Redrawing Global Shipping Routes: The Panama Canal Gets an Upgrade

By Merit Webster

August 15, 1914: A new era in global logistics and international trade began on that hot summer day, when the SS Ancon, a 486-foot U.S. cargo and passenger ship, crossed the continental divide by water and became the first vessel to transit the Panama Canal. The canal’s lock system functioned as a water lift, raising the ship from the Atlantic Ocean to the man-made Gatun Lake (85 feet above sea level) in three stages. Ancon sailed through the 48-mile narrow passageway, descended the locks at the other end of the channel and arrived in the Pacific Ocean.

It was a massive engineering feat. After years of obstacles and setbacks, including malaria outbreaks and a lock redesign to accommodate Panama’s thick jungles and mountainous terrain, the project moved more than 240 million cubic yards of earth, used 61 million pounds of dynamite and cost $400 million (over $10 billion in today’s dollars) to complete. More than 10,000 people died during the course of construction, and the project was almost abandoned on three occasions. But what mattered on that inaugural day was that a 400-year-old maritime dream had finally been realized: at last, the Atlantic and Pacific Oceans were connected. The Panama Canal was open for business.
October 15, 2014: The Panama Canal of today is a flurry of activity. More than 14,000 trips take place annually, and its strategic location serves over 140 maritime trade routes in more than 80 countries. The U.S. is the key beneficiary, with over two-thirds of cargo passing through the canal either destined to or originating from America; China is second, with a 22% share. The canal handles over 5% of all goods moving around the world—a significant share of the global market, considering the majority of maritime trade is river bound and localized.

The Gatun Locks (Atlantic side) and the Miraflores Locks (Pacific side) raise and lower vessels in much the same way they did on that maiden voyage. Containerships and bulk carriers line the horizon, waiting for their turn to ascend and descend the system. But the bottleneck has grown worse in the past several years, with average transit times increasing from 9 hours in 1999 to over 13 hours by 2008. That its capacity has not been able to keep up with growth in global trade poses a crucial challenge for the canal; shippers operating on tight timetables will increasingly look to other transport methods if the congestion does not improve. Tolls, too, have climbed substantially as the number of containerships transiting the canal has doubled since the early 2000s.

Adding to the chaos, excavators are busy at work on both sides of the channel, constructing a deeper, wider third set of locks. The extensive $6 billion construction project, which was scheduled for fall 2014 completion but has been delayed 18 months, will effectively create a new traffic lane, accommodating between 12 and 14 additional vessels daily (more than 2,000 additional trips per year) and significantly larger ships (13,000 twenty-foot equivalent units [TEUs] vs. the current maximum of 5,000 TEUs). In total, cargo capacity will double as the Panama Canal seeks to maintain relevancy on the global stage and provide an answer to its chief competitors—U.S. intermodal (cross-continent transportation via railroad and truck) and the Suez Canal.

As the largest engineering project ever undertaken in the early 20th century, the Panama Canal strengthened the U.S. economy, boosted a global shipping industry and dramatically shortened shipping routes—saving containerships the long and treacherous journey of 5,000-plus miles around South America’s Cape Horn. The current renovation, which even by today’s standards is one of the largest infrastructure projects worldwide, will certainly affect a wide range of parties in the global logistics industry, including steamship companies, logistics providers, shippers and port operators. Yet in an ever-connected, globalized world, with dynamic trade patterns and several exogenous factors at play, it is unclear exactly how these parties will be affected once the project is finished.

Changing Trade Dynamics and Canal Limitations
Within 10 years of the inaugural voyage, the Panama Canal had changed the dynamics of international trade. Distances shortened considerably; cargo that had historically moved by transcontinental rail (between the U.S. East and West Coasts) or around the tip of

---

1 Source: U.S. Department of Transportation (DOT) and Maritime Administration (MARAD), “Panama Canal Expansion Study—Phase 1 Report,” November 2013.
2 Source: Georgia Foreign Trade Conference, February 2, 2015.
South America could now route directly through Central America by water. Transportation costs fell concurrently, and more than 5,000 trips were made annually through the canal’s ports by the end of World War I. Parts of Central and South America, particularly on the western coasts of Chile and Peru, for the first time entered the global marketplace as the canal made possible seaborne trips carrying commodities destined for the U.S. East Coast and Europe.

Today, the majority of flows through the canal are part of the East Asia-U.S. East Coast trade routes, and the hub has become an important facilitator of international trade between the two regions. Between 1990 and 2011, trade between the U.S. and China ballooned from $15 billion to $291 billion, and goods either destined for or originating from East Asia and the U.S. now comprise 39% of total cargo flowing through the canal. The U.S. supplies soybeans and corn to meet China’s growing population needs, and in return, China sends an even greater value of finished electronics, clothing and other exports to the U.S. That so many of the ships transiting the canal are either destined to or originating from these regions makes sense; three of the United States’ top five waterborne trading partners are the Asian economies of China, Japan and South Korea.

The development of new manufacturing centers in China and other East Asian countries over the past 30 years has precipitated a move to even longer distance shipping hauls and larger vessels in order to capture economies of scale. The relationship between vessel sizes and shipping costs is straightforward: costs per unit decrease the larger the size of the vessel. As such, standard ship sizes have grown considerably. The industry has increasingly turned to post-Panamax vessels, which carry up to 13,000 TEUs, as a preferred choice for transocean routes – yet these ships cannot fit through the Panama Canal’s narrower traffic lanes. Consequently, the canal is losing market share, as more than a third of all container vessels, bulk carriers and tankers are simply too large to fit through its lanes. And the ships just keep getting bigger: a U.S. Army Corps of Engineers study predicted that by 2030, nearly two-thirds of containerships worldwide would be too big to use the existing locks system.

**The East Asia-U.S. Global Trade Route Alternatives**

When selecting which ships to deploy on a particular trade route, ship operators consider cost, time and capacity. Their objective is to find the optimal mix of the key economic drivers – the least costly route, the shortest distance and the maximum amount of goods that can be transported at any given time. The type of good being transported also matters. Raw commodities, which operate with very thin margins, generally go the least costly route; high-value, time-sensitive or perishable goods will take the shortest route.

For illustration purposes, a weekly containership service between Northeast Asia and the U.S. East Coast through the Panama Canal requires an eight-ship rotation to cover port calls and sailing times without interruption, which translates to two transits through the canal weekly and 104 transits annually. Any delay or failure in this tight logistics chain creates additional expenses and potential losses for ship and cargo owners; reliability of service is absolutely critical to the smooth functioning of the global logistics industry.

As noted, the Panama Canal has lost credibility in recent years with its overflowing ports and wait times that sometimes exceed 24 hours. With the doubling of cargo capacity and the new ability to transit post-Panamax ships, it intends to recapture its place as the preeminent choice for shippers moving cargo between Shanghai and New York. However, the canal does not operate in

---

6 Source: Virginia Western Community College, “Theodore Roosevelt and the Panama Canal.”
9 Source: Panama Canal Authority, “Proposal for the Expansion of the Panama Canal,” April 2006.
isolation; combined with other global economic forces such as recurring labor issues and congestion at U.S. West Coast ports, sustained low energy prices in North America and higher labor costs shifting manufacturing away from East Asia, logistics costs related to the canal’s new expansion program are just one of the forces affecting international trade dynamics. Two alternatives will continue to compete with the canal for cargo.

Competitor No. 1 – Intermodal: East Asia Through the Continental U.S.

The fastest way to get cargo from China to the U.S. East Coast is first by ship (15 days from China to the West Coast) and then by rail (six days from the West Coast to the East Coast), for roughly 21 days; more than 75% of U.S. imports from Asia reach the country via intermodal means, compared with 19% of all exports through the canal, which takes 26 days.\(^{11}\) Despite intermodal’s five-day advantage, with total expenses factored in, it costs $600 more per TEU to ship through intermodal vs. the canal.\(^{12}\) Rail does not carry nearly as many goods as the post-Panamax ships, which individually carry as much cargo as 16 trains.

Furthermore, as the U.S. intermodal system has grown quickly and become increasingly overloaded, a series of issues have affected the economics of shipping via this method, including labor strikes, chassis shortages and congestion at the key West Coast ports of Los Angeles and Long Beach, California. Serious shipping delays and the ability to transit significantly more cargo imply that the expansion will make shipping routes through the canal more cost-effective – even if it takes longer. Analysts predict that an expanded canal could take between 20% and 25% of current West Coast freight volumes.\(^{13}\)

Competitor No. 2 – Maritime: East Asia Ports Through the Suez Canal to the East Coast

The other alternative is to send cargo from East Asia to the U.S. East Coast via the Suez Canal, a sea-level canal in Egypt with no locks or pinch points that can take the larger post-Panamax vessels. The Suez saw its share of traffic representing trade between Asia (including Southeast Asia) and the U.S. East Coast rise from 30% in 2010 to 42% by October 2013.\(^{14}\) However, shipping cargo from Shanghai to New York this way takes nearly 28 days; a vessel taking the Suez route will make 4.7 round trips yearly (77 days per trip), vs. 6.5 round trips annually (56 days per trip) through the Panama Canal.\(^{15}\) Costs can also add up quickly; once the Panama Canal allows post-Panamax containership transits, the Panama route will save 23% on total transportation costs vs. the Suez Canal route.\(^{16}\)

The Suez poses a credible threat to the Panamanian business in some cases. Maersk, for example, stopped shipping through Panama and only sends ships through its Egyptian competitor. There is talk of a “Suezmax” ship – which can carry up to 18,000 TEUs – becoming the global standard one day, which could cause

---


\(^{12}\) Source: The Economist, October 2014.


\(^{14}\) Source: The Economist, October 2014.


\(^{16}\) Source: Panama Canal Authority, “Proposal for the Expansion of the Panama Canal,” April 2006.
Key Trade Routes: Shanghai to New York

- **U.S. Intermodal Route:**
  18,000 TEUs+ along Pacific Ocean route; limited on land (16 railcars equal one post-Panamax)

- **Panama Canal Route:**
  Current capacity – Panamax (up to 5,000 TEUs); post-expansion capacity – post-Panamax (up to 13,000 TEUs)

- **Suez Canal Route:**
  Suezmax (18,000 TEUs+) with no capacity constraints

Numbers are an approximation and may vary based on size and type of ship.

a similar problem all over again. Additionally, if manufacturing continues to move from China to Southeast Asian countries, whose ports are closer to the Suez, the route’s relevance will likely grow as global sourcing patterns change. In the medium term, however, it will generally be cost advantageous and shorter to route East Asian cargo through the Panama Canal.

**Implications**

One clear implication of the Panama Canal’s infrastructure development initiative is the impact it’s having on the U.S. East Coast. The bustling ports of Boston, New York/New Jersey, Baltimore and others have identified the need for infrastructure improvements to accommodate the larger ships and improve load and unload times. East and Gulf Coast ports are expected to invest nearly $30 billion in the coming years to deepen channels and create new loading docks, according to the American Association of Port Authorities. The southeastern U.S. is also expected to benefit from the larger oceangoing ships transiting the canal, making the region a more important distribution center and link in the supply chain.

The expansion project of the 21st century likely won’t have quite the dramatic effect on international trade that the 20th century construction did, yet the ambitious upgrade will improve trade route efficiencies, divert cargo toward the most economic routes and provide a much-needed overhaul to supply chain infrastructure in the Western Hemisphere. There will be winners and losers as parties seek to maintain their relevancy on the global logistics stage. That the Panama Canal will soon accommodate vessels carrying 13,000 containers worth of soybeans, electronics and sweatshirts through its thick steel gates will likely be a winner for global commerce.

*Brown Brothers Harriman has a long history of investing in the transportation and logistics sector – as well as financing goods moving through it – and members of the team visited the Panama Canal in 2014 to learn more about the expansion program. The consequences of such a large infrastructure investment for the global logistics industry and on international trade patterns is a key question we ask ourselves as we evaluate investment opportunities in the sector.*
The Facts: Spotlight on Top Commodities Moving Through the Canal

Containerships - measured in twenty-foot equivalent units (TEUs) – are cargo ships that carry their load in truck-size intermodal containers. Over the past two decades, they have been the fastest-growing vessel segment traversing the Panama Canal, largely for carrying goods manufactured in Asia and sent to the U.S. Yet other vessel types carrying commodities originating in the U.S. – dry bulk carriers, which transport unpackaged bulk cargo such as grains and cement, and tankers, which carry petroleum products and liquefied natural gas (LNG) – will also benefit from the expansion program, and with them, the U.S. export market.

No. 1 Commodity Type: Grains

- As the leading group of commodities passing through the Panama Canal, the majority of grain cargo flow (soybeans, wheat, corn, barley and sorghum) originates in the U.S. Midwest and is destined for East Asia. Farmers looking to export can elect to ship their crops down the Mississippi River to Gulf Coast ports or send product by freight train.
- China is the United States’ largest end market for grains and soybeans; exports total more than $25 billion annually.17
- Two-thirds of all grain exports are routed to the Gulf Coast and shipped through the canal18 – equal to 45 million tons of grain in 2014, according to the U.S. Department of Agriculture.
- The canal has lost more than 10% of its market share in the past decade as economic development in Southeast Asia and congestion in Panama have caused exporters to turn to Pacific Northwest ports.
- The expansion project will lower transport costs by an estimated $14 per metric ton and boost volumes by 30% between 2011 and 2020.19

No. 2 Commodity Type: Petroleum Products and Natural Gas

- In 2012, U.S. refiners sent over 5 million tons of residuals and refined products to Asia via the canal, nearly 8 million tons to South America (mostly diesel) and 3.5 million tons to Central America (mostly gasoline).20
- The widening of the Panama Canal will allow a large percentage of the world’s tankers to pass through its gates – a market that it has almost no share of right now. Most tankers must travel via the Suez or around Cape Horn currently.
- Trade patterns for coal and petroleum products are not expected to change materially due to declining demand for the former and narrowed price spreads for the latter (the U.S. still operates with a ban on crude oil exports).
- A significant increase in trade activity is expected for LNG and liquefied petroleum gas (LPG); these products are gaseous at room temperature but with cooling and reduced pressure become transportable in liquid form.
- An abundance of gas available in the U.S. as a result of the shale revolution will find an attractive end market in Asia-Pacific countries, which comprise 40% of global consumption of LPG and LNG.21 With direct access through the canal, these commodity producers will find it more efficient and less costly to transport their products.

19 Source: Business Insider, August 2014.
21 Source: Business Insider, August 2014.