SESSION V: Continuing Evolution of Marine Terminal Design and Cargo Handling Systems

Presented By
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Williamsburg, Virginia
International Port External Industry Pressures Driving Today’s Logistics
More than 98% of everything we consume, wear, eat, drive and construct is brought to us via ships through the North American port system.
Relationship Between US Trade and US Prosperity – 1930 to 2005
(US Trade & Gross Domestic Product - $ Billions)

Source: USDOT Based on USDOC Data
Vessel Cargo Handling Circa 1955
US Navy Fast Frigate Circa 2045
What We Know Today... Will Surely Be Different Tomorrow!
To Be Competitive Today...
Marine/Intermodal Terminals Must Reduce Throughput Cost & Increase Cargo Velocity Securely and as Stewards of the Environment
Who Decides Where the Cargo Goes?
Who Owns & Controls Today’s Cargo?

• The “Shipper” or “Beneficial Cargo Owner” (BCO)

• BCO = Importer of record, the entity that physically takes possession of cargo at destination and does not act as a third party in the movement of such goods

• The person or company who is usually the supplier or owner of commodities shipped.
The Speed of Shipper – BCO Decisions Today:

**E-Commerce Tools Speed Trade Decisions Instantly:**

- **Freight Planning and Optimization** - Electronic Tender Management Tools: Rapidly gather & analyze multiple freight logistics bids instantly.

- **Data Visibility** - Shipment data is available electronically via the Web or Desktop E-tools, in real-time or close to it.
Poll of the Top 1000 “Blue Chip” Multinational Shipper Priorities

- 38% Competitive Freight Rate
- 43% Schedule Reliability & Consistency
- 12% Transit Time & Speed
Today’s Logistics Truth:

“The customer wants more and is willing to pay less for it.”
Functional Classification of Global Maritime Cargoes

All Maritime Cargo
- General Cargo
  - Break Bulk: Sacks, Cartons, Crates, Drums, Pallets, Bags
  - Neo-Bulk: Lumber, Paper, Steel, Autos
  - Containerized: Containers, Lift On/Lift Off (Lo/Lo), Roll On/Roll Off (Ro/Ro)
- Bulk Cargo
  - Liquid Bulk: LNG, Petroleum, Molasses, Chemicals, Vegetable Oil
  - Dry Bulk: Grain, Sand & Gravel, Scrap Metal, Coal/Coke, Clinker, Fertilizer
What is the Value of a Single Container Load?

(Example 40 ft. Container, FEU)

<table>
<thead>
<tr>
<th>=</th>
<th>1,890 Cases</th>
<th>@ $25.50/Case</th>
<th>=</th>
<th>$48,195</th>
</tr>
</thead>
<tbody>
<tr>
<td>=</td>
<td>432,000 Packs</td>
<td>@ $4.00/Pack</td>
<td>=</td>
<td>$1,728,000</td>
</tr>
<tr>
<td>=</td>
<td>10,000 Pairs</td>
<td>@ $30/pair</td>
<td>=</td>
<td>$300,000</td>
</tr>
<tr>
<td>=</td>
<td>315 20” TVs</td>
<td>@ $299/TV</td>
<td>=</td>
<td>$94,185</td>
</tr>
</tbody>
</table>

Source: Virginia Port Authority
International Maritime Cargo Demand Trends
Global Shipping Routes Plotted by AIS GPS

2010 Busiest Routes:
(1) Panama Canal, (2) Suez Canal, (3) Shanghai Port

Shorter – Faster Arctic Ocean Route

2+ Months A Year Using Convoys

Half the Time & Distance
Emerging Markets Lead the Global Recovery

BRIC Countries

Including US & Canada

Source: IHS Global Insight – World Trade Service
A Turning Point in Global Economic History

The Advanced Economies Will Decline From 2/3 share of the Global Economy to a 1/3 Global Share. The Global Economy Will See Higher Average Pace of Growth in the Future...

Source: IMF - Forecast by TD Economics, December 2009
Growth in Global Merchandise Trade
(Intra Europe Trade Excluded)

(Trillions of U.S. dollars)

Source: IHS Global Insight – World Trade Service
2025 World Container Port Market Demand
(Millions of TEUs)

10% CAGR from 1990 - 2008
(9.1% ) global volume loss for 2009
Recovery in 2010 with 14.8% growth
50% projected rise 2009-2015

Source: Drewry Shipping Consultants October 2011
Historical Global Container Market Demand (Millions of TEUs)

North American Growth Lags Other Global Regions

Source: Drewry Shipping Consultants
Global Container Demand – Millions of TEUs

(2012 Growth = 8.1%)

Source: Drewry Shipping Consultants
Southeast Asian Manufacturing Centroid Shift

Current Inbound U.S. Cargo Flow

Expanded Asian Panama Canal 2014 Flows

Eastbound: All Water Flow

Eastbound: US Intermodal Rail Flow
Southeast Asian Manufacturing Centroid Shift

With Manufacturing Centroid Shifts Into Vietnam and/or India, The North American East Coast will See Dramatically More Westbound Suez Traffic
2014 Suez Canal Pricing Strategy:
The Suez Canal has an opportunity to competitively alter global shipping patterns by undercutting 2014/15 Panama Canal new pricing strategy.
The Growing Asian Import Trade Challenge
The World’s Top 20 Ports Posted a 15.1% Volume Growth in 2010 (2009 Rank in Brackets)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Port</th>
<th>Mteu</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shanghai</td>
<td>29.07</td>
<td>16%</td>
</tr>
<tr>
<td>2</td>
<td>Singapore</td>
<td>28.43</td>
<td>10%</td>
</tr>
<tr>
<td>3</td>
<td>Hong Kong</td>
<td>23.53</td>
<td>12%</td>
</tr>
<tr>
<td>4</td>
<td>Shenzhen</td>
<td>22.51</td>
<td>23%</td>
</tr>
<tr>
<td>5</td>
<td>Busan</td>
<td>14.21</td>
<td>19%</td>
</tr>
<tr>
<td>6</td>
<td>LA/LB</td>
<td>14.10</td>
<td>19%</td>
</tr>
<tr>
<td>7</td>
<td>Ningbo</td>
<td>13.14</td>
<td>25%</td>
</tr>
<tr>
<td>8</td>
<td>Guangzhou</td>
<td>12.55</td>
<td>12%</td>
</tr>
<tr>
<td>9</td>
<td>Qingdao</td>
<td>12.01</td>
<td>17%</td>
</tr>
<tr>
<td>10</td>
<td>Dubai</td>
<td>11.60</td>
<td>4%</td>
</tr>
<tr>
<td>11</td>
<td>Rotterdam</td>
<td>11.14</td>
<td>14%</td>
</tr>
<tr>
<td>12</td>
<td>Tianjin</td>
<td>10.08</td>
<td>16%</td>
</tr>
<tr>
<td>13</td>
<td>Kaohsiung</td>
<td>9.18</td>
<td>7%</td>
</tr>
<tr>
<td>14</td>
<td>Port Klang</td>
<td>8.87</td>
<td>21%</td>
</tr>
<tr>
<td>15</td>
<td>Antwerp</td>
<td>8.47</td>
<td>16%</td>
</tr>
<tr>
<td>16</td>
<td>Hamburg</td>
<td>7.94</td>
<td>13%</td>
</tr>
<tr>
<td>17</td>
<td>Tg Pelepas</td>
<td>6.53</td>
<td>8%</td>
</tr>
<tr>
<td>18</td>
<td>Xiamen</td>
<td>5.82</td>
<td>24%</td>
</tr>
<tr>
<td>19</td>
<td>Dalian</td>
<td>5.24</td>
<td>15%</td>
</tr>
<tr>
<td>20</td>
<td>Laem Chabang</td>
<td>5.19</td>
<td>12%</td>
</tr>
</tbody>
</table>

2010: 260 Million TEUs
2009: 226 Million TEUs

This Recovery Reflects the Rebound in Global Container Trade Due Primarily to Intra-Asia Volumes and Supply Chain Inventory Restocking.

Source: Alphaliner Newsletter Volume 2011 Issue 5
Of the 10 busiest ports in the world in 2010, Nine are in Asia; of the top 10, Six are on the Chinese mainland. The Port of Shanghai is No. 1, and The Port of Singapore is No. 2.
Singapore vs. Shanghai Container Volumes
2000 through 2010 Volumes in Millions of TEUs

- **Singapore**: 5.2% CAGR
- **Shanghai**: 17.9% CAGR

**Total 2010 US Port Volume (14.7m)**

Source: Alphaliner Newsletter Volume 2011 Issue 2
Full Global Recovery:

Singapore-based PSA posted a 14.4 percent increase in throughput in 2010.

65.12 million TEUs handled by the PSA Group, a new record for the Singapore Port Operator PSA International. PSA reported its net profit for 2010 rose 20.8 percent to S$1.2 billion.
Dramatic Market Shifts are Underway that will Affect the Very Core of US Trade and Transportation

<table>
<thead>
<tr>
<th>Year</th>
<th># 1</th>
<th># 2</th>
<th># 3</th>
<th># 4</th>
<th># 5</th>
<th># 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>USA/CA</td>
<td>USA/CA</td>
<td>Japan</td>
<td>Germany</td>
<td>USA/CA</td>
<td>USA/CA</td>
</tr>
<tr>
<td>2010</td>
<td>USA/CA</td>
<td>Japan</td>
<td>CHINA</td>
<td>Japan</td>
<td>USA/CA</td>
<td>USA/CA</td>
</tr>
<tr>
<td>2020</td>
<td>USA/CA</td>
<td>CHINA</td>
<td>CHINA</td>
<td>Japan</td>
<td>INDIA</td>
<td>INDIA</td>
</tr>
<tr>
<td>2030</td>
<td>USA/CA</td>
<td>CHINA</td>
<td>CHINA</td>
<td>INDIA</td>
<td>INDIA</td>
<td>INDIA</td>
</tr>
<tr>
<td>2040</td>
<td>USA/CA</td>
<td>CHINA</td>
<td>CHINA</td>
<td>INDIA</td>
<td>INDIA</td>
<td>INDIA</td>
</tr>
<tr>
<td>2050</td>
<td>USA/CA</td>
<td>CHINA</td>
<td>CHINA</td>
<td>INDIA</td>
<td>INDIA</td>
<td>INDIA</td>
</tr>
</tbody>
</table>

Source: HIS Global Insight
China: New World Economic Engine

Population:
US: 307 million
China: 1,338 million
(1/5 World)

The number of Chinese children in elementary school is equivalent to the total US population.
Shanghai International Shipping Center
Yangshan Deep Port & Logistics Park

New Port City

New Logistics Park

20 Mile New Port Access Bridge Constructed in 3 yrs

54 New Berths
Shanghai International Shipping Center
Yangshan Deep Port - 20 Mile Bridge Access

“Second Longest Ocean Bridge in the World”
Shanghai Yangshan Deep-Water Harbour
Yangshan Deep Port – 54 Berths East China Sea
New Emerging Economic Global Drivers

(BRIC → ASEAN 2014) + India
Huge Population Growth Over Next Decade
Top 10 countries to add 422 million people by 2020

<table>
<thead>
<tr>
<th>Country</th>
<th>2010</th>
<th>2020</th>
<th>Nominal Change</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>1,173,108,018</td>
<td>1,326,093,247</td>
<td>152,985,229</td>
<td>13.0%</td>
</tr>
<tr>
<td>China</td>
<td>1,330,141,295</td>
<td>1,384,545,220</td>
<td>54,403,925</td>
<td>4.1%</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>88,013,491</td>
<td>120,420,018</td>
<td>32,406,527</td>
<td>36.8%</td>
</tr>
<tr>
<td>USA</td>
<td>310,232,863</td>
<td>341,386,665</td>
<td>31,153,802</td>
<td>10.0%</td>
</tr>
<tr>
<td>Nigeria</td>
<td>152,217,341</td>
<td>182,344,492</td>
<td>30,127,151</td>
<td>19.8%</td>
</tr>
<tr>
<td>Pakistan</td>
<td>177,276,594</td>
<td>204,274,257</td>
<td>26,997,663</td>
<td>15.2%</td>
</tr>
<tr>
<td>Congo</td>
<td>70,916,439</td>
<td>95,605,489</td>
<td>24,689,050</td>
<td>34.8%</td>
</tr>
<tr>
<td>Indonesia</td>
<td>242,968,342</td>
<td>267,532,450</td>
<td>24,564,108</td>
<td>10.1%</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>158,065,841</td>
<td>180,753,264</td>
<td>22,687,423</td>
<td>14.4%</td>
</tr>
<tr>
<td>Brazil</td>
<td>201,103,330</td>
<td>222,607,506</td>
<td>21,504,176</td>
<td>10.7%</td>
</tr>
</tbody>
</table>
# Asian Hourly Wage Rates in US Dollars

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>1.56</td>
<td>1.63</td>
<td>1.83</td>
<td>2.16</td>
<td>2.51</td>
<td>2.90</td>
<td>3.29</td>
<td>3.66</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>7.24</td>
<td>7.27</td>
<td>7.42</td>
<td>7.64</td>
<td>7.95</td>
<td>8.27</td>
<td>8.68</td>
<td>9.11</td>
</tr>
<tr>
<td>India</td>
<td>0.50</td>
<td>0.49</td>
<td>0.53</td>
<td>0.57</td>
<td>0.61</td>
<td>0.66</td>
<td>0.72</td>
<td>0.78</td>
</tr>
<tr>
<td>Indonesia</td>
<td>0.51</td>
<td>0.51</td>
<td>0.59</td>
<td>0.67</td>
<td>0.77</td>
<td>0.88</td>
<td>0.98</td>
<td>1.08</td>
</tr>
<tr>
<td>Japan</td>
<td>24.30</td>
<td>26.23</td>
<td>22.59</td>
<td>21.70</td>
<td>20.41</td>
<td>19.81</td>
<td>19.51</td>
<td>18.73</td>
</tr>
<tr>
<td>South Korea</td>
<td>13.21</td>
<td>11.27</td>
<td>13.31</td>
<td>14.54</td>
<td>16.49</td>
<td>18.70</td>
<td>20.91</td>
<td>23.38</td>
</tr>
<tr>
<td>Malaysia</td>
<td>2.99</td>
<td>2.80</td>
<td>2.97</td>
<td>3.18</td>
<td>3.38</td>
<td>3.58</td>
<td>3.80</td>
<td>4.03</td>
</tr>
<tr>
<td>Philippines</td>
<td>1.65</td>
<td>1.59</td>
<td>1.67</td>
<td>1.77</td>
<td>1.87</td>
<td>1.99</td>
<td>2.11</td>
<td>2.24</td>
</tr>
<tr>
<td>Singapore</td>
<td>13.18</td>
<td>12.86</td>
<td>13.18</td>
<td>13.85</td>
<td>14.69</td>
<td>15.59</td>
<td>16.53</td>
<td>17.54</td>
</tr>
<tr>
<td>Taiwan</td>
<td>7.24</td>
<td>6.56</td>
<td>6.95</td>
<td>7.19</td>
<td>7.50</td>
<td>7.85</td>
<td>8.19</td>
<td>8.52</td>
</tr>
<tr>
<td>Thailand</td>
<td>1.08</td>
<td>1.06</td>
<td>1.04</td>
<td>1.08</td>
<td>1.19</td>
<td>1.27</td>
<td>1.35</td>
<td>1.42</td>
</tr>
<tr>
<td>Vietnam</td>
<td>0.81</td>
<td>0.86</td>
<td>0.87</td>
<td>0.89</td>
<td>0.97</td>
<td>1.03</td>
<td>1.07</td>
<td>1.10</td>
</tr>
</tbody>
</table>

Source: JOC, IMA Asia – Asia Forecasts 2010
Majority of New Indian Container Port Capacity Favors Southeast Asian Continual Centroid Shift to the WEST
Ho Chi Minh City Regional New Port Container Terminal Development
(12 Port Terminals in 14 years)

VIETNAM – Has Become the Apparel Distribution Capital of the World – The “Apparel Shipper”

VIETNAM - Ho Chi Minh City, (Saigon) Bitexco Financial Tower
The Astounding Ocean Marine Carrier Industry Comeback
2011 Top Containership Carriers
(Monthly Change in Operating Capacity (TEUs))

Source: Alphaliner Newsletter Volume 2011 Issue 16
### 2012 Top 20 Global Ocean Carrier Fleets

(% Share of World Fleet – June 2012)

**APM-Maersk is 16.2% of the World Fleet (2.66 M TEU)**

<table>
<thead>
<tr>
<th>Rank</th>
<th>Operator</th>
<th>TEU</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>APM-Maersk</td>
<td>2,658,921</td>
<td>16.2%</td>
</tr>
<tr>
<td>2</td>
<td>Mediterranean Shg Co</td>
<td>2,221,293</td>
<td>13.5%</td>
</tr>
<tr>
<td>3</td>
<td>CMA CGM Group</td>
<td>1,328,516</td>
<td>8.1%</td>
</tr>
<tr>
<td>4</td>
<td>COSCO Container L.</td>
<td>704,349</td>
<td>4.3%</td>
</tr>
<tr>
<td>5</td>
<td>Evergreen Line</td>
<td>650,205</td>
<td>4.0%</td>
</tr>
<tr>
<td>6</td>
<td>Hapag-Lloyd</td>
<td>642,291</td>
<td>3.9%</td>
</tr>
<tr>
<td>7</td>
<td>APL</td>
<td>611,619</td>
<td>3.7%</td>
</tr>
<tr>
<td>8</td>
<td>COSL</td>
<td>576,369</td>
<td>3.5%</td>
</tr>
<tr>
<td>9</td>
<td>Hanjin Shipping</td>
<td>541,466</td>
<td>3.3%</td>
</tr>
<tr>
<td>10</td>
<td>MOL</td>
<td>481,856</td>
<td>2.9%</td>
</tr>
<tr>
<td>11</td>
<td>OOCL</td>
<td>421,545</td>
<td>2.6%</td>
</tr>
<tr>
<td>12</td>
<td>NYK Line</td>
<td>419,696</td>
<td>2.6%</td>
</tr>
<tr>
<td>13</td>
<td>Hamburg Süd Group</td>
<td>415,337</td>
<td>2.5%</td>
</tr>
<tr>
<td>14</td>
<td>Yang Ming Marine Transport Corp</td>
<td>354,152</td>
<td>2.2%</td>
</tr>
<tr>
<td>15</td>
<td>K Line</td>
<td>348,566</td>
<td>2.1%</td>
</tr>
</tbody>
</table>

Source: Alphaliner Top 100 2012 Operated Fleets
2009 Carrier Losses: Container Ocean Carriers Suffered $52 Million/Day Average Loss

Shoals of Red Ink: $19 Billion in Losses in 2009
In 2009 the Ocean Carriers Lost $10 Billion Every Six Months

Jan-Sept 2009 vs 2008

Note: MSC’s US Import Volume was Flat Through the First Nine Months of 2009

Source: JOC Top 40 Container Lines, PIERS Global Intelligence Solutions
2010: Container Carriers Most Profitable Performance in History - $14B in Profit

2010: Total Revenues Rising 42%; Total Container Handlings Increased by 14%; Freight Rates Increased 26%

Source: Alphaliner Newsletter Volume 2011 Issue 16
2011: Carriers Reverse Direction

Main carriers: Operating Profits 2011 vs 2010 ( Ranked by Operating Margin %)

- 2011 Op Profit
- 2010 Op Profit
- 2011 Margin
- 2010 Margin

Source: Alphaliner Newsletter Volume 2012 Issue 14
Current Carrier Industry Earnings (EBIT) Profit/Loss and Margins 2008-2011

Source: Drewry’s Container Forecaster First Quarter 2012
Carrier Short-Term Funding Needs vs Cash
($ Million - End of 2011) Carrier Operating Margins are Improving

Source: Alphaliner – Volume 2012 Issue 15
North American Cargo Demand Trends
(Déjà vu Experience)
2011 Top 10 US Port Container Volume

(1,000s of TEUS)

Source: AAPA 2011 North American Container Traffic – Port Rankings
MARAD’s Top 10 US Port Historical Average Annual Growth Rates
( Last 15 Years: 1995 to 2010)

Savannah is the Fastest Growing Port in the US

Source: US Department of Transportation, BTS, PIERS as of 9/2010
(West Coast Ports Handle 63% of Imports)

Source: CSX Transportation May 12, 2011 - Director of Strategic Analysis
Transpacific Container Trade Recovery
(Millions of TEUs)

“Note the 2 to 1 Asian Import Imbalance”

Source: IHS – Global Insight - The Global Outlook – October 14, 2010
Transatlantic Container Trade Recovery

(Millions of TEUs)

Source: IHS – Global Insight - The Global Outlook – October 14, 2010
San Pedro Bay (POLA + POLB)
Container Volume Forecast

344% Increase by 2035
From 2009 Levels

Source: IHS Global Insight 2010 Forecast
In calendar 2010, 40-footers led year-over-year growth at 19.5 percent, followed by 20-footers at 19 percent and 53-footers, 16.2 percent.

Source: Intermodal Association of North America, 2012
U.S. Manufactured goods trade increased 11.7 percent year-over-year during calendar 2011, with exports up 11.3 percent and imports, 11.8 percent.
2011 US Agricultural Commodities

U.S. agricultural commodities trade increased 19 percent year-over-year during calendar 2011, with exports up 17.7 percent and imports, 20.9 percent.

Source: US Department of Commerce, US Census Bureau, Foreign Trade Div

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US Agricultural Trade Value Forecast

Source: USDA Economic Research Service - USDA Agricultural Projections to 2021
North American Emerging Mega-Regions

Future US Growth Areas

Midwest
Converging Mega Consumption Zones

Source: America 2050 Prospects - Regional Plan Association
If Chicago was a Port, it would be the largest in North America
CSX & NS National Expansion of Integrated Intermodal Rail Logistics Centers

Recent Midwest Intermodal Rail Hubs
Maritime Vessel Technology Trends
April 26, 1956

The deck of the *Ideal X* at Port Newark preparing for the historical sailing of the world’s first containership.

58 Modified 35-foot Truck Containers

In 1955 Malcolm McLean, sold McLean Trucking, and secured a bank loan of US$42 million to build the world's first container ship.

April 2006:

50 Year Anniversary of the Container
World Container Ship Evolution

1st Generation (Pre-1960 - 1970)
- Ideal X

- Full Cellular

3rd Generation (1985)
- Post Panamax

- Super Post Panamax

5th Generation (2000 - 2006)
- Ultra Post Panamax

6th Generation (2006 - 2012)

TEU Capacity
- 101 TEU – (58 - 35 ft Containers)
- 2,305 TEU
- 3,220 TEU
- 4,848 TEU
- 8,600 TEU
- 15,000+ TEU
Madison Maersk (3,928 TEUs) in the Panama Canal
(Current Max Panamax Vessel Approx. 4,800 TEUs)
Maersk’s New 30 Vessels (ordered) are 4 Times the Current Size of the Panama Canal & 1.5 times the Size of the Expanded Panama Canal

2013
Triple-E Maersk Class
18,000 TEU

2006
Emma Maersk Class
15,500 TEU

1997
Sovereign Maersk class
8,100 TEU

1996
Regina Maersk class
7,100 TEU

23 Containers Wide – 9 Tiers Above the Hatch
21,000 TEU Ultra Large Twin Engine Container Ship - 2011

23 Containers Wide

Source: Alphaliner Newsletter Volume 2011 Issue 4
### Containership Orders – Country of Build
(Orders Since January 2010)

<table>
<thead>
<tr>
<th>Country</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>S Korea</td>
<td>139</td>
</tr>
<tr>
<td>China</td>
<td>64</td>
</tr>
<tr>
<td>Taiwan</td>
<td>16</td>
</tr>
<tr>
<td>Philippines</td>
<td>12</td>
</tr>
<tr>
<td>Romania</td>
<td>4</td>
</tr>
<tr>
<td>Japan</td>
<td>2</td>
</tr>
<tr>
<td>Germany</td>
<td>1</td>
</tr>
</tbody>
</table>

**Source:** Alphaliner Newsletter Volume 2011 Issue 21

![Graph showing the percentage of orders by country.](image)

92%
Record New Container Ship Delivery > 10,000 TEUs
(11 Vessels now 13,000 to 14,000 TEUs)

132 New Containerships > 10,000 TEUs

Source: Alphaliner Volume 2012 Issue 14
The Size of Container Ships to Come
(Average Containership size by Trade Route)

Expect Much Larger Containerships

Source: Alphaliner Volume 2012 Issue 14
Largest Container Vessel to Dock at a North American Port – March 21, 2012

MSC Fabiola (12,562 TEUs) at the Port of Oakland Built in Korea 2010

**Length Overall (LOA):** 366.08M - 1,201 Ft  
**Breadth:** 48.2M – 158 Ft  
**Maximum water draft (fully loaded):** 15.50M - 50.85 Ft  
**Deadweight Tonnage:** 146,093 metric tons

Future Mega Container Vessel Characteristics:

- **Capacity = up to 22,000 TEUs**
- **Deck Stow:** 23 wide & 7-9 Containers above hatch
- **Length =** up to 1,445 ft (4.5 Football Fields)
- **Beam =** up to 194 ft
- **Deadweight Tonnage =** 220,000 Long Tons
- **Draft =** up to 54 ft

Far Exceeds the 2014/15 Panama Third Lane Capacity
Vessel Size Expansion - Terminal Impacts
(Port Terminal Infrastructure & Equipment Geometry Impacts)

Increased Terminal Throughput

Boom Outreach

Super Post Panamax 18,000 to 22,000 TEU

New Panamax (2014/15) 12,600 TEU

Current Panamax 4,800 TEU

Depths 48 to 54 ft

Height Above Deck

Storage Area Impacts

Source: Georgia Ports Authority and Vickerman & Associates
Future Container Vessel: NYK Super Eco Ship
Future Container Vessel: NYK Super Eco Ship

NYK Super Eco Ship 2030
Green Ship Design for the Future

Nominated for the Clean Innovation award at Nor-Shipping 2009

TOTAL CO₂ reduction 70%
Panama Canal Expansion: New Capacity
Panama Canal Historical Tonnage Traffic

Source: ACP Data
The Panama Canal Circa 1914
Panama Canal Current
Width: 13 Containers Across
Panama Canal Third Lane Expansion
Circa December 2014/January 2015
Panama Canal Expansion

More than 14,000 ships a year pass through the 50 mile 1914 manmade Link between the Pacific Ocean & Caribbean Sea carrying 275 million tons of Cargo and $100 billion in container shipping.

A $5.25 Billion Investment in a 3rd Set of Locks Equating to 16% of Panama’s National GDP

Source: ACP Data
Panama Canal Expansion
Program Components

Source: ACP Information
Panama Canal Transit & Tonnage Traffic
(Transits and PCUMS Tonnage 1914 to 2009)

Source: ACP Data
The Panama Canal is a Vital Link for US Grain Exports

Source: Fearnleys Research
A Larger Share of Other Vessels Will be Able to Transit the Canal - Fully Loaded

Crude Oil - 0% to 42%

LNG - 10% to 90%

Dry Bulk - 55% to 80%
Panama Canal Third Lane Expansion Capabilities

Source: ACP Expansion Project
The New Post Panamax Capacity Favors All - Water Service Routes with the Following Vessel Characteristics:

- **Vessel Capacity:** 9,000 to 10,000 TEUs
- **Vessel Draft:** 46 to 50 feet (tropical fresh water)
- **Required Port Channel Depths:** 50 to 54 feet
- **LOA:** 1,000 to 1,200 feet
- **Beam:** 140 to 160 feet

*The New Panama Canal Workhorse*
The Container Ship Colombo Express (8750 TEU)
Today Only The Port of Virginia Can Handle The New 2015 Panamax Vessels Fully Loaded

- **JAX**: 38 ft (4,500 TEU)
- **NY/NJ**: 42 - 45 ft
- **Savannah**: 44 - 47 ft (8,500 TEU)
- **Miami & Charleston**: 44 - 47 ft
- **By 2015:**
  - **NY/NJ**: 50 ft
  - **Miami**: 50 ft
  - **Baltimore**: 50 ft
- **By 2016:**
  - **Savannah**: 50 ft
  - **Charleston**: 50 ft
- **Norfolk**: 55 ft (authorized)
  - 10,000 to 12,500+ TEU

Source: Virginia Port Authority (VPA) October 2011
Port Authority of New York & New Jersey
Entrance Channel & Harbor Dredging Program
($1.6 Billion Program, Completion December 2014)
Raising of the Bayonne Bridge
(Estimated at $1 billion)

**Future** Clearance: 214 ft

**Current** Clearance: 155.3 ft

Maximum Vessel: 7,000 TEUs

Existing Level: 64 feet
Panama Canal
Future Transit
Revenues & Canal Alternatives
Typical Container Vessel Service Route
Asia to USEC: Weekly Service with 8 - 4,320 TEU Vessels
Generating 104 Yearly Transits and $150 million in Annual Canal Transit Fees

Source: ACP Data
### 2025 Summary of Canal’s Financial Results

(To 2025 In Millions of Dollars – Annual Fees)

<table>
<thead>
<tr>
<th>Financial Results</th>
<th>Year 2005</th>
<th>Year 2025</th>
<th>Annual average growth rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCUMS Tons</td>
<td>279</td>
<td>508</td>
<td>3.0%</td>
</tr>
<tr>
<td>Transit Revenue</td>
<td></td>
<td>6,101</td>
<td>8.9%</td>
</tr>
<tr>
<td>Other Revenues</td>
<td>92</td>
<td>125</td>
<td>1.5%</td>
</tr>
<tr>
<td>Total Revenues</td>
<td>1,209</td>
<td>6,227</td>
<td>8.5%</td>
</tr>
<tr>
<td>Operating Costs</td>
<td>444</td>
<td>1,016</td>
<td>4.2%</td>
</tr>
<tr>
<td>Fee per Net Ton</td>
<td>218</td>
<td>668</td>
<td>6.5%</td>
</tr>
<tr>
<td>Public Services Fees</td>
<td>2</td>
<td>2</td>
<td>0.0%</td>
</tr>
<tr>
<td>Depreciation</td>
<td>61</td>
<td>231</td>
<td>6.8%</td>
</tr>
<tr>
<td>Net Income</td>
<td></td>
<td>4,310</td>
<td>11.6%</td>
</tr>
</tbody>
</table>

**Source:** ACP Financial Data

**546% Increase**

**890% Increase**
Alternative “Dry Canal” Proposals to Counteract Anticipated Canal Fees/Costs

APM Terminals announced $1 billion Container Port in Costa Rica

China’s proposal: 136-mile “dry canal” (Pacific Port of Buenaventura & Atlantic Coast Port of Cartagena in Colombia.)
Non-Transit Panama Canal “Feeder Services” May Be the Real Boom from the Canal Expansion

Weekly Through Transits
Feeder Services – No Transit

Source: ACP and Compare, 2008 Data
Panama Maritime Authority Becomes A Major Transhipment Center

Port Development in Panama

Manzanillo International Terminal (MIT)

Colon Container Terminal

1996: 235 Thousand TEUs
2009: 4.23 Million TEUs
2015: 7.4 Million TEUs

Source: Panama Maritime Authority
Panama Canal Expansion Impacts: Prediction Scenarios
Panama Canal Vessel Deployments Will Determine New US Logistics Patterns

The Distance to New Orleans and Savannah Via the Panama Canal

A Competitive & Robust Landside Access to the Gateway Port’s Inland Market will be a Key Success Factor!
The Primary North American Competitor to the Panama Canal is the Class I Rail Intermodal System

(Potential Increased Service Offerings and System Capacity)

Source: USDOT Maritime Administration (MARAD) 2009
Post 2015 Expanded Canal: Predicting the Future Impacts for the US East & Gulf Coasts?

IF:
✓ West Coast Ports & Rail become/remain congested…
✓ East Coast Ports Accommodate the big ships…
✓ Canal Cost Remains Price Competitive with Suez…
✓ Cargo Trade Volumes Continue to Increase…
✓ Canal’s infrastructure keeps pace with Growth…

Then:
✓ Global Carriers will route as much traffic via the expanded Panama Canal as it can handle…
Post 2015 Expanded Canal: Predicting the Future Impacts for the US East & Gulf Coasts?

**IF:**

- Panama Canal Tolls are Set to Maximize Revenue and not Container Volumes…
- East Coast Ports *Can’t* Accommodate the big ships – Channel Draft & Terminal Impacts…
- Class I Railroads Exert Their “Pricing Flexibility”…
- All-Water Time is not competitive for High Value Time Sensitive Intermodal Landbridge Cargo…

**Then:**

- The Panama Canal Market Shift to the East and Gulf Coast May Not Occur at All!
Panama Canal Large Vessel Market Penetration into the US Midwest
Shanghai to North American Destination Transit Times:
(Ocean Transit and Rail Land-Bridge Routings in Days)

Source: Based on Prologis data
Panama Canal’s Designation of “Prime” and “Competitive” Canal Markets Destinations

The Autoridad Del Canal de Panama

Legend:
- Light Blue: Non-Canal Market
- Medium Blue: Competitive Area
- Dark Blue: Prime Canal Market

Transportation Options:
- Transpacific – Via Intermodal
- All Water via Suez Canal
- All Water via Panama Canal
Dramatic Market Penetration in 2015

Panama Canal **Economies of Scale** with permit
deeper market penetration into the US

Reachable Market: 46% of US Population

Reachable Market: 63% of US Population

4,000 TEU ship, all-water.

8,000 TEU ship, all-water.

Indiana at the Epicenter

West Coast Cost Advantage

East Coast Cost Advantage

Source: PB Consultants - CSX Transportation May 12, 2011 - Director of Strategic Analysis
Market Penetration - High Value Goods
($300,000 Per Container – i.e.: Shoes)

24 Knots From India
24 Knots + $2 Eco Tax
20 Knots 8000 TEU
24 Knots 8000 TEU

Vessel @ 24 Knots 4400 TEU

Source: PB Consultants - CSX Transportation May 12, 2011 - Director of Strategic Analysis
Cargo Will Flow “Downhill”
to the
“Lowest Cost - Best Service Levels”
(Total Logistics Costs From Origin to Destination)

More Competitive Regions will End up with the Cargo
Inland Ports Defined
A Convergence of Logistics Trends

Short Sea Shipping Technology
Intermodal Rail
Logistics
Automation
Distribution Center
Inland Ports: Europe’s Current Strategy Applications
Rotterdam World Gateway- EUROGATE Builds an Inland Container Port Network

ECT Main Terminal

Maasvlakte 2 Plan

European Shortsea Network

Short Sea Container Inland Port
The Dutch Transport Ministry and Port of Rotterdam Authority (PoRA) signed a Founding Agreement on June 29, 2009

The Town of Alblasserdam, East of Rotterdam will get a Container Transferium (CT), a Inland Port Container Transfer Facility to be operated by Binnenlandse Container Terminals Nederland (BCTN).

“This is the first time the Port Authority has promoted such a partnership. PoRA to promote transport by rail and water and to shift containers from road to the other modes of transport in order to reduce the number of trucks in the road.”
Dutch Transport Ministry Inland Port Container Transferium (CT) Strategy

(Noord River, Town of Alblomerdam €38 million, open by end-2012)
Dutch Transport Ministry Inland Port Container Transferium (CT) Strategy

(Noord River, Town of Alblasserdam €38 million, open by end-2012)
Emerging Major Inland Port Logistics Centers
Throughput Capacities in Millions of TEUs
Wal-Mart’s New 3.4 million SF (78 acres under roof) Import Distribution Center

The Cost of This Import Distribution Center was Paid for by the Savings in Truck Drayage Between the Warehouse & the Intermodal Rail Terminal
The Inland Port: 

“With Integrated JIT Delivery: The Inland Port Can Greatly Increase a Region’s Freight System Capacity”
Port Privatization
Emerging Pressures: Good or Bad?
Number of Terminals & Total Hectares Controlled by top 10 Port Terminal Operators

Source: Drewry Shipping Consultants
APMT Unsolicited Proposal Dated April 4, 2012
To Control All Port of Virginia Port Facilities
APM Terminals Operates 10 Major Container Terminals within US Port Authorities
(5 Terminals on the East Coast)

Major Container Terminal Operation

Source: APMT Data
“We can't solve problems by using the same kind of thinking we used when we created them.”

*Albert Einstein* 1879-1955
Thank You