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Port & Maritime Industry Trends and Developments

M. John Vickerman

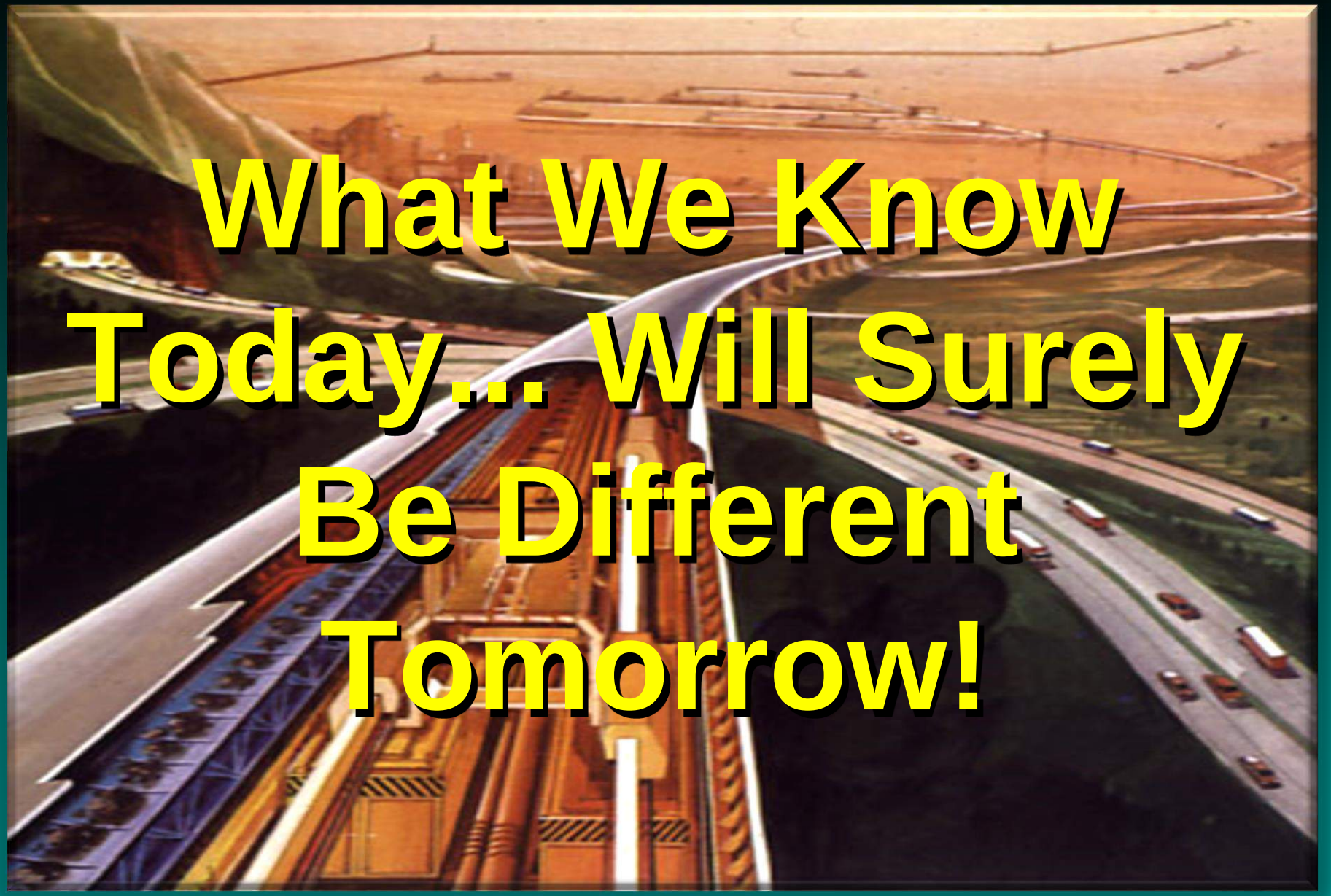
VICKERMAN & ASSOCIATES, LLC

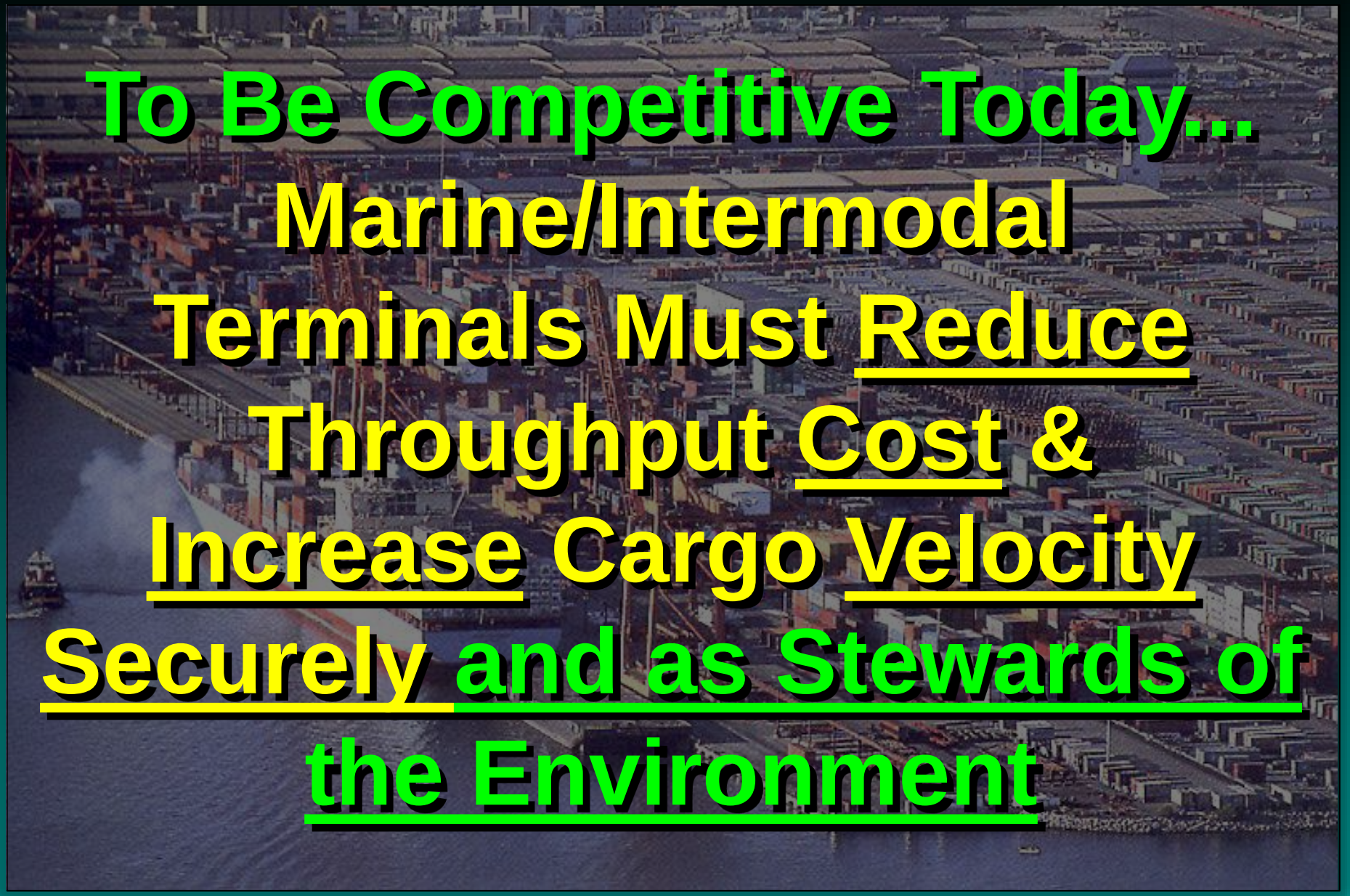
Williamsburg, Virginia

Vessel Cargo Handling Circa 1955

Cargo Handling Circa 2010

US Navy Fast Frigate Circa 2045





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The Evolution of Today's Global Shipping Lanes

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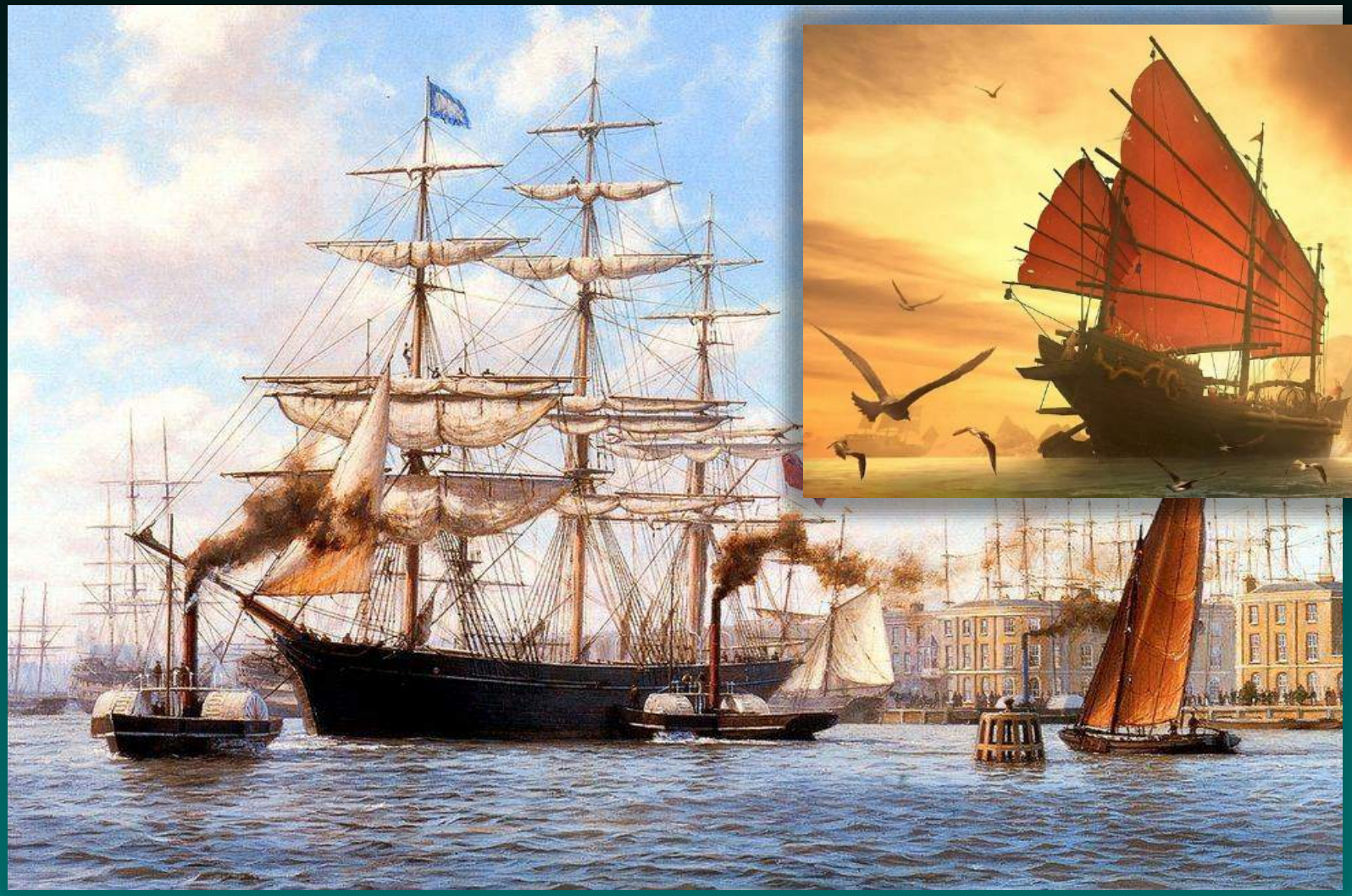
The Maritime Silk Road Replaced the Overland Silk Road as the Primary Trading Route Across Eurasia After the Tang Dynasties (618 to 907)

The Marine Silk Road was a Precursor to:



Today's Modern supply chain logistics, distribution and shipping transportation networks

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The World's Primary Shipping Routes

The Marine Silk Road

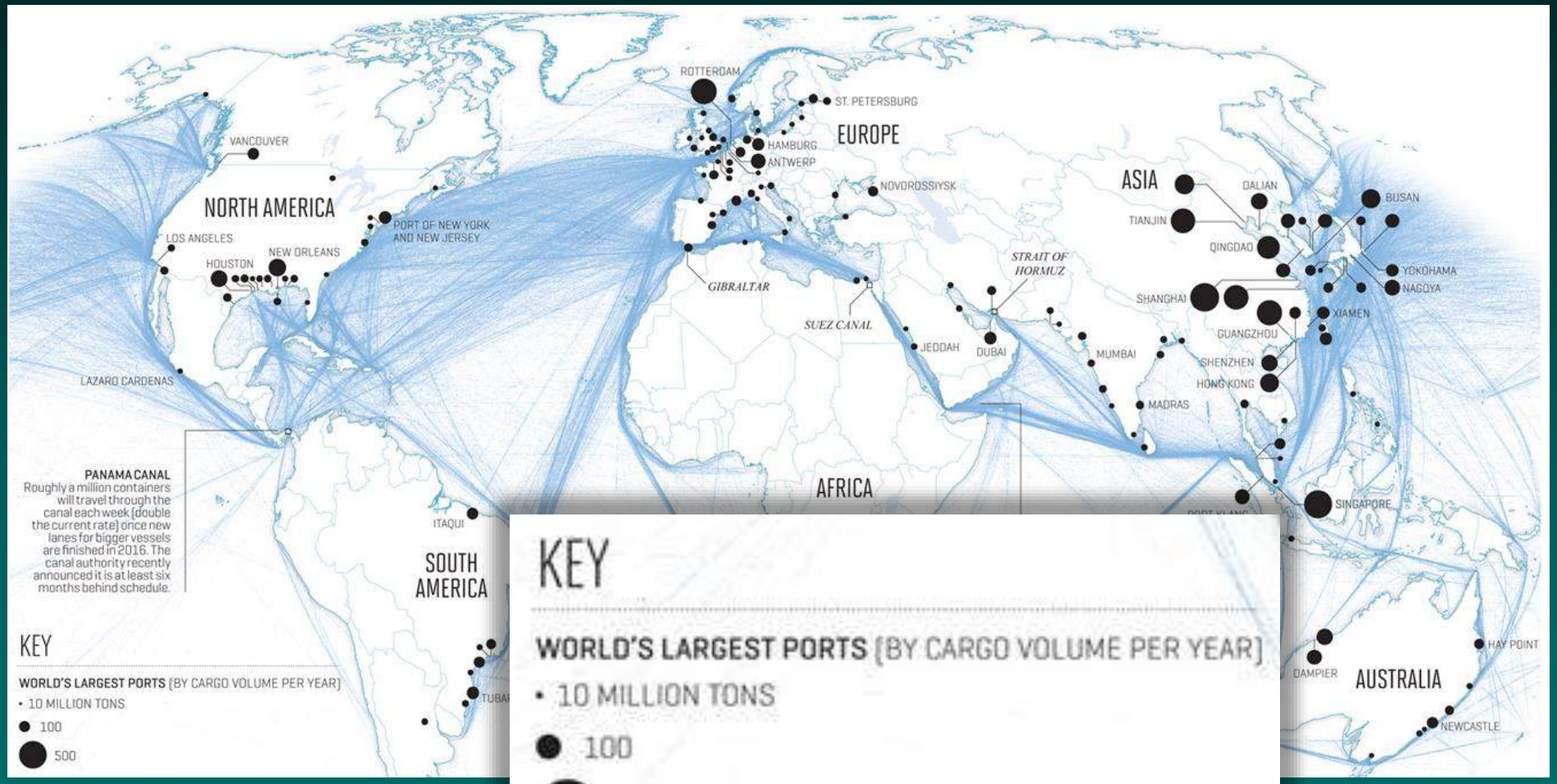
90% of Global Trade is Carried Out by Shipping

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

Indian Ocean Electric Blue Shipping Lane Trails From the Marine Silk Road

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

Where are the Biggest Ports?



KEY
WORLD'S LARGEST PORTS (BY CARGO VOLUME PER YEAR)
• 10 MILLION TONS
100
500

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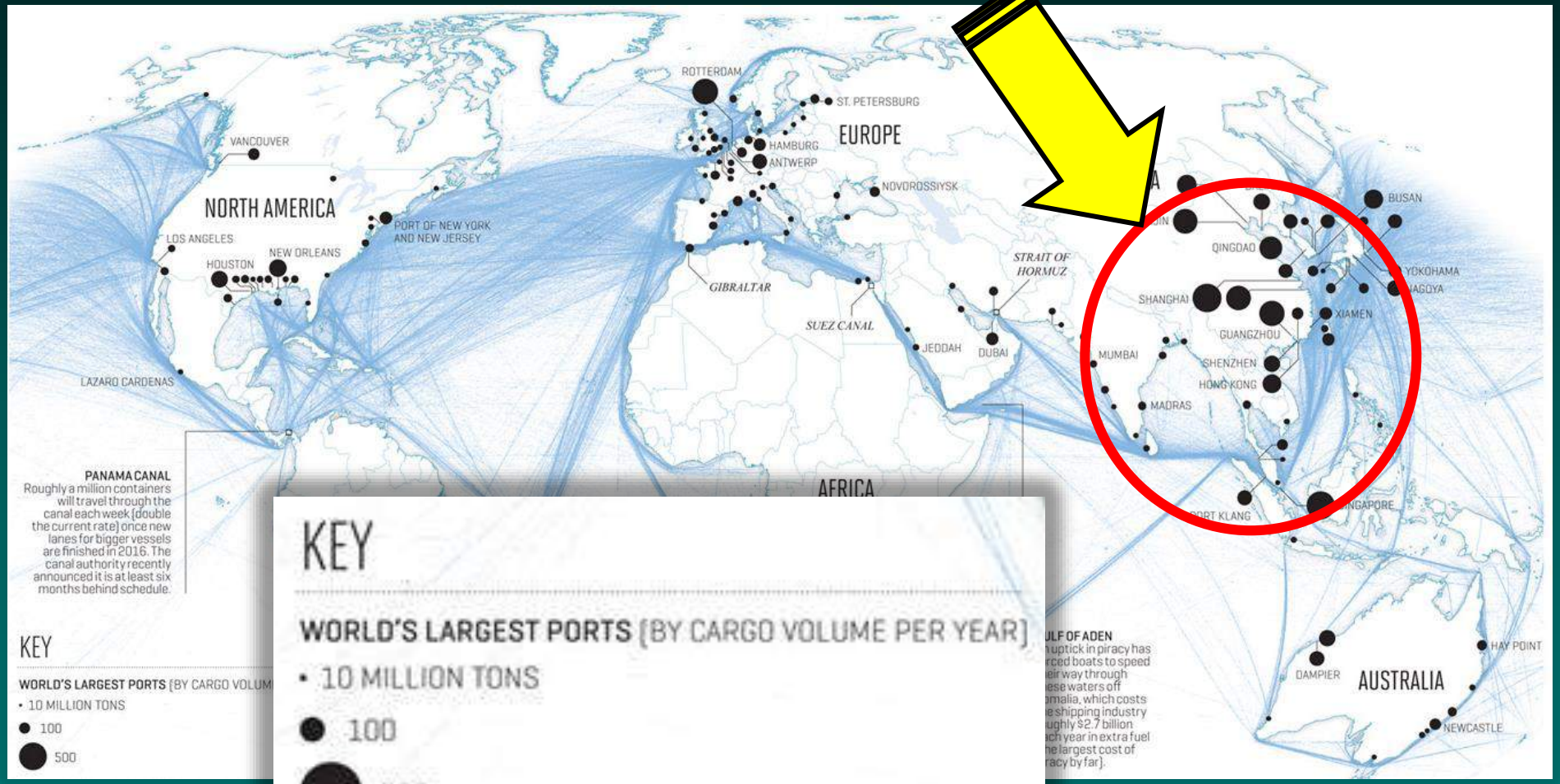
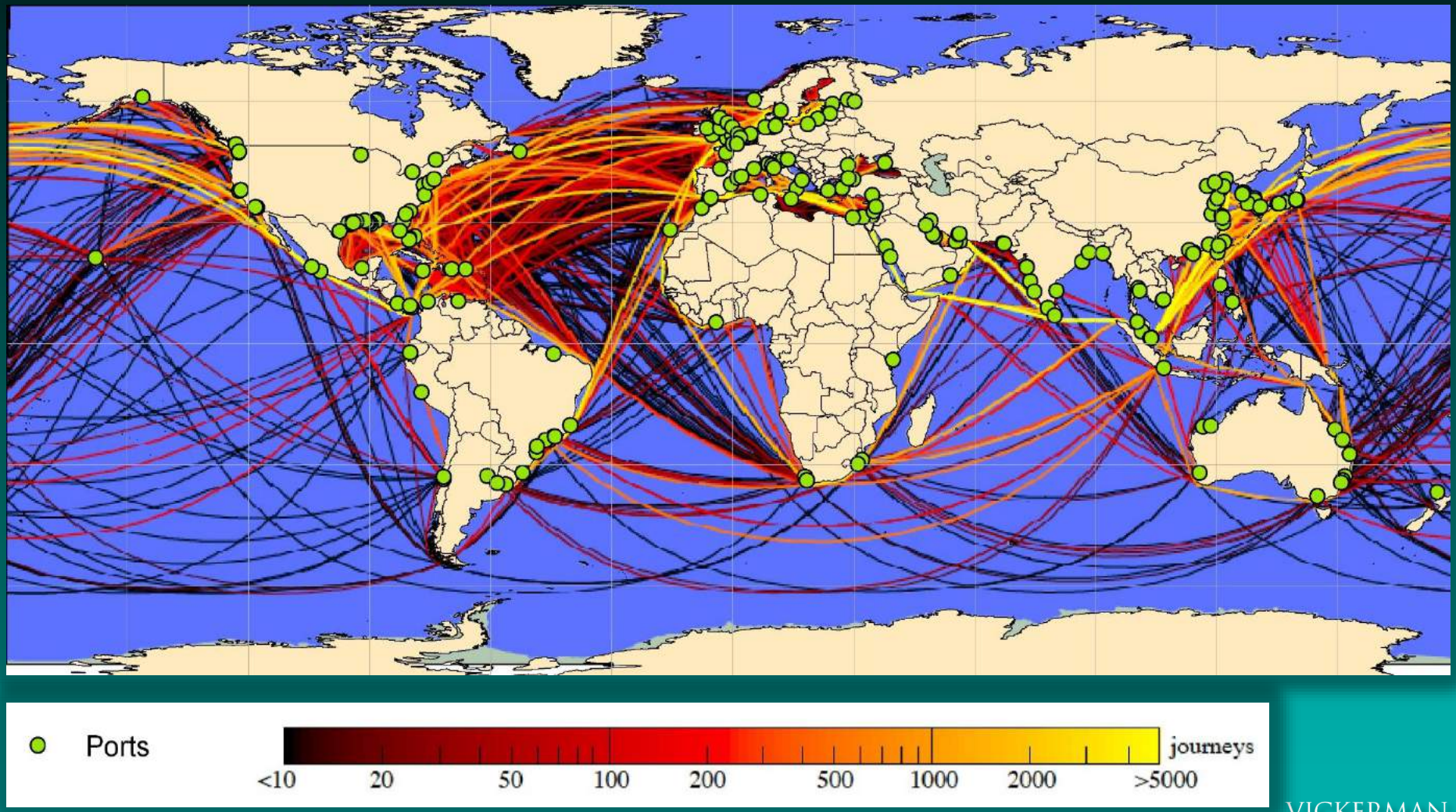
The World's Largest Ports Are Connected Via The Maritime Silk Road

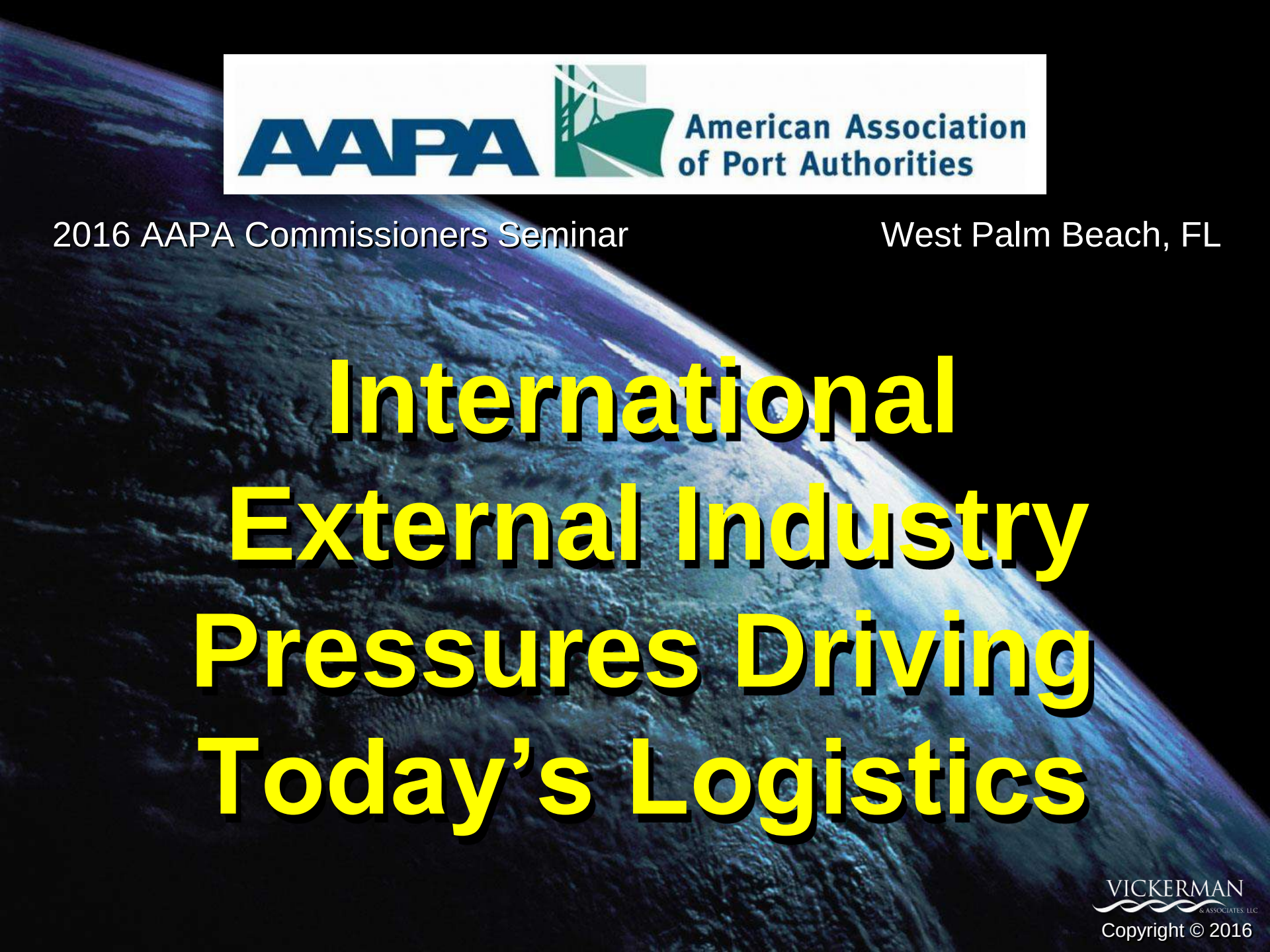


Global Shipping Routes Plotted by AIS GPS

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



Source: National Geospatial Intelligence Agency, American Association of Port Authorities (AAPA).



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International External Industry Pressures Driving Today's Logistics

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For North America, More than 98% of everything consume, worn, eaten, driven and constructed is brought via ships through the North American port system.

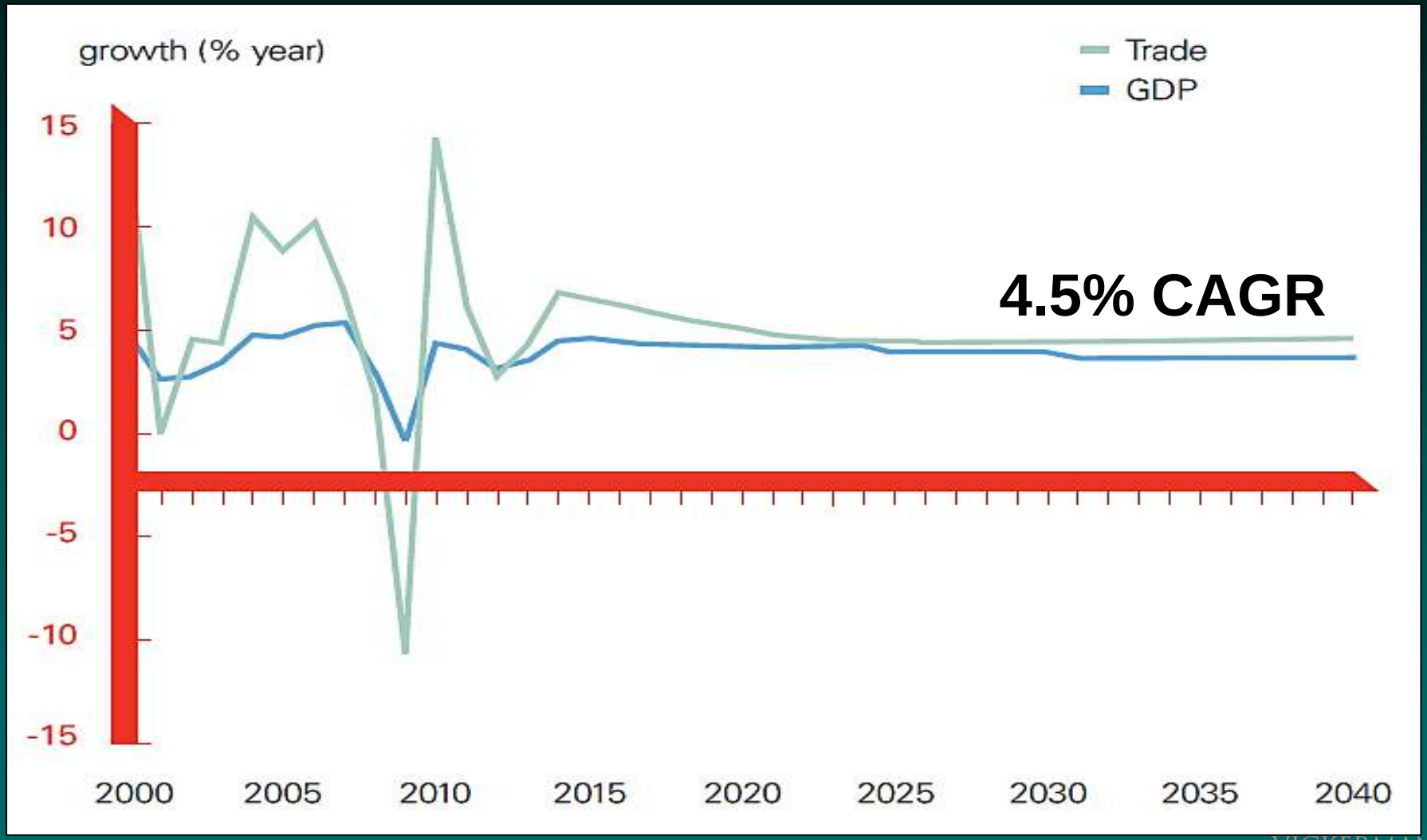
Relationship Between US Trade and US Prosperity – 1930 to 2005

(US Trade & Gross Domestic Product - $ Billions)

Source: USDOT Based on USDOC Data

Growth in GDP and World Trade

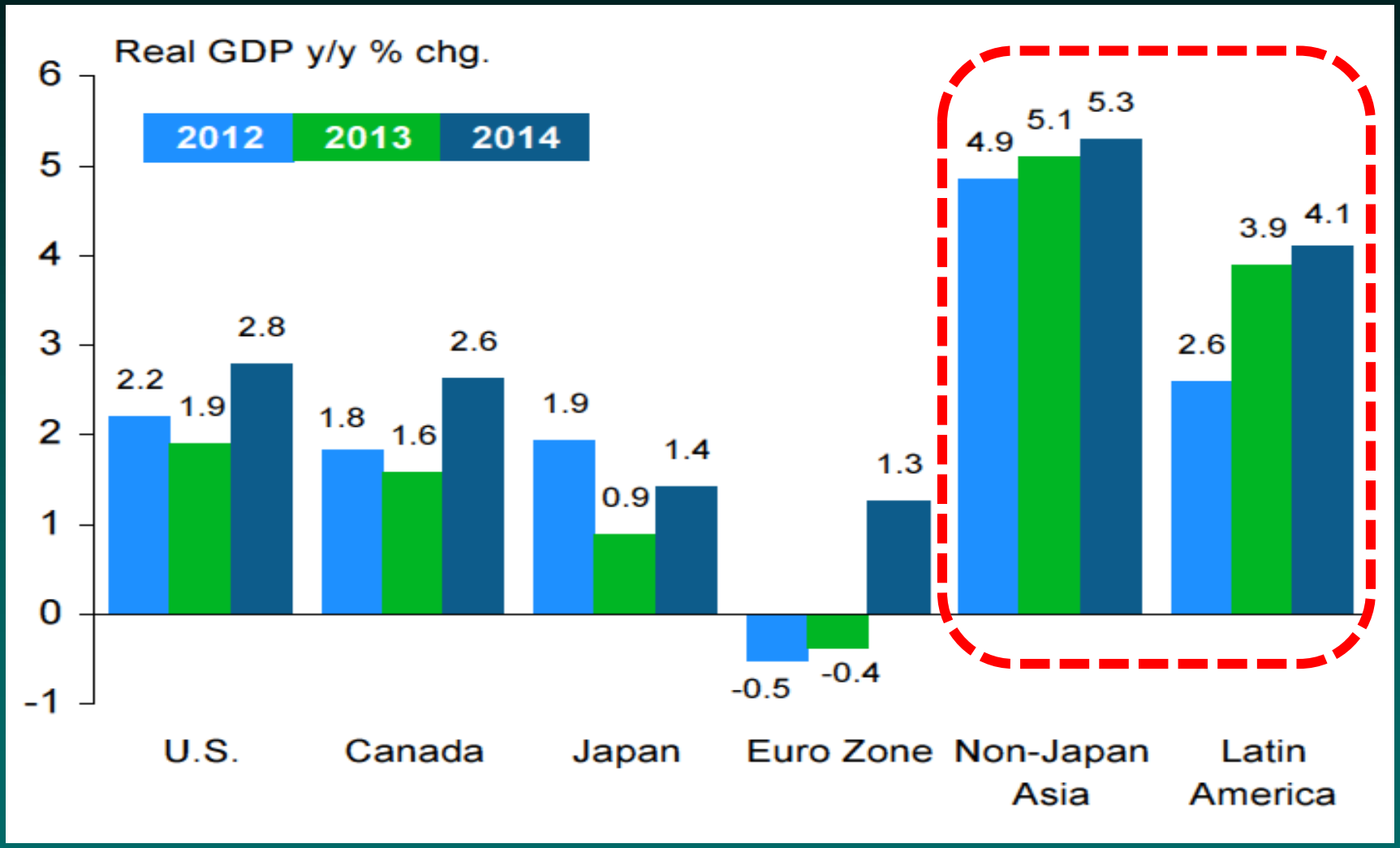
World trade will grow by 73% in the next 15 years with merchandise trade volumes in 2025 hitting $43.6 trillion compared to today's $27.2 trillion



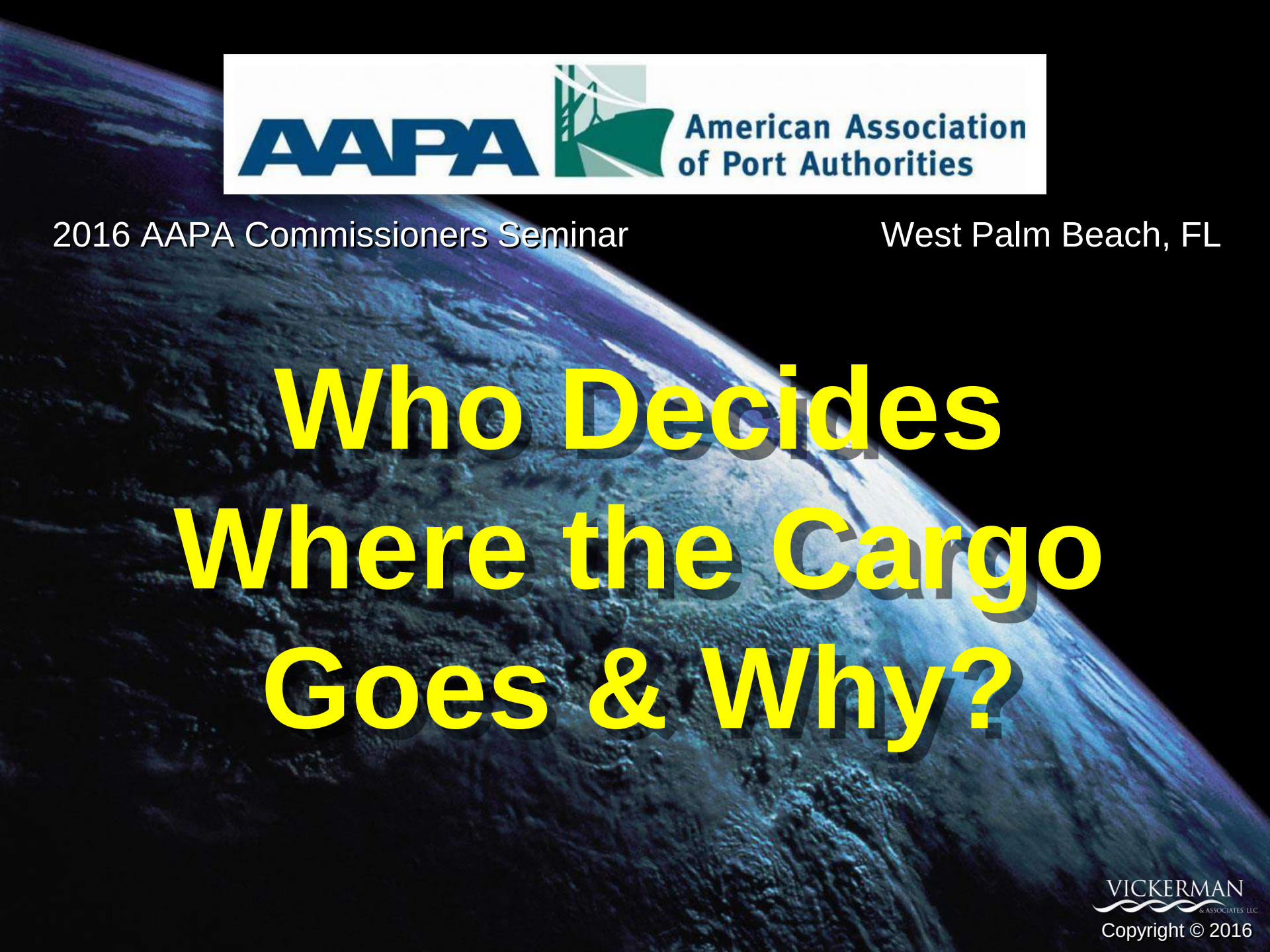
Source: Oxford Economics 2013

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



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Who Decides Where the Cargo Goes & Why?

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American Shipper
The Monthly Journal of INTERNATIONAL TRADE & LOGISTICS
JULY 2012

"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

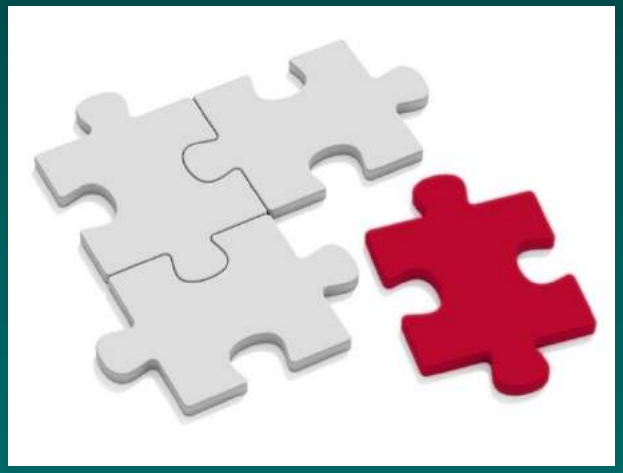
Who Owns & Controls Today's Cargo?

- 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:

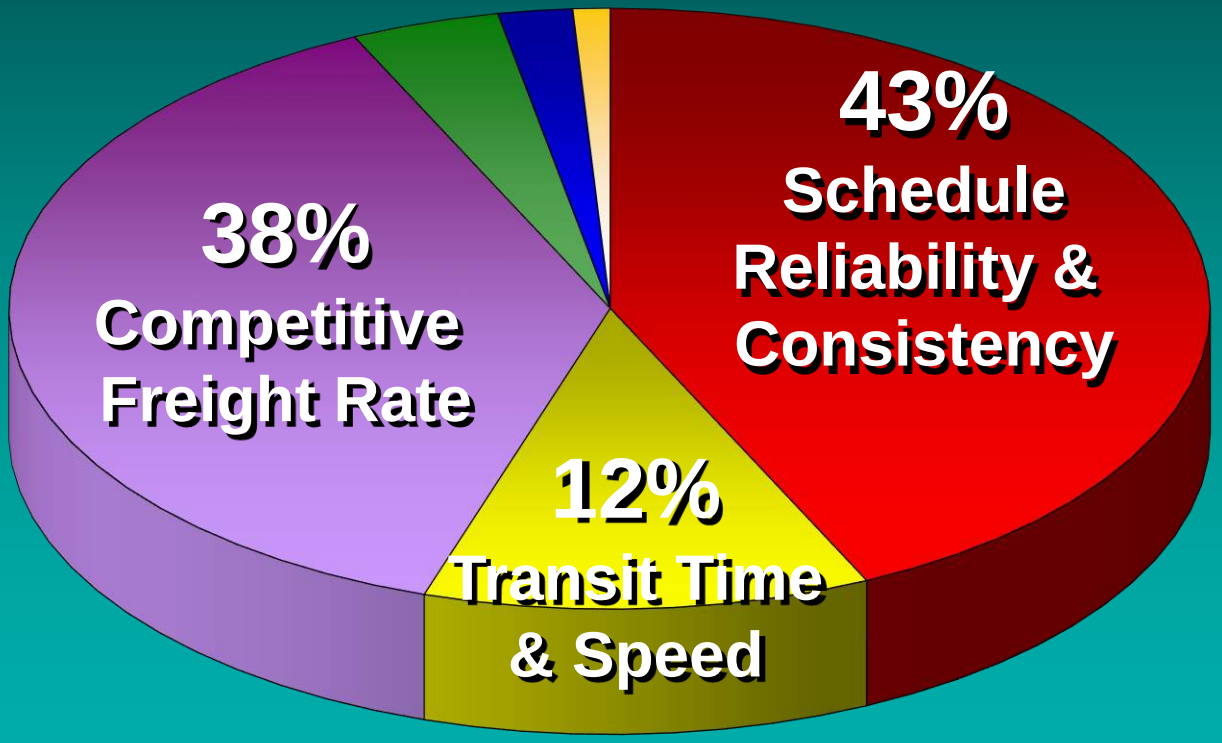
Cargo Will Flow "*Downhill*" to the "***Lowest Cost - Best Service Levels***"

(Total Logistics Costs From Origin to Destination)



Above All Be MARKET DRIVEN

Poll of the Top 1000 "Blue Chip" Multinational Shipper Priorities



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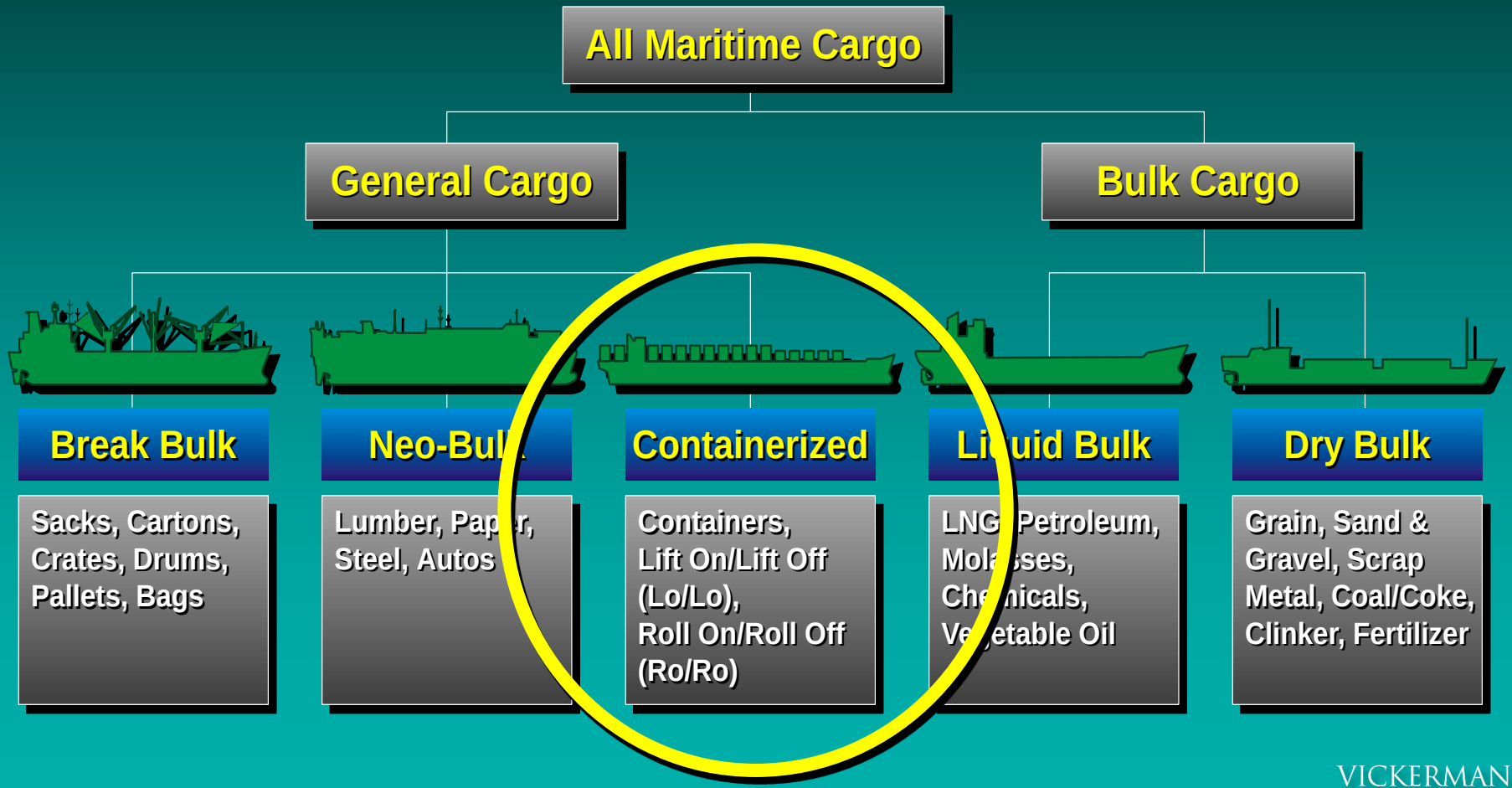
Today's Logistics Truth:

"The customer wants more and is willing to pay less for it."

Functional Classification of Global Maritime Cargoes

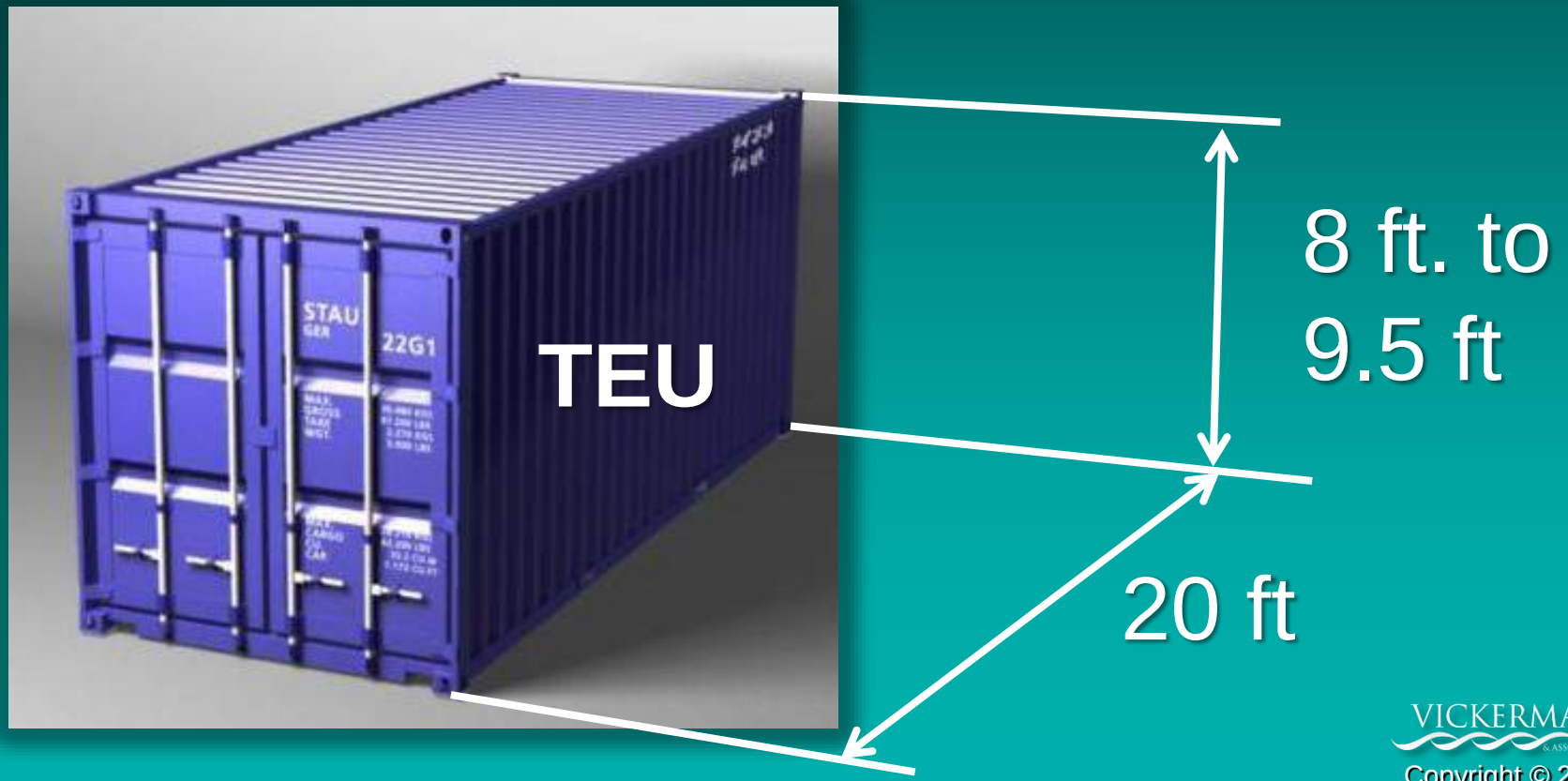


The TEU (Twenty Foot Equivalent Unit)

"The Port & Container Shipping Unit of Measure"

1 TEU = One 20 ft. ISO Container

1 FEU = 2 TEUs = One 40 ft. Container



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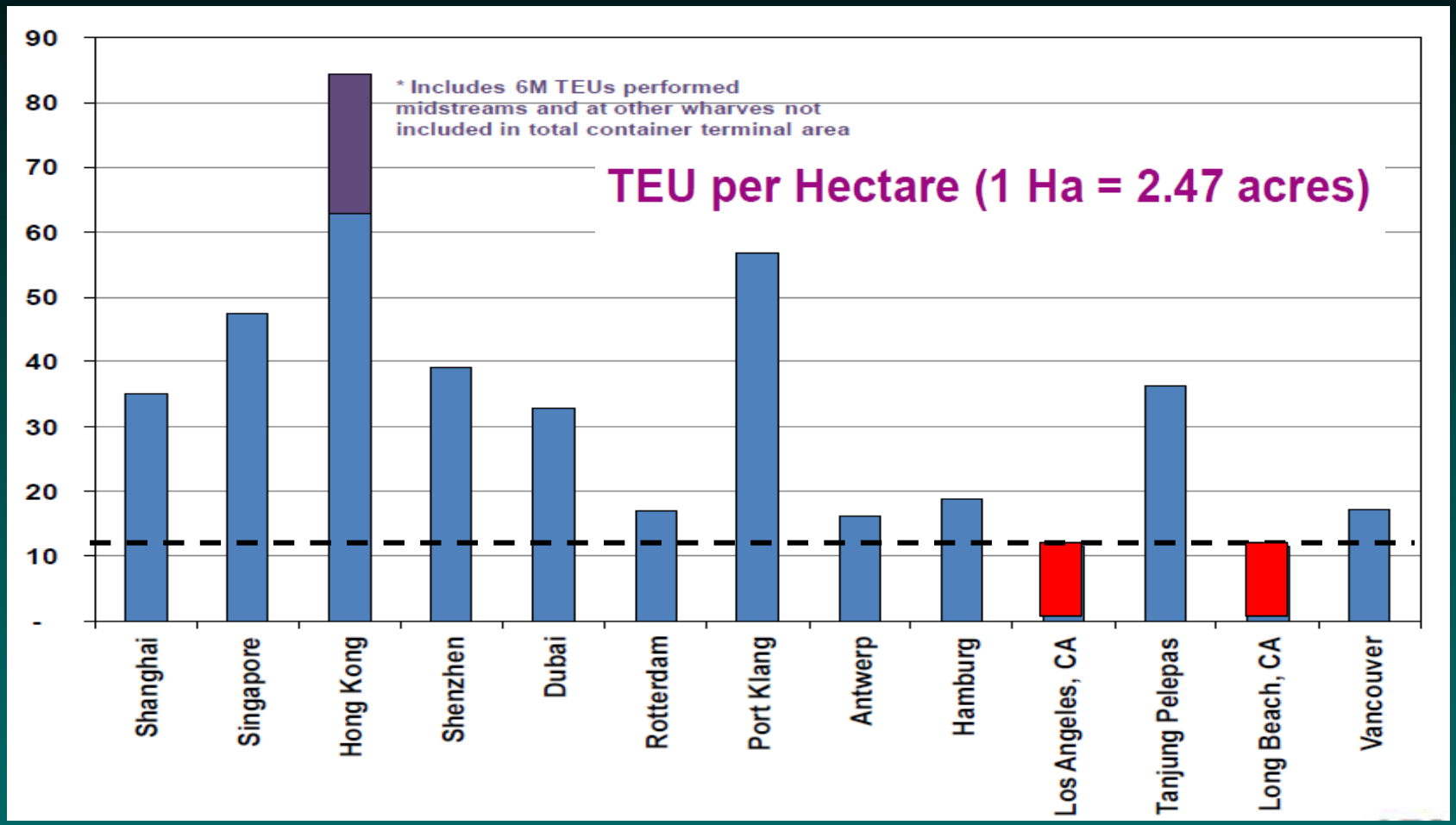
How Much Can a Single Container Hold?

(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

(TEUs/Hectare in Thousands)



Global Ocean Carriers & Terminal Operators
Do Not Consider North American Ports as
"Best Case Practice"

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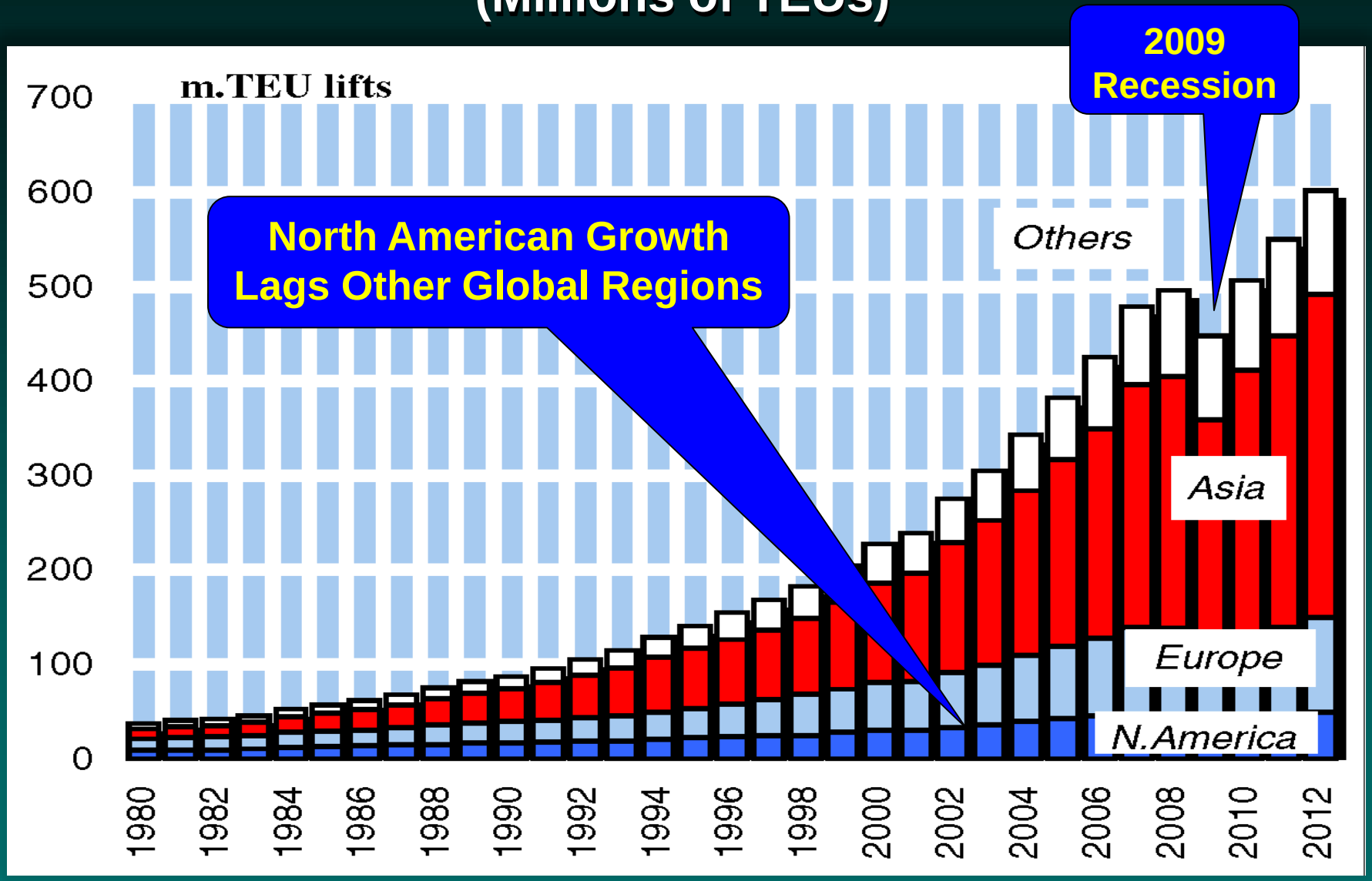
International Maritime Cargo Demand Trends

Historical Global Container Market Demand

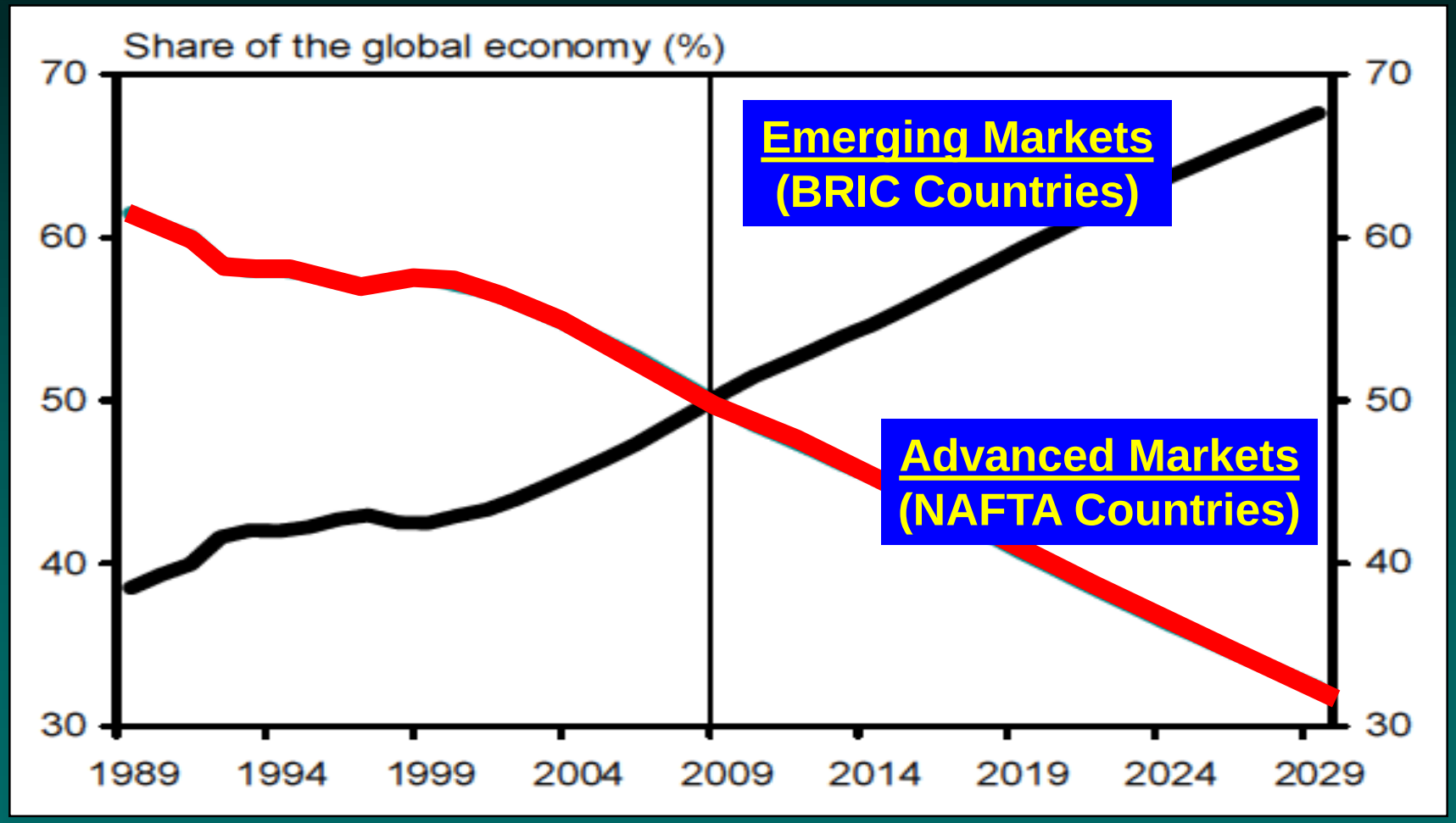
(Millions of TEUs)



Source: Drewry Shipping Consultants

A Turning Point in Global Economic History

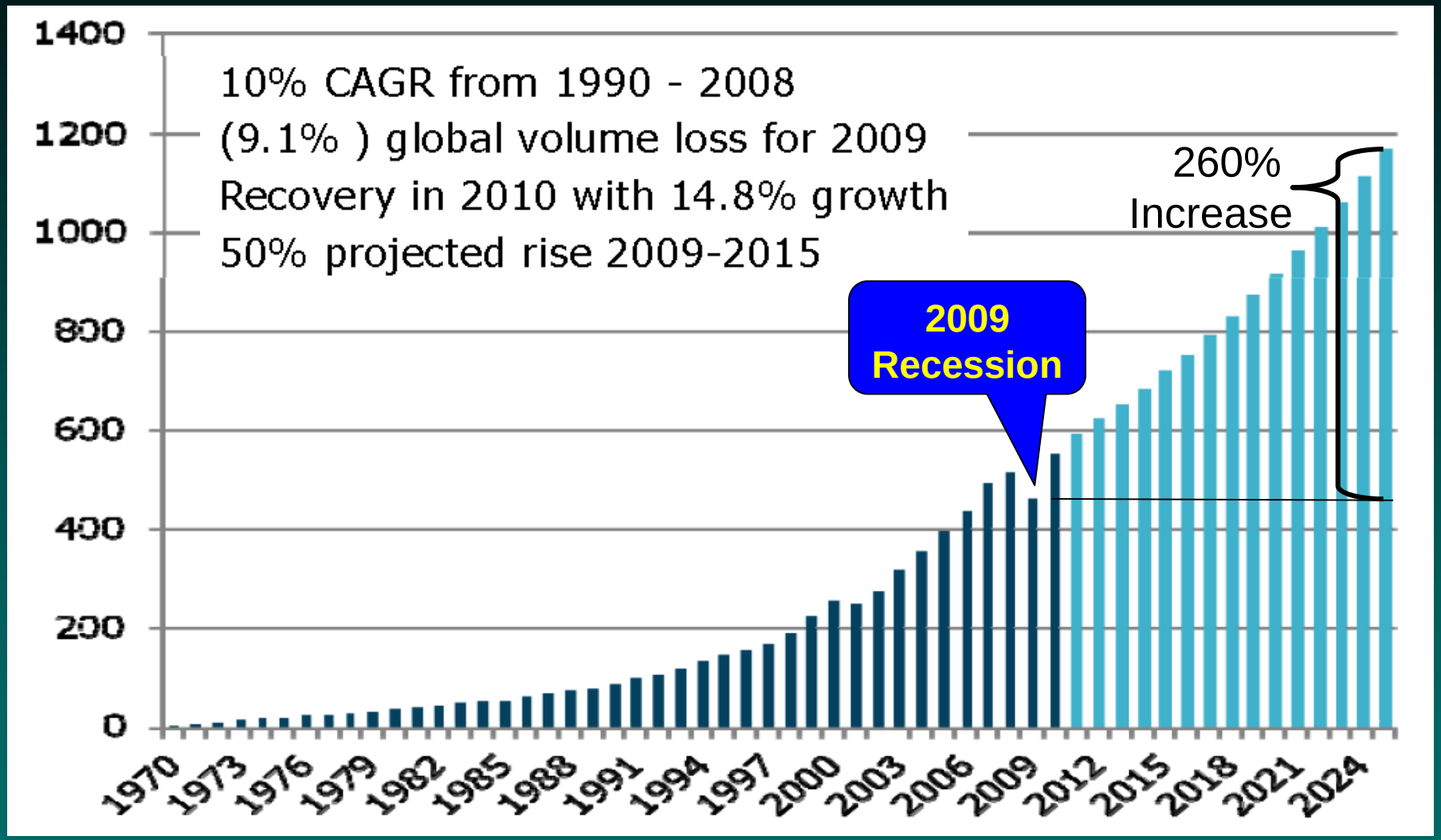
The Advanced Economies Will Decline From 2/3 share of the Global Economy to a 1/3 Global Share. The Global Economy Will See Higher Average Pace of Growth in the Future…



Source: IMF - Forecast by TD Economics, December 2009

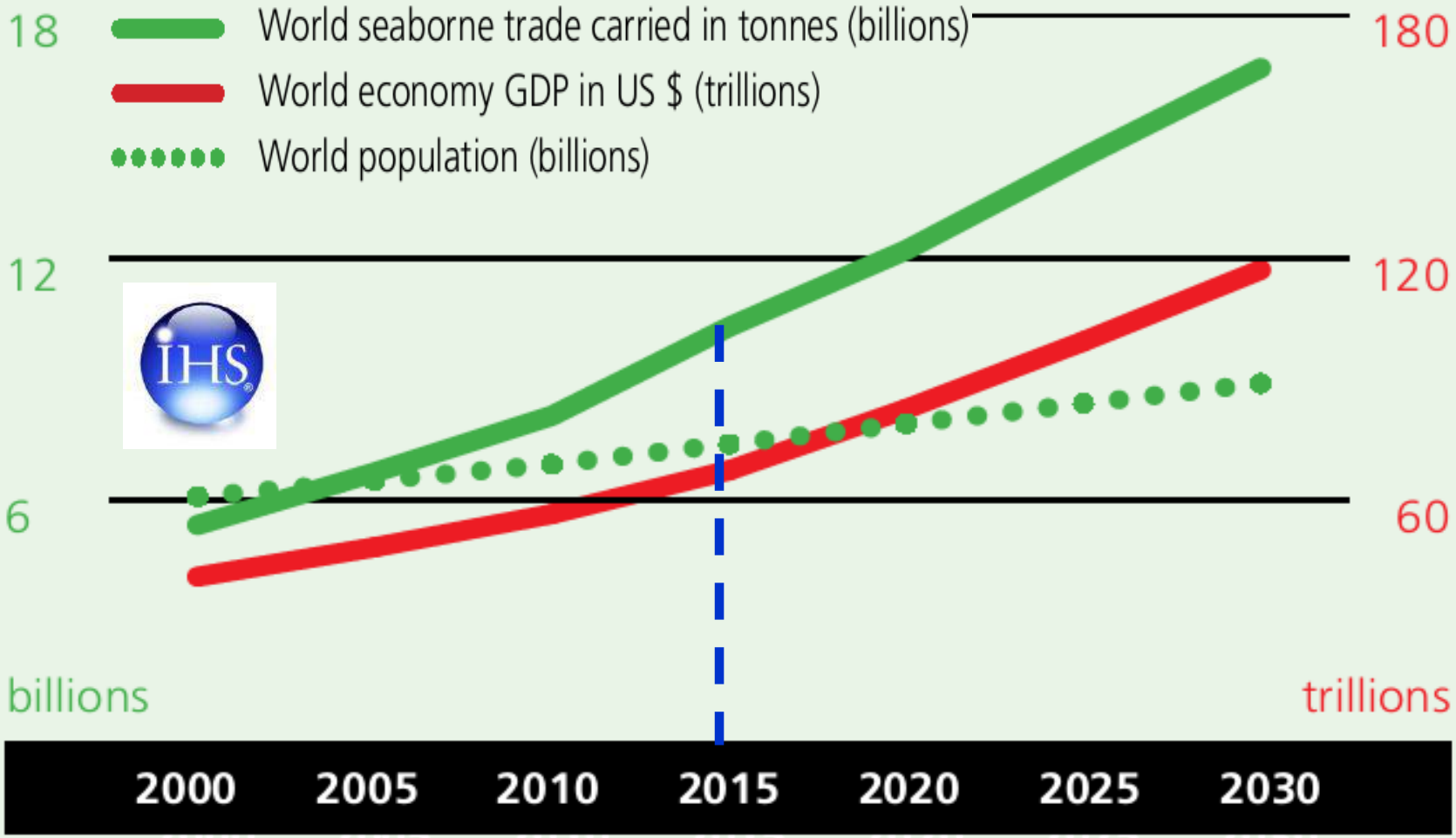
2025 World Container Port Market Demand

(Millions of TEUs)



Source: Drewry Shipping Consultants October 2011

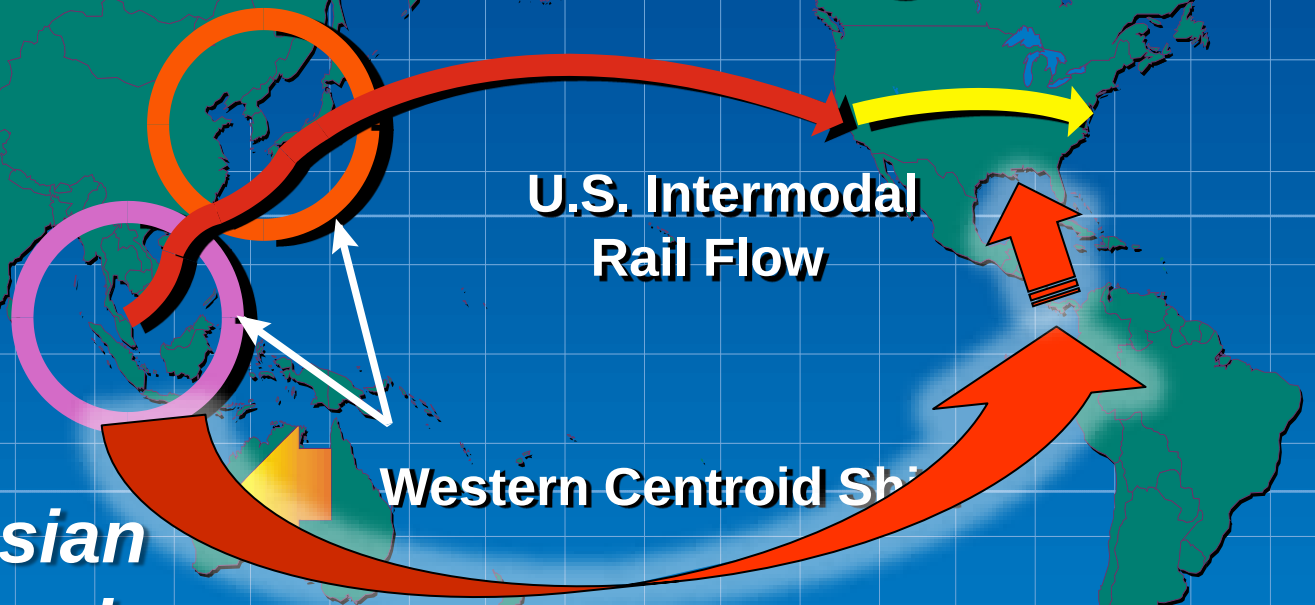
2015 Predicted Increases in World Seaborne Trade & Global Population



Source: IHS Global Insight – World Seaborne Trade, OECD Statistics, UN Population

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

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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

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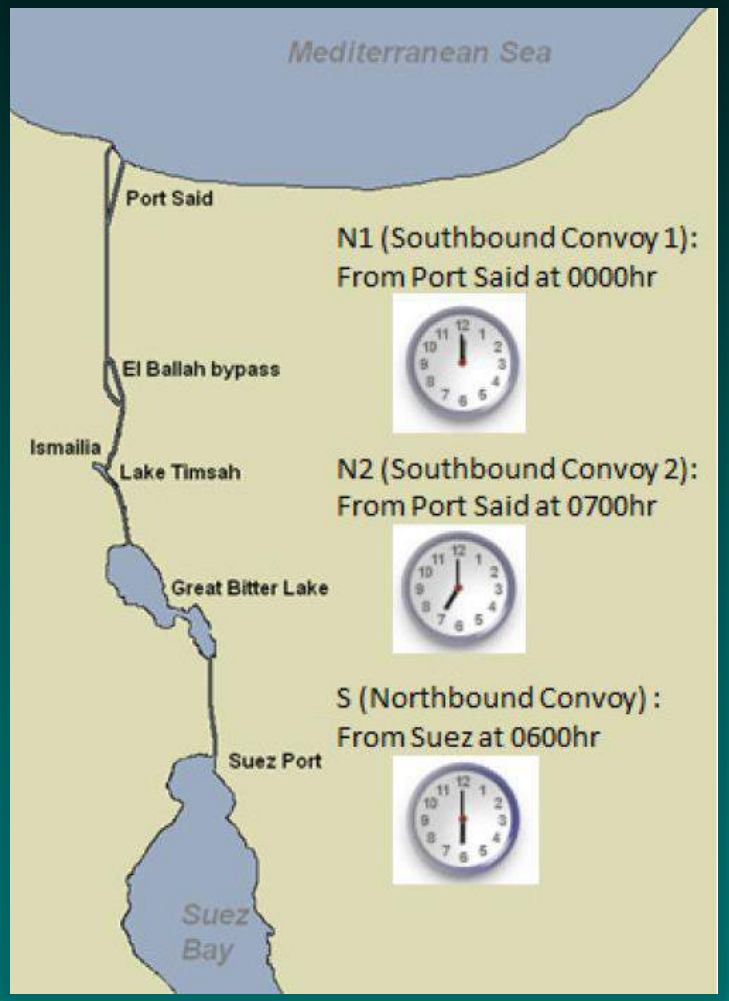
Suez Canal's $8.5 Billion Expansion Plan

(A New $4 Billion 45-mile-long parallel channel and Global Logistics Park)

3 Daily Convoys:

2 Northern Convoys
1 Southern Convoy



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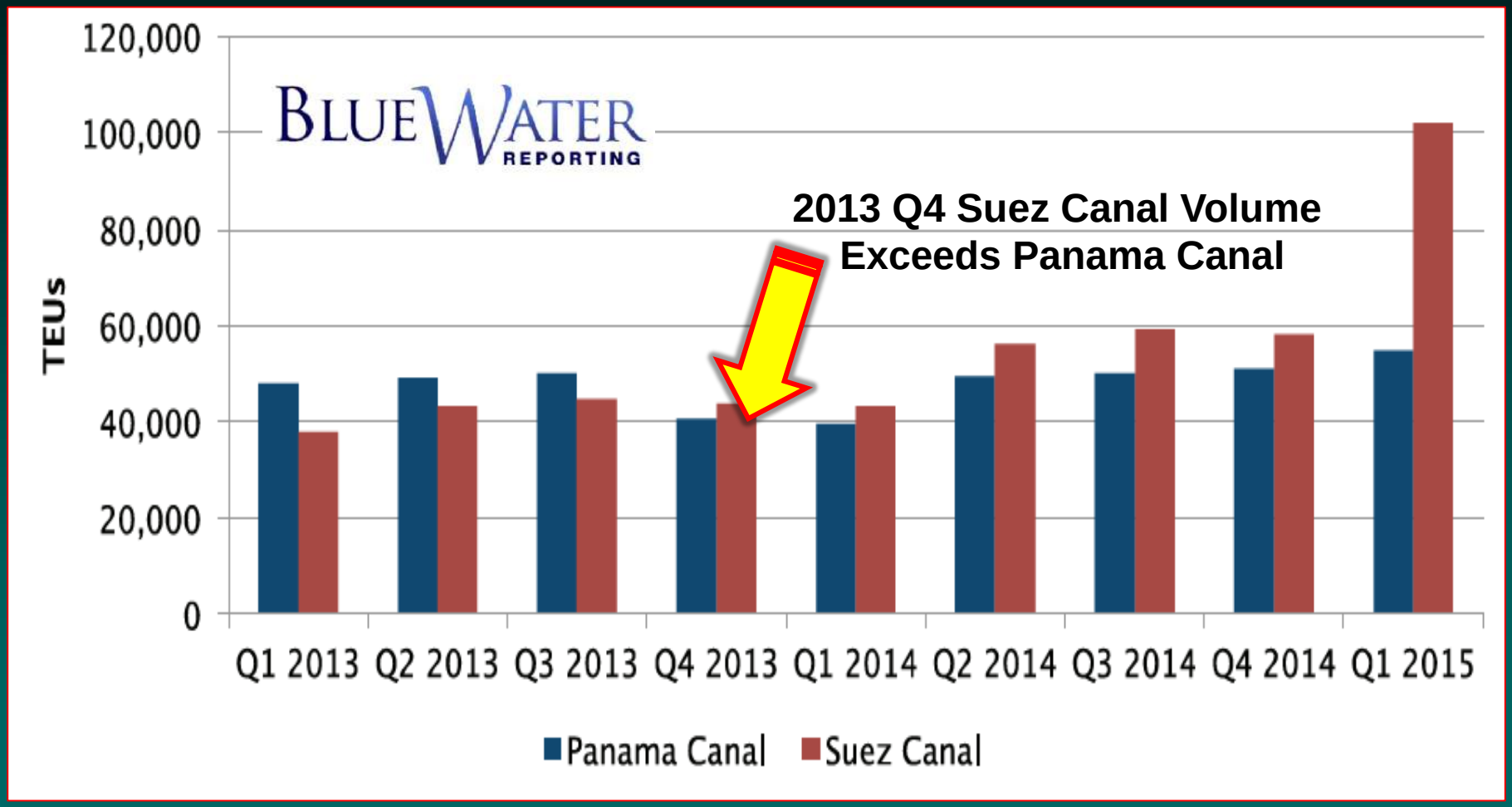
Asia-North America Weekly Throughput:
Panama Canal vs. Suez Canal



Source: American Shipper May 2015

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

To Be Completed by September 2015

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.

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Egyptian Jet Fighter Escort Selfie

(Taken with the New Expanded Suez Canal in the Background)

Source: Photo Courtesy of MIRASCO, August 2015

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The Growing Asian Import Trade Challenge

Container Transhipment 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

(2014 Volumes = Shanghi: 35.28 million TEU – Singapore: 33.87 million TEU).

China-US: Twin Engines of the World

2015 Population:
US: 325 million
China: 1,400 million
(1/5 World – 19%)

The number of Chinese children in elementary school is equivalent to the total US population.

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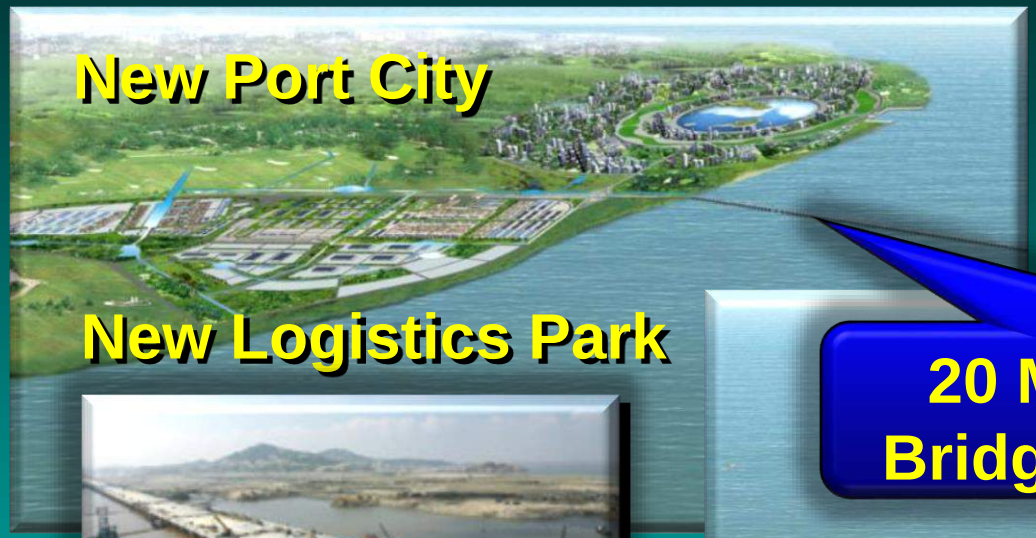
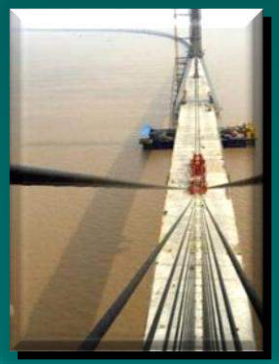
Shanghai International Shipping Center

Yangshan Deep Port & Logistics Park



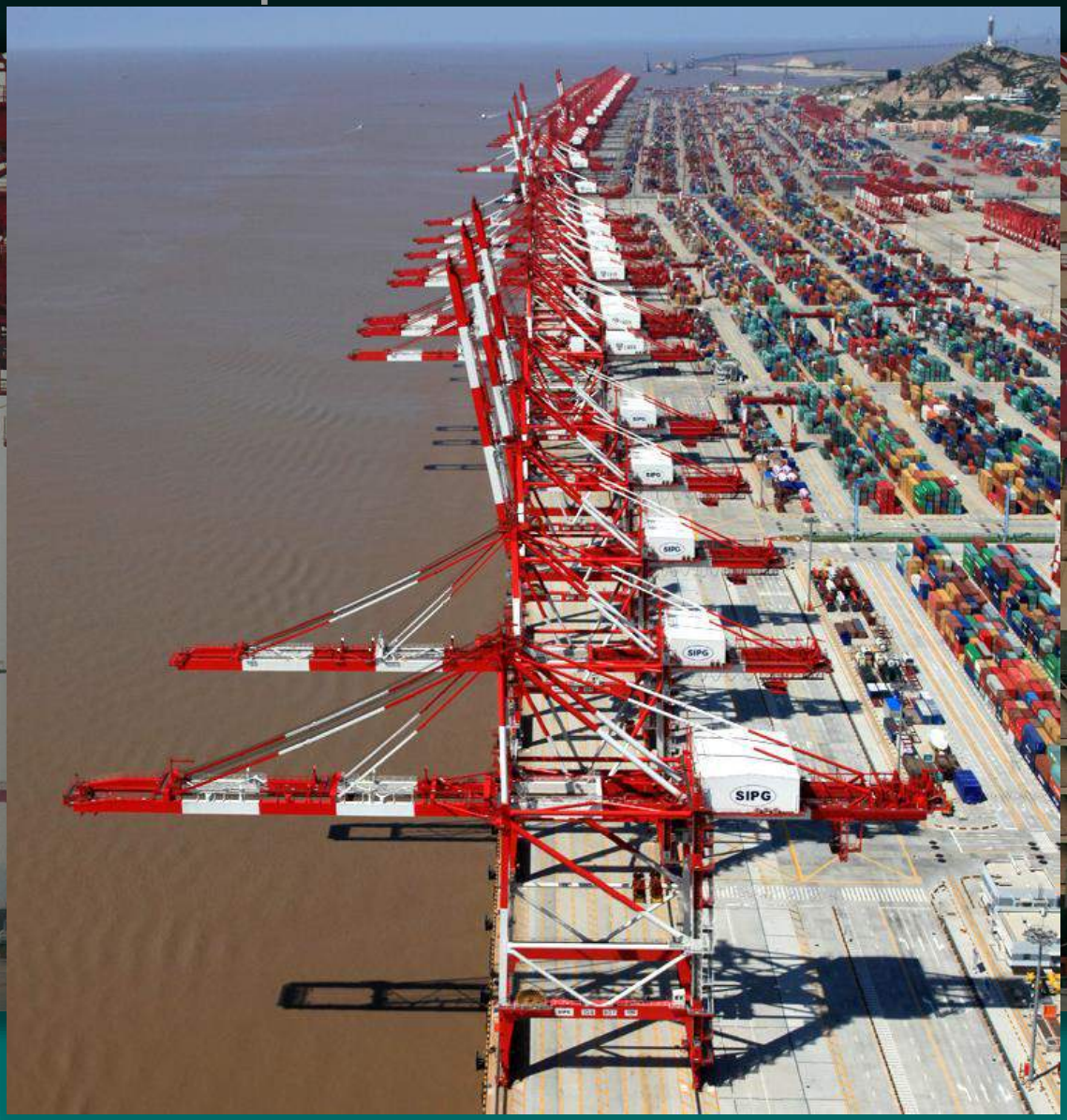


Shanghai International Shipping Center

Yangshan Deep Port - 20 Mile Bridge Access

Shanghai Yangshan Deep-Water Harbour

Yangshan Deep Port – 54 Berths East China Sea



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Shanghai International Shipping Center

Yangshan Deep Port & Logistics Park

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

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Maritime Vessel Technology Trends

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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

1st Generation (Pre-1960 - 1970)

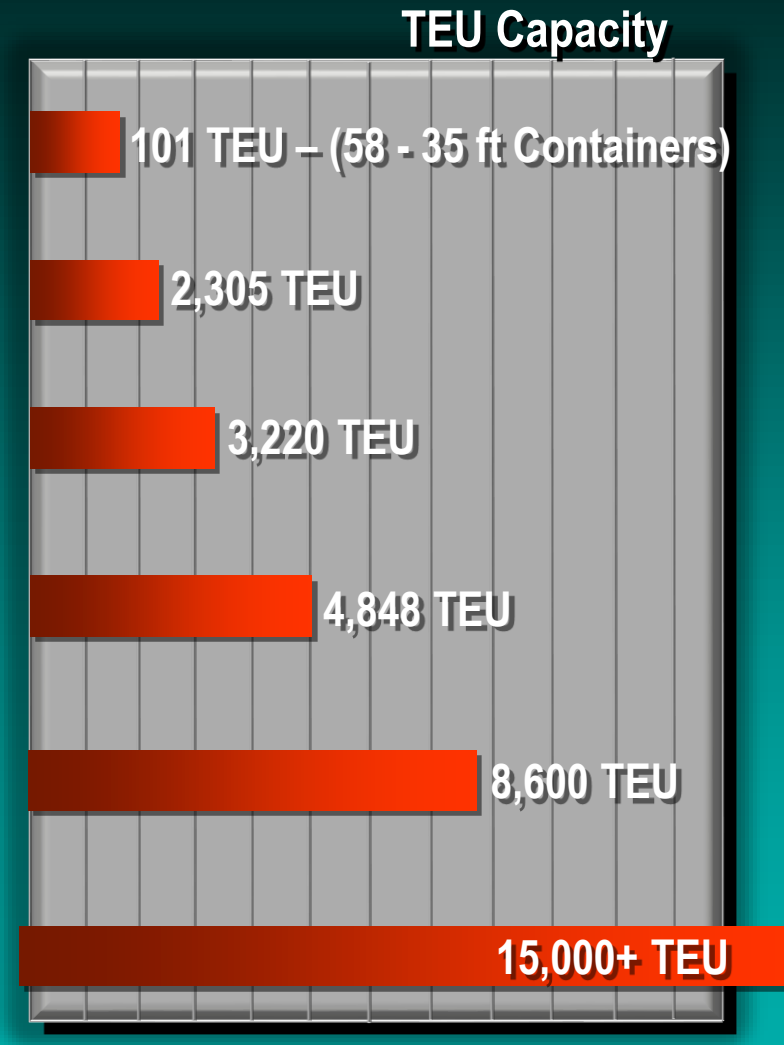
2nd Generation (1970 - 1980)

3rd Generation (1985)

4th Generation (1986 - 2000)

5th Generation (2000 - 2006)

6th Generation (2006 - 2012)



World Container Ship Evolution

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

The Stage is set to Jump again to 22,000 TEU Mega Container Vessels

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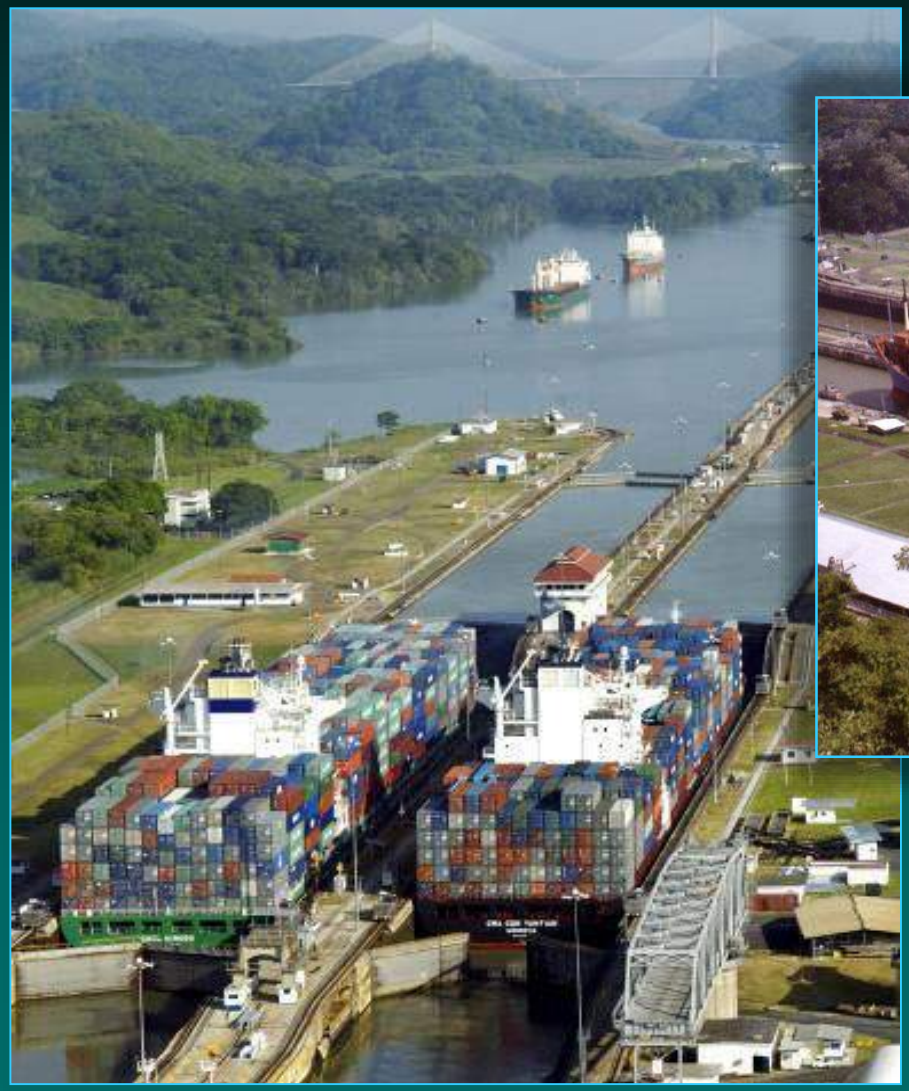
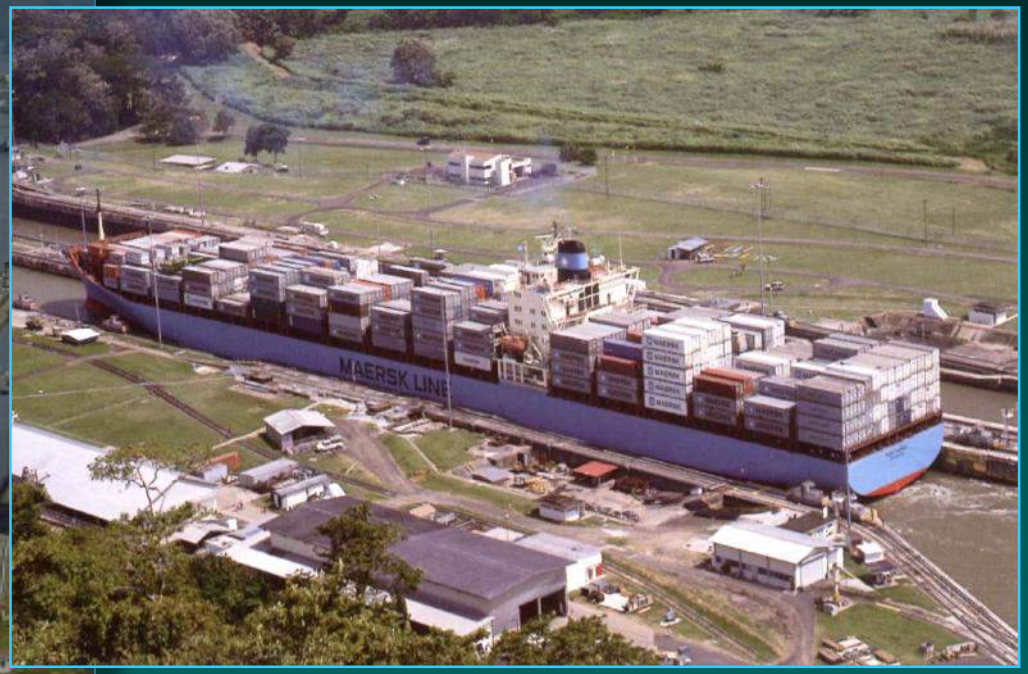
Madison Maersk (3,928 TEUs) in the Panama Canal

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





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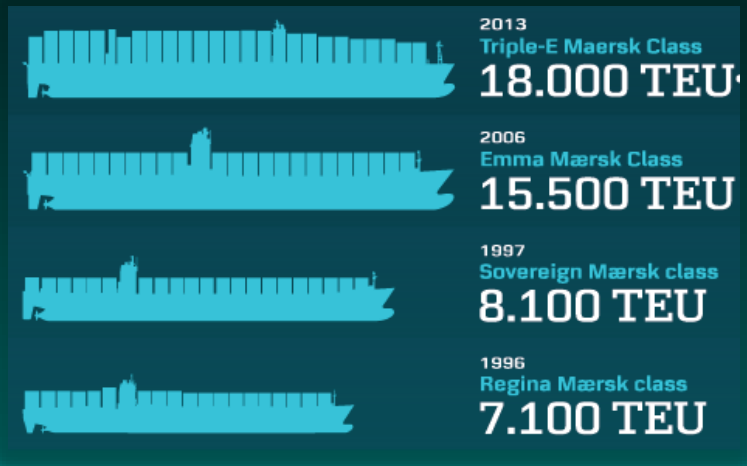
*Maersk's New 30 Vessels (ordered) are **4** Times the Current Size of the Panama Canal & **1.5** times the Size of the Expanded Panama Canal*

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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2018: Ultra-Large 20.000 TEUs Container Ships

2015: Maersk Planning Orders up to
10 New 20,000 TEU Ships ($1.5 Billion Order),
Evergreen, Seaspan and United Arab Shipping Company (UASC)
are also looking at 20,000 TEUs

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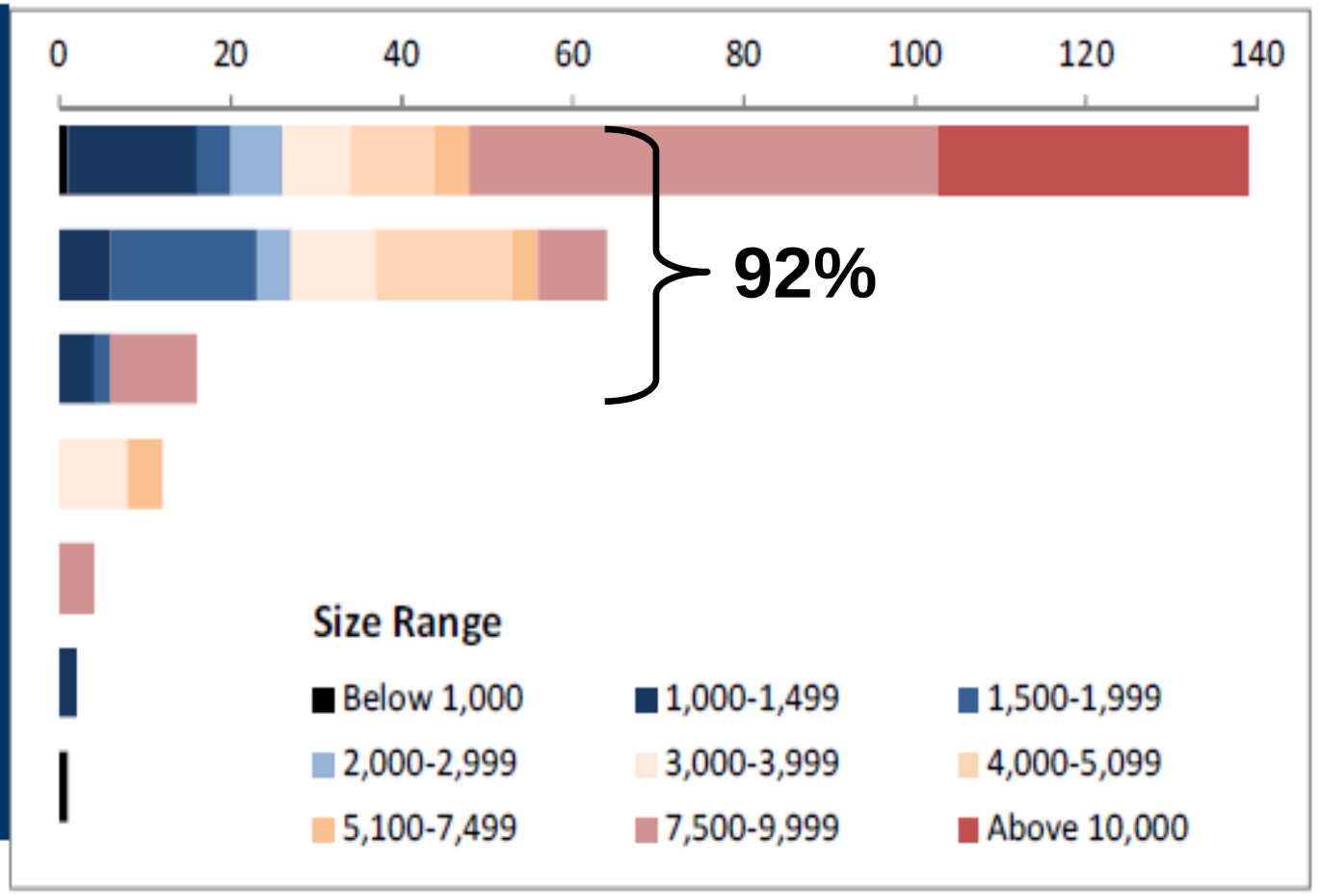
Containership Orders – Country of Build

(Orders Since January 2010)

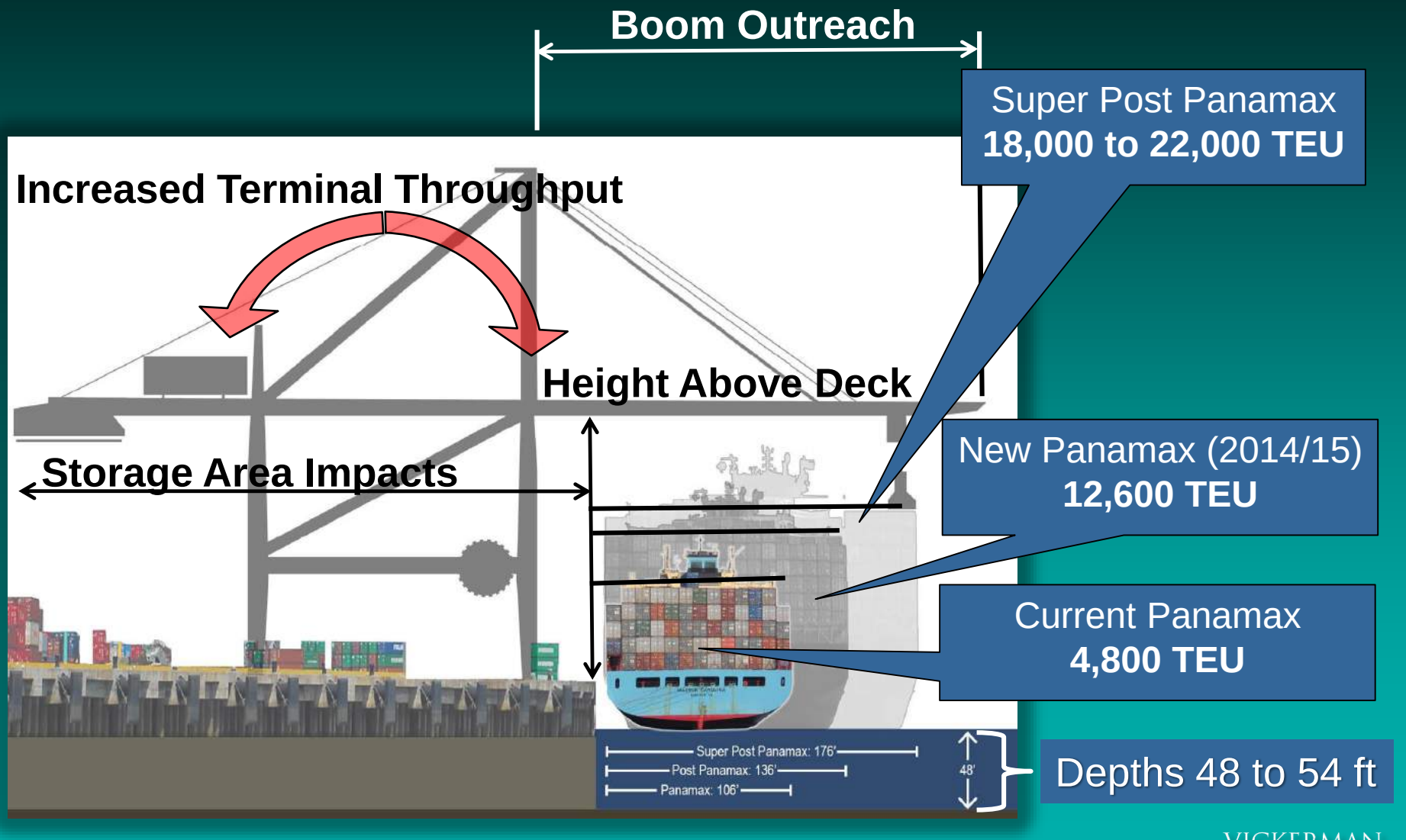
Country	Units
S Korea	139
China	64
Taiwan	16
Philippines	12
Romania	4
Japan	2
Germany	1



Source: Alphaliner Newsletter Volume 2011 Issue 21

Vessel Size Expansion - Terminal Impacts

(Port Terminal Infrastructure & Equipment Geometry Impacts)



Source: Georgia Ports Authority and Vickerman & Associates

NYK LOGISTICS & MEGACARRIER

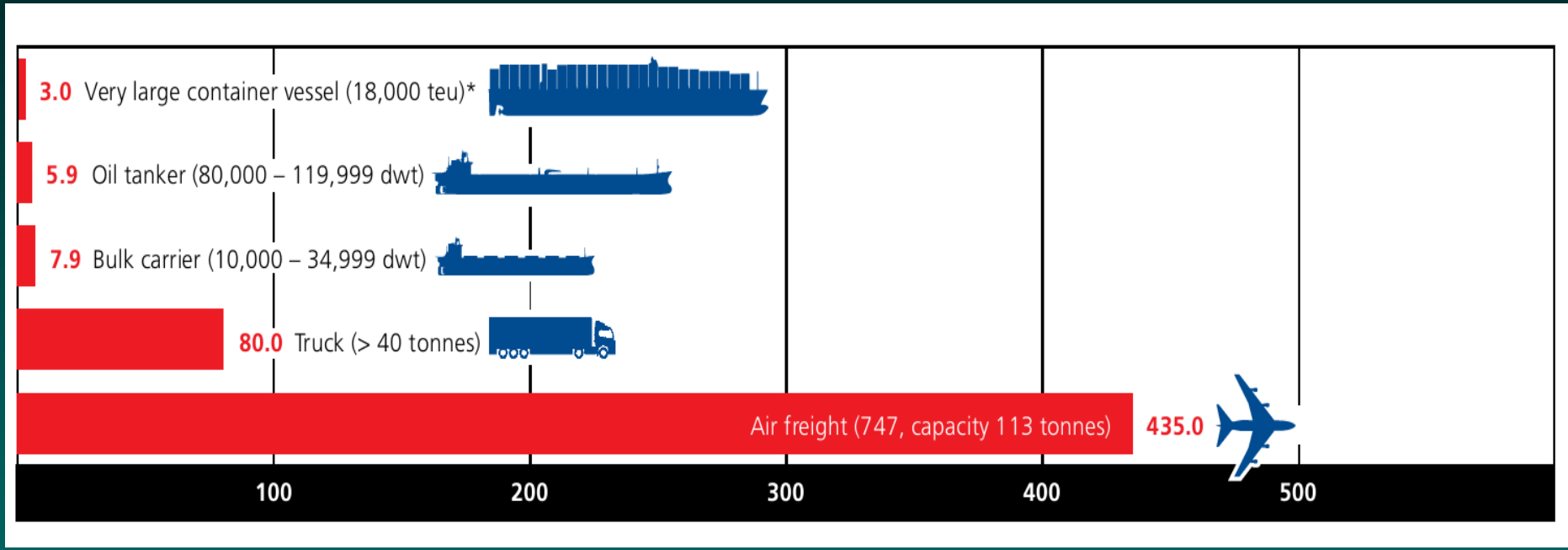
Future Container Vessel: NYK Super Eco Ship

NYK LOGISTICS & MEGACARRIER

Future Container Vessel: NYK Super Eco Ship

Comparison of Typical CO^2 Emissions For Freight Transport Modes

(Grams per Tonne-km)



The ocean shipping industry is the only industrial sector which is already compliant by a legally-binding IMO global agreement to reduce CO2 emissions.

Source: IMO GHG Study, 2009 (*AP Møller-Maersk, 2014)

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Panama Canal Expansion: New Capacity

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Panama Canal Route

ACP

The Autoridad Del Canal de Panama

VICKERMAN & ASSOCIATES, LLC

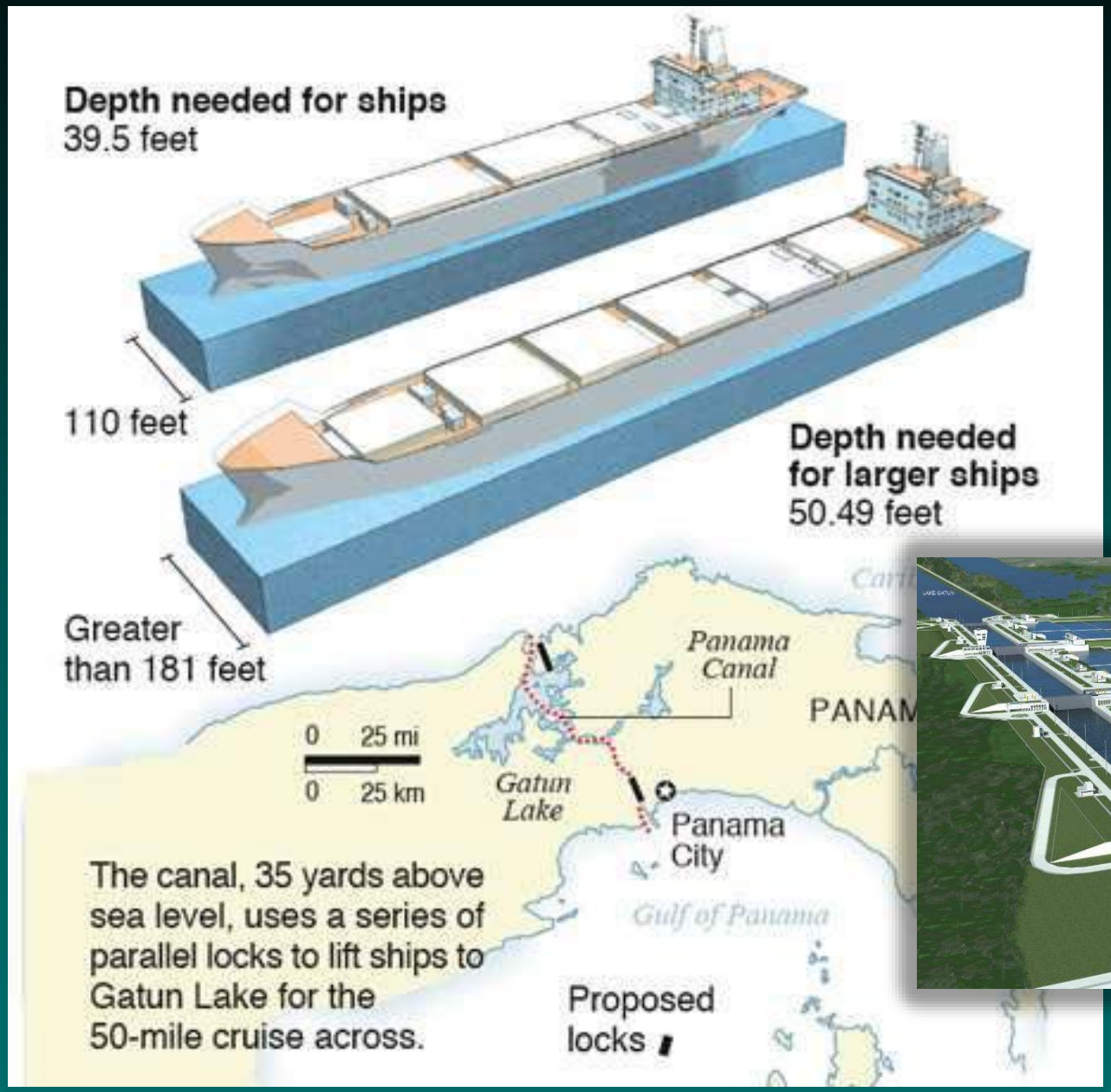
Panama Canal Historical Tonnage Traffic

Source: ACP Data

The Panama Canal Circa 1914

Panama Canal Today

Expansion of the Panama Canal: Circa 2015



Post 2016 Panama Canal

The Autoridad Del Canal de Panama

Panama Canal Third Lane Expansion Circa 2016

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

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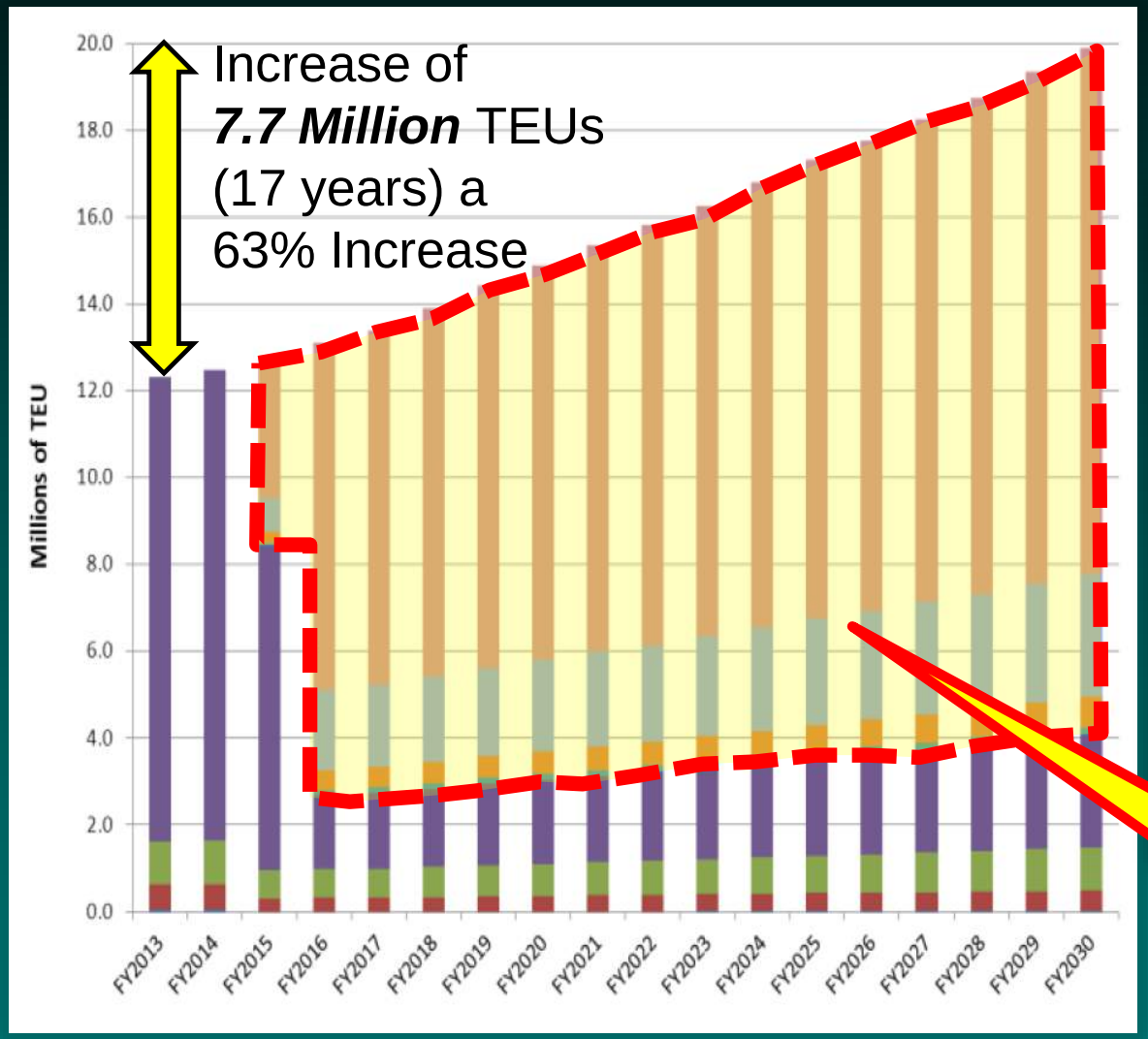
Canal TEU Forecast by Vessel Beam

(FY2013 to FY 2030 – Millions of TEUs)



ACP
The Autoridad Del Canal de Panama

- 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

Source: Container Market Segment and Transhipment Study – Oct 2012 ACP/M&N

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%

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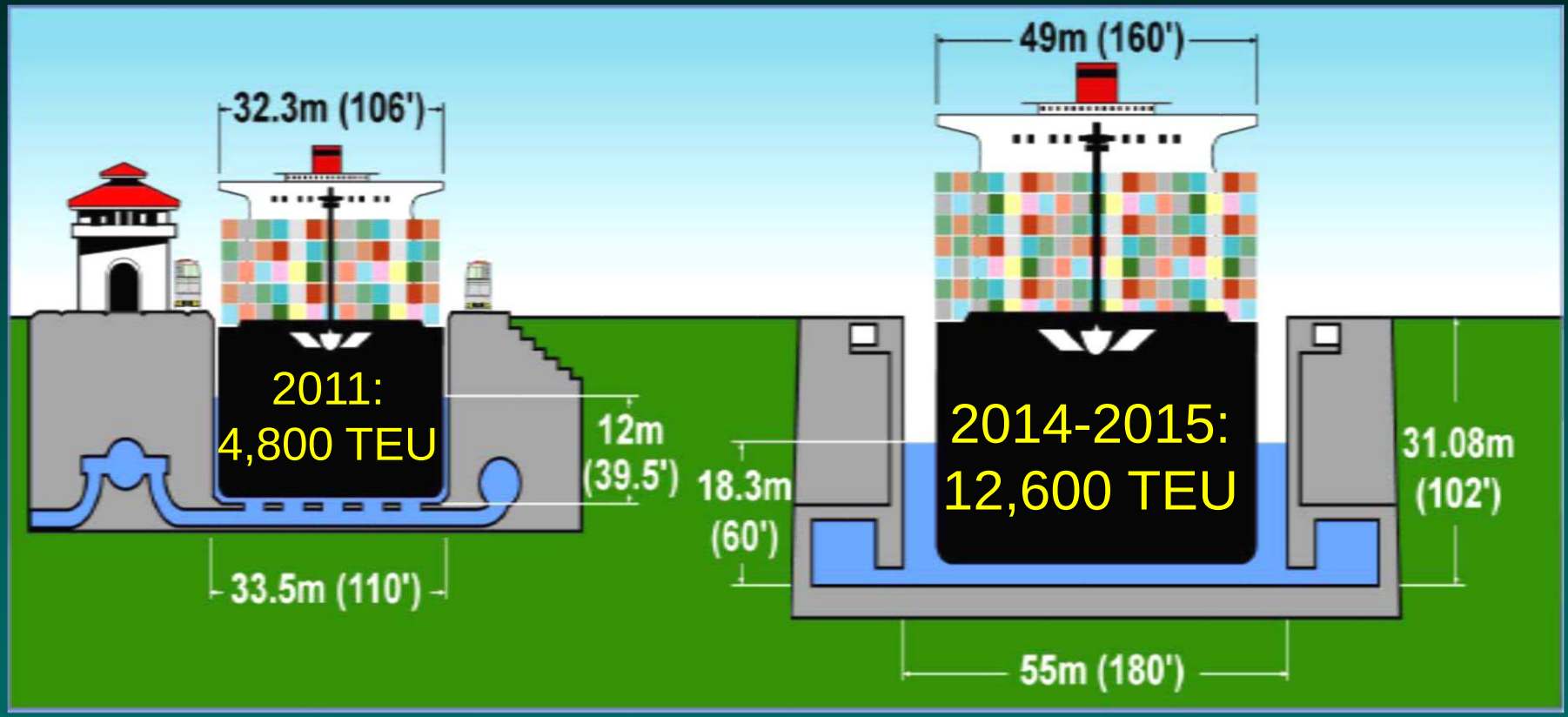
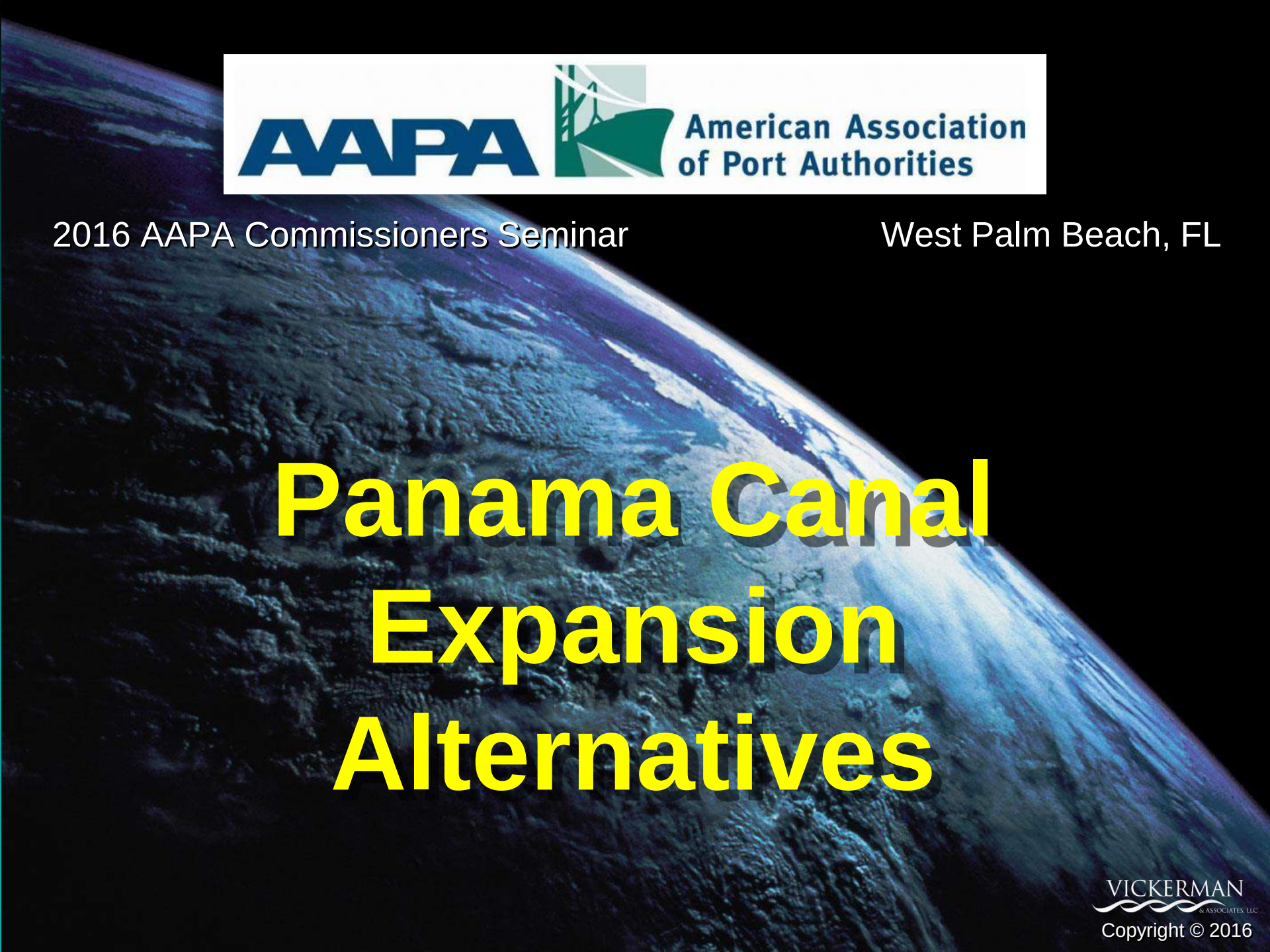
The Autoridad Del Canal de Panama

Panama Canal Third Lane Expansion Capabilities



Source: ACP Expansion Project



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Panama Canal Expansion Alternatives

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

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.

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2025 Summary of Canal's Financial Results

(To 2025 In Millions of Dollars – Annual Fees)

Summary of the Expanded Canal's Financial Results			
Financial Results[1]	**Year 2005**	**Year 2025**	**Annual average growth rate**
PCUMS Tons[2]	279	508	3.0%
Transit Revenue		6,101	8.9%
Other Revenues	92	125	1.5%
Total Revenues	**1,209**	**6,227**	**8.5%**
Operating Costs	444	1,016	4.2%
Fee per Net Ton[3]	218	668	6.5%
Public Services Fees[3]	2	2	0.0%
Depreciation	61	231	6.8%
Net Income		**4,310**	**11.6%**

546% Increase

890% Increase

Source: ACP Financial Data

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Emerging New Caribbean Transhipment Center

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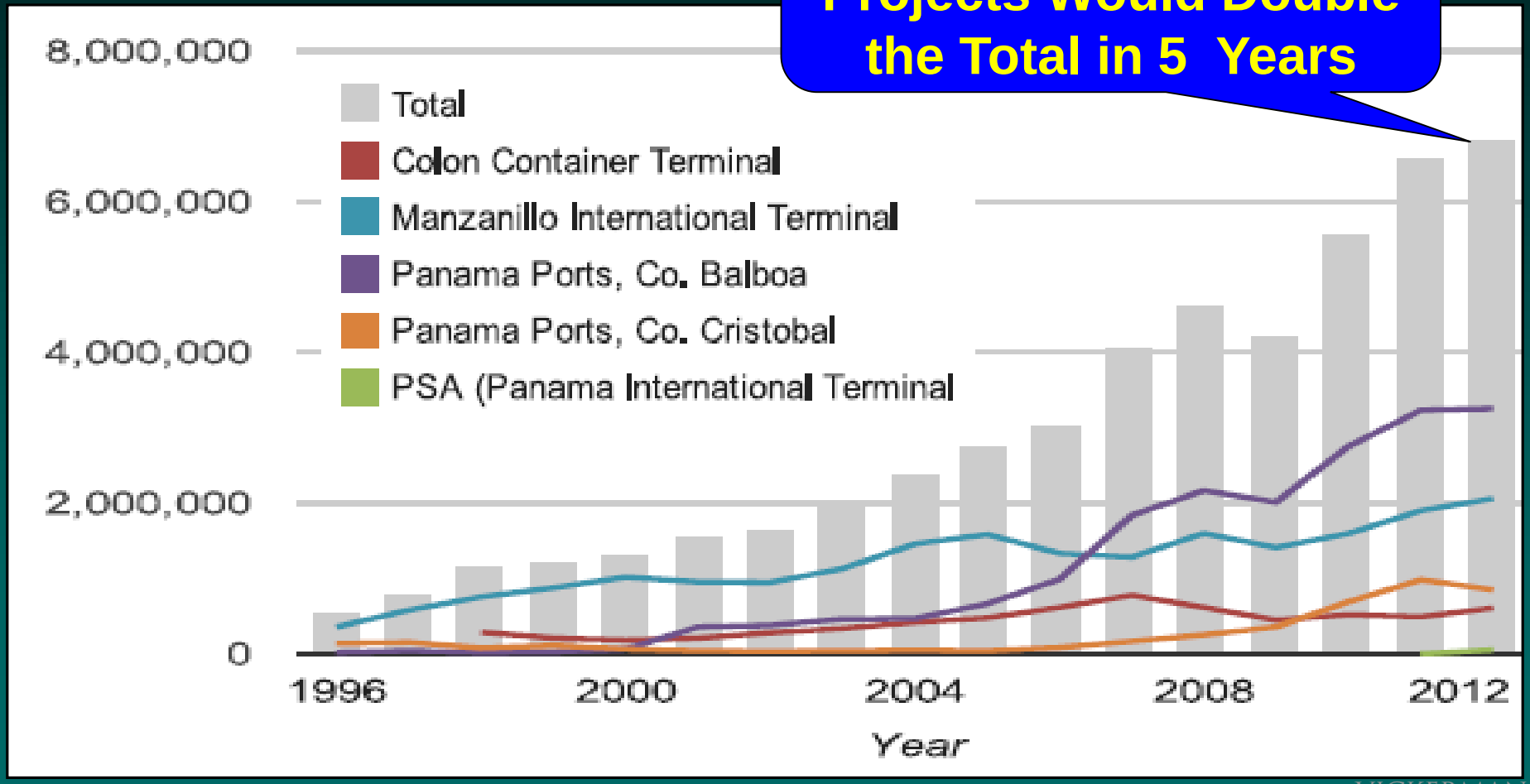
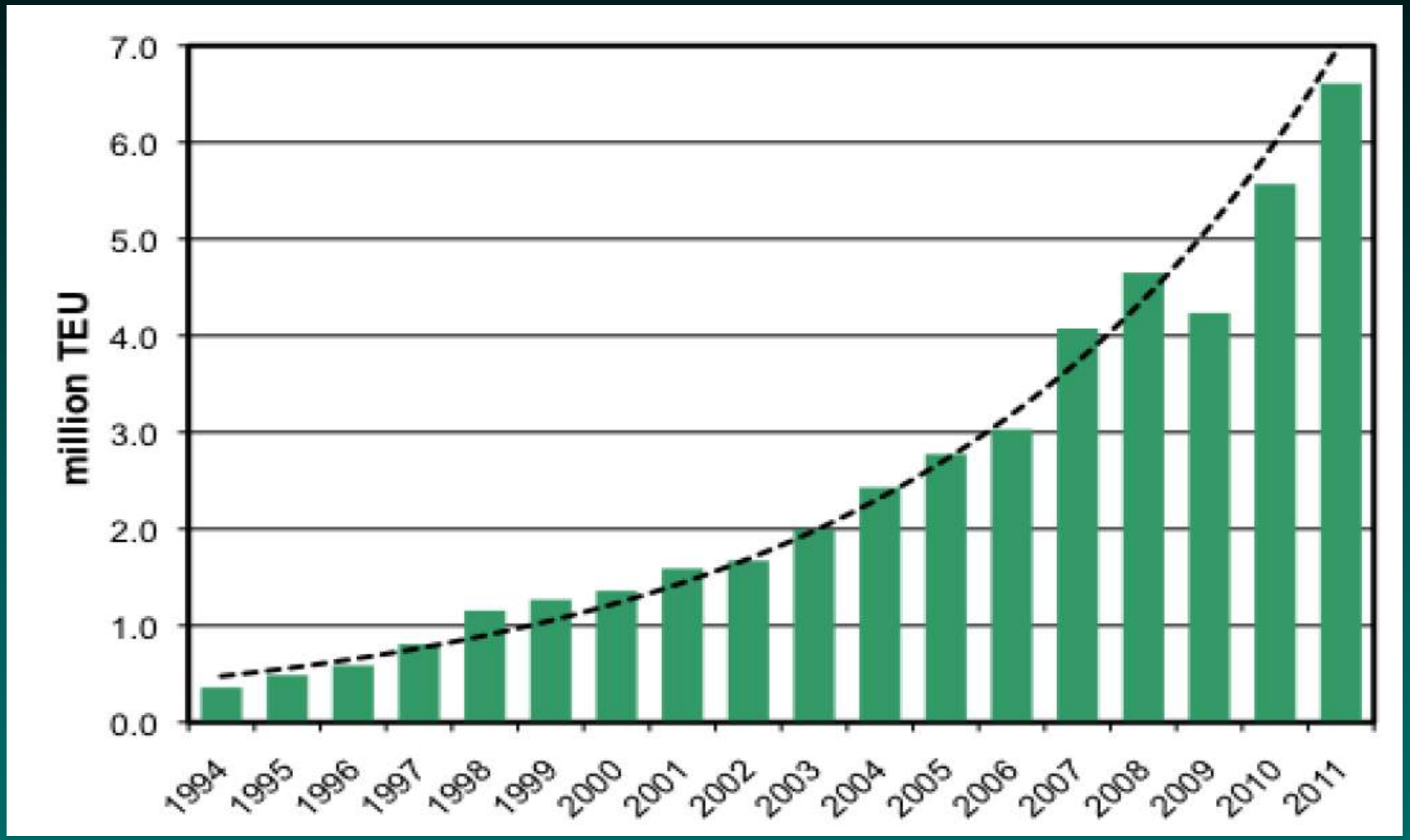
Panama Ports Annual *Transhipment Growth*

"The Singapore of Latin America"

Proposed New Port Projects Would Double the Total in 5 Years



Panama Ports Container *Transhipment Growth*



6.8 Million TEUs – 18.5 % Growth Rate

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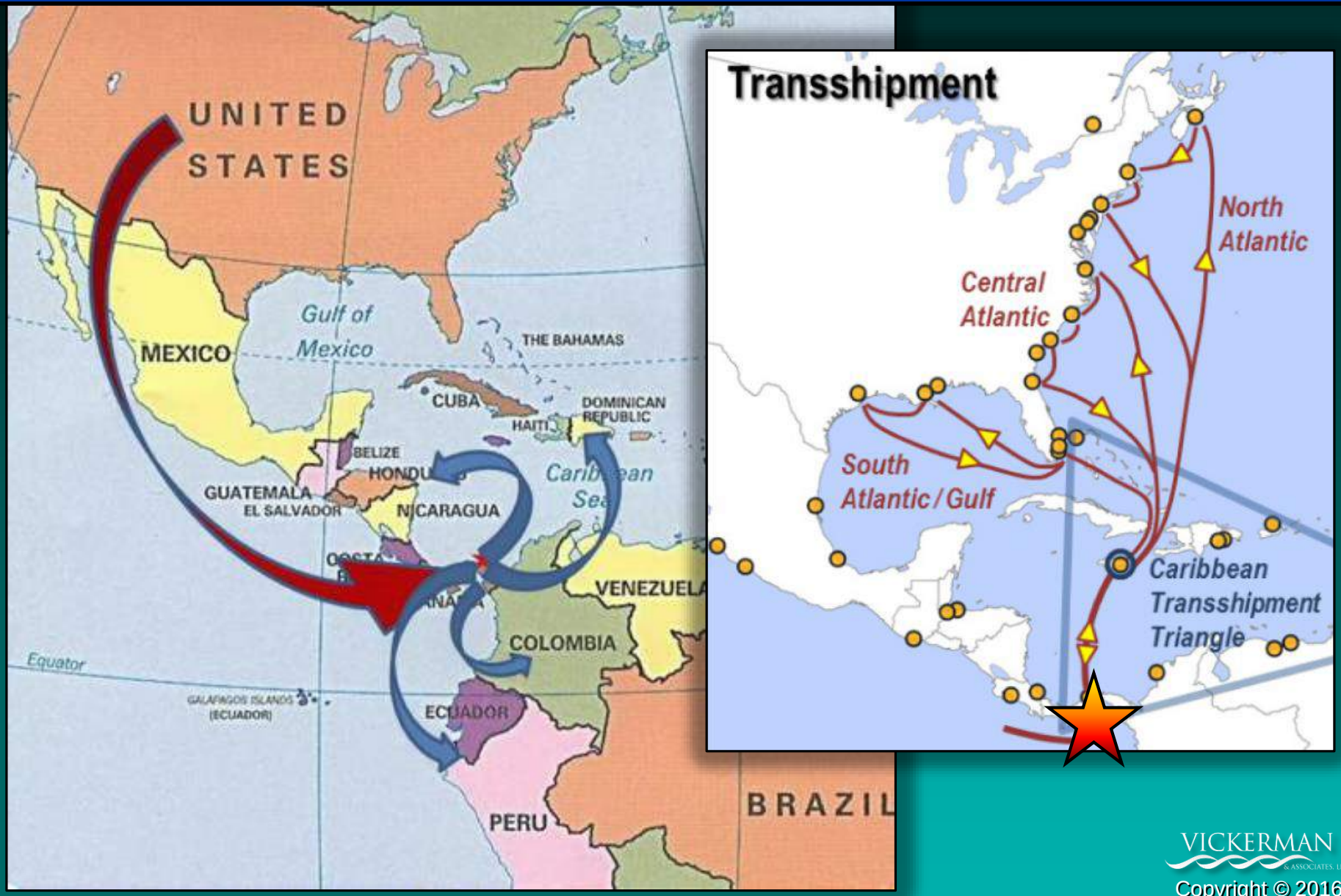
The Panama Canal Expansion Will Move the Caribbean Transhipment Center Point to Panama

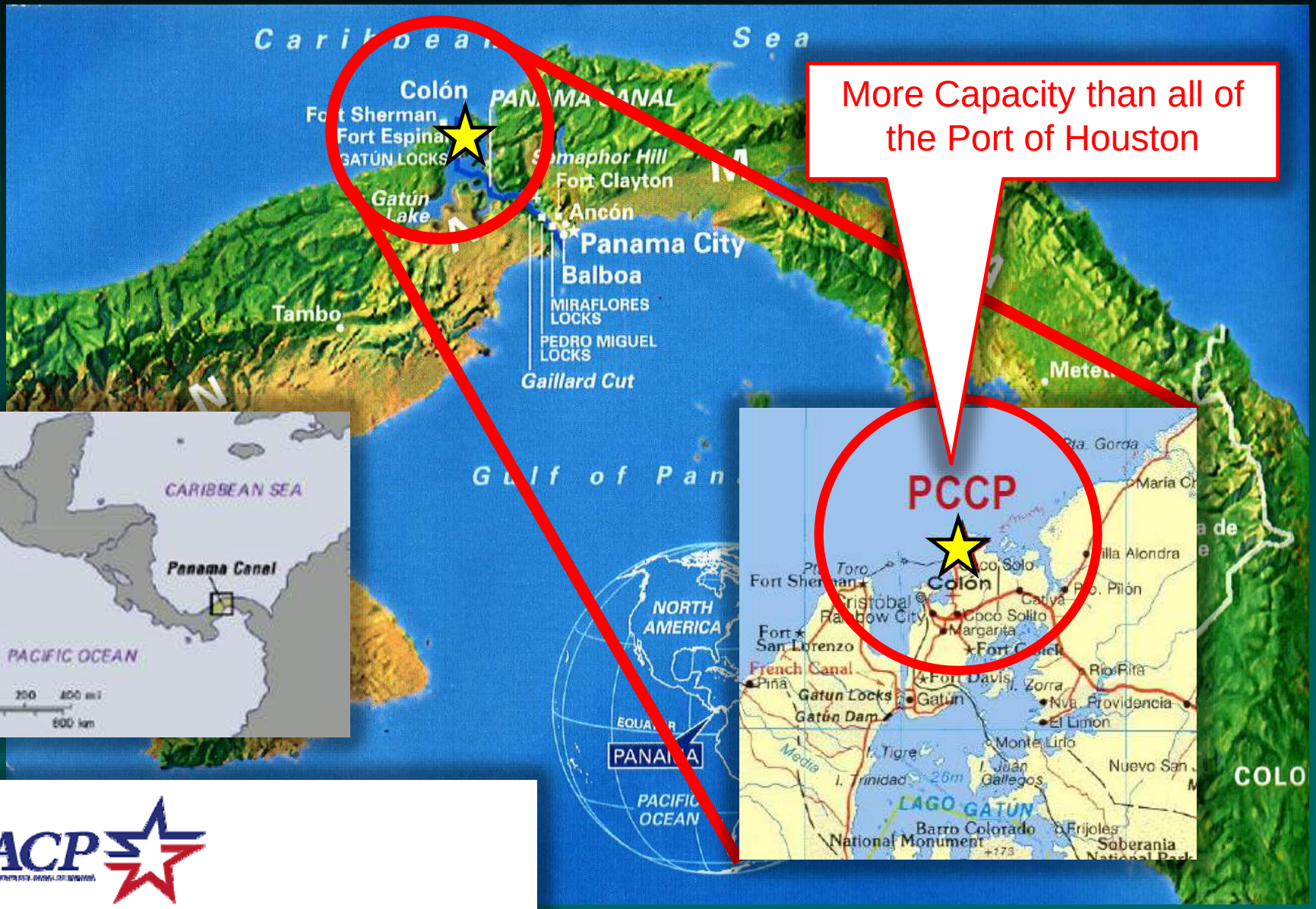


New Panama Canal Pacific Entrance Ports

ACP

The Autoridad Del Canal de Panama

New Panama Canal Atlantic Entrance Port



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Panama Canal Large Vessel Market Penetration into the US Midwest

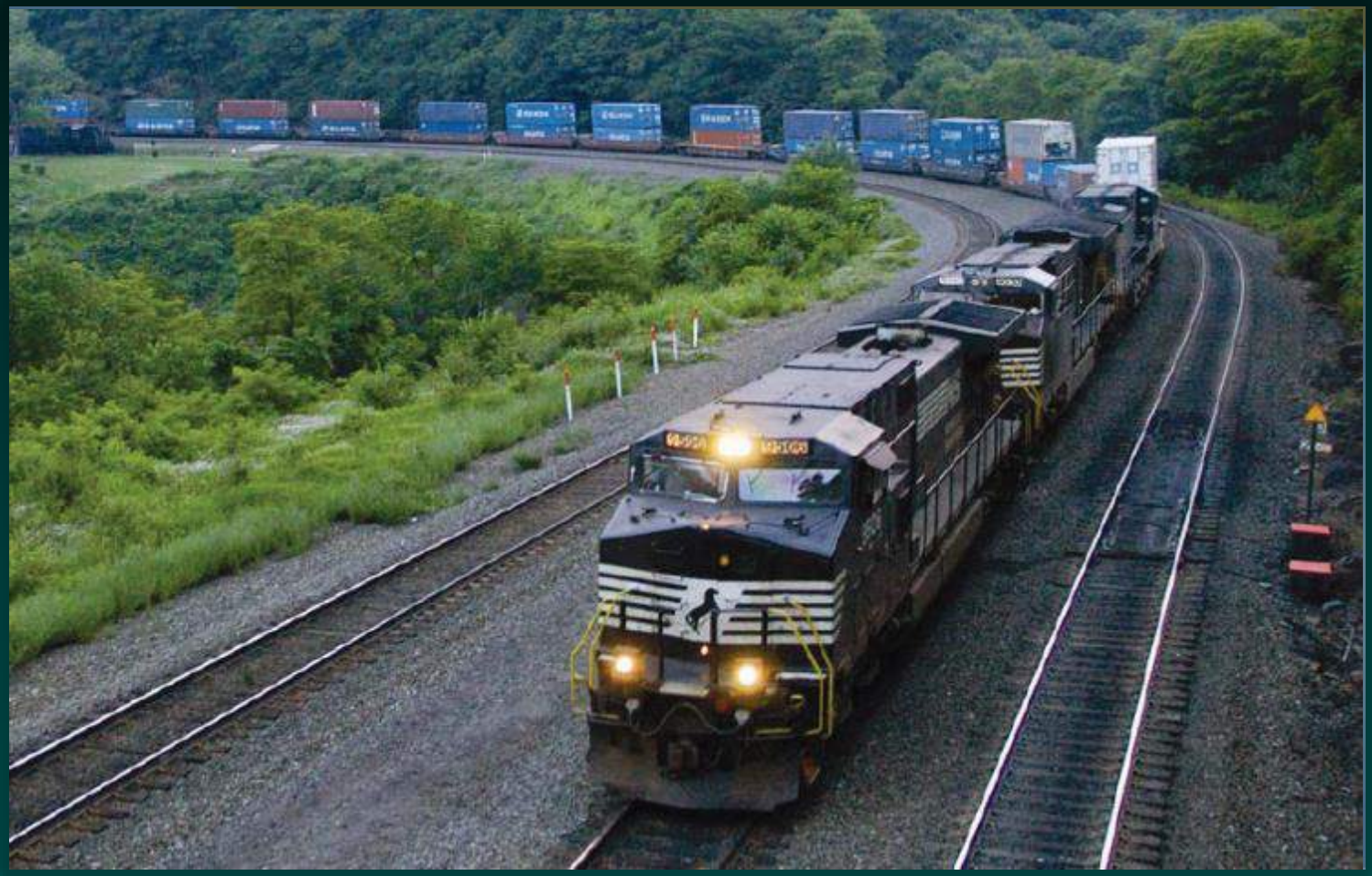
Panama Canal Vessel Deployments Will Determine New US Logistics Patterns

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

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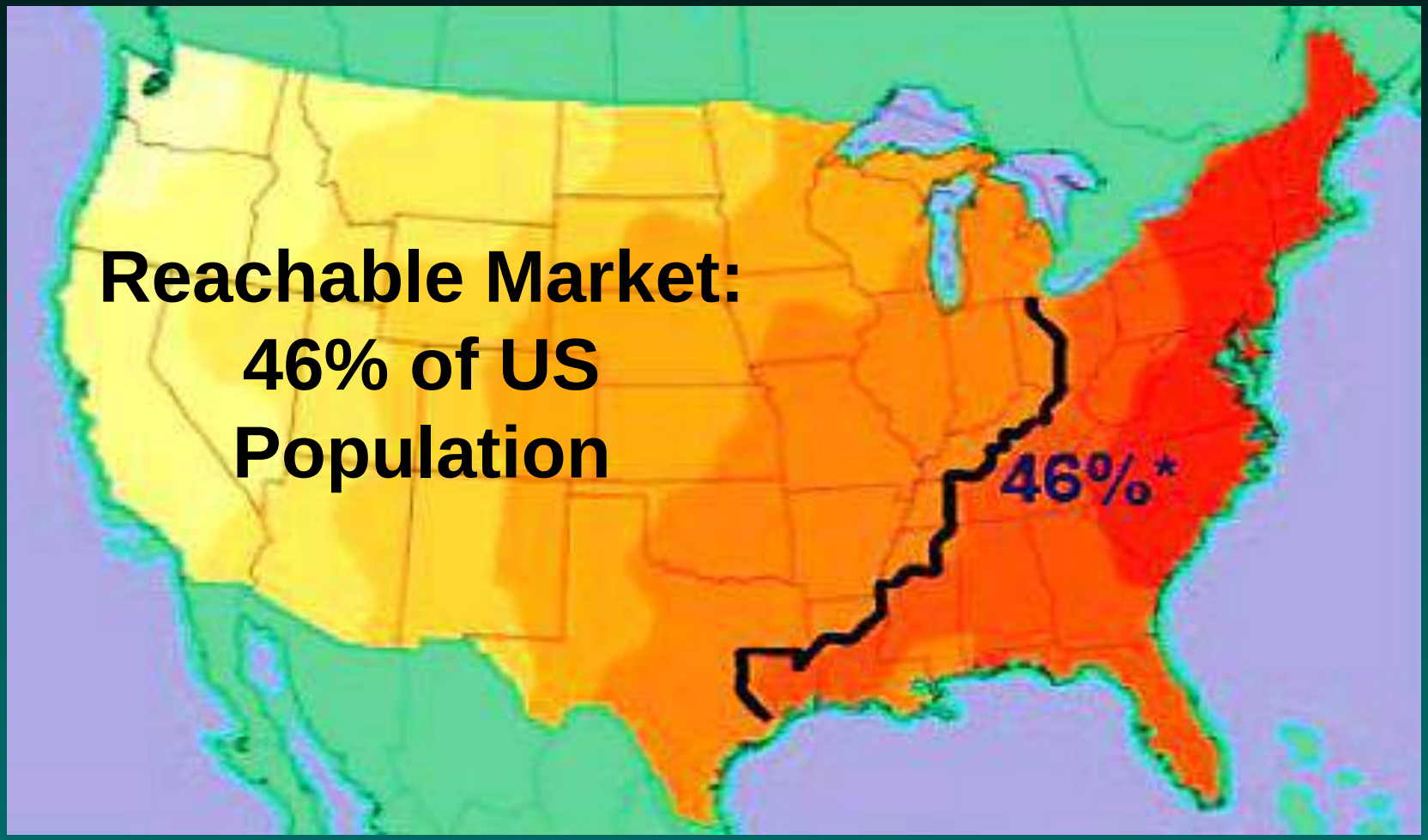
Today's US Market Penetration

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

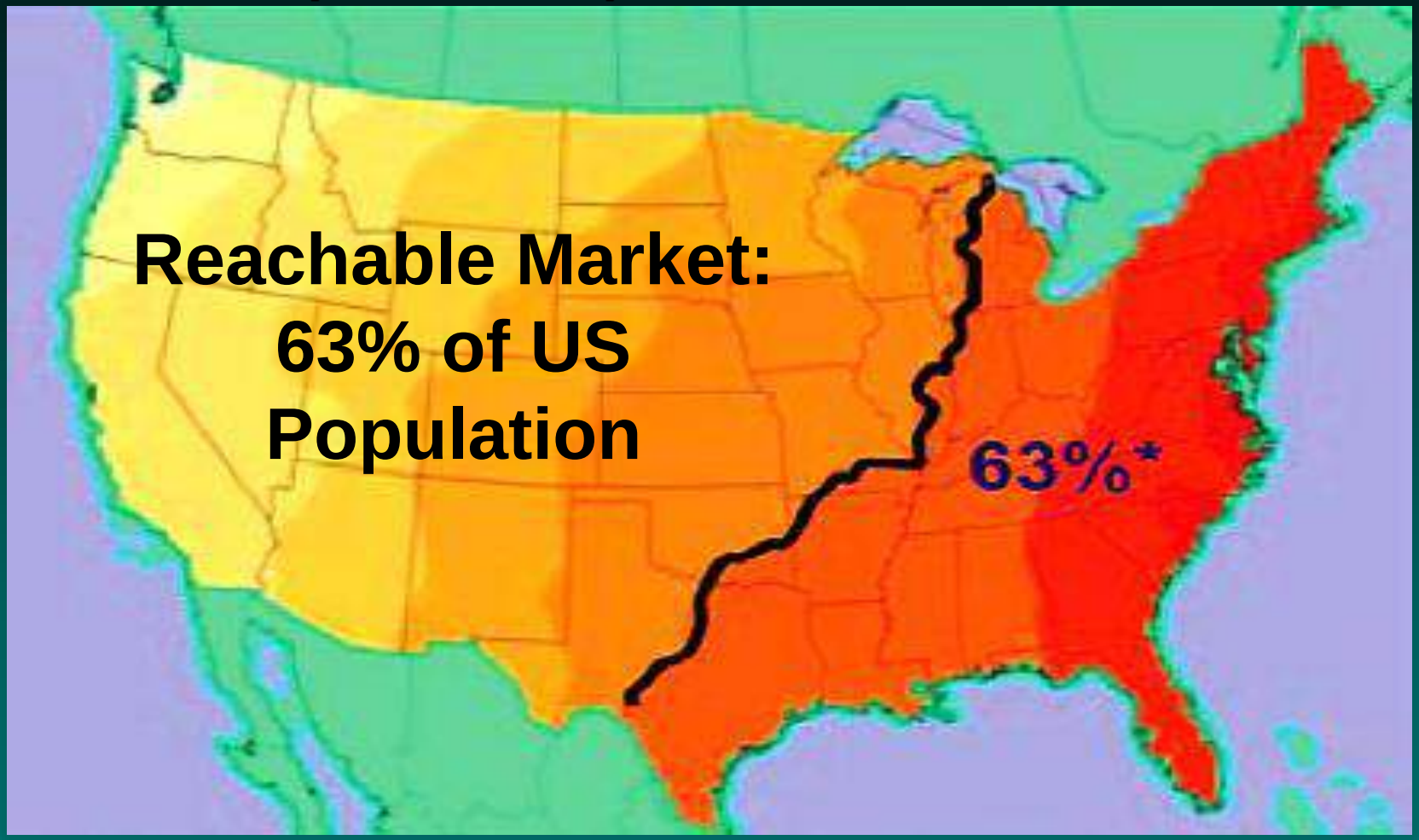


4,000 TEU ship, all-water.

Source: PB Consultants - CSX Transportation May 12, 2011 - Director of Strategic Analysis

Dramatic US Market Penetration after 2016

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



8,000 TEU ship, all-water.

Source: PB Consultants - CSX Transportation May 12, 2011 - Director of Strategic Analysis

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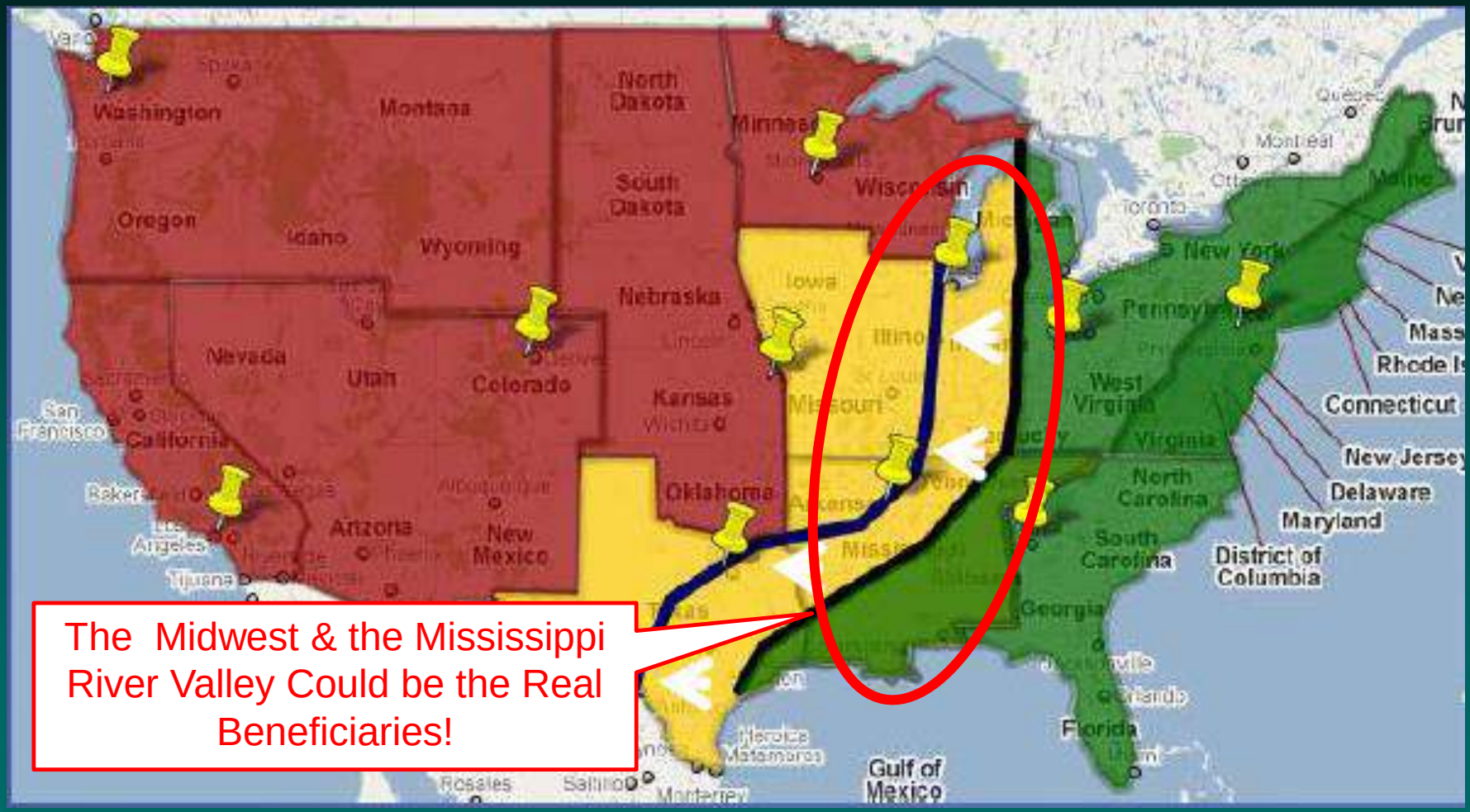
Dramatic US Market Penetration after 2016

Panama Canal <u>Economies of Scale</u> with permit deeper market penetration into the US



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

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Emerging Trade Opportunities for the US Midwest

"Emerging Big Ideas"

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changing course

navigating the future of the Lower Mississippi River Delta

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"Changing Course":

A COMPETITION for a Project of National Significance

A 50-100 year, $15 billion plan that lays out a bold, ambitious, and essential vision for Mid-America's future.

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VAN ALEN INSTITUTE

Led by the Environmental Defense Fund (EDF) & the Van Alen Institute and Funded by:

Rockefeller Foundation
Innovation for the Next 100 Years

Greater New Orleans Foundation
For a vibrant region.

blue moon FUND

THE KRESGE FOUNDATION

The WALTON FAMILY FOUNDATION

A New Mississippi Delta For The World

"***Changing Course***" has brought together teams of the world's best engineers, scientists, planners and designers to show the "***art of the possible***" in creating a self-sustaining delta ecosystem.

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"Changing Course"

Lower Mississippi River Basin Eco System

The Mississippi River Delta Region is:
40 % of the US Marshland
30% of the US Seafood Consumption

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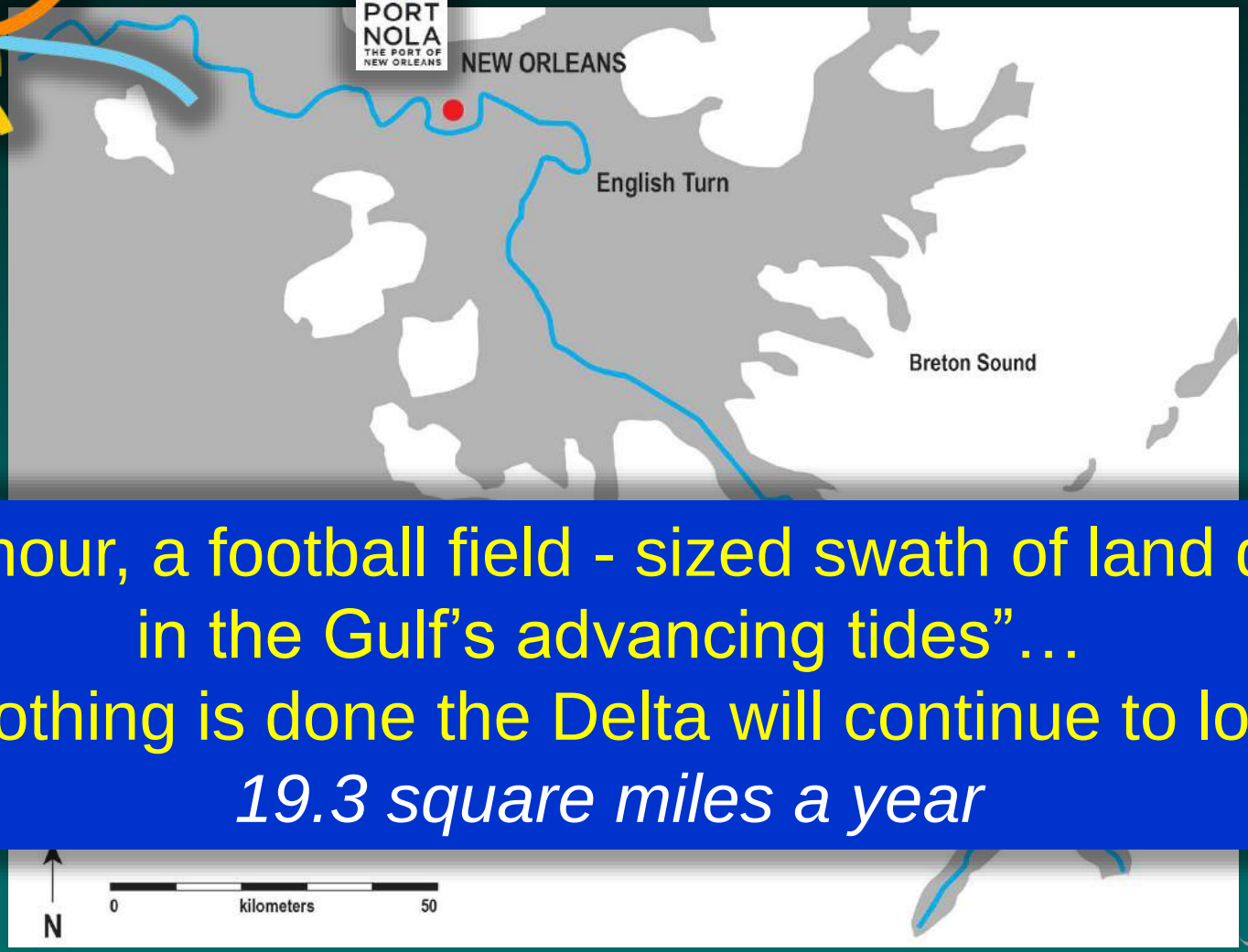
The Lower Mississippi River Today

Over the last century, nearly 1,900 square miles of Louisiana's coastal wetlands have vanished

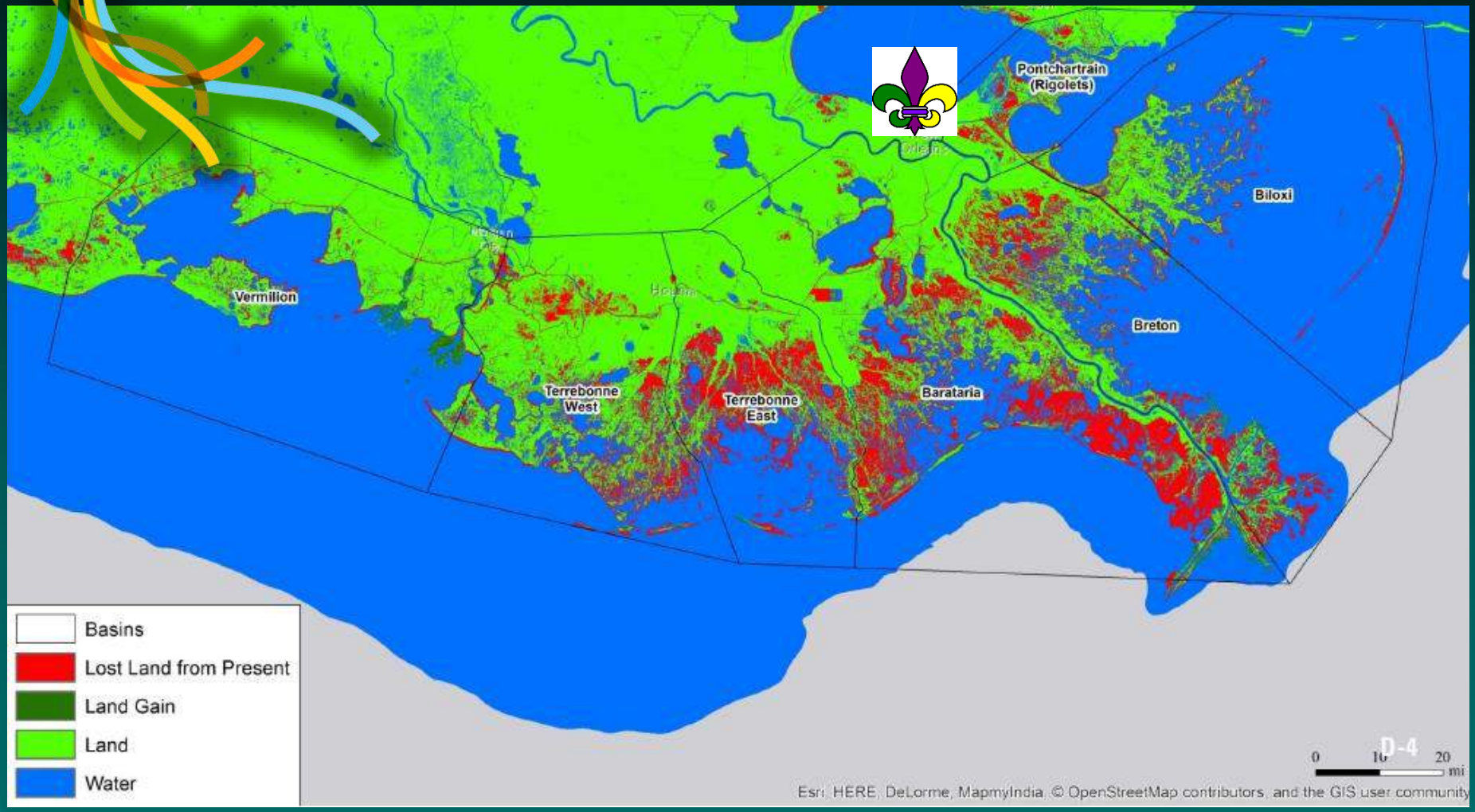


"Every hour, a football field - sized swath of land drowns in the Gulf's advancing tides"…

If nothing is done the Delta will continue to lose

19.3 square miles a year

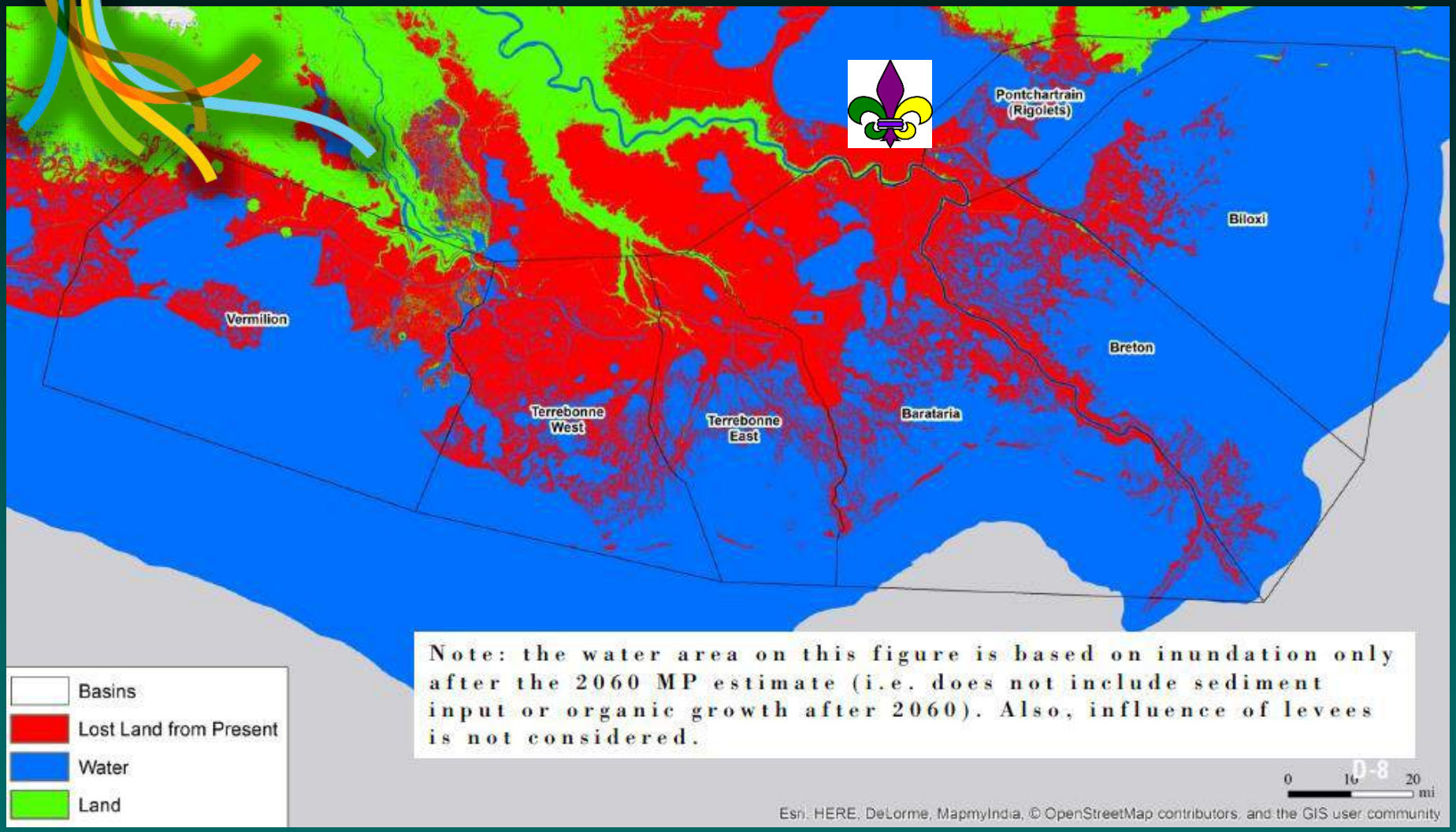
Loss of Land From 1932 to 2015



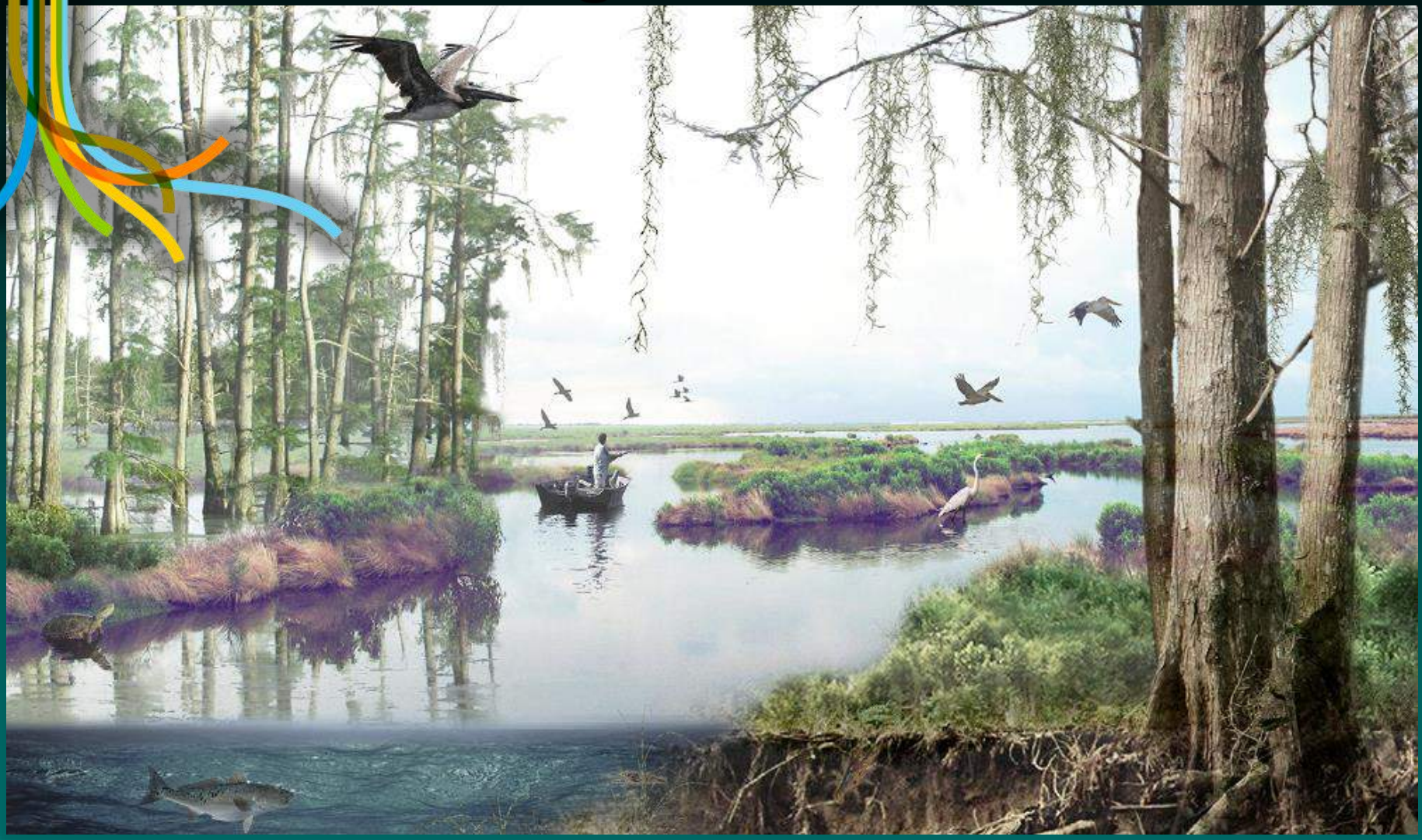
D-4

2115 Land Losses

(Sea Level Rise + Land Subsidence = 1.5 meters)



Restoring America's Delta



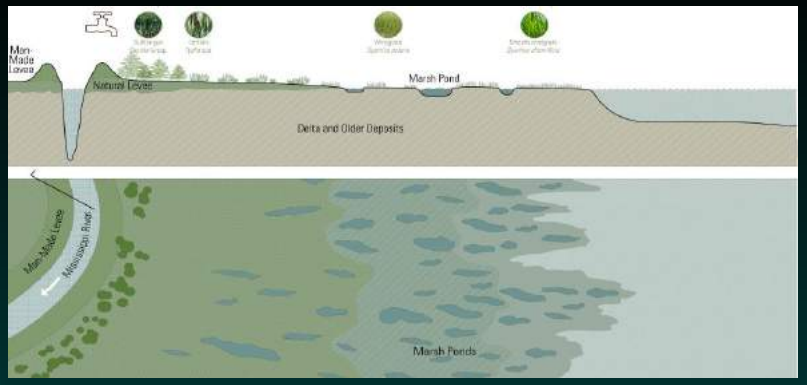
Without action, by **2100** Louisiana will have lost virtually **all** of its coastal wetlands.

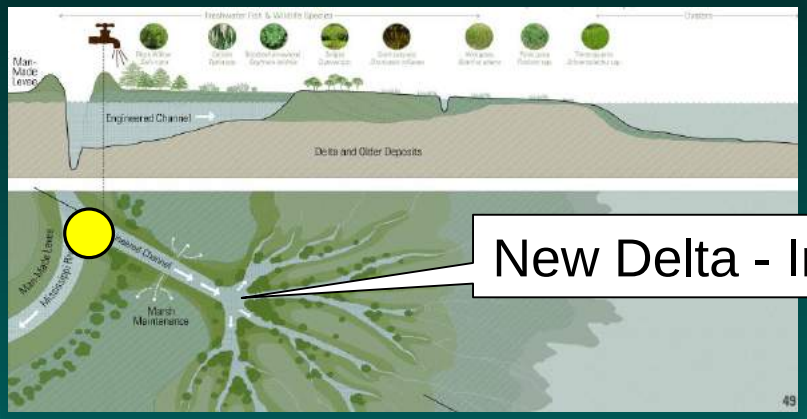
New Orleans is at River Mile 100

(from Mile Zero at Head of Passes)

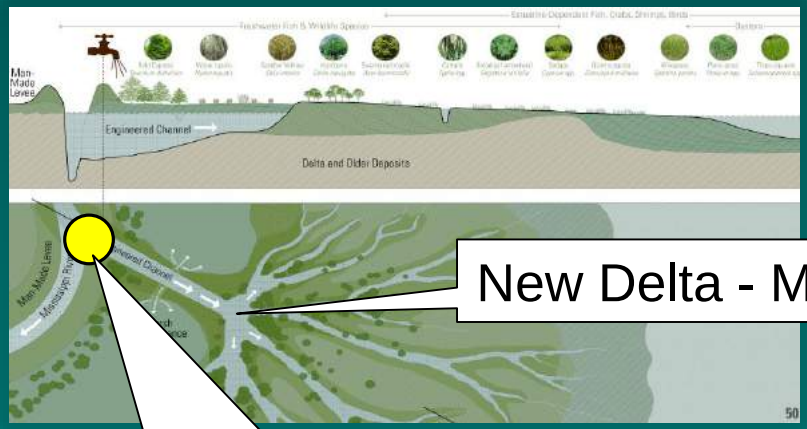
Navigational Solution:

Managed Distributaries – "Controlled New Deltas"





New Delta - Initial

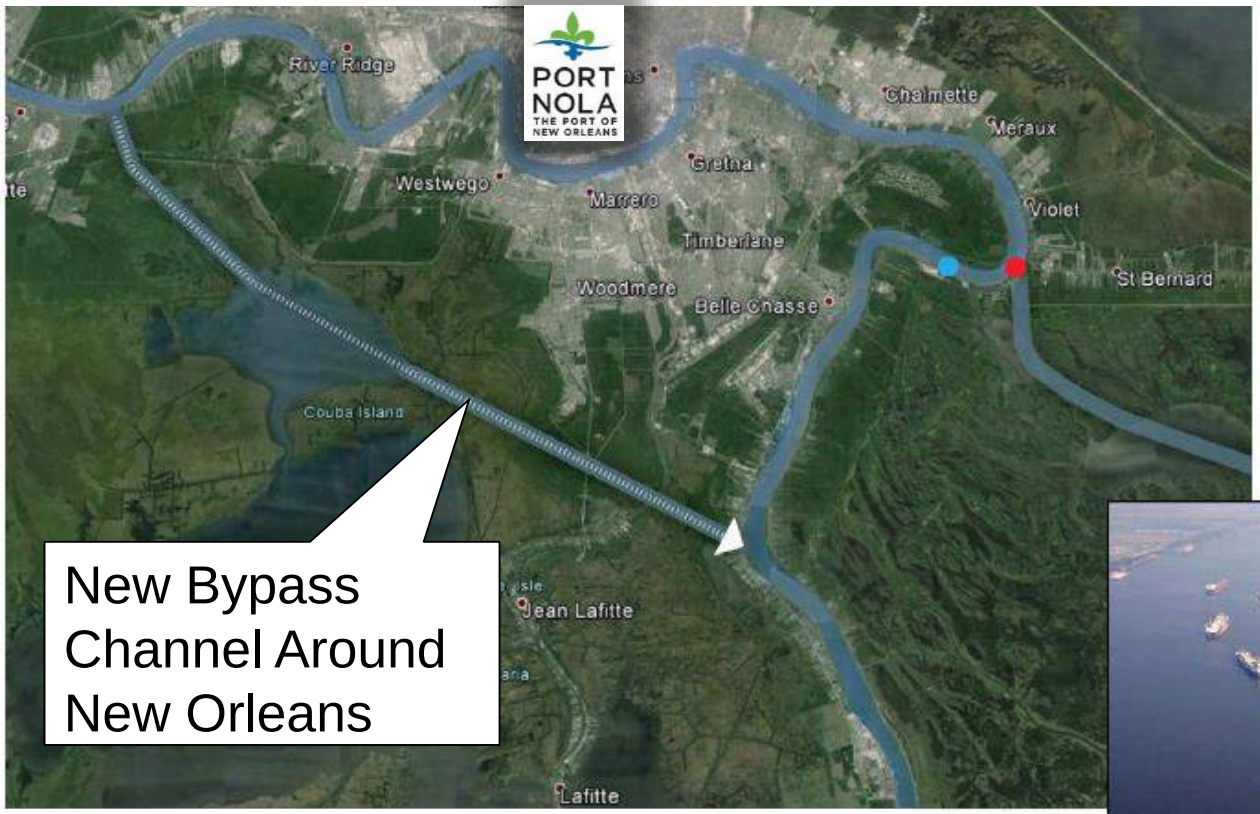


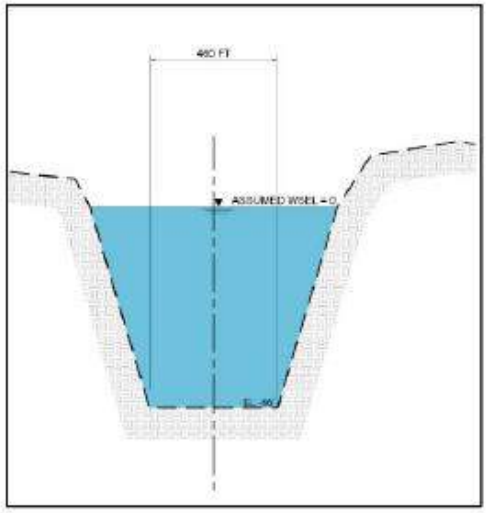
New Delta - Mature

Controlled Gate

Navigational Engineering Solutions

New Orleans Bypass Channel
Reducing Distance to Baton Rouge by 30 Miles &
Eliminates Congestion in the Port of New Orleans





Distributary and vessel channel

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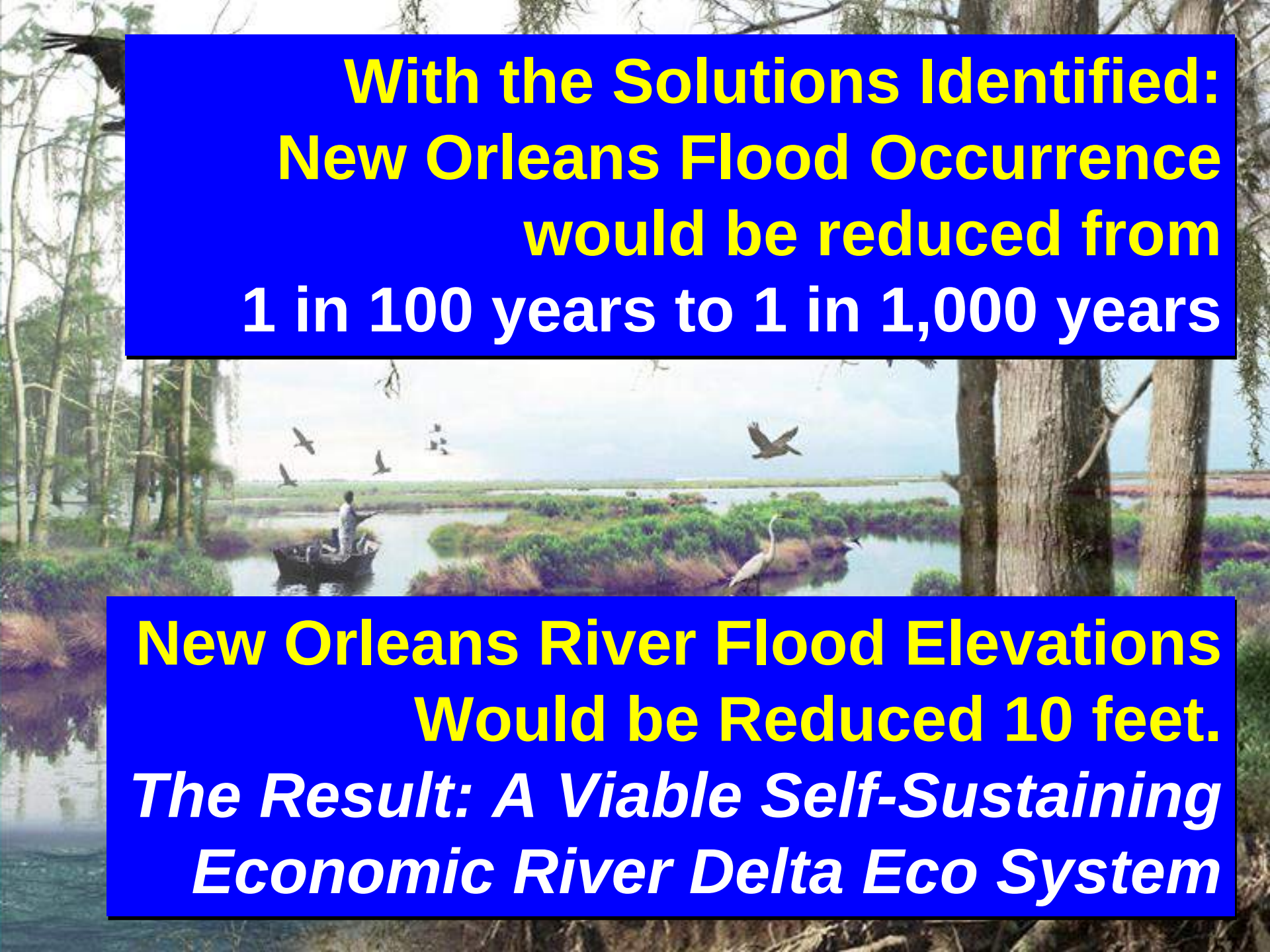

With the Solutions Identified:
New Orleans Flood Occurrence would be reduced from
1 in 100 years to 1 in 1,000 years

New Orleans River Flood Elevations Would be Reduced 10 feet.
The Result: A Viable Self-Sustaining Economic River Delta Eco System

Recommended Navigational Improvements On the Lower Mississippi will "*Shorten the Distance to Open Ocean*" for All River Ports by ***More Than 75 Miles***

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America's New Energy Self Sufficiency

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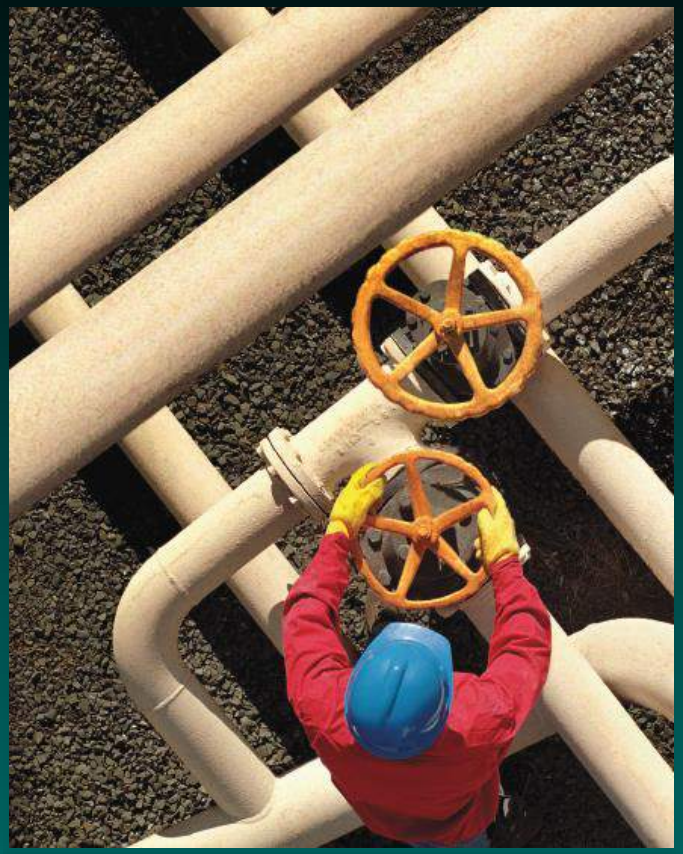
FUELING GROWTH IN CHINA

Falling oil prices increase demand for Chinese exports and boost container carriers' profit prospects

For every $10 fall in the oil price per barrel, there will be an additional $1.1 billion of consumer spending on Chinese exports.

Shale Gas: A Game Changer for US Competitiveness



US oil production recently hit a 20-year high and could surpass Saudi Arabia's output by 2019.

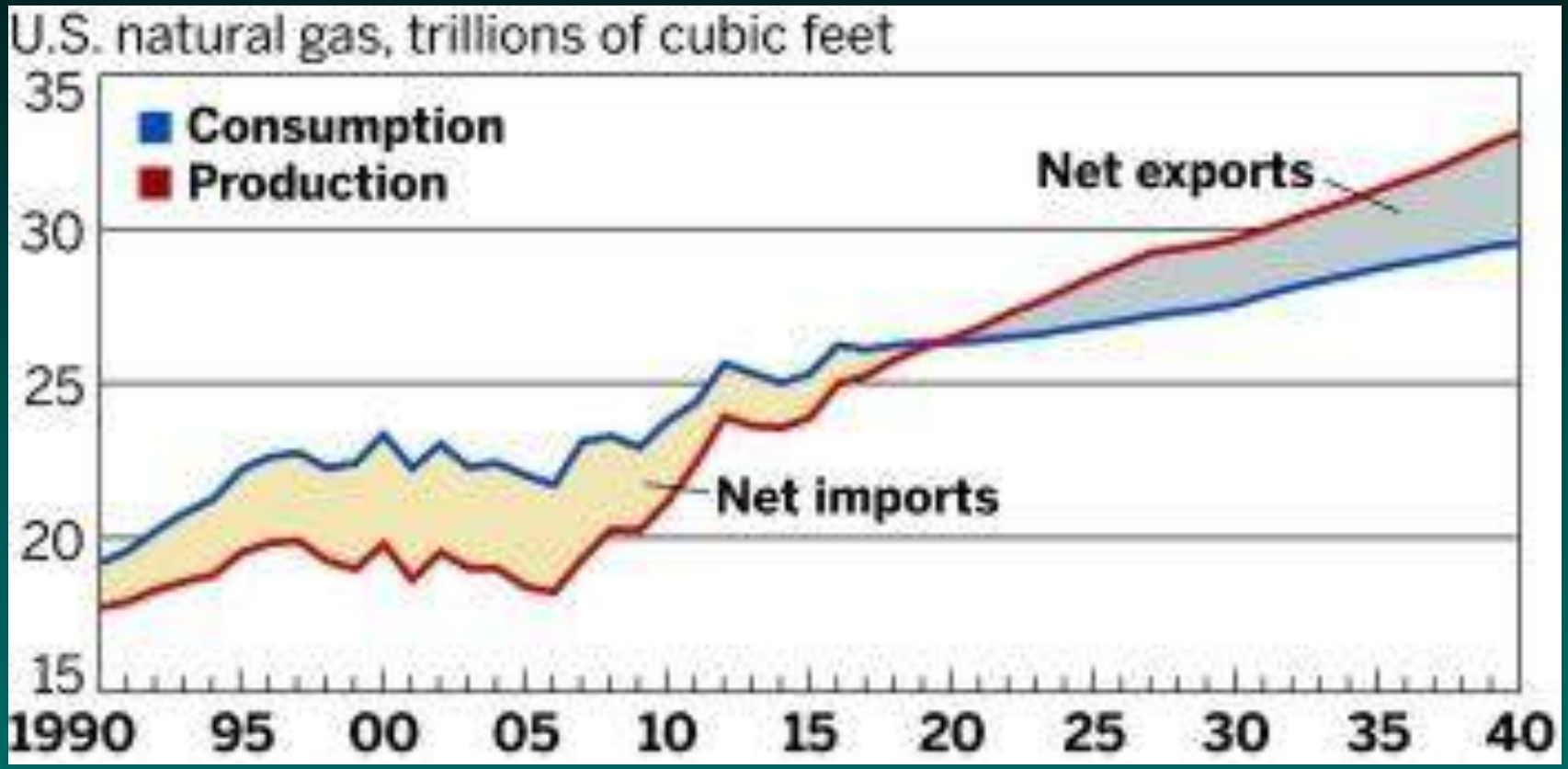
The US has a 100-year supply of natural gas, & will be the world's largest natural gas producer by end of 2015.

Source: US Energy Information Administration, US Department of Energy

Independent Statistics & Analysis
U.S. Energy Information Administration

US Natural Gas Production

(Trillions of Cubic Feet)



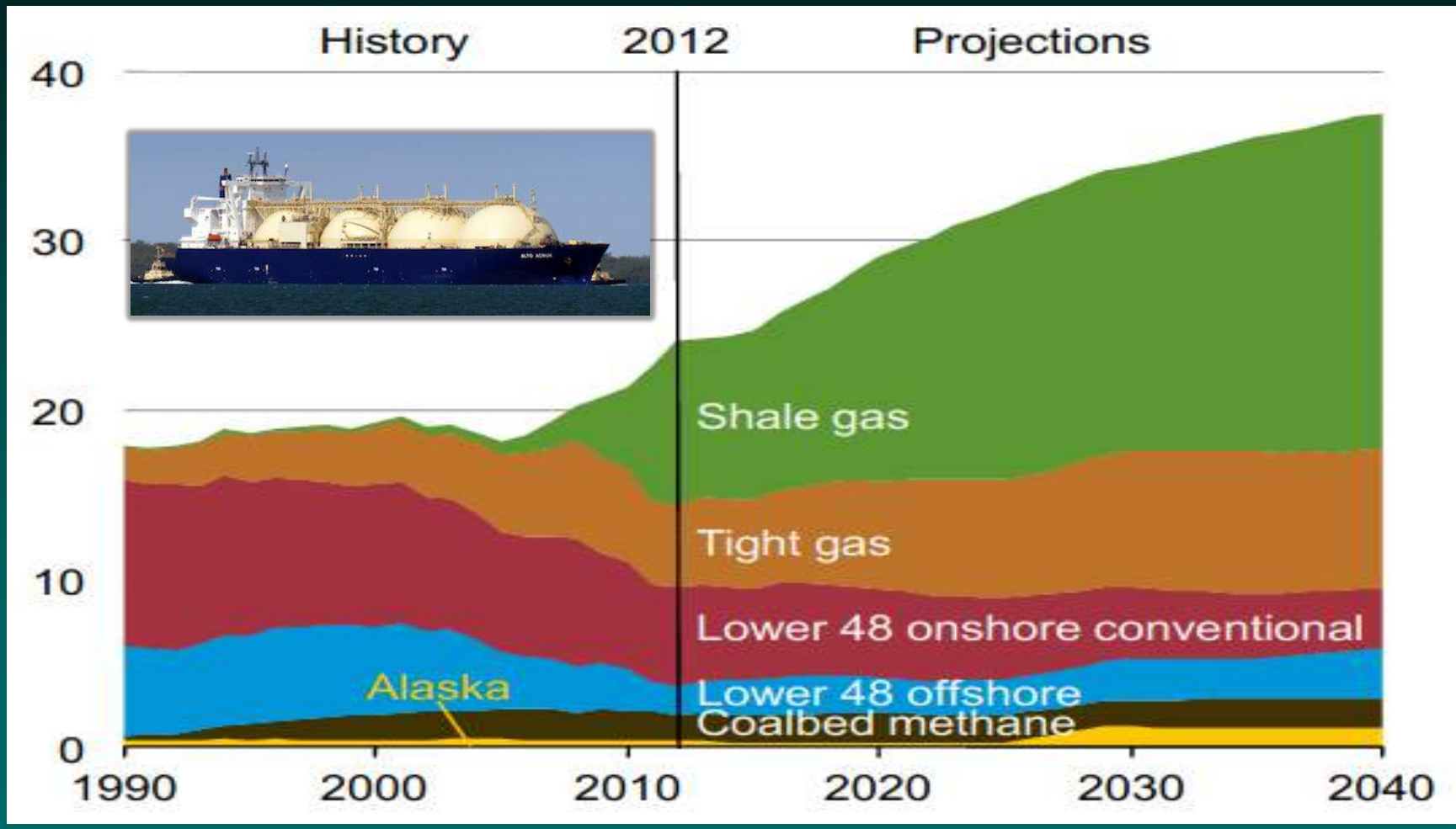
By 2020, U.S. is Projected to Be a Net Exporter of Natural Gas

Source: Derived from US Energy Information Administration: EIA AE 02014

Independent Statistics & Analysis
U.S. Energy Information Administration

US Natural Gas Production by Source

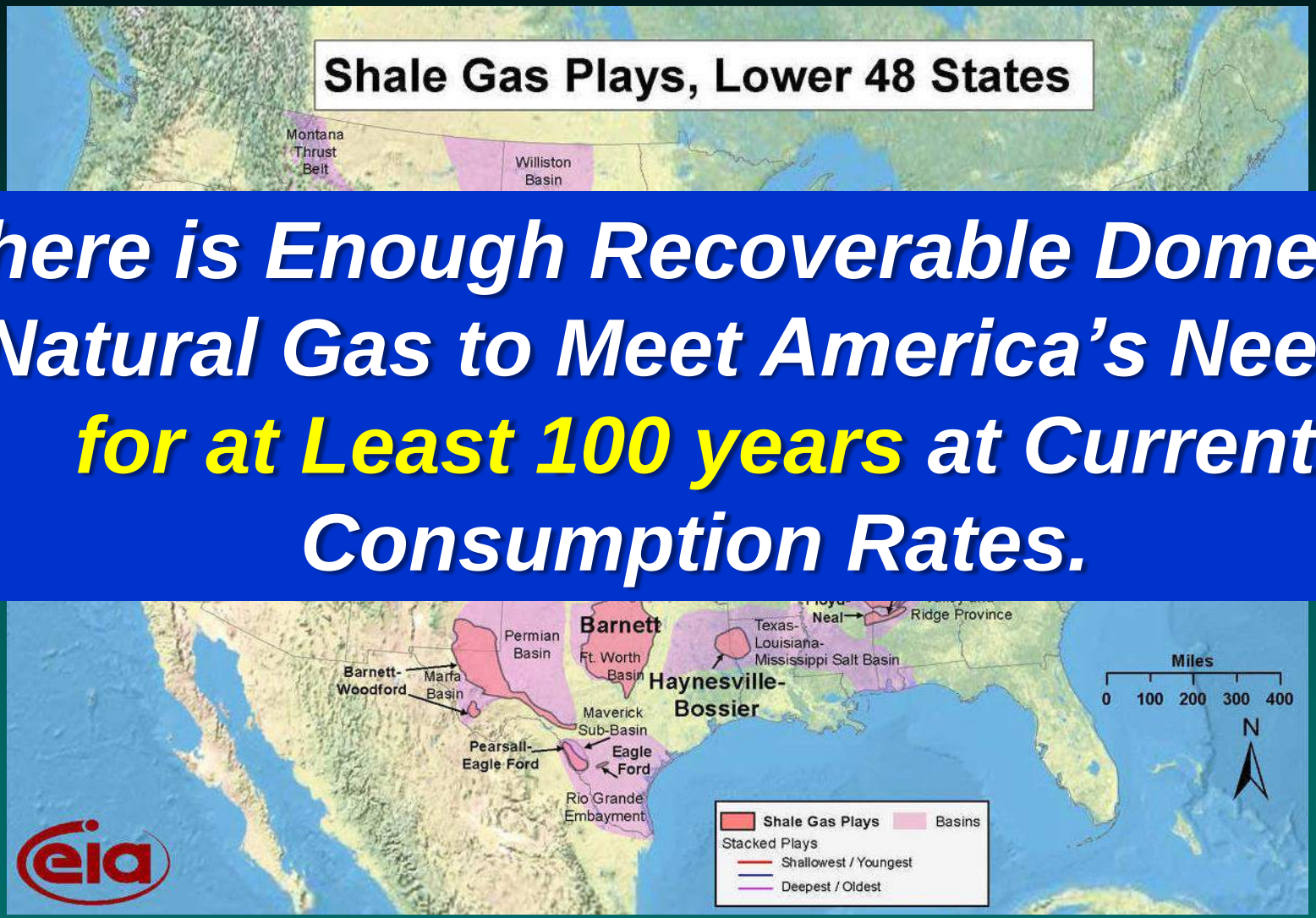
(Trillion Cubic Feet)



Source: Derived from US Energy Information Administration: EIA AE 02014

Independent Statistics & Analysis
U.S. Energy Information Administration

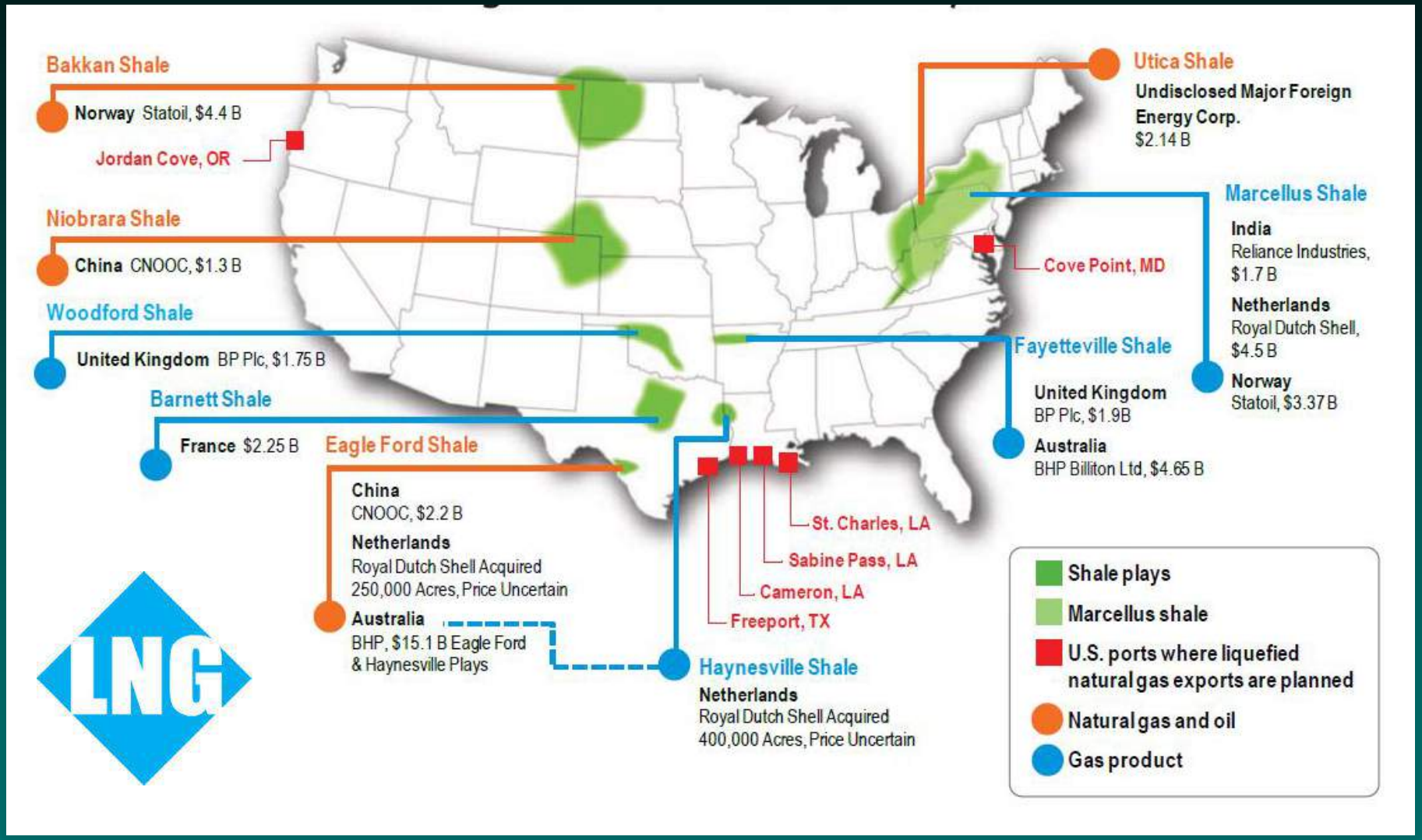
US Shale Gas Basins in North America



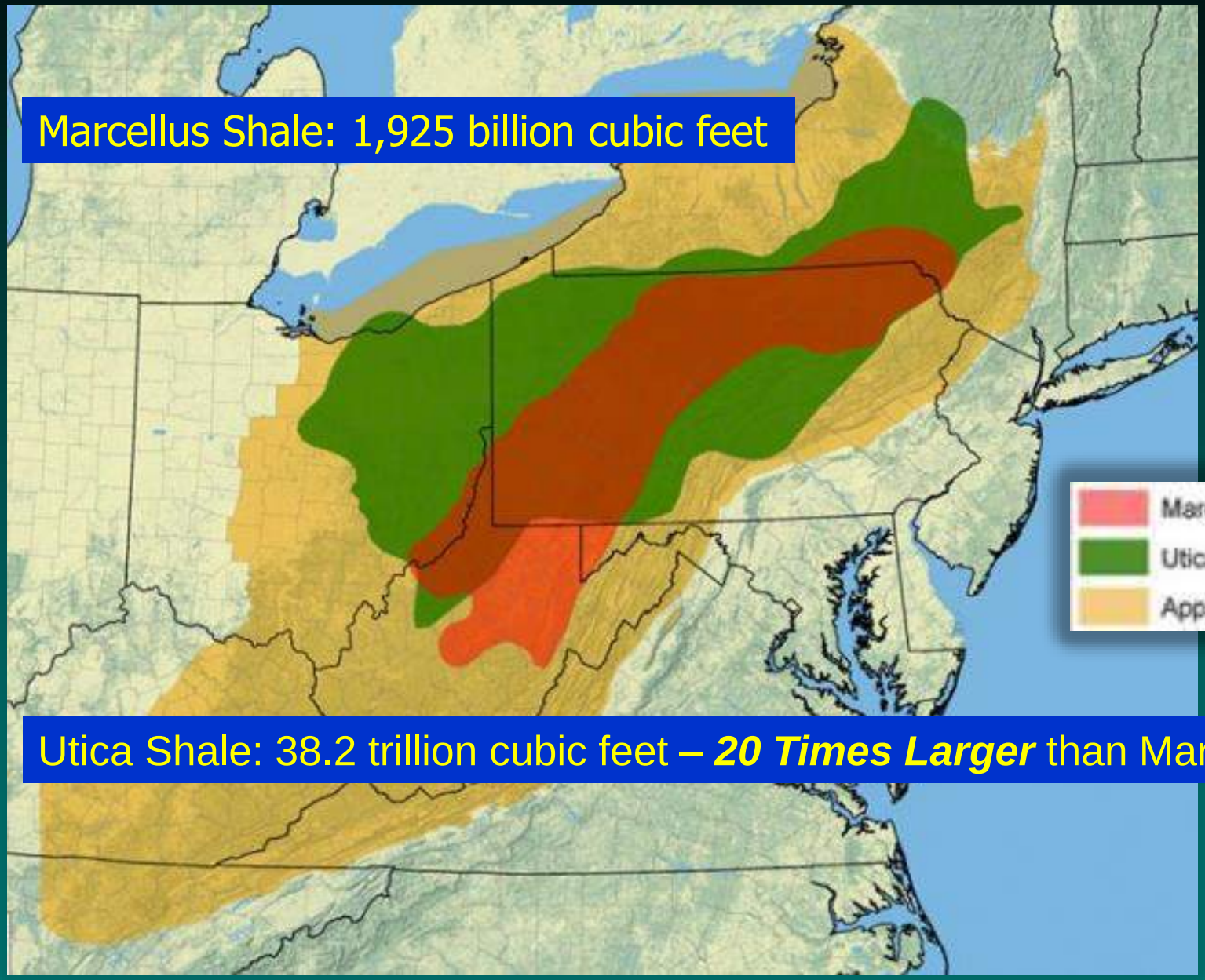
There is Enough Recoverable Domestic Natural Gas to Meet America's Needs for at Least 100 years at Current Consumption Rates.

Source: Derived from US Energy Information Administration: EIA AE 02014

Foreign Investment in US Gas and Oil



Marcellus/Utica/Appalachian Shale Basins



US LNG Exporters Target Marcellus Shale as Feed Gas

(Liquefaction Participants are Now in the Market for Dedicated Pipeline Supply to Match Their Exporting Needs)

Source: Poten & Partners' in July 2014 LNG in World Markets Research Report

US LNG Exporters Target Marcellus Shale as Feed Gas

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Source: Poten & Partners' in July 2014 LNG in World Markets Research Report

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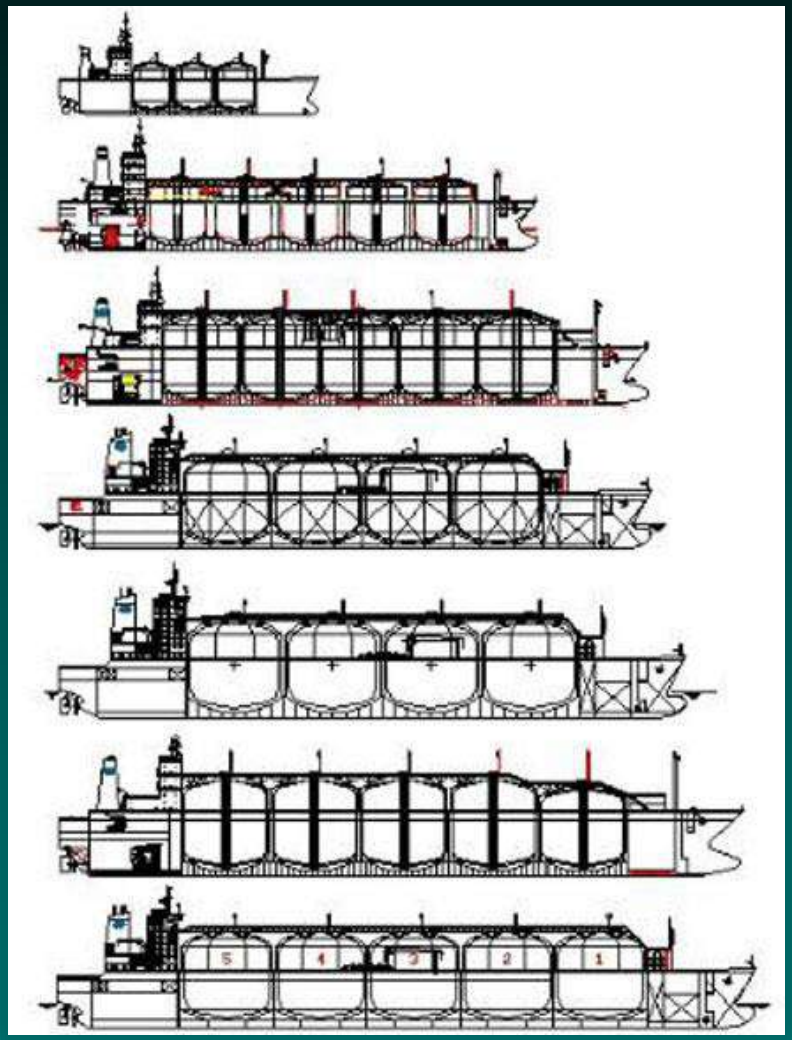
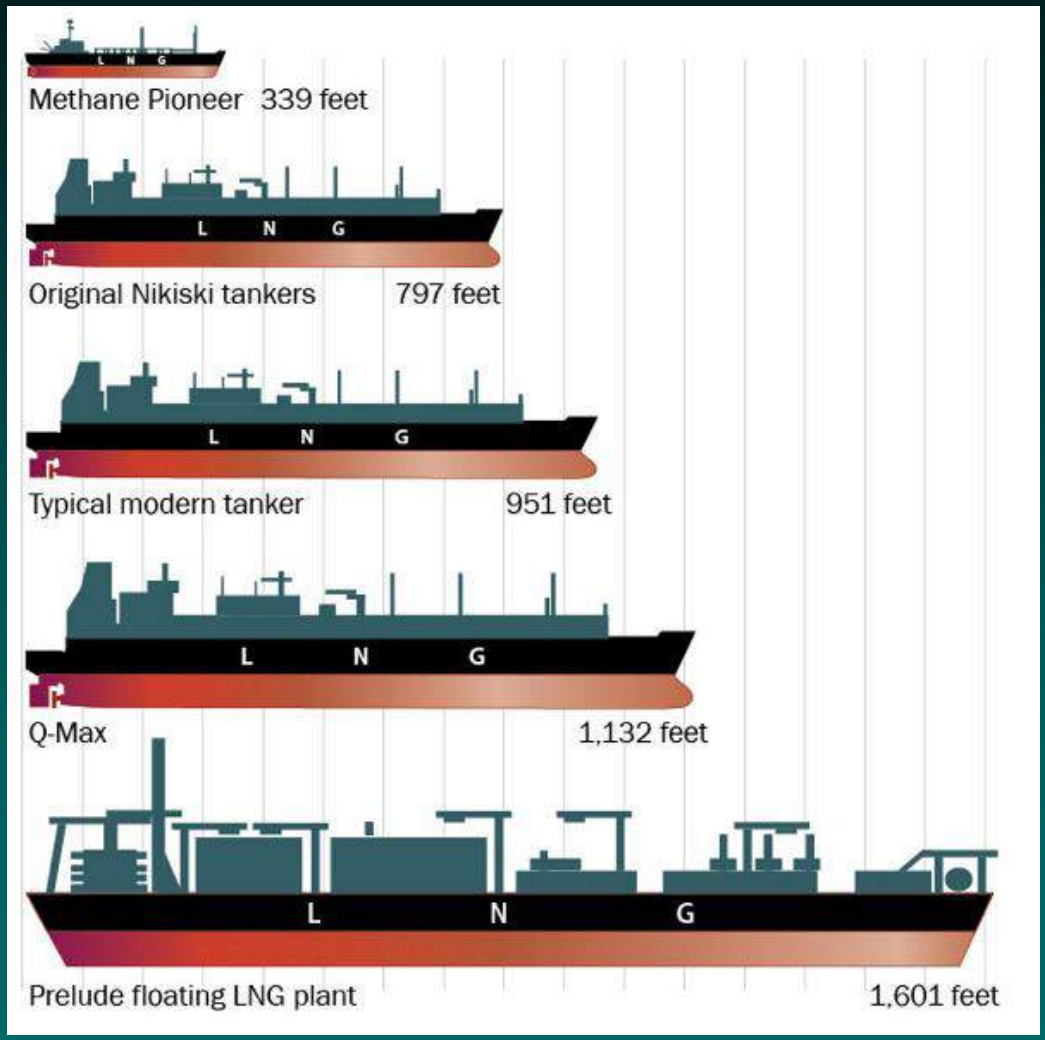
Impacts of the World's Largest Gas Carriers VLGCs

U.S. LNG Export Terminal

LNG Tanker Vessel Size Evolution





Maximum Draft for Any LNG Ship is 12 Meters for LNG Loading and Regasification Terminals

Panamax LNG Vessel Dimensions	
Length:	345 m (1,132 ft.)
Beam:	53.8 m (177 ft.)
Height	34.7 m (114 ft.)
Draft	12 m (39 ft.)
Capacity	266,000 cubic meters 9,400,000 cu ft.

The first **Q-Max** LNG carrier, **Mozah**, was built in November 2007.

Largest Gas Ocean Carrier: Q-Max LNG

Q-Max (Qatar Max)

Gross Tonnage: 164,000 t

Summer DWT: 129,000 t

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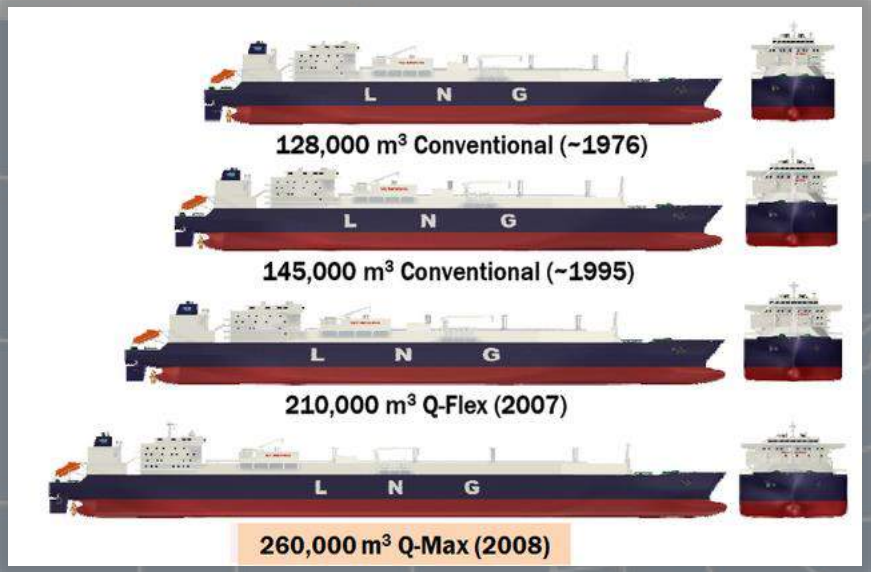
Applications to Export LNG to Non-FTA Countries



Source; Office of Fossil Energy, Application Received by DOE to Export Domestically Produced LNG from the Lower US

2011 International Gross Fixed Capital Formation as a Percent of GDP

(*US is 32nd in the World - Below OECD Nations*)