Union League Club, Chicago, IL *June 14, 2017*

Achieving the Promise of Tomorrow's Emerging Rail & Waterway Opportunities

M. John Vickerman

VICKERMAN & ASSOCIATES, LLC

Williamsburg, Virginia

Vessel Cargo Handling Circa 1955

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Cargo Handling Circa 2010

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US Navy Fast Frigate Circa 2045

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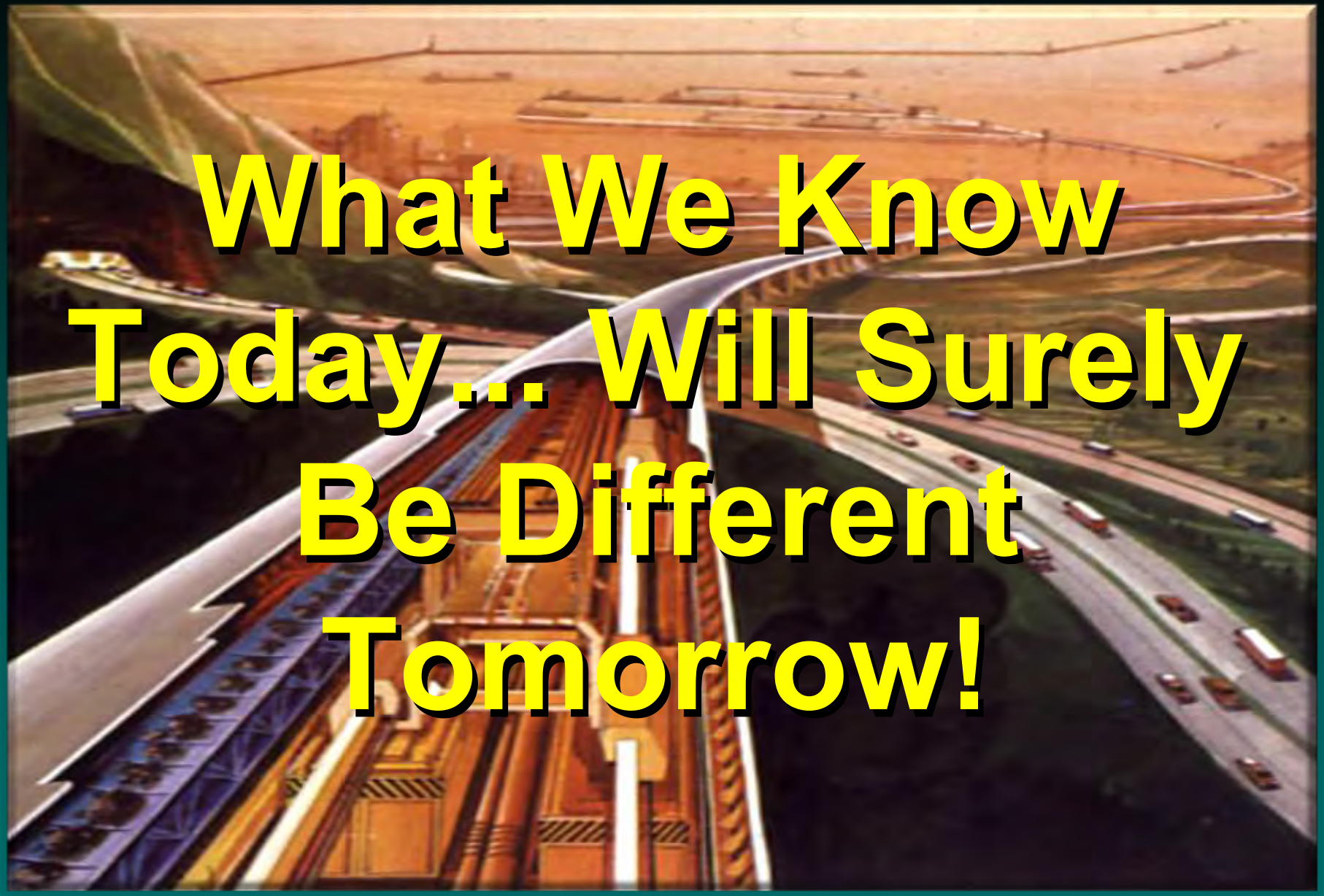

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Linking Railroads, Ports, Trucks, and Waterways

Since my last presentation at the 2016 Rail Summit a year ago,
<u>Three Major Events</u> have changed the US Marine/Inland Waterway/Rail Industry:

- ✓ *The US Arrival of the Mega Container Ships*
- ✓ *High Speed & Capacity Inland Waterway Vessels*
- ✓ *The US Midwest Freight Battleground Matures*

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Linking Railroads, Ports, Trucks, and Waterways

Maritime Vessel Technology Trends: *Emergence of the Mega Container Vessel*

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Largest Container Ship Yet to Call on the Port of Virginia – May 8, 2017

COSCO Development Container Ship – 13, 092 TEUs

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May 8, 2017 Largest Container Vessel to Call at the Port of Virginia

COSCO Development Container Ship – 13, 092 TEUs

Containership COSCO DEVELOPMENT at 1,200 feet long and 158 feet wide, It is 100-plus feet longer that the U.S. Navy's newest aircraft carrier the Gerald R. Ford

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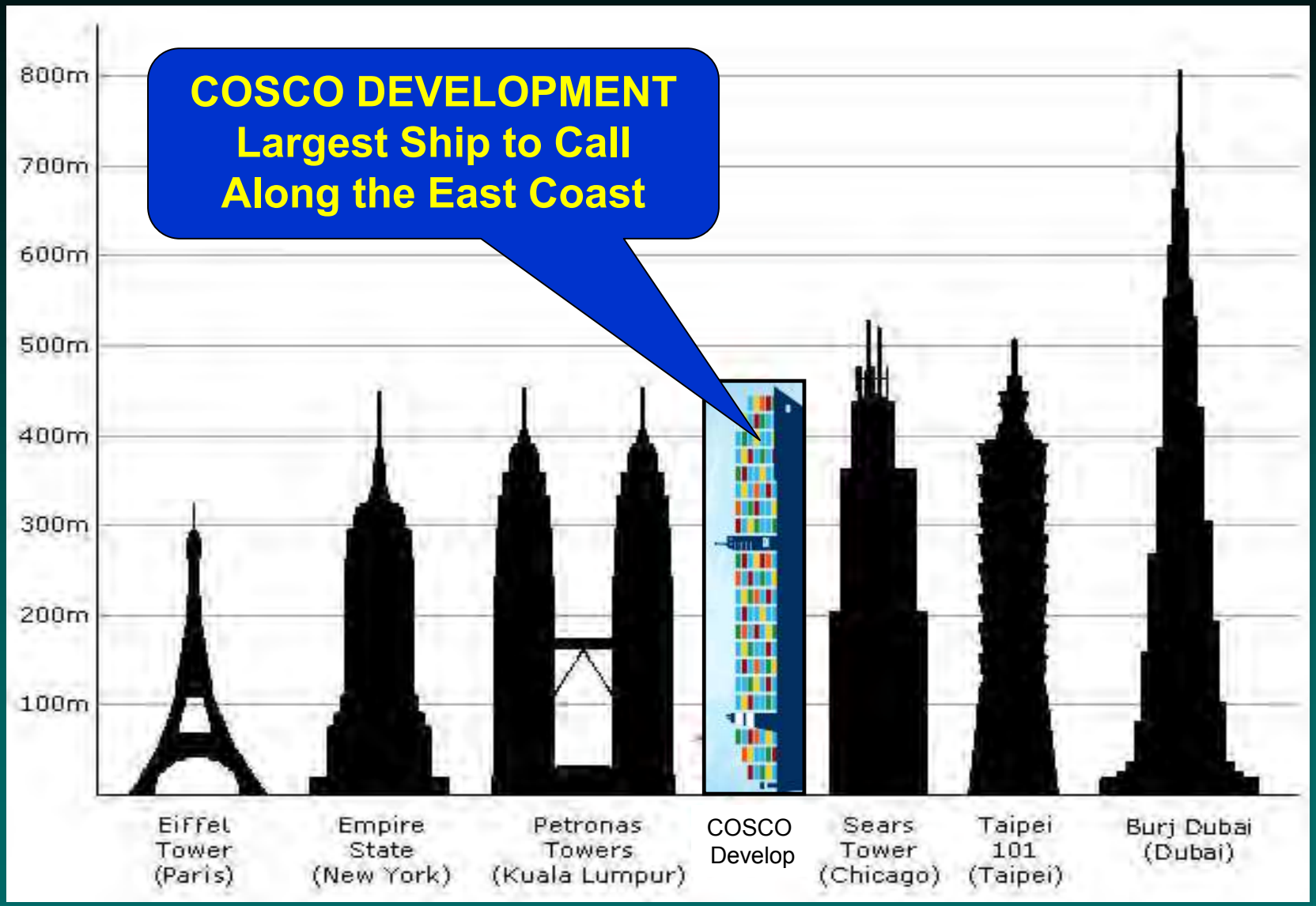
Relative Size of the Mega Container Vessel



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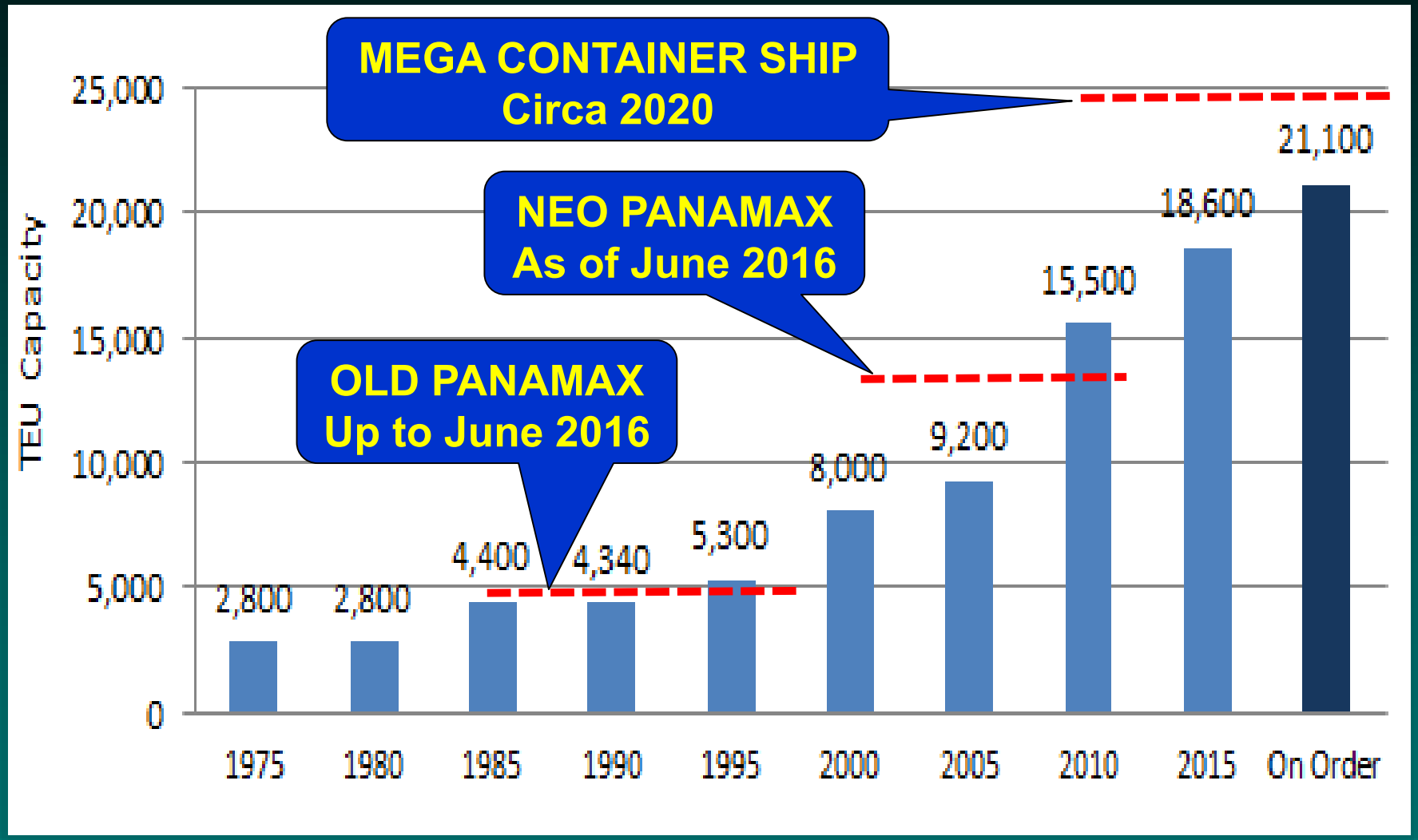
40 Years of Container Ship Size Growth

(TEU Capacity)



Source: HIS Maritime & Trade Historical Vessel and Orderbook Data

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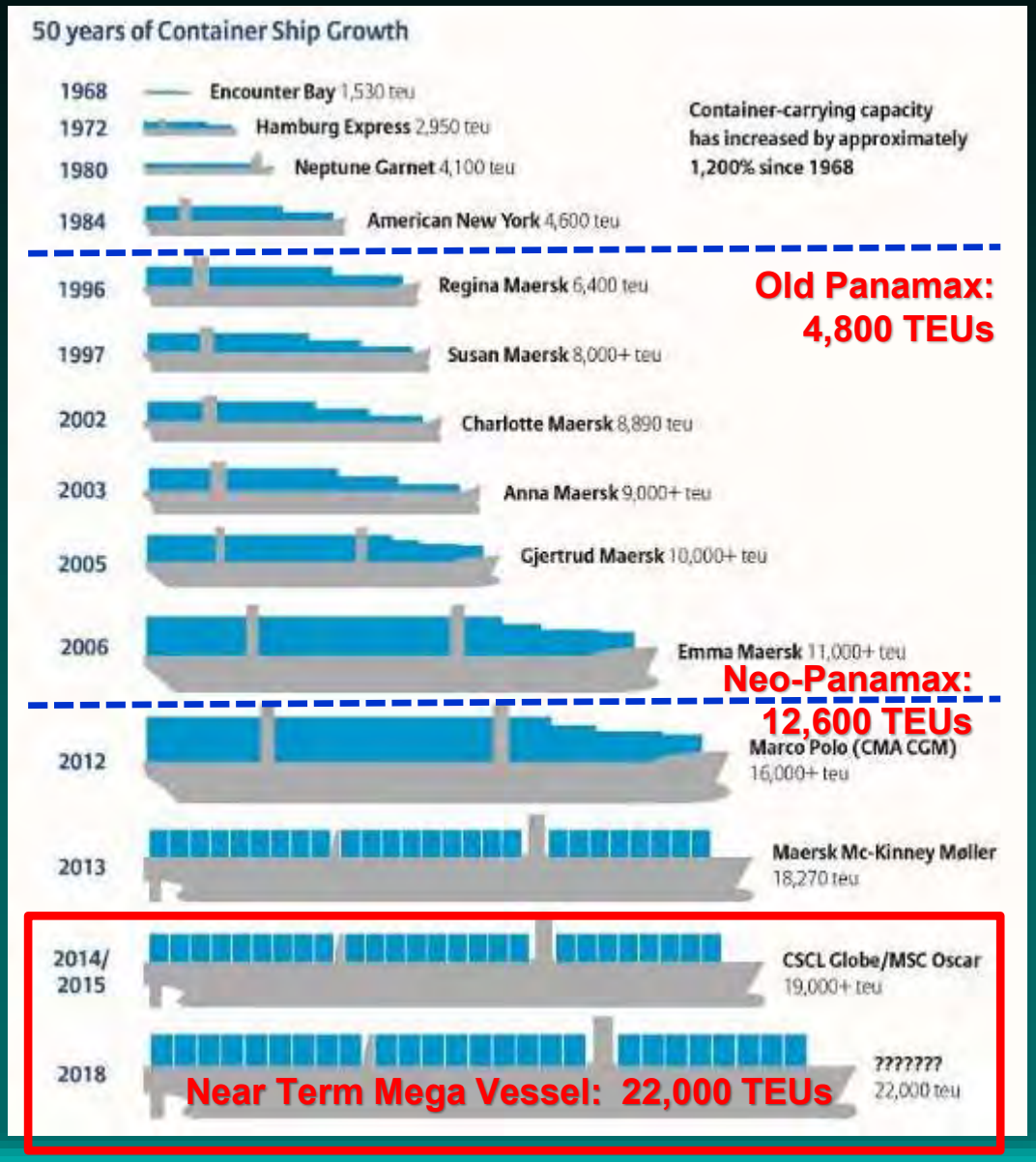
50 Years of Container Vessel Evolutionary Growth



Source: Allianz Global Corporate & Specialty - Data: Container-Transportation.com

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Maersk's 18,000 TEU - Wide Body - Shallow Draft Container Ship

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The Biggest Ship Ever in San Francisco Bay

CMA CGM Benjamin Franklin

1,300 ft. LOA , 177 ft. beam, 18,000 TEUs

Source: CMA CGM, The SF Chronicle

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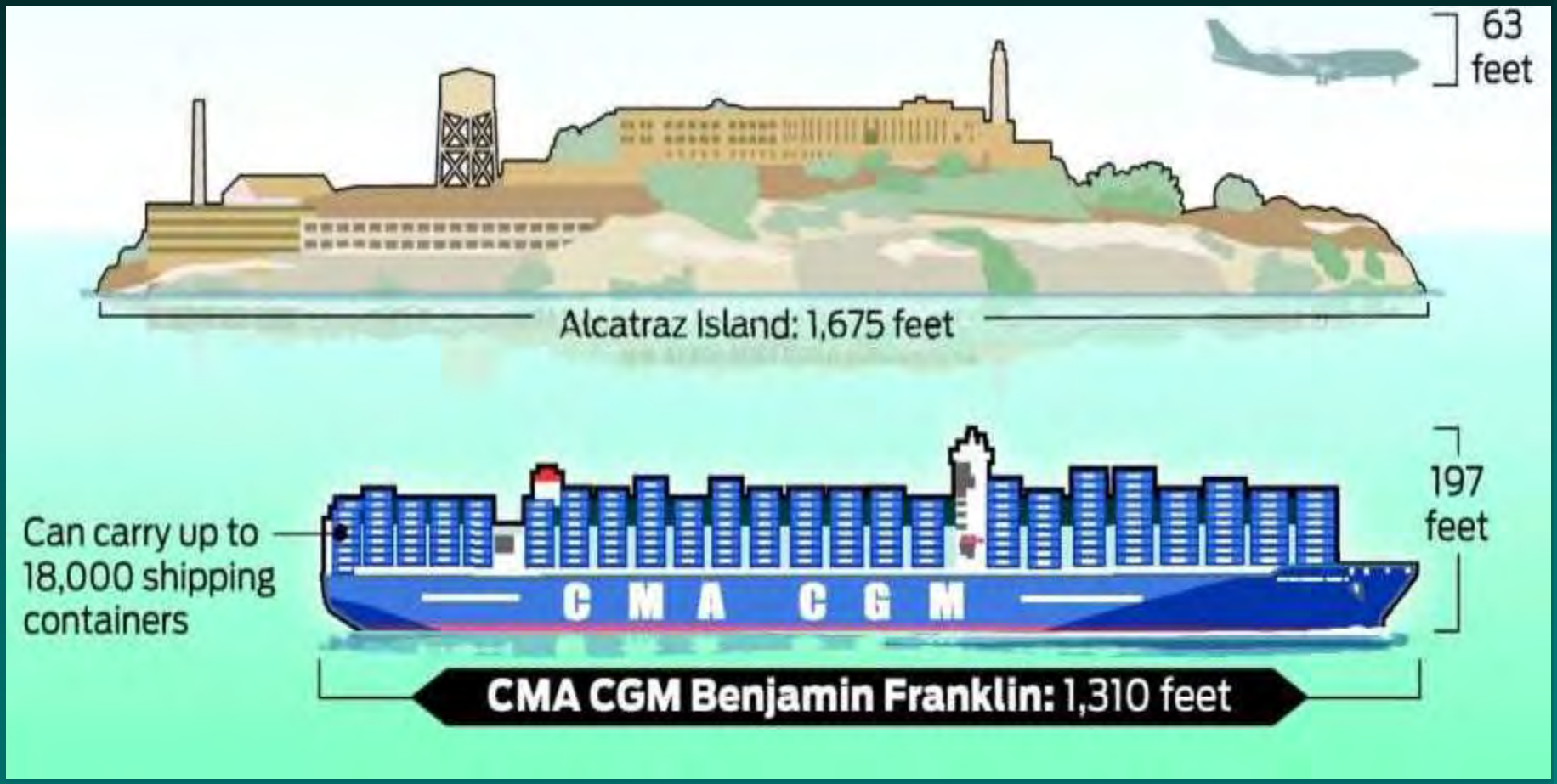
The Biggest Ship Ever in San Francisco Bay

CMA CGM Benjamin Franklin

1,300 ft. LOA , 177 ft. beam, 18,000 TEUs



Source: CMA CGM, The SF Chronicle

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Largest Container Vessel to Call in North America:

(December 26, 2015 APMT POLA - CMA CGM Benjamin Franklin
1,300 ft. LOA and 177 ft. beam, 18,000 TEUs)

The massive Benjamin Franklin was turned in 56 hours of operations, averaging 29.1 lifts per crane, per hour, averaging total 200 container moves against the vessel each hour, for a total of 11,200 lifts..

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2017: 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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South Korea's Samsung Heavy Industries:

OOCL Mega Ships 21,100 TEU to be delivered November 2017

Six ordered at 21,100 TEU, total cost of US$950 million.
The contract also includes options for six additional units.

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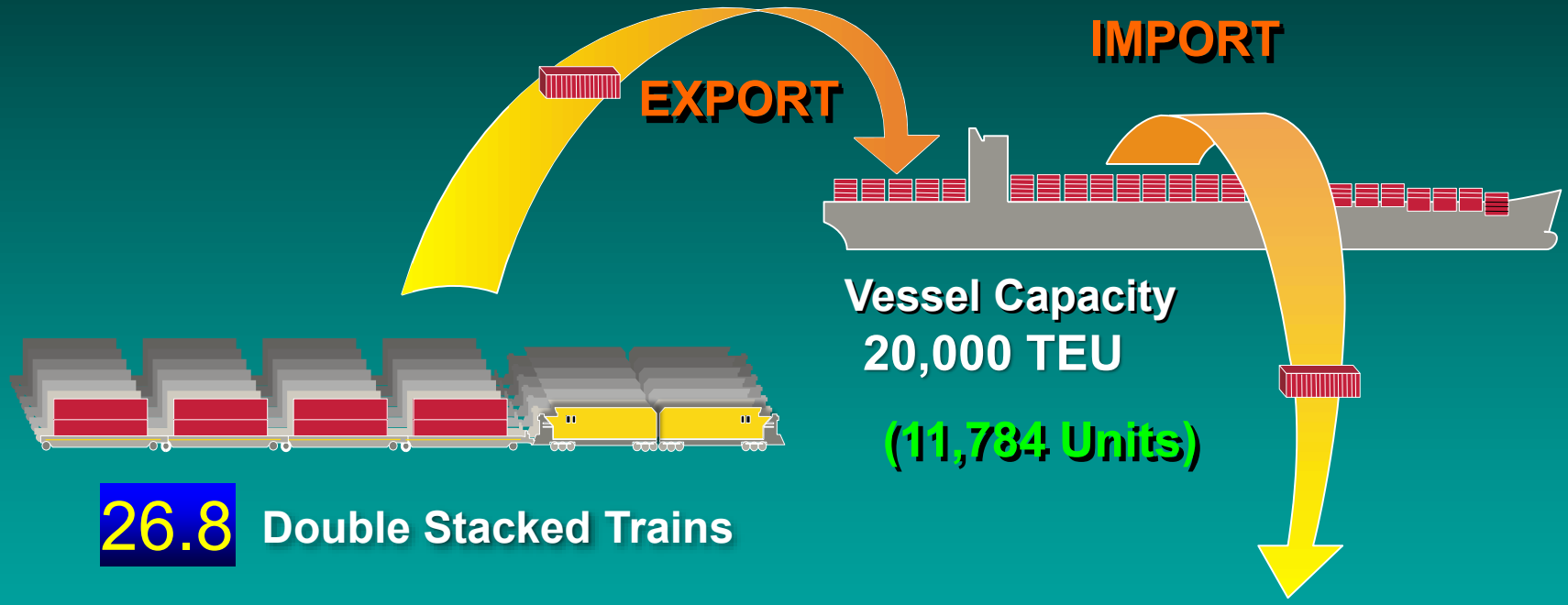
A 20,000 TEU Mega-Container Vessel Can Produce High Intermodal Rail Volumes For One Weekly Vessel Call)



Assuming a 75% Intermodal Rail Split

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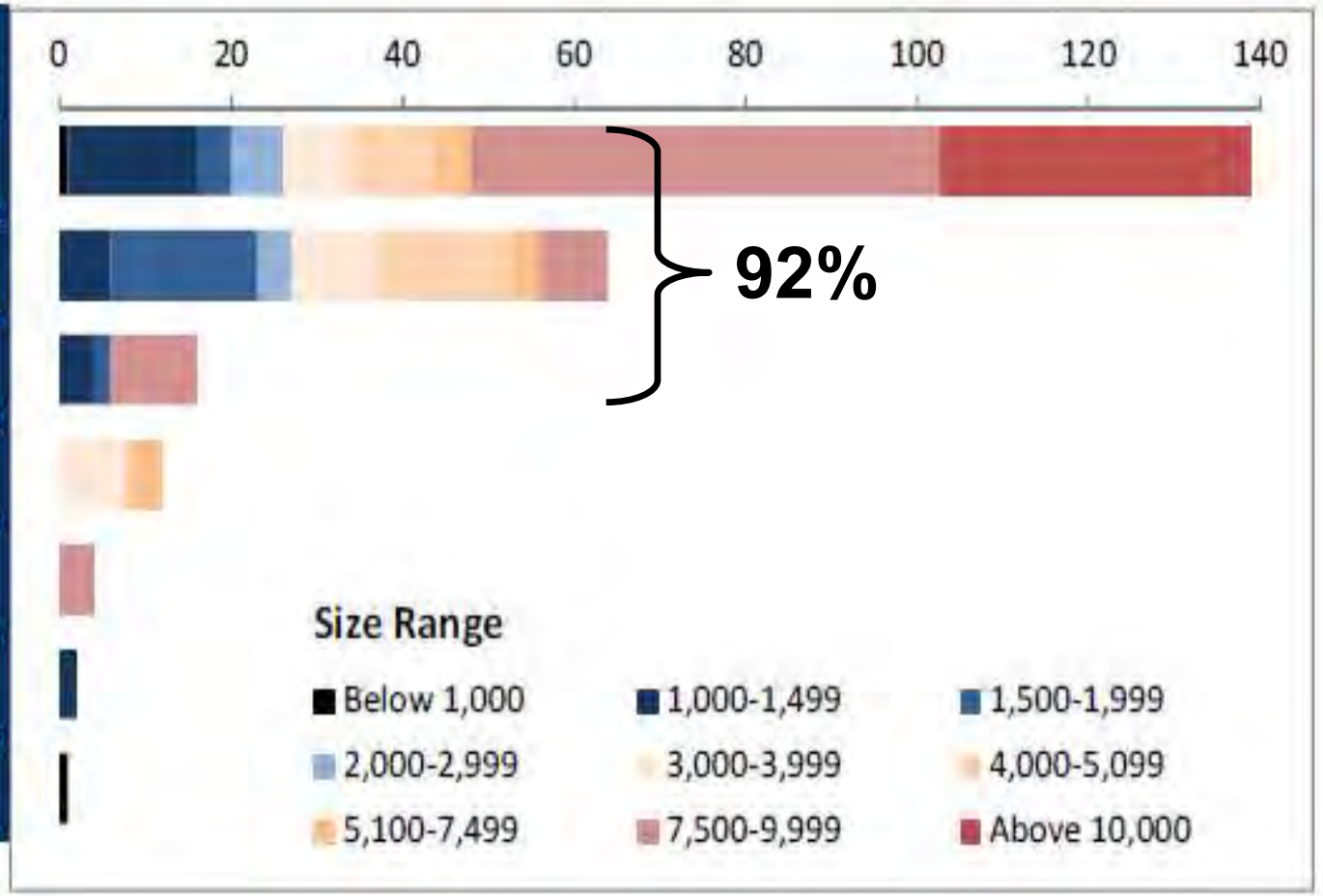
Containership Orders – Country of Build

(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

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Linking Railroads, Ports, Trucks, and Waterways

What Are The Future Mega Ship Possibilities for the Lower Mississippi River?

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Historical Rules Are Changing on the Lower Mississippi River

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Mississippi River Deepening: Southwest Pass to Baton Rouge

(50 to 55 foot depths are possible in the Future)

Mississippi River Ship Channel

Gulf to Baton Rouge, LA - General Reevaluation Report

Table D-32 Project Results

	48 Foot River Depth	50 Foot River Depth
Average Annual Benefits	$105,900,000	$147,810,000
Average Annual Costs	$103,520,000	$138,700,000
Net Benefits	$2,380,000	$9,110,000
BCR	1.02	1.07

Project authorized to 55 feet - full channel. Smaller but positive BCR at 55 feet depth.

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Can Mega Container Vessels Physically Call in the Lower Mississippi River Region?

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Maersk's Triple E Container Ship

1.5 times the Size of the NEW Panama Canal

Wide Body Shallow Draft 18,000 TEU Vessel

(Same Design Draft of the 8,000 TEU Susan Maersk)

(Design Draft of 14.5 Meters = 47.57 feet)

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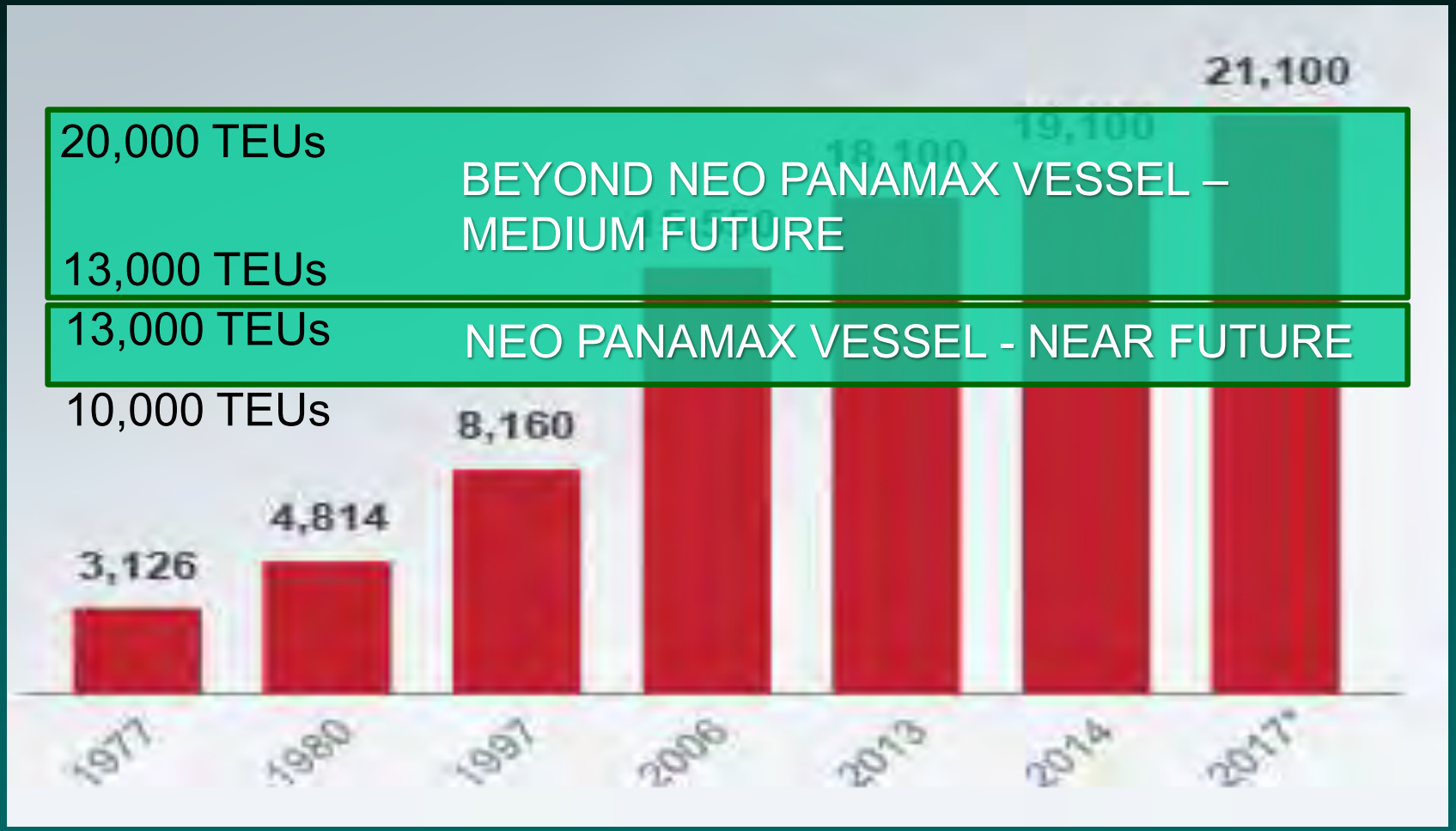
The World's Largest Container Ships On the Mississippi River



Mississippi River Container Vessel Size

Source: OECD/ITF

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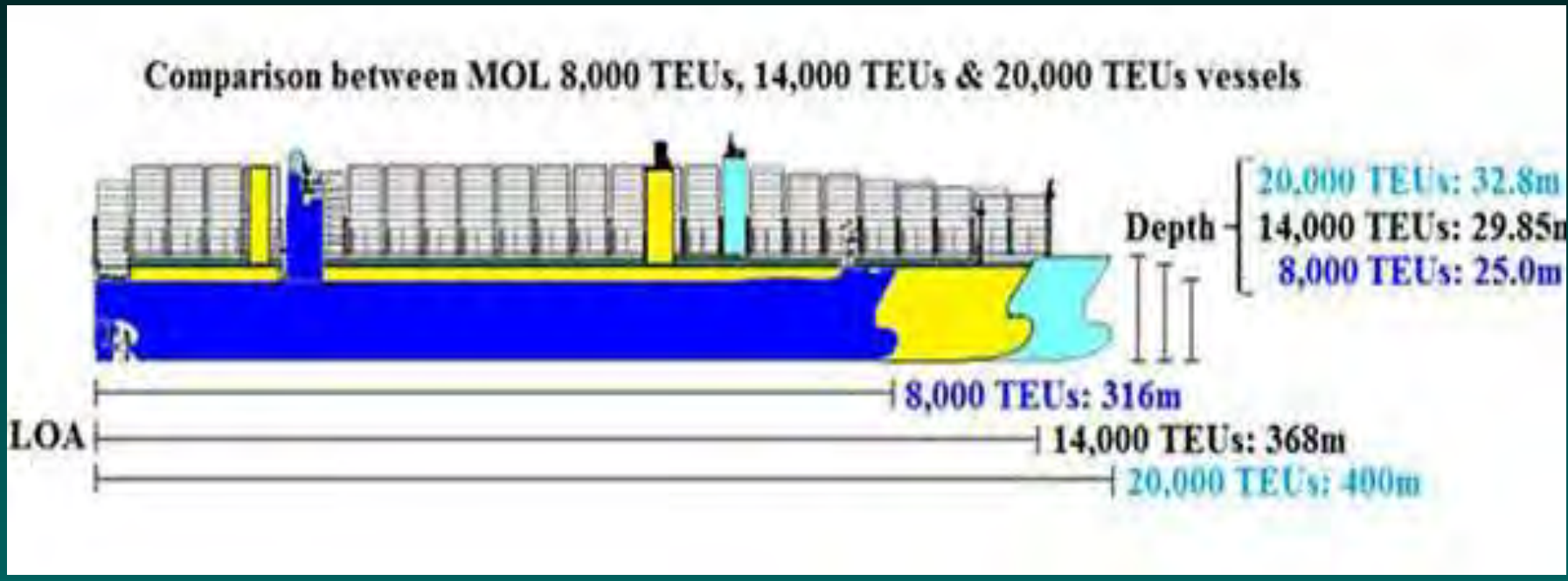
Largest Container Vessel to Call in the Lower Mississippi River was 8,000 TEUs with a Controlling Vessel Draft at 45 ft.



With a Controlling Depths at 50 ft. - 52 ft. the Largest Container Vessel Could Easily Reach 20,000 TEUs in the Lower Mississippi River

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It Is Not Inconceivable that by 2025 the Lower Mississippi Design Vessel May Well be a 20,000 TEU Container Ship

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Linking Railroads, Ports, Trucks, and Waterways

Emerging New Inland Waterway Vessel Technology

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“Deck” Barge Loaded with Containers

“Hopper” Barge Loaded with Containers

Source: USDOT Maritime Administration MARAD

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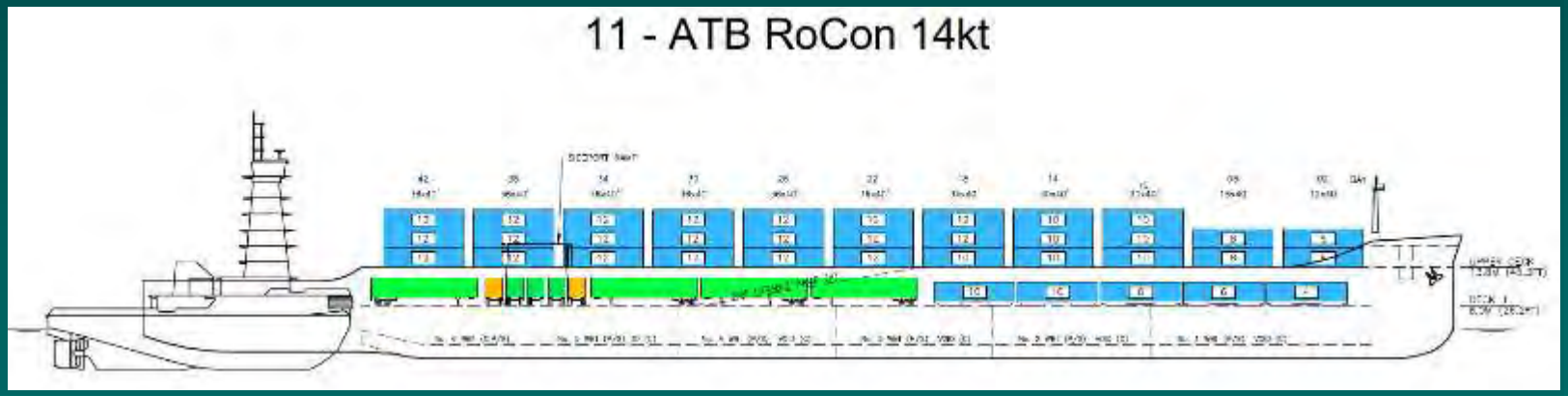
Proposed Domestic AMH/Short Sea Container Services

Proposed New England Marine Highway Project's articulated tug barge short sea container service connecting New York City and Portland, Maine - 900 TEUs



Proposed MARAD ATB Ro/Con – HEC Design - 886 TEUs, Design Draft 14.1 ft. – 14 Knots

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American Patriot Holdings, LLC (APH)
Prototype Container Vessel

A "*State of the Art*" Hull Design to Ensure Optimal Speed in All River Conditions Utilizing LNG as Main Propulsion Fuel

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American Patriot Container Transport, LLC. (APCT) Vessel Fleet Characteristics

LOA Feet	Beam Feet	TEU Capacity	Vessel Drafts
592	100	1824	9.0 ft. 9.6 ft., & 10.0 ft.
772	100	2392	9.0 ft. 9.6 ft., & 10.0 ft.
952	100	2960	9.0 ft. 9.6 ft., & 10.0 ft.
1042	100	3244	9.0 ft. 9.6 ft., & 10.0 ft.

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American Patriot Holdings, LLC (APH)
Prototype Container Vessel

A "*State of the Art*" Hull Design to Ensure Optimal Speed in All River Conditions Utilizing LNG as Main Propulsion Fuel coupled with the Patented Z-Wake Bow Design.

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Inland Waterway Vessel Transfer to Ocean Container Transport

1824 TEUs
to
3244 TEUs

Commercially Viable

200 - 900 TEUs

Are the Cargo & Quantity Viable?

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Linking Railroads, Ports, Trucks, and Waterways

The US Midwest & The Mississippi River Are the New Intermodal Freight Battle Ground

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New State of Marine & Intermodal Competition

Source: NW Seaport Alliance Strategic Business Plan, May 6, 2015

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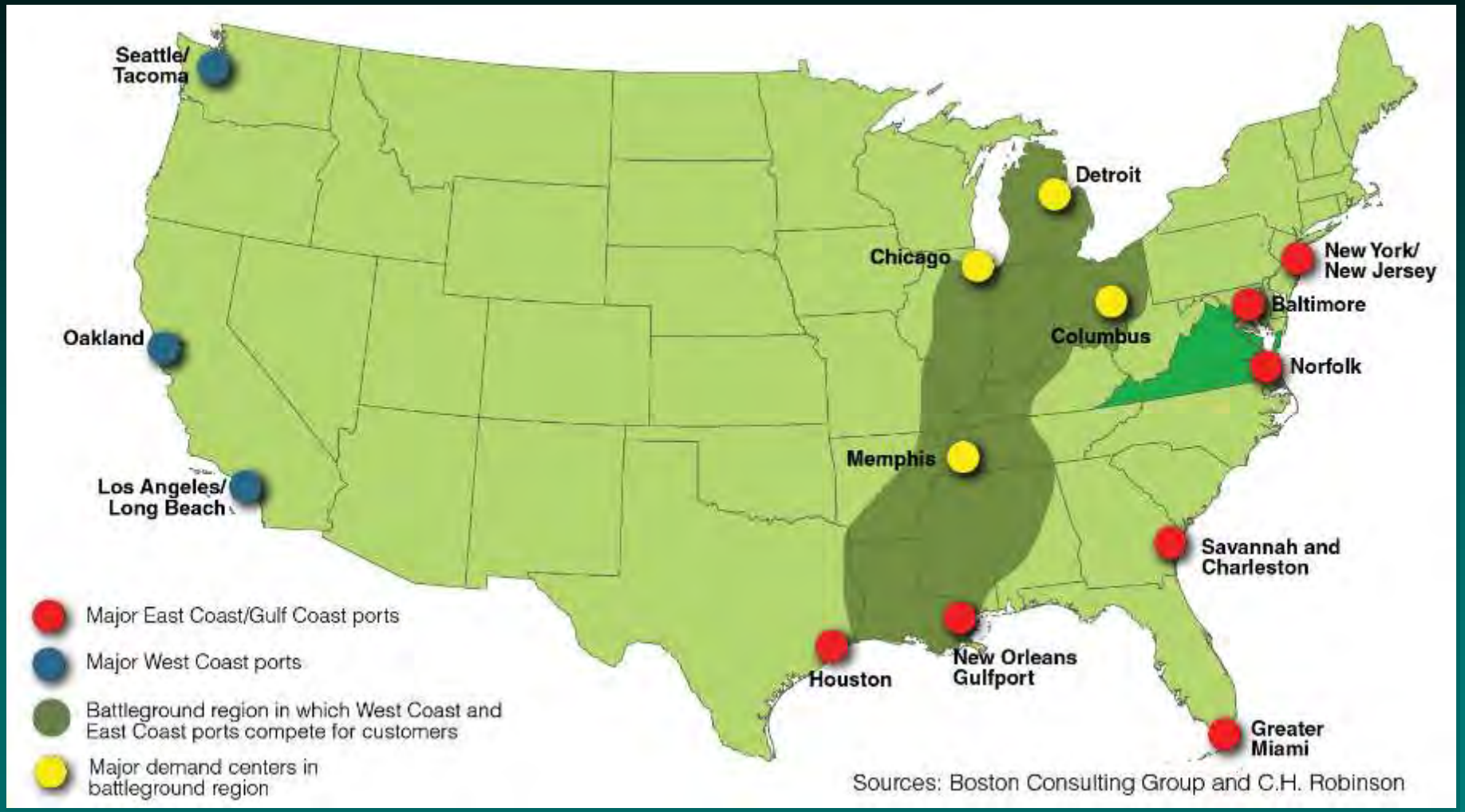
New Container Port Battleground Region

(Representing 15% of the US GDP)



Source: Boston Consulting Group & C. H. Robinson

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New Container Port Battleground Region

(Representing 15% of the US GDP)

Source: USDC Bureau of Economic Analysis – Boston Consulting Group Analysis

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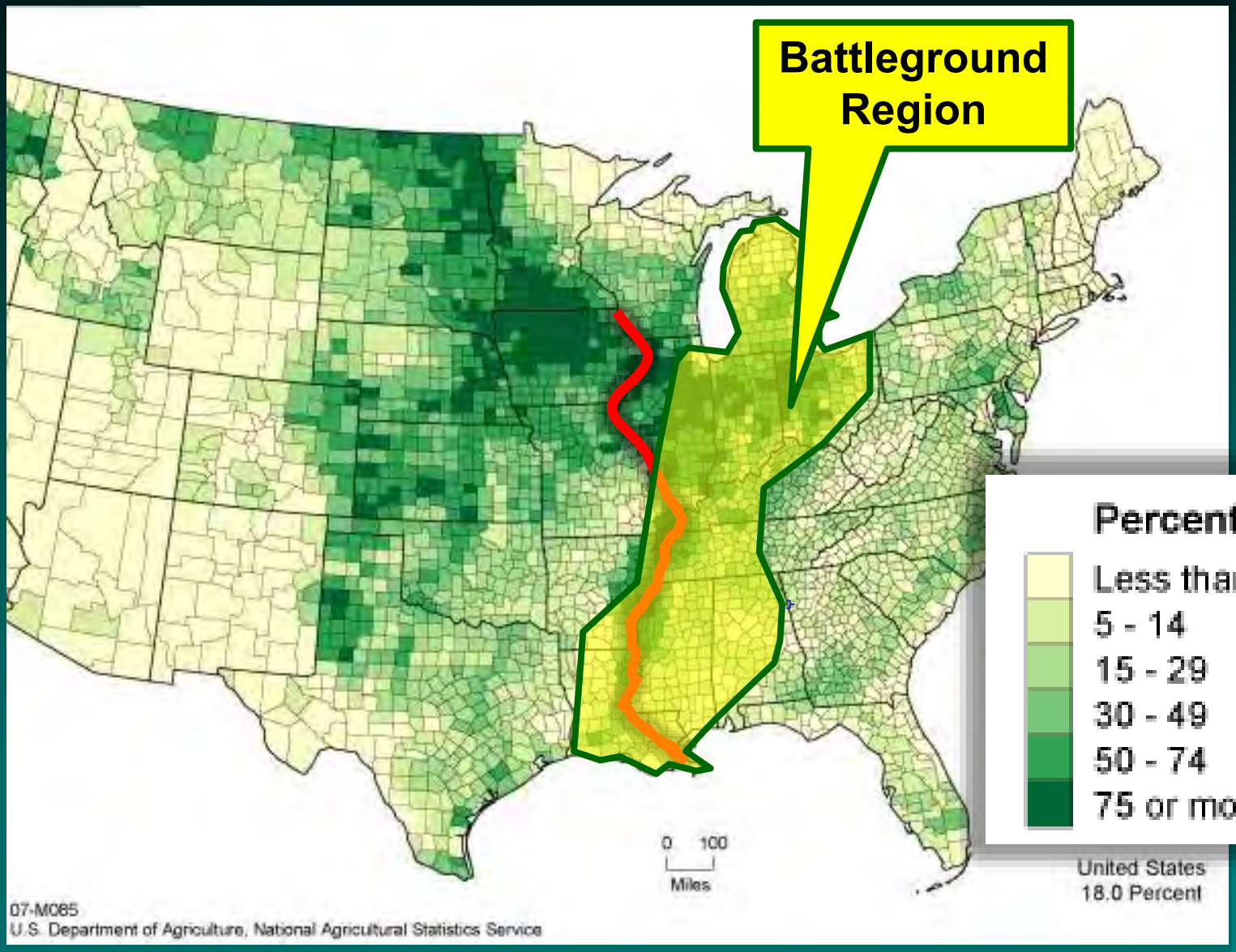
North American Cropland Intensity

(Acres of Cropland as a percent of Land Area)



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The Lower Mississippi River Carries:

(1) 50 to 60 percent of total U.S. Corn exports

(2) 30 to 45 percent of the total U.S. Soybean exports

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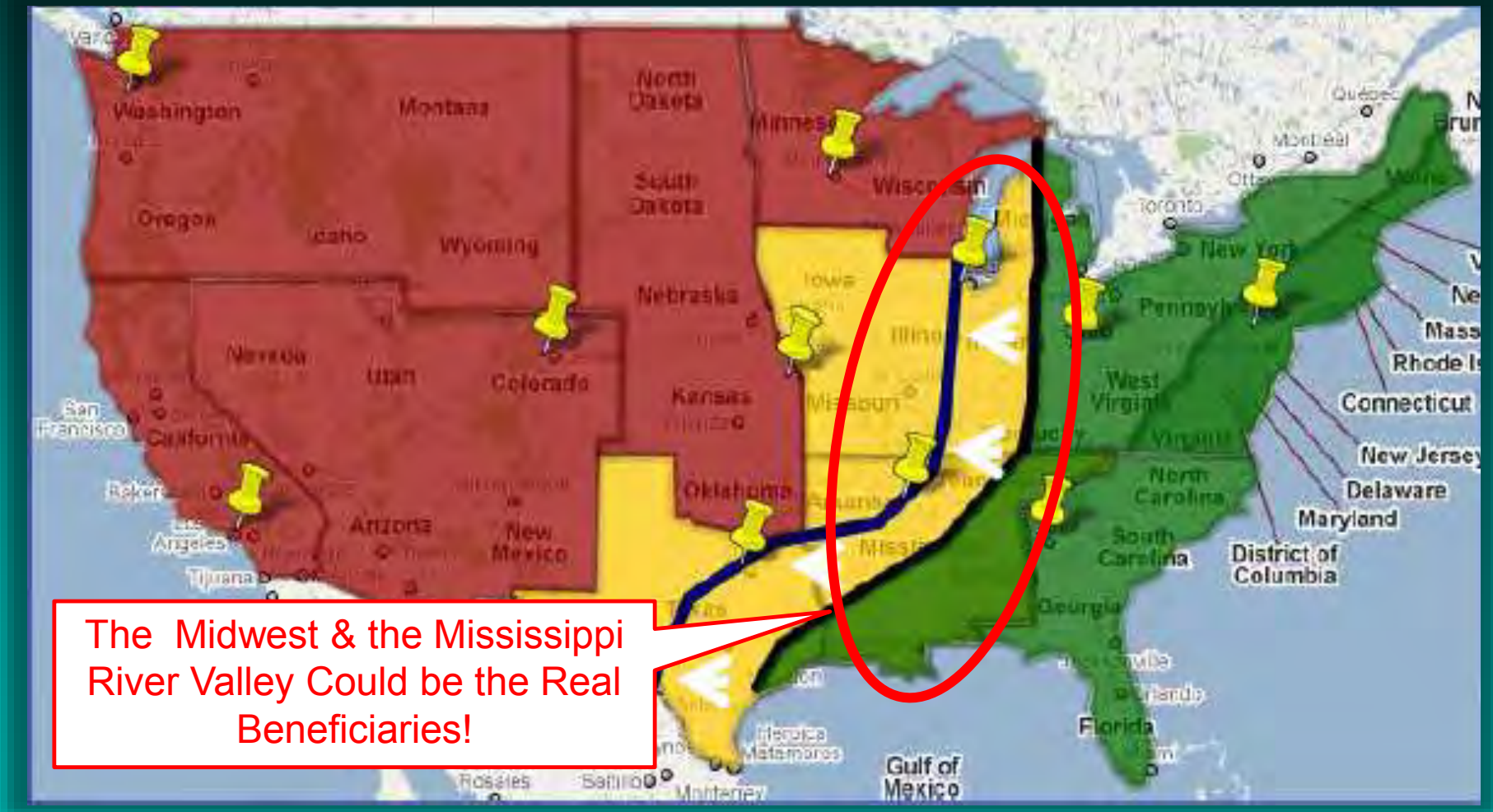
Dramatic US Market Penetration after 2017

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



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

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Dramatic US Market Penetration Is Coming

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 ALL of the Gulf and the Most of the Midwest by 2020

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

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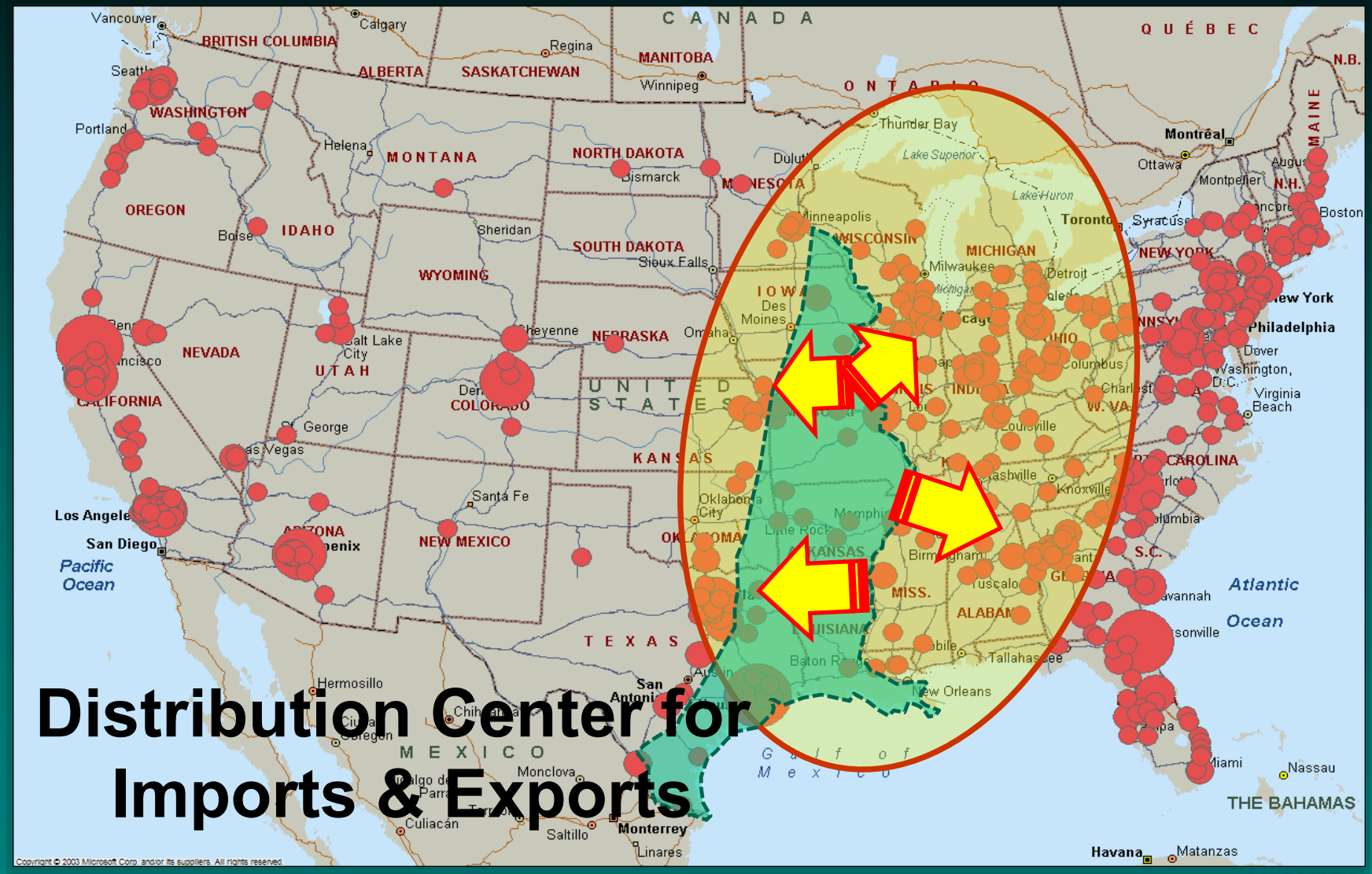
2017 - 2020 Regional Competitive Inland Port & Distribution Center MS River Region



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Linking Railroads, Ports, Trucks, and Waterways

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)

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The Marine Silk Road was a Precursor to:

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

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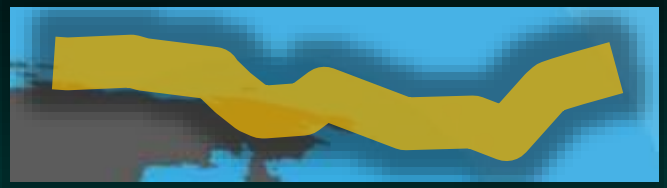
The World's Primary Shipping Route:



The Marine Silk Road

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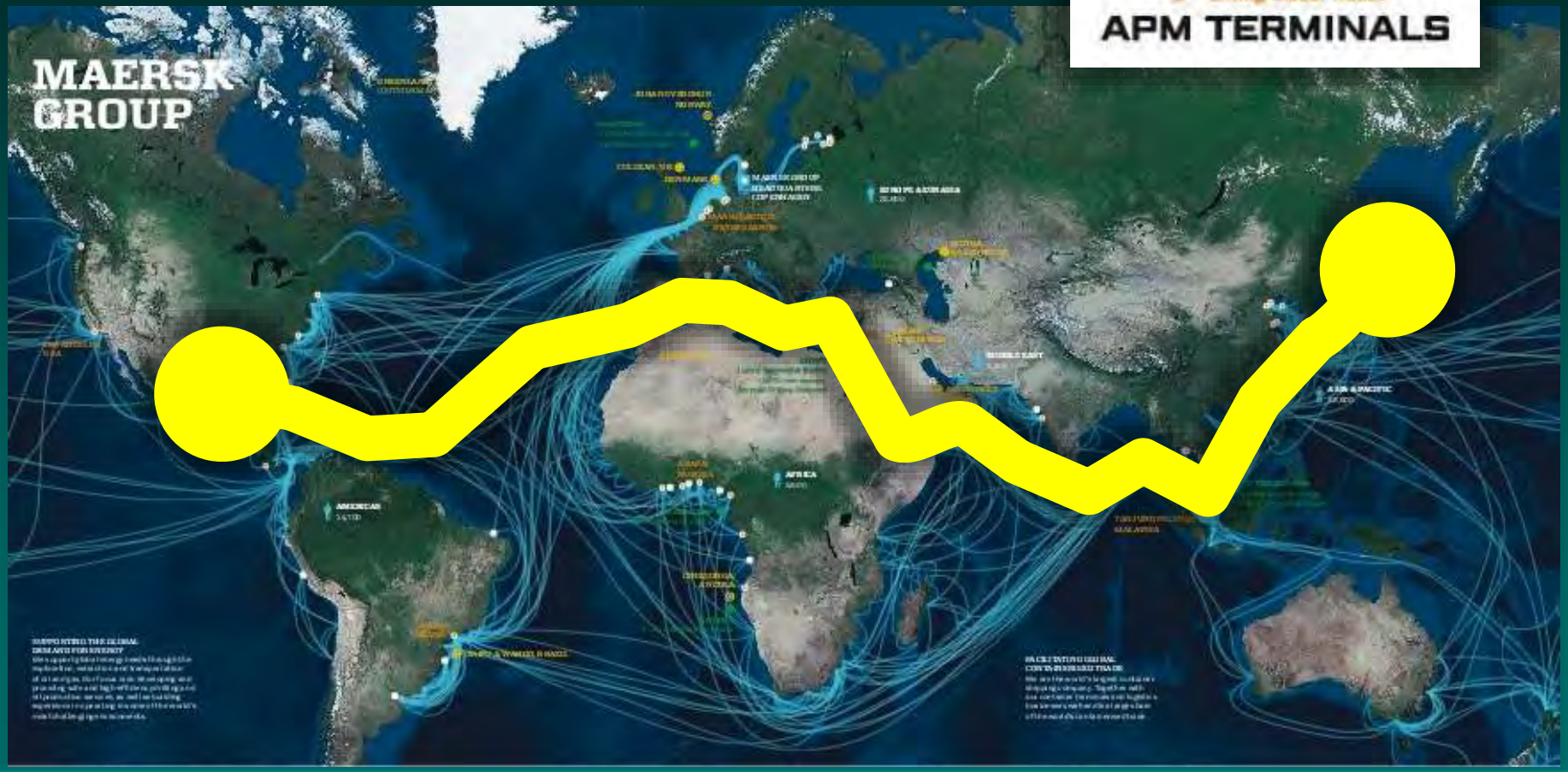
90% of Global Trade is Carried Out by Shipping

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

Maersk's Global Trading Routes Today



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

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

Where are the Biggest Ports?

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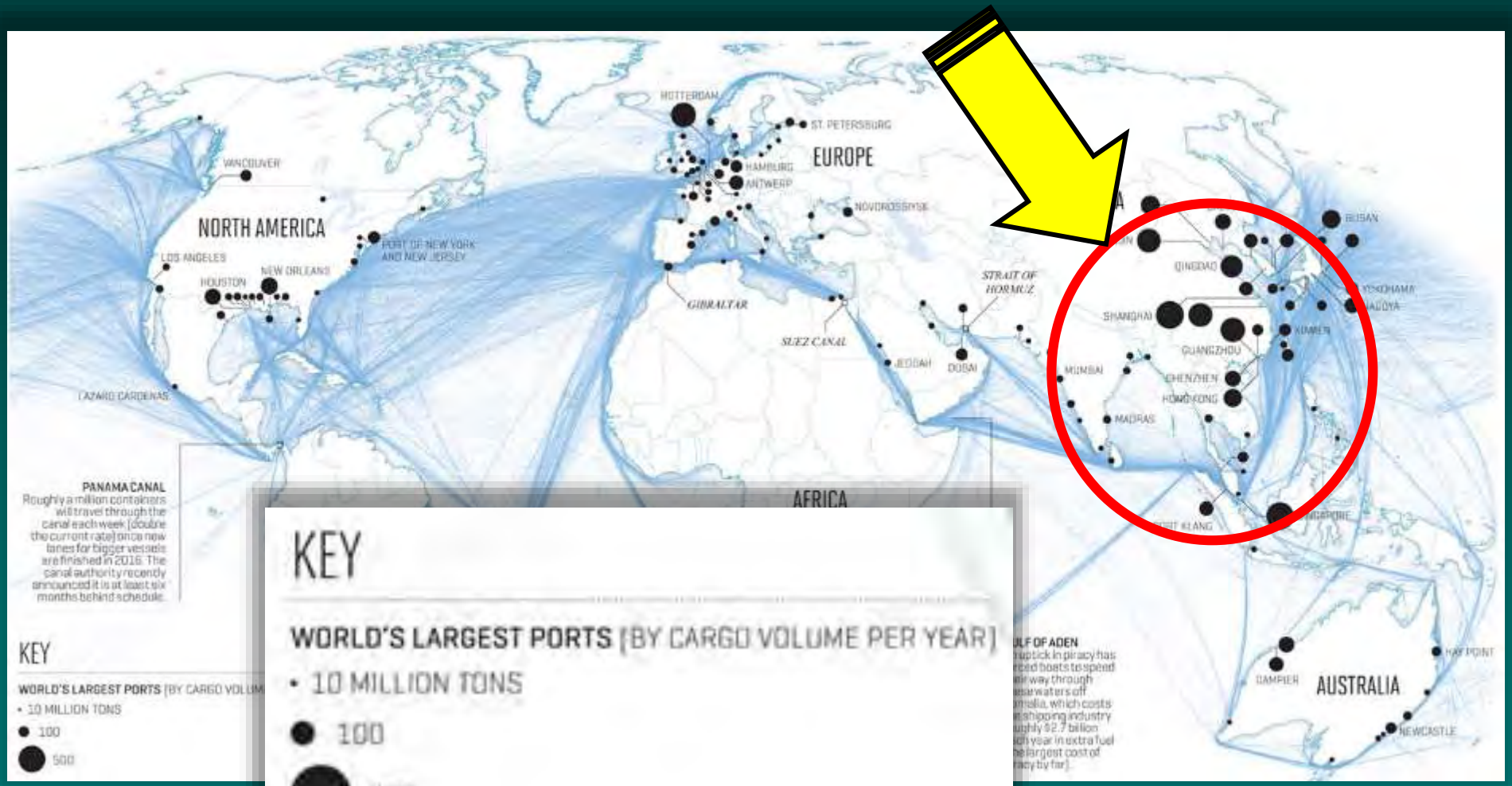
The World's Largest Ports Are Connected Via The Maritime Silk Road



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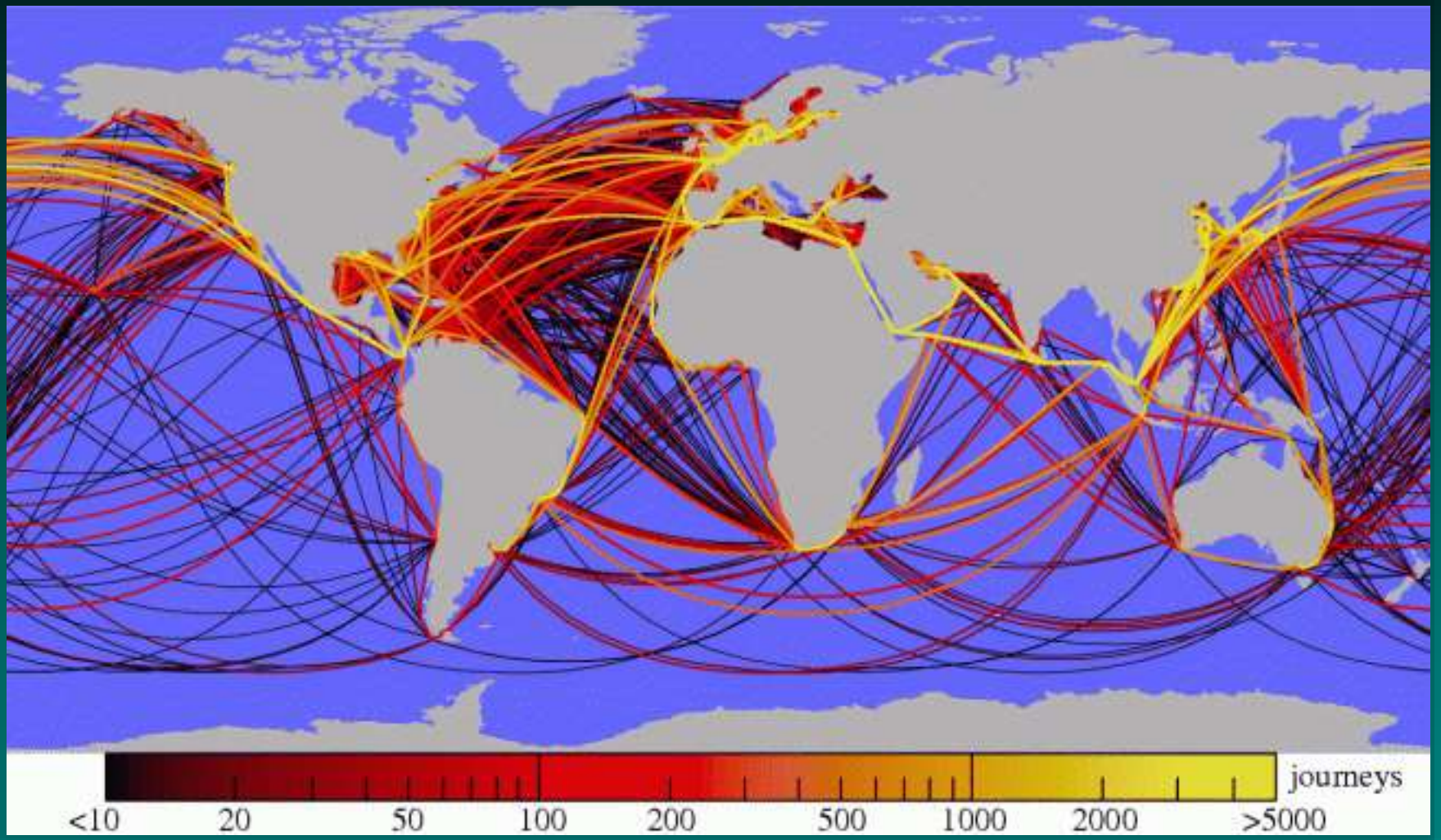
Global Shipping Routes Plotted by AIS GPS

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

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Linking Railroads, Ports, Trucks, and Waterways

International External Industry Pressures Driving Today's Logistics

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More than 98% of everything we consume, wear, eat, drive and construct is brought to us via ships through the North American port system.

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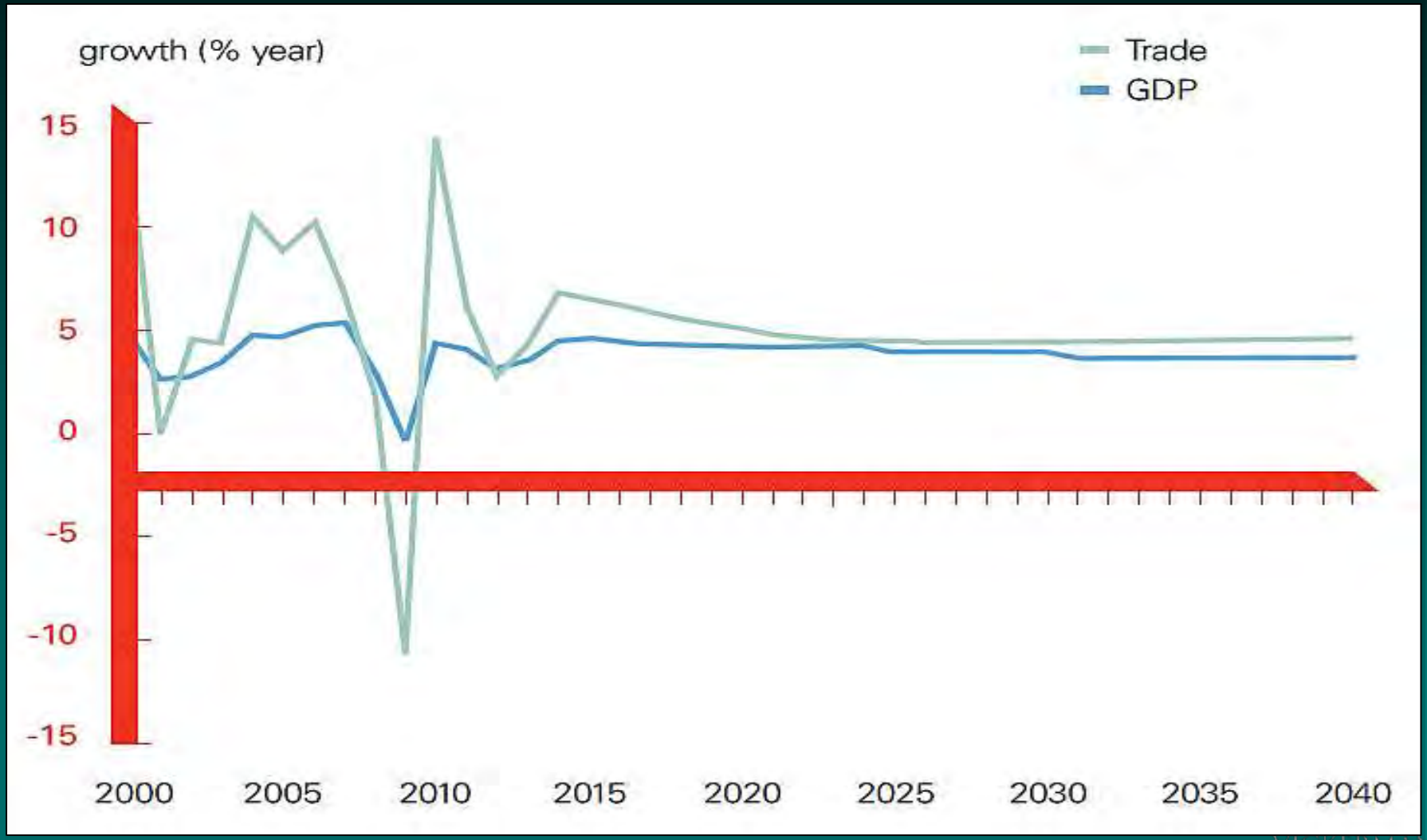
Growth in GDP and World Trade

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

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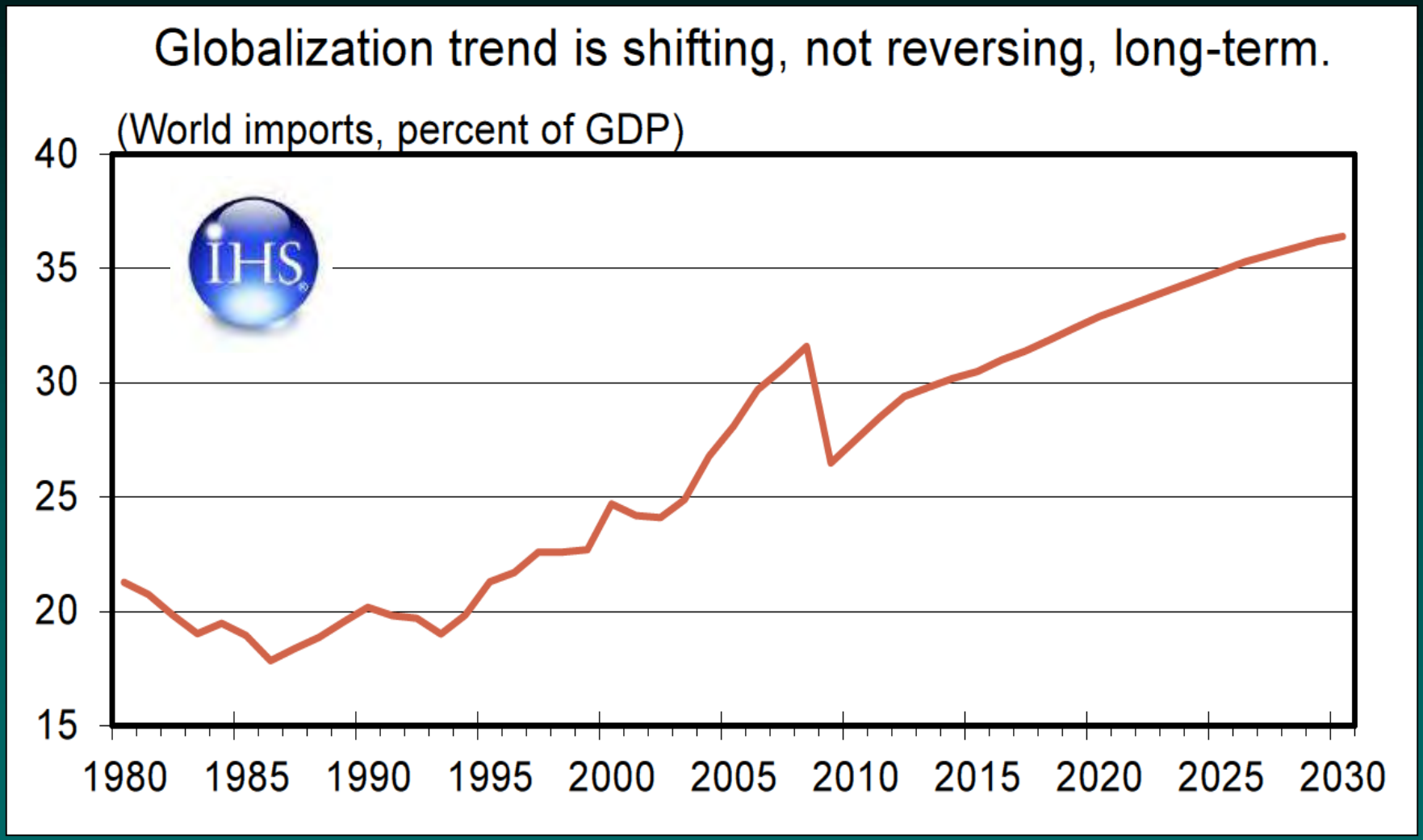
World Trade's Share of the Economy Grows Again



Source: IHS Global Insight – World Trade Service

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Linking Railroads, Ports, Trucks, and Waterways

What Determines Today's Logistics Trade Flows?

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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**.

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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

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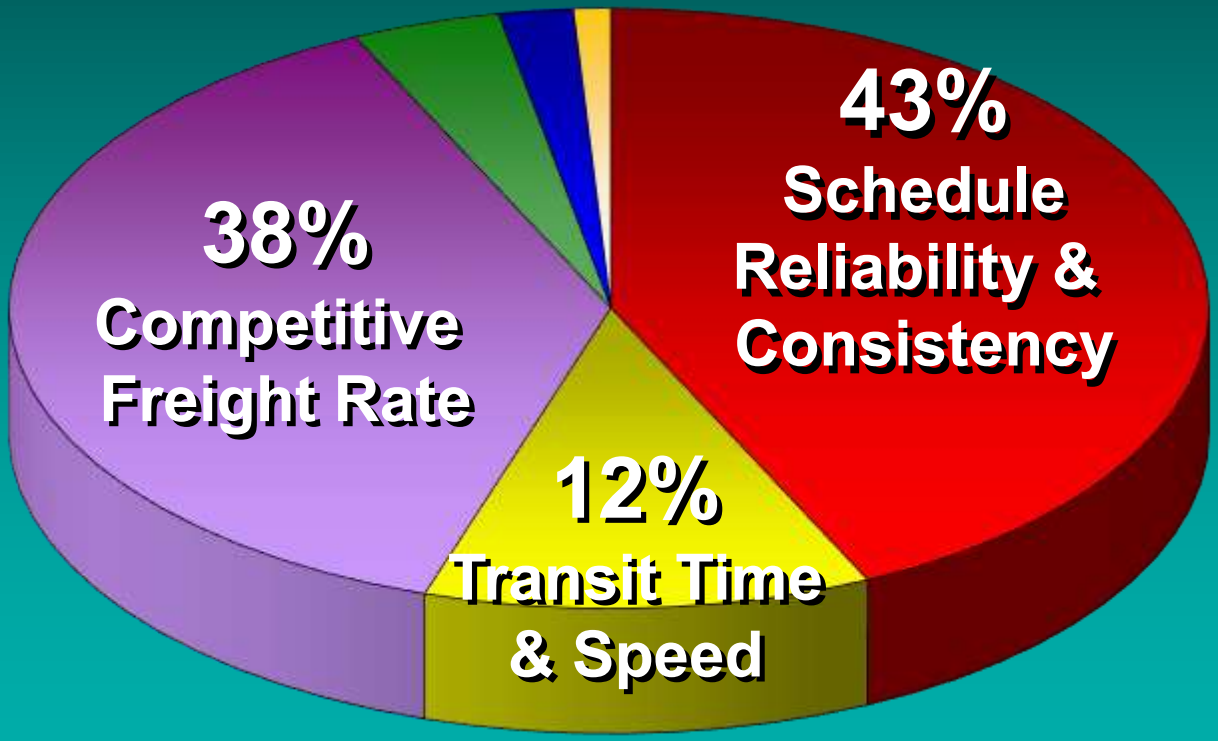
Poll of the Top 1000 "Blue Chip" Multinational Shipper Priorities



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Today's Logistics Truth:

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

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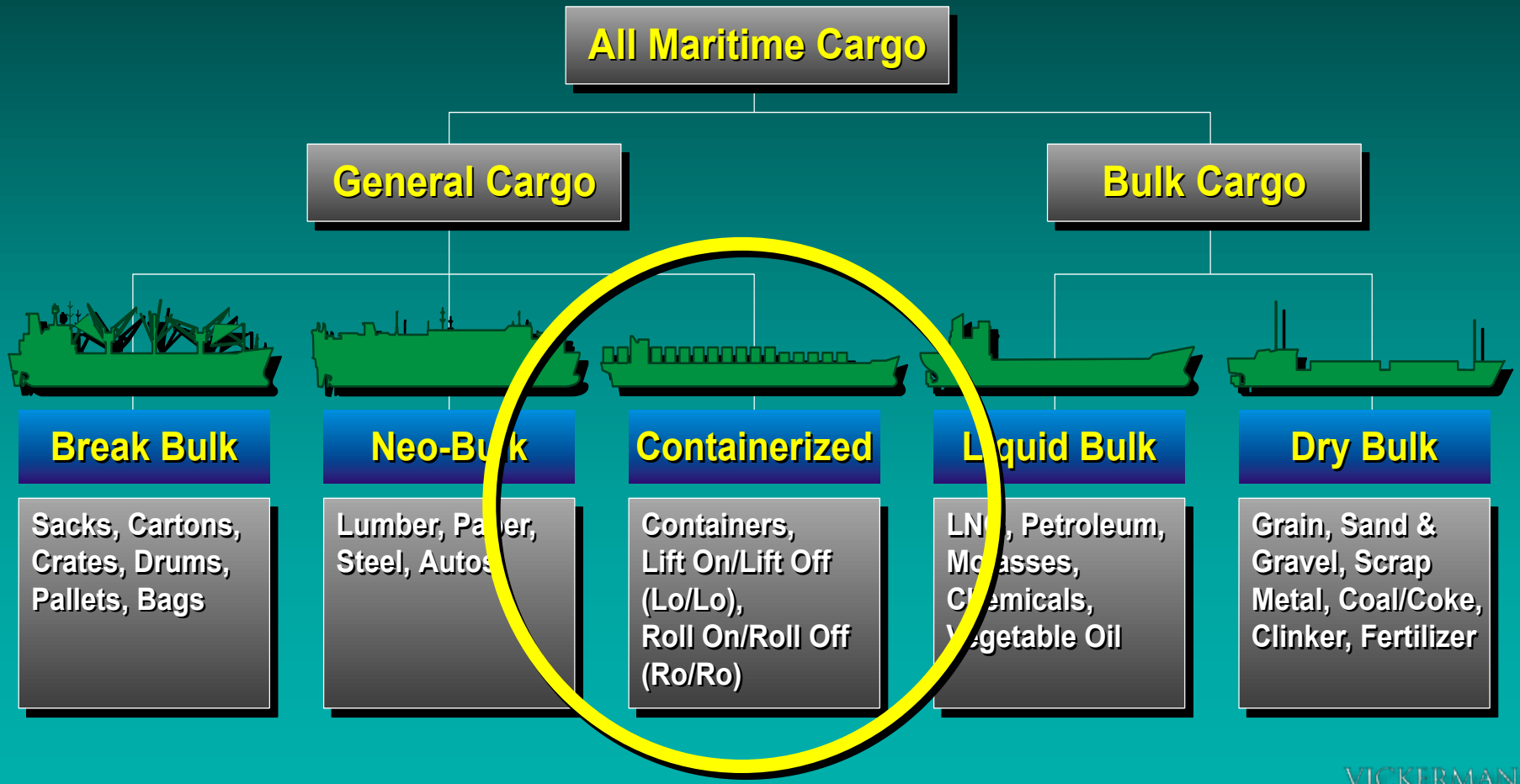
Functional Classification of Global Maritime Cargoes



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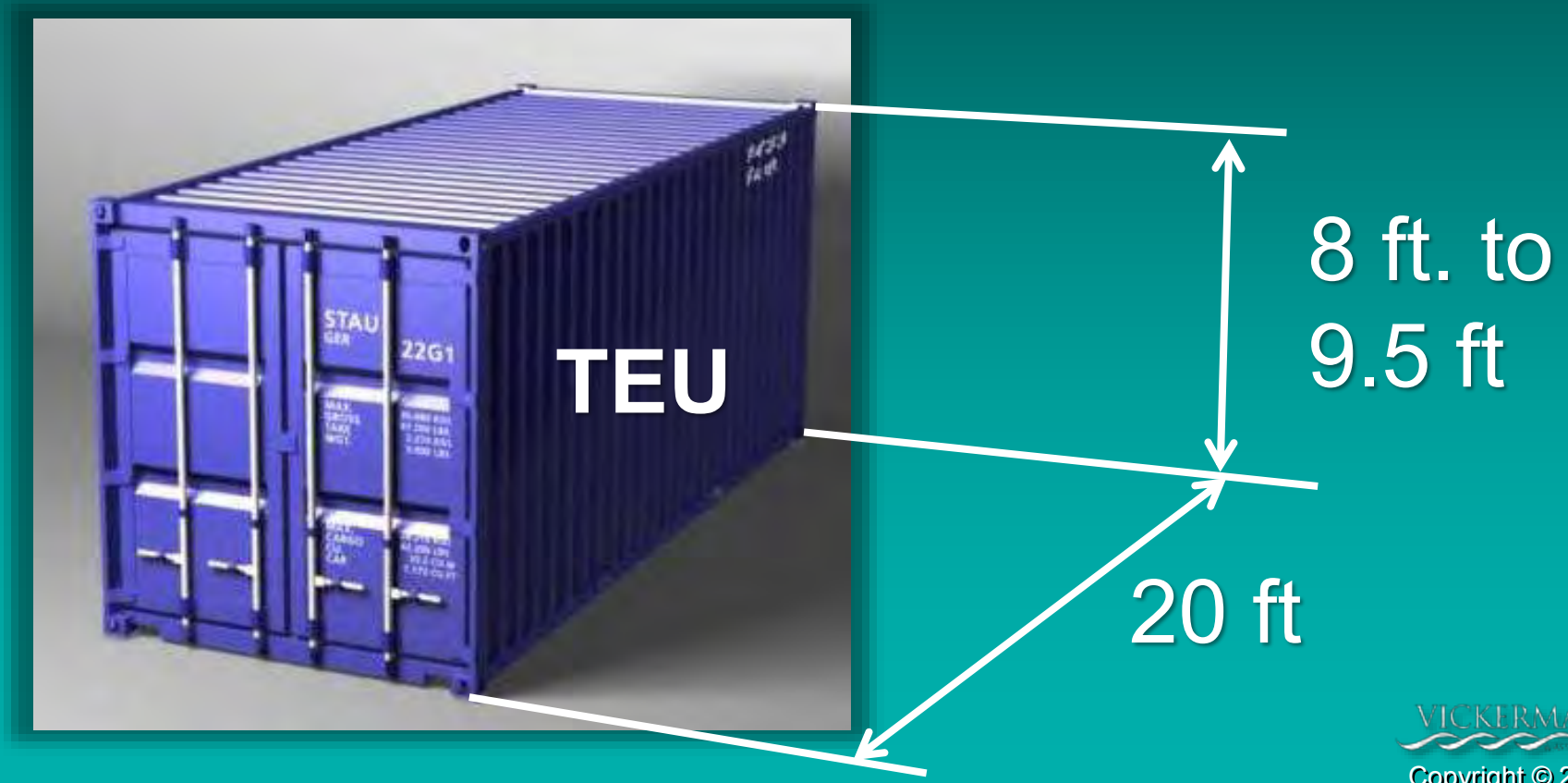
The TEU (Twenty Foot Equivalent Unit)

"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

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International Maritime Cargo Demand Trends

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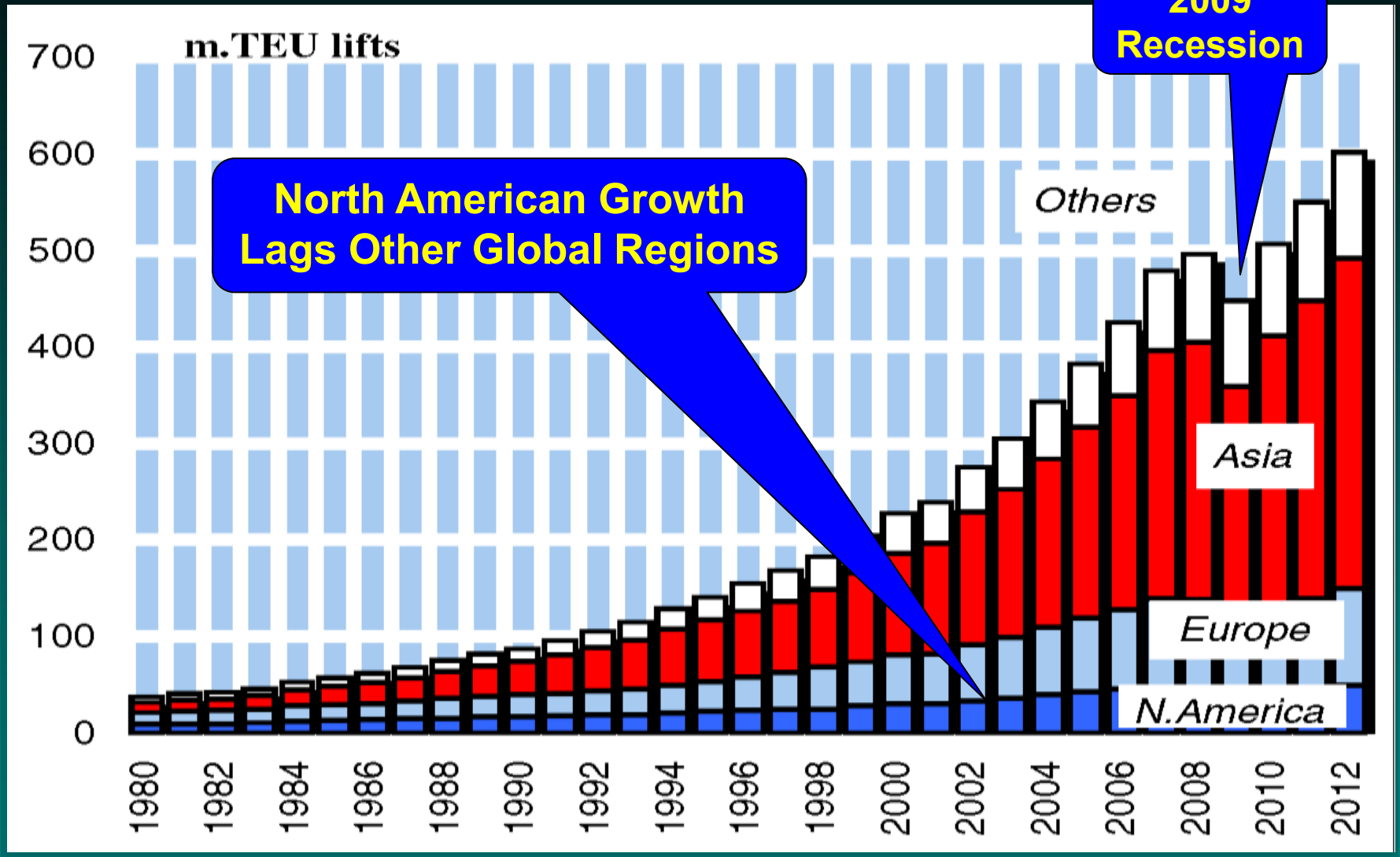
Historical Global Container Market Demand
(Millions of TEUs)



Source: Drewry Shipping Consultants

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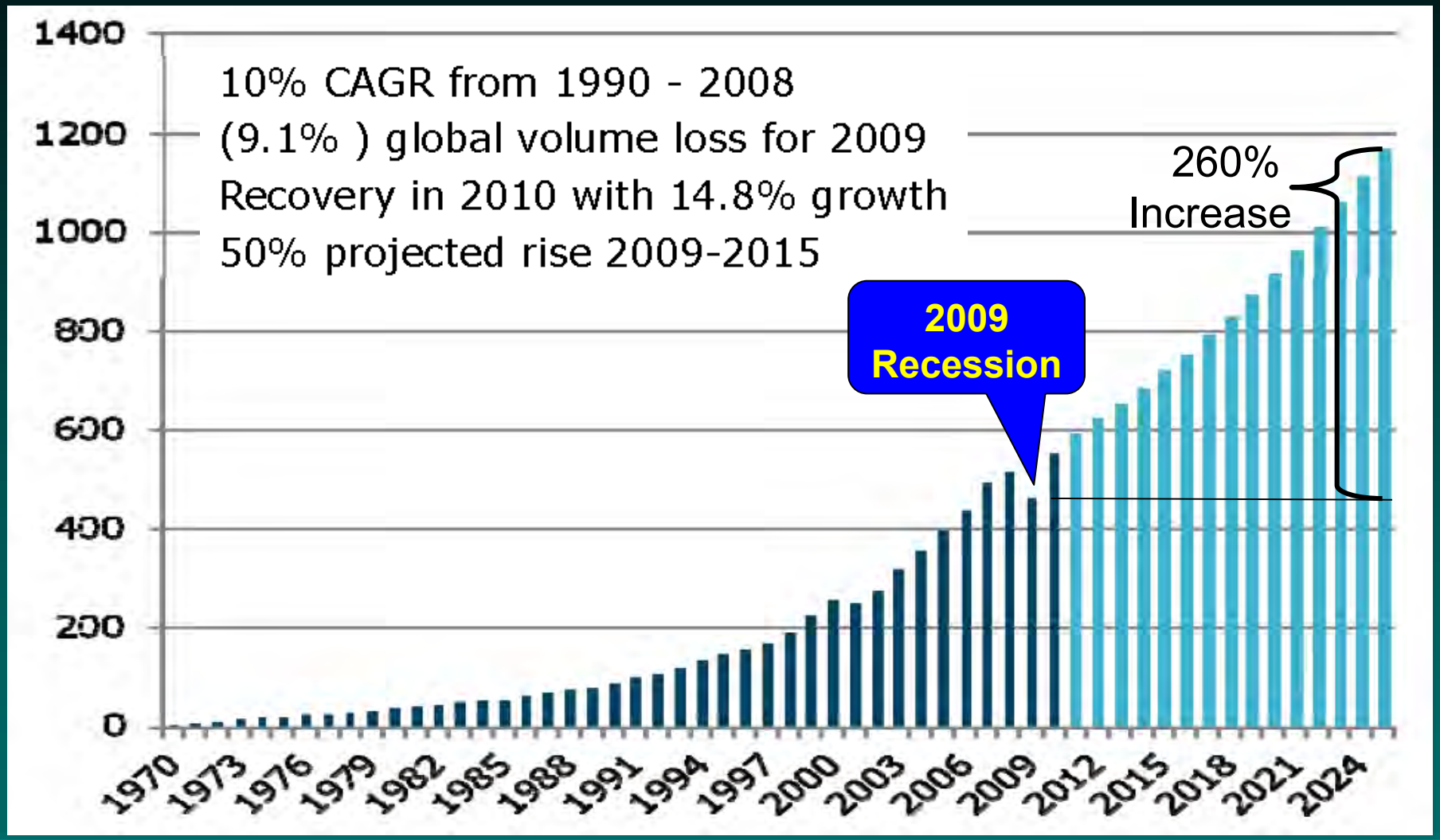
2025 World Container Port Market Demand

(Millions of TEUs)



Source: Drewry Shipping Consultants October 2011

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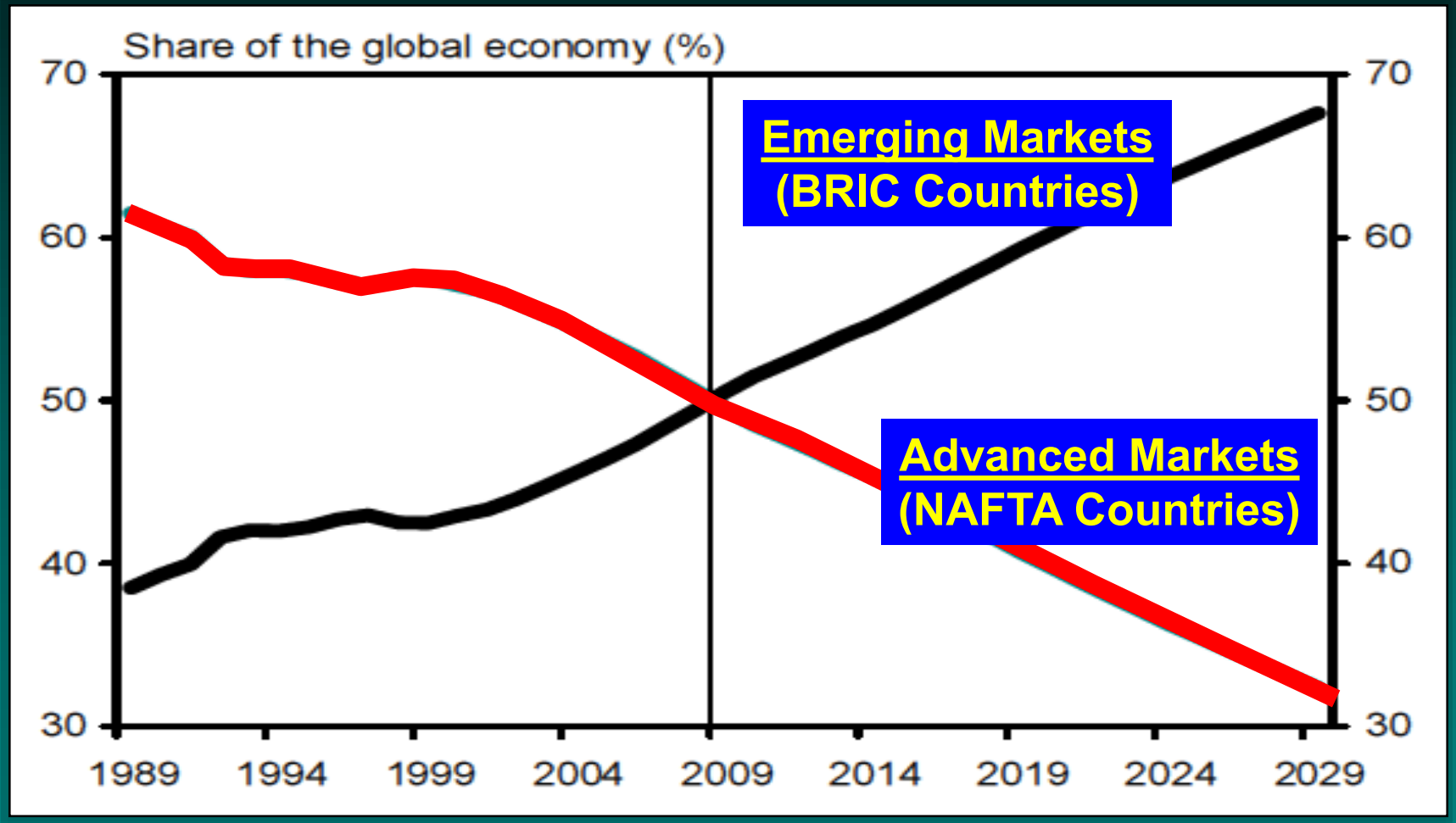
A Turning Point in Global Economic History

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

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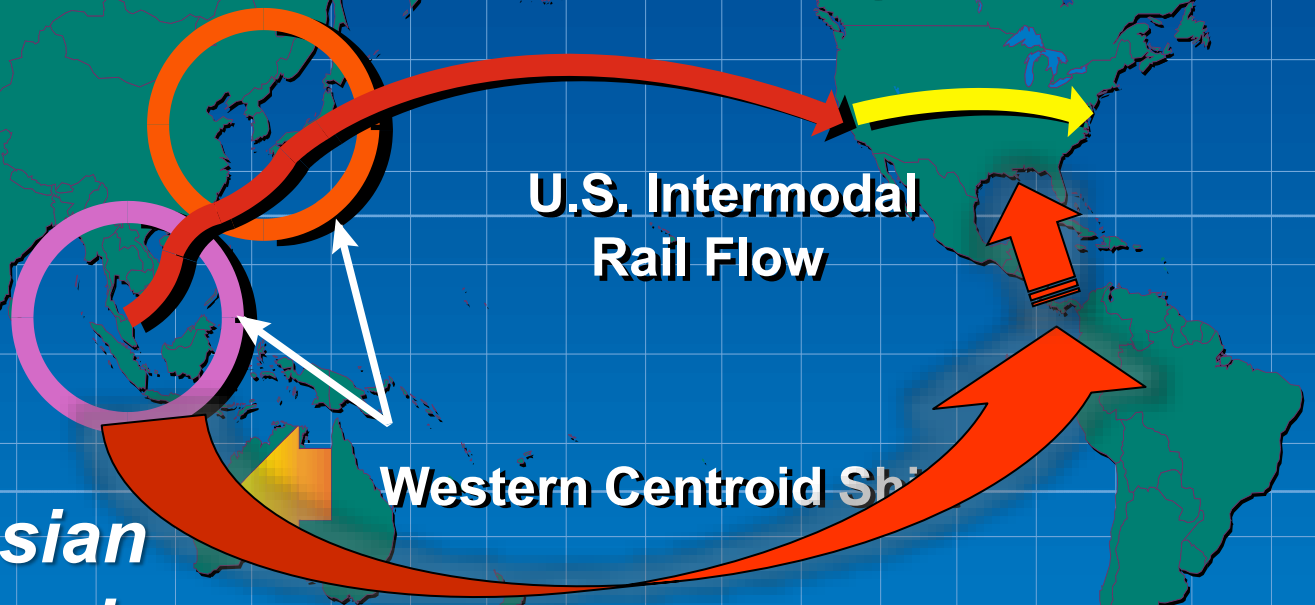
Southeast Asian Manufacturing Centroid Shift

Current Inbound US Cargo Flow



Expanded Asian Panama Canal 2016 Flows

Eastbound: All Water Flow
Eastbound: US Intermodal Rail Flow

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Southeast Asian Manufacturing Centroid Shift

C 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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The Suez Canal's $8.5 Billion Expansion of the Canal

Completed September 2015

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

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Dredging 180 Million Cubic Meters (35-kilometers-long and 24-meters-deep) Shipping Route in Less than One Year

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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 Number of Ships Able to Navigate the Suez Canal Simultaneously Has Increased from 23 to 97, Thus Doubling the Suez Canal Capacity by 2023

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Linking Railroads, Ports, Trucks, and Waterways

The Growing Asian Import Trade Challenge

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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

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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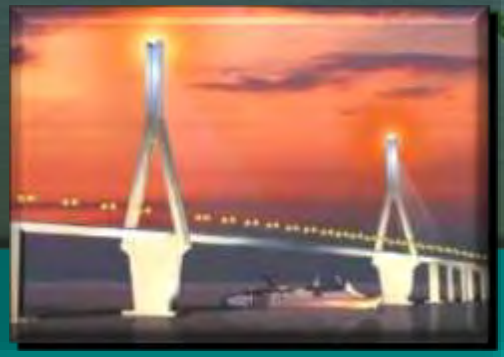
Shanghai International Shipping Center

Yangshan Deep Port & Logistics Park

New Logistics Park

20 Mile New Port Access Bridge Constructed in 3 yrs

54 New Berths



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Shanghai International Shipping Center

Yangshan Deep Port - 20 Mile Bridge Access

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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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Linking Railroads, Ports, Trucks, and Waterways

Panama Canal Expansion: New Capacity

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Panama Canal Expansion Project Inauguration on June 26, 2016.

The first ceremony will begin on the Atlantic side at the new Agura Clara Locks, followed by the new Cocoli Locks on the Pacific side

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Panama Canal Route

ACP

The Autoridad Del Canal de Panama

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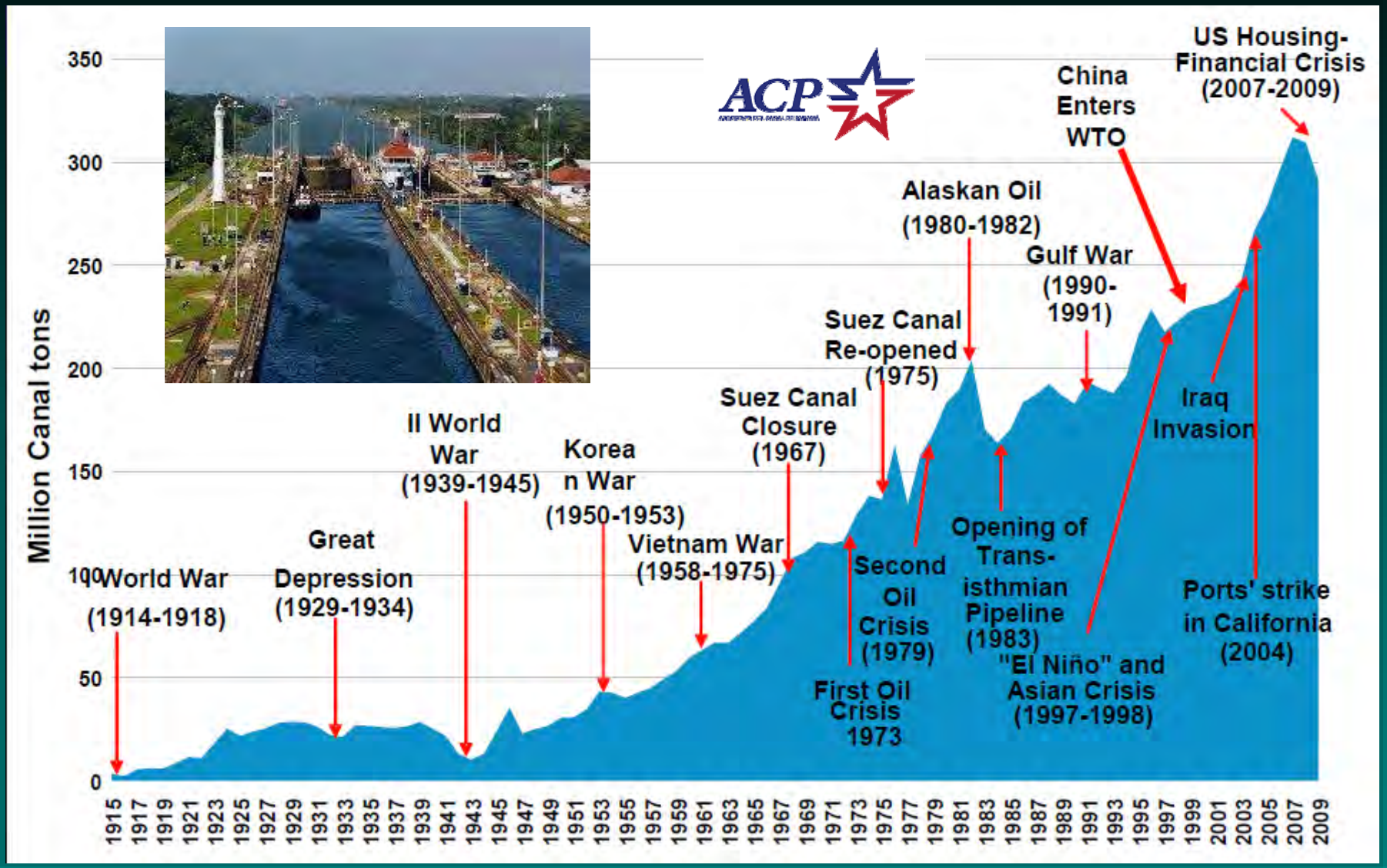
Panama Canal Historical Tonnage Traffic



Source: ACP Data

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The Panama Canal Circa 1914

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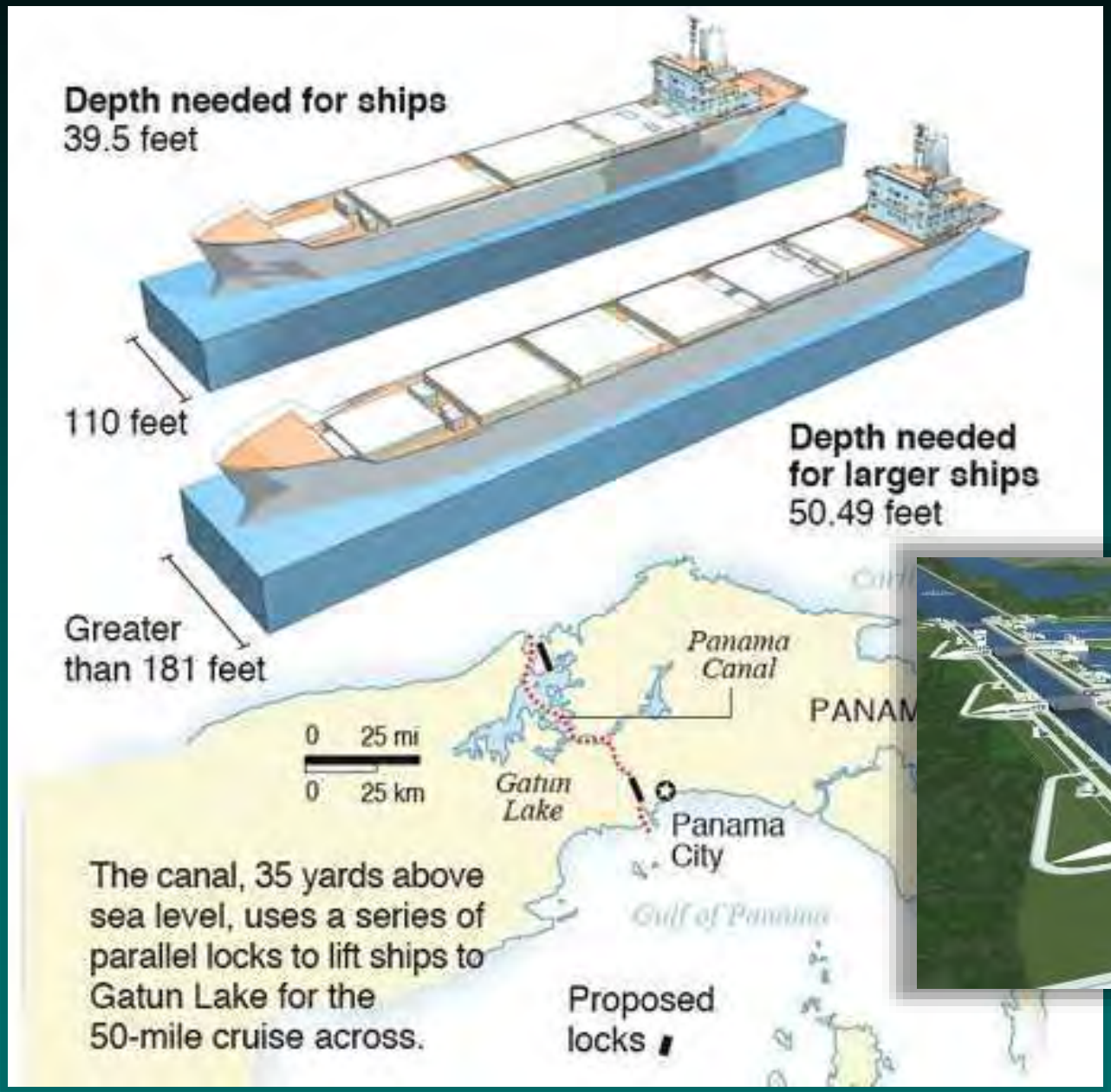
Panama Canal Today

Expansion of the Panama Canal: Circa 2016



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Panama Canal Third Lane Expansion

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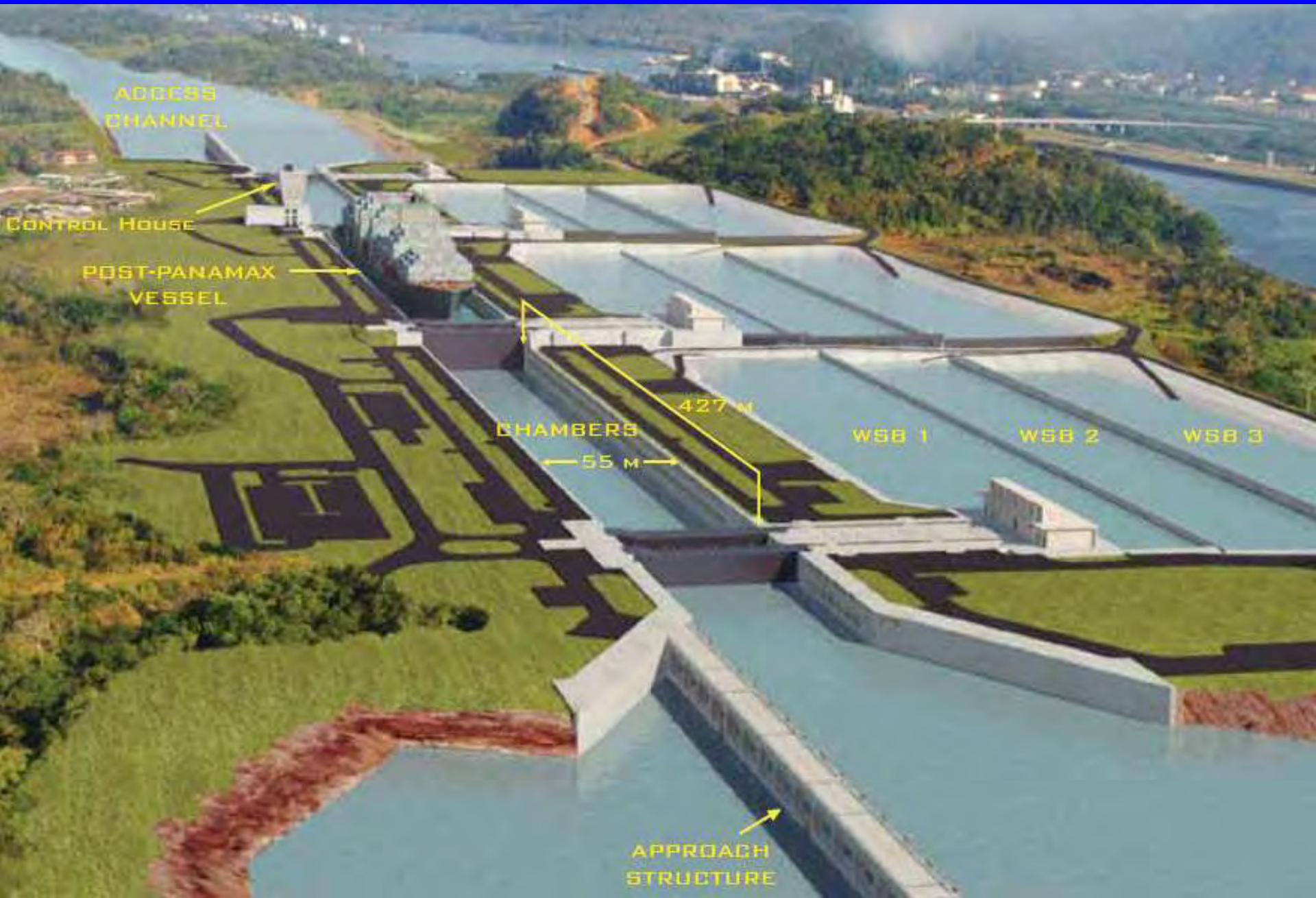
Panama Canal Third Lane Expansion



Panama Canal Third Lane Expansion
Water-Saving Basin Reservoir System

Panama Canal Third Lane Expansion
Sliding Caisson System

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

Source: ACP Expansion Project, Circle of Blue January 27, 2015

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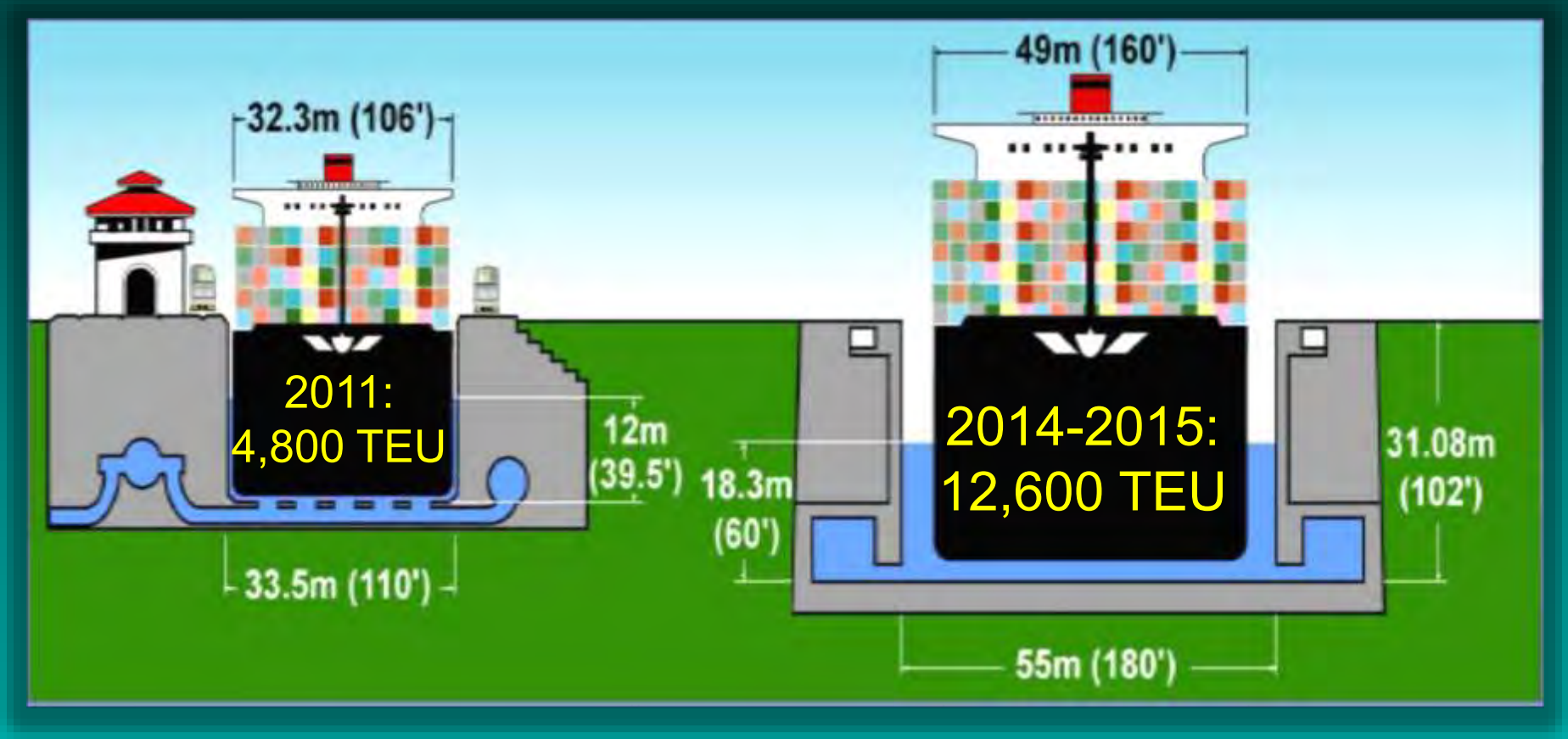
Panama Canal Third Lane Expansion Capabilities



Source: ACP Expansion Project

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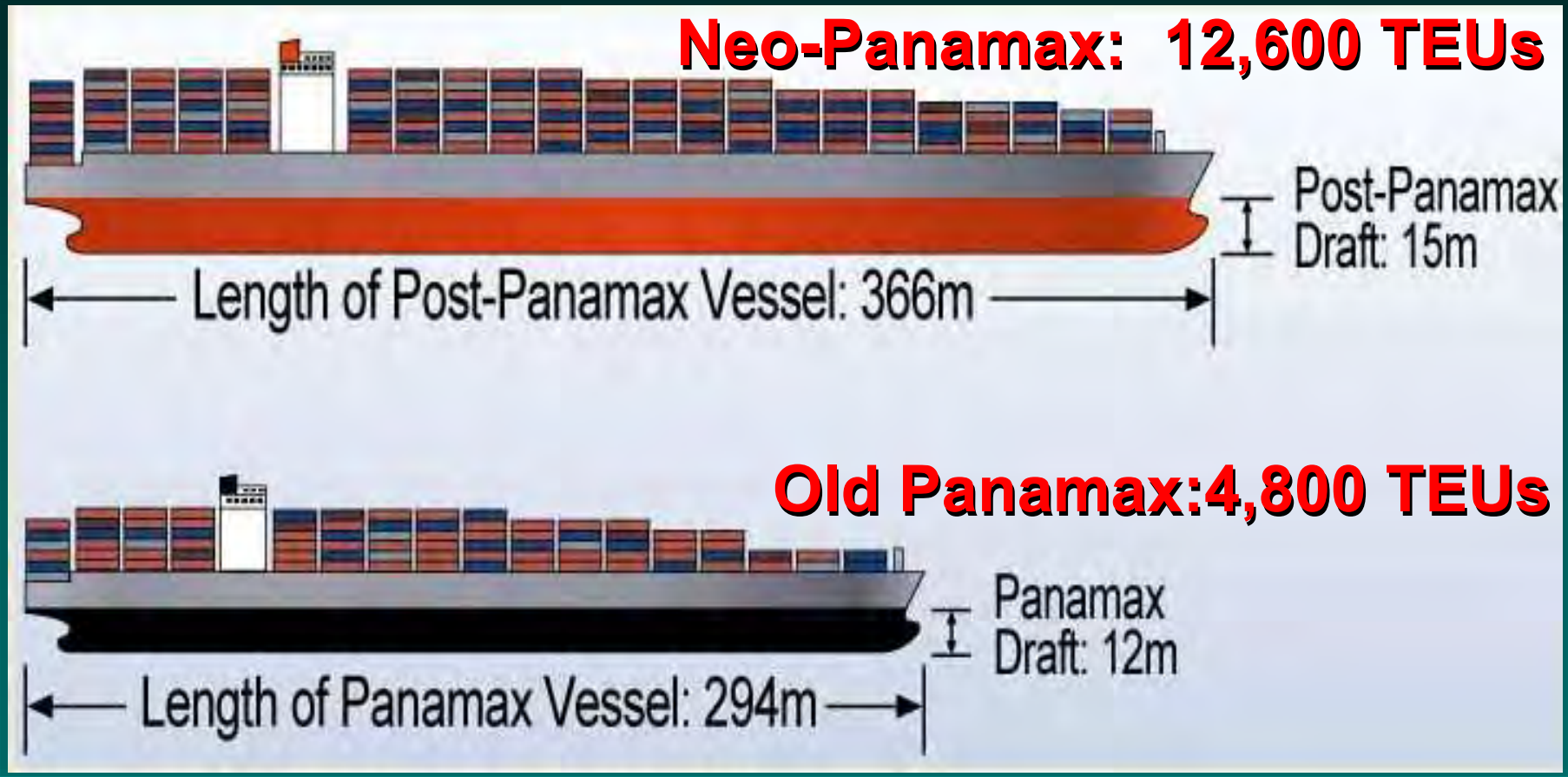
Panama Canal Third Lane Expansion Capabilities



Source: ACP Expansion Project, Circle of Blue January 27, 2015

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The Recent Mega Container Vessels are Too Large for the New Panama Canal Third Lane Expansion

Source: A.P. Moeller-Maersk, Panama Canal Authority

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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!

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Linking Railroads, Ports, Trucks, and Waterways

Emerging New Caribbean Transhipment Center

(Large Ship to Feeder Vessel Transfer)

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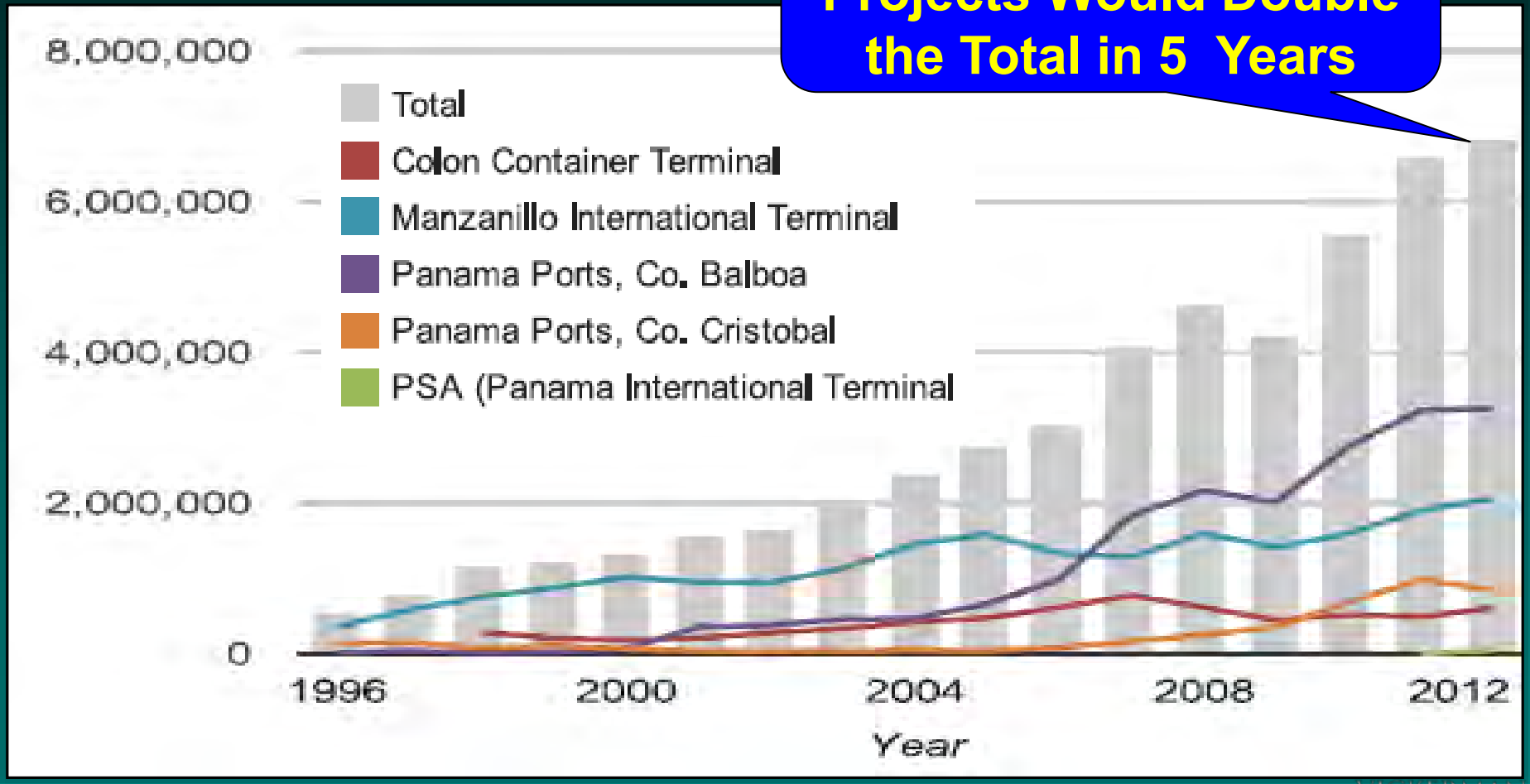
Panama Ports Annual *Transhipment Growth*

"The Singapore of Latin America"

Proposed New Port Projects Would Double the Total in 5 Years



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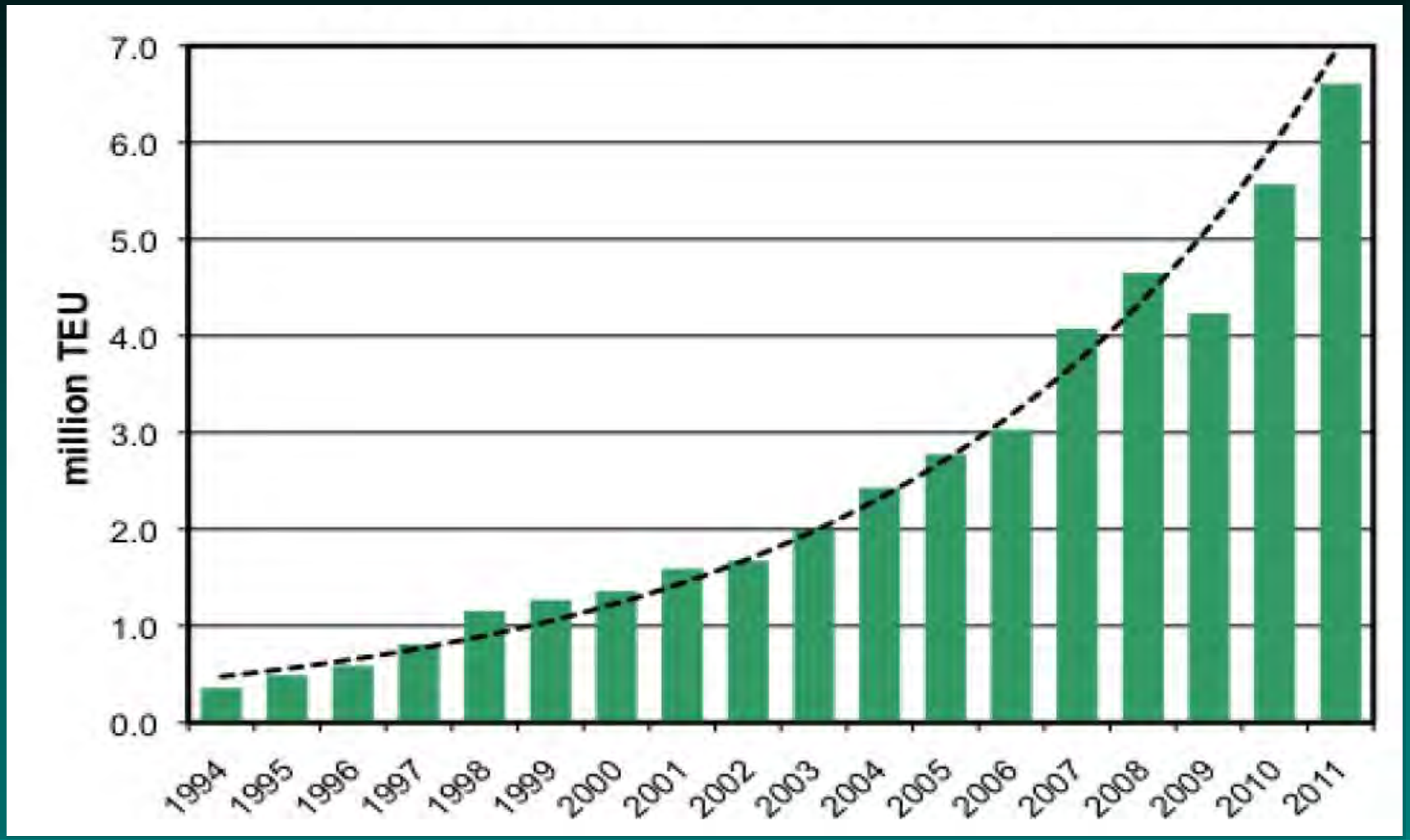
Panama Ports Container *Transhipment Growth*



6.8 Million TEUs – 18.5 % Growth Rate

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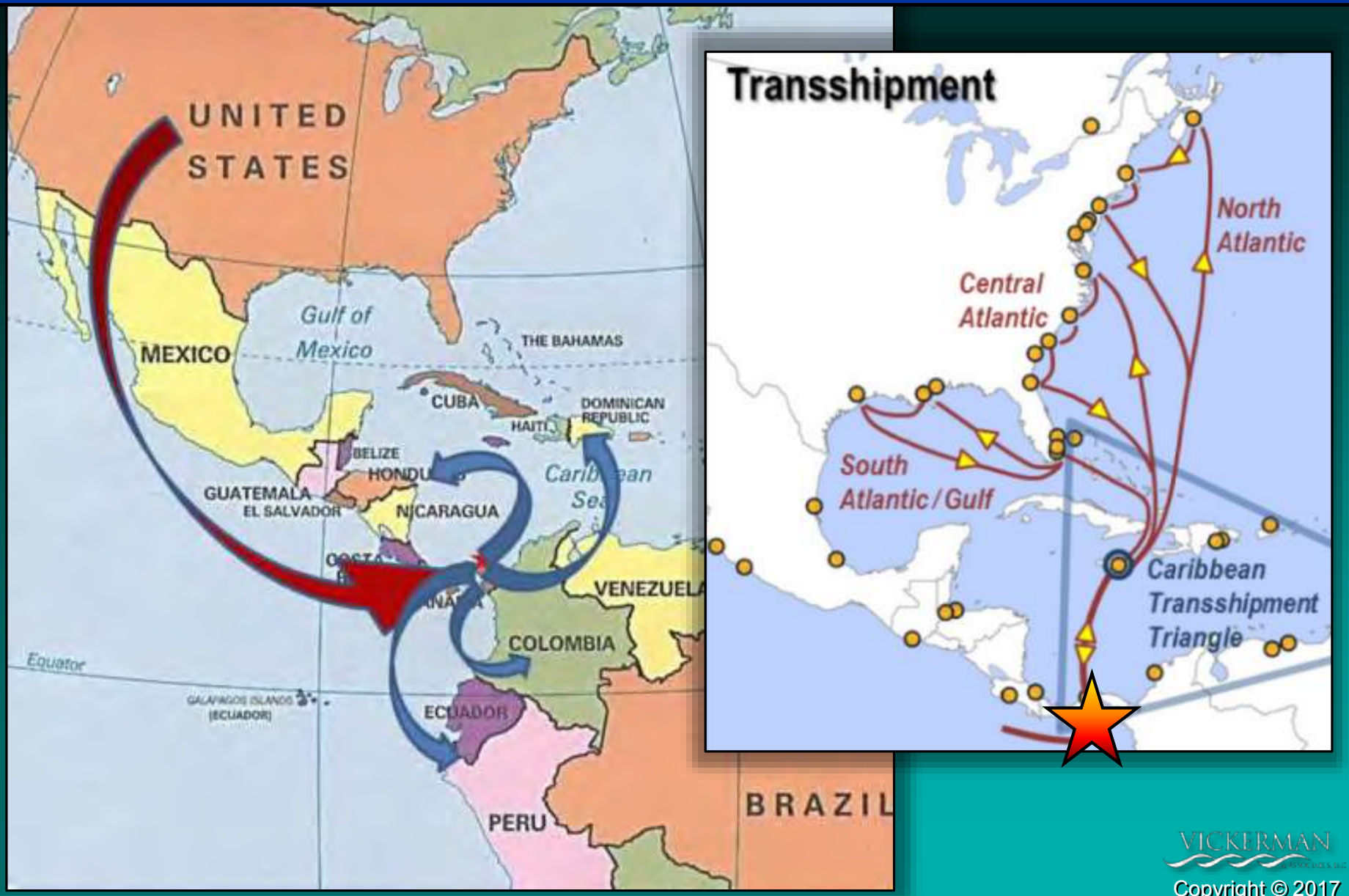
The Panama Canal Expansion Will Move the Caribbean Transhipment Center Point to Panama



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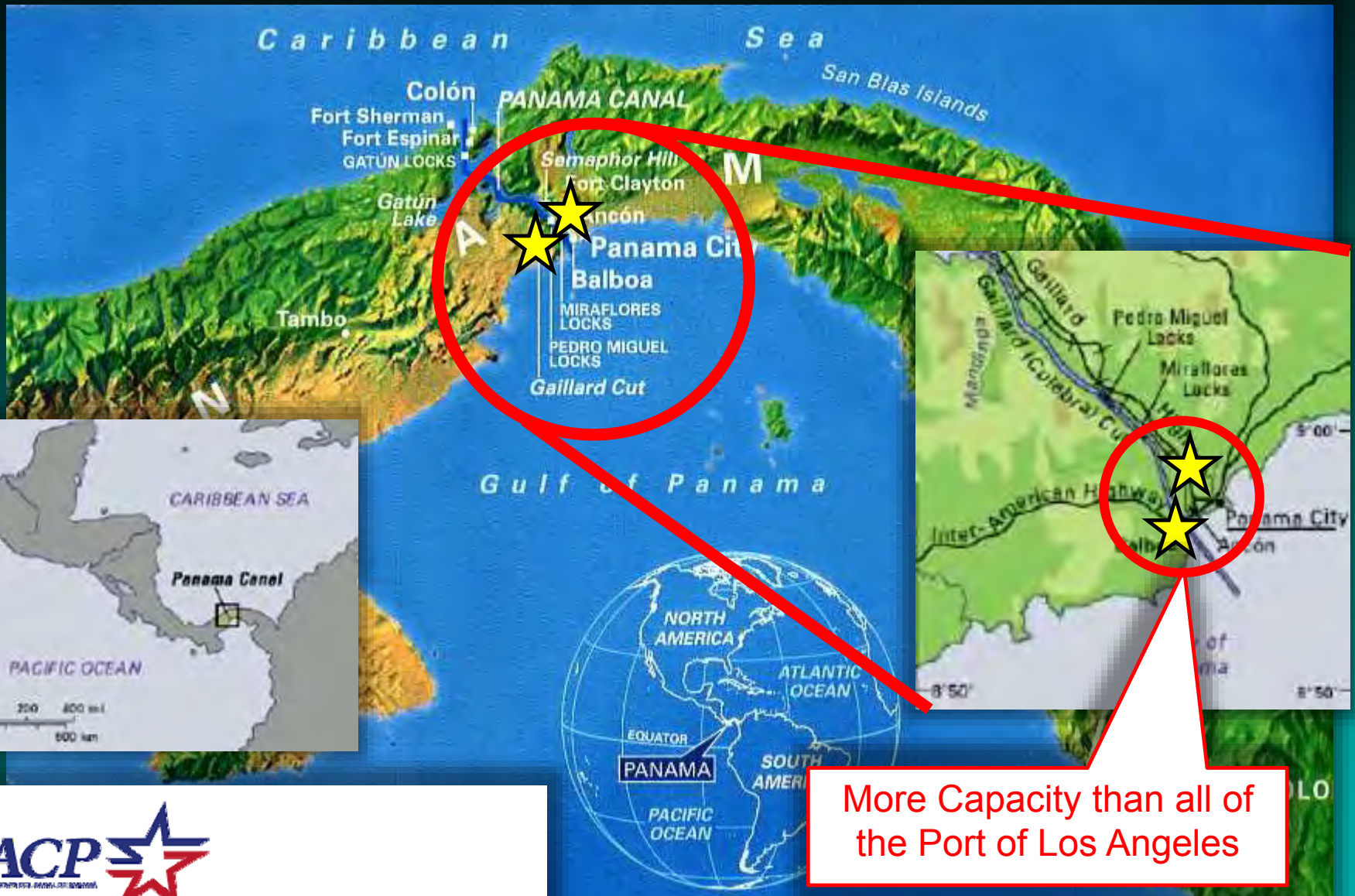
New Panama Canal Pacific Entrance Ports



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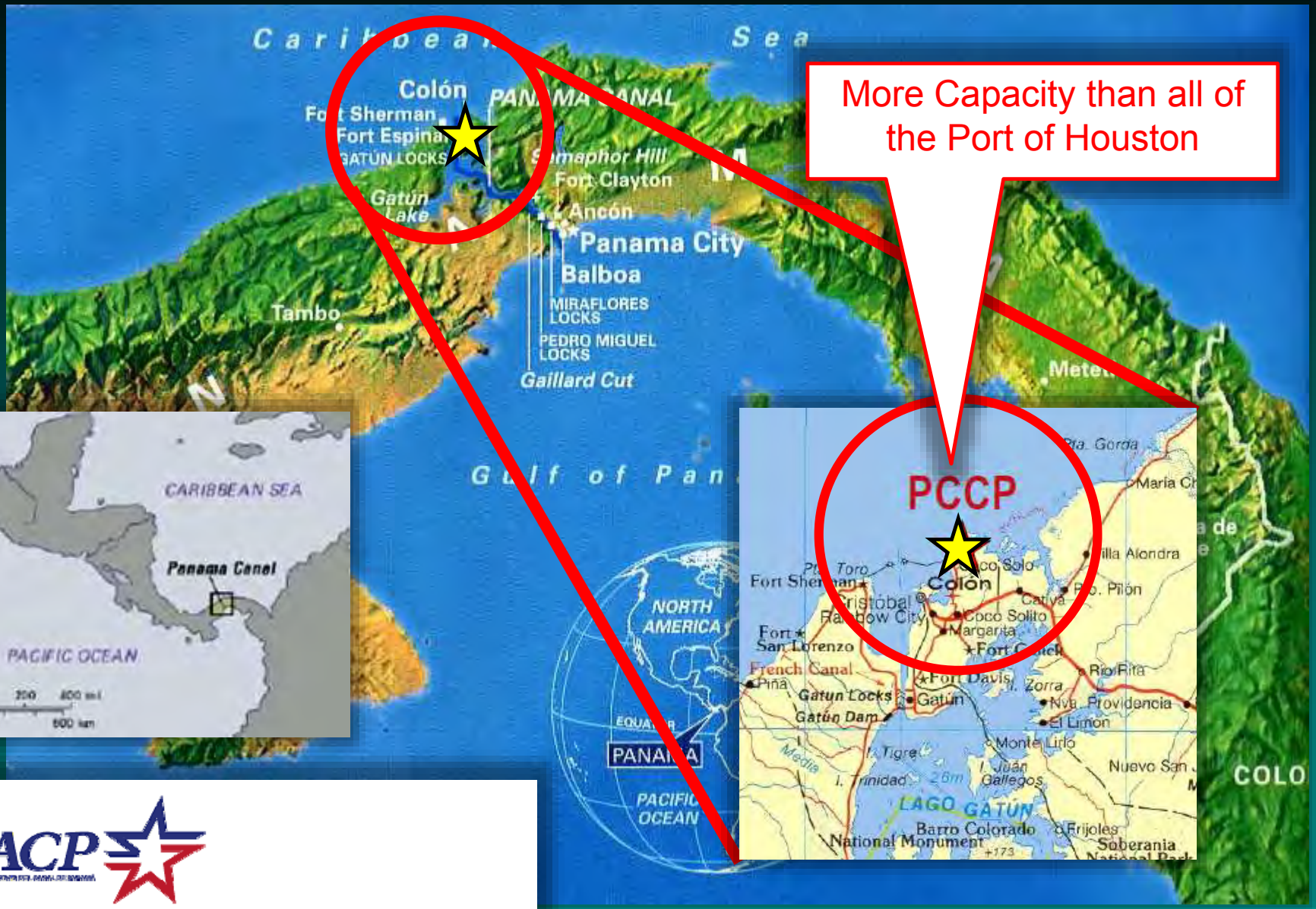
New Panama Canal Atlantic Entrance Port



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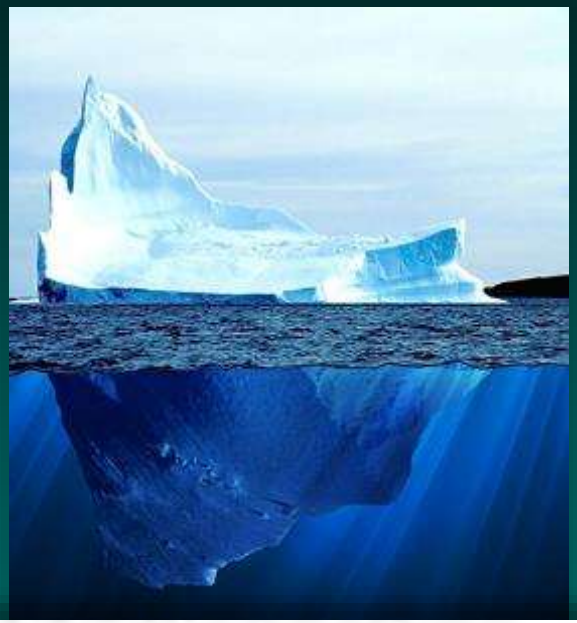
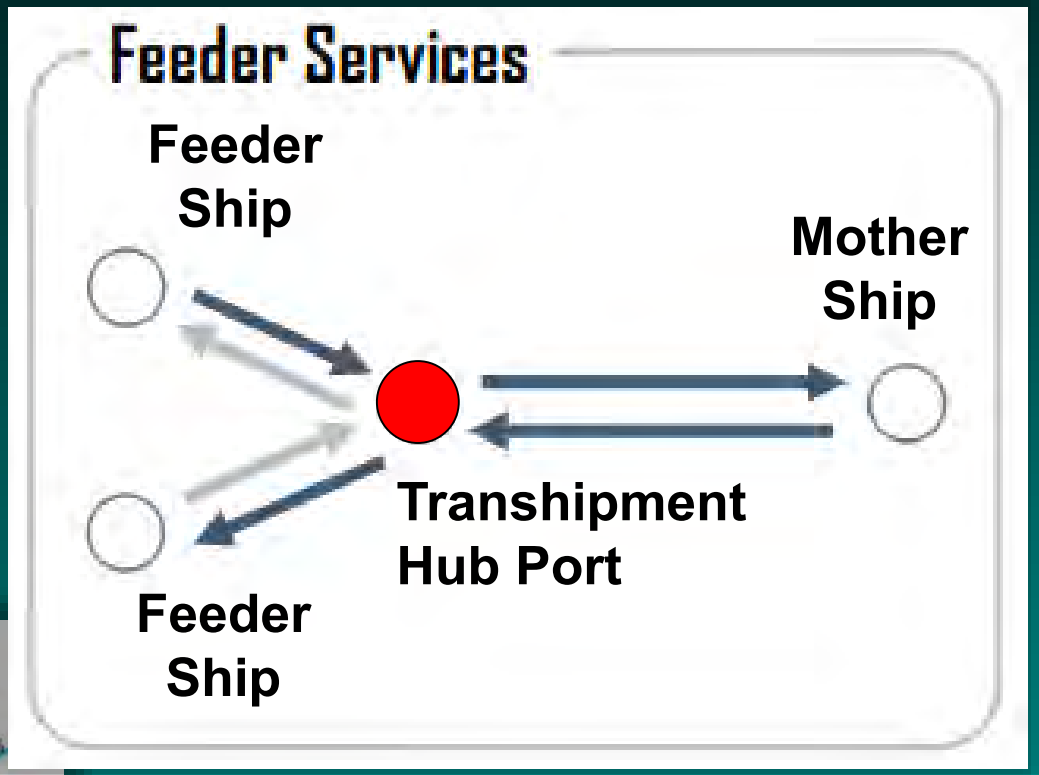
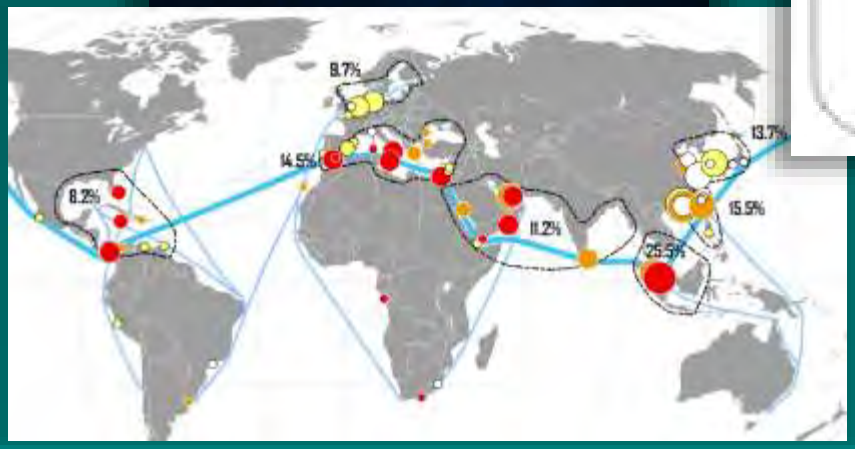
North American Vessel Transshipment:

(Globally Transshipment accounts between 25 and 50% of all container volumes – In the US it's < 15%)







Induced Transshipment/Feeder Ship Operations

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REPORT CARD for America's INFRASTRUCTURE

ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

AMERICA'S GPA:

D+

ASCE 2017 Report Card for America's Infrastructure

ESTIMATED INVESTMENT NEEDED BY 2020:

$4.6 TRILLION

Cost to Improve

Ports: C+

Inland Waterways: D

Roads: D

Failure to Act: It Costs Each US Family $3,400 per year

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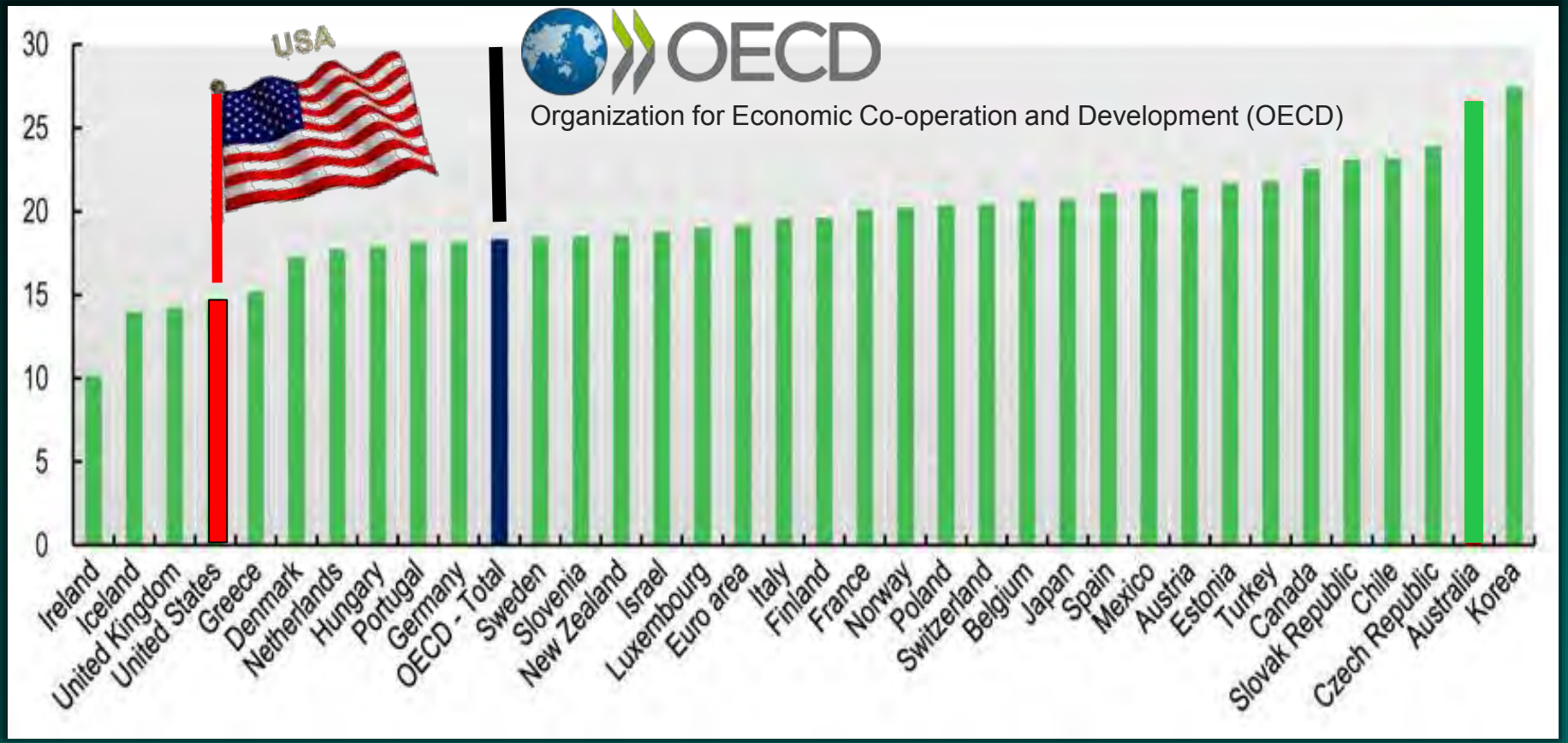
International Gross Fixed Capital Formation as a Percent of GDP

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



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