). This realization has increased interest in shipping Asian cargo directly to the East Coast. Still, both West and East Coast ports are currently spending billions of dollars to upgrade and enhance their facilities in hopes of appearing more attractive to shippers in the future.

The “battle” between West and East Coast ports began soon after the Panama Canal Authority (ACP) broke ground on the largest expansion project in its history. The project, scheduled for completion by the centennial anniversary of the canal in 2014, will

³ Subsequent analyses have estimated the cost of the expansion project to be closer to $10 billion. Of the original price estimate, $3 billion in funds will be supplied via Panama’s retained earnings, with the rest of the funding coming from bilateral and multilateral lenders, led by the Japan Bank for International Cooperation, the European Investment Bank and the Inter-American Development Bank (The Economist, 2009).
⁴ Focus is on Asian cargo as China is currently the largest trade importer with the United States (U.S. Census Bureau, 2011).
add a third lane of traffic. The new lane of traffic will be able to accommodate larger vessels, increasing the total volume of cargo that traverses the canal each year. As such, Rodolfo Sabonge, vice president of marketing research and analysis for the ACP, stated that the Panama Canal Authority anticipates container volume through the canal to double by 2015 (Spivak, 2011).

More than a dozen East and Gulf Coast ports have initiated infrastructure enhancements in hopes of competing for the added trade that likely will come their way in the aftermath of the expansion (Johnson, 2008). Port improvement projects range in scope from building new container terminals and adding cranes to handle the cargo from larger ships, to enhancing highway and rail connections. Perhaps the most common improvement project, and arguably the most important, involves dredging to increase, and maintain, the depth of navigation channels. Table 1 contains the navigation channel depths of some of the major ports on the East Coast.

<table>
<thead>
<tr>
<th>United States East Coast Ports</th>
<th>Mean Low Water (MLW) Depth</th>
</tr>
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<tbody>
<tr>
<td>Boston</td>
<td>38’</td>
</tr>
<tr>
<td>New York / New Jersey</td>
<td>43’</td>
</tr>
<tr>
<td>Philadelphia</td>
<td>38’</td>
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<tr>
<td>Baltimore</td>
<td>40’</td>
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<tr>
<td>Norfolk</td>
<td>48’</td>
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<tr>
<td>Wilmington</td>
<td>42’</td>
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<tr>
<td>Charleston</td>
<td>47’</td>
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<tr>
<td>Savannah</td>
<td>42’</td>
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<tr>
<td>Jacksonville</td>
<td>38’</td>
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<tr>
<td>Miami</td>
<td>39’</td>
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</tbody>
</table>

Table 1. Navigation channel depths at United States East Coast ports. Depths, in feet, are at Mean Low Water (MLW), which is used to represent the average low tide of a region. Source: Panama Canal Authority.

Starting in 1789, the federal government has authorized navigation channel improvement projects in rivers and channels across the United States. Since 1824, when the General Survey Act established the United States Army Corps of Engineers'
(USACE) role as the agency responsible for overseeing the nation’s navigation system, ports have worked in partnership with the USACE to maintain waterside access to port facilities.

In the United States, over 90% of the top 50 ports in foreign waterborne commerce require regular maintenance dredging, resulting in the removal of more than 300 million cubic yards of dredged material annually from navigation channels. An additional 100 million cubic yards of dredged material is removed from berths and private terminals. Annually, the 400 million cubic yards of dredged material is the equivalent of a four-lane highway, 20 feet deep, stretching from New York City to Los Angeles (American Association of Port Authorities, 2007).

Ports require a channel depth of 40 feet to handle the largest ships currently coming through the canal. However, a loaded 8,000-TEU vessel (i.e., a Post-Panamax vessel) sits 46 to 47 feet deep in saltwater and a foot deeper in freshwater (Spivak, 2011). This deeper draft necessitates a channel depth of nearly 50 feet, which many East and Gulf Coast ports currently lack. A USACE study determined that insufficient navigation channel depths restrict nearly 30% of port vessel calls; thus necessitating the need for ports to dredge in order to incorporate larger vessels (Spivak, 2011).

Current East and Gulf Coast port expansion plans total almost $20 billion. Nearly half of the projects are scheduled for completion within the next five years. In today’s economic climate, some question the necessity of such spending. However, according to

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5 TEU (Twenty-foot Equivalent Unit) refers to 20-footlong intermodal containers. TEU serves as a unit of measurement for cargo capacity, and is often used to reference the volume of container ships.
6 To put this price tag in perspective, the federal government has estimated that capital spending at all U.S. ports in the 60 years from 1946 to 2006 amounted to $31 billion (Spivak, 2011).
Sean Connaughton, administrator of the United States Maritime Administration, port improvement projects are necessary. The existing sentiment is that “ports that expand now will be [best] positioned to capture additional market share when the canal is finished” (Johnson, 2008).

Motives and Drivers of the Expansion Project

The requirements of containerized shipping have been a driving influence behind expansion efforts. Although nearly a century old, the canal continues to be a crucial facilitator of global trade. However, since the 1990s, an incessant growth in global trade has placed stress on the canal as it struggles to handle the mounting number of vessels in a timely manner.

By the late 1990s, concern was raised that the Panama Canal could reach its operating capacity by the second decade of the 21st century (CanagaRetna, 2010). Specifically, in 2006, the ACP estimated that the canal would reach its current operating capacity before 2012 (Mid-America Freight Coalition, 2011). Theodore Prince, a port consultant and board member of the Intermodal Transportation Institute at the University of Denver, succinctly sums up the issue: "If the Canal didn't do something, it would have been at capacity and verging on obsolete" (Spivak, 2011).

Beyond the expected surge in global trade, and related capacity issues anticipated in the coming years, there were several additional factors driving the expansion project:

- The Panamanian goal of using the expanded canal, and thereby the expected increase in vessel traffic, as the principal mechanism for securing economic growth, with the hopes of generating sufficient wealth to propel Panama into the ranks of other advanced economies. The ACP predicts that the expanded canal
will boost Panama’s annual growth rate by 1.2%, helping the Gross Domestic Profit (GDP) of Panama to grow 2.5 times the 2005 level by 2025. In a population of roughly 3.4 million people, over 1 million are poor. An increase in the growth of Panama’s GDP, as predicted in the aftermath of the canal’s expansion, would lift 100,000 Panamanians out of poverty (The Economist, 2009).

• The intense focus in the shipbuilding industry to build increasingly larger vessels in order to create substantial economies of scale. Restricted by capacity constraints, many shipping companies began to re-configure their routes and bypass the Panama Canal. This trend became increasingly apparent as a growing share of the global containership fleet reached a size beyond the capacity of the existing canal. The maximum vessel size able to currently traverse the Panama Canal is defined in the industry as a “Panamax” vessel. As a point of comparison, the current crop of Panamax vessels can transport approximately 4,500 TEUs. A larger class of vessel now in use (i.e., “Post-Panamax”) has the capacity to move between 5,000 and 12,000 TEUs (Figure 1). Expansion of the canal was a prerequisite to accommodate this new class of enormous vessels.7

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7 Post-Panamax vessels are expected to account for 48% of the global container fleet by 2014 (Rodrigue, 2010).
The bulk of the ships traversing the canal transport goods to and from the United States, which is unquestionably the leading economy in the world. Nearly 14,000 vessels, loaded with more than 275 million tons of cargo, passed through the canal last year. Annually, nearly 70% of the canal’s estimated $100 billion of containerized cargo is either destined for, or originated in, the United States (CanagaRetna, 2010). Therefore, as is the case in a number of instances, a bevy of corporations involved in the manufacturing and shipping of this cargo sought measures to improve the efficiencies related to moving the freight in and out of the United States. One such measure related to promoting the expansion of the canal as a means to transport goods more cost-effectively.

**Specifics of the Canal Expansion**

The Panama Canal currently has two shipping lanes, which can accommodate Panamax vessels up to 965 feet long and 106 feet wide. Table 2 provides a comparison of
vessel size limitations, both before and after the expansion project. The canal regularly operates at or near its capacity of 35 vessels per day. During much of the year, such a restraint can mean dozens of ships are moored off each coast, waiting up to a day or longer to enter the canal. The third set of locks will allow an additional 15 vessels per day.

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2014</th>
</tr>
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<tbody>
<tr>
<td>Length</td>
<td>965ft (294m)</td>
<td>1200ft (366m)</td>
</tr>
<tr>
<td>Beam</td>
<td>106ft (32.3m)</td>
<td>160ft (49m)</td>
</tr>
<tr>
<td>Draft</td>
<td>39.5ft (12m)</td>
<td>50ft (15m)</td>
</tr>
</tbody>
</table>

Table 2. Panama Canal vessel size limitations. Source: Drewry Supply Chain Advisors.

The expansion project, financed in part through loans from development banks, has four main components:

- New lock systems will be built parallel to the existing locks. The new locks will employ a rolling gate principle, using side basins to minimize water consumption.
- Both the Atlantic and Pacific access to the canal will be dredged to accommodate larger vessels.
- The continental divide cut and the navigation channels between the Pacific Locks and Gatun Lake\(^8\) will be expanded to accommodate larger vessels.
- The Gatun Lake navigation channel will be deepened. In addition, the water level of the lake will be raised from 26.7 meters above sea level to 27.1 meters, allowing for an increase in the water supply available for use by the new lock systems.

**United States Ports**

\(^8\) Gatun Lake was formed in 1913 when the Charges River was dammed during the creation of the Panama Canal. Traveling across Gatun Lake is a major segment (>20 miles) of the route taken by ships transiting the canal (Rodrique, 2010).
Ports have shaped the history of North America. As early as the 1400s, sheltered harbors provided safe refuge for early explorers and settlers. Developing cities relied on docks and shipping terminals for communication. Ports emerged as the early settler’s commerce lifeline to the rest of the world.

As a nation, the United States is served by publicly- and privately-owned marine facilities, with approximately 360 commercial sea and river ports scattered across the country. American ports handle more than 2 billion tons of cargo annually (American Association of Port Authorities, 2009). By 2020, the United States Department of Transportation projects that total freight moved through American ports will have increased by more than 50% in comparison to 2001 figures (CanagaRetna, 2010). Figure 2 illustrates the increasing trend in global trade.

![World Total Trade, Present and Future](image)

Figure 2. Global Trade in TEUs, Present and Future (1995-2025). Containerized cargo remains the fastest growing mode of international seaborne transport. Data courtesy of Global Insight, Inc.
Regionally, the role played by East and Gulf Coast ports in the national economy is prodigious. According to the most recent United States port rankings, conducted in February 2010, 57% of the total trade in the United States involved 51 East and Gulf Coast ports (U.S. Census Bureau, 2011).

**Challenges Faced at West Coast Ports**

For a number of decades, West Coast ports – particularly the Ports of Los Angeles and Long Beach, the nation’s two busiest ports⁹ – have served as the primary entry points for ships loaded with Asian cargo. By the 1990s, cargo from Asia burgeoned to unmatched levels, solidifying Asia’s role as the major exporter for an assortment of goods arriving in the United States. Upon arrival, the cargo is shipped cross-country to the Midwest and East Coast via an intermodal “land bridge,” employing both rail and truck transportation. It is vital that West Coast ports quickly process incoming cargo, allowing it to be transported to its ultimate destination in a timely manner.

During the early part of the last decade, there were several labor disputes at a number of West Coast port facilities, where strikes, lockouts, work stoppages, and “go-slows” resulted in serious service disruptions. In 2002, numerous importers, retailers and consumers were crippled when approximately 7,000 members of the International Longshoremen and Warehouse Union went on strike. The result was the closure of over a dozen West Coast ports for 10 days. This one work stoppage was estimated to have cost the United States economy over $16 billion dollars (Johnson, 2008).

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⁹ The ports of Los Angeles and Long Beach handle roughly 40% of all container cargo traffic that comes into the U.S (Johnson, 2008).
In subsequent years – 2004, 2007, and 2008 – labor disputes cropped up again at a number of West Coast ports, resulting in additional closures. Delays in service accentuated the need to develop an alternate strategy to deal with future shutdowns or closures. An alliance of disparate entities, including importers, retailers, warehouse distributors, shipping companies, and state port authorities, united to reconfigure a number of East and Gulf Coast ports as alternate trade routes for vessels. A critical component of this plan involved the expansion of the Panama Canal, a move expected to grant quicker access to the heavily populated Midwest, Gulf Coast and East Coast markets.

Experts also attribute limited land availability around many of the major West Coast ports as another factor causing a shift toward East and Gulf Coast ports. Limited land availability prohibits construction of additional warehouses and distribution centers in the near vicinity of West Coast ports. As such, many major retailers – Walmart, The Home Depot, Target, and IKEA – have worked with states and port authorities to construct massive, state-of-the-art warehouse facilities in the vicinity of a number of East and Gulf Coast ports.

**Battle of the Ports: West vs. East Coast**

In anticipation of the Panama Canal expansion, a number of East and Gulf Coast ports have undertaken measures to attract additional cargo that is normally delivered to West Coast ports. A partial shift from West Coast ports has already taken place, precipitated by several factors: the labor unrest at the West Coast ports; the move by shipping companies and distributors to explore lower cost alternatives; the lack of land available for expansion in the near vicinity of West Coast ports; and rail capacity that is
significantly lower on the West Coast.

There has been a drop in cargo volume arriving at West Coast ports. Analysis by the AMB Property Corporation\textsuperscript{10} reasons that “much of the drop in West Coast cargo volume is explained by a shift to more goods now going all-water through the Panama Canal to the East Coast, rather than being trans-loaded through one of the West Coast ports” (CanagaRetna, 2010). Additional assessments, including one from the London-based Drewry Supply Chain Consultants, a maritime industry research firm, predicts that “future economic conditions will shine a more favorable light on the all-water route to East Coast and Gulf Coast ports by way of the Panama Canal” (CanagaRetna, 2010).

Predictions are that West Coast ports will see increased competition for cargo following the expansion project. East and Gulf Coast ports could attract up to 25% of the ship traffic that was previously destined for the West Coast (CanagaRetna, 2010). Rising Chinese labor costs may also push some manufacturing back to Mexico and South America, further enhancing the potential for increased traffic transiting the expanded Panama Canal.

The United States Maritime Administration agrees that the canal expansion "will lead to a significant increase in container traffic calling at the Gulf Coast and eastern ports" in the coming decade (Spivak, 2011). The overwhelming consensus is that the expansion of the Panama Canal will facilitate movement away from West Coast ports, especially given the increasingly larger vessels that now will be able to pass through the canal.

\textbf{East Coast Ports Seek to Capture New Opportunities}

\textsuperscript{10}AMB recently merged with ProLogis to become the preeminent global owner, operator and developer of industrial real estate (AMB & Prologis, 2011).
A number of East and Gulf Coast ports have established so-called Memorandums of Understanding (MOUs) with the ACP in an attempt to garner a greater share of transpacific trade. Such agreements stem from a report commissioned by the ACP, in which the ACP recommended forging alliances with East and Gulf Coast ports in hopes of offering an effective value proposition to compete against the North American intermodal system. As of August 2011, 22 MOUs have been signed (Rodrigue, 2010).

Table 3 provides a list of some of the East and Gulf Coast ports that have signed an MOU with the ACP. Such agreements, aimed predominantly at generating new business via the promotion of the all-water route between Asia and the East and Gulf Coasts, commonly feature six elements:

- Joint marketing initiatives
  - Objective: Ensure that the Panama Canal option is part of the marketing plans of both East and Gulf Coast ports, and that any new business generated benefits all involved interests.

- Data exchange
  - Objective: Share information regarding trends in the shipping market, including data on: port calls, transit time, type of commodities, and cargo tonnage. Presumably, better forecasting assumptions will result.

- Market studies
  - Objective: Confidentially share market studies that involve issues of common interest.

- Modernization and improvements
  - Objective: Share information regarding infrastructure development
projects, especially as they relate to port capacity and all-water services.

- Training
  - Objective: Contribute information concerning the development of managerial expertise.

- Technological interchange
  - Objective: Share information on technology capabilities, and perhaps more importantly, include any related datasets.

<table>
<thead>
<tr>
<th>State</th>
<th>Port</th>
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<tbody>
<tr>
<td>Florida</td>
<td>Broward County’s Port Everglades Department</td>
</tr>
<tr>
<td></td>
<td>Manatee County Port Authority</td>
</tr>
<tr>
<td></td>
<td>Port of Miami</td>
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<td></td>
<td>Tampa Port Authority</td>
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<tr>
<td>Georgia</td>
<td>Georgia Ports Authority</td>
</tr>
<tr>
<td>Louisiana</td>
<td>Port of New Orleans</td>
</tr>
<tr>
<td>South Carolina</td>
<td>South Carolina State Ports Authority</td>
</tr>
<tr>
<td>Texas</td>
<td>Port of Houston</td>
</tr>
<tr>
<td>Virginia</td>
<td>Virginia Port Authority</td>
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<tr>
<td>Maryland</td>
<td>Maryland Port Administration</td>
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<tr>
<td>Massachusetts</td>
<td>Massachusetts Port Authority</td>
</tr>
<tr>
<td>New York / New Jersey</td>
<td>The Port Authority of New York and New Jersey</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>Philadelphia Regional Port Authority</td>
</tr>
</tbody>
</table>

Table 3. Ports with Memorandums of Understanding with the Panama Canal Authority (as of June 2010). Reflecting the prevailing view that the Panama Canal’s expansion represents a threat to West Coast markets, no MOUs have currently been signed with West Coast ports. Source: Southern Legislative Conference.

The parameters discussed above are relatively generic and are not legally binding. The importance of the agreements resides in the willingness of the stakeholders to recognize an existing interdependency. Essentially, the ACP and the partnering ports seek to ensure that the substantial infrastructure investments currently being undertaken will lead to increased vessel traffic and cargo volumes of a magnitude that will prove to be mutually beneficial from an economic perspective.
West Coast Ports Counter

As East and Gulf Coast ports strengthen efforts to capitalize on the expected trade boom through the expanded canal, West Coast ports are seeking to maintain their competitive advantage. In the fall of 2009, six major West Coast ports – Seattle, WA; Tacoma, WA; Portland, OR; Oakland, CA; Long Beach, CA; and Los Angeles, CA – established a joint pact entitled the “U.S. West Coast Collaboration.” The main objective of this partnership was to try and rectify three issues that were perceived to be weaknesses for West Coast ports (Rodrigue, 2010):

- Marketing
  - Objective: Identify, and communicate with port users, the advantages of shipping through West Coast ports.

- Image
  - Objective: Improve upon the negative images that West Coast ports may have acquired through recent decades via the dissemination of accurate information. Negative publicity lingers as a result of recent labor strikes.

- Lobbying
  - Objective: Common advocacy at the federal level for further investment in the West Coast intermodal infrastructure, as well as the promotion of a strong National Goods Movement Strategy.

West Coast ports, determined not to relinquish their existing market share, have also initiated other measures to deter the potential diversion of cargo from their ports.
The Port of Seattle recently commissioned Herbert Engineering\textsuperscript{11} to produce a study on carbon emissions that result from global trade routings. The study examined shipments originating in Asia that were shipped through West Coast ports and then on to other markets via intermodal transportation.

Intermodal transport routes were compared with transport from Asia through the Panama Canal to ports in Houston, TX, Savannah, GA, Norfolk, VA and New York, NY. Results of the study determined that goods transported via ships create less carbon dioxide (CO\textsubscript{2}) emissions than rail transportation, provided travel distances are equal (Hebert Engineering Corp., 2011). However, given that ports in the Puget Sound region are closer to Asia than East Coast ports, "this more than offsets the detrimental impact of the longer rail distances from West Coast ports" (O'Reilly, 2010). Moreover, the study maintains that CO\textsubscript{2} emissions are about 41\% less when transporting a container between Shanghai, China and Chicago, IL via the Port of Seattle compared to going through the Panama Canal and shipping to ports near New York/New Jersey.

**Contrarian Perspective Regarding an Increase in East and Gulf Coast Port Traffic**

While the general consensus points toward a tremendous increase in trade flowing to both East and Gulf Coast ports following the expansion of the canal, it is important to acknowledge an existing contrarian perspective. A 2005 report, authored by the aforementioned Drewry Supply Chain Consultants, speculates that even 10 years after the expansion project is completed, many East Coast ports will still lack the capacity to accommodate Post-Panamax vessels (CanagaRetna, 2010).

\textsuperscript{11} Herbert Engineering Corporation, which is actively involved in the design of ships, marine transportation systems, and offshore structures, provides marine consulting services to ship owners, operators, charterers, shipyards, and government agencies (Herbert Engineering Corporation, 2012).
The Drewry report stressed that many East Coast ports were already struggling to meet the requirements of existing containerships, demonstrating that such ports would be ill equipped to handle the larger vessels that loom on the horizon. Moreover, a report published by the Tioga Group,\(^{12}\) which provides freight transportation consulting services, maintains that projections forecasting the transition to East and Gulf Coast ports “underestimates the importance of transit time and reliability in shipper routing choices to move from the West Coast and the role of the local Southern Californian market” (CanagaRetna, 2010).

Acknowledgment of opposing perspectives is important. However, it is indisputable that East and Gulf Coast ports have begun a number of concrete measures to prepare for the increased numbers of large containerships that will undoubtedly appear following the expansion of the Panama Canal.

\(^{12}\) The Tioga Group, headquartered in Philadelphia, is a specialized freight transportation and logistics consulting firm, serving shippers, ports, policymakers, and industry organizations (Tioga Group, 2012).
Part II: Comparative Analysis

The main advantage to all-water container shipping to East and Gulf Coast ports is cost. In comparison to rail and truck transportation, water transportation is almost always less expensive. Furthermore, the new containerships, which allow a vessel to carry two to three times the amount of cargo as a traditional vessel, offer significant economies of scale by distributing costs over more units. According to Drewry Supply Chain Advisors, the cost of transporting a 20-foot-long container from Hong Kong to the eastern United States through a Los Angeles port and then via intermodal transportation is approximately $3,500 (Spivak, 2011). If the same container were loaded onto a Post-Panamax vessel and shipped via the Panama Canal directly to East Coast ports, shipping costs would be $250-$1000 less per container. Therefore, one passage through the expanded canal could save $8 million in shipping costs.

The drawback of shipping directly to East and Gulf Coast ports is travel time. According to industry experts, goods shipped from Asia can take more than a week longer to arrive at East and Gulf Coast ports.

Shipping to the East Coast: Comparison Between All-Water Route and Intermodal Transportation

This analysis compares intermodal transport versus an all-water route when shipping to an East Coast port. The comparison involves four components: cost, energy, emissions, and time. The analysis compared the different shipping alternatives using both

13 Other estimates are less definitive, forecasting savings of as little as $60 per container (Spivak, 2011).
14 Calculation assumes a Post-Panamax vessel carrying 8,000 TEU, with savings of $1,000 per TEU. Comparatively, assuming the lower estimate of savings per TEU (i.e., $250), a Post-Panamax vessel would still save $2 million.
a time value and an emissions value for each shipment type. Additionally, the cost per TEU, depicted below in Table 4, was calculated to provide an estimate of the cost differences when comparing intermodal and all-water transportation.

**Methodology**

The Rochester Institute of Technology, in conjunction with the University of Delaware, previously created two models – the Geospatial Intermodal Freight Transportation model (GIFT) and the Ship Transportation Energy and Emissions Model (STEEM) – that can be applied when conducting comparative analyses (Mitchell, 2011). The GIFT model is a geographic information systems-based tool used to evaluate the energy, emissions, cost, and time-of-delivery attributes of intermodal freight transport (Winebrake, Hawker, & Korfmacher, 2008). The STEEM model is utilized to geographically characterize energy use and emissions for inter-port ship movement for North America (Wang, Corbett, & Firestone, 2007). When used collaboratively, the two models provide a comparison of cost, emissions and travel time from Asian ports to the United States East Coast.

For this paper, the Port of Shanghai, China was selected as the port of origin. In 2011, the Port of Shanghai ranked as the world’s number one port in container traffic volume (World Shipping Council, 2012). The Port of New York/New Jersey (NY/NJ) was selected as the destination port, as it ranks number one on the East Coast in container traffic (American Association of Port Authorities, 2009).

**Results**

The analysis between the Port of Shanghai and the Port of NY/NJ compared three routing options for containerized freight: an all-water route via the Panama Canal;
shipping to Los Angeles and then employing rail transport to get the goods to their final destination; and shipping to Los Angeles and then employing truck transportation to reach the final destination.

Summary statistics, including total travel time, energy usage, CO₂ concentrations, and operating costs, were returned for each of the three potential routes using the aforementioned models. The results of the analysis can be used to compare the various modes of transport.

<table>
<thead>
<tr>
<th>Intermodal Shipping Costs</th>
<th>Route</th>
<th>Mode of Transport</th>
<th>Cost</th>
<th>Cost per Mile per TEU*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Angeles, CA to Savannah, GA</td>
<td>Rail</td>
<td>$2500</td>
<td>$0.53</td>
<td></td>
</tr>
<tr>
<td>Los Angeles, CA to Savannah, GA</td>
<td>Truck</td>
<td>$5200</td>
<td>$0.90</td>
<td></td>
</tr>
<tr>
<td>* Assumes 2,375 mile distance between Los Angeles, CA and Savannah, GA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4. Cost estimates for rail and truck transportation can vary considerably, attributable primarily to fluctuations in fuel prices. Estimates for this analysis were derived from Mitchell, 2011.

<table>
<thead>
<tr>
<th>Sea Shipping Costs</th>
<th>Route</th>
<th>Container Size</th>
<th>Average Cost</th>
<th>Cost per Mile</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Shanghai, China to United States East Coast</td>
<td>20'</td>
<td>$3,101</td>
<td>$0.26</td>
</tr>
<tr>
<td></td>
<td>Shanghai, China to United States West Coast</td>
<td>20'</td>
<td>$2,220</td>
<td>$0.35</td>
</tr>
<tr>
<td></td>
<td>Shanghai, China to United States West Coast</td>
<td>40'</td>
<td>$2,620</td>
<td>$0.41</td>
</tr>
<tr>
<td>* Assumes 11,881 miles between Shanghai and United States East Coast and 6,384 miles between Shanghai and United States West Coast</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5. Sea shipping costs derived from March 2010 report by Drewry Publishing.

<table>
<thead>
<tr>
<th>Shanghai to New York</th>
<th>Transfer</th>
<th>Time (Days)</th>
<th>Energy (BTUs)</th>
<th>CO₂ (gm/TEU)</th>
<th>Operating Cost ($US)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All-Water</td>
<td>N/A</td>
<td>37.3</td>
<td>41,163,319</td>
<td>4,785,900</td>
<td>$3,224</td>
</tr>
<tr>
<td>Intermodal (Water-Rail)</td>
<td>LA/LB</td>
<td>26.8</td>
<td>27,104,247</td>
<td>2,284,701</td>
<td>$3,658</td>
</tr>
<tr>
<td>Intermodal (Water-Truck)</td>
<td>LA/LB</td>
<td>24</td>
<td>56,212,684</td>
<td>4,854,600</td>
<td>$4,611</td>
</tr>
</tbody>
</table>

As depicted in Tables 5 and 6, the all-water route via the Panama Canal is the least expensive option when shipping from Shanghai to New York. The drawback, as previously mentioned, is that maritime shipping has a significantly longer travel time when compared to intermodal alternatives. Yet, as ProLogis/AMB declared in a report last fall: "Given a choice, many shippers today are leaning toward a delivery service that costs less and is more reliable, even if the delivery time were slightly longer" (Spivak, 2011).

Intermodal transport that utilizes trucking is the most expensive shipping option, presumably due to high fuel costs.\textsuperscript{15} However, trucking provides the shortest travel times. In relation to energy and emissions, intermodal shipping that utilizes rail transportation uses the lowest energy and produces the least CO\textsubscript{2} emissions.

As revealed by the model results, there are numerous tradeoffs involved with each method of transport. Depending on which component (e.g., cost, emissions, time) is most important, a company may choose to employ one shipping method over the other alternatives.

\textsuperscript{15} Fuel costs represent nearly 50\% of the operating costs for maritime shipping. Yet, comparatively speaking, maritime shipping has less fuel price sensitivity than both truck and rail transport. As such, higher fuel prices in the future present the possibility that routing options may look to maximize the maritime segment while minimizing the inland segment.
Part III: The Panama Canal Expansion and Southeastern Ports

Methodology

In late 2009, the Southern Legislative Conference (SLC)\(^{16}\) distributed a survey to 52 ports in the southeastern United States in order to obtain the most accurate information on the preparations being initiated by East and Gulf Coast ports on account of the expansion of the Panama Canal (See Appendix I). The survey contained ten questions. In all, 44% (23 of 52) of the ports responded to the survey.\(^{17}\)

Discussion

Though fewer than 50% of the ports responded to the survey, the returned responses contained a wealth of information in regards to the preparatory efforts underway at a number of southeastern ports to be in position to handle an increase in vessel traffic following the expansion of the Panama Canal. Cities with large, deep-water ports (Mobile, AL; Miami, FL; Savannah, GA; South Louisiana, LA; New Orleans, LA; Gulfport, LA; Wilmington, NC; Charleston, SC; Corpus Christi, TX; Houston, TX; Norfolk, VA) responded positively to the survey, indicating their confidence that the expansion of the canal would indeed have a significant impact on East and Gulf Coast ports. Smaller ports (Little Rock, AR; Palm Beach, FL; Fort Pierce, FL; Kansas City,

\(^{16}\) The Southern Legislative Conference, founded in 1947, comprises the largest of four regional legislative groups that operate under The Council of State Governments. Fifteen states – Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, Missouri, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia – comprise the SLC, whose mission is to foster and encourage intergovernmental cooperation among its member states (Southern Legislative Conference, 2012).

\(^{17}\) When the survey was initially distributed, Maryland was a member of the SLC. However, in January 2010, Maryland opted to join the Eastern Regional Conference (ERC) of The Council of State Governments. Still, as Maryland was one of the first states to respond to the survey, and given that the Port of Baltimore is an important component in U.S. shipping circles, Maryland’s responses were included in the results.
MO; Pascagoula, MS; Memphis, TN; Beaumont, TX; and Huntington, WV) that responded to the survey also predicted that they too would be impacted, albeit to a lesser, and oftentimes uncertain, degree.

The Port of Houston, located in the epicenter of the service area between the Rockies and the Ohio Valley, was the most confident in responding to the survey, labeling the expansion of the Panama Canal as a true “game changer” (Moreno, 2011). The port is currently undergoing extensive efforts to enhance multimodal capacities, including expansion of its rail and roadway infrastructure. Many expert analysts agree with the Port of Houston Authority, predicting that the port “will be the most positively impacted U.S. port following the completion of the Panama Canal expansion” (CanagaRetna, 2010). Conversely, the Port of Miami, noting its location as the closest major American container seaport to the Panama Canal, anticipates being first in line to receive vessel calls following the expansion.

A vast majority (~90%) of the ports that responded expect to see an increase in both maritime operations and cargo volumes following expansion of the canal. Even some smaller ports (Palm Beach, FL; Kansas City, MO; Memphis, TN) expressed confidence in their survey responses that the increased container vessel traffic would result in greater business opportunities.

Many of the ports that responded referenced infrastructure improvement projects already underway, or expected to be underway in the near future. Such improvements are necessary in order to manage the increasing number of larger ships expected to arrive following the expansion project. As an example, the Port of Mobile, Alabama is in the midst of a $600 million upgrade, which, when finished, will include a new container
terminal and a turning basin for large ships (Global Supply Chain, 2011). The Port of Mobile predicts such efforts will heighten its ability to attract more trans-pacific trade in the post-expansion era.

When surveyed on specific measures initiated by the ports to accommodate the expected increase in vessel traffic as a result of the Panama Canal’s expansion, the most common response involved the deepening of navigation channels. In working with federal and state officials to deepen the Port of Savannah to a depth of 48 feet, the Georgia Ports Authority declared: “At 48 feet, the Port of Savannah will be able to more efficiently serve the demands of United States commerce and remain a valuable asset in the national marine transportation system” (CanagaRetna, 2010).

The signing of MOUs with the ACP was another common measure initiated by southeastern ports. Based on the survey responses, approximately 35% (8 of 23) of the ports had signed MOUs with the ACP. Ports that have signed an MOU include the ports of: Mobile, AL; Palm Beach, FL; Miami, FL; Savannah, GA; New Orleans, LA; Charleston, SC; Houston, TX,\(^\text{18}\) and Norfolk, VA. In addition, the Port of Gulfport, Mississippi indicated that it was in the planning phase of drafting an MOU with the ACP.

Inland ports have also undertaken efforts to enhance their facilities and operations. The Port of Kansas City, located on the largest navigable inland waterway, converted the former Richards-Gebaur Air Force Base into an intermodal freight process and distribution center. The port now currently boasts the largest rail center (by tonnage) in the United States (KC SmartPort, 2012).

\(^{18}\) The Port of Houston also has a “Sister Port Agreement” with the ACP. Similar to a MOU, the Sister Port Agreement simply encourages cooperation between the Port of Houston and the ACP in an effort to promote trade between the respective markets.
The current restrictive fiscal environment may make it difficult for some ports to acquire the funding necessary to complete their intended improvements. A common theme among port improvement efforts is the reliance on federal funding for part, or all, of the expansion projects. Over half of the responding ports (~52%) indicated an expectation of funds from the federal government. Ports predicting to receive federal funds included: Mobile, AL; Palm Beach, FL; Miami, FL; Savannah, GA; South Louisiana, LA; New Orleans, LA; Kansas City, MO; Gulfport, MS; Pascagoula, FL; Corpus Christi, TX; Houston, TX; and Huntington, WV. The obvious question remains: why should federal funding go to support a port’s expansion, when the benefits will, by-and-large, accrue to the state where the port is located?

The USACE examines all proposed port infrastructure improvement projects and approves the issuance of federal funding if it is deemed that a proposed project will benefit the nation as a whole (Global Supply Chain, 2011). Even if the USACE approves a particular project for federal funding, attaining financial support may prove hard to come by. Growing concerns over the United States federal budget deficit, coupled with pressure to cut discretionary spending, means funding for future state projects will be limited.

Roughly 40% (9 of 23) of the responding ports indicated that their respective state legislatures had enacted legislation to promote port enhancement efforts. Ports in this category included the ports of: Mobile, AL; Savannah, GA; South Louisiana, LA; New Orleans, LA; Gulfport, MS; Pascagoula, MS; Charleston, SC; Beaumont, TX; and Huntington, WV. Legislation initiatives varied, ranging from broad economic development efforts to legislation geared specifically for the ports themselves. An
example of such is seen in Alabama, where the state legislature “enacted legislation that authorized an amendment to the state’s constitution to allocate a portion of the state’s oil and gas capital payments to fund port improvements” (CanagaRetna, 2010). In a statewide vote, this amendment won full approval, which resulted in the Alabama Port Authority receiving $100 million to fund capital improvements at state port facilities.

The ongoing economic recession has not significantly affected port improvement plans. A question in the survey sought to determine whether or not the recession, and the consequent drop in world cargo traffic, altered any port’s preparations. A vast majority of the ports that responded to this question noted that improvements already underway, or about to be undertaken, would continue as planned, regardless of the downturn in the global economy. The response from the Port of Savannah summed up the overwhelming sentiment towards the future of improvement projects, given the recent recession: “While current economic challenges demand consideration, this has not been a time to retreat from the planning and construction that has driven so much prosperity. In fact, this is precisely the time to secure additional capacity and, in so doing, create additional economic opportunity and sustainable growth for generations to come. Our goal is to strengthen our advantages and achieve even greater success moving forward” (CanagaRetna, 2010).

Finally, when asked about major challenges and obstacles faced by the ports in their expansion efforts, over half of the responding ports (52%) indicated that funding concerns presented the biggest challenges going forward. Approximately 13% of the ports that responded indicated that slow-moving regulatory agencies, and thus slow-moving permitting processes, presented the largest obstacle. Other challenges included:
expanding port boundaries, given limited room for development in the immediate
surrounding areas (4%); increasing navigation channel depths, necessary to accommodate
the new class of larger vessels (9%); mounting legal hurdles presented on behalf of
environmental groups (4%); infrastructure expansion given the tight time constraint for
improvements to be accomplished (4%); and technology enhancements (4%).
Part IV: Conclusion

Competitive transportation systems are critical for economic growth. Increases in global trade have put a strain on the North American logistics system, thereby affecting the world transportation network. Future research should examine how the expansion of the Panama Canal may redistribute trade volumes across the North American intermodal system, including ports, railroads, and trucks.

The rapid pace of change in the shipping industry makes projecting to 2014 a formidable task. The lone certainty is that the Panama Canal will be expanded. Rodolfo Sabonge, vice president of marketing research and analysis for the ACP, recently announced that the project continues to be on target for completion in 2014: “The most important detail to note is that we are on schedule and under budget” (Mid-American Freight Coalition, 2011). Yet global freight distribution, in conjunction with the strategy of maritime shipping companies and terminal operators, has become so complex and interrelated that it is uncertain what effects, if any, the expansion of the Panama Canal will have. A change in only one stakeholder’s actions can educe a variety of shipping service reconfigurations, which in turn will have trickle down effects within the entire industry.

Impacts from climate change also pose future uncertainties for the shipping industry; in particular, melting Arctic sea ice and sea level rise present formidable challenges going forward. Over the past few decades, climate change has had a significant effect on Arctic waters. During the summer and fall seasons, Arctic waters are increasingly becoming ice-free. The lengthening of the open-water season has led to new industrial developments as a rising number of large maritime vessels transit either the
Northern Sea Route, over the Russian Arctic, or the Northwest Passage through the Canadian Arctic. As more ice melts, shipping seasons will continue to increase in duration, leading to a potentially significant rise in trans-Arctic shipping. However, it appears that large-scale trans-Arctic shipping is still many years away. Retrofitting vessels to sail through icy waters requires a significant economic investment, and many shipping companies currently do not have fleets that are capable of sailing through the Arctic.

Future sea level rise also poses a daunting challenge for ports. By their very nature, seaports are located in vulnerable areas prone to climate change impacts (e.g., on coasts susceptible to sea level rise). Impacts from climate change will result in more extreme events at many seaports in the future. As indicated by the survey responses above, southeastern ports are in the midst of a rapid expansion. Consequently, adaptation measures must be considered in the future for both waterborne commerce and coastal infrastructure in order to prevent significant impacts from climate change.

Only time will tell if new trade patterns emerge as a result of the expansion project. At a minimum, the expansion project ensures that competition for delivering imports and exports will be strong for years to come, as the expansion project will certainly add new alternatives for the global movement of goods. Ultimately, the Panama Canal expansion is a microcosm for the entire North American seaport system. The ports that will remain competitive in global trade markets are the same ones that must modernize their sea terminals to accommodate the larger ships that will be arriving once the expansion is complete.
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Appendix I

The Council of State Governments’ Southern Office, Southern Legislative Conference (SLC) Survey on Panama Canal Expansion

In light of the new set of locks scheduled to open in the Panama Canal in 2014, ports across the Southern United States are devoting time and resources to prepare for the forecasted increase in the cargo capacity of ships passing through the canal and, consequently, larger ships that are expected to call on Southern ports. In order to provide an update to both legislative and executive branch officials in the South, the SLC is gathering information on the status of these preparations. The SLC has focused on Southern state ports for a number of years, in the form of in-depth reports, legislative testimony and presentations by senior port officials at SLC meetings. This focus stems from the fact that nearly two-thirds of all U.S. exports and imports transit through an SLC port.

The information gathered in this survey will be compiled in a report and forwarded to a range of policymakers, including legislators, legislative staff, governors, senior governors’ staff, economic development officials, port officials and interested others. If you could forward your responses to the questions listed below by November 20, 2009, it will be much appreciated. Please contact me, Sujit CanagaRetna, at scanagaretna@csg.org, or Mikko Lindberg at mlindberg@csg.org, or 404/633-1866, if you have any questions or comments. You may also review the SLC’s prior research on ports in the South at http://www.slcatlanta.org/Publications/EconDev/Ports.html.

1. In what ways, if at all, does your port anticipate being impacted by the expansion of the Panama Canal?
2. What role do you anticipate your port will play after this expansion project is completed?
3. Has your port initiated efforts to accommodate the expected increase in cargo traffic and number of vessels on account of the Panama Canal’s expansion? If so, can you please provide details on this expansion effort, including information such as new container facilities and equipment, deepening efforts, channel maintenance efforts and any other relevant features?
4. If your port has initiated expansion efforts, what is the expected cost of this project? How will your port raise the funds necessary for the expansion? Please specify the breakdown of federal, state, local and private funds.
5. Has the legislature in your state initiated any legislation to propel this expansion process forward and, if so, would you please list the specifics related to the legislation? For instance, a bill number?
6. What preparations has your port initiated in terms of multimodal (rail, truck) transportation solutions?
7. Has the ongoing global economic recession and the steep drop in world cargo traffic resulted in a change in your plans regarding preparing for the Panama Canal expansion?
8. What would you identify as the major obstacles or challenges to your port’s
expansion efforts?
9. Has your port entered into an agreement or memorandum of understanding with the Panama Canal Authority and, if so, what would you categorize as the main elements of this agreement?
10. Are there any other details or related information you would like to emphasize in light of the expansion of the Panama Canal?