



**Erasmus University Rotterdam**

**Msc in Maritime Economics and Logistics**

**2011/2012**

**Impacts of Panama Canal Expansion on the Trans-Pacific Container  
Trades and the U.S. Ports**

**A comparison between the Asia-US West Coast and Asia-US East Coast via Panama Canal post  
expansion from an economic angle and its impacts on the U.S. Ports**

**By**

**Mingli Zhu**

## **Acknowledgment**

I would like to express my sincere appreciation to all those who helped me to complete this thesis. This research project would not have been completed without their support. First of all, I would like to thank my employer, DVB Bank SE, for giving me the opportunity to take this study and their sponsorship throughout the two years; secondly, I would like to thank my supervisor Prof. Michaël Doms for his guidance and advice on this thesis. Moreover, I'd like to express my gratitude to Mr. Shi Lei, Mr. Eric and Mr. Carlos Zepeda who helped me with the questionnaires and provided suggestions to the research project. I would like to also express special thanks to my partner who supported me unconditionally throughout the two years of the study. Last but not the least, I would like to express my thanks to all the MEL staff for their support and guidance throughout my two years with MEL.

## **Abstract**

Since the beginning of the expansion project, the Panama Canal is expected to handle more than double the canal's current annual tonnage capacity upon completion of the expansion. Agreed by most, if not all, industry experts, the Panama Canal expansion is expected to have significant impacts on the existing international seaborne trades, especially on the Asia - US routes. Not only would the existing trading routes be affected but also the ports and the modes of transportation.

Among different shipping sectors, the fast growing container trade is most likely to be hit with the biggest impacts. With the canal's expansion that enables larger container ships to transit through the canal, container ships of up to 13,000 TEUs would be able to call the US East Coast directly. As a consequence, it is a possibility that a tremendous trade volume can be shifted from the congested US West Coast to the US East Coast.

Would the ports on the US East Coast be able to handle the volume that shifted from the US West Coast? The challenge is not only the infrastructure and equipments of the ports but also the timing and cooperation among the ports on the US East Coast. Many decision makers of these ports are already prepared and ready for the expected change once the canal expansion is complete. Based on the forecasts and data, strategic plans and guidance have been adopted to deal with the uncertainties.

This paper provides analysis on the impacts of the Panama Canal Expansion on the US East Coast ports versus the impacts on the US West Coast ports as well as the effects on the US intermodal system. To include perspectives from as many industry participants as possible, the paper presents several analyses based on interviews with industry analysts, US ports, Consultants and Liner companies. It shall as well provide short-cut cost comparison analyses between the water leg and the land based intermodal system from which the preference of the Liner companies is expected to emerge when choosing between the two transports modes. Using the results from this analysis, we will develop integrated scenarios from the supply side and the demand side, assessing the impacts due to the Panama Canal Expansion. Furthermore, a sensitivity analysis and recommendation shall be provided for each scenario.

This paper also compares the two alternatives (water way via Panama Canal to USEC and water way to the USWC plus shipment across the U.S) there are some tradeoffs when determining the best shipping route from Asia to US East Coast. Although the route via Panama Canal might be the cheaper choice it is also a slow opinion. Since cost is shipper's main concern, the route via Panama Canal might be the preferred choice. However, certain cargo may require a faster shipping alternative that the shipper is willing to pay a higher cost. Furthermore, the best alternative appears to be the water route to the U.S. West Coast plus intermodal system by rail to the East Coast.

The results show that the current trade volume split between US East Coast and US West Coast is most likely not to be disturbed within short period of time post to Panama Canal expansion. The current costs of ships that use intermodal system via US West Coast ports is still more

attractive when compared to direct transport via Panama Canal to US East Coast. However, all this could change subject to canal the canal transit fee which might give it the incentive.

## Table of Table of Contents

Acknowledgments	ii
Abstract	iii
Table of Contents	iv
List of Figures	vi
List of Graph	vii
List of Tables	viii
Chapter 1 Introduction.....	1
1.1 Research questions.....	2
1.2 Thesis Objectives.....	3
1.3 Structure of the thesis.....	4
Chapter 2 Panama Canal expansion project.....	5
2.1 Introduction of the expansion project.....	5
2.2 The Panama Canal service overview.....	7
2.2.1 The current transpacific trade routes.....	8
2.2.2 Transpacific Trade Development.....	11
2.2.3 Importance of the Panama Canal.....	12
2.2.4 Shipbuilding Trends.....	13
2.3 Economic point of view - The challenges .....	14
Chapter 3 Ports competitiveness & Literature Review.....	16
Chapter 4 Ports affected by the Panama Canal Expansion (East-West Coast US port ranges).....	19
4.1 The affected U.S. Ports Analysis .....	21
4.1.1 Savannah.....	22
4.1.2 Charleston.....	22
4.1.3 New York/New Jersey.....	22
4.1.4 Norfolk.....	24
4.1.5 Baltimore.....	24
4.1.6 Miami.....	24
4.1.7 Jacksonville.....	24
Chapter 5 Methodology.....	26
5.1 Analysis of research.....	26
5.2 Analysis of interview.....	30
5.2.1 Filed experts/Consultants.....	30
5.2.2 Shipping companies/Liners.....	31
5.2.3 US Ports.....	31
5.2.4 Panama Canal Authority.....	32
5.3 Answer to the research question.....	33
5.4 Development of scenarios.....	39
5.4.1 Case of Walmart.....	36

5.4.2 A typical transpacific trade routes comparisons.....	40
5.4.2.1 The Scenarios.....	41
5.4.3 U.S. Rail Network.....	44
5.4.3.1 U.S. West Coast Rail intermodal network.....	44
5.4.3.2 U.S. East Coast Rail intermodal network.....	46
5.5 Assessment of scenarios.....	49
5.5.1 Panama Canal Toll Conundrum.....	49
5.5.2 Assessment summary.....	50
Chapter 6 Conclusion.....	48
6.1 Conclusion.....	48
6.2 Limitation of the research and suggestion for further research.....	49
List of Reference	50
Annex	
Interview with Mr. Lei Shi – Assistant Vice President, Market Analyst - APL	51
Interview with Ms. Tong Xu – Vice President, Shipping Industry Analyst – China Shipping Container Lines (Dalian) Co., Ltd	52
Interview with Ms. Marianthi Milolouplou – Assistant Vice President, Industry Analyst Research & Strategic Planning Shipping – DVB Bank SE	60
Interview with Mr. Eric Li – Assistant Vice President, Container Shipping Industry Analyst Research & Strategic Planning Shipping – DVB Bank SE	63
Interview with Mr. Pedro R. Hernandez – General Manager, Miami-Dade County Seaport Department	65
Feed Back from Port of Seattle – Ms. LaTonja Brown	67
Interview questions	68

## List of Figures

Figure 1 Panama Canal expansion project .....	05
Figure 2 Panama Canal Expansion Project in Steps .....	06
Figure 3 The transpacific service route via Panama Canal (Asia to USEC).....	08
Figure 4 The transpacific service route from Asia to USEC via Suez Canal.....	09
Figure 5 The transpacific service route Asia to USWC.....	10
Figure 6 Transpacific Trade Development - Imports.....	11
Figure 7 Importance of the Panama Canal .....	12
Figure 8 Container Ship Fleet 2012TD .....	13
Figure 9 Container Ship Oderbook .....	13
Figure 10 Container Ship MSC Fabiola first trip to U.S.....	15
Figure 11 Visualization of the four levels of ports competition.....	17
Figure 12 Transpacific Imports 2011 .....	19
Figure 13 Channel Depth Constraint (U.S. West Coast – East Coast ports range).....	20
Figure 14 East Coast Ports: Channel Depth, Ship Capacity.....	21
Figure 15 Port of New York/New Jersey.....	23
Figure 16 Bayonne Bridge.....	23
Figure 17 Transpacific Imports in East Coast - 2011.....	26
Figure 18 U.S. Population Density by State and County.....	36
Figure 19 U.S. Population Density by State and County divided into 4 region.....	37
Figure 20 Walmart Store Distribution in U.S.....	38
Figure 21 U.S. Top 10 Transpacific importers.....	39
Figure 22 Shanghai to US Ports – distance & time (West Coast & East Coast comparison).....	40
Figure 23 U.S. Intermodal network.....	43
Figure 24 U.S. Rail Intermodal - West Coast - CN.....	44
Figure 25 U.S. Rail Intermodal - West Coast- BNS.....	45
Figure 26 U.S. Rail Intermodal - West Coast- UP.....	45
Figure 27 U.S. Rail Intermodal - East Coast- NG.....	46
Figure 28 U.S. Rail Intermodal - East Coast- NS 1.....	49
Figure 29 U.S. Rail Intermodal - East Coast- NS 2.....	47
Figure 30 U.S. Rail Intermodal - East Coast- KCS.....	48

## **List of Tables**

Table 1 Route information on transpacific service via Panama Canal .....	08
Table 2 Route information on transpacific service from Asia to USEC via Suez Canal .....	09
Table 3 Route information on transpacific service from Asia to USWC.....	10
Table 4: Benchmarking scores of ports' main characteristics.....	25
Table 5 Number of consumers by region.....	37
Table 6 Transpacific Imports China-US.....	39
Table 7 Panama Canal toll rate estimation.....	49
Table 8 Transpacific Routes Comparison.....	50



## Chapter 1: Introduction

Container Shipping is one of the high growth areas for the ships coming from Asia. Over the years, due to decreased reliance on the Panama Canal for transportation, the share of Post Panamax container ships in the global container ship fleet has increased. Based on the current delivery schedule, 46% of the global container ship fleet will be Post Panamax by 2012 (Clarksons SIN). With the expansion, the Panama Canal has the opportunity to attract this portion of the fleet with a lower transit cost per TEU carried. The shipping companies have already taken into account the expansion plan which will be operational in 2014. Their order books featured increased number of Post Panamax ships as early as in 2007 (Clarksons SIN) . As soon as the third set of locks of the Canal open, liners are expected to deploy the larger ships. However, Post Panamax vessels over 8,000 TEUs are not expected to be deployed on the Far East – U.S. East Coast (USEC) via Panama route on a large scale in the immediate future due to infrastructure limitations, especially the air draft limitation of the Bayonne Bridge at port of New York & New Jersey.

In addition to infrastructure limitations, cargo volume is not high enough to support optimal utilisation of vessels over 8,000 TEUs. Total weekly capacity deployed on the Asia to U.S. West Coast (USWC) services aggregated to 261,202 TEUs as of end November 2011 (Piers, 2011). On the other hand total imports from Asia to USWC in the month of November 2011 was 903K TEUs (Piers, 2011), thereby giving an utilisation rate of 80%. It is noted that container ships from Asia to US also carry cargo destined for Central America which gets transhipped at one of the U.S. West Coast ports, but the transshipment cargo is not expected to significantly change the utilization rate on Asia-USWC route. Liner services from Asia with aggregated weekly capacity of 45,768 TEUs have direct port calls at Lazaro Cardenas and Manzanillo, the largest ports in West Coast Central America which together account for nearly 93% of the container throughput in West Coast Mexico (Piers, 2011).

Furthermore, Port of New York & New Jersey is the largest container port on the U.S. East Coast (USEC) accounting for 40% of the total US container imports through U.S. East Coast and Gulf of Mexico (The Port Authority of New York & New Jersey). However, the air draft of the Bayonne Bridge restricts most Post Panamax vessels over 8,000 TEUs to visit terminals west of the bridge which amounts to 85% of the total port handling capacity. Norfolk, the nearest major port to New York & New Jersey capable of accommodating large container ships of 8,000 TEUs and above, is about 500 km south from port of New York & New Jersey and it currently handles only 12% of Asia-USEC container imports (Piers, 2011, Port of Norfolk). The throughput level of Norfolk makes it unlikely a substitute of New York & New Jersey in the near future and it will be difficult to fill a Post Panamax ship on a weekly basis to call Norfolk without calling Port of New York & New Jersey. Meanwhile, the economic benefit of utilizing larger ships will be offset by the additional trucking costs from Norfolk to the warehousing facilities and consumer bases which are primarily concentrated in the Northeastern region of the U.S.

## 1.1 Research questions

The Panama Canal is one of the most vital routes for international seaborne trade; it joins the Atlantic Ocean and the Pacific Ocean with a 77km stream. In 2009, there were about 17,000 ships passing through the canal. The main objective for the canal expansion is to enable bigger ships to avoid the long route via either the Strait of Magellan or Cape Horn at the southernmost tip of South America.

The first attempt to construct the canal was in 1880 under French leadership and then followed by a second effort by the U.S. succeeding in opening the canal in 1914. The largest ships that could pass through the canal is known as Panamax ships which have deadweight of 65,000-80,000 metric tons.

In 2006, the Panamanian government approved a \$5.26 billion project to upgrade and expand the capacity of the Panama Canal system which was already 92 years old (PCA 2012). With significant support from the Panamanian government and worldwide corporate entities, the Panama Canal expansion project is estimated to be completed by 2014. Upon completion of the project, the canal would allow transit of the current Post-Panamax containerships, which have deadweight of up to 150,000 tons, LoA of 1,200 feet and can carry up to three times the cargo of Panamax containerships. The expansion will create a new third lane which will double the canal's capacity, and decrease the transit time by reducing congestion. The expanded canal will remove the existing barriers to most types of cargoes on the principal East-West trades.

At present, the principal limiting factor the canal imposes is its locks. These physical features constrain ships by length, beam and draft, and these three variables effectively limit the volume of cargo any ship can transit through the canal.

The canal currently limits dry bulk cargoes to around 64,000 metric tons, liquid bulk cargoes to around 62,000 metric tons and containerships to around 4,400 TEU. In commercial terms, the largest bulk ships that can transit at present are Panamaxs, and the largest containerships that can transit are the more moderate of the Post Panamax design (less than 5,000 TEU).

So how will the expansion of the Panama Canal affect trade (especially container trade) flows between US and Asia (west and east)? Would the expansion make any difference on freight rate comparing to the current shipping pattern? Given that cargo on the Asia-USEC route is mainly shipped to USWC then relayed to destination by way of intermodal transportation, would the current inland traffic reduce tremendously after the expansion? How would Panama Canal Authority balance between investment return and reasonable canal fee to attract operators to use the expanded canal?

Main research question:

Impacts of Panama Canal Expansion on the trade flow via Trans-Pacific routes Container Trades and the U.S. Ports

Sub-questions:

How are the U.S. ports affected upon the completion of the Panama Canal expansion?

What will be the overall impact on the trade routes for liner business?

To what extent will Panama Canal expansion influence the demand for container ships?

What route is the operators' preferred choice? A comparison analysis between transpacific Asia-USWC route and Asia-USEC route via Panama Canal post expansion from an economic angle.

## 1.2 Thesis Objectives

The Panama Canal Authority is currently expanding the dimensions of the Canal in order to enable larger ships to transit through the canal and thereby maintain its competitive position. The expansion is expected to affect trade patterns. Currently, vessels with US-bound cargo are one group of the canal's biggest users accounting for 34% of all tonnage (in long tons) transited through the Canal in 2011. The study focuses on containerised cargo traffic from Asia to East Coast of the US ("USEC") because (i) containerised cargo is the single biggest category of cargo shipped through the Canal, and (ii) containerised cargo, which grew at 7.2% CAGR over the past decade (Alphaliner), is the fastest growing cargo category being shipped through the Canal. The aim of the study is to analyse how the Canal's expansion will affect the transpacific trade flow and if the U.S. ports would change their operational and business strategy in anticipation of the Panama Canal expansion.

Theoretically, it is expected that the canal expansion will lead to a significant change in trade flow patterns, especially that of the containerised cargo. The changes are closely related to the container traffic flow between Asia and the US via the Panama Canal. Besides the changes in container traffic, the effects on economic side, i.e. freight rates, are expected to be stupendous too.. However, the canal expansion is not expected to lead to immediate increase of transit volume, as the associated inland/intermodal transportation costs would become a very critical measure.

To break in to details, with larger ships being able to transit through the canal, it would be more economical with shorter delivery time for ships to carry goods from Asia to USEC by all water services through the Panama Canal than by inland transport after getting discharged from services calling USWC. The change in the trade flow would also create a competition among the ports at USWC and USEC. The South-eastern ports for instance are expected to get an increase in container throughput. Due to the increase in cargo lifting, it would trigger infrastructure development and the facilities of the ports in USEC in order to accommodate bigger ships. On the other hand, in order to be able to compete with the canal, the ports at USWC may also have to improve their port facilities and hinterland infrastructure, so to attract larger ships.

With the growth of Asia-US containerised trade and increased container ship capacity, the Panama Canal was expected to handle the growing traffic. The Panama Canal Authority (PCA) claimed that, the expansion project was tailored particularly for the growing containerised trades between Asia and USA. In 2009, containerised trade between Asia and US was about 10.6 million TEUs, of which 23% was transited through the Panama Canal (Alphaliner).

The expansion plan expects a 20% rise in capacities and double tonnage due to the economies of scale attained. This is expected to reduce the operating costs per ship by 7 - 17%, and will also reduce average transit time for ships. Therefore, with increased capacities, the expanded Panama Canal will be able to provide a lower cost option to the traffic that currently goes to USWC Ports or through the Suez Canal. Currently there are six ports in US handling 70% of total U.S. container imports, namely Los Angeles/Long Beach (LA/LB), New York/New Jersey (NY/NJ), Seattle/Tacoma, Savannah, Charleston and Oakland. All of these ports either already can or will be able to accommodate Post-Panamax ships by 2014.

The main research objectives are to have a clear view on the current sea traffic flows/international trade flows between Asia and the US which are transported via Panama Canal. With qualitative reasoning and quantitative research, an estimation of the trade flows between US and Asia after the expansion will be conducted along with analysis on the impacts on the US ports and the intermodal system.

### 1.3 Structure of the thesis

The thesis consists of two main parts. The first part focuses on the overview of current container traffic on the transpacific route and the trade flow between Asia and U.S.. The second part focuses on the analysis of the impacts of the Panama Canal expansion on the trade flow, the U.S. ports and its intermodal system.

Chapter 1 – Introduction of the thesis, with research questions and general objectives. General information on the Panama Canal.

Chapter 2 – A detailed explanation of the expansion project. The progress of the expansion project and the challenges it's facing.

Chapter 3 – Port competition & Literature review.

Chapter 4 – An overview of the ports that would be affected by the Panama Canal Expansion. Analysis on the ports' competitiveness of the ports that affected by the expansion.

Chapter 5 – The methodology of the research. A presentation of the methodology used, mainly focus on interviews and content analysis. The result of the analysis, then the scenarios been developed and their assessments.

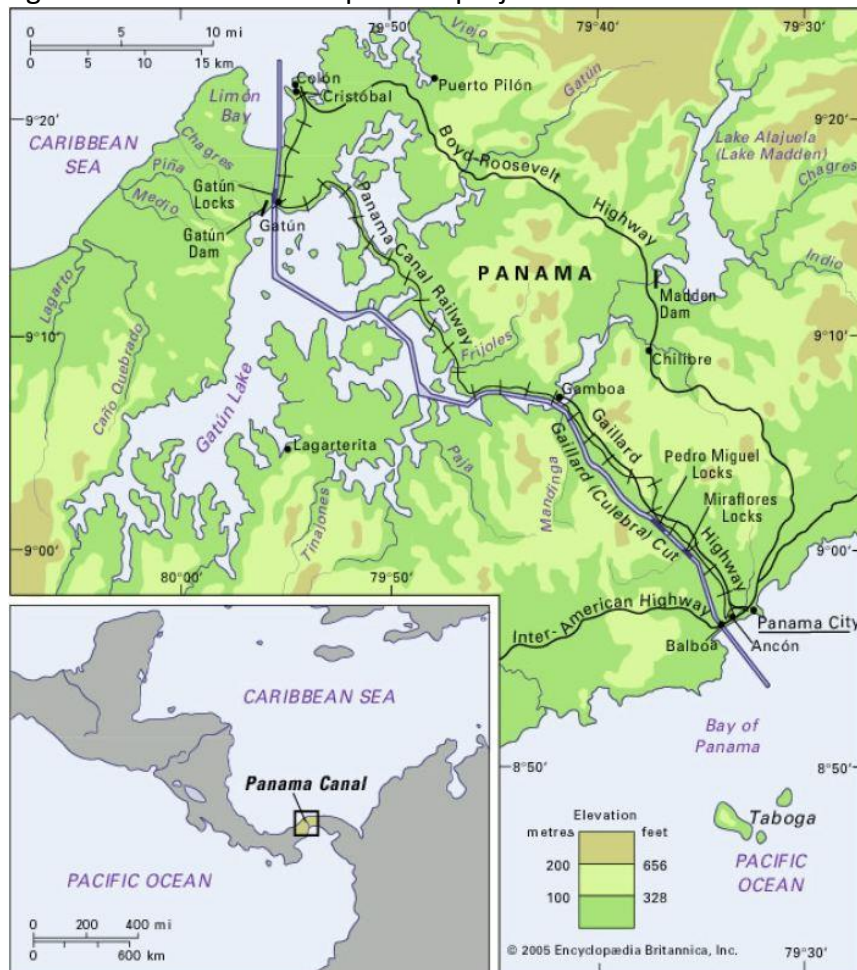
Chapter 6 – Conclusion of the thesis. The research question shall be answered. The limitation of this study and suggestion for future follow up research.

## Chapter 2: Panama Canal Expansion Project

### 2.1 Introduction of the Panama Canal expansion project

Targeting for completion in 2014, the USD 5.2 billion investment project could be divided into several components. the dredging and widening of the Atlantic and Pacific access to the canal will be carried out to accommodate larger ships. (Figure 1) This includes an addition of 9.1 million square meter water surface area at the Pacific end and the Atlantic entrance, and a dry excavation of approximately 14 million cubic meter materials. There will be two complete new lock systems, one on the Pacific side and the other one on the Atlantic side. The new locks complexes will have three chambers, water-saving basins and rolling gates. A new access channel will be constructed to link the new locks on the Pacific side to Culebra and the navigation channels between the Pacific Locks and Gatun will be expanded.

Figure 1: Panama Canal expansion project

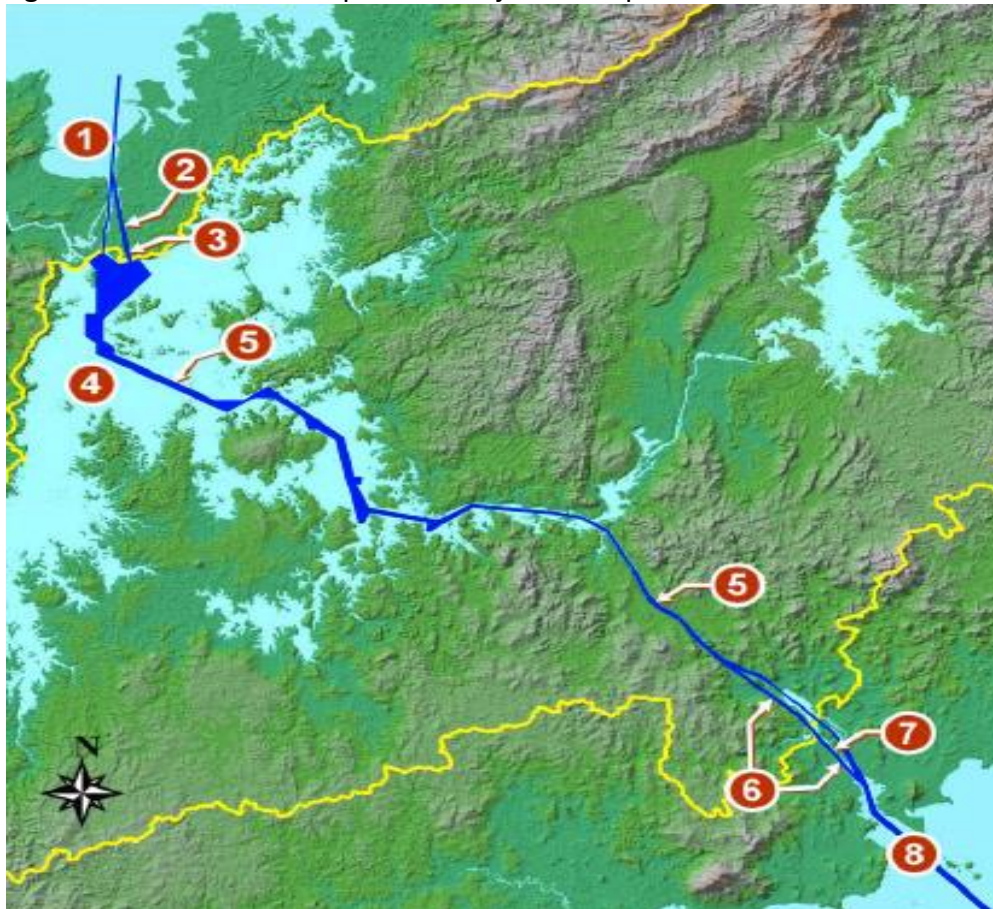


Source: ACP

The current width of the Culebra Cut can only handle ships heading in one direction at a time. Post completion of this phase, ships can transit in both directions at the same time which shall increase the throughput.

The Gatun Lake expansion will include the deepening of the Gatun Lake navigation channel and raising the water level of the lake from 26.7 meters above sea level to 27.1 meters thereby increasing the water supply available to the lock systems. In terms of ship size, the current width of the locks allows only ships having beam less than 32.3m to transit, which, for container ships, translates to ships having maximum nominal capacity of 4,800-5,000 TEUs. When the new locks were constructed, ships with beam of 49m will be able to transit, increasing the allowed container ship capacity to approximately 13,000 TEUs.

Figure 2: Panama Canal Expansion Project in Steps



Source: ACP

1. Deepening and widening of the Atlantic entrance channel
2. New Approach channel for the Atlantic Post Panamax locks
3. Atlantic Post Panamax locks with 3 water saving basins per lock chamber
4. Raise the maximum Gatun lake operating water level
5. Widening and deepening of the navigational channel of the Gatun lake and the Culebra Cut
6. New approach channel for the pacific post panama locks
7. Pacific Post Panamax locks with 3 water saving basins per lock chamber
8. Deepening and widening of the Pacific entrance channel

## 2.2 The Panama Canal service overview

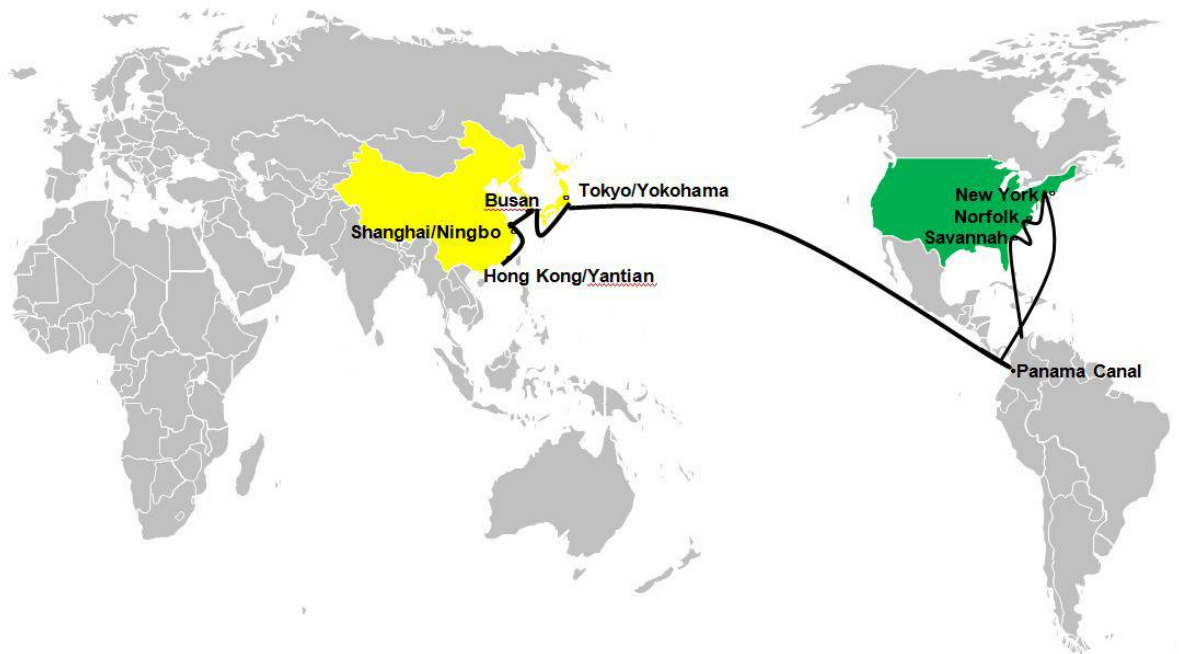
Containerised trade between Asia and the USEC amounted to 10.6 million TEUs in 2011 consisting of a wide array of consumer goods. Of these 10.6 million TEU's, approximately 2.4 million TEU (23%) transited through the Panama Canal while 7.3 million (69%) were imported through the West Coast and then transported to inland consumer base through the intermodal system. The remainder travelled through the Suez Canal.

The expansion of the Panama Canal is expected to change cargo flow between Asia and USEC in various ways. With larger ships being able to transit across the Canal it may become more economical and faster to ship goods through the Canal rather than overland through the congested ports in the West Coast. This potential shift will create competition between West Coast and Gulf/East Coast ports. The south-eastern US will be particularly well positioned to benefit from increased cargo flows. This competition among ports will also stimulate infrastructure investment in two ways. At the West Coast, ports will try to compete against the Canal by upgrading their facilities and improving hinterland infrastructure. In the East/Gulf Coasts ports will encourage ports to upgrade their facilities to handle bigger ships.



2.2.1 The current transpacific trade routes are mainly divided in to three routes:

Figure3: The transpacific service route via Panama Canal (Asia to USEC)



Source: Aphaliner

The figure 3 above showing a typical transpacific service carrying imports from Far East to U.S. East Coast via the Panama Canal. Currently, there are 140 ships deployed on this route. On average, liner services on this route deploy 10 vessels doing round voyages in approximately 70 days. The annual capacity provided by these 140 ships is about 3.4 million TEUs, as container ships of 4,500 TEUs are the workhorse on this route at the moment.

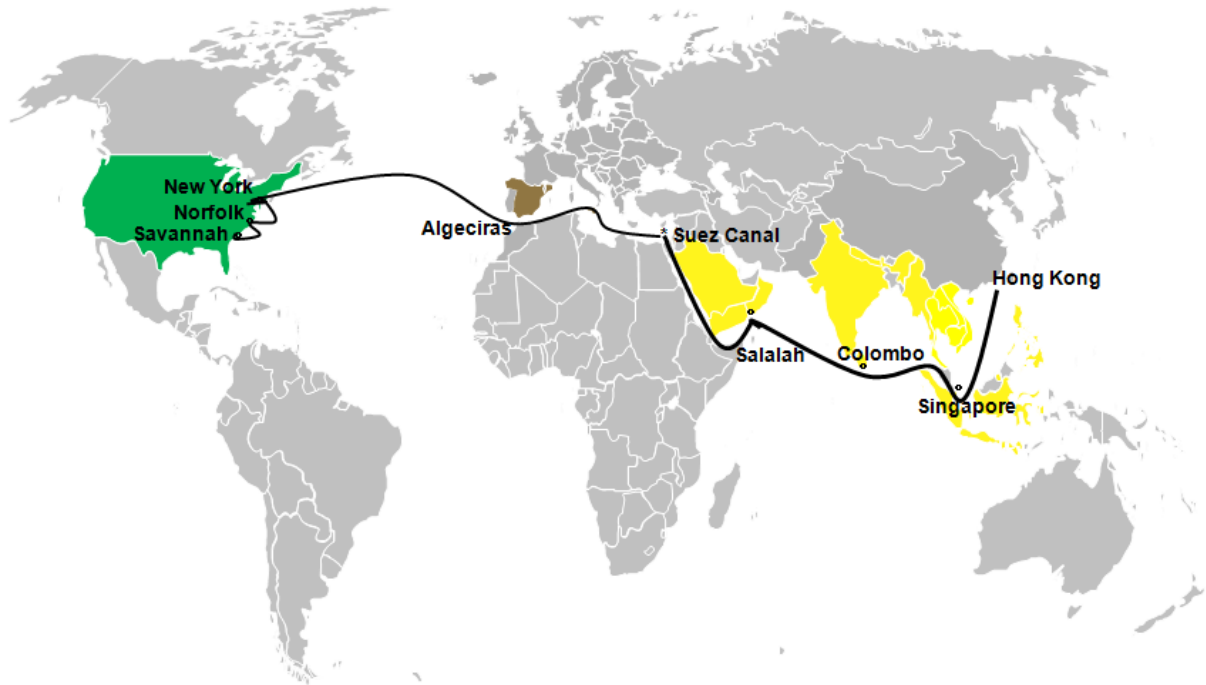
Table 1: Route information on transpacific service via Panama Canal

Route Information	
Annual Capacity	3.35mio TEUs
# of Ships	140 ships
Typical Ships	4,500 TEUs ships
Service Structure	10 ships 70 days R/V
Representing Carriers	Evergreen,ZIM,Hanjin,APL

Source: Aphaliner



Figure 4: The transpacific service route from Asia to USEC via Suez Canal



Source: Aphaliner

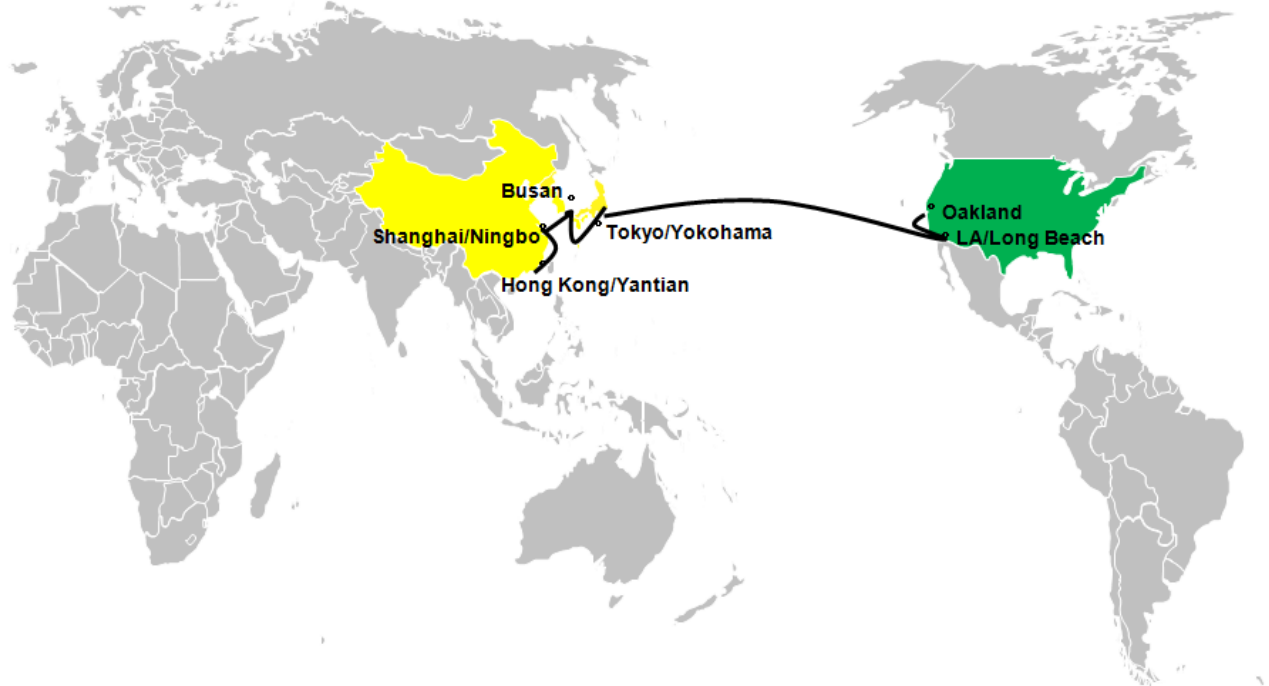
Imports from Asia reach the U.S. not only via Panama Canal but also via other routes such as the Suez Canal route, which is mainly utilized by liners for cargo originated from South East Asia. There are 48 ships currently deployed in this route, approximately 12 container ships in each loop with each ship completing a round trip in 84 days. More details are provided in the in Table2 route information on the transpacific service via the Suez Canal.

Table 2: Route information on transpacific service from Asia to USEC via Suez Canal

Route Information	
Capacity Deployed	1.27mio TEUs
# of Ships	48 ships
Typical Ships	8,000 TEUs ships
Service Structure	12 ships
	84 days R/V
Representing Carriers	Maersk, APL, CMA CGM, MSC

Source: Aphaliner

Figure 5: The transpacific service route Asia to USWC



Source: Aphaliner

Majority of capacity on the transpacific trades is deployed in services from Asia to U.S west coast route, after which the cargo is discharged and transported inland via intermodal system. Currently there are 284 ships deployed in this route.

As this route is shorter than other two trade routes, it has the least number of ships per service, on average 6 container ships per loop with a round trip in 42 days. The annual capacity carried by these 284 ships is 13.2 million TEUs which is the highest when compared to the other two transpacific service routes.

Table 3: Route information on transpacific service from Asia to USWC

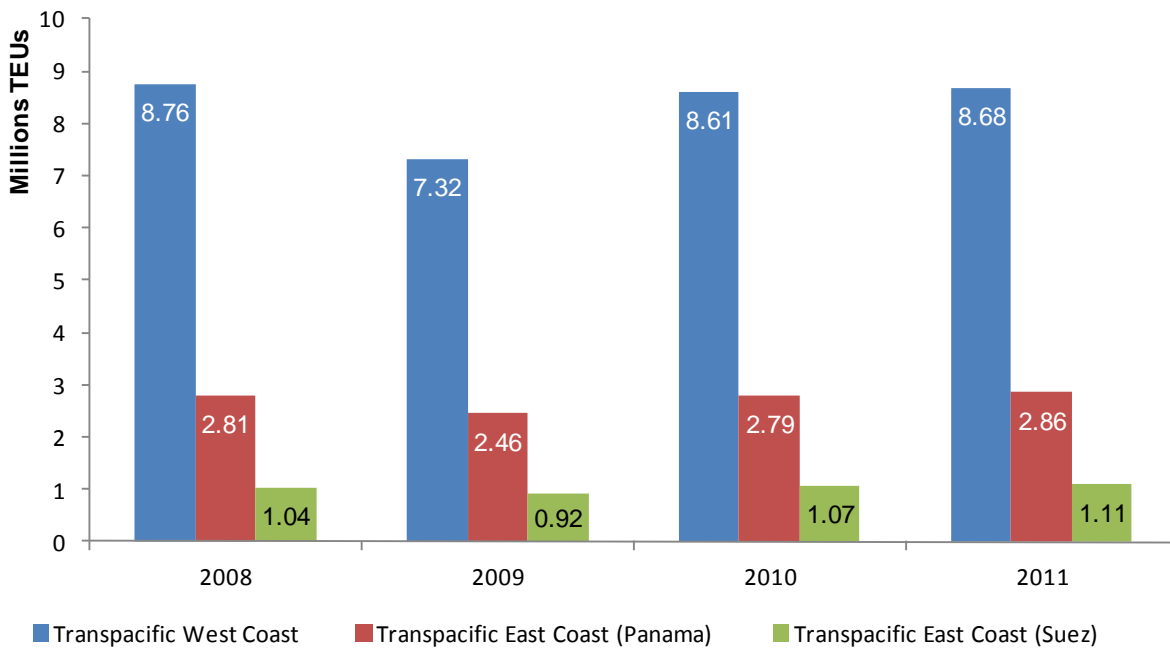
Route Information	
Capacity Deployed	13.2mio TEUs
# of Ships	284 ships
Typical Ships	8,000 TEUs ships
Service Structure	6 ships
	42 days R/V
Representing Carriers	Maersk, APL, COSCON, MSC

Source: Aphaliner

## 2.2.2 Transpacific Trade Development

In the figure below, we can see the trade development for the US containerised imports on the transpacific routes over the last four years. It is apparent that the split between the various routes has hardly changed over the last four years, including over the recent economic and shipping crisis. In percentage terms, approximately 69% of the transpacific US imports are through US West Coast, 22% through US East Coast via the Panama canal and 9% through US East Coast via the Suez canal.

Figure 6: Transpacific Trade Development - Imports

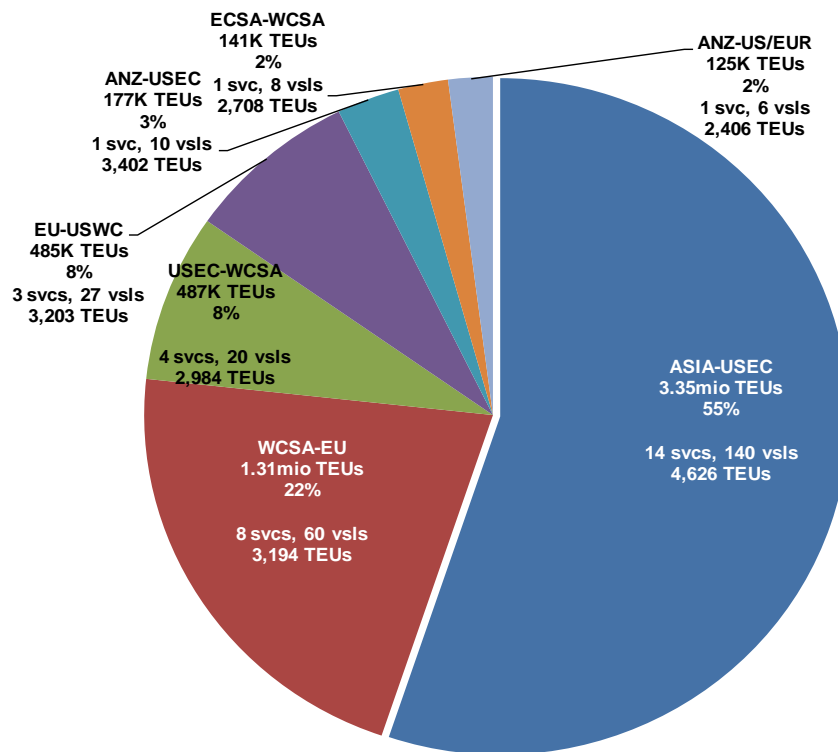


Data Source: Piers 2011; Clarksons SIN

### 2.2.3 Importance of the Panama Canal

There are seven major container trade shipping routes that cross the Panama Canal and their share of annual capacity is shown in figure 7. In total, 32 services deploy 271 container ships in these seven trade routes providing a total annual capacity of 6.1 million TEUs. The Asia to U.S. East Coast via Panama trade route accounts for 55% of the total annual capacity passing through the canal. As aforementioned, the average ship size on this trade route is approximately 4,500 TEUs (Panamax container ship), representing the one constrained vessel size by the current lock dimensions.

Figure 7: Importance of the Panama Canal



Data Source: Alphaliner 2011

## 2.2.4 Container Shipbuilding Trends

The current Post Panamax fleet stands at 507 ships with an aggregated nominal capacity of 3.05mio TEUs, which represents around 21.7% of the available cellular TEU capacity (Clarksons). The trade between US and Asia which constitutes over 50% of the Canal's traffic currently mainly hinges on low costs. Therefore, the Canal's ability to attract the Post Panamax vessel would largely be a function of cost as well as the time advantage that the Canal offers as indicated by the Danish operator- Maersk Line. The labour costs in China are rising and there is also pressure of revaluation on the Chinese Yuan. In view of this, the potential cost savings through the Panama Canal would play an important role in prolonging the cost competitiveness of the current global production and distribution systems.

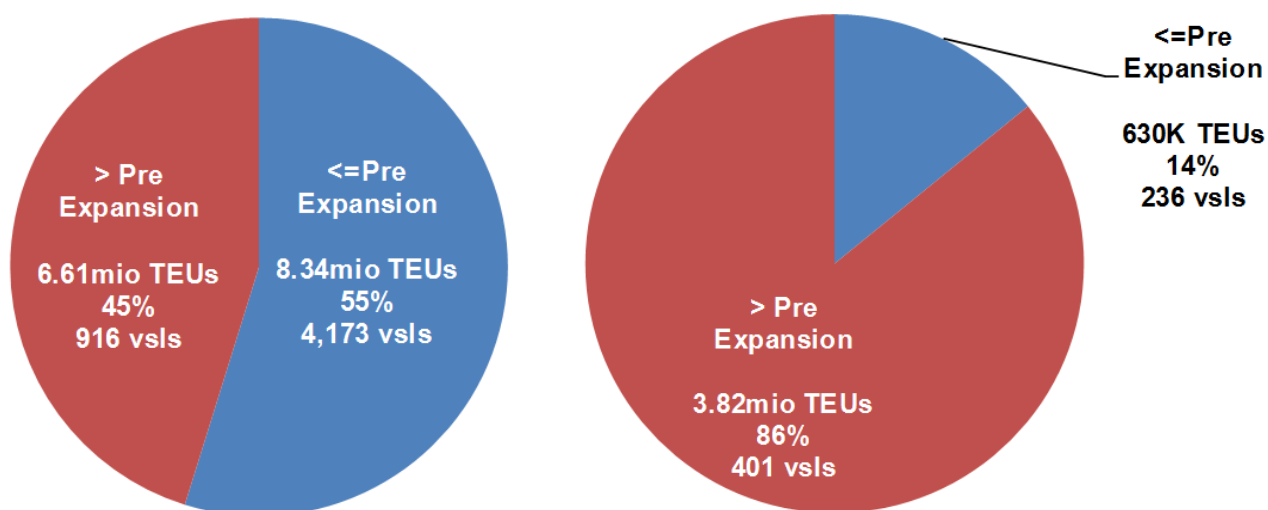


Figure 8: Container Ship Fleet 2012TD (Source: Clarksons)

Figure 9: Container Ship Oderbook (Source: Clarksons)

In the figures above, the container ship fleet is divided into two categories. Blue represents container ships that can transit through the Panama Canal before the canal expansion while Red represents those cannot. There are approximately 4,200 container ships out of 5,100 in the current fleet that can transit through the Canal. However, due to the trend of ordering larger ships, approximately 400 container ships on order (86% of the orderbook) are unable to transit through the Panama Canal.

After the canal expansion, the picture would change drastically. If we assume that the Canal expansion would be completed today, only 40 container ships out of the current container ship fleet and 70 container ships in the new order would be unable to transit.

## 2.3 Economic point of view - The Challenges

Expansion of the Panama Canal is expected to increase the Canal's capacity regarding the number and size of ships that can safely transit, post-2014. The maximum allowed dimensions for ships transiting through the expanded Canal will be 366 meter LOA, beam within 49 meter and draft of 15.2 meter. However, although the expanded canal can accommodate much large container vessels, reducing the slot cost, if transiting the Panama Canal is the optimal solution from an economic point of view depends on several other factors. Some of the variables that are examined by voyage planners in their voyage calculations before deciding whether or not to use a route through the Panama Canal include freight rates, bunker prices, the distance between loading and discharging port, Canal Costs, possible congestion at the Canal and port infrastructure.

First of all the freight rates are examined before a new route is established. Therefore, whether the expansion of the Panama Canal will establish new trading patterns will depend on the freight rates negotiated by Owners, as well as the tolls and bunker savings.

Bunker prices vary significantly from one location to another and as bunker costs account for a significant percentage of voyage costs, an increase in bunker prices may undermine the economic feasibility of using the expanded canal.

The distance between the loading and discharging port is probably the single most important variable that will determine whether Owners will choose a route through the Panama Canal. This will determine the time of the voyage and the quantity of fuel oil to be consumed.

The Panama Canal tolls are determined by ship measurements parameters. The tonnage measurement system for the Panama Canal is known as the Panama Canal Universal Measurement System (PC/UMS). Net Canal tonnage is calculated using a formula based on the total ship capacity with different rates applied depending on the loading status of the ship. For ships carrying cargo or passengers, the "laden" rate is applied, while for ballasting ships, a ballast rate is applied. For container ships, the rate is calculated based on the total TEU capacity, including both below-deck and on-deck capacity.

Canal costs are important in voyage calculations too. Recently the Panama Canal Authority published a study, in which it was concluded that an increase in the canal tolls is recommended to achieve the required return of investment. An increase in toll fees could immediately impact transits involving larger ships which are the main focus of the expanded canal. As suggested by increases of toll fees in the recent years, the cost of transiting the Canal may increase approximately 10-12% per annum.

Congestion could be another issue for the canal. Delays and interruptions in Canal traffic reduce the Canal's service reliability, causing the Panama Canal route to become less cost effective and impairing the Canal's competitiveness. However, with the expansion of the Panama Canal, the perceived service reliability should increase because there will be fewer expected delays in transit time, thereby reducing average voyage time.

Figure 10: Container Ship MSC Fabiola first trip to U.S.



Source: Lloyd's List

Similar to the shipbuilding preference over larger ships, to reach better economies of scales is also one of the rationales behind the canal expansion. However, one challenge is to “fulfil the scale”. Figure 10 shows a very large container ship MSC Fabiola made her first trip to the US in May 2012. With a possible intake of 12,550 TEUs, it has 30% more capacity compared to the largest container ship that ever called U.S. before. However, it is only 70% full on arrival at Long Beach and the load line is seen well above the water. It is not scheduled to make another transpacific voyage, likely because of the low capacity utilisation level.

The size of trade for various commodities and consequently the number of ships transiting through the Canal will also be subject to existing port infrastructure on either side of the canal.

Last but not the least, there are several of alternative methods which could be keen competitors against the Panama Canal for business. Investments in pipeline projects to accommodate crude oil and refined petroleum products transport via rail across US or alternative seaborne routes such as transiting through the Suez Canal and/or sailing via Cape of Good Hope could undermine the volume of cargo transiting the Panama Canal.

### Chapter 3: Ports competitiveness & Literature Review

There are many analysis on the impacts of the Panama Canal expansion on ports and articles discussing the ports' readiness to accommodate larger ships. Baltimore and Virginia and Hampton are known able to handle large ships, up to 12,000 TEU container ships, which travel via Cape of Good Hope. Meanwhile, many other ports have already put their port expansion into action, port infrastructure would be improved and the facilities would be upgraded. In the long run, all those development would benefit the ports to increase the operations efficiency and throughput level. According to Dupin (2009, Port's ship come in), due to expected change in the trade flow, many other ports which have no support from the government were to be privatised in the near future as a solution to source capital for investment. Most of the ports are not ready for the swift vessel upsizing yet with draft limitation as one of the most common problems that many are facing. However, as mentioned by Dupin, most ports at the USEC are expected to dredge their channels and upgrade their cranes to reach 23 rows in order to accommodate the larger ships, especially the container ships.

Meanwhile, many ports are trying to also improve the intermodal system like Norfolk. The Southern Heartland Corridor project and National Gateway project would allow double stacked trains to reach inland faster and more efficiently. According to Dupin (Dupin, 2009, Port's ship come in), since the distribution centres have been growing in the region near to USEC and it is more costly for inland transport from USWC, it may lead to higher freight rates for USEC/USGC bound cargo. Another analyst Miller.G (2008, US Container Trades) thinks that there will be many new additional distribution centres to be established on USEC/USGC in order to reduce the inland transport costs which will make the USEC/USGC ports better choices in the coming years. According to the predications by many analysts that, with increasing ships size, better economical scale and growing Asia export markets, especially the containerized cargo market, the USEC/USGC ports would become highly efficient ports in terms of large ships handling.

In addition to the physical limitations of the current ports in USEC/USGC, there are many other factors we need to take into consideration, such as location of manufacturing for instance. Recently, many manufacturing plants in inland China were shifted to west India. This shift made Panama Canal immediately unattractive for USEC imports as it is closer from west India to USEC via the Suez Canal. According to Knight (Knight, K. 2008, The Implications of Panama Canal Expansion to U.S. Ports and Coastal Navigation Economic Analysis), certain goods would favour route via the Suez Canal over the Panama Canal.

#### The determinants of ports competitiveness

It is known that there's no universal definition for port competition. The most acknowledged one would be the one illustrated by Verhoeff (1997) in his dissertation "Port Competition". He stated that:

*"Port competition aims at acquiring trade in specific traffic categories, with port operators (and their terminals) as the main actors engaged in this competition and with*



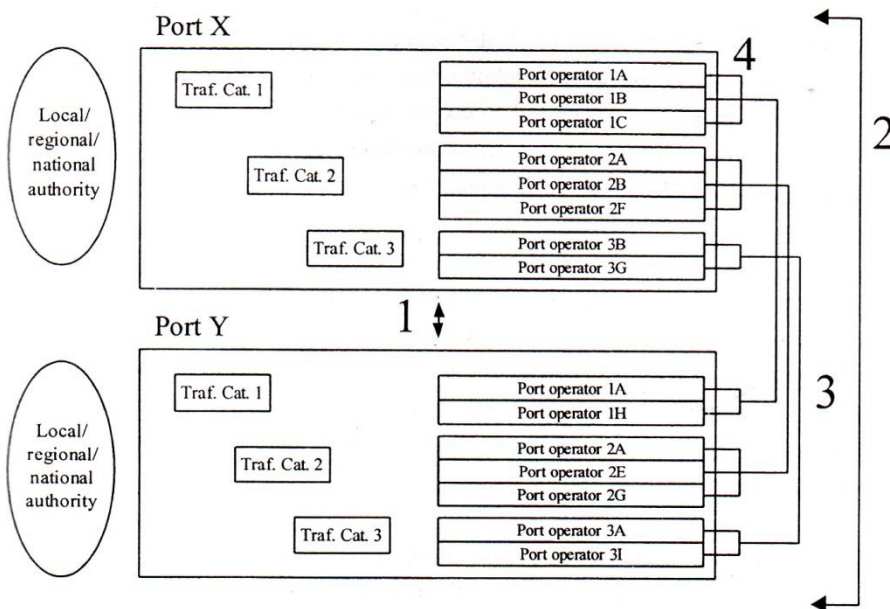
*port authorities as supporting actors providing opportunities for –and imposing constraints on the port operators directly and on the broader port cluster indirectly”*

In board sense, port competition is commonly known as ‘competition between or within ports’ (Haezendonck, 2001). Verhoeff has also identified the four different levels of port competition: (P.13)

1. *“ Competition between port companies or intra-port competition;*
2. *Competition between ports or inter-port competition*
- 2 *Competition between port cluster (this is between a group of ports with joint geographical characteristics)*
- 3 *Competition between port ranges with a range defined as a number of ports sharing the same coastline and having a more or less common hinterland”*

Haezendonck (2001) adopted the same approach to define port competition. In her analysis, she pointed out that when conducting a port competition analysis, the commodity structure is extremely important. She also mentioned that it is important to include competition between port authorities as well as the competition among operators. In her research, she has identified the four levels as illustrated in figure 11 below:

Figure 11: Visualization of the four levels of ports competition



Source: Haezendonck, 2011

On the first level, “Inter-Port competition on a port authority level”, port authorities aim to increase the port competitiveness by providing suitable port infrastructure, which include optimal port working conditions and to prevent monopolies. On the second level, the “Inter-Port competition on a commodity level” where the competitors compete to gain market share and combat for a better position within the competition. The third level points to the “Inter-Port competition on an operator level” and the final level “Intra-Port cluster competition” is the competition among the port operators.

This is similar with Verhoeff (1981)'s study mentioned above, which also recognized the complexity of the port competition analysis. He stated in his study:

*“Seaport competition is very much talked about, but seldom is it thought about deeply... It is usually referred to in rather general terms such as the competitive position of port X, the competition between port X and Y... Seaport competition has a complex nature...because of its complexity it is inappropriate to speak of the competition. Great care and clarity are necessary to identify and classify this competition.”*

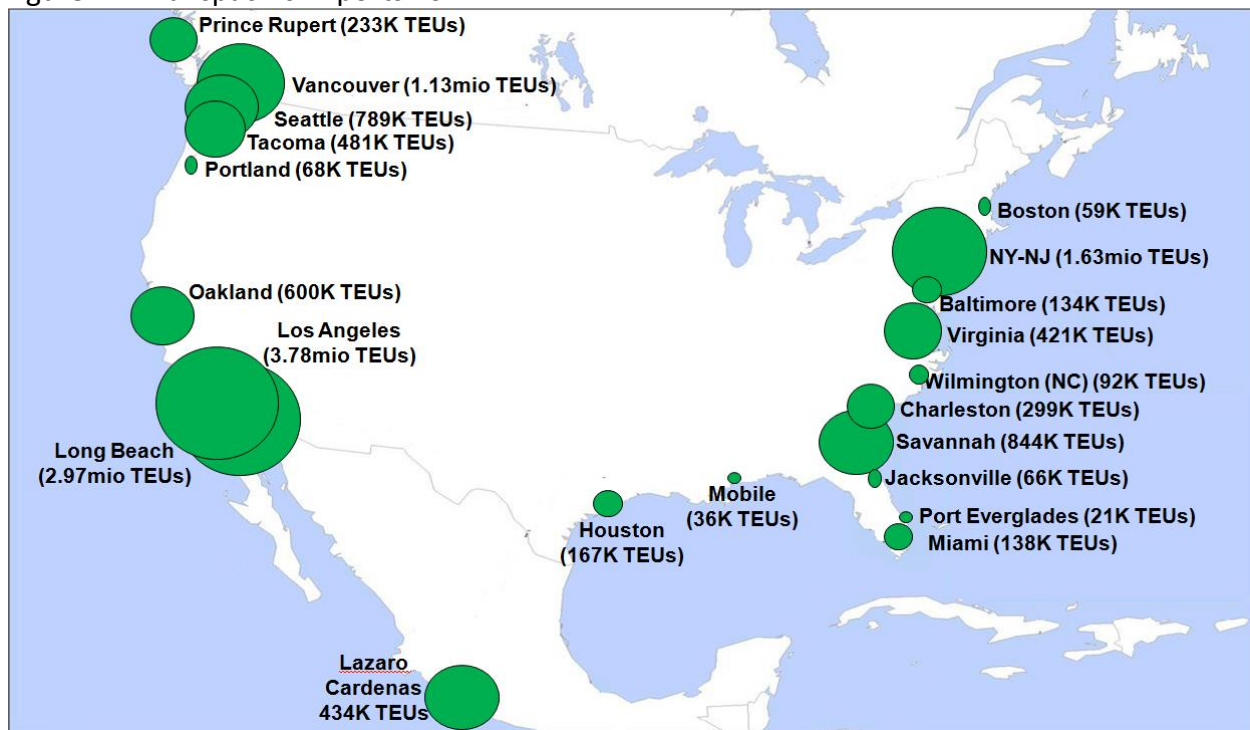
Moreover, on the basis of the literature review, with the addition of Van der Sluijs' work (Van der Sluijs, 2007) and work conducted by Cullinane (2009), the determinants of port competitiveness can be identified by the points below:

- Infrastructure and superstructure – port geographical location, channel depth/berth, number of container terminals, length of the quays, container storage capacity.
- Equipment: number of quay cranes, number of GTM cranes, number of straddle carriers and number of forklifts.
- Service: speed of cargo handling, delay in cargo handling, delay in custom inspections, quality management, ship turnaround time, ship waiting time, transshipment capabilities, bunkering service, fresh water service, waste management.
- Hinterland: inland transportation network, Roads connections, intermodal links, connectivity with inland terminals, distance between connections
- Labour: Productivity, flexibility of working hours, power of the union, workers' skills, professionalism of the labour.
- Costs: towage dues, mooring dues, cargo handling costs, dwell time fee, storage fee, terminal charges, fresh water service costs, bunkering costs, waste dues.
- ICT: communication portal, documentation, info tracking, info sharing.
- Environment: environmental standards implementation, relationship port city, environmental responsibilities.
- Authorities: government policies, authority intervention, local government community, management structure, private sector involvement
- Other: port reputation, reliability, preference of lines, marketing and promotions, customer relationships, efficiency.

#### Chapter 4: Ports affected by the Panama Canal Expansion (East-West Coast US port ranges)

Earlier in chapter two we discussed the split of the Eastbound transpacific containerised cargo between U.S. West Coast imports and East Coast imports which was roughly 69% for USWC versus 31% for USEC. A further breakdown at port level is illustrated in figure 12. At US East Coast, the major ports for the transpacific imports are New York/New Jersey, Virginia/Norfolk and Charleston/Savannah. At US West Coast, the major ports are Long Beach, Los Angeles, Oakland and Seattle.

Figure 12: Transpacific Imports 2011



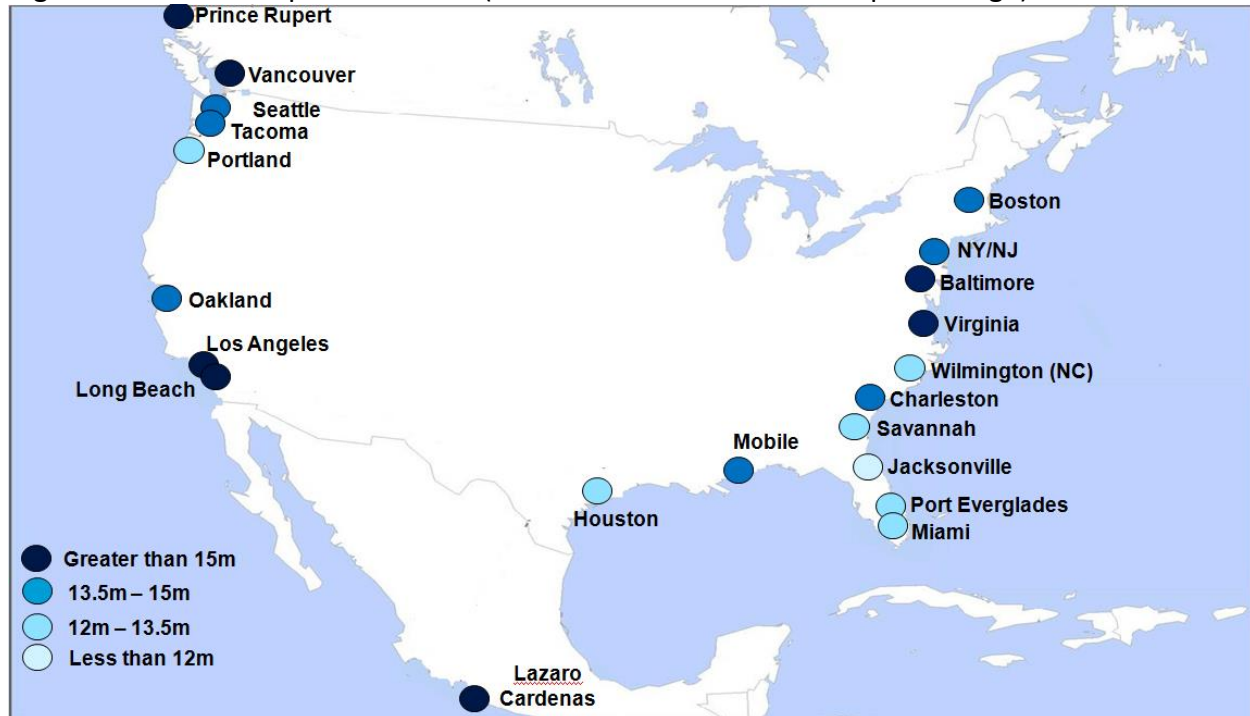
Source: PIERs, Port Sites

The ports on the U.S. East coast and Gulf area are under the pressure to expand their capacity in order to accommodate the larger container ships which would be able to transit through the Panama Canal and call the ports on the East Coast up on the completion of the Panama Canal expansion in the near future. Channel depth, among other factors, is an important constraint for ports on the East Coast. As draft of the Post Panamax Container ships is generally over 14.5 meters, we can see from figure 11 below that there are currently six ports on the U.S. East Coast with sufficient depth to handle large containerships. It is noted that most ports on the U.S. west coast are deep enough to handle the large containerships from a geographic point of view.

Deepening water channel could be a tedious and time consuming task, let long the environment studies required to be conducted well before commencement of any dredging or deepening project. In addition to water depth, longer berth and bigger cranes could also be limiting factors for port calls by the Post Panamax container vessels in the near future. Furthermore, storage space for containers at the port as well as efficient cranes required to handle the increased volume influx due to these large container ships may well require facility

upgrade at the terminals. Not all ports are equipped with highly efficient gears as it involves large capital investment in the port. The time consuming nature of the required infrastructure upgrade suggests that if the ports are not ready today, most likely they are unlikely to be ready to receive large container ships (Post Panamax Containership) 2 years later when Panama Canal expansion is completed.

Figure 13 Channel Depth Constraint (U.S. West Coast – East Coast ports range)



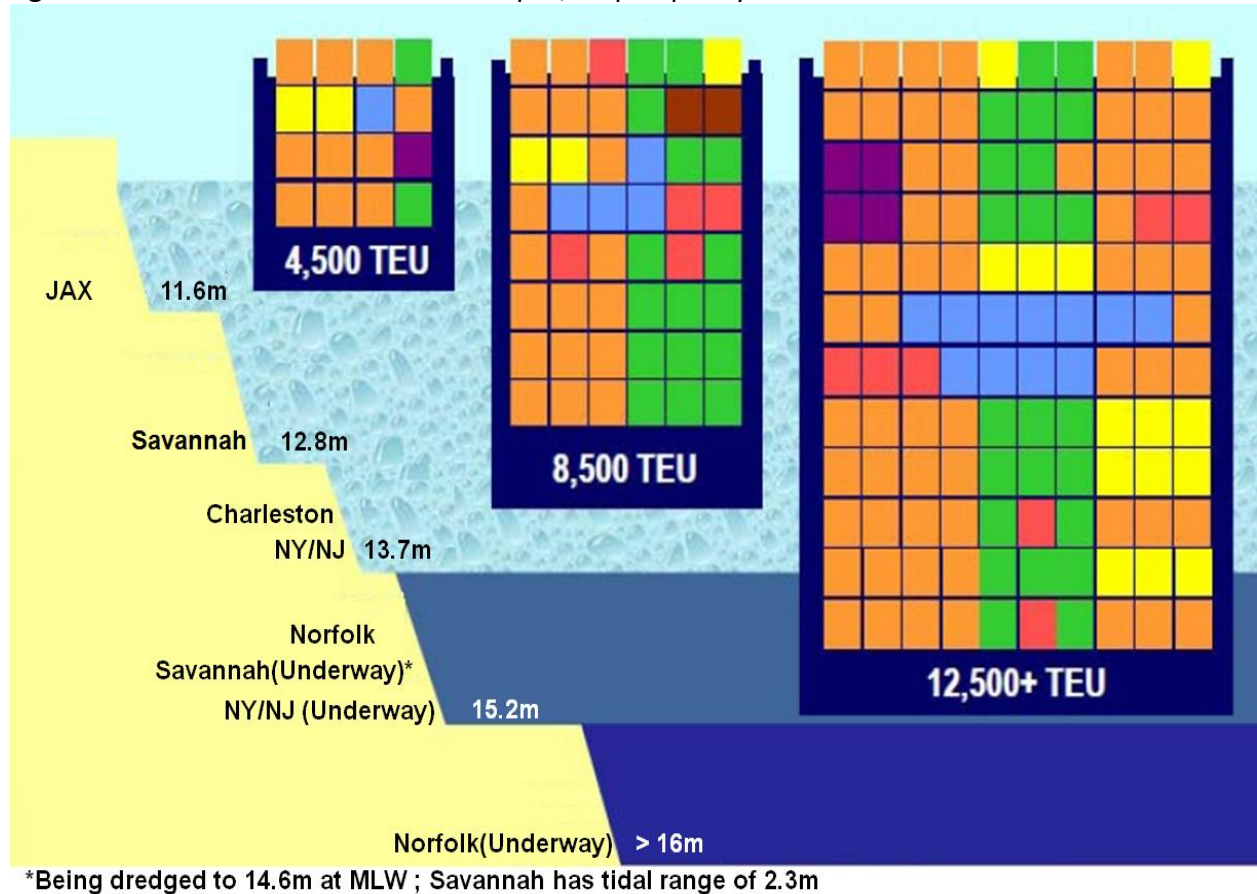
Source: U.S. Ports 2011 Data

container ships. Not all ports are equipped with highly efficient gears as it involves large capital investment in the port. These point out that if the ports are not ready today, most likely they would not be ready to receive large container ships (Post Panamax Containership) in the near future when Panama Canal expansion is completed.

#### 4.1 U.S. Port analysis

*“The ports of New York/New Jersey, Savannah, Charleston, Virginia all are going to benefit, while smaller ports like Philadelphia, Baltimore, Wilmington, Boston are poised to become niche, ports rather than compete with bigger ports” (Dublisch 2005).*

Figure 14: East Coast Ports: Channel Depth, Ship Capacity



Source: Alphaliner 2011

The figure above illustrates the channel depth at some of the US east coast ports along with the ship sizes they can accommodate:

- Jacksonville – it has the channel depth at 11.6 meters that can handle Panamax containerships up to 4,500 TEUs.
- Savannah – the channel is slightly deeper than Jacksonville at 12.8 meters which can accommodate container ships up to 6,000 TEUs.
- Charleston & New York/New Jersey – their channel dept is at 13.7 meters which can handle Super Post Panamax containerships that up to 8,500 TEUs.
- Norfolk – it has the deepest channel (the other ports currently under dredging are not considered) at water depth of 15.2 meters that could accommodate Very Large Container ships up to 12,500 TEUs.

The Savannah port currently has a depth of 12.8 meters and is being dredged to 14.6 meters. Although the depths restrict handling of container ships beyond 8,500 TEUs now or above 12,500 TEUs after the canal expansion, the port benefits from having a tidal range of 2.3 meters. While New York/New Jersey port is dredging its way to 15.2 meters, Norfolk is deepening its channel to beyond 16 meters, which will enable the port to accommodate the largest container ships in the fleet and orderbook, including those not be able to transit through the Panama Canal post expansion.

As mentioned earlier, , a port's capability to handle larger ships and increasing volumes depends on, in addition to necessary dredging, other factors such as terminal handling equipments, warehousing, connectivity to road/railways and its IT infrastructure.

So are the ports on the U.S. East Coast ready for the opening of New Panama Canal? They are leaving no stone unturned!

#### **4.1.1 Savannah**

It is undergoing a USD 625 million harbour expansion project. Besides deepening the water channel, it also includes installation of several Super Post Panamax cranes with outreach of up to 22-23 rows.

Unlike many of the other ports, Savannah has the rare advantage that it has major highways next to the port and plentiful space for warehousing and distribution centres. Savannah also has on dock railway connection with both major rail shippers in the South East, CSX and Norfolk Southern (Dubish, 2005). The port expansion project was planned to be completed by 2015. The major task is to deepen the Savannah River from 12.8 meters to 14.6 meters and over the next 10 years, it is planned to add an average of two high speed 23 container outreach cranes every 18 months up to a total of 25 cranes.

#### **4.1.2 Charleston**

"Charleston has a significant advantage over many ports because the channel is such that ships can meet easily without a problem" (Bennett, 2004).

Charleston appears to have a significant advertising tool which makes the port rather unique when compared to the others. The port can accommodate ships up to 8,500 TEUs. It is noted that Charleston has deep water berths so that if a ship can navigate through the channel it will be able to safely dock as well. At present, Charleston is working to turn the old Navy base into Charleston's newest terminal which is a part of the 10-year USD 1.3 billion-investment modernisation project. In addition, the port is putting in place a sediment suspension system that will maintain the depths of the berths at a much lower cost. The three-berth, 280 acre terminal project will increase its throughput by 1.4 million TEUs. The first phase of 171 acres is expected to be completed in late 2018.

#### **4.1.3 New York/New Jersey**

New York/New Jersey accounts for 42% (1.63 million TEUs; Piers, 2011) of transpacific imports at the U.S. East Coast. It is currently carrying out a USD 1.6 billion project to upgrade its infrastructure and other facilities in anticipation of the Panama Canal expansion. The major part



of this project is deepening the water channel to 14.6 meters, expected to be completed in 2014 following the Panama Canal expansion. Moreover, the rail capacity is being increased, creating more intermodal links to the hinterland.

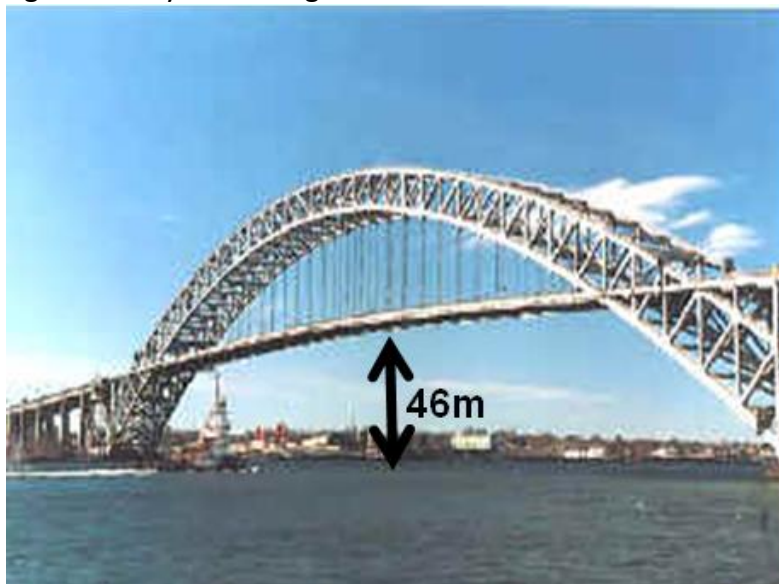
Figure 15: Port of New York/New Jersey



Source: U.S. Army Corps of Engineers

The Globak Terminal which handles approximately 10% of the port throughput plans to double its capacity from 400K lifts to 950K lifts by expanding its berth and container yards. It will extend its berth by 275 meters to 762 meters and there is room to build another 427-meter berth. Additionally, two extra 22 container outreach cranes are to be installed in early 2014.

Figure 16: Bayonne Bridge



Although New York & New Jersey also has terminal capacity expansion plan, the bigger issue for NY/NJ is the air draft limitation due to the Bayonne Bridge. The current height of the bridge restricts a significant number of ships from calling the port. At the current height of 46 meters, approximately 62% of the current container fleet is unable to call the four terminals west of Bayonne Bridge, which accounts for over 80% of the total handling capacity. There is a plan to jack-up the bridge to a height of around 65 meters. However, it will take up to 7-10 years to complete at a cost of over USD 1 billion.

Therefore, given the importance of New York as the nearest deepwater port to the major Northeastern consumer base and distribution centres, the air draft restriction of the Bayonne Bridge will make Post Panamax Containerships in the size range of 6,000 to 8,000 TEUs the prime beneficiaries from the Panama Canal expansion in medium term.

#### **4.1.4 Norfolk**

Norfolk is currently undergoing a water channel deepening project as well as constructing a new terminal at a cost of USD 2.2 billion. The water channel will be dredged from 15.2 meters to 16.8 meters. The USD 2.2 billion terminal at Craney Island would feature a 600 acre facility capable of supporting additional 2.5 million TEUs annually when completed in 2035.

The first phase of the project is expected to be finished by 2019. It includes 220 acres of container yards, 8 cranes and intermodal container transfer facilities. Meanwhile, most of the smaller ports are also taking a step forward and they too are undergoing expansion plans in order to attract the large ships.

#### **4.1.5 Baltimore**

Baltimore positions itself as the closest port to the Midwest. The port is currently undergoing a USD 1.3 billion project, out of which USD 105 million is investment in its terminals to accommodate large container ships. At the moment, the 15.2 meter berth has already been completed; four 23 container outreach cranes are to be installed by the end of August 2012.

#### **4.1.6 Miami**

The Miami port has been advertising itself as the first port of call for Post Panamax Container ships. The USD 1.5 billion “serving as first port of call for Post-Panamax container ships” project is under way, dredging its water channel to 15.2 meters with four 23 container outreach cranes to be installed at the new terminal by 2013. In addition, the construction of a new tunnel providing a four lane link between the port and the highway, as well as the restoration of the Florida East Coast Railway on-port rail service with links to the national railway system, are expected to be finished by May 2014. Thereafter, the cargo would be able to be moved more efficiently to and from the port area with reduced congestion.

#### **4.1.7 Jacksonville**

Jacksonville has capabilities to handle only Panamaxes containerships of up to 4,500 TEUs. However, a USD 1.2 billion investment including USD 600 million dedicated for harbour deepening will change the handling capacity soon. A new terminal is currently being built by TraPac which has the intention to double the operating capacity of Jacksonville with two 17



containers outreach cranes already installed. Upgrading of wharves, on-dock rail and terminal pavement areas at TraPac container terminal is also going on. A new 90 acre facility to be constructed by 2016 featuring two berths for Post Panamax containerships is under development at the Hanjin Container Terminal.

From the above we can see that the U.S. East Coast ports, big and small, are all jumping on the Panama Canal expansion bandwagon with a “build it and they will come” philosophy in mind.

According to chapter three the determinants of port competitiveness points, below is the table of comparison of the ports’ competitiveness post to Panama Canal expansion, on the scale from 5 to 1 indicate how the factors listed affect the ports’ competitive position (5= strong positive; 4= positive; 3= middle/neutral; 2=negative; 1= strong negative)

Table 4: Benchmarking scores of ports’ main characteristics

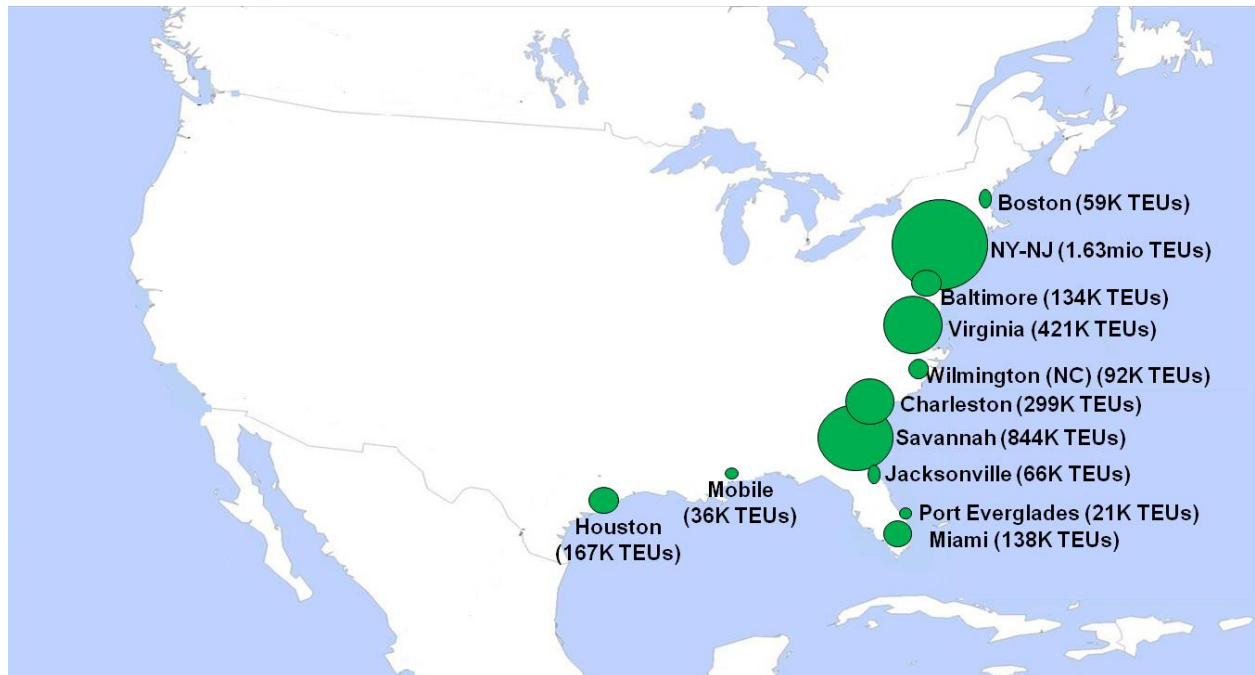
	Infrastructure and Superstructure	Equipment	Service	Hinterland	Labour	ICT	Environment	Authorities	Other
Savannah	4	5	4	5	3	3	4	4	4
Charleston	5	4	4	4	3	3	4	4	4
New York/New Jersey	5	4	4	5	3	3	4	4	4
Norfolk	4	5	4	4	3	3	4	4	4
Baltimore	4	4	4	3	3	3	3	3	3
Miami	4	5	4	3	3	3	3	3	4
Jacksonville	4	5	4	3	3	3	4	3	3

Source: Elaboration of the author based on research

According to the figures above, port Savannah and port New York/Jersey are most likely more ready for the for the container volume increase post to panama canal expansion. However, according to the hinterland market, port Savannah and New York/New Jersey are in a better position than the other ports. In here we are trying to find out the most important port on the east coast. Figure 17 shows the breakdown of transpacific via the east coast at the port level. We can see from three aspects that the most important port at the east coast is New York/New Jersey port, first, we can see that New York/New Jersey accounts for 42% of transpacific imports in East Coast; second is that New York/New Jersey serves the consumer base in New York and also north east of America; third is that the rail connectivity between East coast region

which means the important of New York port will not diminish in the near future. Further in the next chapter in the section of scenario analysis, we will use the case of Asia (Shanghai) to North American ports transportation.

Figure 17: Transpacific Imports in East Coast - 2011



Source: Piers 2011

## Chapter 5 Methodology

### 5.1 Analysis of research

The expanded canal shall remove the existing barriers to most types of cargoes shipped on the principal East-West trades. Currently, the key limiting factor the canal imposes is its locks, whose physical features constrain ships by length, beam and draft. These three dimensions effectively limit the volume of cargo carried by any one ship transiting through the canal.

The canal currently limits dry bulk cargoes to around 64,000 metric tons per vessel, liquid bulk cargoes to around 62,000 metric tons per vessel, and container ships to around 4,500 TEU per vessel.

By 2014, the expanded canal will allow passage of larger ships that previously had to select alternative routes such as the US Intermodal system, the Suez Canal, the Cape of Good Hope or the Cape Horn. This category of larger ships includes: dry bulk ships up to Capesize, crude carriers up to Suezmaxes, and container ships over 5,500 TEUs. The ships that can already transit may be able to transit with more cargo onboard than previously.

While the expanded canal may create new trade patterns, the geographical and economic drivers behind existing patterns are unlikely to change in the near future. Therefore, it is likely that the expanded canal's most immediate effect will be on existing transportation patterns instead of total trade volume. According to the latest data from the Panama Canal Authority, trade between US East Coast and the Far East dominates the traffic by a large margin. Total trade between the US East Coast and the Far East accounted for 122,598 PC/UMS (Panama Canal Universal Measurement System), far eclipsing the next largest trade route, between the US East Coast and South America West Coast at 25,857 PC/UMS<sup>1</sup>

The expansion may have the potential to alter demand and the price of some commodities if the canal can offer significant savings on transportation. It is unclear, however, whether the expanded canal's promise of shorter transit time between Far East and USEC will affect the price thus the demand for most manufactured goods. It may allow larger Far Eastern manufactures with economies of scale to further reduce prices on goods destined for the US, further pressurizing the competitiveness of the smaller competitors and further eroding domestic US manufacturing activities.

In addition to the potential impact on product prices and demand, the composition of the world's merchant fleet is likely to be changed by speeding up the upsizing trend towards larger ships. The large number of newbuildings ordered since the recent economic and shipping crisis is still taking its toll on the industry supply-demand balance. The large orderbook and lower-than-expected demand growth in the past few years caused overcapacity in tanker, bulker and container and many other shipping sectors. The current order book for ships to be delivered

---

<sup>1</sup> The Panama Canal/Universal Measurement System (PC/UMS) is based on *net tonnage*, modified for Panama Canal purposes. PC/UMS is based on a mathematical formula to calculate a vessel's total volume; a PC/UMS net ton is equivalent to 100 cubic feet of capacity. (PCA)

between now and 2014 adds further burden to the tonnage oversupply situation in view of the looming economic slowdown in both the developing and developed economies.

If the expanded Panama Canal offers operators a more cost effective way to transport manufactured goods and commodities, the larger vessels will be favoured due to economies of scale as long as the trade volume can support such large vessels. This may put price pressure on second-hand sales of smaller vessels if owners and operators favour larger ships, especially the larger Post Panamax containerships, on the liner side, and Panamaxes and Capesizes over Supramaxes and Handymaxes, on the bulk side on seaborne trade route that crosses the Panama Canal.

If it occurs, pressure on rates and second-hand prices of smaller vessels may have a tertiary effect on companies in the shipping industry. Due to dropping asset values, many large bulk shipping companies have taken significant write-downs on their existing fleet. With slow steaming and cascading in the liner industry, medium-sized operators and owners may be undermined by the intensified rationalization from larger liner operators. Similarly, the expanded canal may allow some companies to take advantage of the more efficient and less costly logistics at the expense of their competitors.

## 5.2 Analysis of interview

There are five interviews being conducted for the purpose of this research. The interviews are mainly focused in four groups, field experts/Consultants, Shipping companies/liners, U.S. Ports and Panama Canal Authority. In the following, the interviews will be analysed according to each category group.

### 5.2.1 Field experts/Consultants

Most of the interviewed experts/consultants agreed that the Panama Canal expansion project will have significant impacts on the shipping transportation industry and the world trade flow, especially for container shipping sector. However, some pointed that there may not be a shift from U.S. West Coast to the U.S. East Coast. It was explained by experts that a structural change post Panama Canal expansion is unlikely to happen, as it requires infrastructure change on the ports of U.S. East Coast which might take up to years.

While some think that there would be an increase of imbalance, a few think there will not be any imbalance as the market would always restore the balance itself. Most experts consider it difficult to give estimation in percentage of how much the container transportation would shift from Asia-US West Coast to Asia-US East Coast all water services via Panama although most believe there will be a shift. The boldest guess predicts a 25-30% shift though there are also people seeing a negligible shift. The challenges that concerning the Panama Canal expansion include environmental implications, future toll fee which has to justify the investment but at the same time attractive for the operators. It was also worried by some that for the ports that can accommodate ships up to 12,500 TEUs, the large vessels might not be fully utilized in the short run. Air draft at New York/New Jersey port has been pointed out by many as one of the

biggest constraints for the port to get ready for the canal expansion. The other constraints are as aforementioned the infrastructure upgrade and hinterland connections.

As expected, the future toll price via the new Panama Canal is difficult to estimate, nevertheless, some bold guesses given suggest the future toll fee would be USD 100 per TEU unit. It is understood by the experts that according to many liners and current market situation, two to three extra days on the delivery time via Panama Canal is acceptable. However, for time sensitive cargo, the operator would still stick to the Asia-USWC route via the US intermodal system. Hence, the competition between the two transportation routes is likely a close combat and remains to be seen. As for the slow steaming issue, liners are not expected to view it as a big issue as it is more important to show their reliability rather than shorter delivery time.

### 5.2.2 Shipping companies/Liners

Most shipping companies/Liners think that the Panama Canal expansion would affect their current business route from Asia to US West Coast. They would lower the volume through US West Coast via US intermodal system to re-direct port call to US East Coast. Interestingly, they share the same view as industry experts that there will be a shift on the trade balance between transpacific routes Asia-US West Coast and Asia- US East Coast via Panama Canal. However, the percentage of the shift remains to be seen as it is also depending on other elements, such as cost of each transport mode, customer requirement, and unknown toll fee via Panama Canal post expansion.

To deal with the change of shift, one of the strategies from the shipping companies is to upgrade their ships, as liners not intending to be marginalized would follow the general market movement. On the slow steaming issue, operators think it would be the trend for shipping not only for container ships but also for bulkers. With elevated bunker prices, it is a cost saving and eco-friendly way for transportation. Nevertheless, it was pointed out that there will always be customers who prefer fast delivery and disagree with the mode of slow steaming. Thus, shippers are most likely being balanced among their services between the slow steaming and normal scheduling based on customers' requirements.

### 5.2.3 US Ports<sup>2</sup>

The ports on the US East Coast anticipated that the Panama Canal expansion, would lead to a new era of larger vessels with increased business. Ports on the East Coast are getting ready for the big boom.

As mentioned in the analysis earlier, the East Coast ports are stretching their legs and arms to get ready for the opening of the new Panama Canal, not only on the “software” but also on the “hardware”. More than four ports on the East Coast are deepening their water channel in order to accommodate larger ships with higher draft. Additionally, many ports on the East Coast have ordered high speed 23 container outreach cranes so to make sure the load/discharge operation of these large container ships will be fast and smooth.

Different from the industry experts, the US ports holds a slightly more conservative but more uniform view that the cargo volume shift between transpacific routes Asia-US West Coast and Asia- US East Coast via Panama Canal is estimated to be 10% compared to current market share. Port Miami has stated that they anticipate a significant positive impact on the port business, according to their forecasting, the increase in volume is somewhat between 1.7 million – 3.3 million TEUs by the year of 2035.

---

<sup>2</sup> Due to limitation of the feedbacks, the interview for the US Ports groups is narrowed down to Port of Miami which represents relatively some ports on the East Coast.

The US East Coast ports hold a very positive attitude towards the unknown change post Panama Canal expansion. They believe they will see a large increase in container traffic towards the ports on the East Coast. In addition, they believe that the key factor for this container traffic increase would be the better price that the East Coast port could offer which is estimated to be lower compared to the cost of US intermodal system.

#### 5.2.4 Panama Canal Authority<sup>3</sup>

As expected, the Panama Canal Authority has the most positive view on the canal expansion project. It was confirmed by the development advisor of the project that there would not be any losing parties in this; the Panama Canal expansion project would provide opportunities for all. While the US East Coast and the Gulf ports will receive increased volume from the growing market share, it helps the congestion and overall capacity problem on the US West Coast. Zooming on the US East Coast ports, while the larger ports are gearing up in order to accommodate the large container ships, the smaller ports were offered to capture some of the secondary business that the larger ports would not focus on.

Surprisingly, it was also mentioned in the interview that slow steaming trend was also one of the considerations that lead to the Panama Canal expansion project. It was forecasted by the project advisor that a more efficient and economical transport of goods from Asia to U.S. will be seen in the near future (Carver, 2012).

From Panama Canal Authority's point of view, post Panama Canal expansion, the US West Coast would remain strong on the high valued goods because of its connection with US intermodal system for the time sensitive cargo, such as electronics.

Furthermore, on the construction side, the government of Panama is relying on private investors to build and develop the infrastructure alongside the Panama Canal expansion project.

### 5.3 Answer to the research question

So what will be the overall impact on trade routes and liner business?

It is evident that containerships are the Canal's main source of income. Containerised cargo crossing the Panama Canal exceeded 100 million PCUMS tons in 2007; in 2010 the Canal saw 14,000 transits by around 300 container ships deployed on the New York -Panama- Shanghai route. According to the study published on the Panama Canal website, it is estimated that the TEU throughput could triple, increasing to 300m tones by 2025.

Even though an impact of Canal expansion is suggested by the market consensus that more cargo will pass through the canal in larger ships. However it doesn't necessarily mean that more ships will be crossing the Panama Canal. "With big ships you need fewer of them, say, five to

---

<sup>3</sup> The analysis is based on the article written by Natalia Kosk which was published in Global Focus June 2012. This was due to no feedback from the Panama Canal Authority.

run a regular service from China to U.S. West Coast, compared with eight or nine to run a similar service through the canal at its present size.”, says Jürgen Harling, group vice-president of A.P. Moller-Maersk. (The Economist, 2011)

Opening of the third set of locks will not only allow for passage of bigger ships but also will free up transshipment capacity on both sides of the channel. This is expected to increase service flexibility welcomed by container shipping lines. In case of market downturn with low demand, the ships transiting are unlikely to be fully loaded. Shipping companies may then choose alternatives like transshipment with smaller ships with less probability of congestion.

Panama Channel expansion expected to bring more flexibility for shipping lines who look forward to enjoy the benefits of economies of scale and use upgraded facilities of the ports along the U.S. Mexico Gulf and East coast.

With fewer ships needed, smaller ships might be diverted to other regions. With 10K+ TEUs ships deployed in Asia-EU, Post Panamax vessels are likely to be used for routes crossing the Panama Canal, and then the Panamax ships will in turn be cascaded to the Intra Asian trades.

- Shipping Time versus Total Shipping Costs and trading routes share by cargo volumes;

In 2008, liner services between Asia and USWC was the most preferred transpacific route, accounting for 75% of American imports from Asia with an average transit time of 18.3 days (seaborne leg of 12.3 days and 6 days inland transport from USWC to the consumer base near USEC, AXSMarine). At the same time, the Asia–Panama Canal–USEC all water services took up 19% of American imports from Asia with average transit time of 21.6 days. Asia–Suez Canal–USEC route was handling 6% of American imports from Asia with an average transit time of 31.5 days (SCT, 2009)

There was noticeable change of the share split of total shipments among different routes in 2009:

- I. Shanghai- Suez Canal –New York (East Coast) = 28 -35 days accounted for 1% of total shipments;
- II. Shanghai - Panama - New York = 26 days (Channel Transit Time is 24 hours) accounted for 38%;
- III. Shanghai- Los Angeles - New York (East Coast) =17- 21 day accounted for 61% of total shipments;

Of course, the changes depend on freight rates and total shipping costs. In order for the carriers to be incentivised to use the Panama Canal, there should be a difference between underlying unit cost of shipping the cargo from USWC by all water routes through the Panama Canal to USEC versus utilizing railway and trucking from USWC to USEC. Surveys show that to move a container over the US hinterland from LA to NY will cost USD 600 more than shipping it via Panama Channel onboard a Panamax container ship.

- Economies of scale versus toll prices;

The major advantage of Channel passage over U.S. land bridge option can be brought by better economies of scale which is expected to reduce the costs per TEU from the current USD 1,079



to USD 978 after expansion, by deploying 10,000 TEU ships instead of 4,800 TEU ships. (Bryn, 2006);

As indicated by the study published on the web-site of the Panama Canal Port Authority, total cost savings due to the economies of scale are expected to be 8% for using 6,000 TEU Post Panamax ships and 16% for using 8,000 TEU Post Panamax ships comparing to 4,000 TEU Panamax ships. (PCA, 2007);

The Panama Canal toll fees are currently collected based on nominal container carrying capacity while actual load is not taken into consideration. In 2009, the Panama Channel Port Authority was charging USD 72 per nominal TEU. (The Economist, 2009)

- Development of container port infrastructure in US ports to serve larger ships in prospect of Panama Channel expansion:

Although Stopford (Stopford, M. 2009), renowned maritime economist, believes that the incremental benefit of the economies of scale decreases dramatically with container ship capacity goes beyond 6500 TEU, he agrees that megaships will definitely choose to go via the Panama channel. It is also commonly agreed among maritime researchers and analysts that expansion of the canal is a right choice by Panama Port Authorities, which will enable the Panama Canal to firmly maintain its market share rather than to miss this opportunity when the average container ship size becomes increasingly bigger driven by pursuit after the economies of scale.

Panama Port Authority expects to divert at least half of the East Asia-USEC traffic to go via their expanded locks, bypassing the inland railways (The Economist, 2009).

As a result, the Panama Canal expansion and growing ship sizes create constant pressure on the US West coast ports to expand their capacity and increase productivity. Meanwhile, the Panama Canal expansion spurs investment projects for dredging in the USEC ports in order to be able to receive Post Panamax ships of over 10,000 TEUs with draft beyond 15m. Starting from 2007, many U.S. ports initiated plan to increase their port capacities by dredging and introducing new container terminals with more productive equipment to prepare themselves to accommodate Post Panamax ships.

- Demand for Goods Shipped and Trade imbalances

As we already mentioned, one of the biggest destinations for the containerised goods shipped via Panama Canal is the US East Coast. If demand continues to grow, the Panama Canal throughput will also grow. In view of the current global economy where the US consumption growth rate is expected to slow down and demand growth in the Central and South America appears to be promising, South America bound trade may become an additional engine to drive demand for more and bigger ships.

Furthermore, the expanded canal has the potential to shift the pattern of dry bulk exports to the Far East from the US Gulf (USG) East Coast of the US (USEC) and the East Coast of South America (SAEC). Panamax dry bulk carriers will be able to carry substantially more cargo per

transit. Even some Capesize vessels will be able to transit the expanded canal, and this may reduce overall shipment costs and transit times. This opens up the possibility that companies shipping grain ex-USG and metallurgical coal ex-USEC may find it more economical or reliable to bypass the US Intermodal system when shipping to the Far East, China in particular. The expanded canal also may also allow large shipments of iron ore from the SAEC. Therefore, although it appears that while wet bulk commodities, crude in particular, are unlikely to be affected, the major dry bulk commodities may experience a significant shift in trade patterns.

While changes in dry bulk shipping patterns may be significant, the most dramatic possibilities for changes concern containerized traffic. In general, containerships up to 12,500 TEU will be able to transit the expanded canal, more than double the size of containerships that can now transit. The biggest shift in trade patterns could be container shipments from the Far East bound to USEC, most of which currently go through the US Intermodal system via Long Beach, Oakland or SeaTac. Transit time for cargo from other manufacturing areas, such as the India and South East Asia, may remain relatively unchanged as the expanded canal will not offer significantly reduced transit times compared to the Suez canal route for these areas.

These potential changes in trade patterns, however, have several unpredictable influencing factors such as fuel costs (for all vessels) and slow steaming (for containerships) which may attenuate the benefits of hauling large cargoes on longer routes. Furthermore, port capacity and development may not be able to immediately accommodate sufficient numbers of the larger vessels in many of the potentially affected trade routes, particularly on the USEC. Also, the expanded canal's fee structure may wipe out any gains operators might realize using larger vessels. Finally, competitors to the canal, especially participants in the US Intermodal system, may mount viable competitive responses to the canal's expansion.

And to what extend Panama Canal expansion will influence demand for container ships?

Overall the Impacts of the expansion on the container ships demand might prove to be marginal in the long run despite expected yearly 5% growth of the Panama Canal cargo volume due to U.S. West-East coast land bridge route diversion and proliferation of the all water routes via Caribbean to and from US East Coast and South America.

However, if we look on the other side of the equation, and assume that the expansion project will be terminated, impact would be significantly more negative. It will not only lead to Panama Canal marginalization, but also would leave container shipping without such needed opportunity to absorb the overcapacity due to recent demand growth decline in the aftermath of the "great trade collapse" and global economy sluggish recovery.

Moreover, it is worth recalling the logic of Stopford (Stopford, M. 2009) who argued that if there is expanded passage and improved port facilities, bigger ships will come, despite diminishing effects of economies of scale for the container ships above 6,500TEUs. Shipping line's readiness to use newly expanded canal and improved facilities can be traced not only from the statements of the major container shipping lines' executives but also by actual placement of new orders for the exactly the type of ships that can be deployed for the extended Panama Canal.

This trend was confirmed by major shipyards in South Korea that started to receive orders for such ships in 2011 for delivery in 2014 when Panama Canal expansion will be completed.

Such behaviour might be read as a signal that container shipping companies were rushing to prepare for the event but it may also be explained by the neat timing of Panama Canal Authority that scheduled the completion of expansion exactly at the point when the largest part of world container fleet in operation will be above 5000 TEU.

In sum, Canal expansion may influence such macroeconomic factors as aggregate seaborne demand that may lead to changes in structure of production. Expansion will also influence such operational factors as supply chain diversification and differentiation. It will certainly allow utilizing economies of scale, as well as it will allow for larger degree of flexibility in route and ship type selection. Expansion will bring into play such competitive factors as response from East and West coast ports, and improvement of U.S. hinterland transportation. Expansion will help to maintain existing trend of the shift towards Asia – US East coast all water route proliferation (Rodrigue, 2010).

Furthermore, on a global scale there are following factors that can be read from the current state of the container ships supply/demand equation:

- Recent placement of orders for the new Malaccamax ships that can be used only for the Far East - West European trading route and berthed at the deep water ports of Singapore and Rotterdam may lead to shift of residual capacities for the deployment on Panama Channel extended gateway routes. Namely, by shifting fleets of 6,000-8,000 TEU Post Panamax ships from the Asia – European routes to the Far East – North America routes in case they will not be utilized in fast growing intra Asia trades.
- The growth of demand for new capacity and subsequently for new orders will be affected by the extent to which cost savings achieved via utilization of economies of scale such as lower costs per TEU shipped via Panama Canal will surpass the effects of:
  - a) Increased tolls for the extended Panama gateway;
  - b) Slow steaming which might be still implemented in 2014 onwards in order to mitigate effects of overcapacity, fuel economy and environmental concerns.

It is necessary to emphasize that opening of the new locks on the Panama Canal already had a positive effect on the demand for container ships in the short term, clearly seen in the 3 years advance ordering in order to have enough capacity by 2014. It is harder to access long term effect of Panama Canal expansion. Even though there are predictions of about 5% annual growth of cargo flows, it is hard to predict macroeconomic situation at that time and especially in the trades via Panama Canal. However, if predictions are true and Asia-U.S. trade will start to come back due to a considerable recovery of US demand for Asian manufactured goods, then there is hope that all the ordered ships will be employed and more orders will follow the trade growth after 2014.

## 5.4 Development of scenario

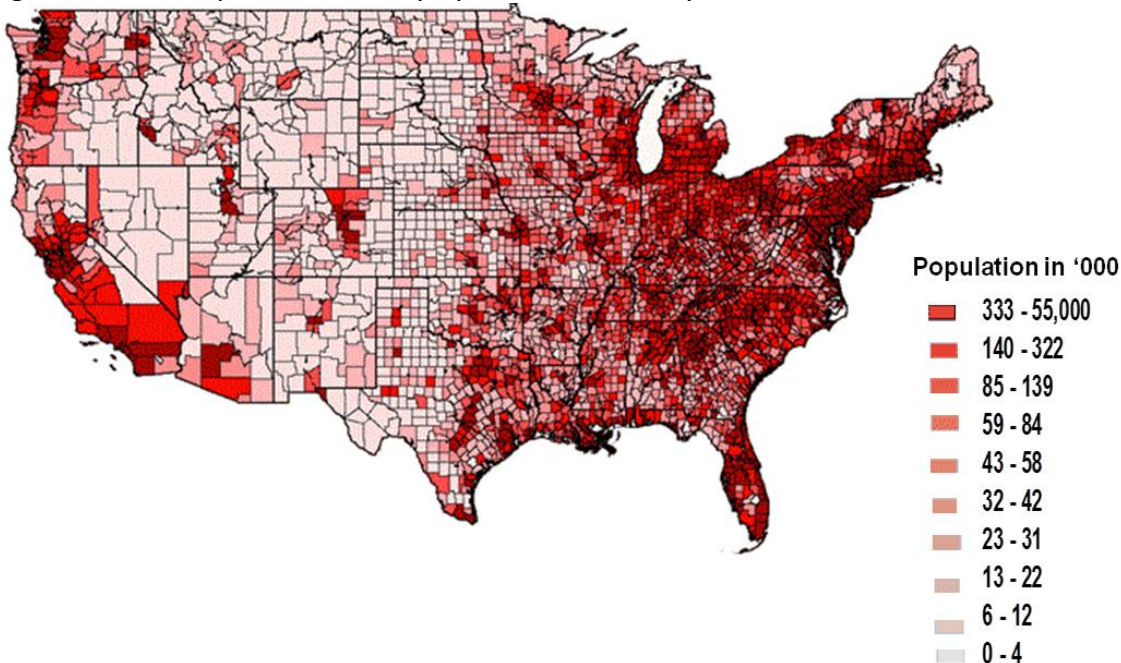
In this chapter we are going to analysis the scenario, first, in order to have a clear view of the containerized goods distribution within the U.S. we are going to take a look at the case of Walmart. We could learn that where are the concentrations of the containerized good being delivered and from which ports those containers being handled, as well as the U.S. intermodal system.

### 5.4.1 The case of Walmart

Since Walmart is one of the largest retailers within U.S, it operates more than 4,000 stores spread within the U.S. especially concentrated on the U.S. East Coast side (Walmart 2012) as we know that almost all Walmart goods are transported in containers it is also a good way to view the container distribution from U.S. ports and via its intermodal system, and also where the concentrations are from a geographic point of view. On the other hand the Walmart stores also serve as a good substitute for the population density map.

The figure illustrated above showing the population density of U.S. by state and county, the dark the red the denser the populated areas.

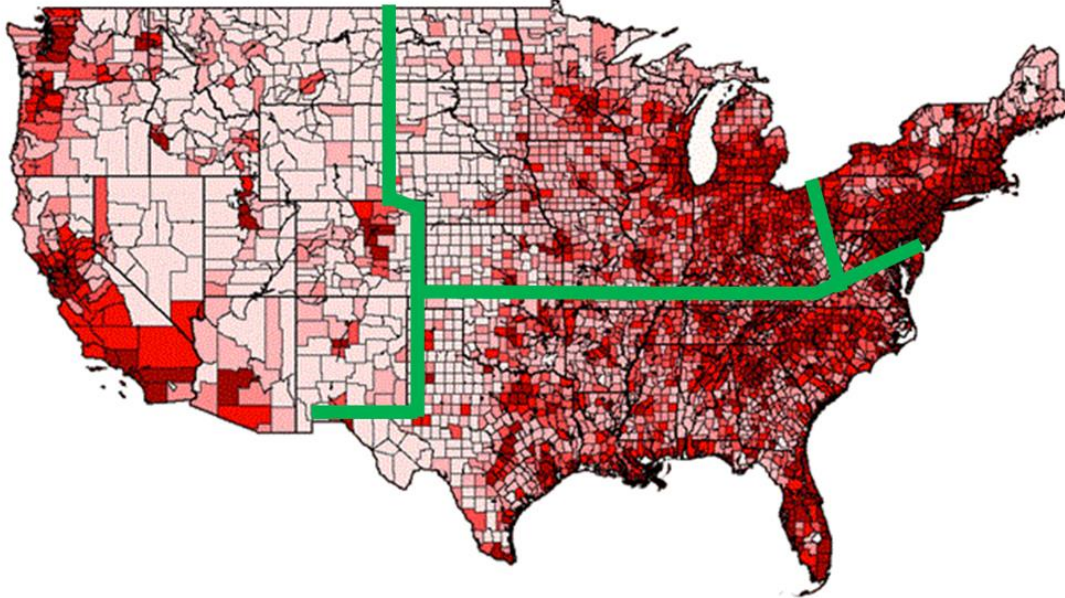
Figure 18: U.S. Population Density by State and County



Source: U.S. Census Bureau

According to the definition by the U.S. Census bureau, we can divide the map into 4 regions, which are West, South, Mid West and North East shown in figure 20 below.

Figure 19: U.S. Population Density by State and County divided into 4 regions



Source: U.S. Census Bureau

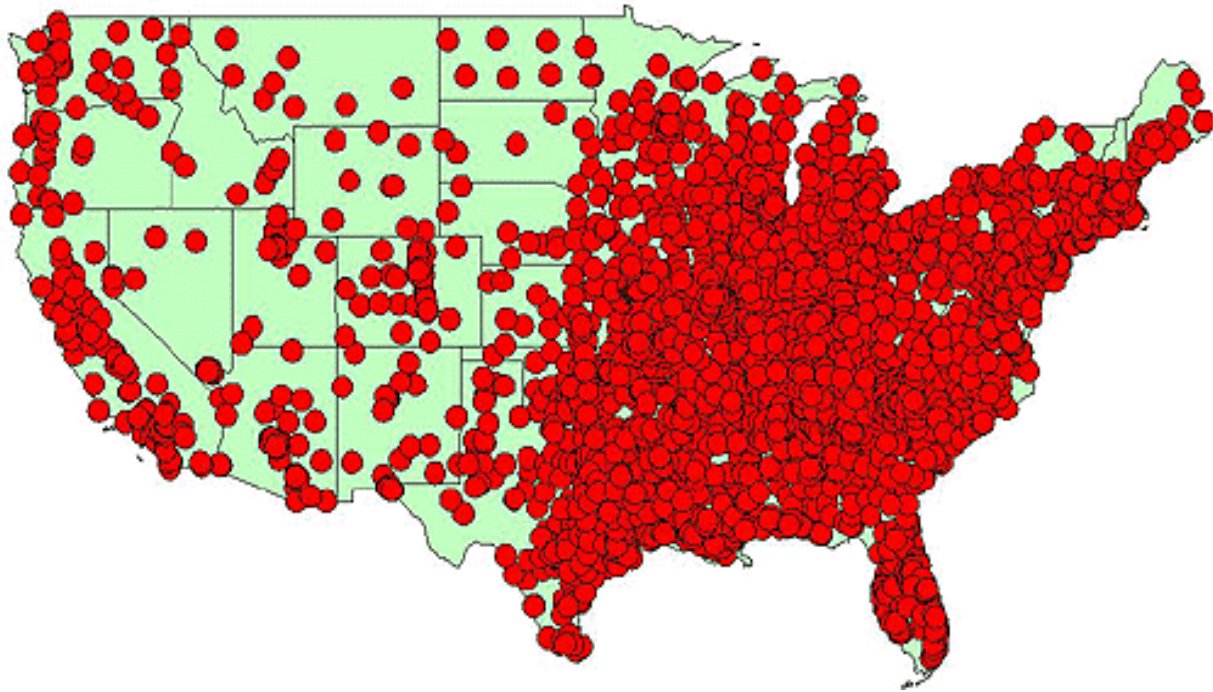
We take Walmart which was one of the biggest retailers in U.S as an example, as we can see from its store distribution map in the U.S. that the stores serve as a good substitute for the population density map. According to the region division aforementioned and data provided by U.S. Census Bureau and Walmart, we calculated as results there are 309 million consumers, divided in to 4 regions as shown in Table 3.

Table 5: Number of consumers by region

Region	Number of consumers in million	% of total
West	72	23%
South	115	37%
North East	55	18%
Mid West	67	22%

Source: U.S. Census Bureau

Figure 20: Walmart Store Distribution in U.S.



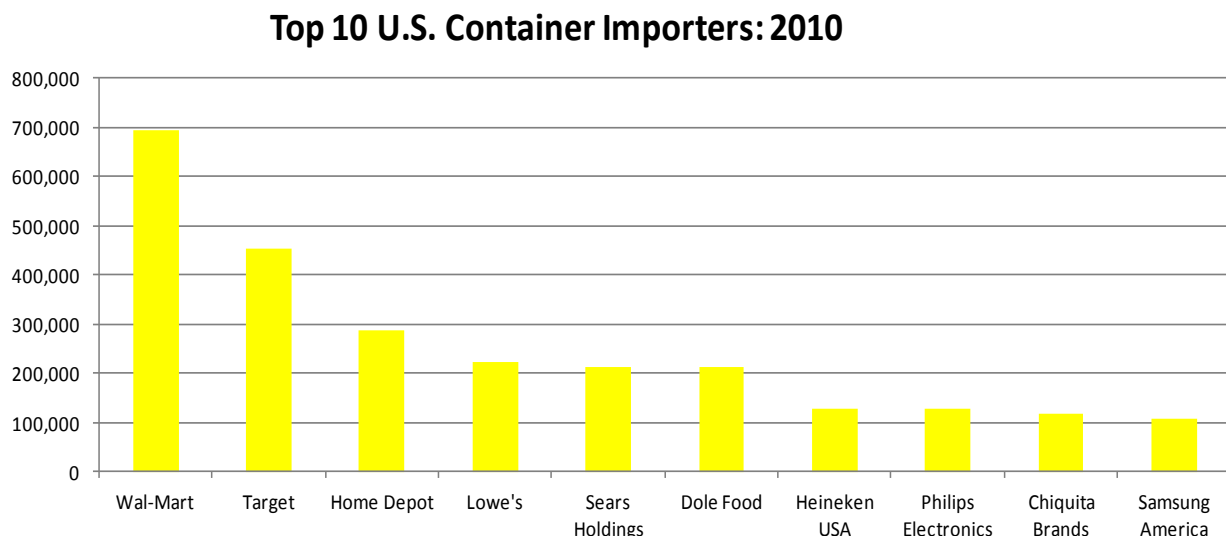
Source: Walmart

Big retailers such as Walmart and home depot account for more than 40% of the container goods imports. Approximately 25% of the imports are handled by original equipment manufacturers such as Philips and Samsung and the remaining 35% by the regional retailers and small original equipment manufacturers.



According to Journal of Commerce, the big retailers dominate the transpacific trade with 40% market share of containerized imports of approximately 5 million TEUs. Original equipment manufacturers account for 25% market share of containerized imports of approximately 3.1 million TEUs. Regional/small retailers, small original equipment manufacturers and assembly plants account for the remaining 35% market share of containerized imports which is approximately 4.4 million TEUs.

Figure 21: U.S. Top 10 Transpacific importers



Source: Journal of Commerce 2010

This leads us to the nature of the containerized import, in the table listed below. The imports from China have been divided into 3 categories, which are low cost merchandise, moderately valued merchandise, and expensive merchandise. Almost 25% of the transpacific imports involve low cost merchandise. Containers carrying this type of cargo often are shipped intact to inland locations to minimize transportation costs.

Moderately valued goods and expensive merchandise account for 50% and 25% respectively. Retailers want to reduce their inventory carrying costs for these cargoes, which increase with the value of the merchandise. One of the ways to reduce inventory carrying costs is to reduce its time in transport.

Table 6: Transpacific Imports Chian-US

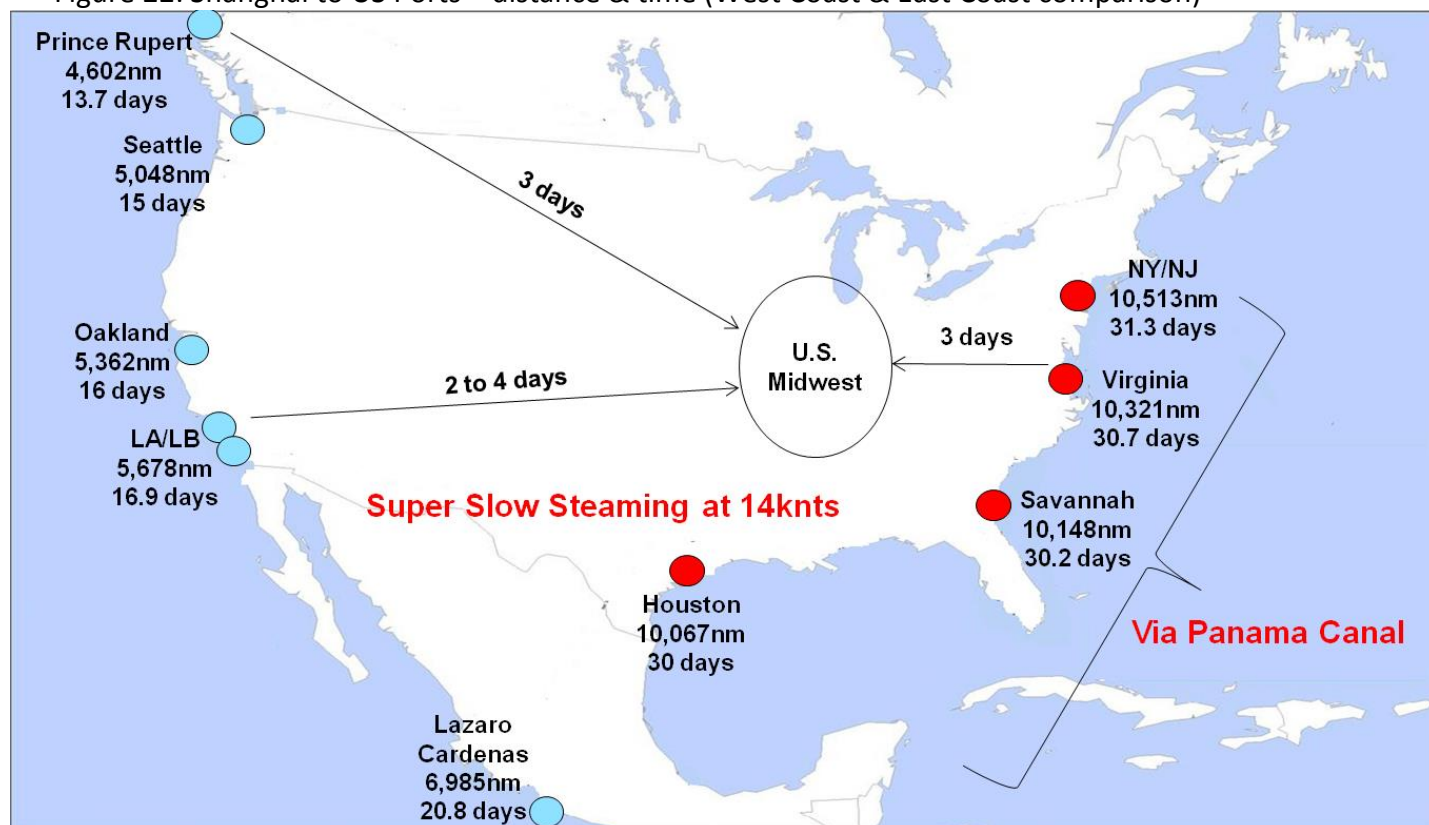
Categories	Break down by TEU unit in million	% of total
Low Cost Merchandise	3.18	25%
Moderately Valued Merchandise	6.35	50%
Expensive Merchandise	3.18	25%

Source: Journal of Commerce

#### 5.4.2 A typical transpacific trade routes comparisons

From the information provided above, we take Shanghai to major North American Ports transpacific route as the scenario to calculate the distance and time. It clear shows in figure 22 that on average it takes 15 to 16 additional days to reach the ports on the East Coast side when compared to reach the ports on the West Coast side.

Figure 22: Shanghai to US Ports – distance & time (West Coast & East Coast comparison)



Source: AXS Marine

We assume high fuel costs of 700 US dollar per ton and that the vessels will be super slow steaming with an average speed of 14 knots. We can calculate that on average it takes up to 15 days or more to reach the U.S. East Coast ports, double the time when compared to the time spent reaching ports at the West Coast, and it does not even include the delay caused by the congestion on the Panama Canal. On the other hand, it takes only 2 to 4 days extra for cargo to travel from Port Los Angeles/Long Beach by rail to the East Coast. So given the time sensitive natures of transpacific imports that whether it's now or 2015 after the canal expansion, importers who want their goods to be shipped faster will prefer liner's who call West coast ports and the US East Coast ports are already at a disadvantage place. Including the time for inland transport from US West Coast ports to the retailers, it still would be shorter. Therefore, given the time sensitive nature of much of the transpacific imports, US East Coast ports are already at a disadvantageous position. As aforementioned in the analysis, there are and will always be importers who want their goods to be shipped faster. Therefore, there will always be shippers having preference over the U.S. West Coast ports.



#### 5.4.2.1 The Scenarios

In the following part, we will take a look at the comparison between two scenarios, we assume there are two companies that are in same type of shipping business both having set their office/distribution centres in Chicago which is one of the important economic areas in the U.S., from geographic point of view, it is fair for both transport routes. Moreover, the two scenarios and critical criteria's will be explained. Base on the empirical data, the outcome of the assessment will also be analyzed.

The two routes being analyzed are:

- a). Shanghai to Chicago via water route to the port of Los Angeles then via intermodal system to arrive at the final destination;
- b.) Shanghai to Chicago through water route via Panama Canal to the port of New York/New Jersey then via intermodal system to arrive at the final destination.

- Company X (scenarios 1)

Company X has its main distribution centre settled in the city of Chicago, Illionis as the point to redistribute the cargos within the region, according to Drewry's data (Drewry Container Forecaster 2010-11), 85% of the cargo is for Chicago, Illionis region and the rest 15% is for other regions nearby. However, for the purpose of this study, we will be only focusing on the imports to Chicago. Furthermore, from the cargoes Chicago distribution centre are redistributed in the following retailing regions: Michigan, Indiana, Ohio and Wisconsin.

The commodity company X imports is interior cloth, such as curtain, sofa cover or bedspread, it is necessary to mention the type of commodity so to understand if the commodity is time sensitive or not. For this type of commodity, more than 80% of the cargo is not sensitive to time in other words, low valued cargos. However, the remaining 20% can be sensitive to time and costly, high valued cargoes. As aforementioned, there is a split between the distributions, as we are focus on the 85% making the share split for each route.

According to Drewry, company X imports 6,000 TEU per year with cargo value of USD 16,000 per container. The relevant data points for the purpose of this study are as follow:

- Type of Commodity: Interior cloth
- Yearly import: 6,000 TEU per year
- Yearly throughput to Chicago at 85%: 5,100 TEU per year
- Cargo value per TEU: USD 16,000
- Total value: 5,100 TEU X USD 16,000= USD 81,600,000
- Water route share at 80%: 4,800 TEU per year
- Value of water route share cargo: 4,800 TEU X USD 16,000= USD 7,680,000
- Intermodal share at 20%: 1,200 TEU per year
- Value of intermodal route cargo: 1,200 TEU X USD 16,000 = USD 1,920,000

- Company Y (scenarios 2)

Company Y also has its distribution center in the city of Chicago, besides the point for redistribute the cargo within the region; the company has another distribution center settled in Los Angeles and has 30% share of the imports. Furthermore, from the cargoes Chicago distribution center are redistributed in the following retailing regions: Michigan, Indiana, Ohio and Wisconsin. For the purpose of this study, we will be only focusing on the 70% share; company Y imports home appliances, such as washing machine, TV set or oven. They are high valued cargos, thus they are also sensitive to time.

According to Drewry, company Y imports 6,500 TEU per year with cargo value of USD 60,000 per container. The relevant data points for the purpose of this study are as follow:

- Type of Commodity: home appliances
- Yearly import: 6,500 TEU per year
- Yearly throughput to Chicago at 70%: 4,550 TEU per year
- Cargo value per TEU: USD 60,000
- Total value: 4,550 TEU X USD 60,000= USD 273,000,000
- Water route share at 55%: 3,575 TEU per year
- Value of water route share cargo: 3,575 TEU X USD 60,000= USD 214,500,000
- Intermodal share at 45%: 2,925 TEU per year
- Value of intermodal route cargo: 2,925 TEU X USD 60,000 = USD 175,500,000

In order to make the comparison analysis of the two selected routes, we will base it on the transport cost data from Drewry. When make the comparison we need to take into account the transport cost, transit time as well as the value of the time towards different cargoes. Transport costs involve ship voyage cost, port handling cost, rail transport cost and Panama Canal toll charges and surcharges.

- The total cost for route one, Shanghai – Los Angeles – Chicago is USD 5,836 in which USD 2,168 was the cost by intermodal (Drewry Container Forecaster 2010-11).
- The total cost for route two, Shanghai – New York – Chicago via Panama Canal is USD 5,230 in which USD 1,983 was the cost by intermodal (Drewry Container Forecaster 2010-11).

Value of time can be denoted as the holding costs and it refers to the value of the time or the value of the cargo while is in the transit time. In order to calculate it, we need to know the interest cost of capital based on its value plus the insurance rate. With this information we can calculate the cargo value per day of transit. The value of time vary by trade flow, cargo type, inventory cost and the costs of financing and the opportunity cost of the cargo not delivered on time (PCA). This last aspect refers to the reliability of the services which is one of the most important factors that influence directly the value of time, since a day of delay will affect the overall costs for the customer. On the other hand, faster delivery time may reduce render payments and increased profits.

We have explained the two scenarios above, which concerns two companies based in Chicago, with different commodities imports with similar amount of import volumes. Moreover, the

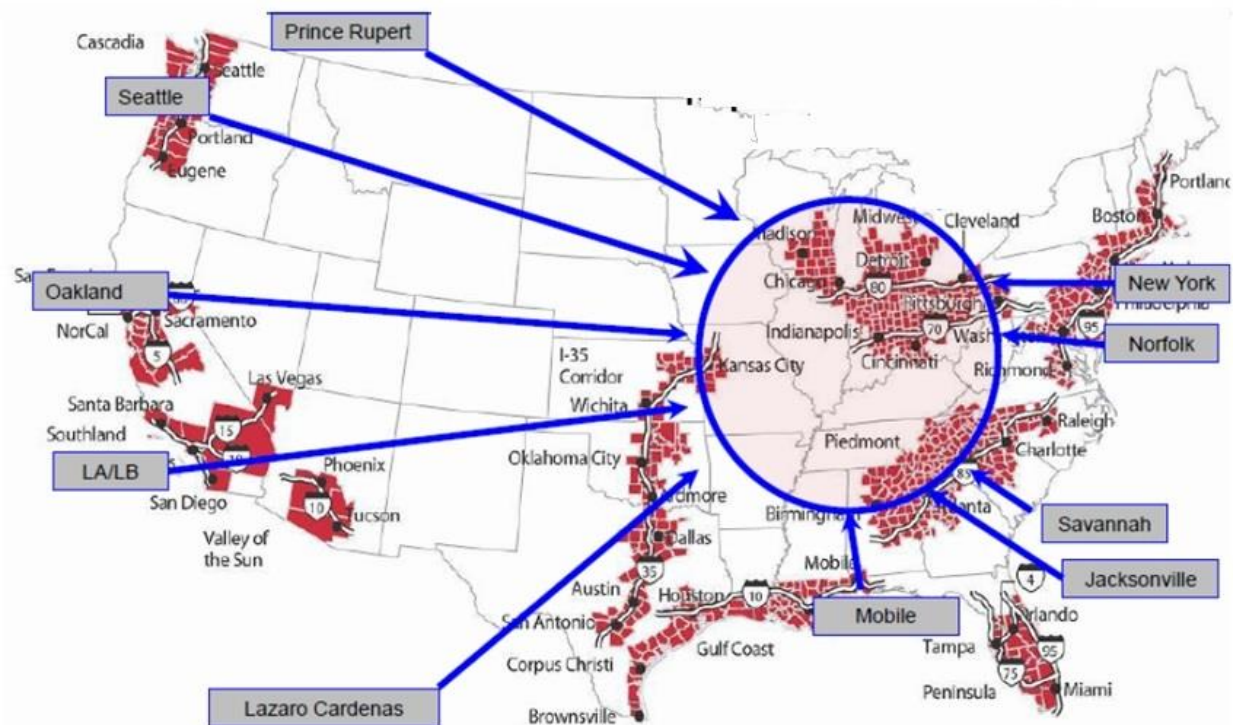
criteria's to take into consideration in order to calculate the total transport cost, which involves the transport costs for each company that comprise shipping cost, port handling cost, rail transport cost and Panama Canal tolls charges and surcharges generated from value of time which involves the interest cost of capital and the insurance rate.

Intermodal has been mentioned many times in the previous part of this chapter, thus in the following part we will take a detailed look in the U.S. intermodal network/system.

Furthermore, as known that the U.S. intermodal network (Figure 23) plays a very important role in determining the chosen ocean route. In figure 23, the red areas represent the routes for trucks while the blue lines represent rail connections. Within the map it has also included the ports of Prince Rupert up north in Canada and Lazaro Cardenas down south in Mexico due to their railroad connectivity to the major railroad terminals in U.S. Prince Rupert benefits from being the nearest port to Asia, which helps a lot in the current era of slow steaming

According to the data provided by AAR, the rail network has 100% rail connectivity from west to Midwest, while only 20% to 30% of USEC ports are on rail. Even though railroads around the U.S East Coast region are enabling double stacking along the east coast corridors, the shorter transit time makes west coast the better alternative for liners.

Figure 23: U.S. Intermodal network



Source: Intermodal Management System; Association of American Railroads

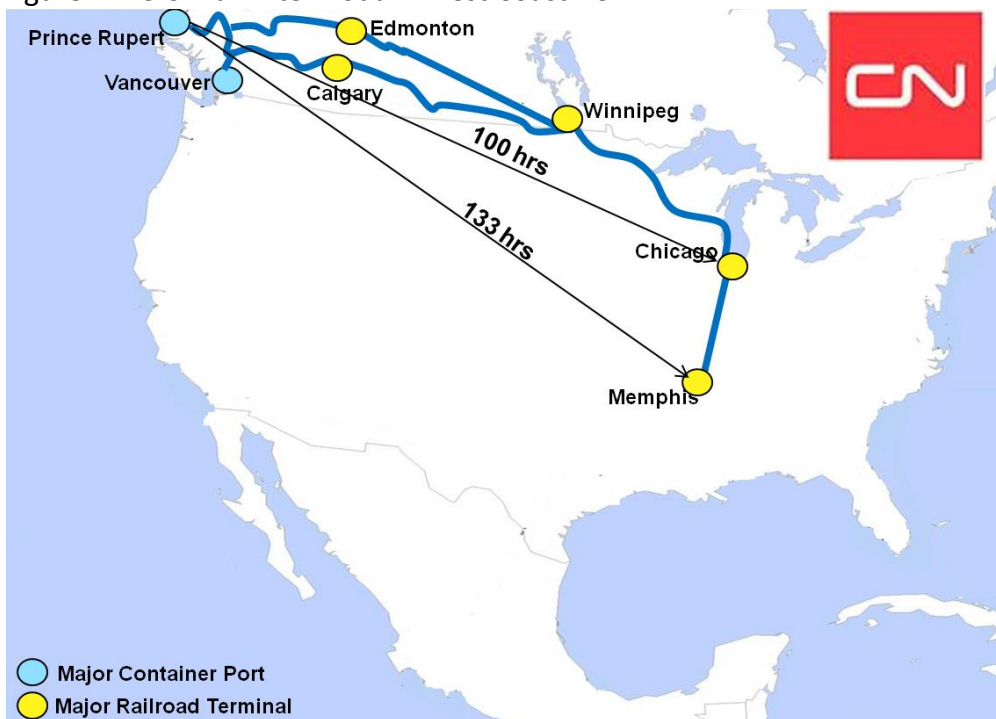
### 5.4.3 U.S. Rail Networks

In the following, we will analyse the U.S. Rail intermodal network in detail.

#### 5.4.3.1 U.S. West Coast Rail intermodal network

The first class one railroad in the Western region is the Canadian National. More than two thirds of imports at Prince Rupert, the nearest North American port to Asia with a travel time of around 13 days from Shanghai when ships are super slow steaming at 14 knots, are transported by Canadian National railway. The cargoes are transported to major inland metropolitan cities such as Chicago and Memphis. It is one of the fastest growing ports in North America. Intermodal travel times from Prince Rupert are 100 hours to Chicago and 133 hours to Memphis.

Figure 24: U.S. Rail Intermodal - West Coast - CN



Source: Association of American Railroads; Journal of Commerce; Piers

The second in the line is Burlington Northern Santa Fe (BNSF, Figure 26). Approximate travel time from Los Angeles to Chicago is 90 hours, which is still unfavourable when compared with Canadian National given the additional 2 to 3 days for the cargo at sea. However, BNSF operates “premium” trains on the Transcorridor with speeds up to 125 km/ph, which allows shipment to reach as fast as 50 hours (Association of American Railroads). The rates from Los Angeles to Chicago on average are around 1,600 US dollar per carload (400 US dollar per TEU) in 2011 which are approximately 75 US dollar per TEU higher than Canadian National rates (Journal of Commerce). Unlike liners operators, railroad operators such as BNSF do not seem to be inclined in a market share war.

Figure 25: U.S. Rail Intermodal - West Coast- BNSF



Source: Association of American Railroads; Journal of Commerce; Piers

The third and final one of class one railroad in the Western region is Union Pacific (Figure 26) whom is working to double track the Sunset Corridor from Los Angeles to El Paso, which will help reduce the transit time (Association of American Railroads).

Figure 26: U.S. Rail Intermodal - West Coast- UP



Source: Association of American Railroads; Journal of Commerce; Piers

#### 5.4.3.2 U.S. East Coast Rail intermodal network

Moving on to the East, we first have the National Gateway project by CSX, a USD 700 million project to create a highly efficient double-stack intermodal link between Virginia and the Midwest (Association of American Railroads). As of beginning 2012, CSX completed a third of the clearance work. The entire project will commence operations in 2014, coinciding with the opening of the Panama Canal (Journal of Commerce).

Figure 27: U.S. Rail Intermodal - East Coast- NG



Source: Association of American Railroads; Journal of Commerce; Piers

Then there was Norfolk Southern' Heartland Corridor (Figure 27) which was completed in 2010 (Journal of Commerce). The project involved raising clearances in approximately 30 tunnels and overhead obstacles. Also, it reduced travel time from Virginia to Chicago to 3 days instead of 4 days. In the beginning of 2012, Norfolk Southern completed the Heartland Connector on the same route (Figure 28) which is a double-stack line between Columbus and Cincinnati, which is the intermodal hub in Ohio (Journal of Commerce).



Figure 28: U.S. Rail Intermodal - East Coast- NS 1

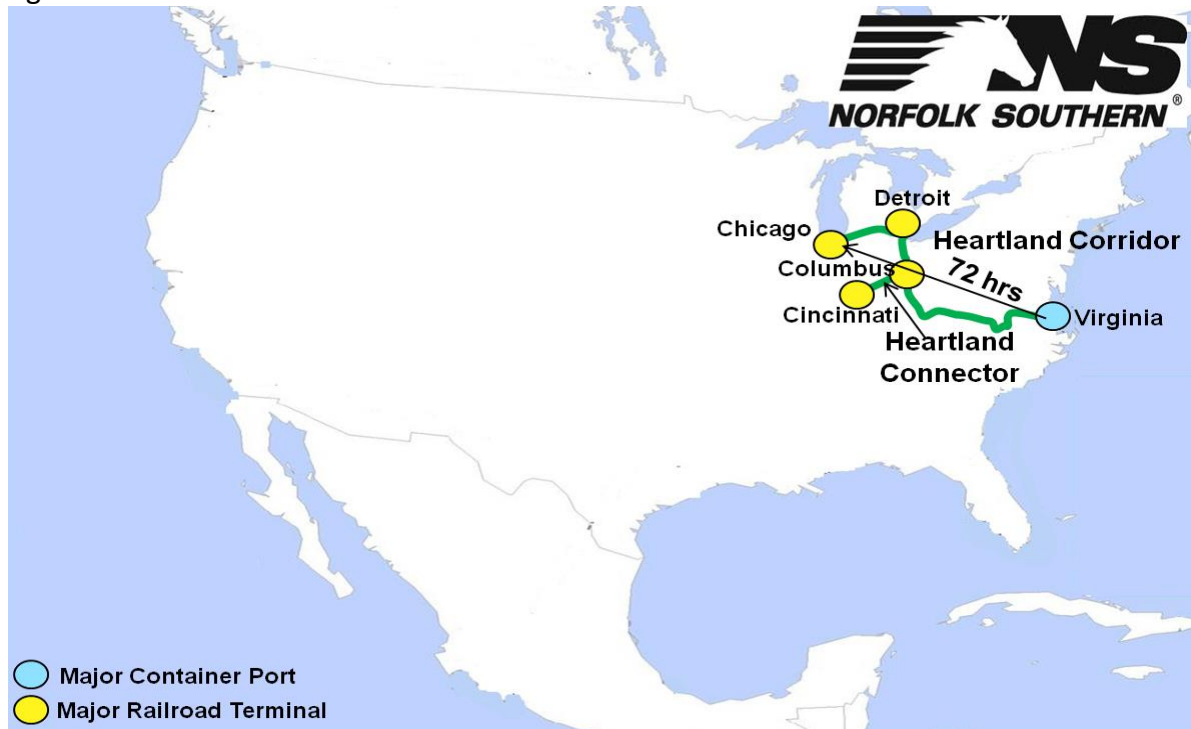
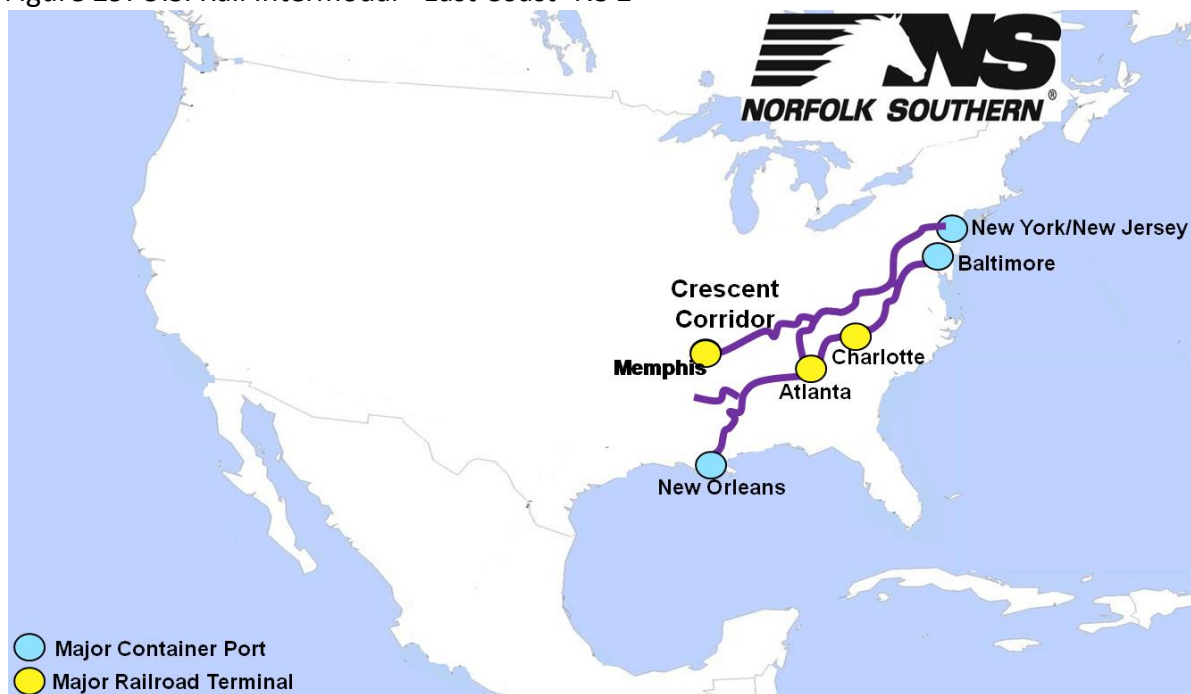


Figure 29: U.S. Rail Intermodal - East Coast- NS 2



Source: Association of American Railroads; Journal of Commerce; Piers

The last major corridor in the East is the ongoing Crescent Corridor project by Norfolk Southern “Kansas City Southern Liner” (Figure 29) which will eventually link supply chains from Memphis and New Orleans to New Jersey. However, unlike the other corridors, the emphasis here is on domestic intermodal trade instead of international seaborne imports (Association of American Railroads).

Figure 30: U.S. Rail Intermodal - East Coast- KCS



Source: Source: Association of American Railroads; Journal of Commerce; Piers

There are two key points to note for the upcoming development in rail corridors in the East region. There is no major rail project reaching to the large consumer base in the North east. The region is not likely continued to be served by trailers from port of New York. Therefore, importance of New York will not diminish even as other East coast ports undergo expansion in near to medium term. The economic benefit of utilizing larger vessels calling ports such as Norfolk for North East cargo will be offset by the trucking costs. As a result, post Panama Canal expansion the upsizing of vessels calling New York is expected to take place, albeit restricted by Bayonne Bridge.

The connectivity to Midwest will continue to improve, and it will help to capture market share from trailers. However, the average intermodal carload rate of NS is USD 350 with 3 days transport time from the port to the Midwest (Piers 2011). Therefore, it would not help swing the intermodal market share from West Coast to the East Coast. The rail intermodal rates are unlikely to decrease as the railroad also needs to recover its investments.

Last but not the least, there is the Kansas City Southern's recently completed corridor from Lazaro Cardenas to Houston which will provide stiff competition to transpacific imports to Southern U.S. Although the shipments of white goods and electronics from Mexico to U.S. have increased tremendously on this railroad, so far the port has not attracted cargo imported from Asia. However, it has a built-in economic advantage over the U.S. ports such that containers imported through these foreign ports are not subject to the U.S. harbour maintenance tax. Similar advantage is also enjoyed by Prince Rupert. It is also noted that the harbour maintenance tax averages around USD 80 per TEU and is up to USD 200-300 per TEU for electronics and automotive parts. (Journal of Commerce).



## 5.5 Assessment of scenario – cost analysis

### 5.5.1 Panama Canal Toll Conundrum

Given the info mentioned above, the Panama Canal toll fee post expansion can be estimated by the calculation below in Table 6. The cost per TEU is evaluated to give an estimate of the cost relationship between intermodal and water way shipments to the US East Coast. Below is the breakeven analysis for North East Asia (Shanghai) to U.S. East Coast (New York/New Jersey) service to switch from Panama Canal route to Suez Canal route for time insensitive shipments.

- Extra distance via Suez Canal (avoiding piracy zone) → 2,239 nm (AXSMarine distance table)
- Excess time take at 14 knots → 6.7 days (AXSMarine distance table)
- Current toll – \$74/TEU + \$8/Laden TEU (assume equal number of ships in both service and equal port charges)

Table 7: Panama Canal toll rate estimation

	5000 TEUs	8500 TEUs	13000 TEUs
Fuel Consumption in tons/day @14 knots	30	55	60
Total Consumption	201	368.5	402
Cost @ \$700 per ton	\$140,700	\$257,950	\$281,400
OPEX in \$ per day	\$5,200	\$7,500	\$9,200
Extra OPEX + Fuel Costs	\$175,540	\$308,200	\$343,040
Suez Canal Transit Fee	\$327,300	\$440,000	\$627,000
5 yr vsl in 2015	\$45,000,000	\$72,000,000	\$97,000,000
Int over 6.7 days @5% p.a 70% loan	\$28,910	\$46,257	\$62,319
Total Extra Costs	\$531,750	\$794,457	\$1,032,359
Extra Cost per TEU*	\$112	\$98	\$83

Source: Elaboration of the author based on research and calculations

Data Source: Journal of commerce (fuel costs, bunkering price); Drewry(OPEX costs); PCA(toll rate calculation); Suez Canal Authority(Toll rate calculation); Alphaliner (Container Ship Fuel Consumption Calculation)

The approximate Panama toll rate is estimated based on the level which will cause the shipper to switch to Suez Canal route for shipments originating from North East Asia to U.S. East Coast. It is assumed that the cargo is time insensitive, so the shipper is indifferent to any route being used. The extra time with super slow steaming will be approximately be 7 days through the Suez Canal route. A sensitivity analysis on various vessel sizes is performed to estimate the breakeven costs; above which the liner will prefer to ship via the Suez Canal route. The current toll charges at Panama Canal are USD 74 per TEU of nominal capacity plus USD 8 US dollars per laden TEU. As the Panama Canal authorities need to recover the USD 5.2 billion investment, it is believed that the new pricing will be higher than the current prices. However, most likely the

canal cost will be capped at container ships of 8,500 TEUs. Nevertheless, this remains to be seen as larger container ships can transit and it is unknown to us the time horizon intended for the Panama Canal authorities to recover its investment or how they plan to spread the recovery across other shipping sectors.

### 5.5.2 Assessment summary - The Routes Comparison

Table 8 is a summary assessment of the scenarios on the various transpacific routes post expansion. It is done on the basis of liners' preference on costs, timeliness and reliability. When Maersk trumpets its daily Maersk service, it did not refer to cost or time, but their reliability! While costs and time to transport are well understood, reliability or consistency is difficult to measure. We try to judge whether the goods are shipped intact and arrive and depart at a predetermined time.

Table 8: Transpacific Routes Comparison

Route	Cost	Time	Reliability
<b>West Coast/ Intermodal</b>	➤Cheaper than All-Water Services to Midwest	➤Fastest way to reach even East Coast	➤Same as Panama route for shipments destined to Midwest
<b>Panama Canal</b>	➤Lower cost than Suez route from North East Asia subject to new toll rate	➤Faster than Suez route from North East Asia	➤More reliable than Suez route
<b>Suez Canal</b>	➤Lower cost than Panama route from South East Asia	➤Faster than Panama route from South East Asia	➤Least preferred ➤Piracy ➤Transshipment

Source: Elaboration of the author based on research

For time sensitive goods, the combination of U.S. West Coast plus U.S. intermodal system is expected to be the winner. With increasing bunker prices and super slow steaming as the new norm, longer routes calling USEC via the Panama Canal or Suez Canal have their attractiveness too. In terms of reliability, the Suez Canal route is the least preferred case due to the higher number of transshipment calls and piracy. The Panama Canal route is expected to improve reliability of liner services post expansion as the new lock and channels will reduce congestion in the canal area.

## Chapter 6 Conclusion

### 6.1 Conclusion

The Panama Canal is a vital component of the international seaborne trade system, especially in the routes connecting U.S. with major Asian economies. The Panama Canal is facing capacity constraints in view of increasing trade volume amidst growing competitive pressure. Therefore, the expansion project seems to be an opportune move.

The canal is likely to boost trade, especially the routes connecting U.S. and Northeast Asia, by reducing transportation costs. China is likely to benefit the most as its exports will become more competitive to the large US consumer base in the North-eastern region of the US. The expansion is also likely to encourage new routes connecting China with major mineral and oil producing countries in South America and West Africa. This may give further impetus to trade along these routes.

The biggest competitor of the Canal, the U.S. intermodal system, is likely to face increased pressure as the Canal is getting ready to host bigger ships with reduced transit time. The major ports currently handling the bulk of imports through U.S. west coast may see a moderation in demand. Most consumer products are more likely to be shifted to the Canal compared to high-value and time-sensitive goods. The intermodal system may thus retain the competitive position in this segment.

The expansion is likely to push the distribution centres from the current locations further east, closer to densely populated regions. At the same time, ports along the Eastern and Southeaster coast with advanced facilities will benefit from the expected increase of cargo volume. The expanded canal will principally benefit companies that ship manufactured goods from Asia to the US East Coast and companies shipping some bulk commodities from the US East Coast or US Gulf to Asia.

Over the last two decades, the structure of world trade has changed from port competition to route competition. There are a myriad of factors behind the choice of trade route, including but not limited to cost factor. Reliability, transit time, and frequency of service all play a part in that decision making process. The Panama Canal Expansion aims to deliver improvements on the above factors, thus is expected to enhance Panama Canal as one of the more preferred routes for the Asia – US East Coast trades. The expansion project will also speed up the improvement on connectivity of ports and enhance the profitability of container shipping lines through deployment of the more cost efficient Post Panamax container ships. The Panama Canal expansion aims to boost the Panamanian economy, as well as to stimulate the world trade through better allowed economies of scale..

The canal expansion will increase the number of vessels making all-water voyage to US East Coast and, possibly to a smaller extent, the trade volume transiting the canal, being rerouted from West Coast to East Coast. However, this could change depending on the canal transit fee which brings uncertainty on the expected impacts on trade volume and transportation pattern.

## 6.2 Suggestions for Further Research

For further study and projection of container cargo and ships demand, more in-depth analysis of the global trades is necessary. This study should be based on the forecasts for the global economic revival and provide detailed analysis on the demand for seaborne containerised trade in the above mentioned trading routes.

Further research should have the desirable structure and methodologies that will concentrate on demand estimation for certain size class of ships and in this particular case the Post Panamax and Super Post Panamax ships. For the estimation of demand of this group of ships, it is necessary to take into account following factors:

- General macroeconomic situation and availability of trade financing;
- Availability and feature of ship financing, including loan structures, leverage, and financing costs;
- Market saturation, market structure and freight rate dynamics: supply demand balance, capacity utilization ratio, scraping level, second-hand sale and purchase market activity, new buildings programs, charter rates, freight rates and so on;
- Possibilities of cascading of vessels from one trading routes to another;
- Growth of trade in merchandise goods and consumer products;
- Infrastructure upgrading at canals, deepwater ports, inland and river ports, and intermodal systems etc;
- Costs: ship prices, insurance, container box prices, bunker prices, port and canal Fees etc;

## References:

ACP (2012), "Project Progress Report", Panama Canal Authority: access at:  
<http://www.pancanal.com/eng/expansion/rpts/informes-de-avance/avance.html>

ACP (2011) Annual Report 2011

Almeida, R., (2011) "Intermarine Interview Part 3: Panama Canal Expansion, Container Trade, and the KG System"

American Shipper (2012), "Why the expansion of this waterway may not influence where maritime cargo enters the U.S."

Autoridad del Canal de Panama, (2006) "Plan Maestro del Canal de Panama, Panama Canal Authority"

Alphaliner, data on ports: <http://www.alphaliner.com/>

AXS Marine distance table access at: <http://www1.axsmarine.com/distance/>

Berman, J., (2006), "Panama Canal expansion to reduce congestion, boost capacity" 2006:11

Ben, M., (2009), "Capturing the Canal: Port of New Orleans, Gulf Coast look for share of Panama Canal expansion", New Orleans CityBusiness 2010

Ben, M., (2009), "View differ over Louisiana impact from Panama Canal expansion", New Orleans CityBusiness 2009

Burnson, P., (2012), "Is The Panama Canal Expansion Really a Game Changer?" Global Links, Supply Chain Management Review

Bussy, J., (2009) "Canal Expansion" Latin Trade 2009

Bussolo, M., De Hoyos R.E., Medvedev D., (2011) "Distributional Effects of the Panama Canal Expansion" Poverty Reduction and Economic Management Network

Carpanese, S. and Sooredoo, N. (2004) "Why Should Panama Expand the Canal," Msc Thesis, Erasmus University Rotterdam – Center for Maritime Economics & Research, Rotterdam, The Netherlands

Clarksons Shipping Intelligence Network 2010, <http://www.clarksons.net/sin2010/>

Chloe, H., (2007) "Panama Canal expansion will attract investment flows" Euromoney 2007:1

Delmy L. Salin, US Dept of Agriculture, Impact of Panama Canal Expansion on the U.S. Intermodal system Jan '10

De Goey, F., (2004) "Comparative Port History of Rotterdam and Antwerp (1880-2000), Competition, Carog and Costs", Aksant Academic Publishers, Amsterdam 2004

Drewry (2009), " US Transpacific Intermodal Today and Tomorrow" A CIGMA Commentary

Dupin, C. (2006). "The post-Panamax Canal." American Shipper

Dupin, C. (2009). "Port's ship come in." American Shipper

Gonzales J., et al (2008), "Improving Logistics Costs for Transportation and Trade Facilitation," Research Working Paper 4558, World Bank

Hine, L. (2010) "Traders Waking Up to Panama Canal Potential," *Trade Winds*, January 26, 2010 edition, London, UK

Hsuan, A. (2009) "West Coast Ports Band Together to Fight Global Competition," *The Oregonian*, Portland OR, United States

Haezendonck E., v.d. Broeck J., Jans T. (2011) "Analysing the lobby-effect of port competitiveness' determinants a stochastic frontier approach", Springer Science+Business Media, LLC 2011

Haezendonck E., (2001) "Essay on strategy analysis for seaports", Elvira Haezendonck & Garant Publishers, Garant 2001

IWR White Paper on Panama Canal (2008) "IWR White Paper & ACP Report on Shipping Strategies"

Jerry W.L. (2009), "Canal's expansion keeps Panama's growth on fast track" Boulder Country Business Report 28:5

Journal of Commerce (2006), "Port of Huston endorses Panama Canal expansion, New York 2006:1

Knight, K., (2008), "The Implications of Panama Canal Expansion to US Ports and Coastal Navigation Economic Analysis" US Army Corps of Engineers, Water Resources

Khatz, G. (2011) " The Expansion's Market Impact", *Marine Technology July 2011, 8-9*

Kosk, N., (2012) "Panama canal Expansion Drives International Shipment Growth" Global Focus 2012

Limão N., Venables A., (2001) "Infrastructure, Geographical Disadvantage, Transport Cost, and Trade," *The World Bank Economic Review*, Vol. 15, No. 3, 451-479

Marcella, V., (2011) "Gulf Ports Anticipate Panama Canal Expansion's Benefits" *Area Development Site and Facility Planning*, ProQuest Business Collection 45:6

McDonald, A. (2010) "US Southeast: Positioned for Growth," *World Trade Report*, Vol. 23 issue 1, Charleston SC, United States

McDonald, D., (1977) "The Path Between The Seas: "The Creation of the Panama Canal"

McCue, Dan. "Gulf State Ports See Panama Canal as Game Changer." *World Trade* 22, no. 10 (October 2009): 40-45. Business Source Complete, EBSCOhost

McClatchy (2012), "East Coast ports ready for uptick in shipping from Panama Canal", *The Portland Press Herald Marine News*, access at: [http://www.pressherald.com/business/debate-runs-deep-on-coastal-impact\\_2012-05-09.html](http://www.pressherald.com/business/debate-runs-deep-on-coastal-impact_2012-05-09.html)

Miller, G. (2008). "US Container Trades." *Fairplay International Shipping Weekly*  
Mongelluzzo, B., (2012), "Pacific Container Lines Plan Another Rate Hike", *The Journal of Commerce*: access at: <http://www.ioc.com/print/433546>

Moreno, G. (2010) "Service Will Promote Port of Houston in Asia," *Houston Chronicle*, September 26, 2010 edition, Houston TX, United States of America

Myers, B. (2010) "Views differ over Louisiana impact from Panama Canal expansion," *New Orleans City Business*, New Orleans LA, United States

Neil, A., (2008) "Some East Coast Ports to Gain from Panama Canal Expansion" *Transport Topics*, ProQuest Business Collection 3801:3

Nicholas, J., (2011) "Panama Canal expansion unlikely to immediately impact scrap exporters", *American Metal Market*

Penfold, A., (2007), "Impact of Panama Canal on Asia-North America Container Trades," *Ocean Shipping Consultants Presentation*

PIERS Global Intelligence Solutions, US/Asia import & export data, access at: <http://www.piers.com/>

PR Newswire (2007) "Panama Canal Expansion Breaks Ground: Thousands Join Panamanian President, World Leaders to Witness History"

Radelet S., Sachs J., (1998) "Shipping Costs, Manufactured Exports, and Economic Growth," accessed at: <http://admin.earth.columbia.edu/sitefiles/file/about/director/pubs/shipcost.pdf>

Robert W., (2006), "Canal expansion could turn Panama into hub", Financial Times, London 2006:12

Robert W., (2005), "Panama Canal expansion may force toll rise", Financial Times, London 2001:1

Rodrigue, JP., (2010), "Factors Impacting North American Freight Distribution in View of the Panama Canal Expansion," Van Horne Institute

Szakonyi, M., (2012) " Eastern US Rails Poised for Growth on Either Coast", The Journal of Commerce: access at: <http://www.joc.com/print/432962>

Stopford, M., (2009) "Maritime Economics" 3<sup>rd</sup> edition, Routledge

Southeast Farm Press (2011) "Panama Canal expansion crucial for exports"

T. Leach P., (2012), "NY-NJ Port Expedites Bayonne Bridge Project", The Journal of Commerce: access at: <http://www.joc.com/print/433673>

T. Leach P., (2012), "Panama's New Captain", The Journal of Commerce, Vol.13 N.20: 10 - 14

T. Leach P., (2012), "Erasing Shipping's Capacity Glut", The Journal of Commerce: access at: <http://www.joc.com/print/434103>

T. Leach P., (2007), "Savannah getting ready for Panama Canal expansion" The Journal of Commerce 2007:1

The Louis Berger Group Inc. (2003) "The Panama Canal Impact on the Liner Container Shipping Industry," Washington D.C., United States of America

Toscjwell, P., (2012) "Coastal Shift- Not!", The Journal of Commerce: access at: <http://www.joc.com/print/430806>

Trace, K. (2002). "Globalisation of Container Shipping: Implications for the North-South Liner Shipping Trades." Economic Papers: A journal of applied economics and policy, 21(4), 1-21

Trade in the Americas: Expanding the Panama Canal for the 21st Century by Gail Dutton, November 2, 2007

Transport Topic (2012), "Panama Canal Expansion Worries California Ports" ProQuest Business Collection 3979:10

United States Energy Information Administration, (2010) *International Energy Outlook 2010*, Department of Energy



UNCTAD, Review of Maritime Transport, United Nations 1997-2010

U.S. Census Bureau data on U.S. population 2010 access at: <http://www.census.gov>

US Department of Transportation (2009) "America's Container Ports: Freight Hubs that Connect Our Nation to Global Markets," Washington D.C., United States of America

Villa-Mayora, AC, (2010), "Route Feasibility for Container Transportation: Panama Canal New Route vs. US Intermodal System (USWC – USEC)," Maritime Economics and Logistics ( MEL ) Msc thesis

Verhoeff, J.M., (1981) "Seaport Competition: some fundamental and Political Aspects", Maritime Policy and Management 1981:8

Walmart data on store distribution in the U.S. access at <http://www.walmart.com/>

White, R.D., (2012) "Panama canal expansion shifts playing field", The Virginian-Pilot & the Ledger-Star, ProQuest Information and Learning.

Wijnst, N., Wergeland, T., (2009) Shipping Innovation, IOS Press

Wilmsmeier, G., & Hoffmann, J. (2008). "Liner Shipping Connectivity and Port Infrastructure as Determinants of Freight Rates in the Caribbean" Maritime Economics & Logistics, 10(1-2), 130-151.

Woo, J.K. (2008), "Study of Liner Strategy on the Far East-Europe Service Route Using System Dynamics," Msc. Thesis, Erasmus University

## **Annex**

Interview with Mr. Lei Shi – Assistant Vice President, Market Analyst - APL

**1. As an expert in the field, what was your initial opinion/view regards to the Panama Canal Expansion Project?**

It is an important project that is expected to have significant impact on shipping, especially for container shipping.

**2. Do you see any trend which might trigger the imbalance? For instance, once the expansion finished, most of the deployed ships on transpacific routes would shift to Asia-US East Coast route via Panama Canal (especially the ones currently deployed between Asia-USWC routes)?**

Any structural change is not expected by Panama Canal expansion itself alone – it has to come hand-in-hand with infrastructure improvement both inland and at ports on USEC. One key challenge at the moment is the air draft limitation due to Bayonne Bridge in port of NY/NJ, the largest container port on USEC and handling about half of the container imports on USEC. The air draft restricts majority of container ships over 8K TEUs from accessing the terminals west of the bridge. This considerably offsets the potential ships upsizing allowed by the new Panama Canal after expansion – up to 12-13K TEUs. Although other ports on USEC, such as Norfolk, may be able to accommodate ships over 8K TEUs, the inland rail network has to be further developed in order for the imports to be transferred to the major consumer bases in the Mid-West and North-East of the US.

Before the above mentioned, or any alternative solutions, can be implemented, the shift from Asia-USWC then intermodal transport to Asia-USEC all water service via Panama is expected to be gradual.

Also, although larger ships reduces slot cost as a result of economy of scale, the larger ships can only be efficiently utilized if there is sufficient cargo support the ships size. In view of very limited ships over 10K TEUs deployed on Asia-USWC, larger ships are not expected to be optimal for USEC which imports a smaller volume.

**3. If there's increase of imbalance, what would you think the trigger would be?**

The trigger could be an increased air draft in NY/NJ, significant inland network improvement linking other USEC deep water ports to the consumer heartland, any congestion or union strike on the USWC ports or, in the medium term, the trade volume growth outpaces the growth of railway network capacity from USWC to the inland.

**4. Would you give a rough estimation in percentage of how much container transportation would shift from Asia-US West Coast route to Asia- US East Coast route via Panama Canal?**

It is difficult to have estimation especially in view of the challenging market conditions. Any deployment change relating to Asia-USEC via Panama made may be more a result of compromise to the overcapacity rather than the rational decision based on the fundamentals. In view of the fact that Asia-USEC via Panama takes about 25-30% of Asia-US imports, the % split could increase moderately to 30-35% in near term.

**5. What is your view on the challenges that concerning the Panama Canal and the expansion project?**

The potential capability of accommodating ships up to 12-13K TEUs may not be fully utilized in short term. In addition, as delay of transit was often seen before, the time required for the large ships to transit the Canal would remain to be further tested in practice.

**6. As aforementioned, if we assume the container transportation volume would increase via Panama Canal route. Would you think the ports on the US East Coast would be ready for the increase of volume? Would there be any constraints?**

Air draft at NY/NJ is being addressed, although the current plan, jacking-up the bridge, is expected to be completed in 2019. Before that can be done, if larger ships are to be deployed to call other USEC ports, deepening of some USEC ports may be required. One other key constraint are the inland connection as currently the railway network needs to be further developed.

**7. Would you give a rough estimation on the future toll fee via the Panama Canal?**

This is a commercial decision which needs to be balanced between required return for the investment of the expansion program and competition for volume to transit the canal. Unfortunately I cannot put a figure on the estimated increase of canal fee.

**8. As we know that US has efficient intermodal system between US East Coast to US West Coast, what is your view on its competitiveness versus the expansion of Panama Canal that larger container ships could directly call US East coast ports.**

According to many shippers' feedback, a slightly longer delivery time (Asia-USEC via Panama) is not a big problem as long as the delivery is as scheduled. Therefore, the competition between the two modes is very much down to slot cost. Due to the air draft restriction in NY and requirement for inland network connecting other ports to the consumer base, the cost competitiveness of the Asia-USEC via Panama route remains to be seen.

**9. What is your opinion on container ship slow steaming? Would it defeat the purpose of transit via Panama Canal expansion given the fact that it is already 2-3 days longer when Asia-USEC transit via Panama Canal compare to Asia-USWC with intermodal system?**

Asia-USEC transit via Panama takes 2-3 days longer than Asia-USWC with inland intermodal transport. Despite the longer transit time, it is not expected as a big issue as shippers focus more on reliability than shorter delivery time. The Asia-USEC via Panama route actually gives more room for slow steaming due to the longer voyage time.

**10. As an industry analyst, would you take such significant project into your forecast? Could you briefly describe your forecast methodology?**

As mentioned, it is expected to carry considerable impacts on both the demand and supply sides of container shipping. On demand side, the key consideration is the volume shift from Asia-USWC to Asia-USEC via Panama. On the supply side, it mainly concerns the upsizing of the ships deployed on Asia-USEC via Panama and the implied cascading effects on other sizes.

- 1. The Panama Canal Expansion will definitely have a significant impact on the shipping industry, container sector especially. Do you see this impact affecting your company business?**

Yes, definitely will affect our business.

- 2. What would be the impact on your company?**

Some of Originally import volume through west-coast via railway to east regions will change to direct east-coast call .Ships calling east coast will be upgraded .Transport of East coast transit will be decreased

- 3. What is your opinion on the trade balance between transpacific routes Asia-US West Coast and Asia- US East Coast via Panama Canal? Do you see a big shift from transpacific route Asia-US West Coast to the latter once the expansion is done?**

Currently, the volume of east coast transit accounts for 25% of total transpacific volume, and 75% for west coast transit. There will be a shift, but we did not foresee a big shift from west-coast transit to east –coast after expansion is done.

Reasons:

- Transit time of west coast is about 2 weeks, transit time of west coast via railway serves for east regions is about 6-7 days after discharge from west coast. But it's about 4 weeks for east coast transit; at this point it is not competitive for east coast transit.

- Based on current volume distribution , regional Distribution Centers and railway service are established and especially made for customers who located in east regions ,unless there is a

Big decrease in transport cost made customers change to pick up containers at east coast, otherwise the shift is not significant

- 4. Would this shift have any impact on your company business? If so what would the impacts are and what are your strategies to deal with this shift?**

Upgrade some of ships, and invest service depends on market.

- 5. Once the expansion is done, the competition among US ports would increase to a higher scale, port on the US East Coast would want to receive the bigger ships that able to transit via expanded Panama Canal. As a shipping company would receive any incentive offer from any of the US ports so to have your ships calling their ports?**

Not sure at this moment

**6. What is your opinion on container ship slow steaming? Would it defeat the purpose of transit via Panama Canal expansion given the fact that it is already 2-3 days longer when Asia-USEC transit via Panama Canal compare to Asia-USWC with intermodal system?**

As some of container lines like MAERSK and CMA CGM which are leaders of shipping lines now place slow steaming strategy to some of their trade strings. As sake of cost saving and eco-friendly, this is a trend for container business .But ,shipping lines will balance their services between slow steaming and normal scheduling based on customer preference .

For example, each of top ten carries owns about 8-10 strings of FE-EU service whatever in co-service or independent running ,but there is no possible to slow down all strings of FE-EU service from owners point of views , they will choose one or two strings for slow steaming which normally as backup services ,but they will remain normal speed for most competitive service for example daily MAERSK ,or AE service of CMA.

This also apply to transit via Panama Canal ,there are always customers stay with fast delivery and against slow steaming.

**1. As an expert in the field, what was your initial opinion/view regards to the Panama Canal Expansion Project?**

Originally I considered the expansion as a necessity to absorb the admittedly increased number of ships that use the Canal. The delays due to traffic in the Canal should be reduced while the fact that slightly bigger ships would be able to use the Canal seemed quite promising for trade.

**2. Do you see any trend which might trigger the imbalance? For instance, once the expansion finished, most of the deployed ships on transpacific routes would shift to Asia- US East Coast route via Panama Canal (especially the ones currently deployed between Asia-US West Coast routes)?**

Depending on the Sector in question, we should assume bigger or smaller changes in trade patterns. Providing the necessary infrastructure in US East Coast ports is built, container ships for instance may shift their trade patterns to some extent. Crude tankers on the other hand are less likely to be affected. Dry-bulk as well may go through some changes but nothing as extreme as in containers. The Canal is only one part of the equation. The infrastructure is another part. And last but not least, in order for the Canal to be chosen, it should serve a specific trade between 2 regions that cannot be serviced cheaper with other transport means (pipelines, railways etc)

**3. If there's increase of imbalance, what would you think the trigger would be?**

I doubt there will be an imbalance in store. The market will always balance itself in the end as needed and simply because a new trade route is available, trade will not automatically shift unless there are realistic needs. In case there is indeed a change, I believe the main trigger would be either the possibility of procuring resources at a lower cost or the forceful termination of a current trade (for instance civil unrest in Brazil may disrupt raw material exports to USAC and create a new route from Oceania to USAC through the Canal)

**4. Would you give a rough estimation in percentage of how much container transportation would shift from Asia-US West Coast route to Asia- US East Coast route via Panama Canal?**

It would really depend on how many ports would be able to service bigger container ships as well as whether using the Canal would make sense from an economic point of view versus using the US rail. With the Panama Canal Authorities ready to shoot the tariffs through the roof it is really hard to predict at this point.

**5. What is your view on the challenges that concerning the Panama Canal and the expansion project?**

The Canal started construction in 1881 and was completed in 1914 at a time when the technological means were nowhere as efficient as what they have at their disposition today. The main challenges in my opinion would be environmental rather than constructual. The expansion of the Canal is partially aimed at servicing a bigger amount of ships per day. The environmental implications from the increase in traffic could easily be overlooked as the potential economic profit takes precedent.

- 6. As aforementioned, if we assume the container transportation volume would increase via Panama Canal route. Would you think the ports on the US East Coast would be ready for the increase of volume? Would there be any constraints?**

Given the recent recession and its effect on global trade, whether there will be enough cargo shipped through the Canal to justify the millions of \$ cost needed to deepen the US East Coast ports remains to be seen. The main constraint right now seems to be the financing of the infrastructure upgrades. In most projects, once there is enough money, times can be adjusted to meet any deadline. However, as most ports have been seeking federal funding for the cost of harbor-deepening at a time when public spending is strained at best, it remains to be seen whether how many ports will indeed move forward with the planned upgrades. Last but not least, in cases of neighbor ports, it may not make economic sense to invest in all of them as there will not be enough cargo for all.

- 7. Would you give a rough estimation on the future toll fee via the Panama Canal?**

It is quite unclear at this moment what the future tolls will be. The Canal Authority has already showed signs of an almost unreasonable and unfair increase in tolls for most ships except containerships, but at the end of the day it will be the users that will shape up the tolls by using or rejecting the Canal if the tolls are too high.

- 8. As we know that US has efficient intermodal system between US East Coast to US West Coast, what is your view on its competitiveness versus the expansion of Panama Canal that larger container ships could directly call US West coast ports.**

After the expansion, larger container ships will be able to transit the Canal and call the East ports, however whether the Canal will be more competitive compared to the US intermodal system will be determined by a variety of factors. To begin with, at this point, the Canal is less costly but as mentioned earlier this may change as the pricing for larger ships is yet to be announced. In addition, since the Intermodal system is vulnerable to union strikes or congestions at various choke points (ports, highways, railways) the Canal is generally viewed as more reliable. However, in recent history, quite often the Canal itself has been a major chokepoint with ships waiting more than 24h to transit. Although the 3<sup>rd</sup> set of locks should solve this issue, the efficiency of the expanded Canal remains to be proved. Moreover, shipping through the Canal has a longer navigation time (21.6 days) than the U.S. Intermodal System route (18.3 days, depending on the carrier).

- 9. What is your opinion on container ship slow steaming? Would it defeat the purpose of transit via Panama Canal expansion given the fact that it is already 2-3 days longer when Asia-USEC transit via Panama Canal compare to Asia-USWC with intermodal system?**

The purpose of transit via the Panama Canal is to cut on costs as Intermodal is more expensive as of now. Transshipment through the Canal takes longer than using the US intermodal system and slow steaming only widens the discrepancy. Whether the actual cost of transiting the Canal will justify the longer waiting period remains to be seen. At the end of the day, from an importer's pov, longer voyage time means an additional inventory cost, additional insurance and more exposure to unforeseen events such as bad weather or a port strike.



**10. As an industry analyst, would you take such significant project into your forecast? Could you briefly describe your forecast methodology?**

Depending on the sector in question I would assign some or no weight to the forecast. Although for containership the expansion should definitely be factored in, for crude tankers for instance the effect is negligible and therefore I would not take it into account.

**1. As an expert in the field, what was your initial opinion/view regards to the Panama Canal Expansion Project?**

The expansion project will not be the game change of the shipping market.

**2. Do you see any trend which might trigger the imbalance? For instance, once the expansion finished, most of the deployed ships on transpacific routes would shift to Asia- US East Coast route via Panama Canal (especially the ones currently deployed between Asia-US West Coast routes)?**

No. The Canal expansion will increase the size of ships making the all-water transit. But this will not be enough to influence the number of TEUs transiting the canal, or being rerouted from West Coast to East Coast.

**3. If there's increase of imbalance, what would you think the trigger would be?**

I don't think there will be increase of imbalance.

**4. Would you give a rough estimation in percentage of how much container transportation would shift from Asia-US West Coast route to Asia- US East Coast route via Panama Canal?**

0%. It will not be enough to influence the number of TEUs transiting the canal, or being rerouted from West Coast to East Coast.

**5. What is your view on the challenges that concerning the Panama Canal and the expansion project?**

Toll fee increase, competition from intermodal network, constrains on NJNY port.

**6. As aforementioned, if we assume the container transportation volume would increase via Panama Canal route. Would you think the ports on the US East Coast would be ready for the increase of volume? Would there be any constrains?**

Yes, ports on US east coast are planning expansion on their capacity and shall be able to handle the transportation volume. But the constrain is the Bayonne Bridge with the height of 45m.

**7. Would you give a rough estimation on the future toll fee via the Panama Canal?**

My estimation would be \$100 per TEU.

**8. As we know that US has efficient intermodal system between US East Coast to US West Coast, what is your view on its competitiveness versus the expansion of Panama Canal that larger container ships could directly call US East coast ports.**

Very strong! On average it takes 15-16 additional to reach East coast as compared to reach West coast and this does not count in the delay caused by the congestion on the Panama Canal. But, it takes only about 2 – 4 days for cargo to travel from Los Angeles to Chicago by rail. The key point to note is that whether its now or 2015 after the canal expansion, importers

who want their goods to be shipped faster will prefer liner's who call West coast ports and the ports on the east coast are having a significant disadvantage.

- 9. What is your opinion on container ship slow steaming? Would it defeat the purpose of transit via Panama Canal expansion given the fact that it is already 2-3 days longer when Asia-USEC transit via Panama Canal compare to Asia-USWC with intermodal system?**

Make east coast via Panama Canal even less competitive compared to west coast.

- 10. As an industry analyst, would you take such significant project into your forecast? Could you briefly describe your forecast methodology?**

Yes. But results show less than expected effects on containership market.

- 1. The Panama Canal Expansion will definitely have a significant impact on the shipping industry, container sector especially. Do you see this impact affecting the port business?**

PortMiami anticipates a large increase in business as a result of the Panama Canal expansion and is well into the process of improving its facilities and services to accommodate the arrival of the larger ships.

- 2. What do you think the impact would be, in a detailed view?**

As PortMiami expands in tandem with the Panama Canal, projections show an increase from 847,249 TEUs (2010) in cargo throughput to somewhere in the range of 1.7 – 3.3 million TEUs (2035). Cruise passenger projections show an increase from 4.1 million passengers (2010) to 5.9 million (2035).

- 3. What are the strategies you prepared to deal with this impact?**

PortMiami is currently in the process of a large-scale improvement of its cargo facilities. The Port has received Federal approval to begin a deep dredge project, increasing the depth of the Port's South Channel to 50-feet, and is in the planning stages of the project. To further prepare for the increased size of the new ships, the Port is currently in the process of procuring new Super-Post-Panamax cranes, adding to those already present. A reconstructed rail system is on pace for completion by early 2013, which will include an inland distribution center. With this development, in addition to the May 2014 completion of the PortMiami tunnel that will connect the Port to the interstate highway system, cargo will be able to move more efficiently to and from the Port while reducing downtown traffic. There are also plans to consolidate facilities to maximize the efficiency of the cargo area.

- 4. What is your opinion on the trade balance between transpacific routes Asia-US West Coast and Asia- US East Coast via Panama Canal? Do you see a big shift from transpacific route Asia-US West Coast to the latter once the expansion is done?**

Currently, a large percentage of Florida's imported goods arrive via rail from the ports in Los Angeles and Long Beach. Through a combination of PortMiami's planned improvements and an expanded, more efficient Panama Canal, we anticipate an estimated 10 percent shift in cargo ships arrivals from Asia to the East Coast.

- 5. Would this shift have any impact on the port business? If so what would the impacts are and what are your strategies to deal with this shift?**

Since PortMiami is one of only a few ports that will have sufficient depth to handle Super-Post-Panamax ships, and the only one south of Virginia, we anticipate a significant positive impact on Port business. In terms of specific numbers, as in question 2, we are forecasting a large increase to the range of 1.7 – 3.3 million TEUs by 2035. Also as mentioned before, PortMiami is well on its way to being able to handle these shifts in business by way of improved intermodal system.

- 6. Once the expansion is done, the competition among US ports would increase to a higher scale, what are the advantages you have over the other US ports? Especially when compared with your neighbor ports.**

The advantages that PortMiami would have over other US ports would be the deeper 50-foot channel, the additional Super-Post-Panamax cranes, the intermodal yard with connections to nearby rail yards, the Port's close proximity to extensive warehousing, and the Port Tunnel which will create a direct connection to the interstate highway system.

- 7. If interviewee is a USEC port – how would you see the advantages you hold when comparing yourself to the USWC ports? If the “shift” ever happens, being able to accommodate New Panamax ship transit via the expanded Panama Canal what are your strategies to attract more volume on your side?**

The lower cost of shipping to Miami than a US West Coast port is a key factor, which will help attract more business. We feel that our proximity to the Caribbean and Latin America will help increase cargo traffic through PortMiami. Additionally, the rail and roadway infrastructure improvements will facilitate import/export from Midwestern US states.

- 8. Assuming container volumes on the Panama Canal route increase, which US East Coast ports are likely to see the biggest increases in container volumes and why?**

For all of the previously stated reasons, we believe PortMiami will see the largest increase in container traffic. Norfolk (Virginia) and New York are also expected to see an increase in container volume. Due to their current deep draft, they are already able to receive larger ships. New York has some height restrictions for ships, due to interference with bridges.

- 9. Questionnaire on the port competitiveness: scale 1-5 (1= negative, not competitive in this aspect at all; 2= on the low side, not very competitive in this aspect; 3= neutral; 4=on the upper side, competitive in this aspect; 5= positive, extremely competitive in this aspect.)**

Note: Our response below is based on availability of PortMiami's key infrastructure components, which are mostly scheduled to be completed by the time the Panama Canal's expansion is complete.

- Geographical location of the port (5)
- Maritime connections (5)
- Physical infrastructure (5)
- Hinterland connectivity (5)
- Road transport connectivity (5)
- Rail transport connectivity (5)
- Range of services provided (5)
- Quality of the services (5)
- Environmental management (5)
- Port communication platform (5)

## Feed Back from Port of Seattle – Ms. LaTonja Brown

“The statement the port uses in terms of the Panama Canal.

**Large-scale changes in trade patterns should not be taken as a forgone conclusion.** The canal expansion is a significant milestone. Yet it should not be taken as a foregone conclusion that the expansion in and of itself will result in large-scale changes in trade patterns. It is far from certain there will be a large demand for an expanded, all-water route via Panama. In fact, some say the greatest part of the shift to East Coast ports as part of shippers’ supply chain diversification strategies has already occurred. In fact, the Suez Canal currently enables post-Panamax ships to provide an all-water route between Asia and East Coast ports. Post-2014 cargo volumes through the canal will be subject to many variables, including the uncertain impact of canal fees, the price of fuel, and inventory carrying costs. This makes forecasting the effects of the expansion difficult. “

## Appendix

### Interview Questions:

Interview questions – Field experts/Consultants:

1. As an expert in the field, what was your initial opinion/view regards to the Panama Canal Expansion Project?
2. Do you see any trend which might trigger the imbalance? For instance, once the expansion finished, most of the deployed ships on transpacific routes would shift to Asia- US East Coast route via Panama Canal (especially the ones currently deployed between Asia-US West Coast routes)?
3. If there's increase of imbalance, what would you think the trigger would be?
4. Would you give a rough estimation in percentage of how much container transportation would shift from Asia-US West Coast route to Asia- US East Coast route via Panama Canal?
5. What is your view on the challenges that concerning the Panama Canal and the expansion project?
6. As aforementioned, if we assume the container transportation volume would increase via Panama Canal route. Would you think the ports on the US East Coast would be ready for the increase of volume? Would there be any constraints?
7. Would you give a rough estimation on the future toll fee via the Panama Canal?
8. As we know that US has efficient intermodal system between US East Coast to US West Coast, what is your view on its competitiveness versus the expansion of Panama Canal that larger container ships could directly call US East Coast ports.
9. What is your opinion on container ship slow steaming? Would it defeat the purpose of transit via Panama Canal expansion given the fact that it is already 2-3 days longer when Asia-USEC transit via Panama Canal compare to Asia-USWC with intermodal system?
10. As an industry analyst, would you take such significant project into your forecast? Could you briefly describe your forecast methodology?

## Interview Questions – Shipping Companies/Liners

1. The Panama Canal Expansion will definitely have a significant impact on the shipping industry, container sector especially. Do you see this impact affecting your company business?
2. What would be the impact on your company?
3. What are the strategies you prepared to deal with this impact?
4. What is your opinion on the trade balance between transpacific routes Asia-US West Coast and Asia- US East Coast via Panama Canal? Do you see a big shift from transpacific route Asia-US West Coast to the latter once the expansion is done?
5. Would this shift have any impact on your company business? If so what would the impacts are and what are your strategies to deal with this shift?
6. Once the expansion is done, the competition among US ports would increase to a higher scale, port on the US East Coast would want to receive the bigger ships that able to transit via expanded Panama Canal. As a shipping company would receive any incentive offer from any of the US ports so to have your ships calling their ports?
7. What is your opinion on container ship slow steaming? Would it defeat the purpose of transit via Panama Canal for faster delivery?



## Interview Questions – U.S. Ports

1. The Panama Canal Expansion will definitely have a significant impact on the shipping industry, container sector especially. Do you see this impact affecting the port business?
2. What do you think the impact would be, in a detailed view?
3. What are the strategies you prepared to deal with this impact?
4. What is your opinion on the trade balance between transpacific routes Asia-US West Coast and Asia- US East Coast via Panama Canal? Do you see a big shift from transpacific route Asia-US West Coast to the latter once the expansion is done?
5. Would this shift have any impact on the port business? If so what would the impacts are and what are your strategies to deal with this shift?
6. Once the expansion is done, the competition among US ports would increase to a higher scale, what are the advantages you have over the other US ports? Especially when compare with you neighbor port \_\_\_\_\_.
7. If interview USWC ports – how would you see the advantages you hold when compare to the ports from USEC? If the “shift” ever happens, what are your strategies to keep the volume on your side?
8. If interview USEC ports – how would you see the advantages you hold when compare to the ports from USWC? If the “shift” ever happens, being able to accommodate New Panamax ship transit via the expanded Panama Canal what are your strategies to attract more volume on your side?
9. Questionnaire on the port competitiveness: scale 1-5 (1= negative, not competitive in this aspect at all; 2= on the low side, not very competitive in this aspect; 3= neutral; 4=on the upper side, competitive in this aspect; 5= positive, extremely competitive in this aspect.)
  - Geographical location of the port
  - Maritime connections
  - Physical infrastructure
  - Hinterland connectivity (USEC)
  - Road transport connectivity (USEC)
  - Rail transport connectivity (USEC)
  - Range of services provided
  - Quality of the services
  - Environmental management
  - Port communication platform

## Interview Questions – Panama Canal Authority

1. The Panama Canal Expansion will definitely have a significant impact on the shipping industry, what is your view on the impact? Which shipping sector would be affected the most in your opinion?
2. Would the most affected shipping sector matter to Panama Canal?
3. What is your opinion on the trade balance between transpacific routes Asia-US West Coast and Asia- US East Coast via Panama Canal? Do you see a big shift from transpacific route Asia-US West Coast to the latter once the expansion is done?
4. What would be the biggest impact on Panama Canal from this big shift?
5. Is Panama Canal being 100% ready for the increase of volume?
6. What are the strategies you prepared to deal with it?
7. Once the expansion is done, the competition among US ports would increase to a higher scale, port on the US East Coast would want to receive the bigger ships that able to transit via expanded Panama Canal. As Panama Canal Authority, what is your view on this?
8. Would high competitiveness of US East Coast ports benefit Panama Canal? In which sense?
9. What are the incentives you could offer to shipping lines to transit via Panama Canal to USEC instead of free route via Cape of Good Hope?
10. What is your opinion on container ship slow steaming? Would it defeat the purpose of transit via Panama Canal for faster delivery?