



**2014 AAPA Marine Terminal Management Training**  
Hyatt Regency Philadelphia at Penn's Landing      October 7, 2014

# ***Continuing Evolution of Marine Terminal Design & Cargo Handling***

M. John Vickerman



Williamsburg, Virginia

# Vessel Cargo Handling Circa 1955





## Cargo Handling Circa 2010

# US Navy Fast Frigate Circa 2045



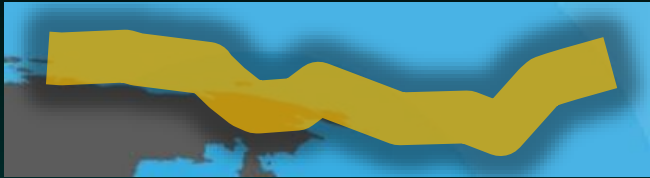


**What We Know  
Today... Will Surely  
Be Different  
Tomorrow!**



# The Evolution of Today's Global Shipping Lanes

# The World's Primary Shipping Routes

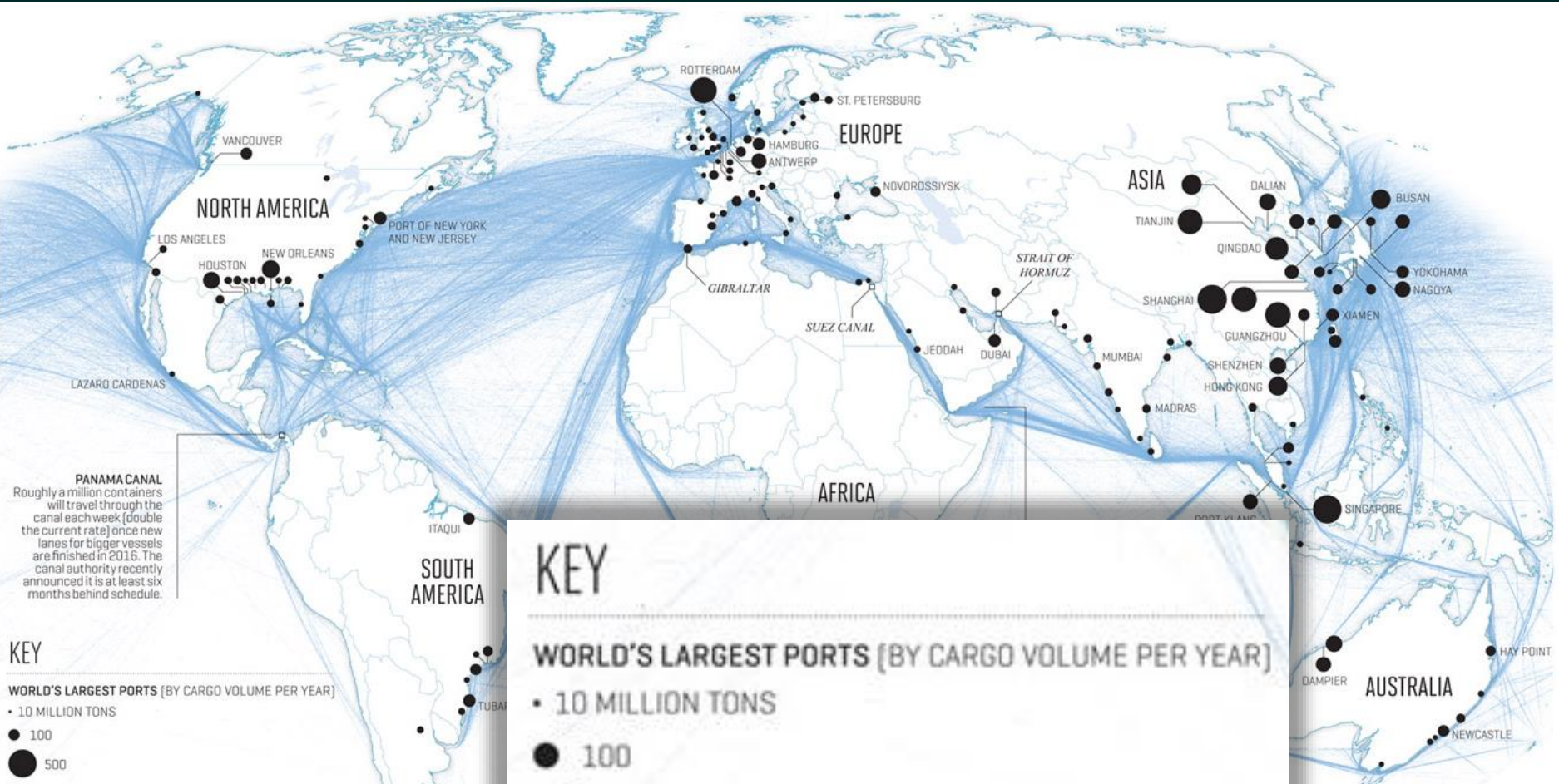


## The Marine Silk Road



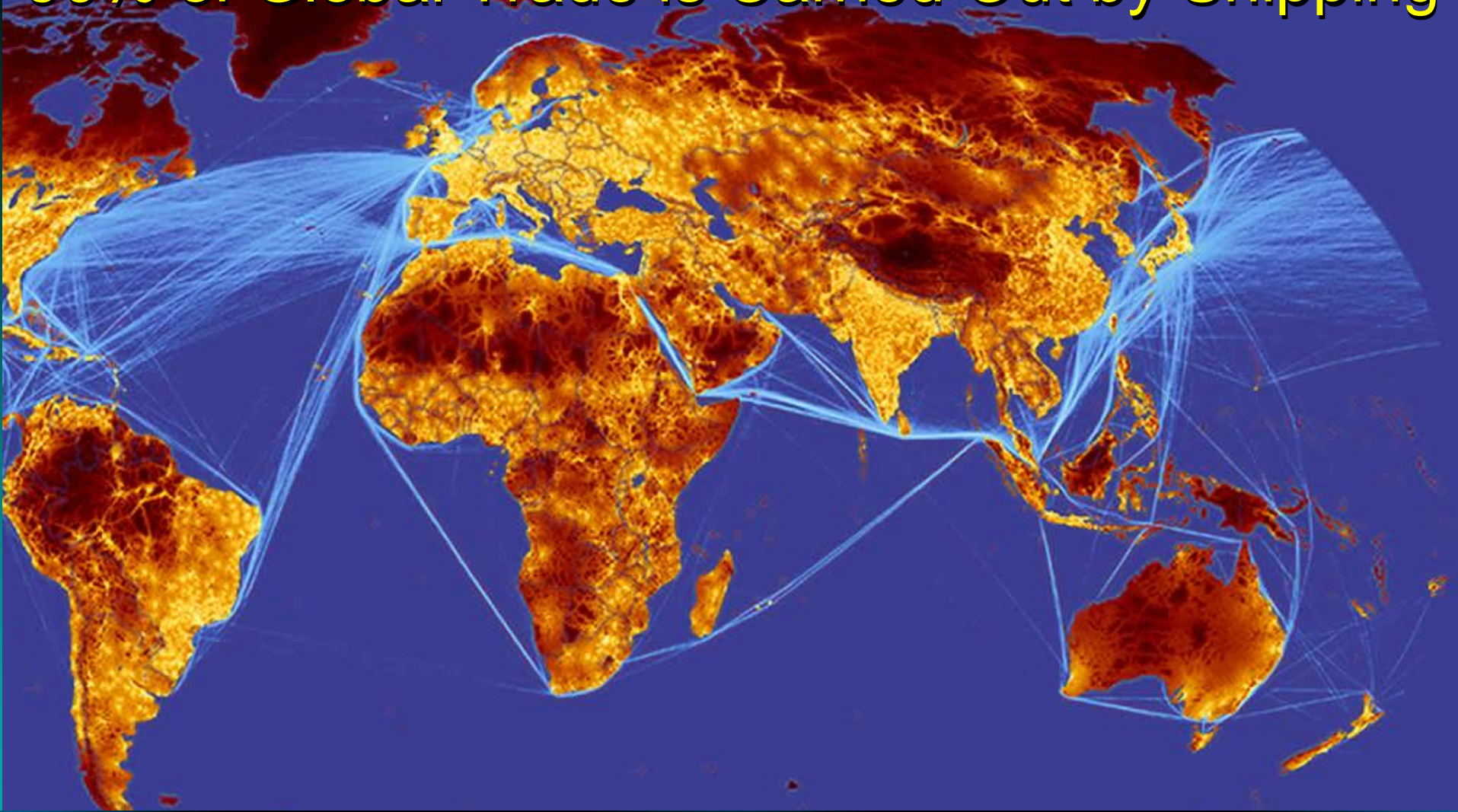
# The World's Largest Ports Are Connected Via The Marine Silk Road

## Where are the Biggest Ports?





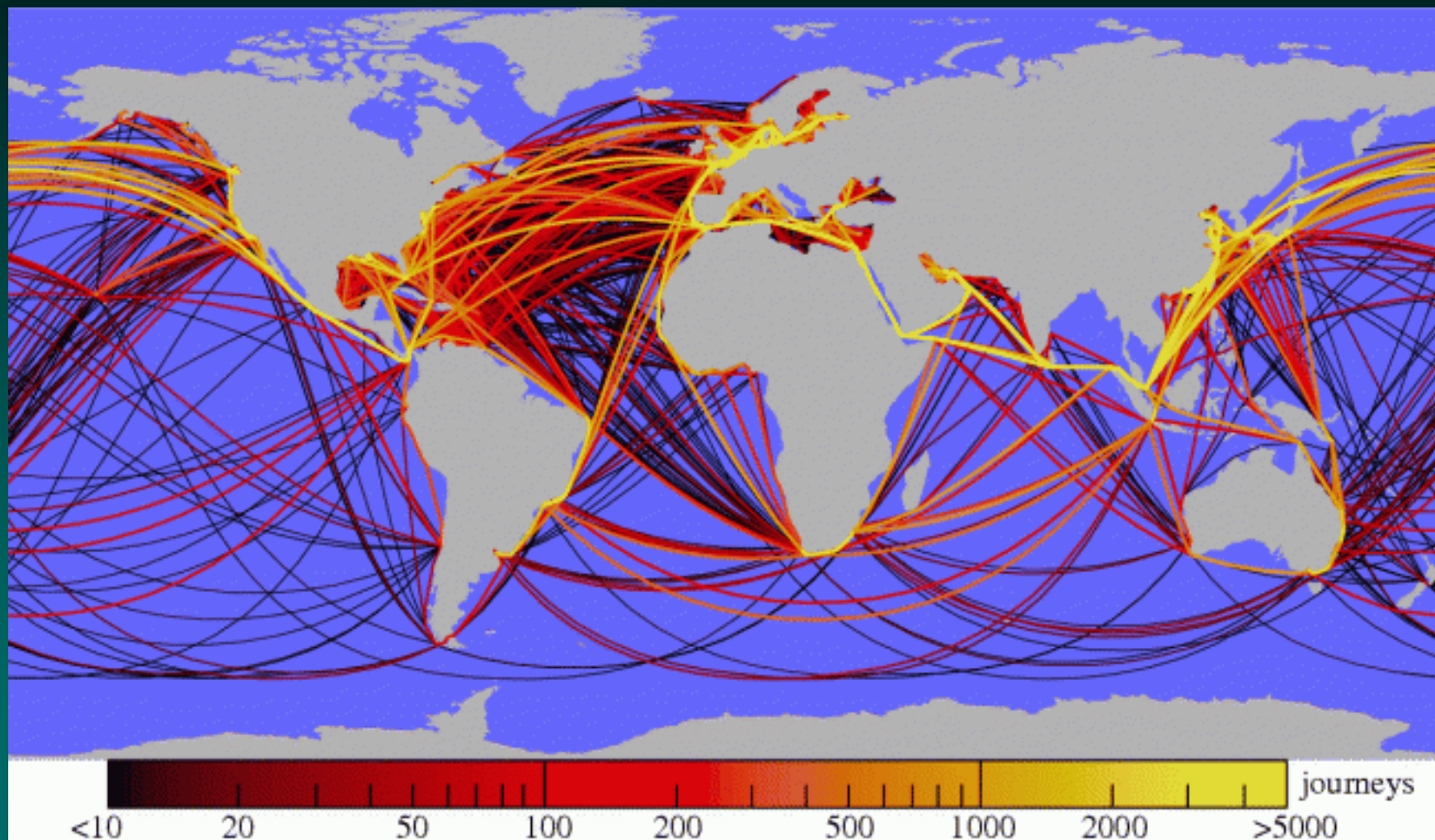
# 90% of Global Trade is Carried Out by Shipping




The Majority of Today's Ocean Trade is Conducted on the Marine Silk Road

# Global Shipping Routes Plotted by AIS GPS

*Today's Busiest Shipping Routes:  
(1) Panama Canal, (2) Suez Canal, (3) Offshore China*



Source: Wired Science January 2010 Journal of the Royal Society: Interface



**To Be Competitive Today...  
Marine/Intermodal  
Terminals Must Reduce  
Throughput Cost &  
Increase Cargo Velocity  
Securely and as Stewards of  
the Environment**



# **International 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

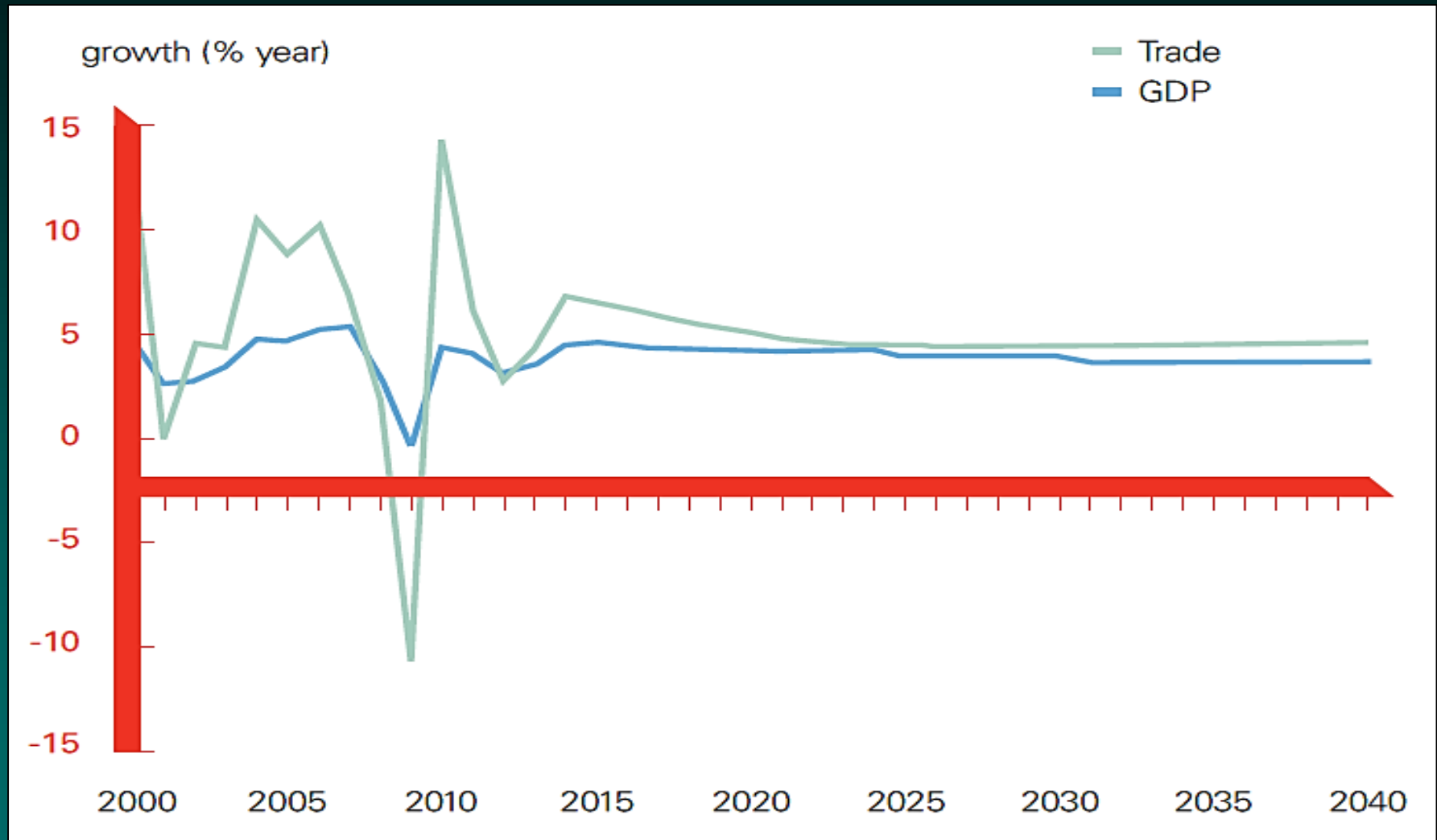
(US Trade & Gross Domestic Product - \$ Billions)



Source: USDOT Based on USDOC Data

# Growth in GDP and World Trade

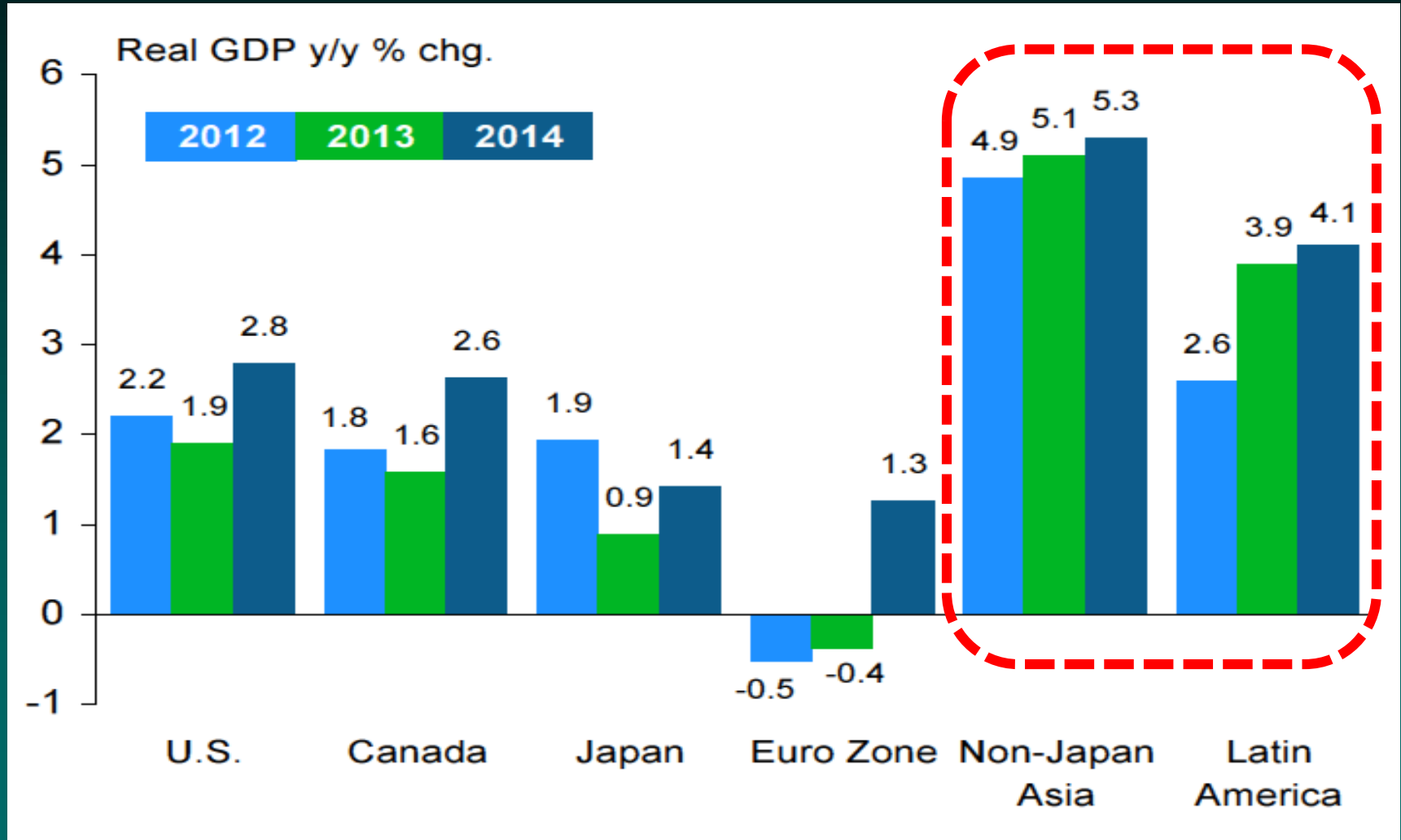
World trade will grow by **73% in the next 15 years**. With merchandise trade volumes in 2025 hitting \$43.6 trillion compared to today's \$27.2 trillion



Source: Oxford Economics 2013

# Continuing Economic Global Growth

International trade is set to significantly grow despite current economic uncertainty in the U.S. and elsewhere around the world



Source: TD Economics Forecast as of March 2013





# Who Decides Where the Cargo Goes?



*“Cargo will go according to where it will flow most readily. That **decision is made by the shippers and consignees** and not by the terminal operator”*

**Eric Sisco**

President of APM Terminals Americas Region

*Source: American Shipper, page 42, July 2012*

# Who Owns & Controls Today's Cargo?

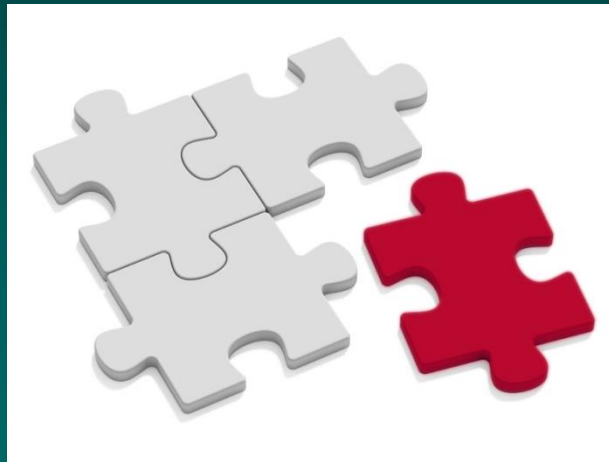


- The “**Shipper**” or “**Beneficial Cargo Owner**” (**BCO**)
- **BCO** = Importer of record, the entity that physically takes possession of cargo at destination and does not act as a third party in the movement of such goods
- The person or company who is usually the **supplier or owner of commodities shipped.**



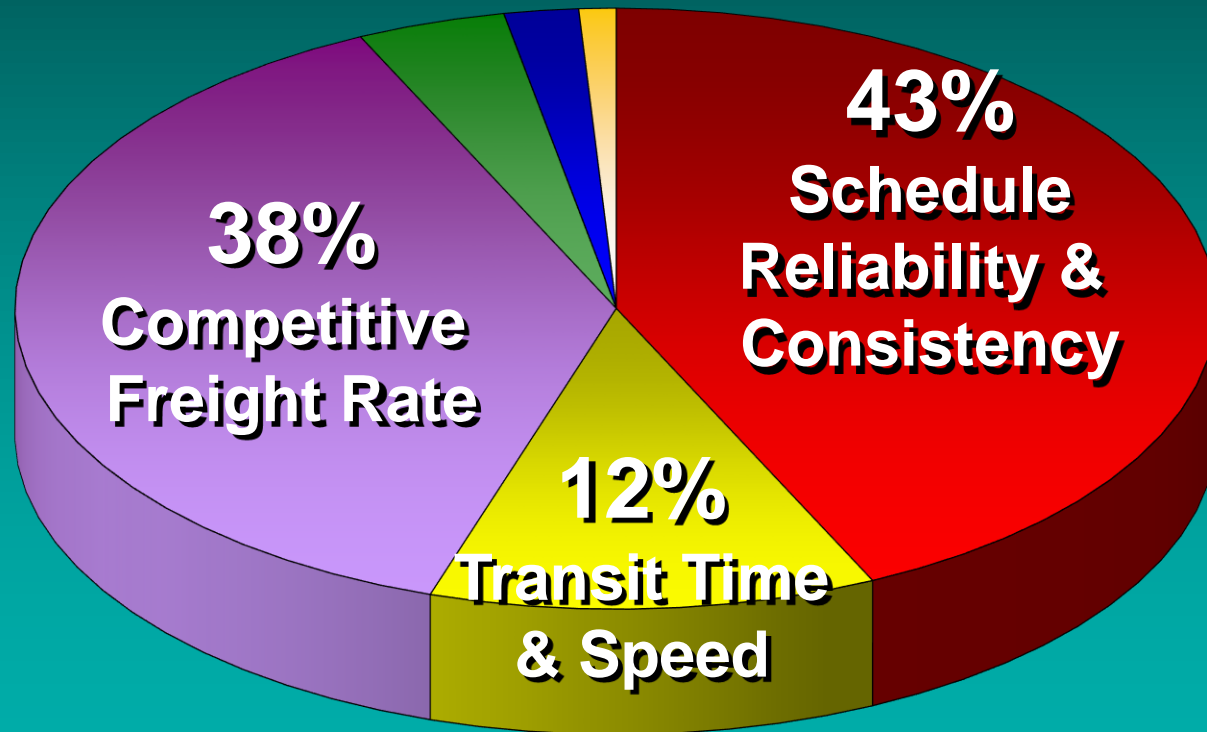
## **Key Success Factor:**

Cargo Will Flow “*Downhill*” to the  
“**Lowest Cost - Best Service Levels**”  
(Total Logistics Costs From Origin to Destination)



**Above All Be MARKET DRIVEN**

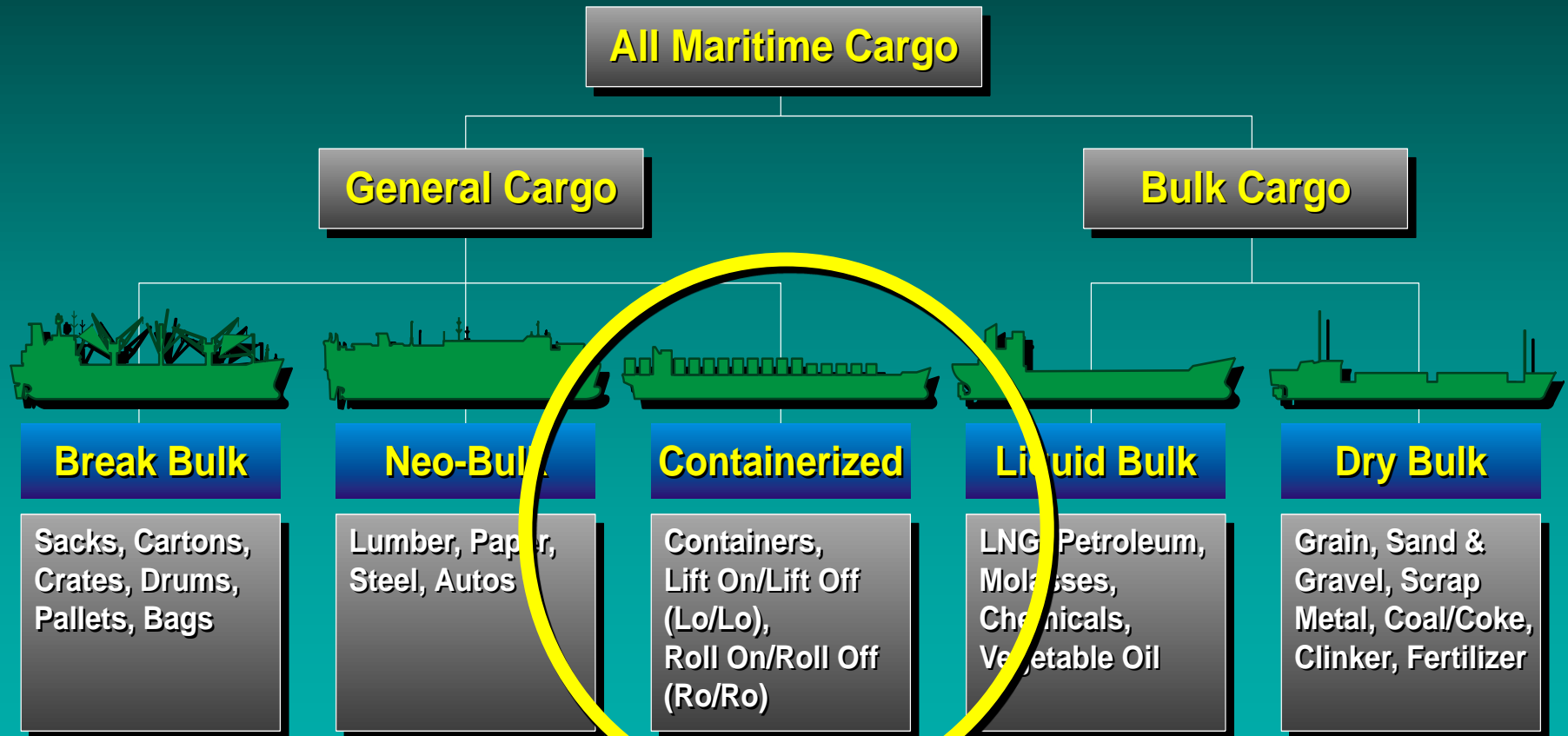
# Poll of the Top 1000 “Blue Chip” Multinational Shipper Priorities



# Today's Logistics Truth:

*“The customer  
wants **more** and  
is willing to pay  
**less** for it.”*

# Functional Classification of Global Maritime Cargoes

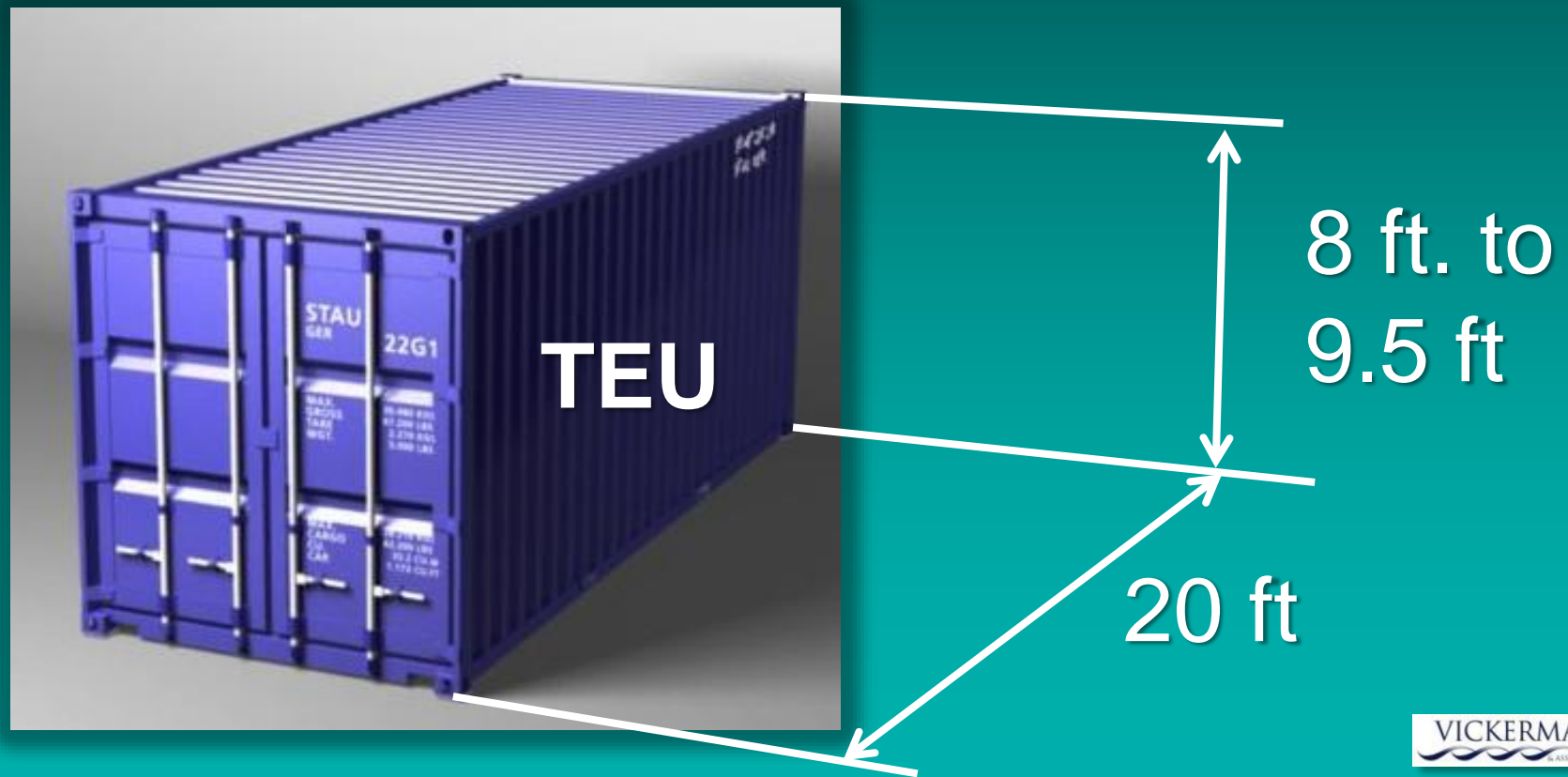


# The TEU (Twenty Foot Equivalent Unit)

*“The Port & Container Shipping  
Unit of Measure”*

1 TEU = One 20 ft. ISO Container

1 FEU = 2 TEUs = One 40 ft. Container





# How Much Can a Single Container Hold?

(Example 40 ft. Container)

Example  
Value \$



= 1,890 Cases @ \$25.50/Case = \$48,195



= 315 20" TVs @ \$299/TV = \$94,185

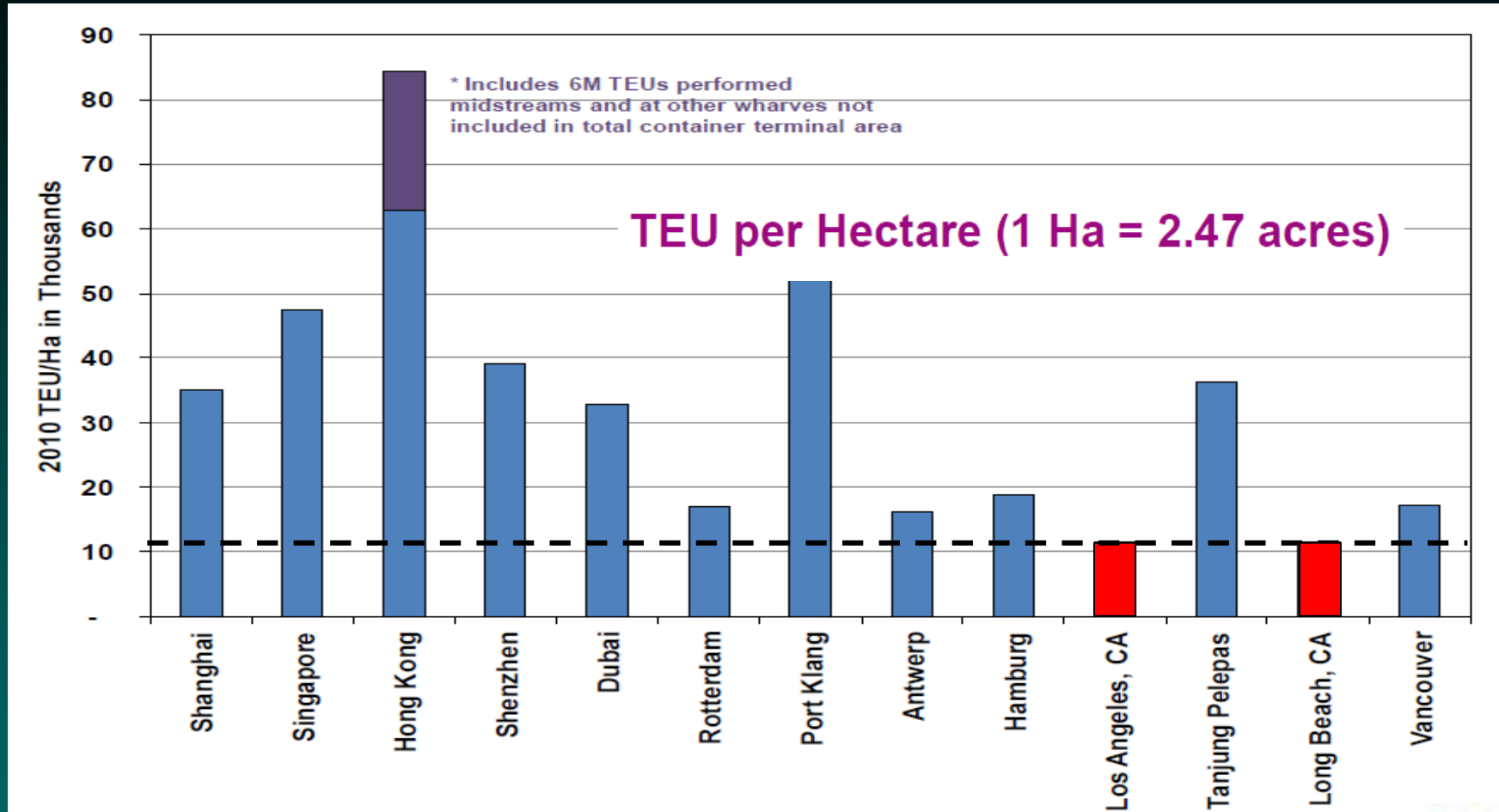


= 10,000 Pairs @ \$30/pair = \$300,000



= 432,000 Packs @ \$4.00/Pack = \$1,728,000

# Top Global Container Port Productivity

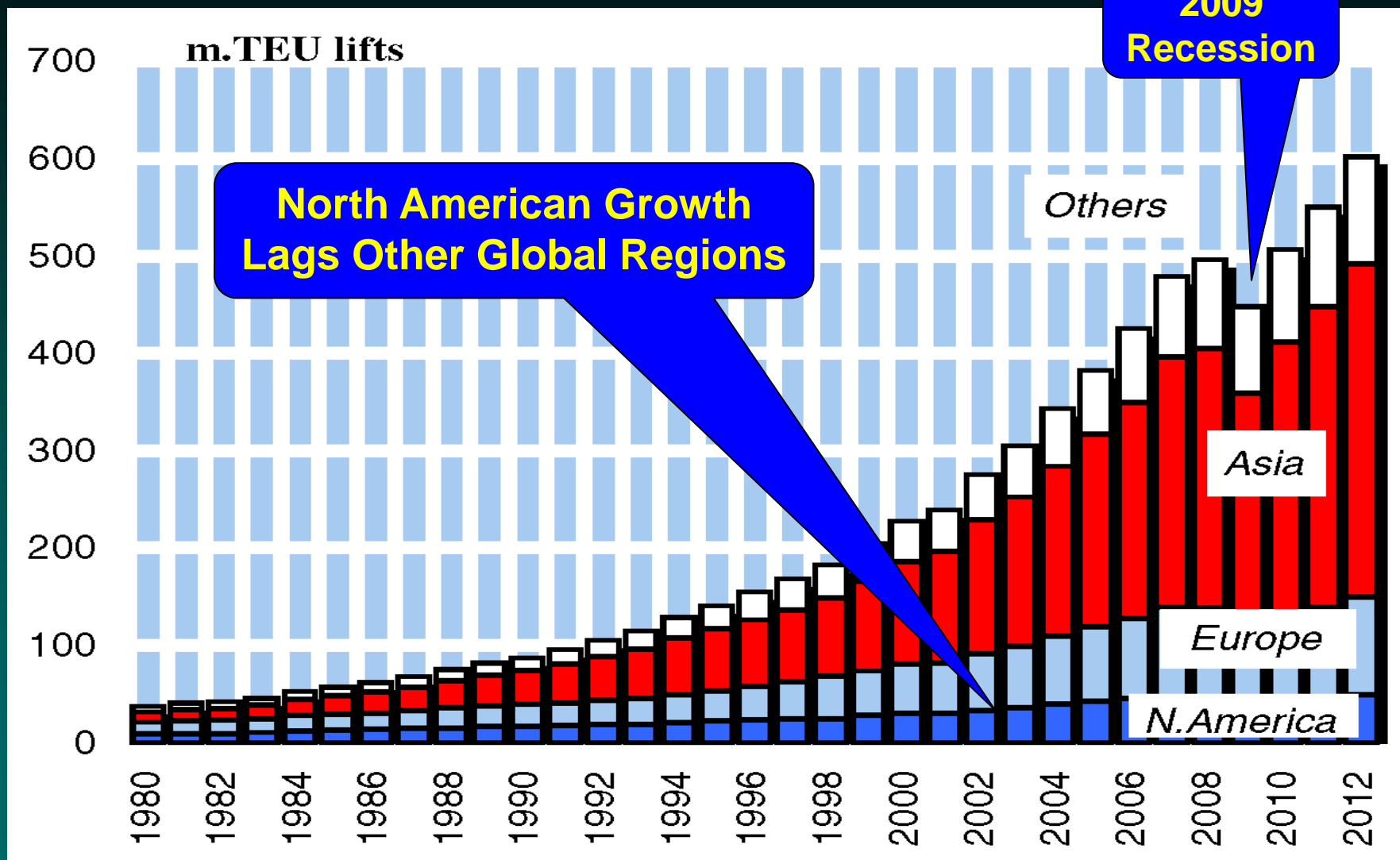


*Global Ocean Carriers & Terminal Operators  
Do Not Consider North American Ports as a  
“Best Case Practice”*



# International Maritime Cargo Demand Trends

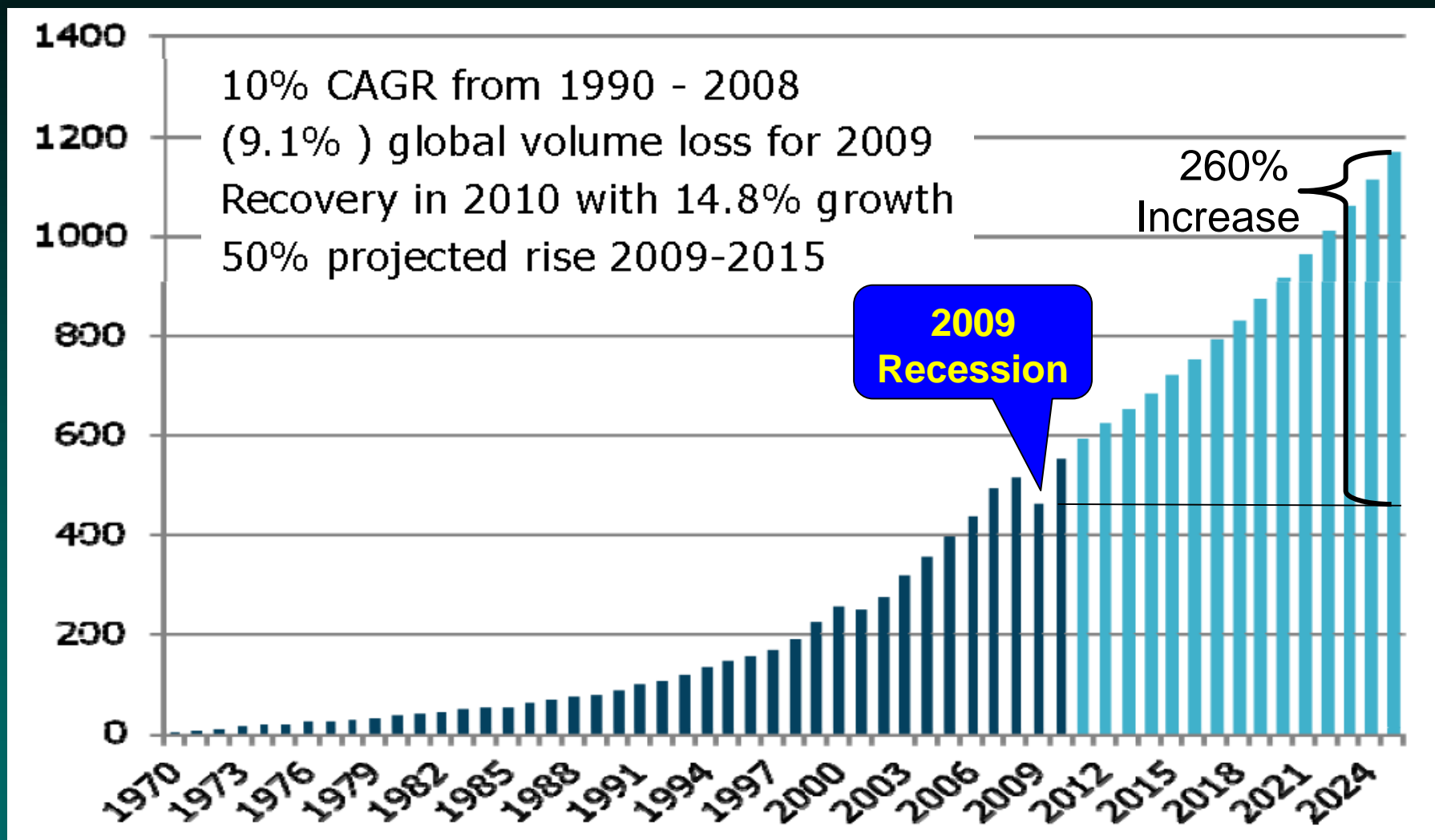
# Historical Global Container Market Demand (Millions of TEUs)



Source: Drewry Shipping Consultants

# 2025 World Container Port Market Demand

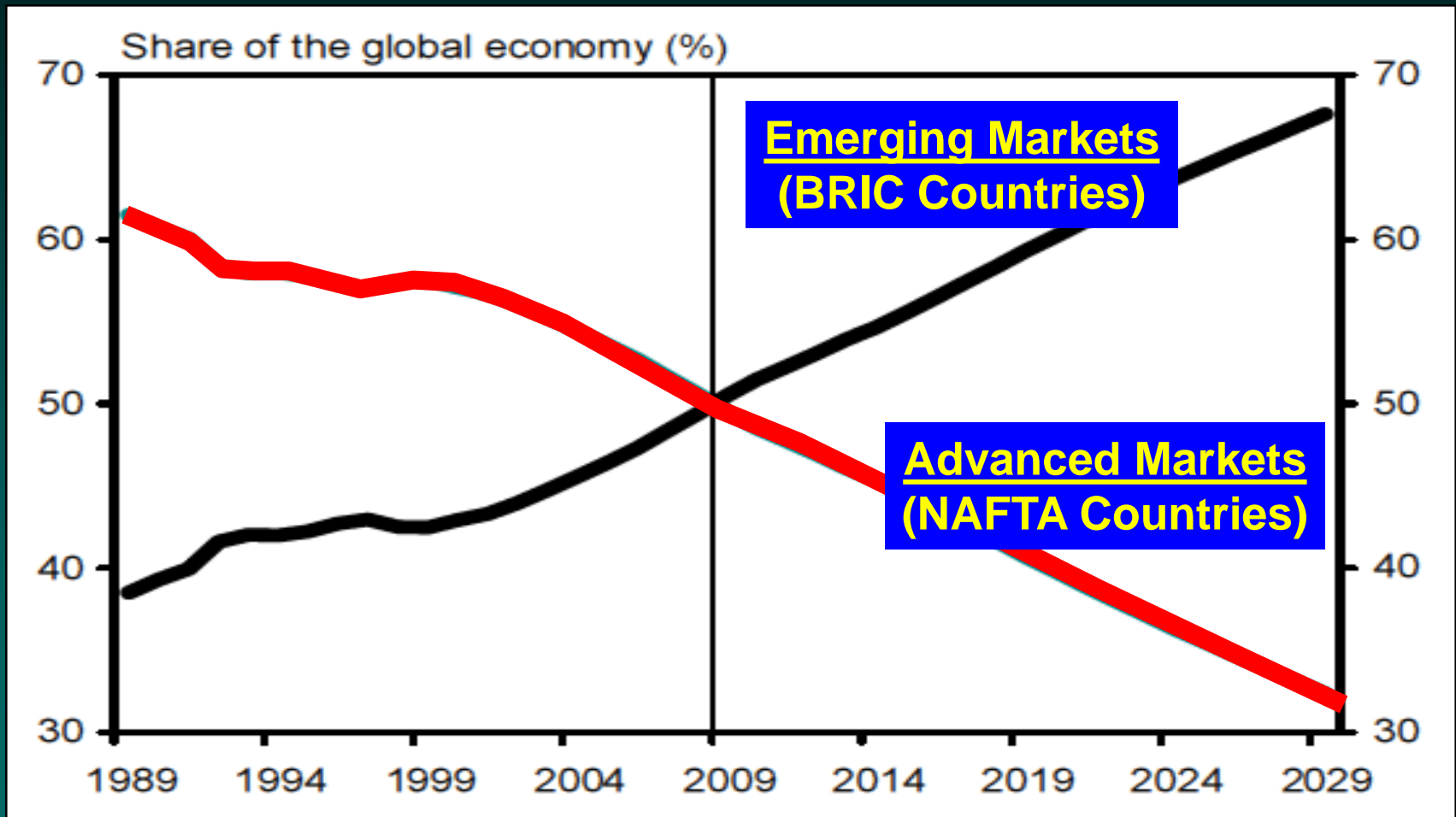
(Millions of TEUs)



Source: Drewry Shipping Consultants October 2011

# A Turning Point in Global Economic History

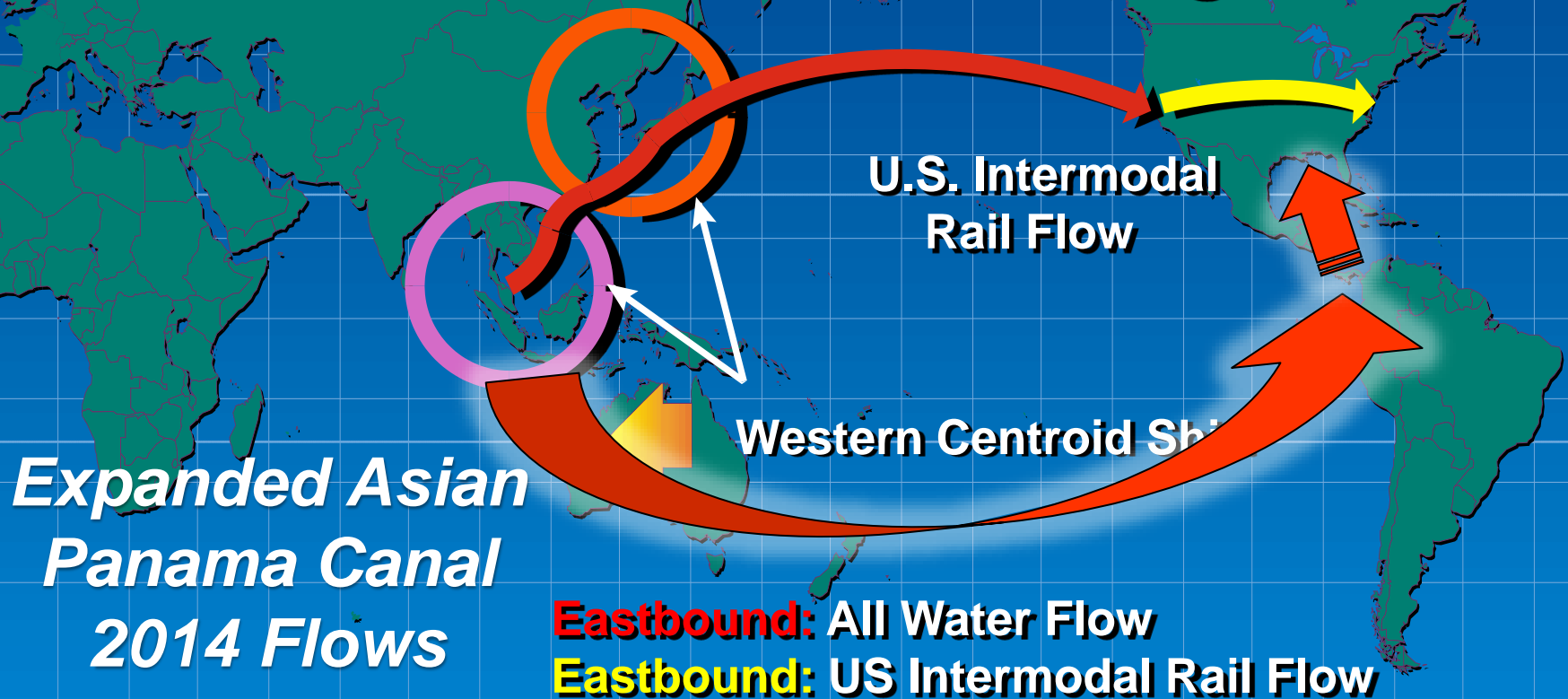
The Advanced Economies Will Decline From 2/3 share of the Global Economy to a 1/3 Global Share. The Global Economy Will See Higher Average Pace of Growth in the Future...



Source: IMF - Forecast by TD Economics, December 2009

# Southeast Asian Manufacturing Centroid Shift

## Current Inbound U.S. Cargo Flow



# Southeast Asian Manufacturing Centroid Shift

Cu

Flow



U.S. In  
Rail Fl

**With Manufacturing Centroid Shifts Into Vietnam  
and/or India, The North American East Coast will  
See Dramatically More Westbound Suez Traffic**





# Suez Canal Container Vessel Convoy Traffic

*(Ships Currently Transit the Suez Canal in 3 Daily Convoys)*



## 2015 Suez Canal Pricing Strategy:

The Suez Canal has an opportunity to competitively alter global shipping patterns by undercutting 2015 Panama Canal new pricing strategy.





**August 5, 2014**

**The Suez Canal Announces a \$4 Billion  
Expansion of the Canal**

**New 45-mile-long parallel channel cutting  
waiting times to transit by 3 hrs. from 11 hrs.**

**Half of a \$8.5 billion project that includes a  
free trade zone, an industrial park and a  
regional logistics hub for the Middle East,  
North Africa and the Mediterranean.**



# The Growing Asian Import Trade Challenge

# Container Transshipment World Records

Of the 10 busiest ports in the world,  
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

These Two Ports are Larger Than All  
North American Ports Combined

# China-US: Twin Engines of the World



## Population:

US: 314 million

China: 1,344 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**

交通部第三航务工程勘察设计院制



# Shanghai International Shipping Center Yangshan Deep Port - 20 Mile Bridge Access

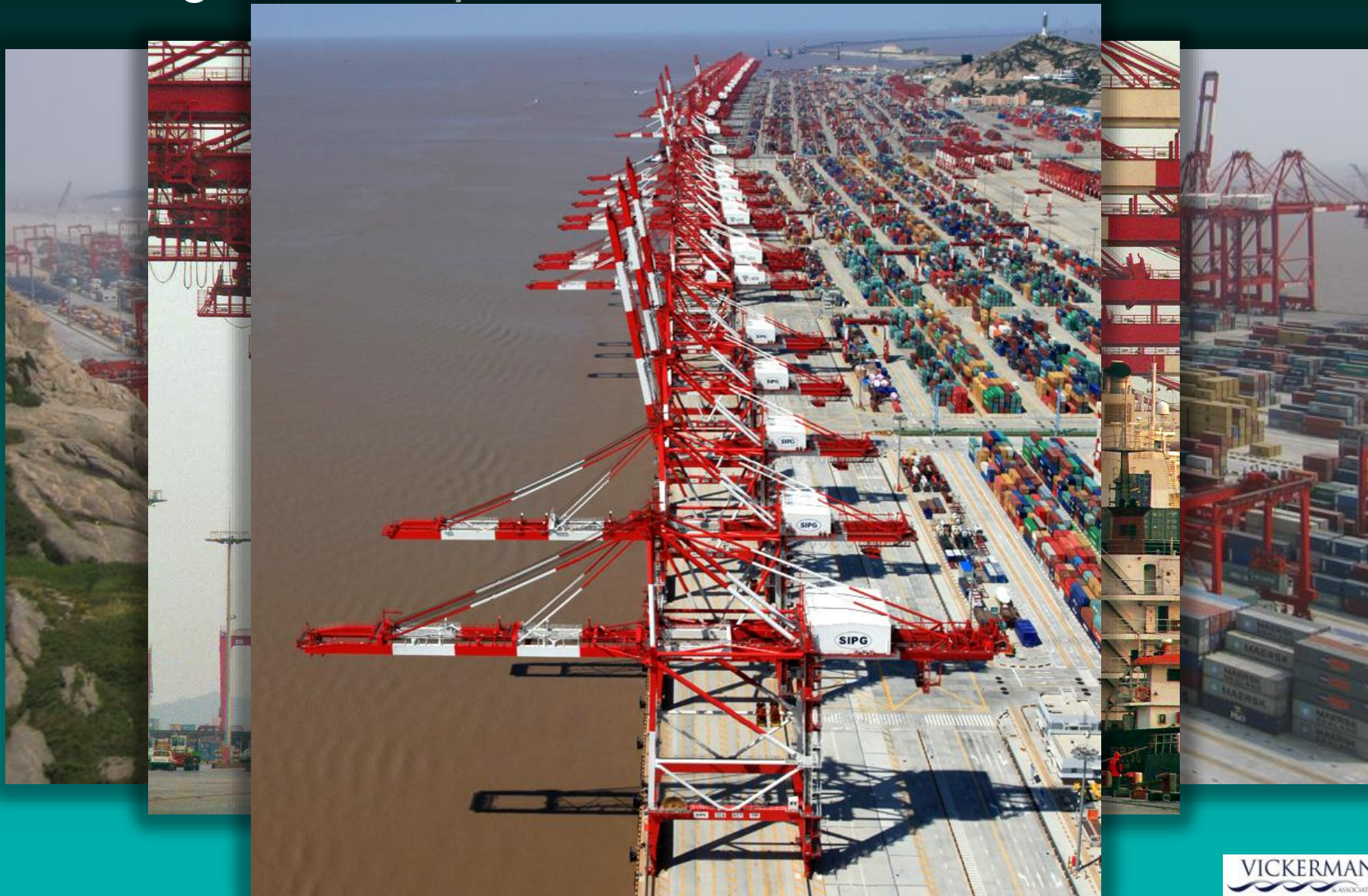
*“Second Longest Ocean Bridge in the World”*





# Shanghai Yangshan Deep-Water Harbour

Yangshan Deep Port – 54 Berths East China Sea



# Shanghai International Shipping Center

## Yangshan Deep Port & Logistics Park



Shanghai Port Set a 2011 Record by Handling over 30 million TEUs



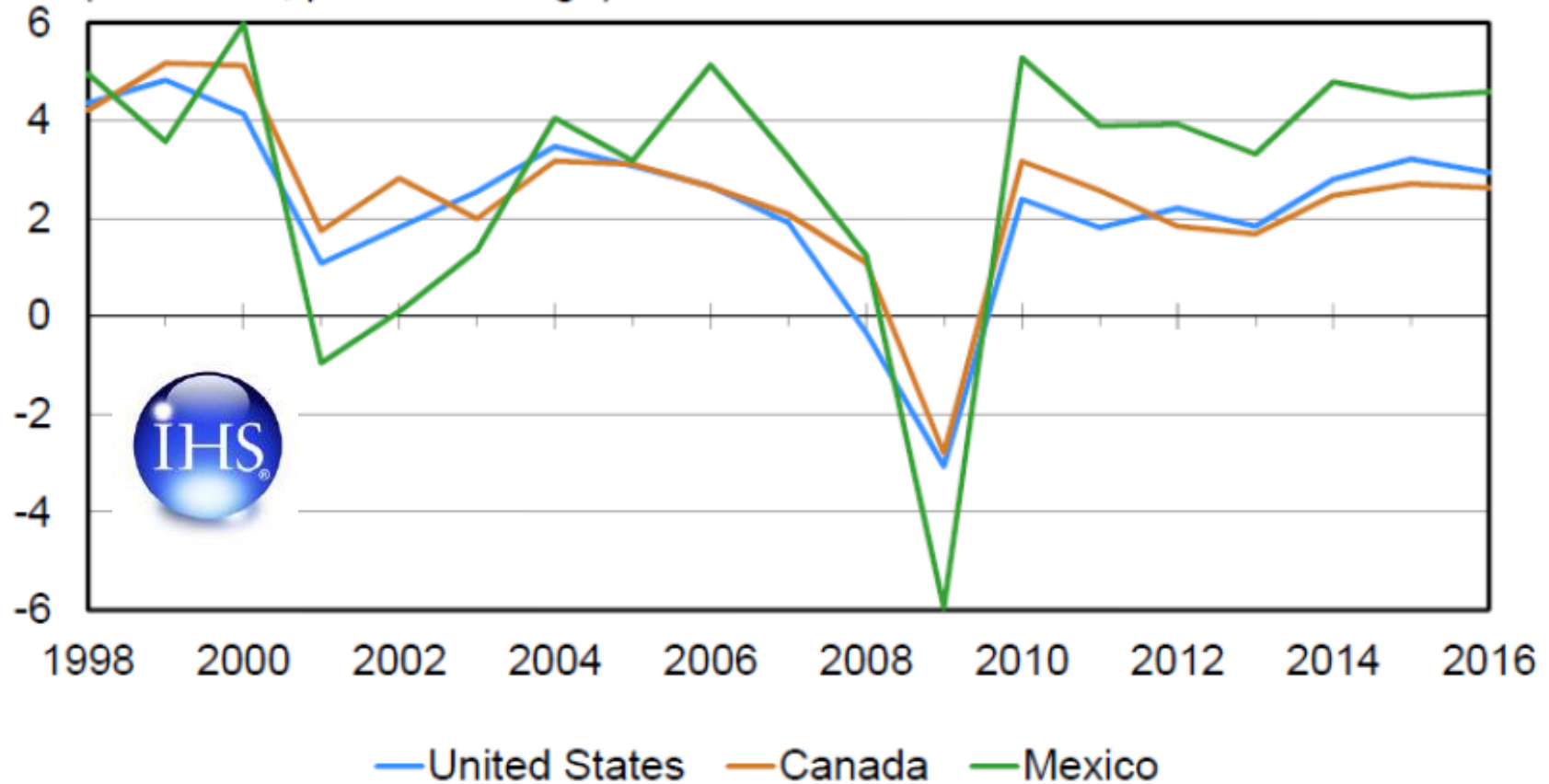
# North American Cargo Demand Trends

*(Déjà vu Experience)*

# NAFTA Trade Partners Are Growing

**Mexico grows faster with near-shoring and broad trade growth**

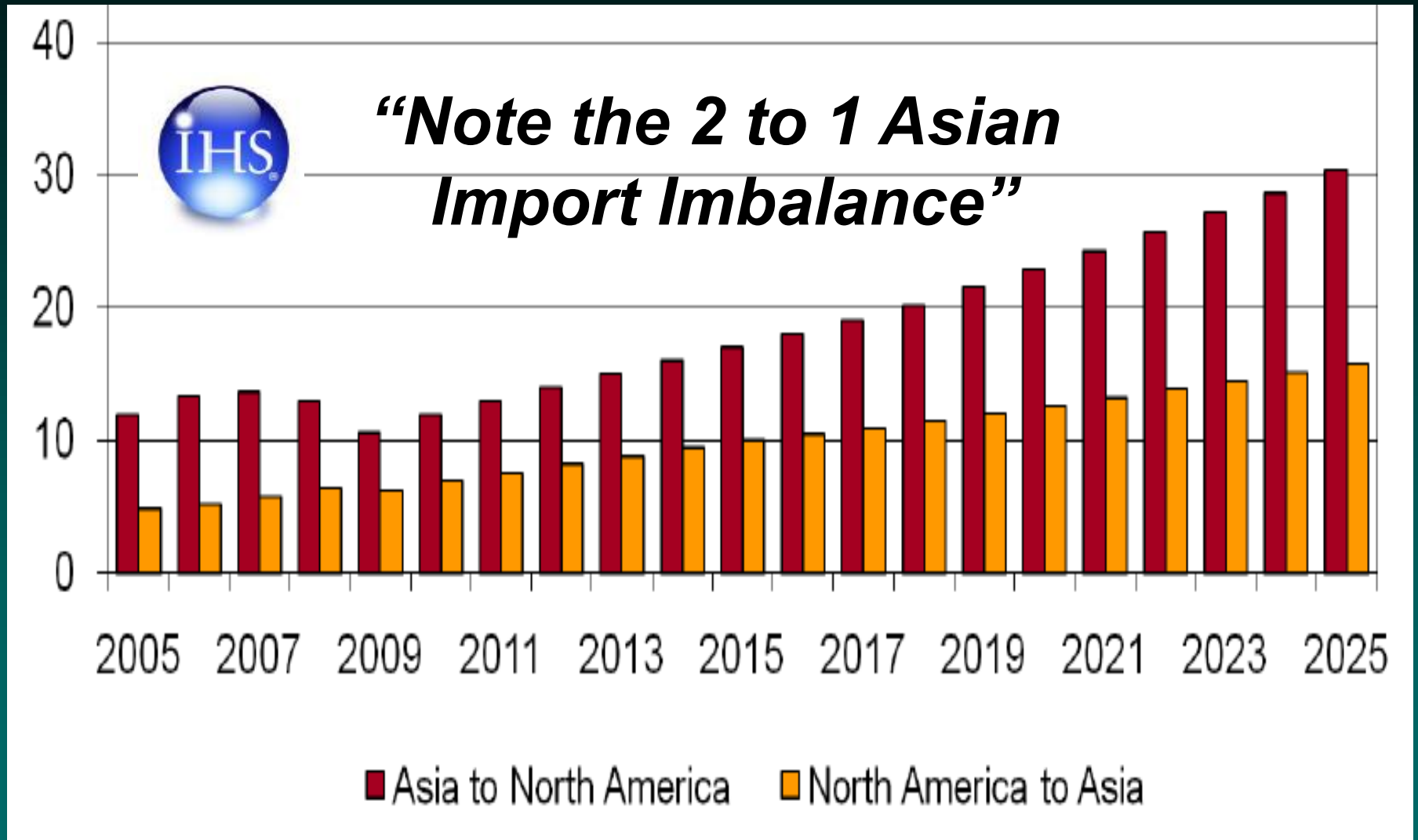
(Real GDP, percent change)



Source: IHS Global Insight – World Trade Service

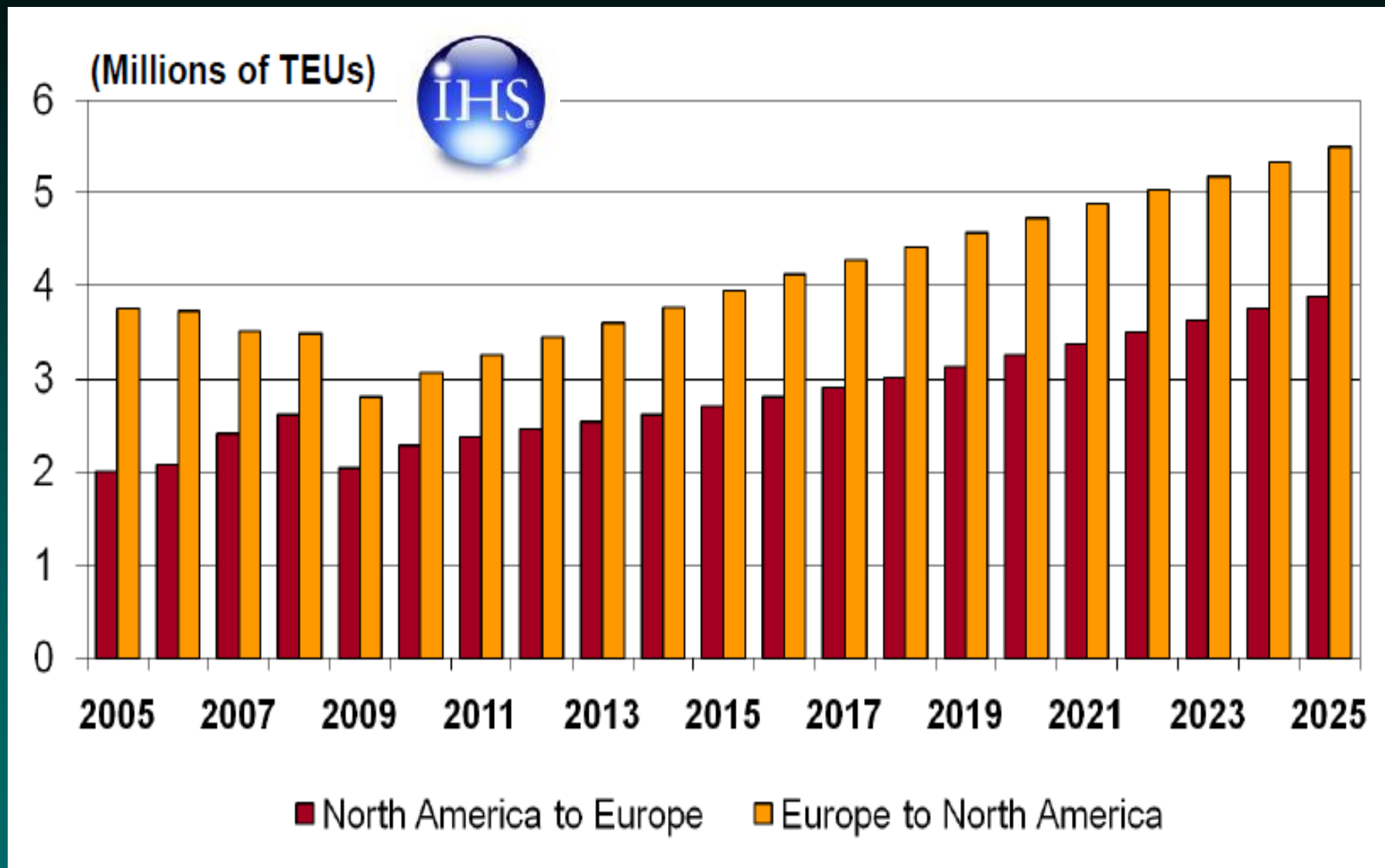
# Transpacific Container Trade Recovery

(Millions of TEUs)



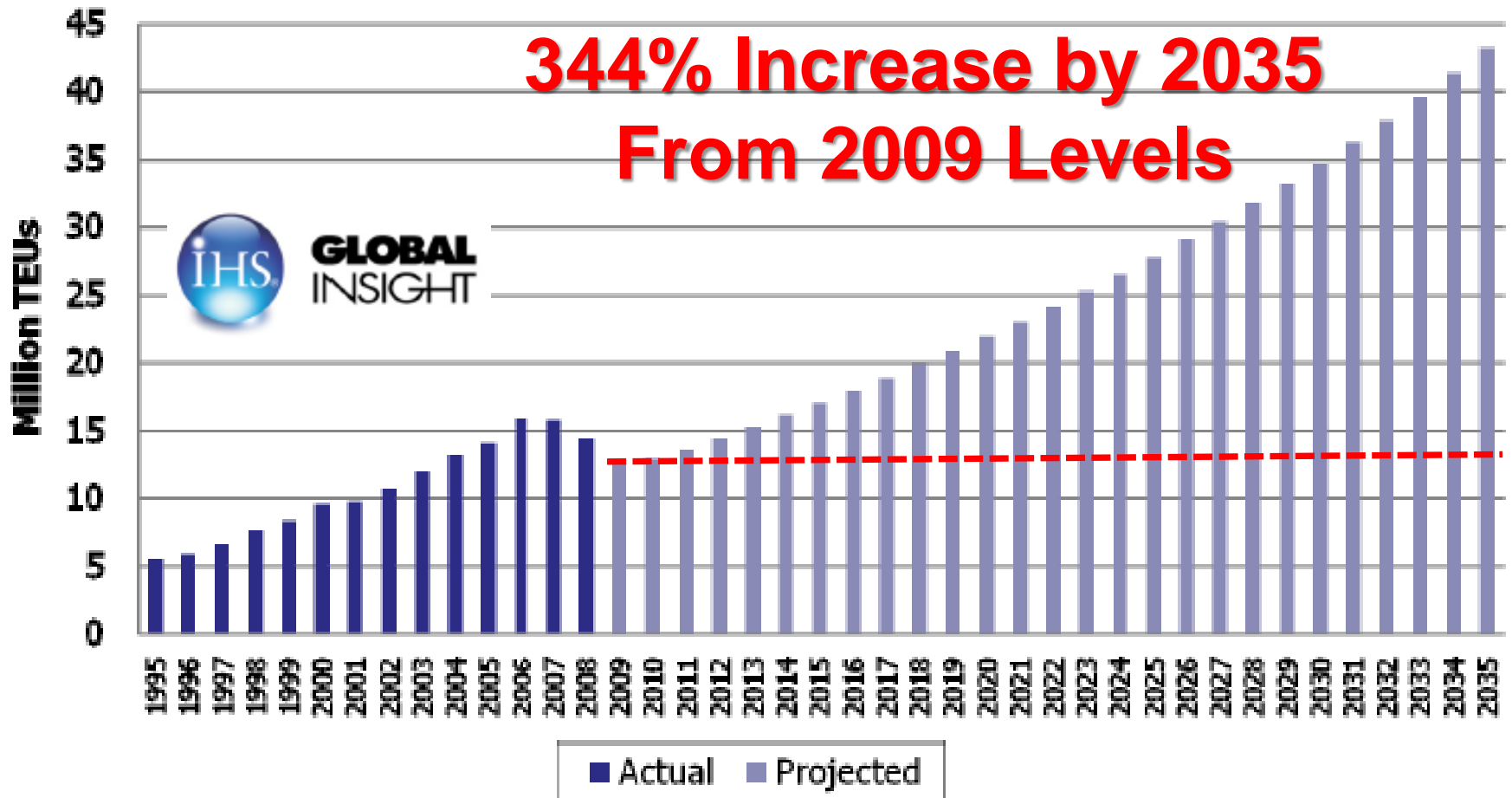
Source: IHS – Global Insight -The Global Outlook – October 14, 2010

# Transatlantic Container Trade Recovery



Source: IHS – Global Insight -The Global Outlook – October 14, 2010

# San Pedro Bay (POLA +POLB) Container Volume Forecast



Annual Growth Rate in Recovery Averages Around Five Percent



# Maritime Vessel Technology Trends



April 26, 1956

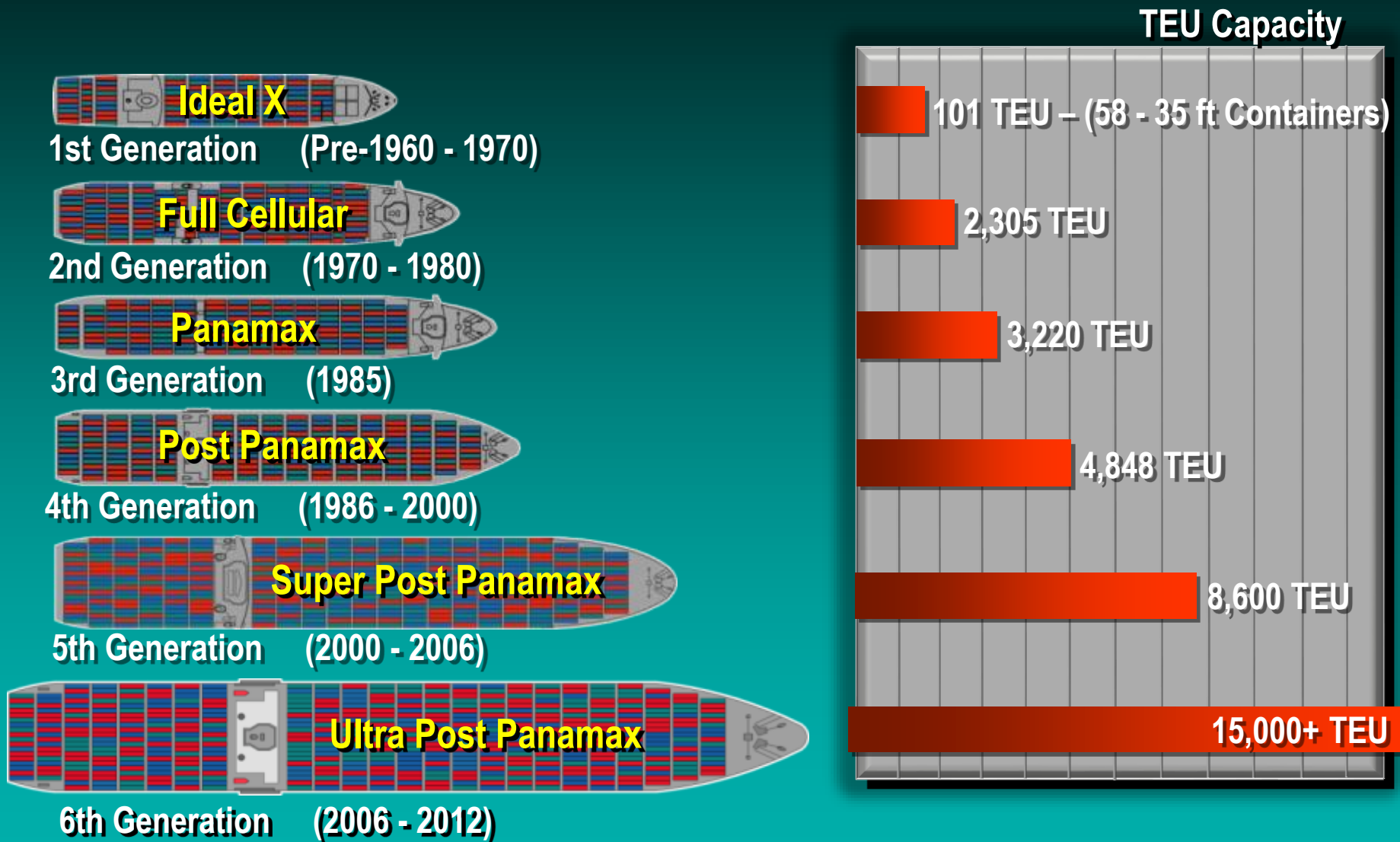
58 Modified 35-foot Truck Containers

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

April 2006:  
50 Year Anniversary of the Container

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

# World Container Ship Evolution



# World Container Ship Evolution



**24% increase** in the average container ship size  
from **2008 to 2012**

# Madison Maersk (3,928 TEUs)

## in the Panama Canal

(Current Max Panamax Vessel Approx. 4,800 TEUs)



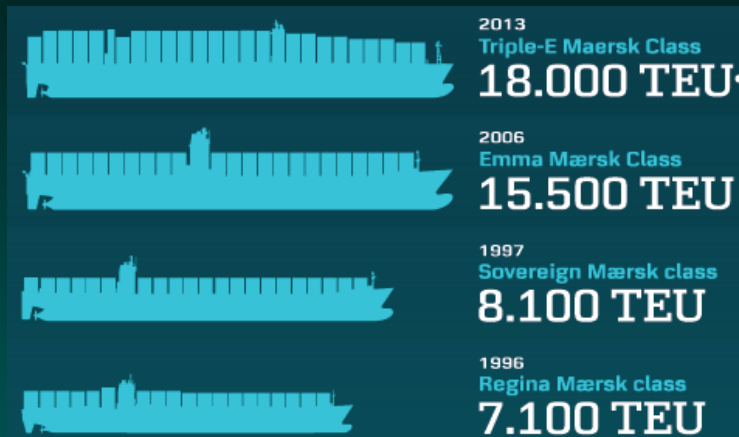
**Maersk's New 30 Vessels (ordered) are 4 Times the Current Size of the Panama Canal & 1.5 times the Size of the Expanded Panama Canal**





**MAERSK**  
LINE, LIMITED

# February 2011: A.P. Moller-Maersk Orders 30 – 18,000 TEU Container Vessels “*Largest in the World*”



**23 Containers Wide – 9 Tiers Above the Hatch**

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# 21,000 TEU Ultra Large Twin Engine Container Ship



**ALPHALINER**

**23 Containers Wide**



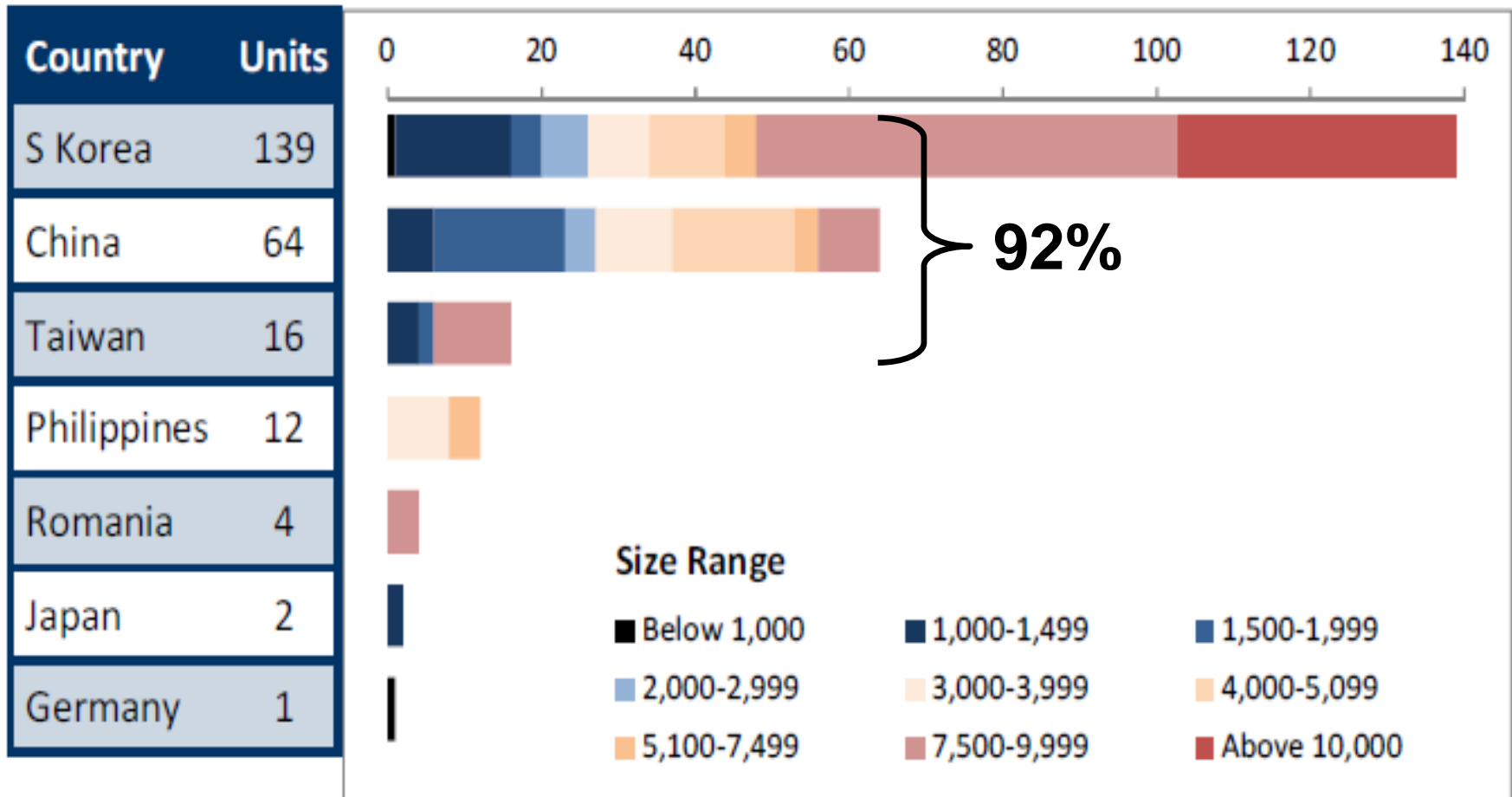
Source: Alphaliner Newsletter Volume 2011 Issue 4

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# Containership Orders – Country of Build

## (Orders Since January 2010)



Source: Alphaliner Newsletter Volume 2011 Issue 21





***New Era of LNG Vessels  
is on the Horizon:  
Will LNG be the Fuel of the  
Future for Shipping ?***



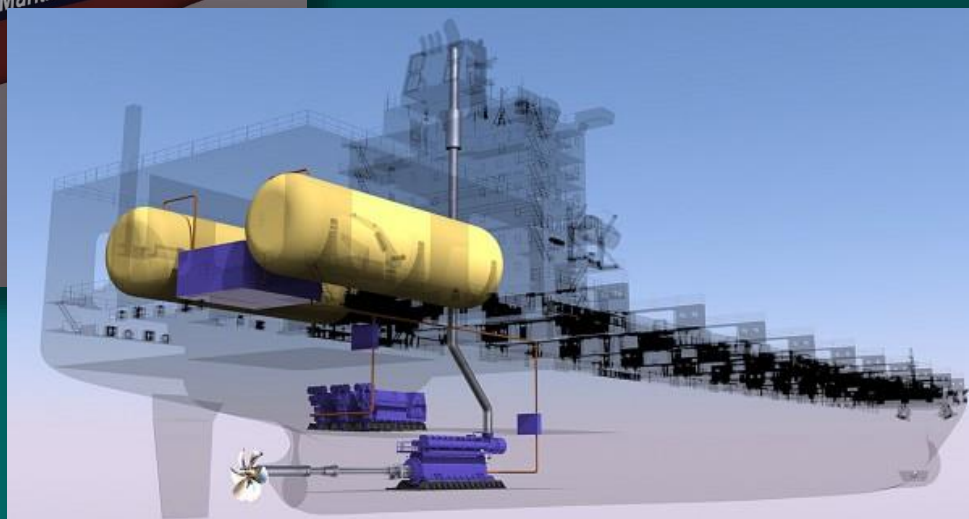
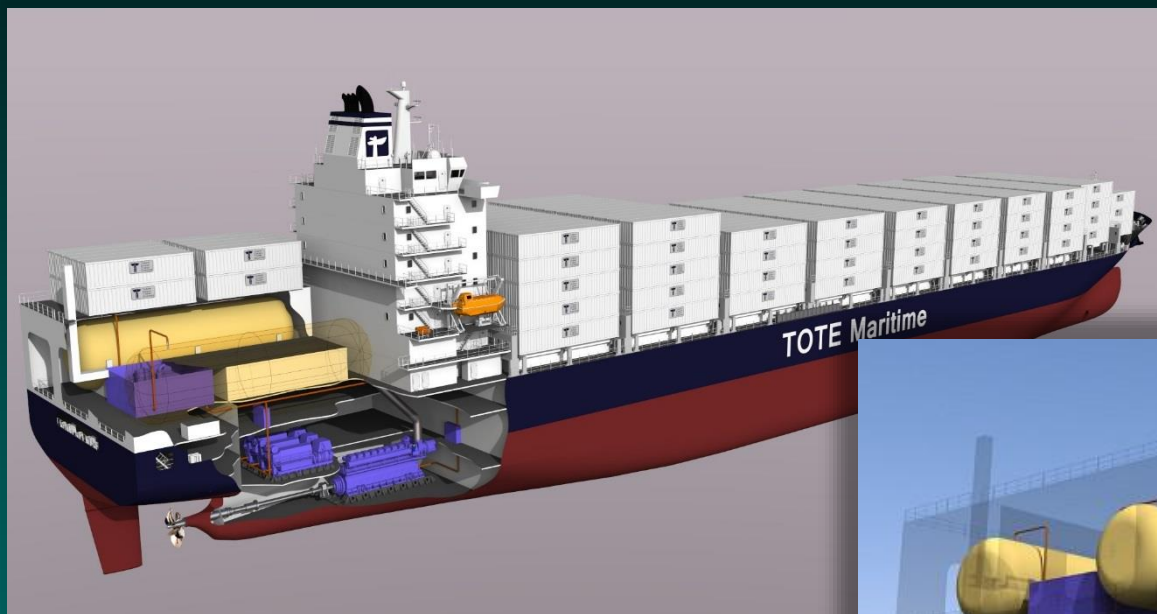
# TOTE Orders Two New LNG Powered Container Ships & Two RO/RO Conversions: Largest LNG Powered Ships in the World



These ships will be the largest ships in the world powered primarily by Liquefied Natural Gas (LNG).



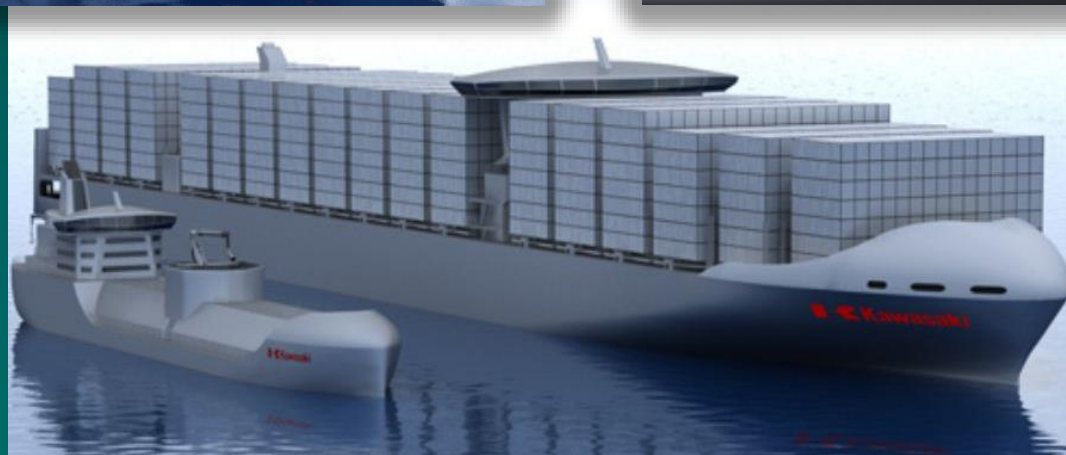
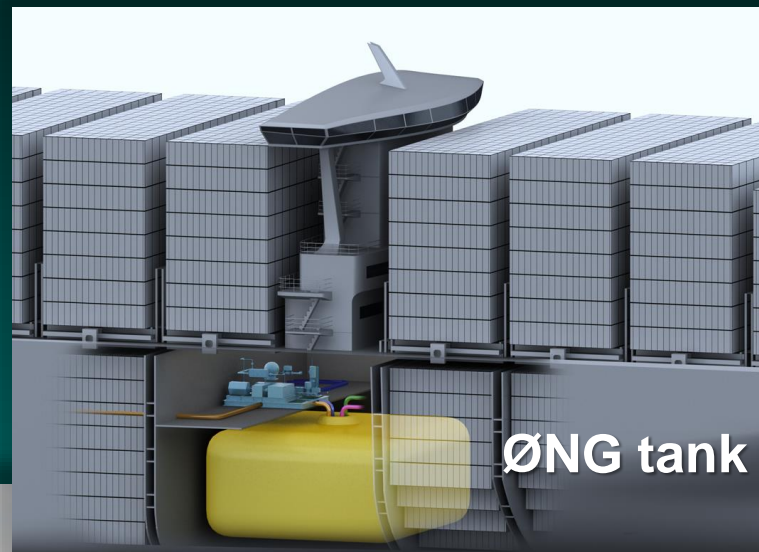
# TOTE Orders Two New LNG Powered Container Ships & Two RO/RO Conversions: Largest LNG Powered Ships in the World



Two 839-foot Orca-class vessels to liquefied natural gas-diesel dual fuel operation for Seattle-Alaska service and two 764-foot new-builds for the Florida-Puerto Rico trade



# Kawasaki Heavy Industries 9,000 TEU container ship Fuelled by LNG



A new type of LNG tank that provides more space for container cargo.

# Germanischer Lloyd (GL) & IHI Marine United Inc. (IHIMU) Concept Study 13,000 TEU Container Vessel Fuelled by LNG



The eFuture 13000C design (©IHIMU)

# LNG Vessel Bunkering: *North American Ports Are Not Prepared...*





# Panama Canal Expansion: New Capacity

# Panama Canal Route



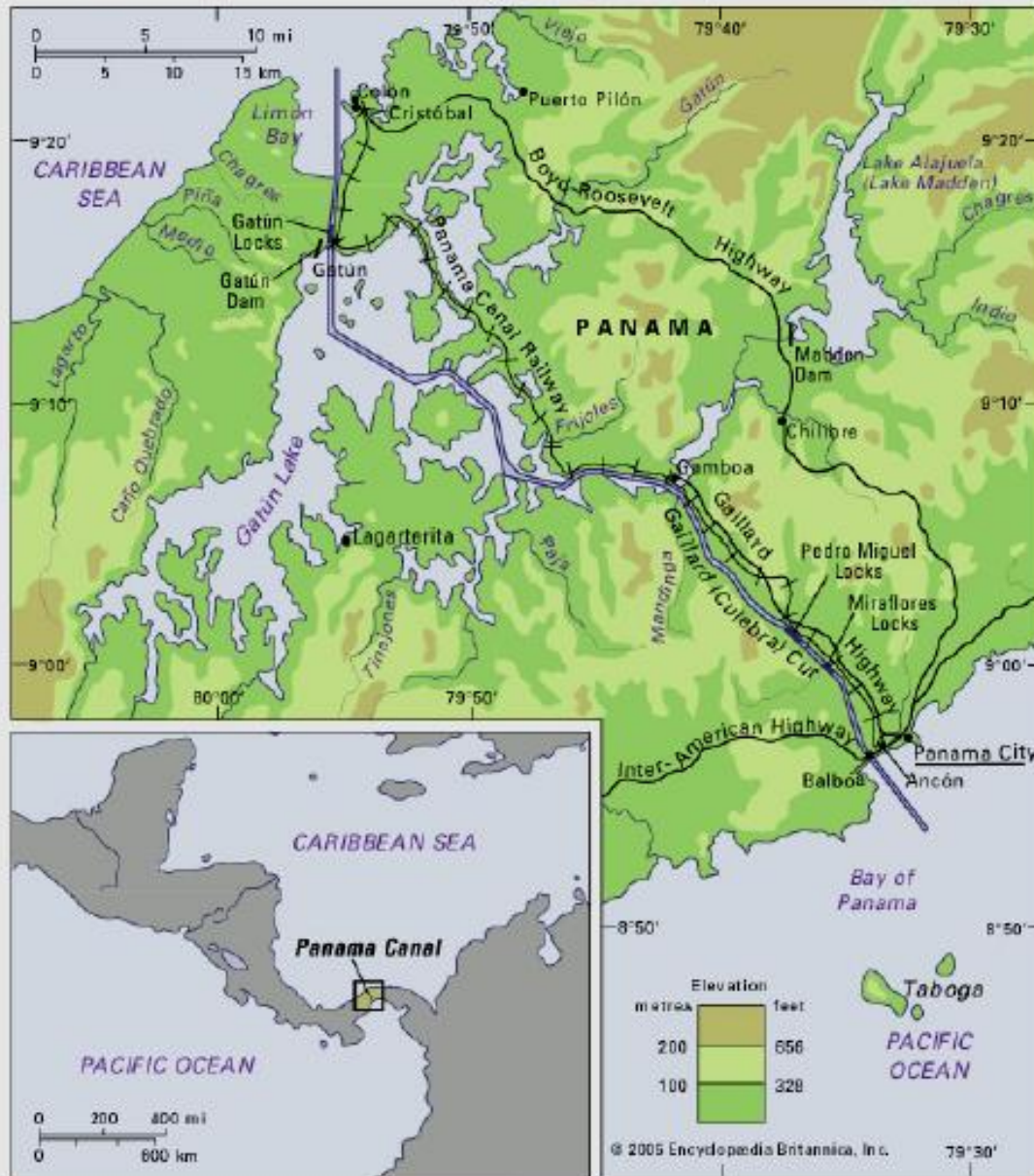
The Autoridad Del Canal de Panama

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# Panama Canal Expansion



The Autoridad Del Canal de Panama

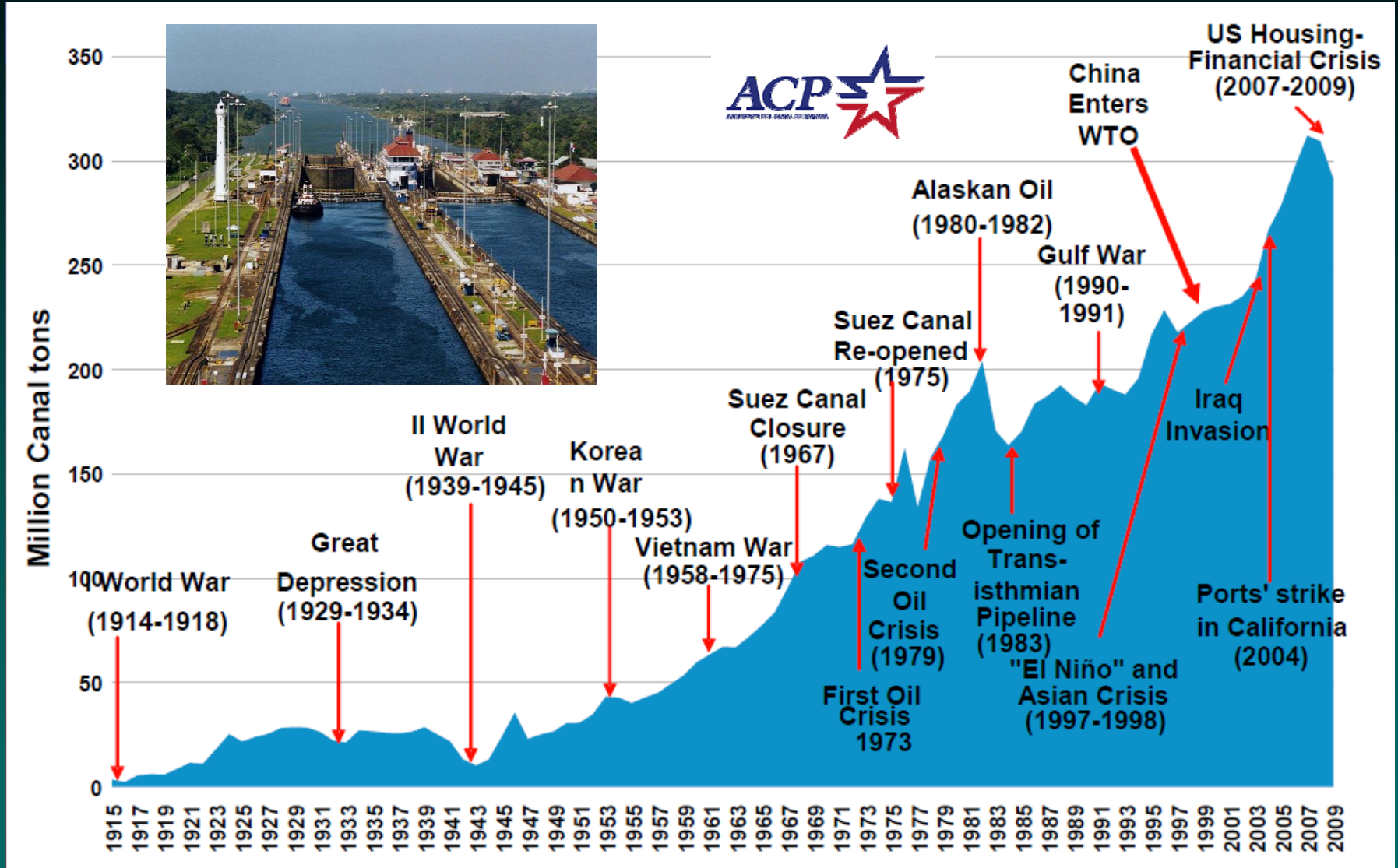
More than **14,000 ships** a year pass through the **50 mile long** 1914 manmade Link between the Pacific Ocean & Caribbean Sea carrying **275 million tons of Cargo** and **\$100 billion in container shipping**

Source: ACP Data

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# Panama Canal Historical Tonnage Traffic



Source: ACP Data

# The Panama Canal Circa 1914



# Panama Canal Today



The Autoridad Del Canal de Panama



# Expansion of the Panama Canal: Circa 2016

Depth needed for ships  
39.5 feet

110 feet

Greater than 181 feet

Depth needed  
for larger ships  
50.49 feet



0 25 mi  
0 25 km

Panama Canal  
Gatun Lake  
Panama City  
Gulf of Panama

Proposed locks

The canal, 35 yards above sea level, uses a series of parallel locks to lift ships to Gatun Lake for the 50-mile cruise across.



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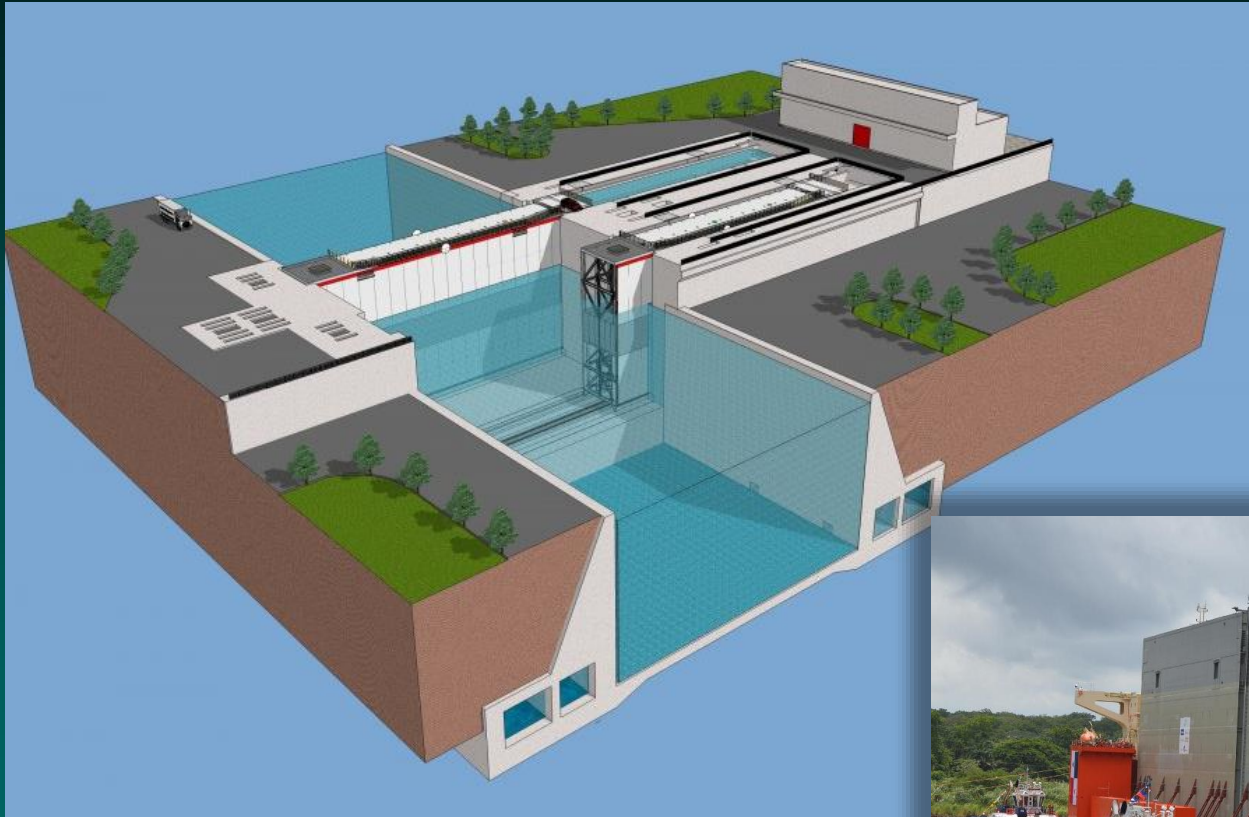


The Autoridad Del Canal de Panama

# Post 2016 Panama Canal



# Panama Canal Third Lane Expansion Circa Late 2015 / Early 2016



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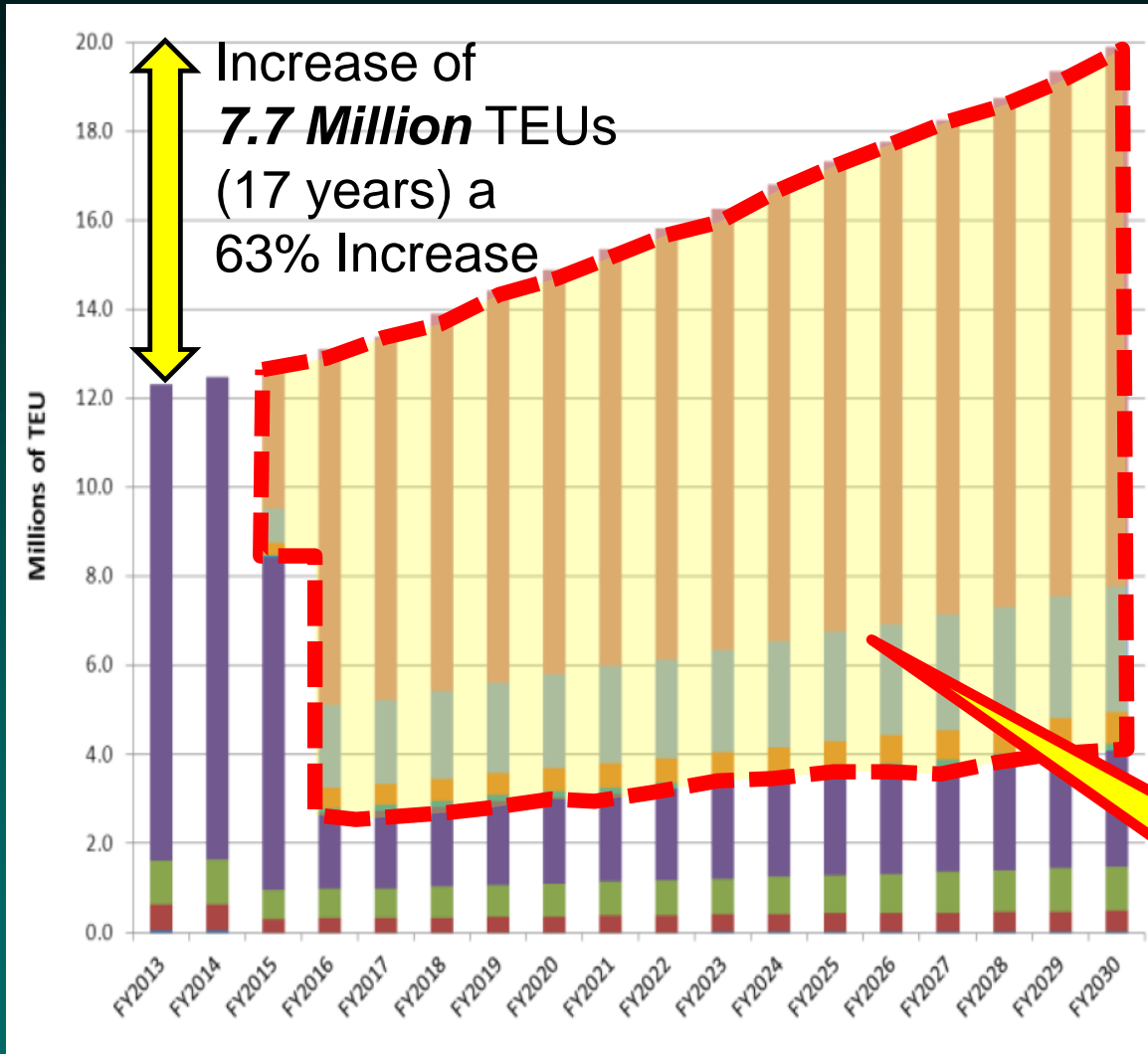
# A \$5.25 Billion Investment in a 3<sup>rd</sup> Set of Locks Equating to 16% of Panama's National GDP





# Canal TEU Forecast by Vessel Beam

(FY2013 to FY 2030 – Millions of TEUs)



- 140' or more
- 120' - 139.99'
- 107' - 119.99'
- 100' - 106.99' (> 39.5' Draft)
- 100' - 106.99' (< 39.5' Draft)
- 91' - 99.99'
- 80' - 90.99'
- Less than 80'

**Beyond Current Panamax Width**

# ***A Larger Share of Other Vessels Will be Able to Transit the Canal - Fully Loaded***



*Crude Oil - 0% to 42%*



*LNG - 10% to 90%*

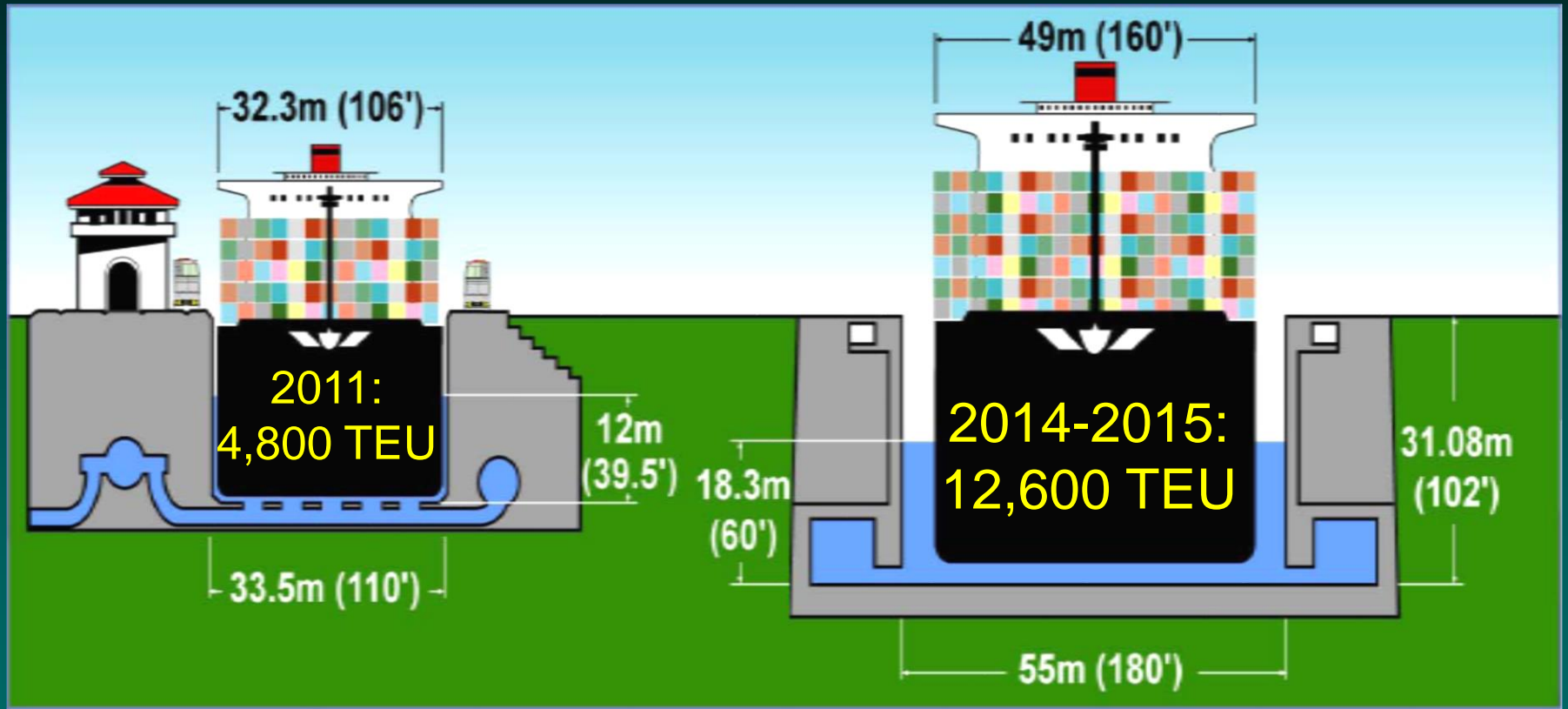


*Dry Bulk - 55% to 80%*



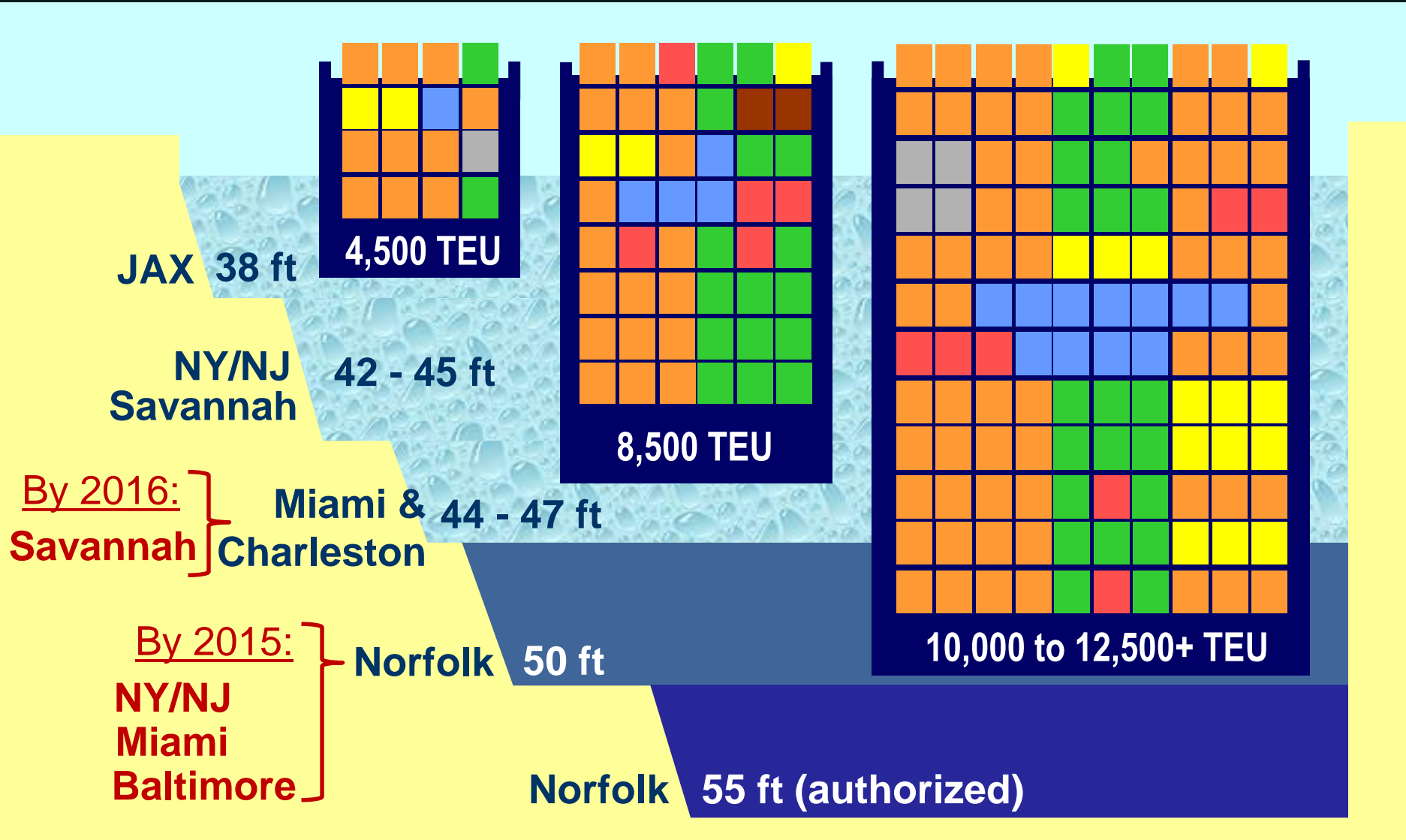
The Autoridad Del Canal de Panama

# Panama Canal Third Lane Expansion Capabilities



Source: ACP Expansion Project

# Today Only The Port of Virginia Can Handle The New 2015 Panamax Vessels Fully Loaded



Source: Virginia Port Authority (VPA) October 2011

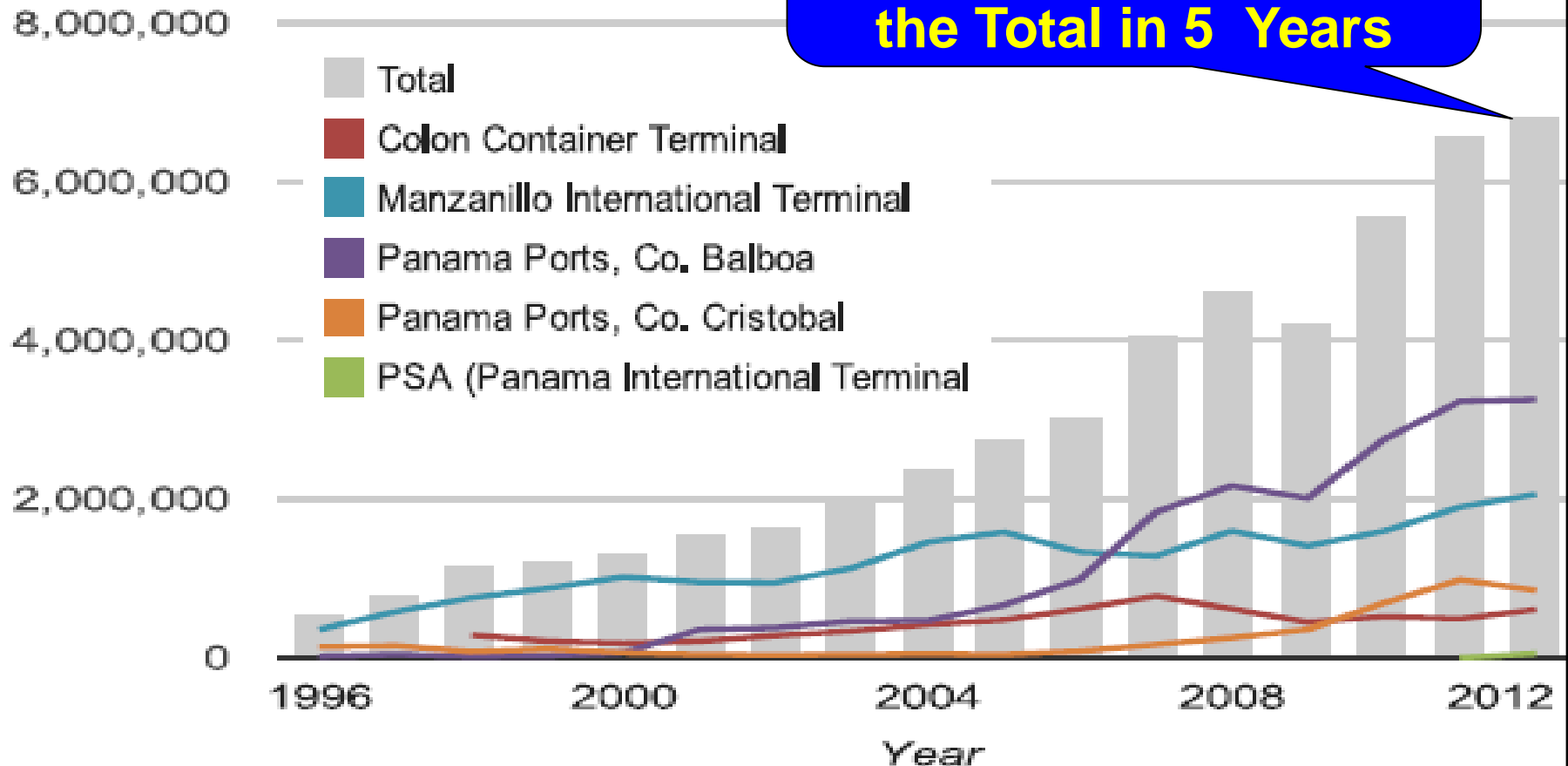


***Emerging New  
Caribbean  
Transshipment Center***

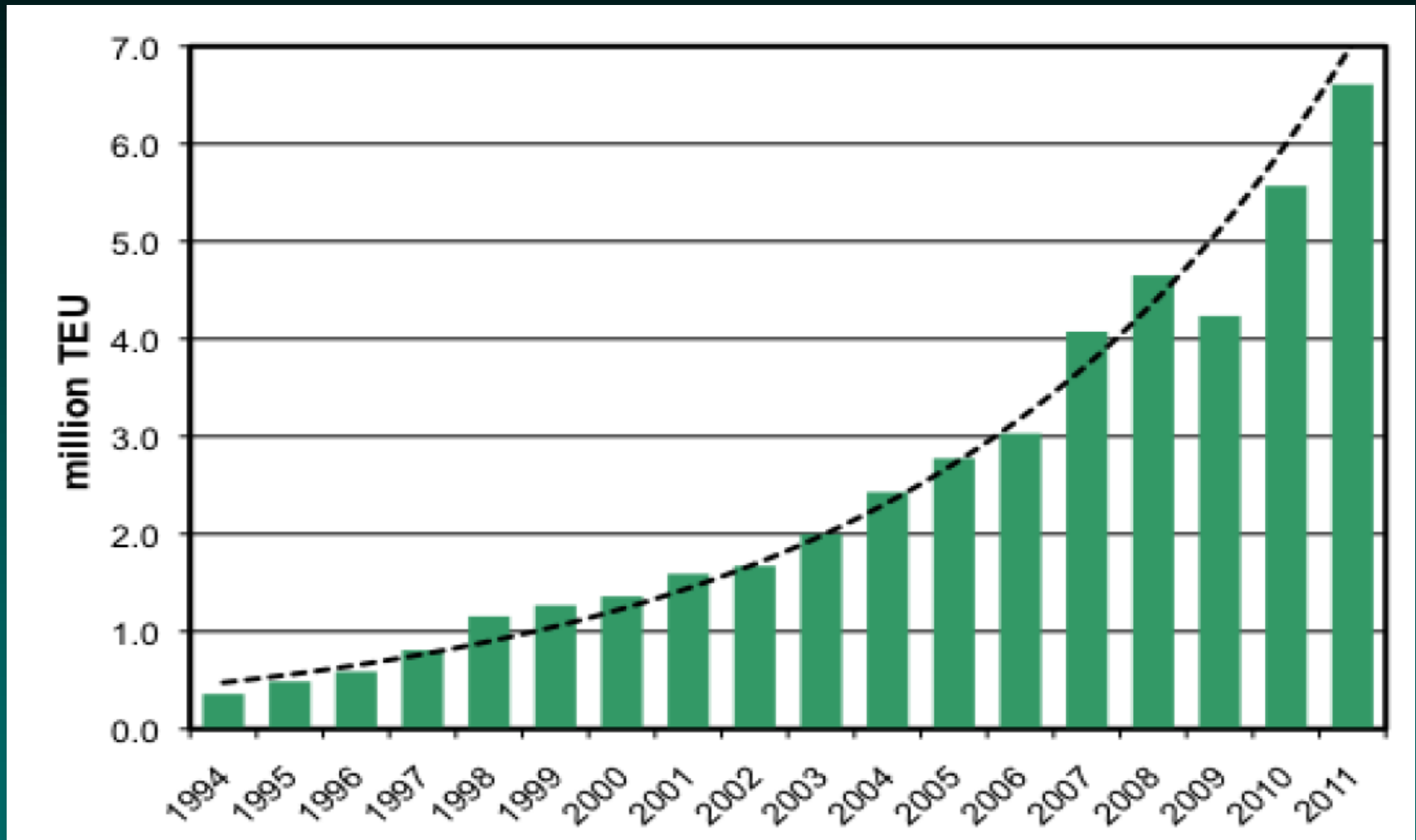
# Panama Ports Annual Transshipment Growth

“The Singapore of Latin America”

**Proposed New Port  
Projects Would Double  
the Total in 5 Years**

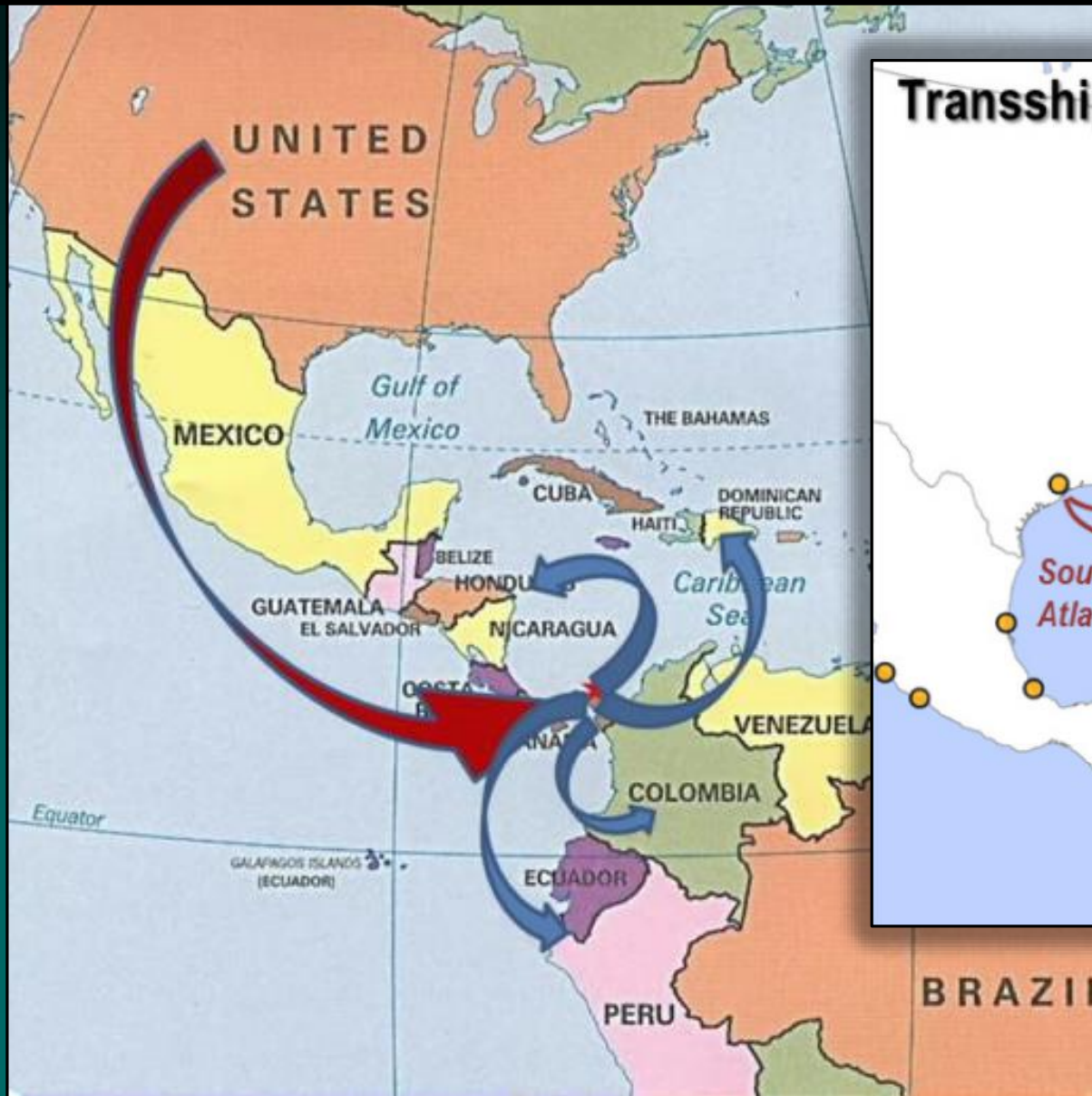


# Panama Ports Container Transshipment Growth



6.8 Million TEUs – 18.5 % Growth Rate

# The Panama Canal Expansion Will Move the Caribbean Transshipment Center Point to Panama





# 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

# New Panama Canal Pacific Entrance Ports



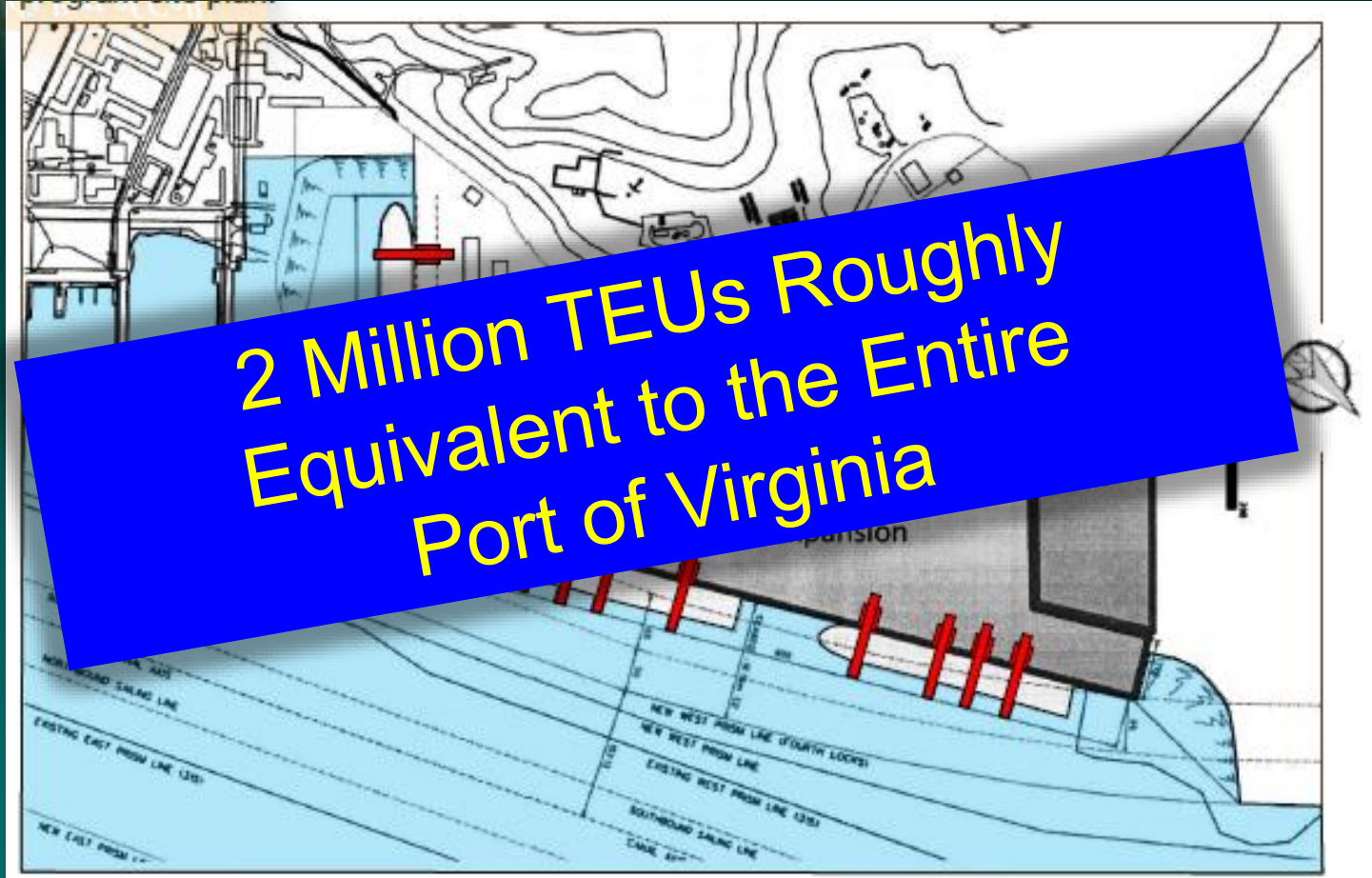
More Capacity than all of the Port of Los Angeles



**The Autoridad Del Canal de Panama**



# PSA Panama International Terminal (PPIT) Western Entrance Conceptual Site Plan, Phase I +II

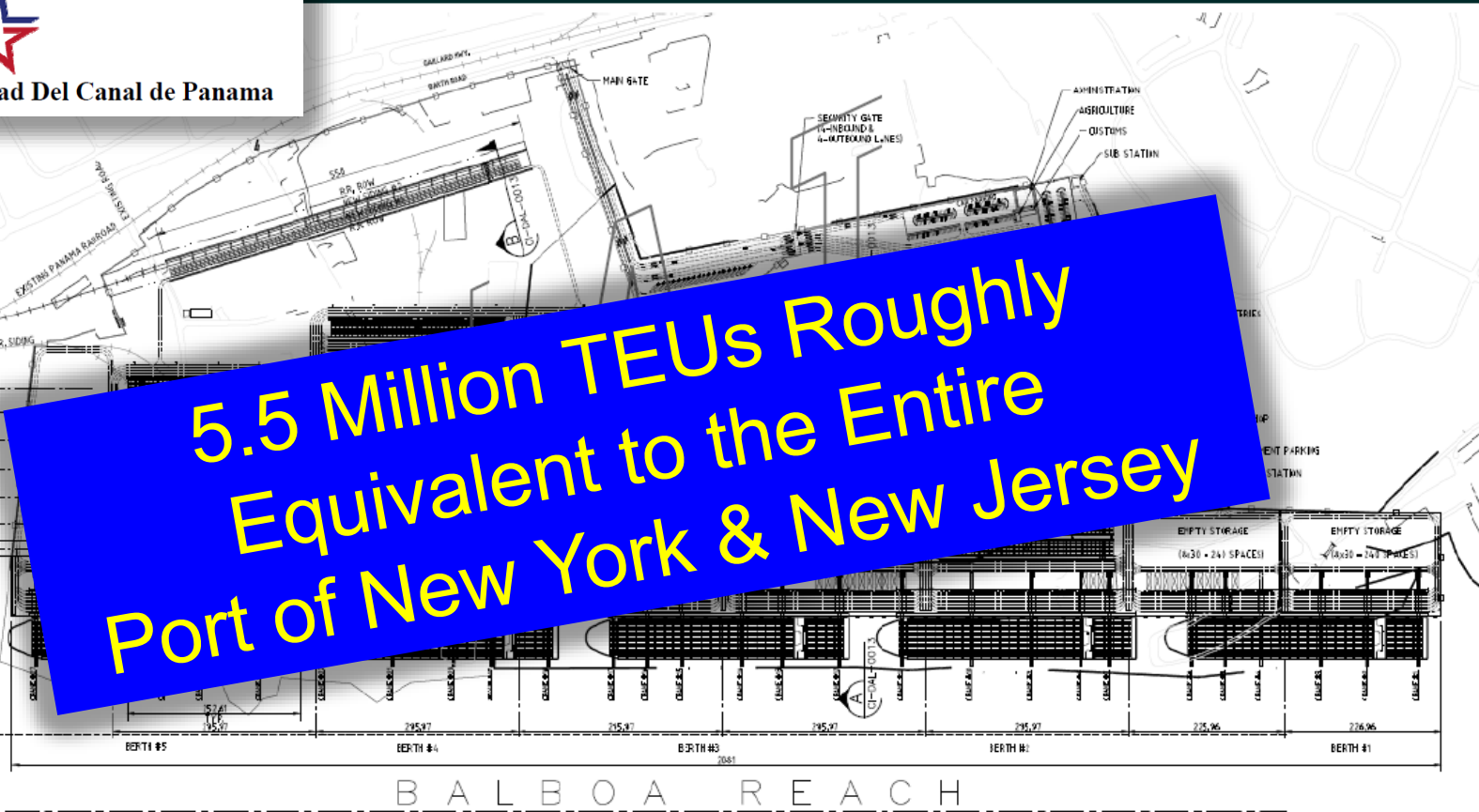


# Corozal Oeste Container New Transshipment Terminal Panama Canal Western Entrance - Phase I & II



The Autoridad Del Canal de Panama

5.5 Million TEUs Roughly  
Equivalent to the Entire  
Port of New York & New Jersey



Source: ACP Expansion Project – Rodolfo Sabonge AAPA January 24, 2013

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# Corozal Oeste Container New Transshipment Terminal Panama Canal Pacific Entrance - Phase I & II



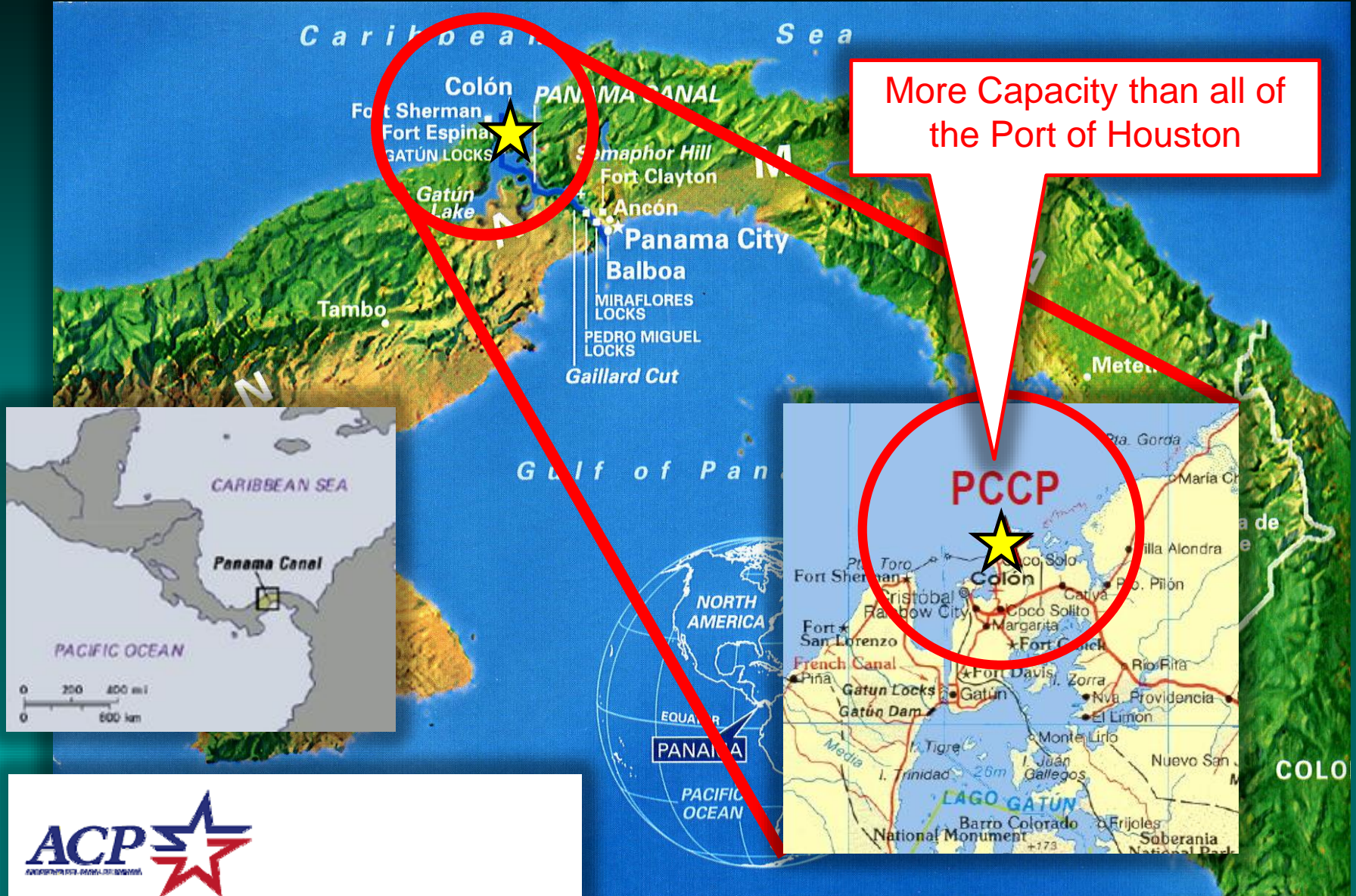
**Terminal: 116 hectares (286.6 acres)**

Source: ACP Expansion Project – Rodolfo Sabonge AAPA January 24, 2013

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# New Panama Canal Atlantic Entrance Port



More Capacity than all of the Port of Houston



**ACP**  
The Autoridad Del Canal de Panama



JONES LANG  
LASALLE

# Panama Colon Container Port

(New \$600 Million Container Port  
Panama Canal Atlantic Entrance)

# PCCP



The terminal, with an initial capacity of two million TEU, will be constructed by a consortium of Asian developers under the name Panama Colon Container Port LLC (PCCP)



# Panama Canal Large Vessel Market Penetration into the US Midwest



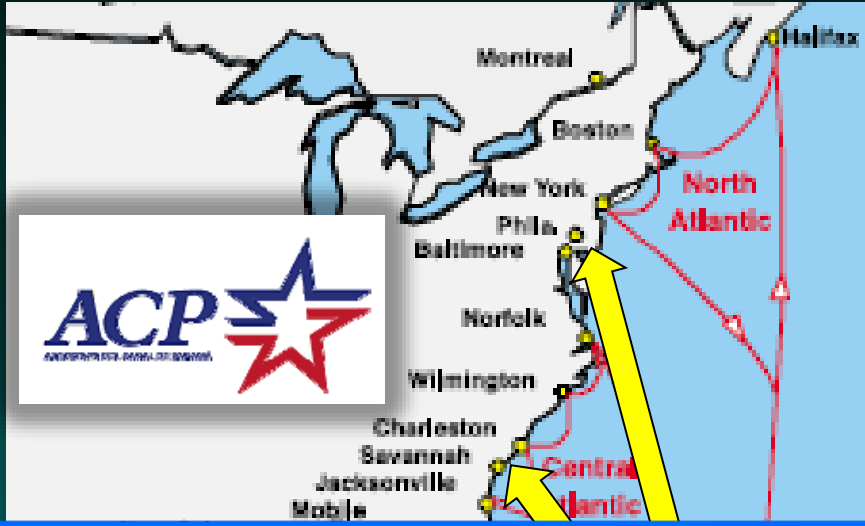
# Nicaragua's \$40 Billion Contract with Chinese HKND to Dig a Rival to the Panama Canal



# Alternative “Dry Canal” Proposals to Counteract Anticipated Canal Fees/Costs

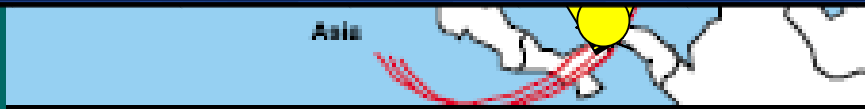


# Panama Canal Vessel Deployments Will Determine New US Logistics Patterns



*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

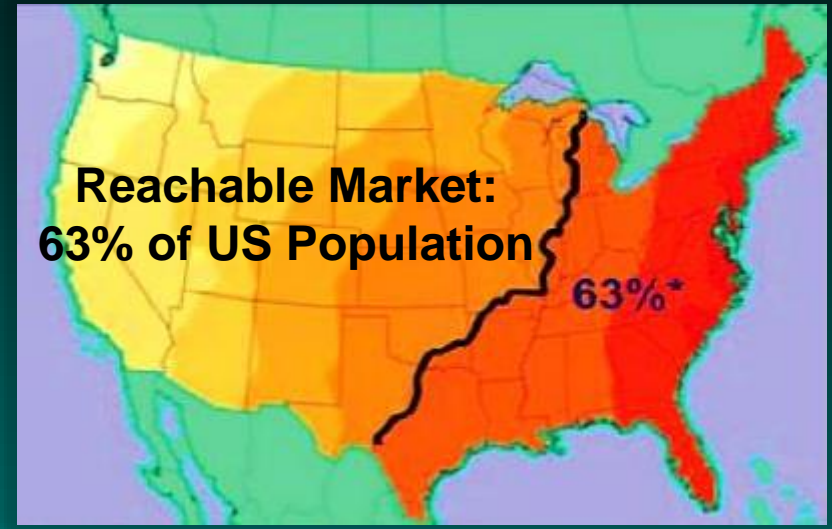
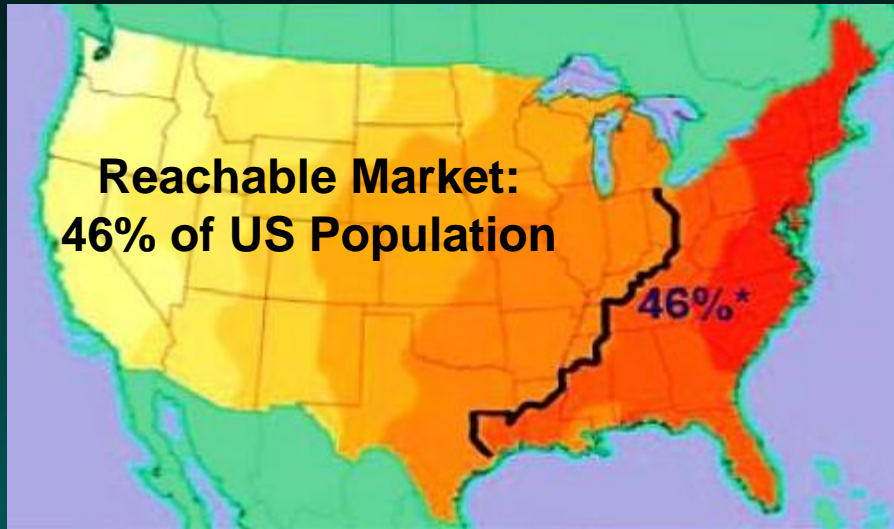
*(Potential Increased Service Offerings and System Capacity)*



Source: USDOT Maritime Administration (MARAD) 2009

# Dramatic US Market Penetration after 2015

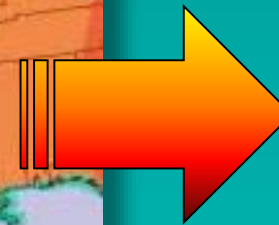
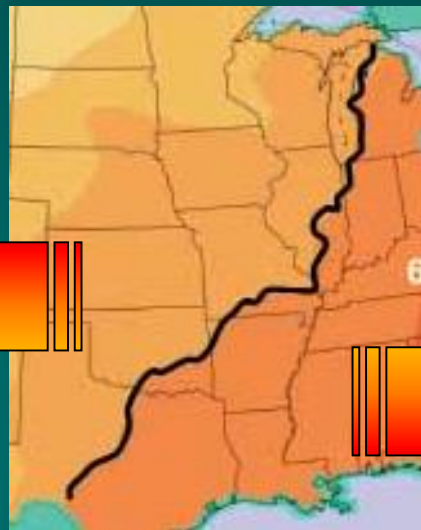
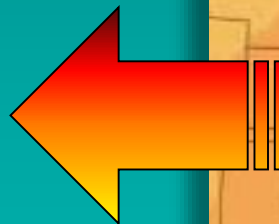
*Panama Canal Economies of Scale with permit deeper market penetration into the US*



4,000 TEU ship, all-water.

8,000 TEU ship, all-water.

West Coast  
Cost Advantage



East Coast  
Cost Advantage

# US and Canadian Rail Land Bridges

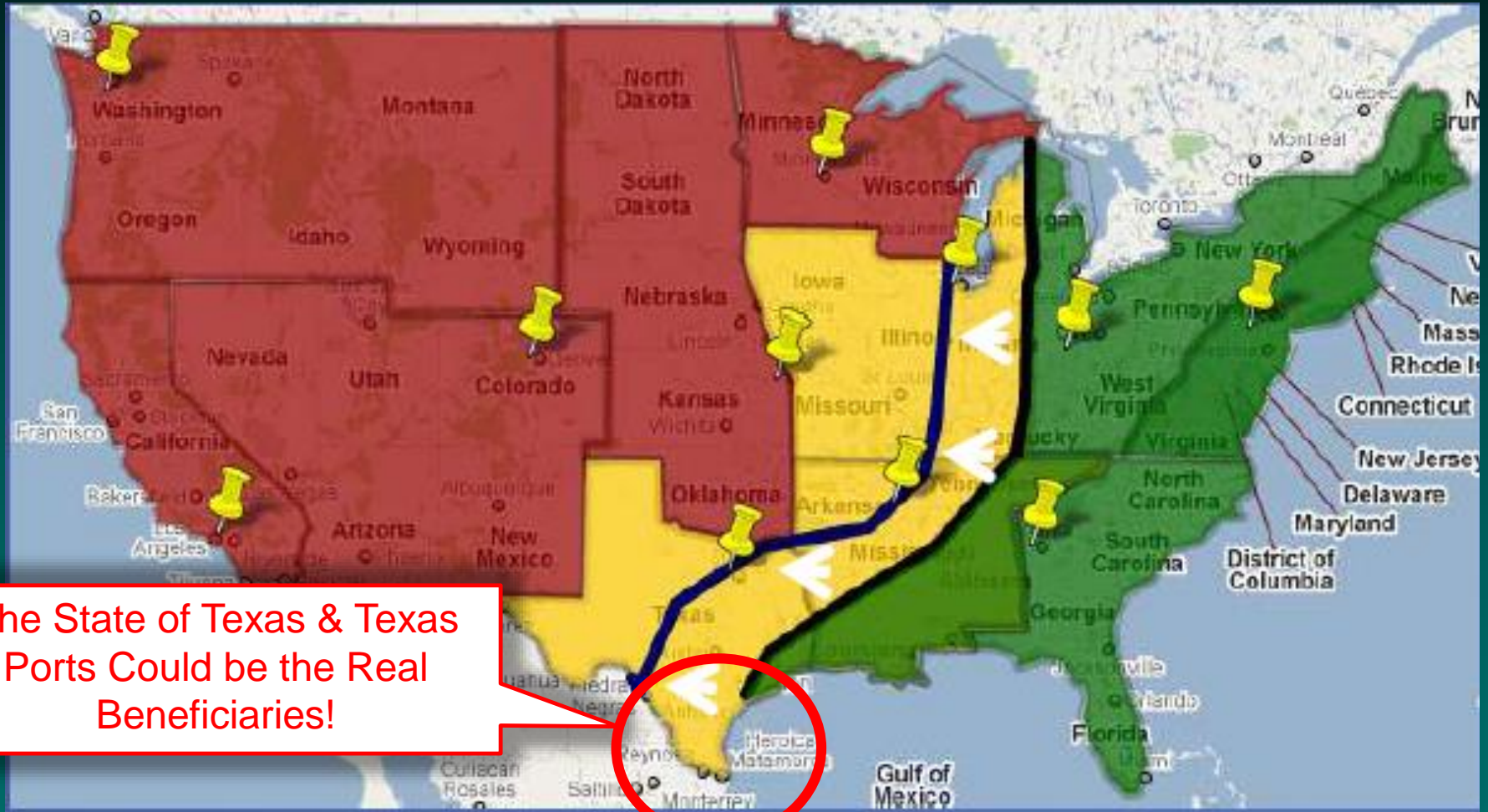
**Panama Canal Market  
Penetration Break Even Cost  
Control Zone**



Source: USDOT PB Panama Canal Expansion Study, June 2012

# Dramatic US Market Penetration after 2015

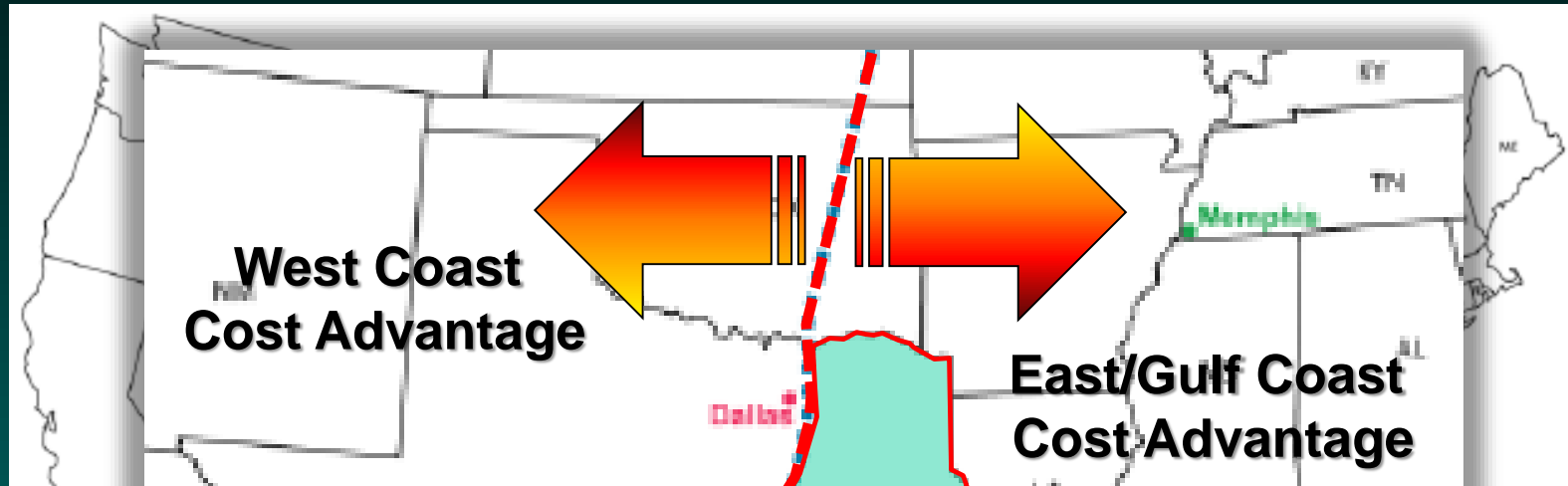
*Panama Canal Economies of Scale with permit deeper market penetration into the US*



The State of Texas & Texas Ports Could be the Real Beneficiaries!

# Dramatic US Market Penetration after 2016

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



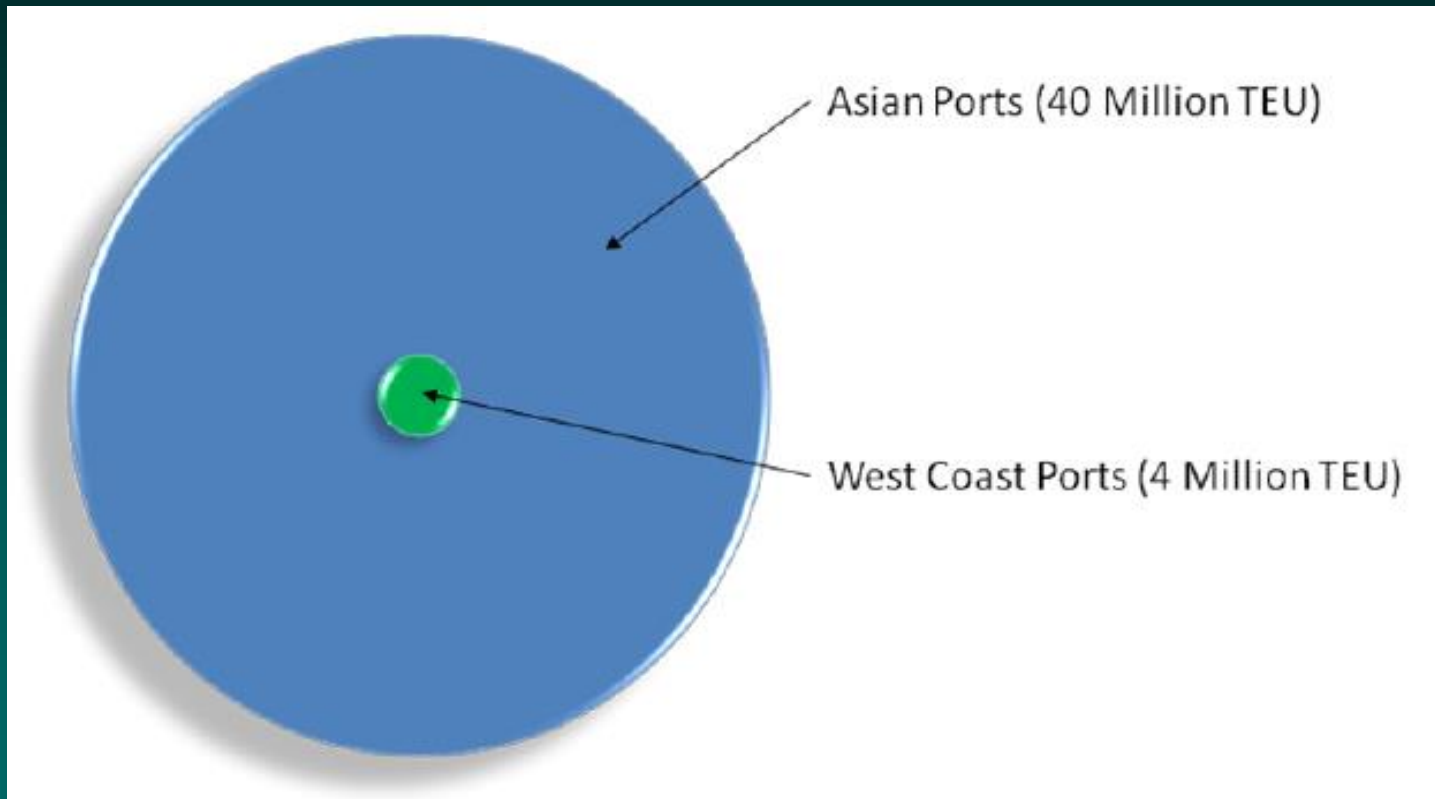
**The Panama Canal will prove to be a strong contender for Asian trade serving not only the US East Coast, but also most of Texas and the Midwest by 2016.**

*Source: Potential Effects of the Panama Canal Expansion on the Texas Transportation System, Texas DOT, Cambridge Systematics October 2011*



# Is This Trade Trend Long Lasting?

## *Planned Port Container Capacity Expansion in Asia Compared to US West Coast Ports*



Source: Potential Effects of the Panama Canal Expansion on the Texas Transportation System, Texas DOT, Cambridge Systematics October 2011



***Thank You***



The logo for Vickerman & Associates, LLC features the name "VICKERMAN" in a large, blue, serif font. Below it is a decorative blue wavy line. To the right of the wavy line, the text "& ASSOCIATES, LLC" is written in a smaller, blue, serif font.

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