Panama Canal: Expansion Status and Future Impact

“NUTC Business Advisory Council Meeting”
Evanston, IL - October 2015

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Executive Vice-President
Planning and Business Development
Panama Canal Authority
Panama Canal Authority at a Glance

Business Description

- The Panama Canal Authority, autonomous legal entity in charge of the operation, administration, management, preservation, maintenance, and modernization of the Canal
- Leading market position in the container liner segment with a 51% capacity deployed on the Northeast Asia to U.S. East coast route
- Stable business with diversified revenue streams:
  - Toll income, electric power sales, potable water sales and other marine services
- The Panama Canal is undergoing an Expansion program expected to significantly increase the Canal’s capacity and strengthen its world-wide competitive position

<table>
<thead>
<tr>
<th>Year</th>
<th>Vessel Transits</th>
<th>Vessel Tonnage (in millions of PC/UMS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>14,544</td>
<td>333.7</td>
</tr>
<tr>
<td>2013</td>
<td>13,660</td>
<td>320.6</td>
</tr>
<tr>
<td>2014</td>
<td>13,482</td>
<td>326.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Transit Revenues (in thousand of US dollars)</th>
<th>Other Revenues (in thousand of US dollars)</th>
<th>Total Revenues (in thousand of US dollars)</th>
<th>Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>$2,323,931</td>
<td>$305,220</td>
<td>$2,629,151</td>
<td>10,016</td>
</tr>
</tbody>
</table>

Source: ACP and public information
Understanding the Operations of the Canal

- With an extension of 80km, the Panama Canal connects the Atlantic and Pacific oceans.
- The Panama Canal uses systems of locks (compartments) that work as water lifts.
- The ships are raised from the sea level to the level of Gatun Lake.
- Ships then cross the channel through the continental divide and enter the set of locks that will take them to the sea level again.

A day in the Canal (Atlantic To Pacific Route)

1. Atlantic locks which raise ships to the Gatun Level form the sea level or vice versa.
2. Ships cross the canal through the Gatun Lake.
3. Ships arrive to the exit locks to reach the sea level again.
4. Ships exit the Canal.

Source: ACP
Maritime Transit Operational Overview

Vessel Evolution

Average Vessel Size (in PC/UMS)

<table>
<thead>
<tr>
<th>Year</th>
<th>PC/UMS in FY</th>
<th>PC/UMS Tonnage in MM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1955</td>
<td>4,832</td>
<td>14,193</td>
</tr>
<tr>
<td>1975</td>
<td>9,931</td>
<td>14,721</td>
</tr>
<tr>
<td>1995</td>
<td>18,940</td>
<td>14,702</td>
</tr>
<tr>
<td>2014</td>
<td>27,286</td>
<td>13,481</td>
</tr>
</tbody>
</table>

Avg. '06-'14: 14,284

Volume Evolution

<table>
<thead>
<tr>
<th>Year</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC/UMS Tonnage in MM</td>
<td>298</td>
<td>313</td>
<td>310</td>
<td>299</td>
<td>301</td>
<td>322</td>
<td>334</td>
<td>321</td>
<td>327</td>
</tr>
</tbody>
</table>

Volume Breakdown 2014

<table>
<thead>
<tr>
<th>Category</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Container</td>
<td>111.0</td>
</tr>
<tr>
<td>Dry Bulk</td>
<td>119.9</td>
</tr>
<tr>
<td>Vehicle Carriers</td>
<td>86.0</td>
</tr>
<tr>
<td>Chemical Tankers</td>
<td>83.4</td>
</tr>
<tr>
<td>Crude/Product</td>
<td>45.8</td>
</tr>
<tr>
<td>Other</td>
<td>43.0</td>
</tr>
<tr>
<td>Other</td>
<td>42.9</td>
</tr>
<tr>
<td>Other</td>
<td>29.7</td>
</tr>
<tr>
<td>Other</td>
<td>30.3</td>
</tr>
<tr>
<td>Other</td>
<td>28.3</td>
</tr>
<tr>
<td>Other</td>
<td>15.7</td>
</tr>
<tr>
<td>Other</td>
<td>17.8</td>
</tr>
<tr>
<td>Other</td>
<td>19.1</td>
</tr>
<tr>
<td>Other</td>
<td>38.0</td>
</tr>
<tr>
<td>Other</td>
<td>38.6</td>
</tr>
<tr>
<td>Other</td>
<td>39.6</td>
</tr>
</tbody>
</table>

327 PC/UMS MM Tons

Source: ACP
A Key Facilitator of Transcontinental Seaborne Trade

The Panama Canal’s relevance to the global economy is evidenced by the strong correlation of its vessel traffic with global seaborne trade.

**Worldwide Cargo Market Share**

<table>
<thead>
<tr>
<th>Cargo Type</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Containerized Cargo</td>
<td>2.6%</td>
<td>2.6%</td>
<td>1.5%</td>
<td>1.1%</td>
<td>1.1%</td>
<td>4.7%</td>
<td>2.2%</td>
<td>1.5%</td>
<td>1.3%</td>
<td>1.2%</td>
<td>1.4%</td>
<td>1.1%</td>
<td>1.1%</td>
</tr>
<tr>
<td>Grains</td>
<td>12.3%</td>
<td>12.3%</td>
<td>12.3%</td>
<td>12.3%</td>
<td>12.3%</td>
<td>12.3%</td>
<td>12.3%</td>
<td>12.3%</td>
<td>12.3%</td>
<td>12.3%</td>
<td>12.3%</td>
<td>12.3%</td>
<td>12.3%</td>
</tr>
</tbody>
</table>

**Relevance of the Canal to Selected Countries**

<table>
<thead>
<tr>
<th>Country</th>
<th>FY 2013*</th>
<th>FY 2014*</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>136.5</td>
<td>154.1</td>
</tr>
<tr>
<td>China</td>
<td>46.4</td>
<td>51.5</td>
</tr>
<tr>
<td>Chile</td>
<td>29.0</td>
<td>29.5</td>
</tr>
<tr>
<td>Japan</td>
<td>20.0</td>
<td>21.7</td>
</tr>
<tr>
<td>Colombia</td>
<td>17.5</td>
<td>19.2</td>
</tr>
<tr>
<td>South Korea</td>
<td>16.8</td>
<td>19.1</td>
</tr>
</tbody>
</table>

Millions of Long tons - Trade Through the Canal

The Canal is a key asset for the region’s competitiveness.

Source: ACP with information from IHS, July 2014

(1) Data as of 2014
Critical Cornerstone of Global Maritime Transportation

- Serves 144 maritime routes and 1,700 ports in 160 countries
- Privileged location with the most economical and time saving option between the Americas, Asia and Europe
- The right to limit the access to the Canal grants pricing advantages without distorting demand

### Unique Position in the World Maritime Trade

#### Route (2)

<table>
<thead>
<tr>
<th>Market Segment</th>
<th>From</th>
<th>To</th>
<th>Panama</th>
<th>Miles</th>
<th>Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Containership (roundtrip)</td>
<td>NE Asia</td>
<td>US East Coast</td>
<td>22,000 nm</td>
<td>4,600 nm</td>
<td>14</td>
</tr>
<tr>
<td>Vehicle Carrier</td>
<td>NE Asia</td>
<td>US East Coast</td>
<td>10,859 nm</td>
<td>3,631 nm</td>
<td>8</td>
</tr>
<tr>
<td>LNG (3)</td>
<td>US Gulf</td>
<td>Japan</td>
<td>9,623 nm</td>
<td>4,494 nm</td>
<td>10</td>
</tr>
<tr>
<td>Dry Bulk</td>
<td>US Gulf</td>
<td>Dalian, China</td>
<td>10,069 nm</td>
<td>5,284 nm</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cape of Good Hope</td>
<td>15,353 nm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Savings

<table>
<thead>
<tr>
<th></th>
<th>Miles</th>
<th>Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Containership</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicle Carrier</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LNG (3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dry Bulk</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: ACP

(1) Container cargo market share on the Northeast Asia to U.S. East coast route
(2) nm = Nautical Miles
(3) Expected savings after the Canal’s Expansion
The Panama Canal Service Package...

- Reliability
- Sustainability
- Connectivity
- Economies of Scale

100 years
Reliability...
Operational Reliability Since the Canal’s Opening

Solid Experience

- Over 100 years of operations
- The canal has stopped operations only 17 hours in total since 1,999 (year in which ACP assumed control of the Canal)
- Maintenance is executed without interrupting or slowing down operations
- Customer satisfaction of ~99% in 2014\(^{(1)}\)
- Predictability: Published tariffs and fixed transit date with reservation
- Sufficient to attend large traffic volumes with 7,379 Panamax type vessels transited in 2014, exceeding previous record of 7,241 in 2012

Safe and secure - Opens 24 hours a day, 7 days a week, 365 days a year

<table>
<thead>
<tr>
<th>PCNT Tonnage in MM(^{(2)})</th>
<th>PC/UMS Tonnage in MM</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>53</td>
</tr>
</tbody>
</table>

Source: ACP

Steady transit levels through decades
Sustainability – Capital Investment Program

Dredging

Bridge over Atlantic side

Launches

Ground dams

Fuel Pipeline and Tank Farm

Tugboats

Accumulated Investment – Capex (USD millions)

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>102</td>
<td>102</td>
<td>139</td>
<td>113</td>
<td>137</td>
<td>150</td>
<td>162</td>
<td>115</td>
<td>167</td>
<td>68</td>
<td>98</td>
<td>188</td>
<td>321</td>
<td>363</td>
<td>511</td>
<td>2,914</td>
</tr>
</tbody>
</table>

Budget: 2,914 USD millions
Sustainability – The Green Route

- The CO₂ emission reduction in the planet as a result of the Panama Canal route
- The actions taken by ACP: Environmental management in operations and Canal Watershed sustainability programs
- Become carbon neutral
CO₂ Emission's for Container Vessels
Asia – USEC

New York - Kaoshiung

<table>
<thead>
<tr>
<th>Route</th>
<th>Panamax</th>
<th>Intermodal USA</th>
<th>Cape of Horne</th>
<th>Cape of Good Hope</th>
<th>Suez Canal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panama Canal</td>
<td>2.51</td>
<td>2.64</td>
<td>4.07</td>
<td>2.86</td>
<td>3.02</td>
</tr>
<tr>
<td>Panamax</td>
<td>2.06</td>
<td>2.38</td>
<td>3.37</td>
<td>2.86</td>
<td>2.51</td>
</tr>
<tr>
<td>Neopanamax 8000 TEU</td>
<td>1.82</td>
<td>2.23</td>
<td>2.98</td>
<td>2.53</td>
<td>2.21</td>
</tr>
</tbody>
</table>
Connectivity...
The Panama Canal is a cornerstone of the Western Hemisphere’s maritime trade and a prime asset in the Americas.
The Panama Canal’s strategic position renders it a crucial role in the Western Hemisphere’s seaborne trade dynamics. More than 225MM tons made their way through its waters in 2014.

Source: ACP

(1) Long tons
Hanjin Shipping Service Network through the Panama Canal

- Panama Canal Customers’ Ranking for Container Vessels - Position No. 9
- Provides 5 weekly services through the Panama Canal - AWE-1, AWE-2, AWE-3, NUE3 & GME (Asia – USEC)

<table>
<thead>
<tr>
<th>Service through the Panama Canal</th>
<th>Vessels deployed</th>
<th>Vessel size range</th>
<th>Average vessel size</th>
<th>Yearly Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWE1</td>
<td>9</td>
<td>4,024 – 4,545</td>
<td>4,283</td>
<td>222,699</td>
</tr>
<tr>
<td>AWE2</td>
<td>10</td>
<td>4,250 – 5,050</td>
<td>4,517</td>
<td>234,884</td>
</tr>
<tr>
<td>AWE3</td>
<td>10</td>
<td>4,014 – 4,738</td>
<td>4,422</td>
<td>229,918</td>
</tr>
<tr>
<td>NUE3</td>
<td>9</td>
<td>4,024 – 5,500</td>
<td>4,364</td>
<td>226,928</td>
</tr>
<tr>
<td>GME</td>
<td>9</td>
<td>4,250 – 4,300</td>
<td>4,263</td>
<td>221,664</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Service that do transshipment in Panamanian Ports</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASPA / ACSA5</td>
</tr>
<tr>
<td>12</td>
</tr>
<tr>
<td>6,350 – 9,326</td>
</tr>
<tr>
<td>7,667</td>
</tr>
<tr>
<td>398,662</td>
</tr>
</tbody>
</table>

Source: ACP/MEMN, August 2015.
Economies of Scale ....
Canal Expansion Program
Expansion Program at a Glance

**Atlantic Entrance Deepening & Widening**
- Dredging of Canal’s entrance in the Atlantic Ocean

**Gatun Lake Navigation Channel Widening & Deepening and Deepening of the Culebra Cut**
- Removal of subaquatic material to deepen & widening of the navigation channel in the Gatun Lake and the Culebra Cut

**Pacific Access Channel**
- A new access channel north of the new locks on the Pacific side
- Executed in four phases (PACs 1 to 4), entails the excavation of ~50 MMcu.m of material along a 6.1 km span

**Atlantic Side Post-Panamax Locks**
- Features 3 chambers, 9 water-saving basins, a lateral filling and emptying system, and 16 rolling gates
- Enables raising Gatun Lake’s maximum operating level by 45 cm to improve the Canal’s water supply and draft dependability

**Pacific Side Post-Panamax Locks**
- Features 3 chambers, 9 water-saving basins, a lateral filling and emptying system, and 16 rolling gates

**Pacific Entrance Deepening and Widening**
- Deepening the Pacific entrance to 15.5 m below mean low water level and widening it to 225 m

17.66 M³

Source: ACP
The Expansion will create a new lane of traffic along the Canal through a new set of locks, doubling the waterway’s capacity. The Expansion Program at a Glance:

<table>
<thead>
<tr>
<th>Pre-Expansion</th>
<th>Post-Expansion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Vessel Capacity</td>
<td>Panamax (294m length)</td>
</tr>
<tr>
<td>Capacity</td>
<td>4,400 TEU's</td>
</tr>
<tr>
<td>Canal Water Time&lt;sup&gt;(1)&lt;/sup&gt;</td>
<td>31.5 h</td>
</tr>
<tr>
<td>Container Cargo Market Share&lt;sup&gt;(2)&lt;/sup&gt;</td>
<td>39%</td>
</tr>
</tbody>
</table>

- **Location of the Gates in the Atlantic**
  - Atlantic Ocean
  - Lower Chamber
  - Middle Chamber
  - Upper Chamber
  - Gatun Lake

- **Location of the Gates in the Pacific**
  - Gatun Lake
  - Upper Chamber
  - Middle Chamber
  - Lower Chamber
  - Pacific Ocean

- **PROFILE OF THE THIRD SET OF LOCKS**
  - 80 km

Source: ACP

<sup>(1)</sup> As of September 30, 2014

<sup>(2)</sup> Container cargo market share on the Northeast Asia to U.S. East coast route in 2013

<sup>(3)</sup> ACP preliminary estimation

<sup>(4)</sup> As of June 30, 2015
**Key Milestones of the Canal’s Expansion**

**2007**
- Expansion works begin with a protocol blast in Paraiso Hill

**2008**
- Contract with 5 multilateral credit agencies for US $2,300MM

**2009**
- GUPC (Grupo Unidos por el Canal) is awarded the design and build contract for the third set of locks

**2010**
- First and second dry excavation contracts are delivered by Constructora Urbana and Cilsa Minera
- Meco finalizes the third phase of dry excavation of the Pacific access channel

**2011**
- Jan de Nul, Belgian company, delivers the northern entrance of the Pacific access channel
- Partial flooding of the new Neo-Panamax Channel

**2012**
- Both maritime entrances to the Canal are now wider and deeper for Neo-Panamax Transit

**2013**
- Initial filling of the Atlantic (Jun 11) and Pacific (Jun 22) locks

**2014**

**2015**
- Arrival of the last four gates of the third set of locks

*Source: ACP*
The New Locks

Atlantic Locks

Pacific Locks

Source: ACP

Video Canal Expansion Program
Panama Canal Expansion Milestone: Filling of the Atlantic Locks Complex

June 11, 2015

During an initial phase of filling, which will take approximately five days, the Canal will gradually raise the water level within the lower chambers of the new locks, pumping in approximately 50 thousand cubic meters of water per hour from Gatun Lake. This will allow for the testing of the first gates.
The intricate filling process will make use of powerful electric and diesel pumps, designed specifically for the job. The electric pumps are expected to provide 30,000 gallons of water per minute each, while an added network of 13 diesel pumps will work to pump 7,000 gallons of water per minute each, filling the lower chamber at a rate of nine inches per hour.

The filling and subsequent testing of the new Pacific locks is expected to take approximately 90 days to complete.

June 22, 2015
June 23, 2015

The gates have buoyancy tanks that allow them to weigh 15% of their actual weight inside the water-filled new locks.
Global Maritime Trade Trends

**Seaborne Trade (Mt)**

- Alliances, mergers and vessel sharing agreements will dominate the global maritime market pursuing a more competitive status.
- Raising oversupply will lead to more market consolidation impacting negatively on the deployed capacity and cargo volume.
- Positive impact from the 2015 U.S. west coast port labor negotiations, resulting in cargo diversion through the Panama Canal.

**Container Trade (Mt)**

- A major part of Panama Canal tolls comes from this segment.
- World demand for containerized cargo will continue its increasing trend at an average growth of 5%.
- Containerized cargo volumes for U.S. will keep its positive trend, with a sustained recovery of 3.4%.
- Delivery of Neo and Post-panamax vessels will continue putting pressure on vessel deployment in favor of the Panama Canal by increasing its average vessel size.

**Dry Bulk Trades (Mt)**

- With the Canal’s Expansion, moderate growth of thermal coal & metallurgical coal movements are expected due to economies of scale.
- Good grain harvest outlook for the U.S. and the development of port terminals in Northern Brazil may stimulate a grain route through the Panama Canal to Asia.
- Ballast transits levels are expected to remain low given the current downward freight market.
- China’s slow growth will impact seaborne trade of raw materials.

**Oil Trades (Mt)**

- The U.S. is expected to continue exporting condensed ultralight oil to Asia, increasing transits through the Panama Canal.
- With the Expansion, oil flows from Colombia and Venezuela to Asia will be in Neopanamax vessels.
- Increased demand in Europe, decreases shipments of petroleum products from the Panama Canal.
- Crude exports from Ecuador to the Gulf of Mexico stimulates shipments through the Panama Canal.
- Competitive LPG prices from the U.S. will impact positively flows through the Panama Canal into Asia.

**LNG Trades (Mt)**

- Shale Gas revolution has turned the U.S. into a net exporter of LNG.
- Main flows expected to come from the Gulf of Mexico to Asia via the Panama Canal.

**Source:** ACP and Clarkson Research Services
The Expansion will Significantly Enhance the Canal’s Global Competitive Position

**Relevant Vessel Capacity Increase**

**Existing Locks**
- 294 m
- 32 m
- Maximum capacity of transiting vessels **4,400 TEU**

**New Locks**
- 366 m
- 49 m
- Maximum capacity of transiting vessels **up to 14,000 TEU**

**Operational Optimization with Economies of Scale**

**Exporters**
- Shipping Lines

**Importers**
- Consumers

**Economies of scale - Efficiencies in the supply chain – Connectivity**

**Increasing Market Participation Persuading New Players to Consider the Panama Canal Route**

- The Expansion will increase attended vessels from 294 to 366 mts
- Transported capacity increase from 4,400 TEU to 14,000 TEU
- Increase Canal’s cargo market share to ~50% in one of the main seaborne routes(1)
- Just-in-time; Reservation System

**Container Vessels**
- Up to 14,000 TEU new volumes from:
  - Latin America
  - Recover market from:
    - West Coast United States
    - Suez Canal

**Dry Bulk**
- Up to 170,000 DWT
  - Coal from Colombia
  - Metalurgical coal from Vancouver
  - Iron Ore from Brazil in Minicasize (85,000-120,000 DWT)

**Liquid Bulk**
- Up to 150,000 DWT
  - Tankers
  - Petroleum Products

**LNG/LPG**
- LNG Up to 177,000m3 and VLGC

Source: ACP
(1) ACP preliminary estimation on container cargo market share on the Northeast Asia to U.S. East coast route
Panama Canal's Diversification Strategy
Panama Canal's Diversification Strategy

**Corozal Container Terminal**
- Additional transshipment creates the need for more container terminal capacity – To be executed in two phases
- Total capacity: 5MM TEU

**Roll-On Roll-Off Terminal**
- Potential for a dedicated terminal for vehicle transshipment in Panama

**LNG Terminal**
- Capitalizes on global LNG flows
- Offers LNG bunkering to vessels
- Opportunities in regional re-distribution

**Pipelines**
- Opportunities related to the flow of petrochemicals and refined products from one ocean to the other

**Vessel Repairs Services**
- There is a need for facilities to provide major scheduled ship repairs, routine maintenance or emergency repairs
- Both Atlantic and Pacific markets

**Top-Off Operations**
- Potential for developing a ship-to-ship top-off operations in Panama
- Capitalizes on new routes for ores from the Northern coast of South America to Asia

**Bunkering**
- Opportunities to obtain a larger market share in vessel bunkering through more efficient operations

**Logistics Parks**
- Capitalizes on recovered areas
- Offers a strategic location for distribution and value-added activities

**Power Generation**
- Cost-competitive through the use of LNG as alternate fuel source
- Reduces the carbon footprint

**Video Panama: Logistics & Connectivity**

Source: ACP
Thank you!