Union League Club, Chicago, IL *May 9, 2019*

Compelling New North American Trade and Transportation Opportunities and Challenges

M. John Vickerman

VICKERMAN & ASSOCIATES, LLC

Williamsburg, Virginia

Current Market Conditions Appear to be Improving for Marine Carriers

Expect the Global Maritime Trade Volume to Double by 2030…

Source: JOC.COM January 2018

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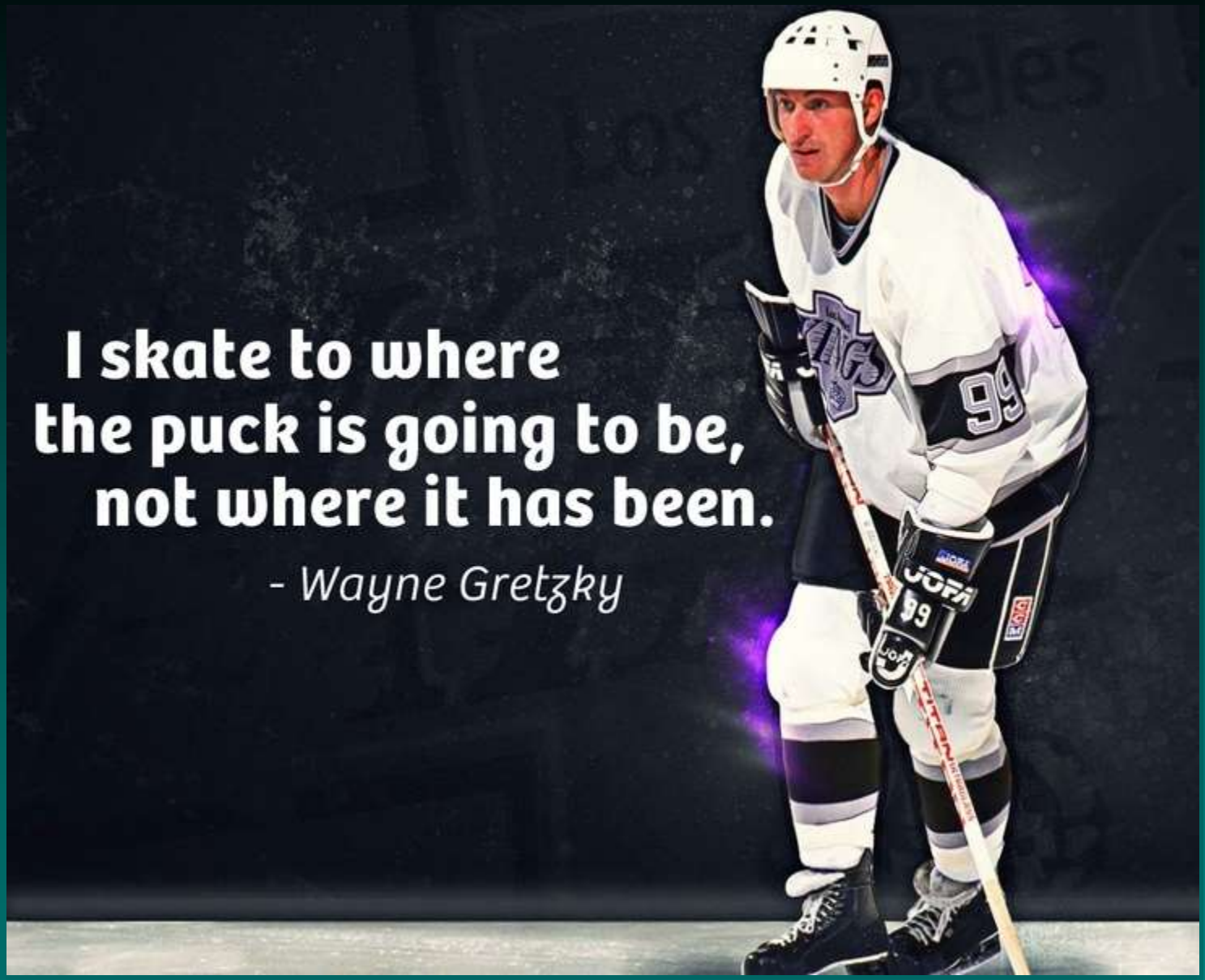

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EMERGING OPPORTUNITIES FOR RAIL & WATER

Since the 2018 Rail Summit a year ago, Major Events have changed the US Marine/Inland Waterway/Rail Industry:

- ✓ *Substantial Growth in Global Trade Demand*
- ✓ *US Port Terminal Privatization Expands*
- ✓ *Dramatic Container Ship Size Growth*
- ✓ *High Speed & Capacity for Inland Waterway Vessels*

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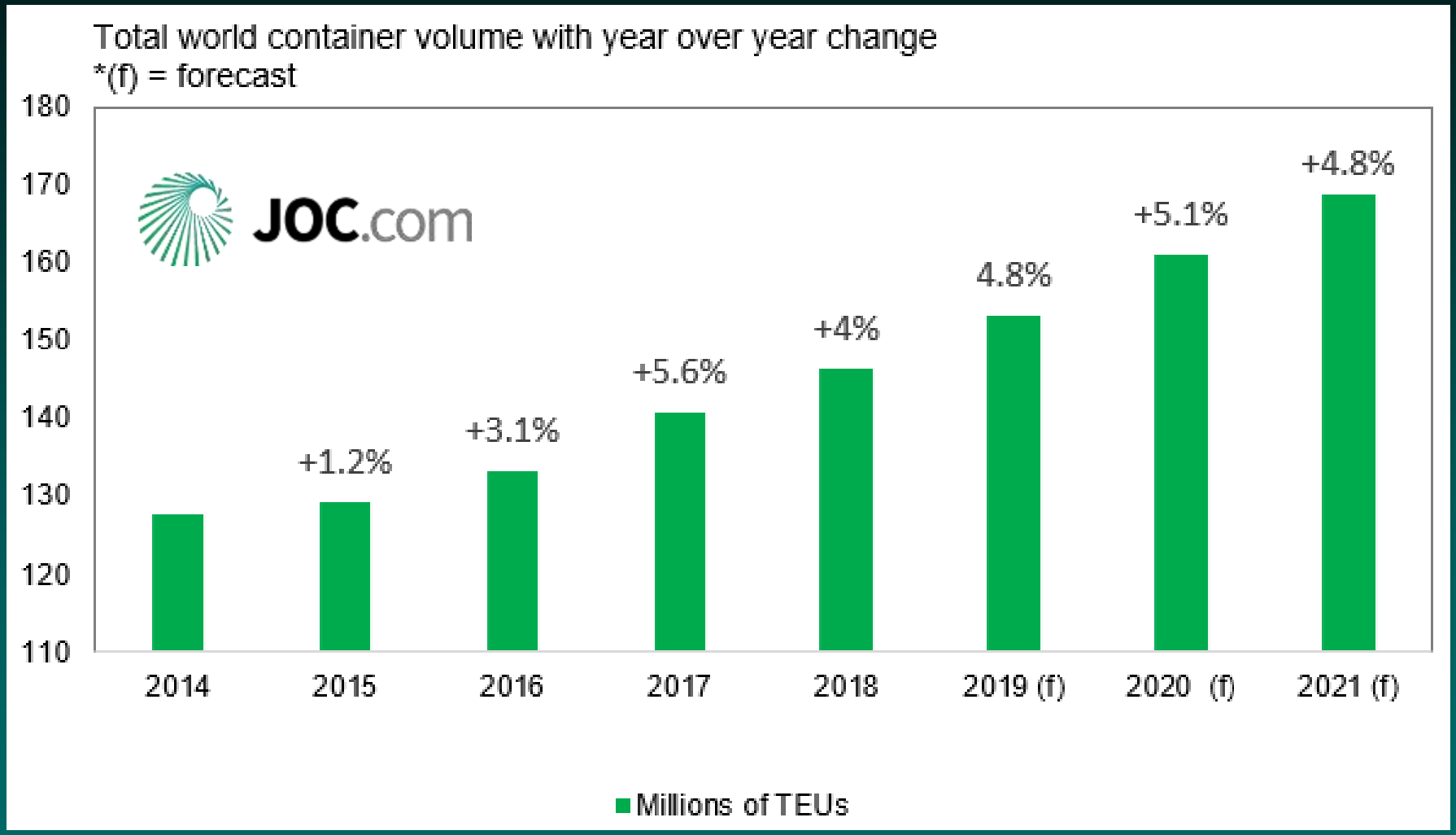
Expect the Global Maritime Trade Volume to Double by 2030

*"In the next 10-15 years **world trade is projected to grow significantly**. It is estimated that this growth will result in a **doubling of seaborne trade volumes** from 10 billion tons of cargo annually today to 20 billion tons of cargo around 2030".*

Source: Danish Maritime Forum, 24-28 October 2016

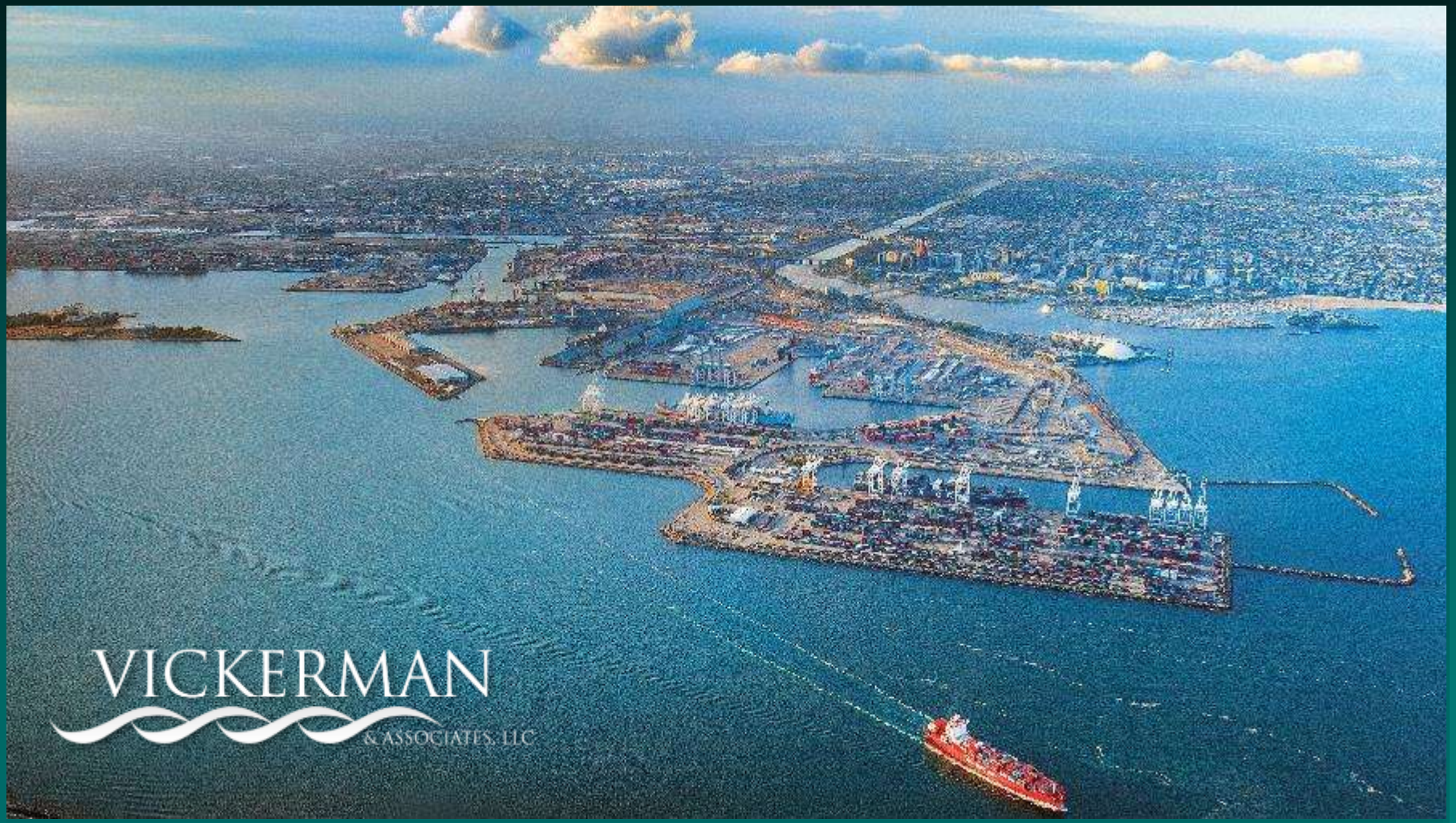
Global Container Trade Growth Forecast

(Accelerating in 2019 and Beyond)



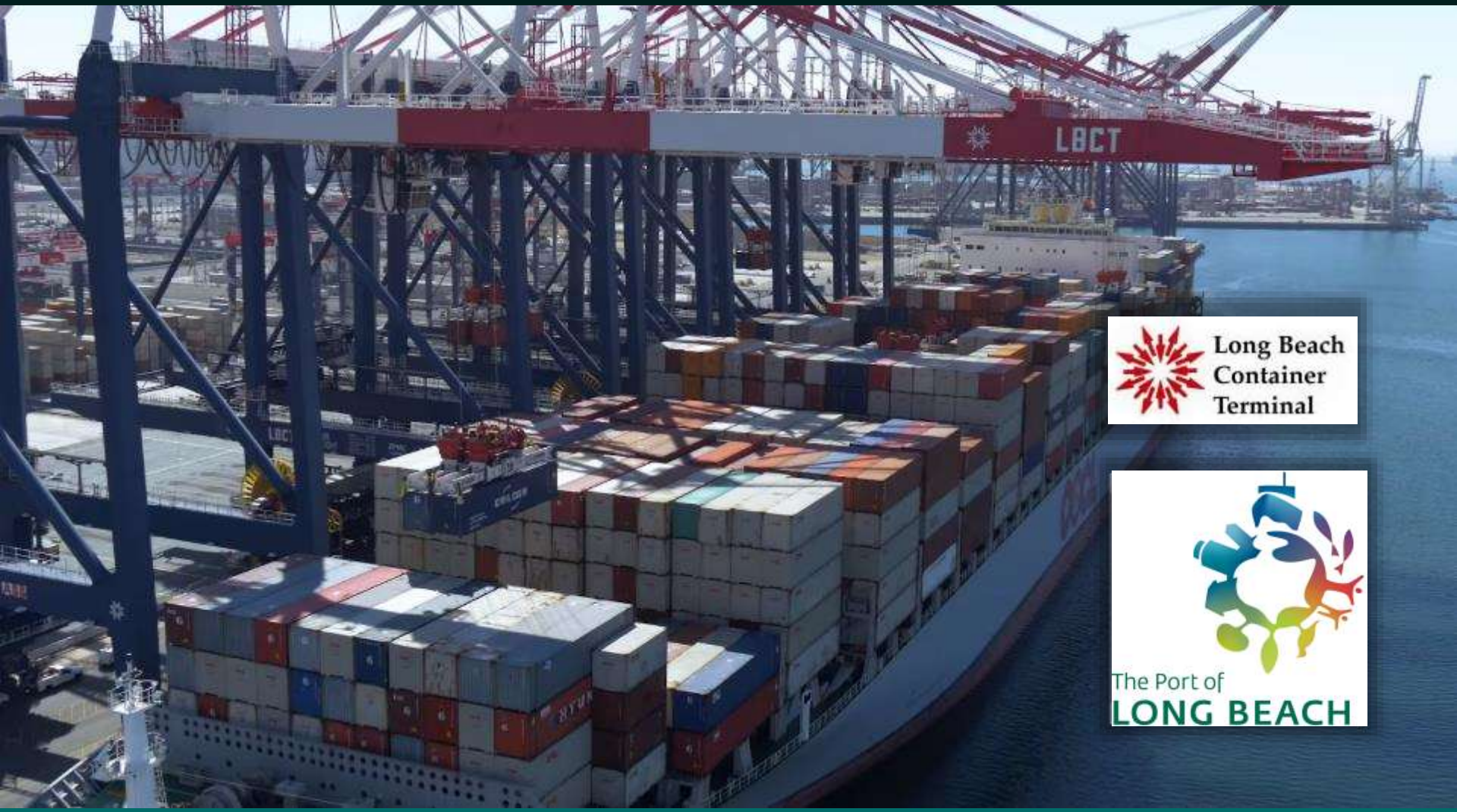
Source: 2019 HIS Markit –Trends in the World Economy and Trade report - JOC

Comprehensive Update to the Current POLB Port Master Plan



Long Beach Container Terminal (LBCT)

Automated High Productivity STS Cranes



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Long Beach Container Terminal (LBCT)

STS Cranes & Automated Guided Vehicles (AGVs)

Macquarie Infrastructure Partners (Australian Banking and Investment Group) has expanded its US footprint beyond the East Coast to the West Coast through the $1.78 billion purchase of Long Beach Container Terminal (LBCT) from Hong Kong's Orient Overseas (International) Limited (OOIL).

Macquqrie has stakes in New Jersey's Maher Terminals at Port Elizabeth and Penn Terminals. Buying LBCT gives it major port assets on the US West and East coasts.

Source: JOC April 30, 2019

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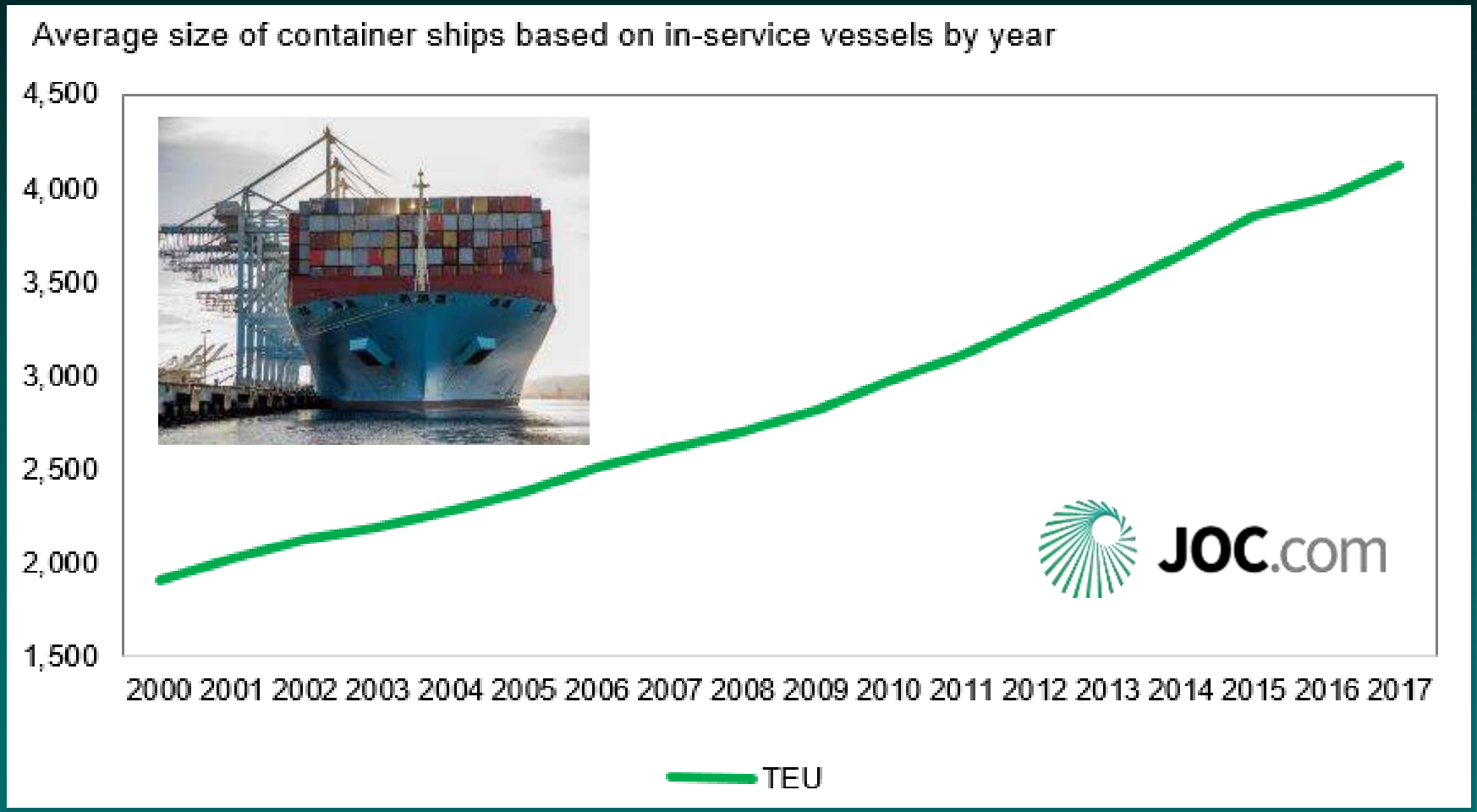
US East Coast Port Vessel Sizes from Asia Have Been Increasing Since the Opening of the Expanded Panama Canal in June 2016

The maximum vessel size has increased from 10,700 TEU to 14,400 TEU, and the share of the Asia-East Coast carried by 12,000 - to 15,000-TEU vessels has increased from 9.6% to 14.8% in the third quarter of 2018

Average Container Ship Size Climbs

As expected, the average size of ships
in the global fleet continued to grow substantially



Source: 2019 HIS Markit –Trends in the World Economy and Trade report - JOC

US East and Gulf Coast Ports Make Significant Asian Import Market Share Gains

Source: 2019 HIS Markit –Trends in the World Economy and Trade report - JOC

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Emerging Opportunities for Rail and Water

Three Dramatic Mega Trade Trends will Increase Global Trade Demand

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Three Mega Trade Trends to 2030

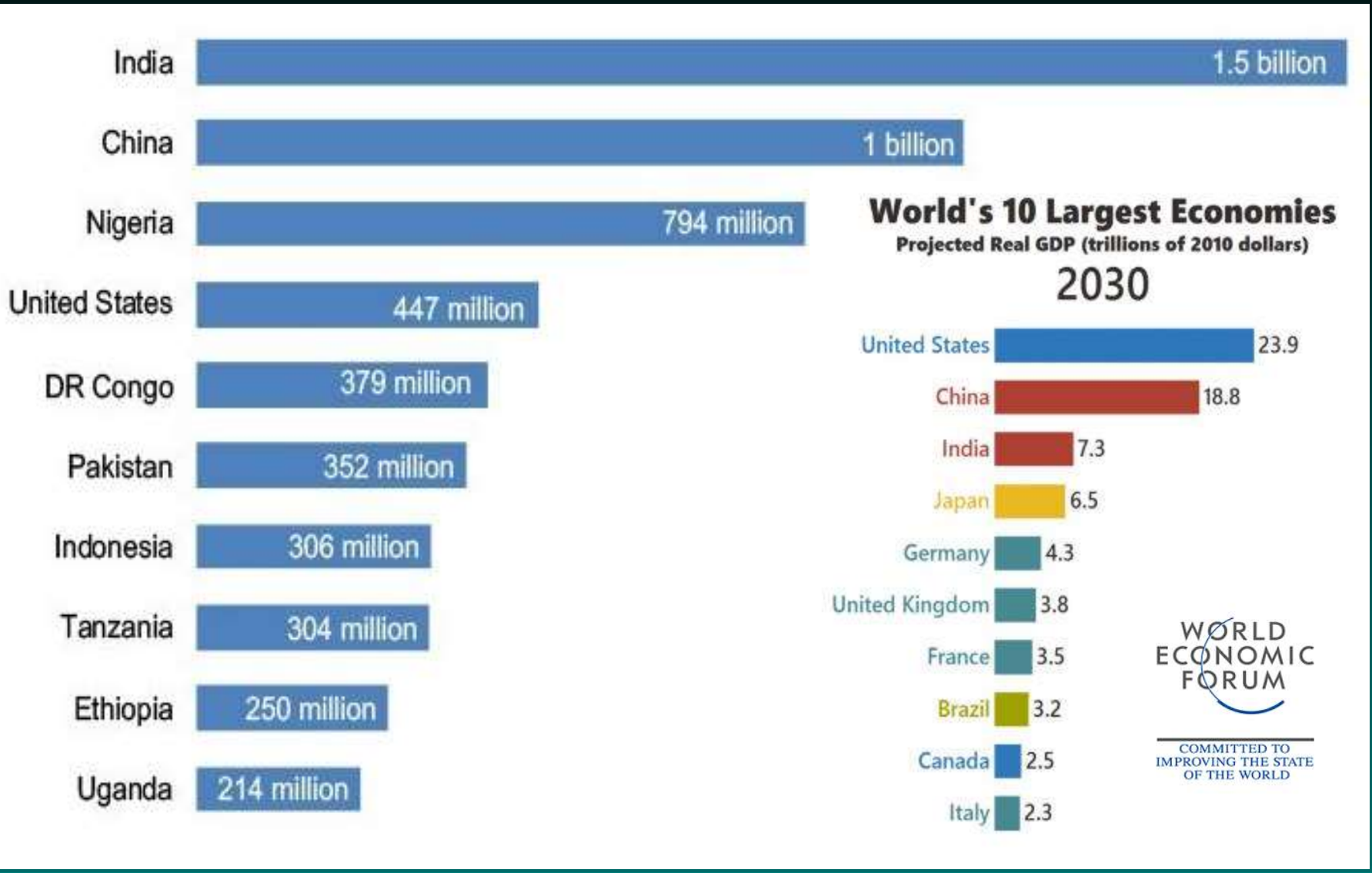
I. INCREASE IN GLOBAL POPULATION:

Global population is likely to be 8.5 billion by 2030, with 96% of growth coming from developing countries.

India will overtake China with the largest population.

Source: Global Marine Trends 2030 – QinetiQ – Lloyd's Register

World's Largest Countries by Population in 2100



Source: UN Population Data

Three Mega Trade Trends to 2030:

II. GLOBAL GDP COULD GROW THREE TIMES WITHIN THE NEXT 20 YEARS

The countries with the largest growth in per capita GDP will be China, Vietnam, India and Indonesia.

Purchasing power in developing Asia will rise 8 times between 2010 and 2030.

Source: Global Marine Trends 2030 – QinetiQ – Lloyd's Register

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Three Mega Trade Trends to 2030:

III. 40% HIGHER ENERGY DEMAND IN 2030

China oil consumption could triple, overtaking the USA to become the largest oil consumer.

The USA will remain the biggest natural gas consumer, while China will see the largest growth in natural gas consumption.

Source: Global Marine Trends 2030 – QinetiQ – Lloyd's Register

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Emerging Opportunities for Rail and Water

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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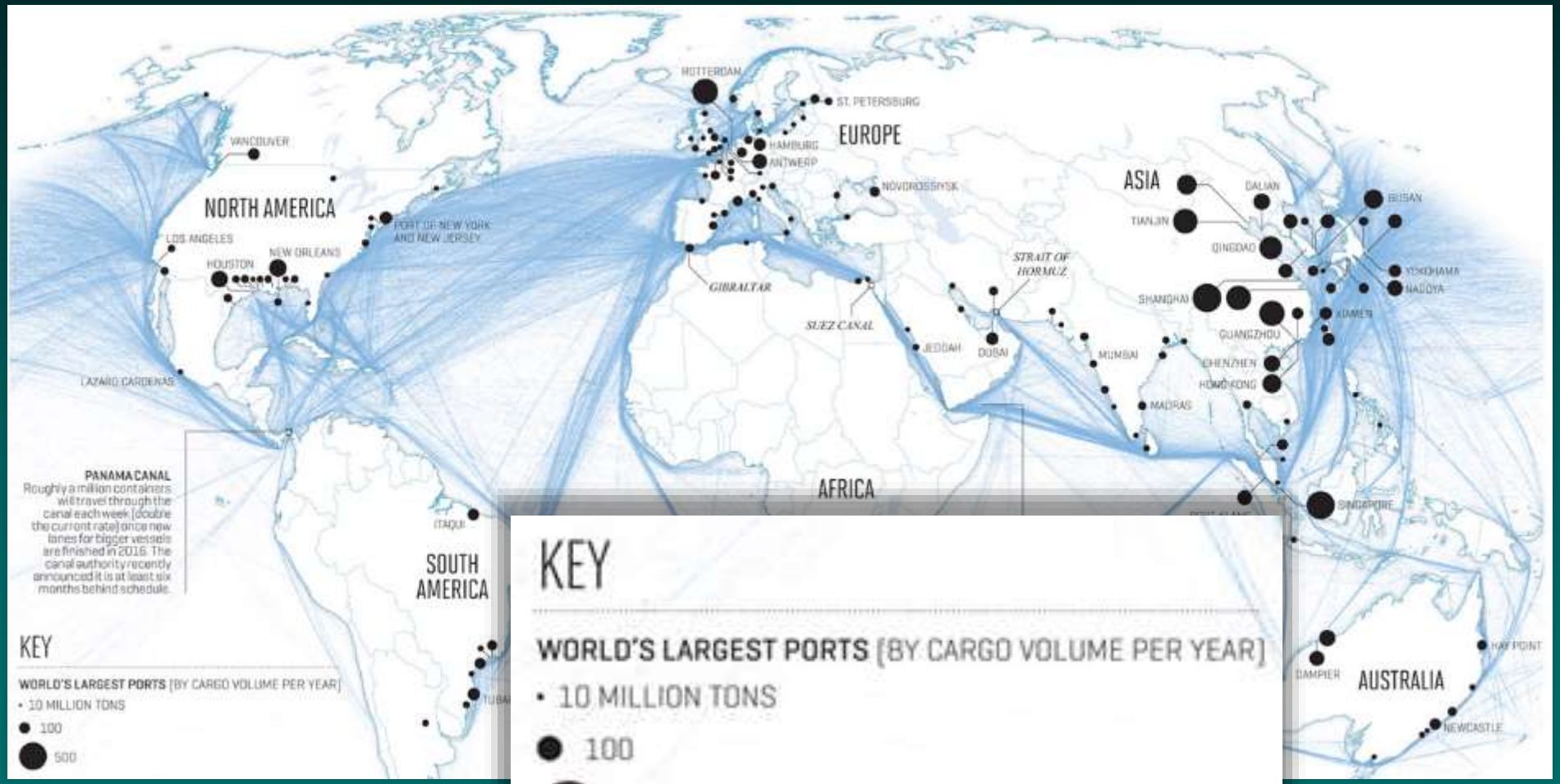
90% of Global Trade is Carried Out by Shipping

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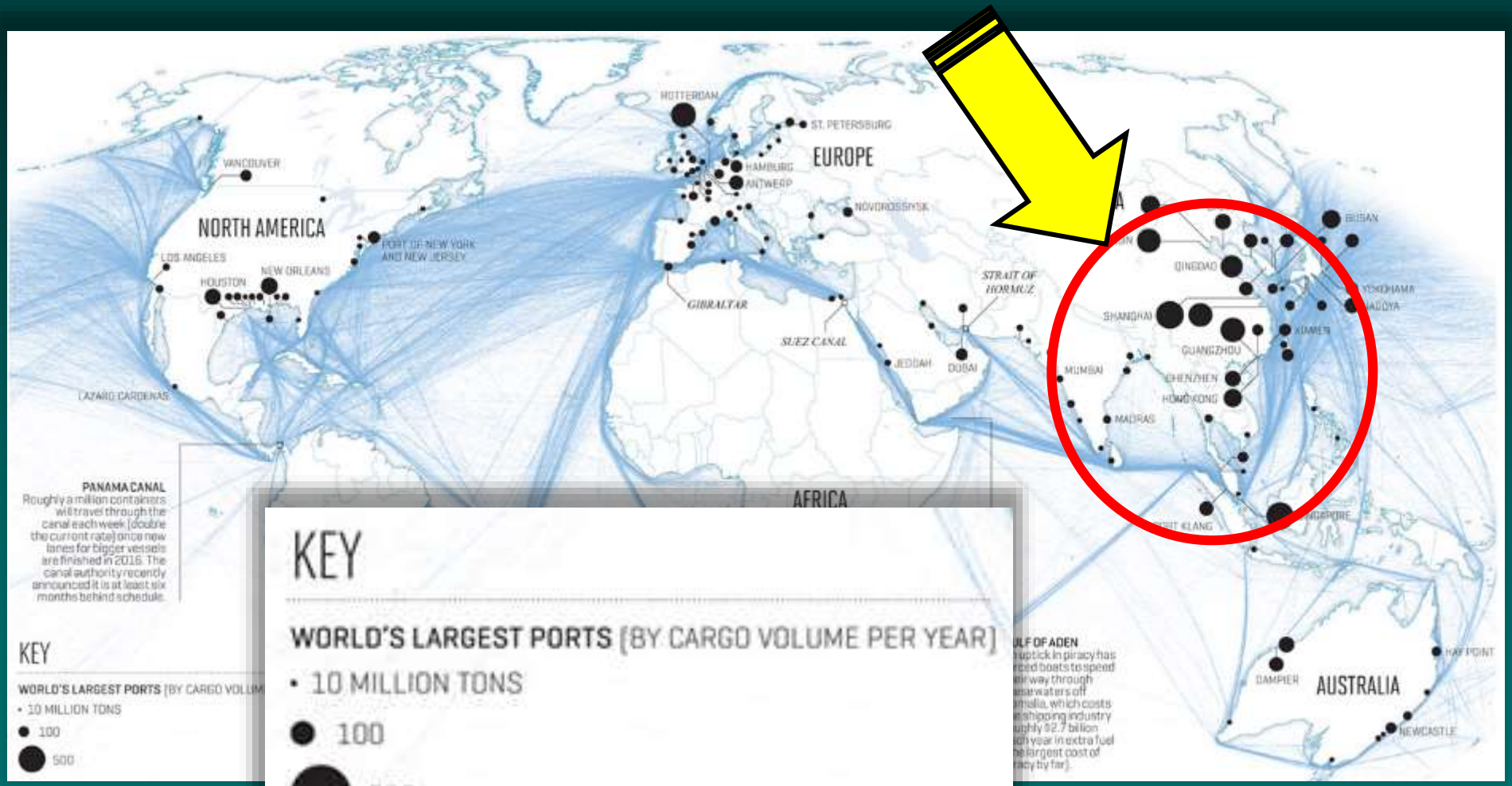
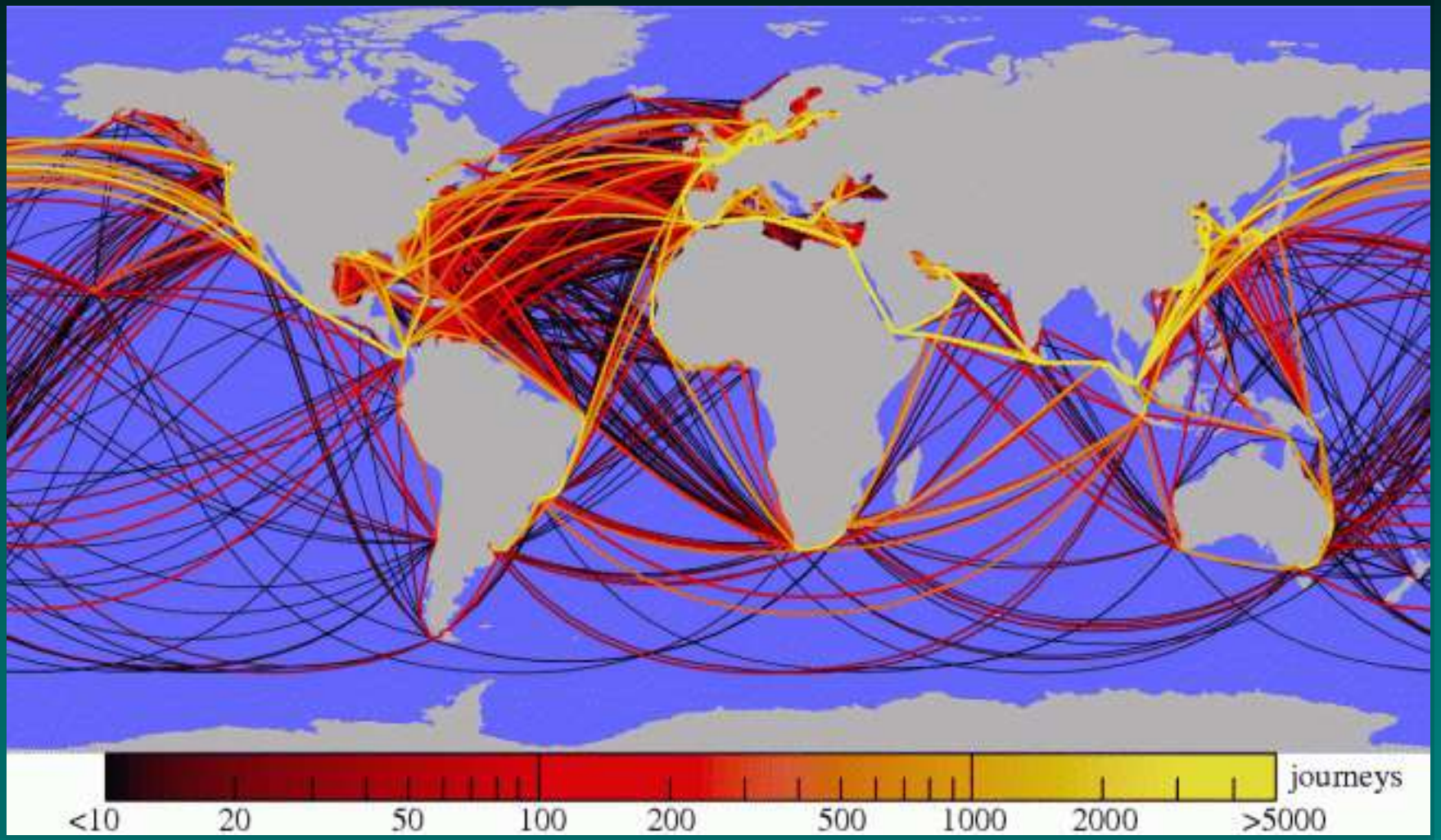
The World's Largest Ports Are Connected Via The Maritime Silk Road



Global Shipping Routes Plotted by AIS GPS

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



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

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Emerging Opportunities for Rail and Water

International Maritime Cargo Demand & Logistics Trends

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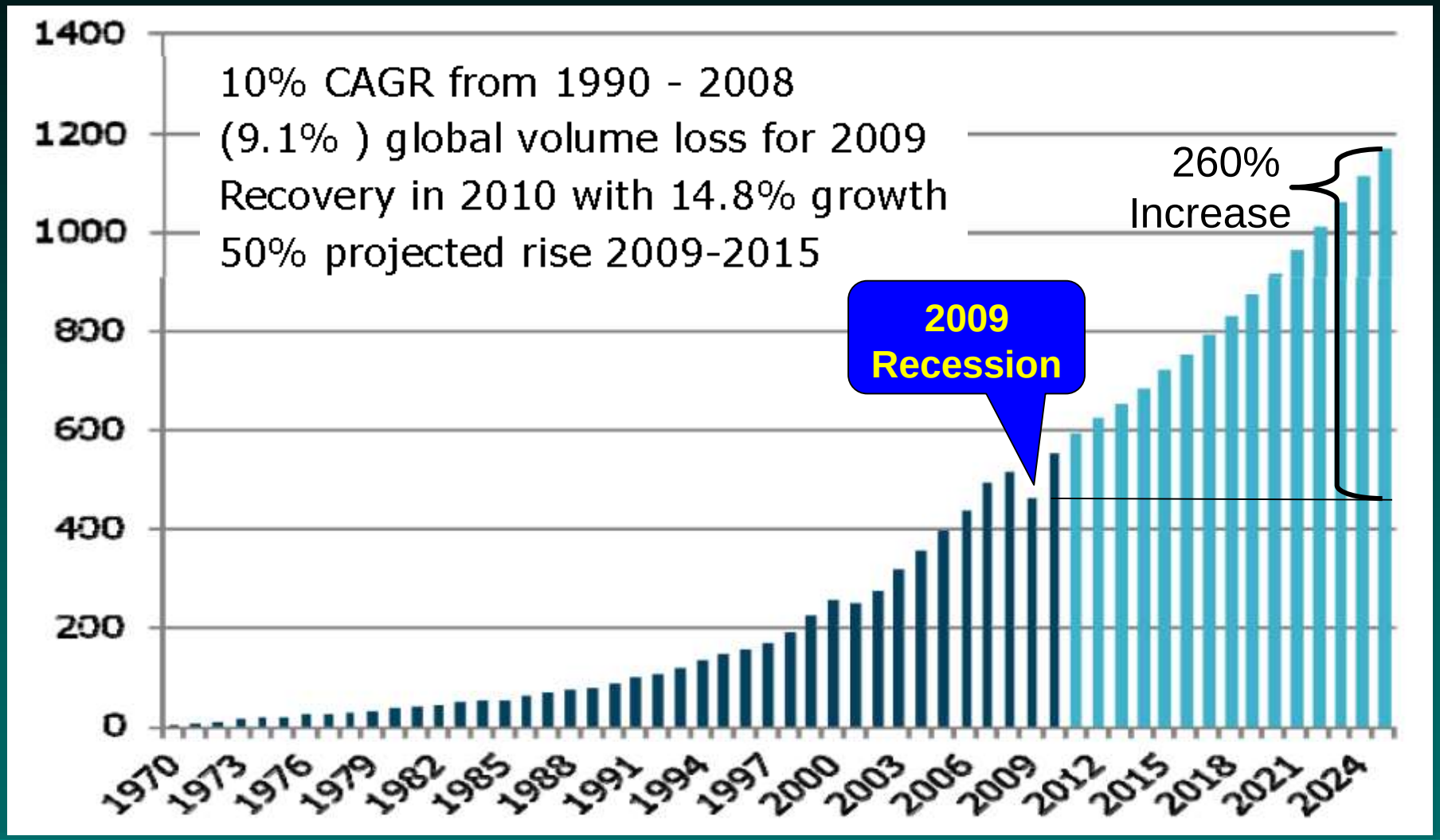
2025 World Container Port Market Demand

(Millions of TEUs)



Source: Drewry Shipping Consultants

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

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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Emerging Opportunities for Rail and Water

The Arrival of Mega Container Ships in North America

(The Advent of Ultra Large Container Vessels (ULCV) – Megamax MGX 24 Vessel)

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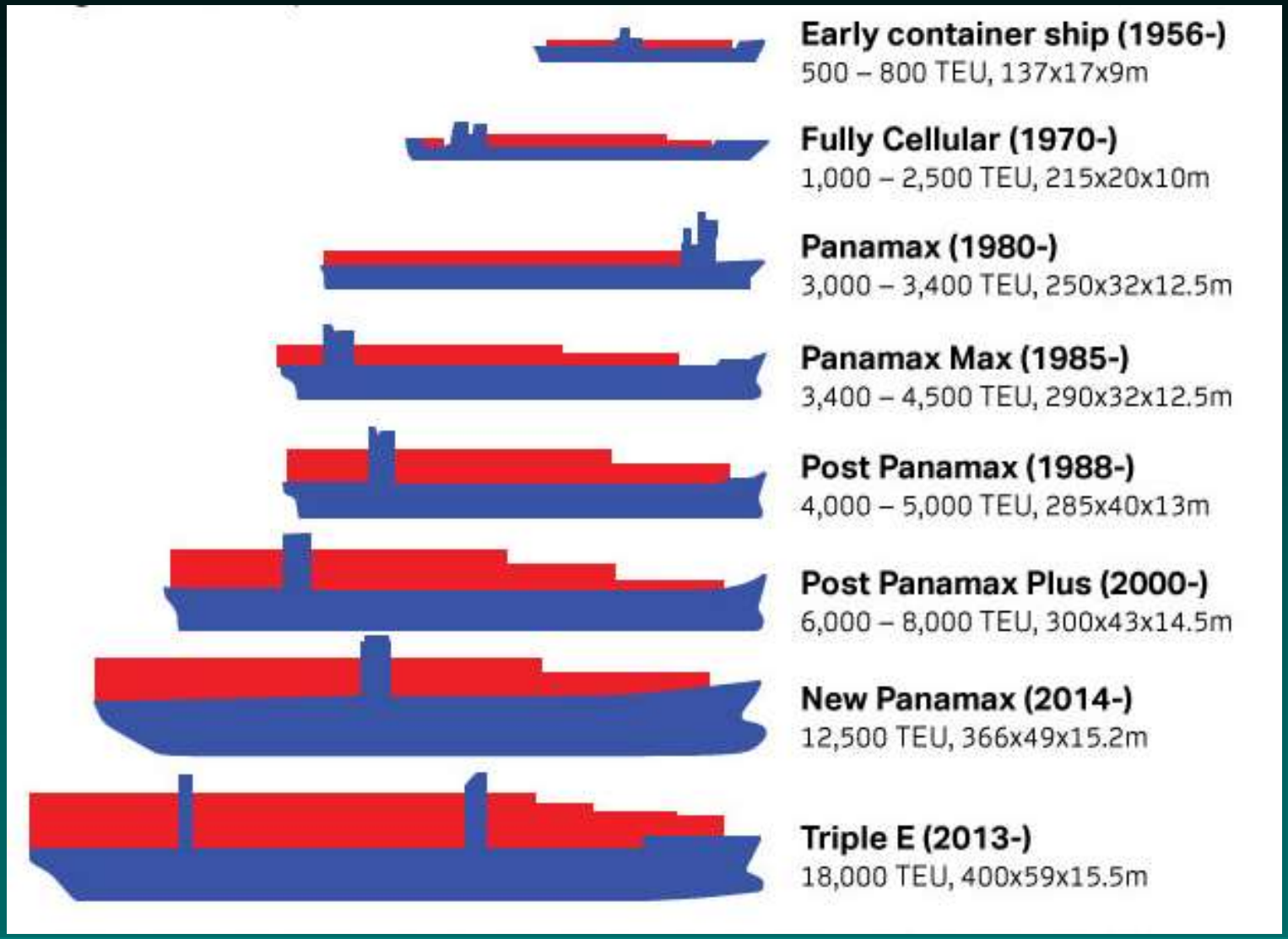
Evolution of the Modern Container Vessel



Source: FORWARD Florida Media, March 2014 – Adapted with permission from the Geography of Transport Systems, Jean-Paul Rodrigue

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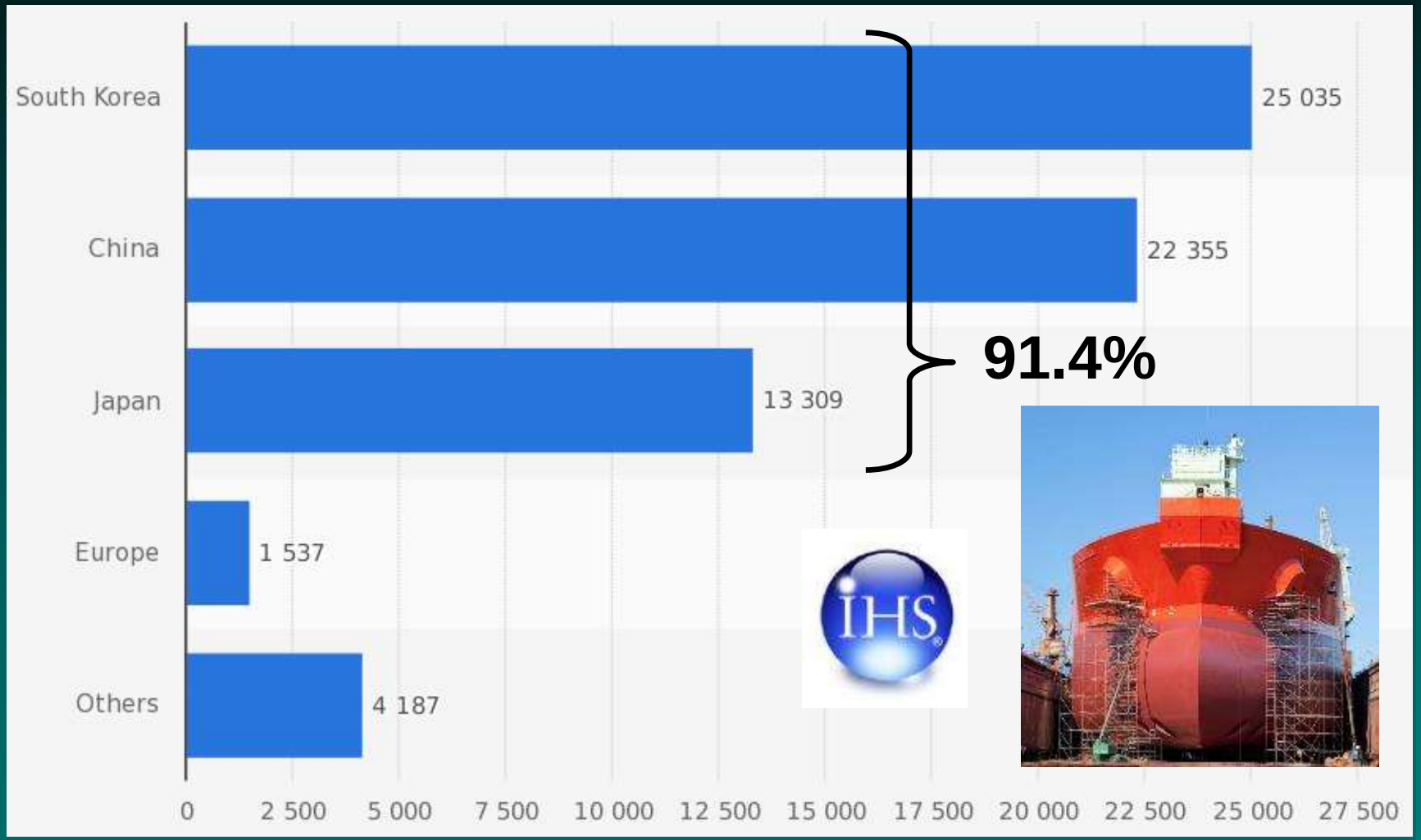
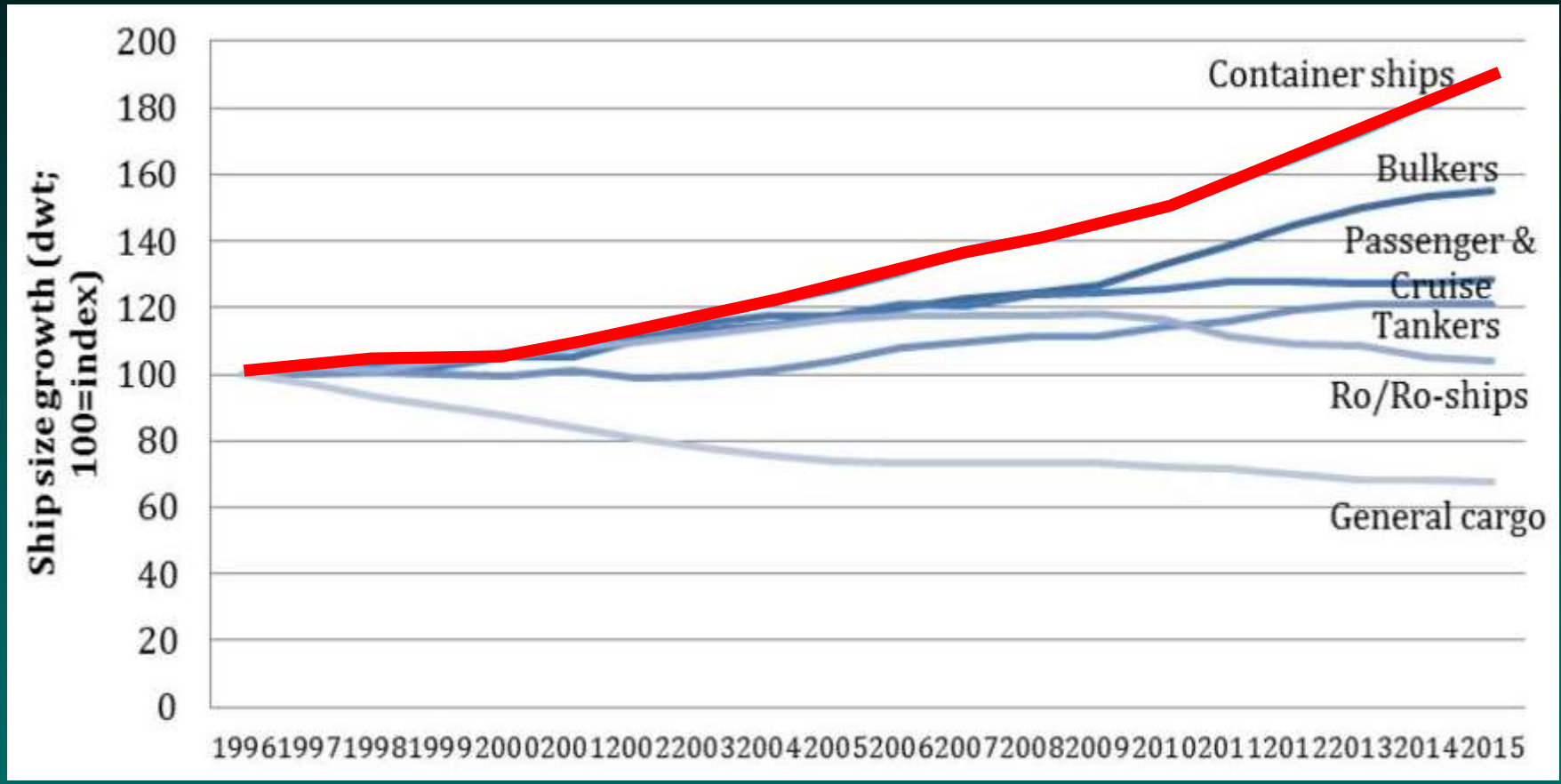
Largest Shipbuilding Nations in 2016

(Gross Tonnage, in 1,000s)



Source: IHS, Shipbuilders' Association of Japan, Statista 2018

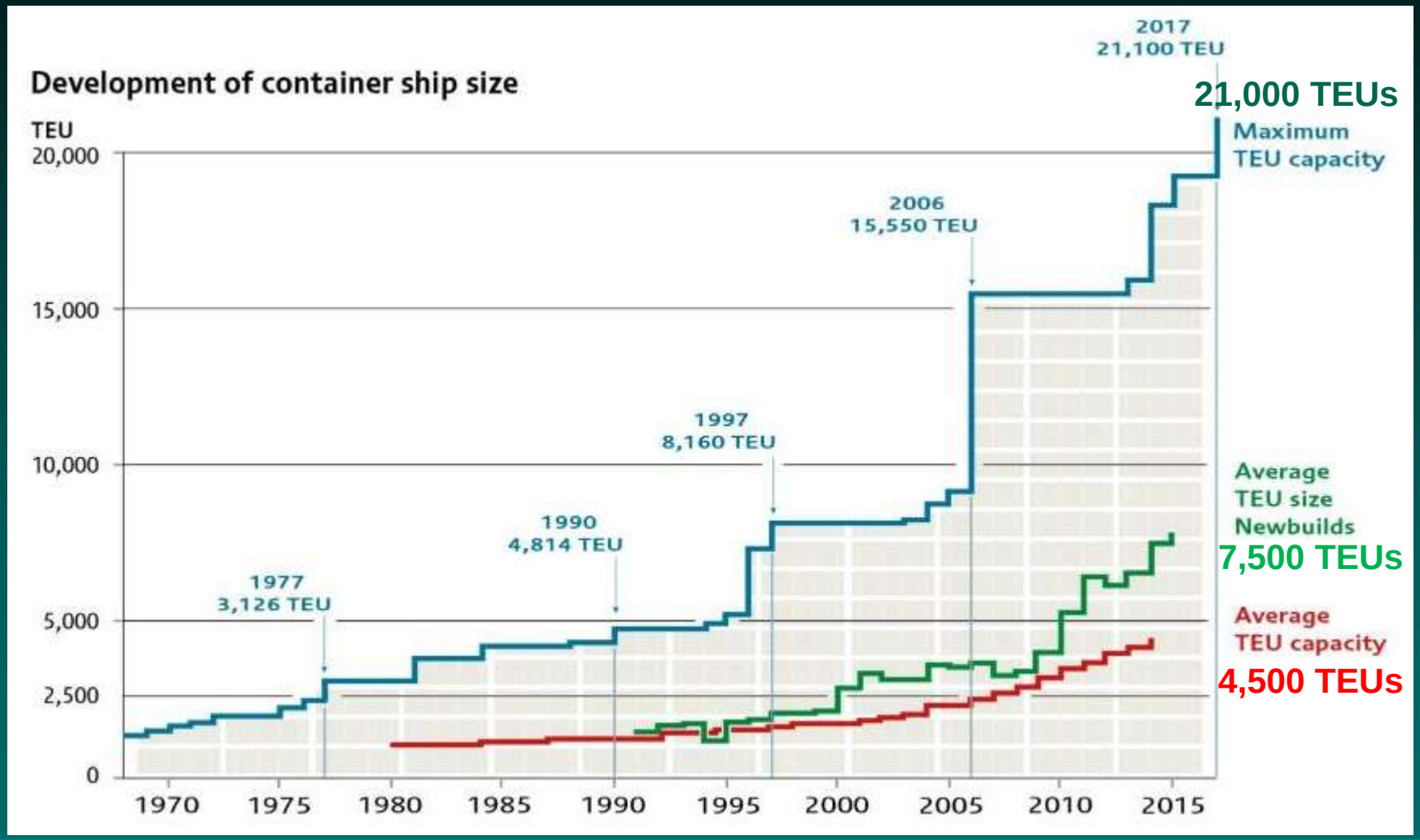
Container Ships are Growing at a Faster Pace Than all Other Ship Types



Size of container ships has been growing at a faster pace than all other ship types.

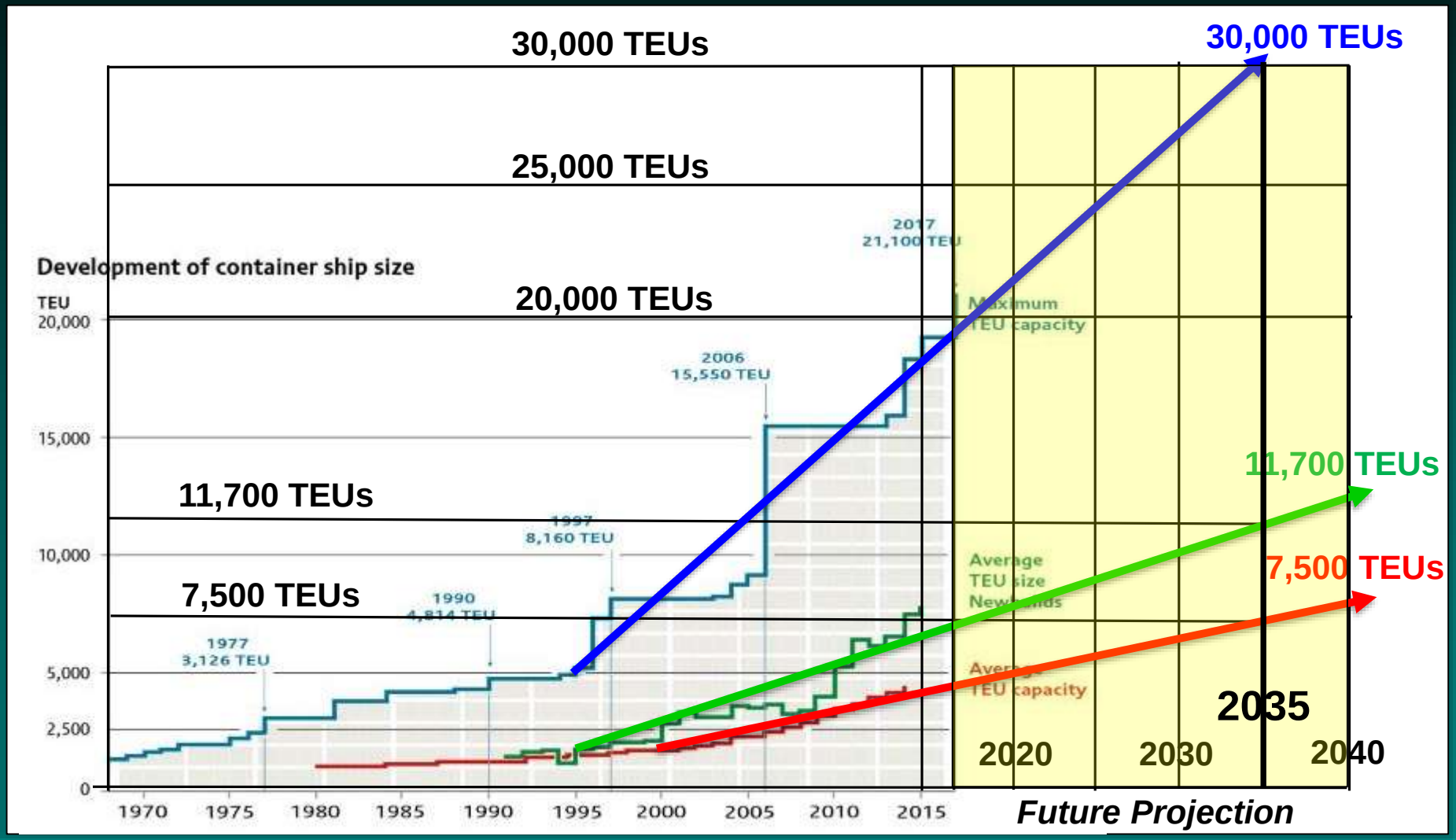
Source: Clarkson Services – OECD/ITF 2015 Project: Impact of Mega Ships

OECD Historical Development of Container Vessel Size (1970 to 2017)



Source: Clarkson Services – OECD/ITF 2015 Project: Impact of Mega Ships

Future Development "Extrapolated" OECD Container Vessel Size (2015 to 2035)



Source: Clarkson Services – OECD/ITF 2015 Project: Impact of Mega Ships

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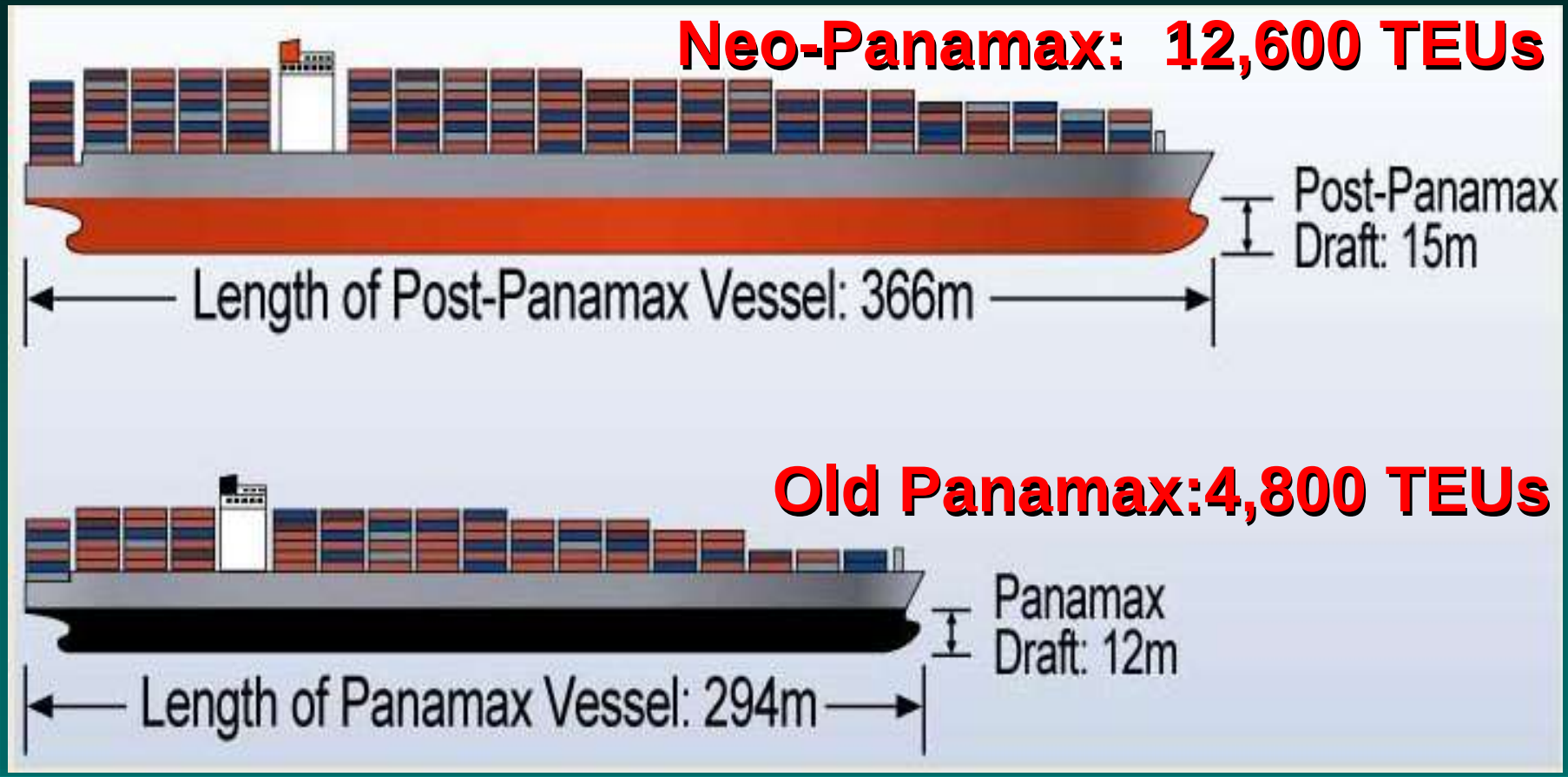
ACP
The Autoridad Del Canal de Panama

Panama Canal Third Lane Expansion Capabilities



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

Largest NEO-PANAMAX Containership to Transit the New Panama Canal – August 2017

(OCEAN Alliance's weekly South Atlantic Express (SAX) service)

CMA CGM's THEODORE ROOSEVELT:

TEU Allowance: **14,855 TEUs**

Vessel LOA: 365.9 meters **(1,200.66 ft.)**

Vessel Beam: 48.2 meters **(158.31 ft.)**

Vessel Max. Draft: 16 meters **(52.49 ft.)**

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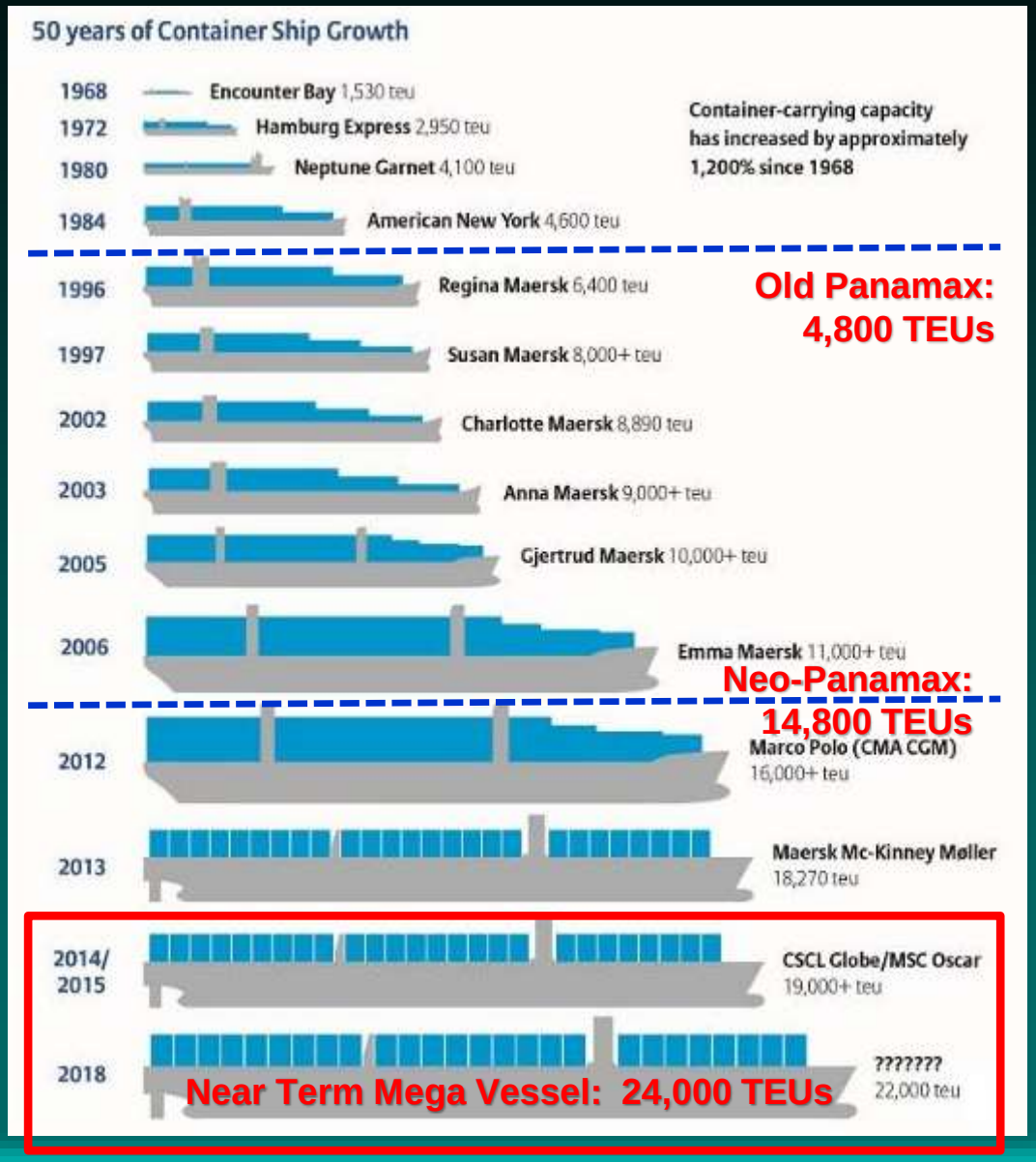
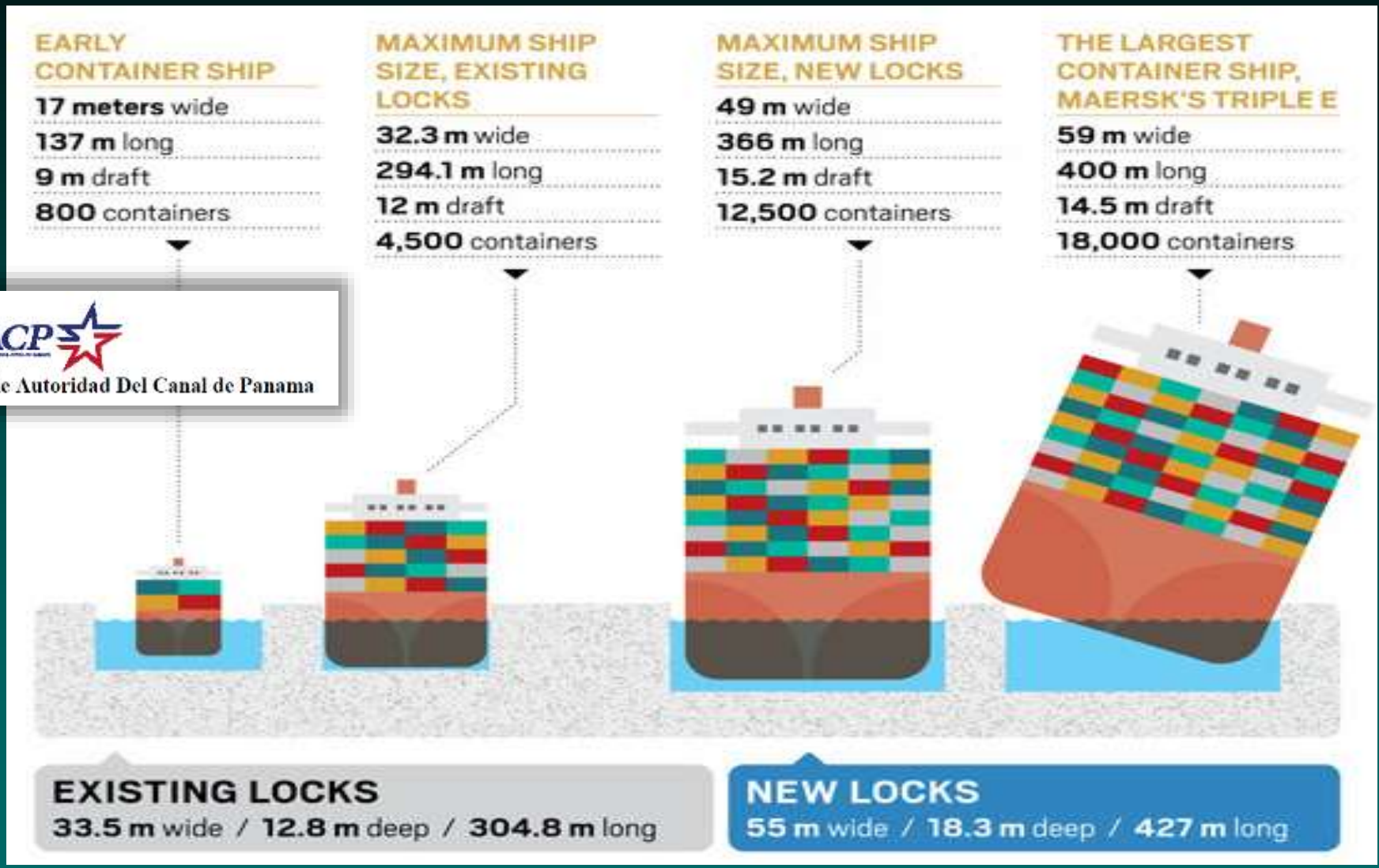
50 Years of Container Vessel Evolutionary Growth



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

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



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

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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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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CMA CGM Orders 9 New 22,000-TEU Vessels

CMA CGM Group's US$1.5 billion order for nine LNG Powered 22,000-TEUs container ships for delivery from the end of 2019.

Asia-Europe trade may be set for 24,000 TEU ships from 2019

Source: American Shipper - Lloyd's List

Hyundai Heavy Industries (HHI) Confirms Orders of "*Megamax*" Boxships to Daewoo Shipbuilding & Samsung Heavy Industries For TWELVE 23,000 TEU Container Ships

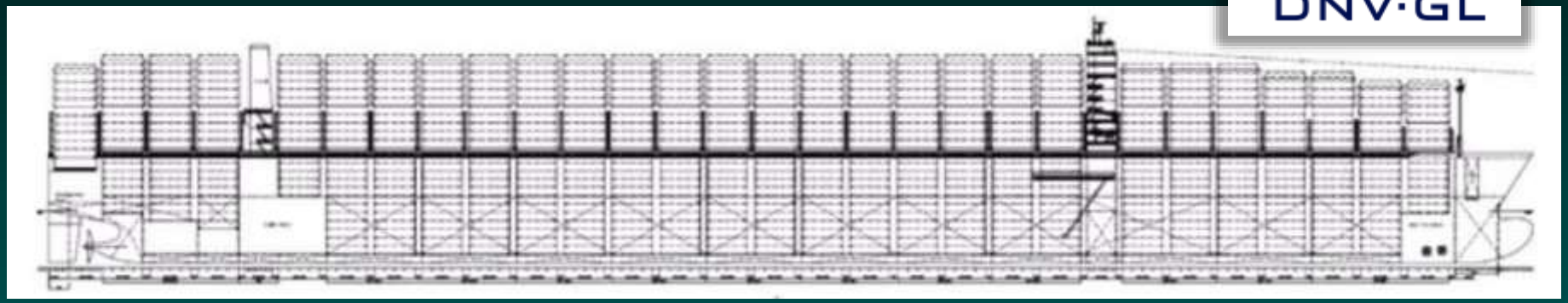
(Delivery in the second quarter of 2020)

- The twelve 23,000 TEU vessels will be deployed in the Asia-North Europe trade.
- All the "*ECO FRIENDLY*" new vessels will be sequentially delivered in the right time to prepare for the 2020 environmental regulations.

Source: Maritime Executive September 2018

Next Generation: *Suezmax 26,000 TEUs*

26 Bays, 25 Rows - Ultra Large Container Ships (ULCS)



With a Beam of 25 rows & Length of 26 bays
(LOA: 430 meters – 1,411 feet)
the ULCS capacity could reach **26,300 TEU.**

***Port of Antwerp**: New Terminals in Europe are using 26,000 TEU design vessels*

Source: DNV GL in-house methodology - “Concept Design Assessment”

Ultra Large Container Vessels (ULCV): Megamax-24 Era

(Post Neo-Panamax Comparative Vessel Characteristics)

ALPHALINER

***Alphaliner*: Megamax - 24**

MGX-24 Vessel

Length: 24 Container Bay
Breath: 24 Deck Rows
Height: 24 Container Tiers
In Hold: 12 container Tiers

Mega Container Vessel	Alphaliner Designation	TEU Capacity	Length ft.	Beam ft.	Loaded Draft ft.	Explanatory Notes
ACP "Neo-Panamax"	-	12,600	1,200	160.7	49.90	ACP Neo-Panamax Data
MAX Neo-Panamax	-	14,500	1,201	158.31	52.49	CMA CGM's T. Roosevelt
Post Neo-Panamax	**MGX-20**	**20,000**	**1,312**	**192.49**	**52.49**	**Design Vessel LNG**
Post Neo-Panamax	**MGX-22**	22,000	1,315*	193.57	52.49	CMA CGM 22,000 Option to go to 24 Rows
Post Neo-Panamax	**MGX-24**	24,000	1,319	201.44	52.49	
Post Neo-Panamax	**MGX-26**	26,000	1,411	209.31*	52.49	ULCV Suezmax 26,000 TEUs

* Calculated Value/Derived Value

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

26.8 Double Stacked Trains

Assuming a 75% Intermodal Rail Split

26.8 Double Stacked Trains

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Emerging Opportunities for Rail and Water

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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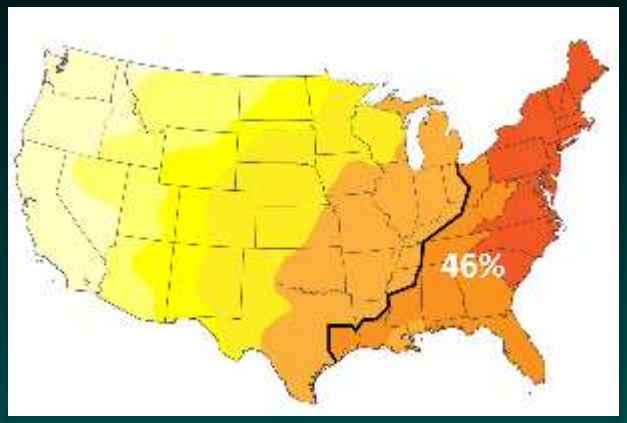
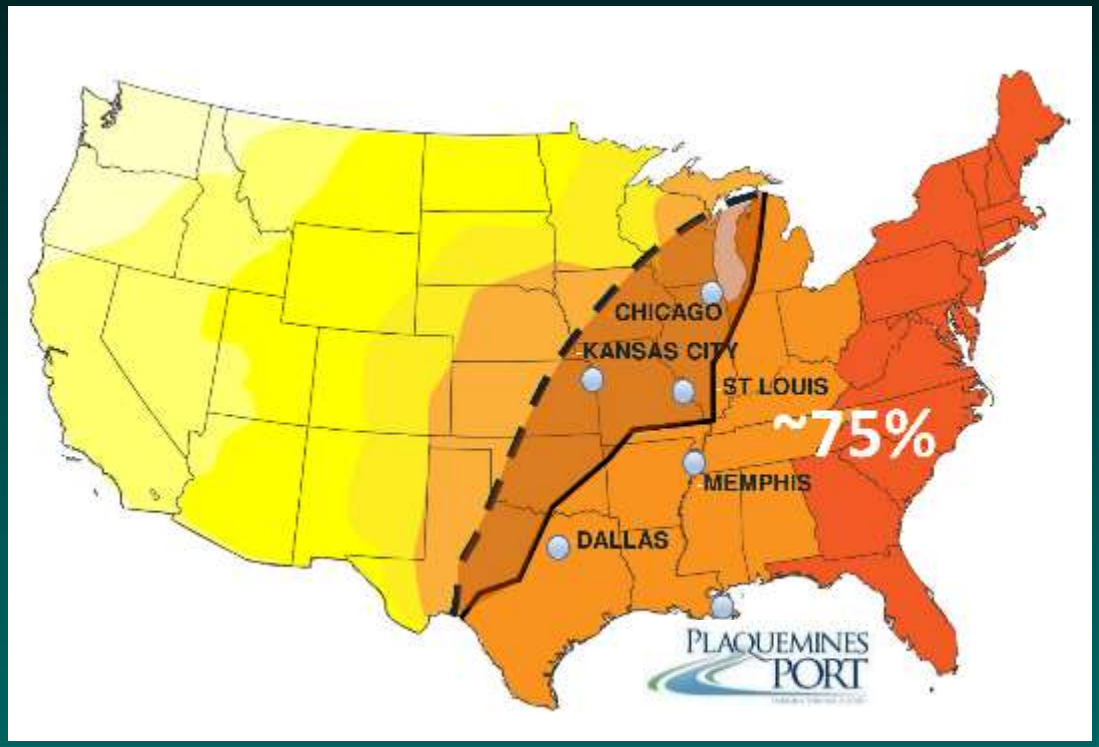
US Market Penetration Via Panama Canal Expansion

(Economies of Scale)



46 % Penetration, Before 2016
Via All Water, 4,500 TEU Vessels

63 % Penetration, After 2016
Via All Water, 8,000 TEU Vessels



75 % Penetration, 2018 & Beyond
Via All Water & Pendulum Service
14,500 TEU Vessels

Source: Potential Effects of the Panama Canal Expansion on the Texas Transportation System

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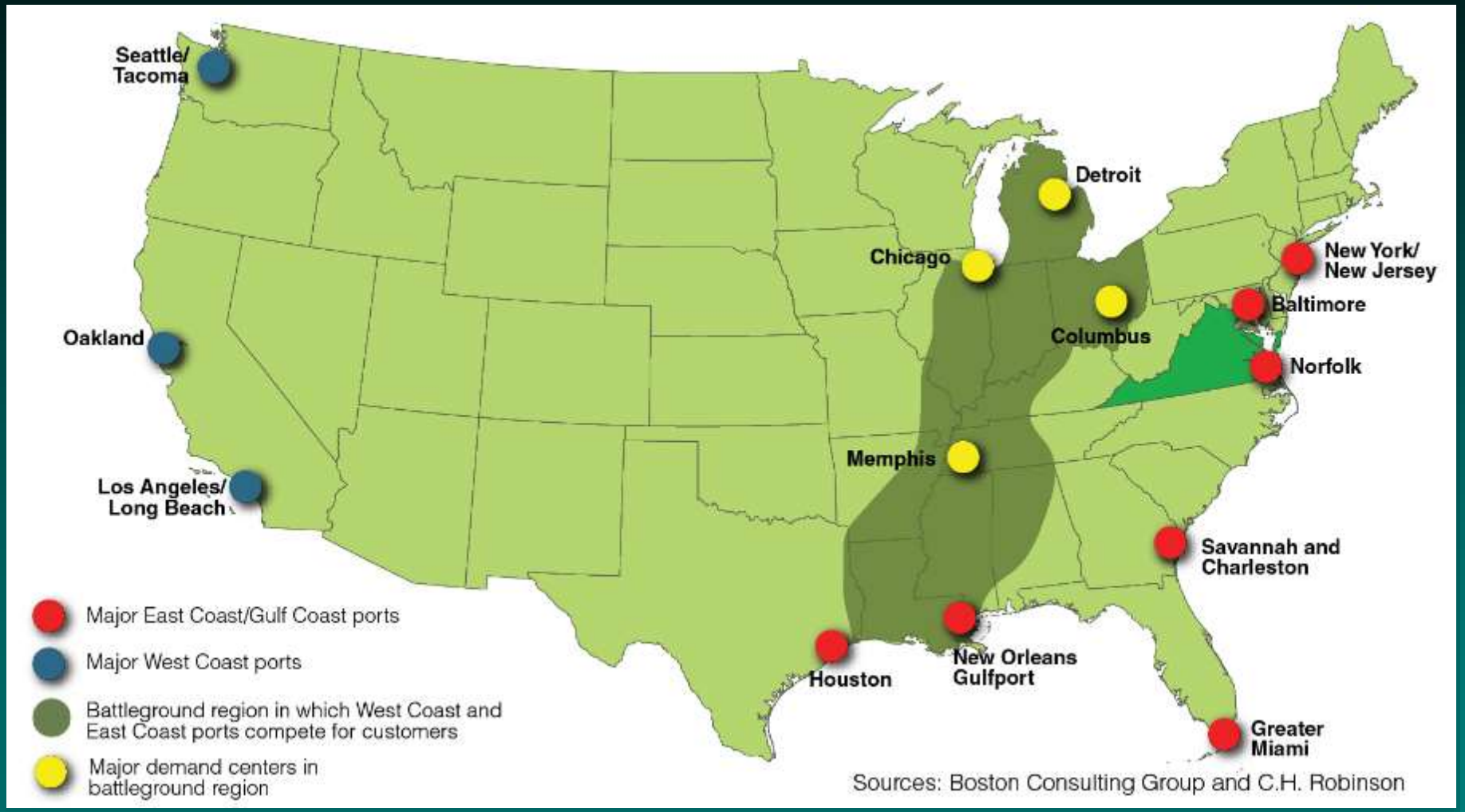
New Container Port Battleground Region

(Representing 15% of the US GDP)



Source: Boston Consulting Group & C. H. Robinson

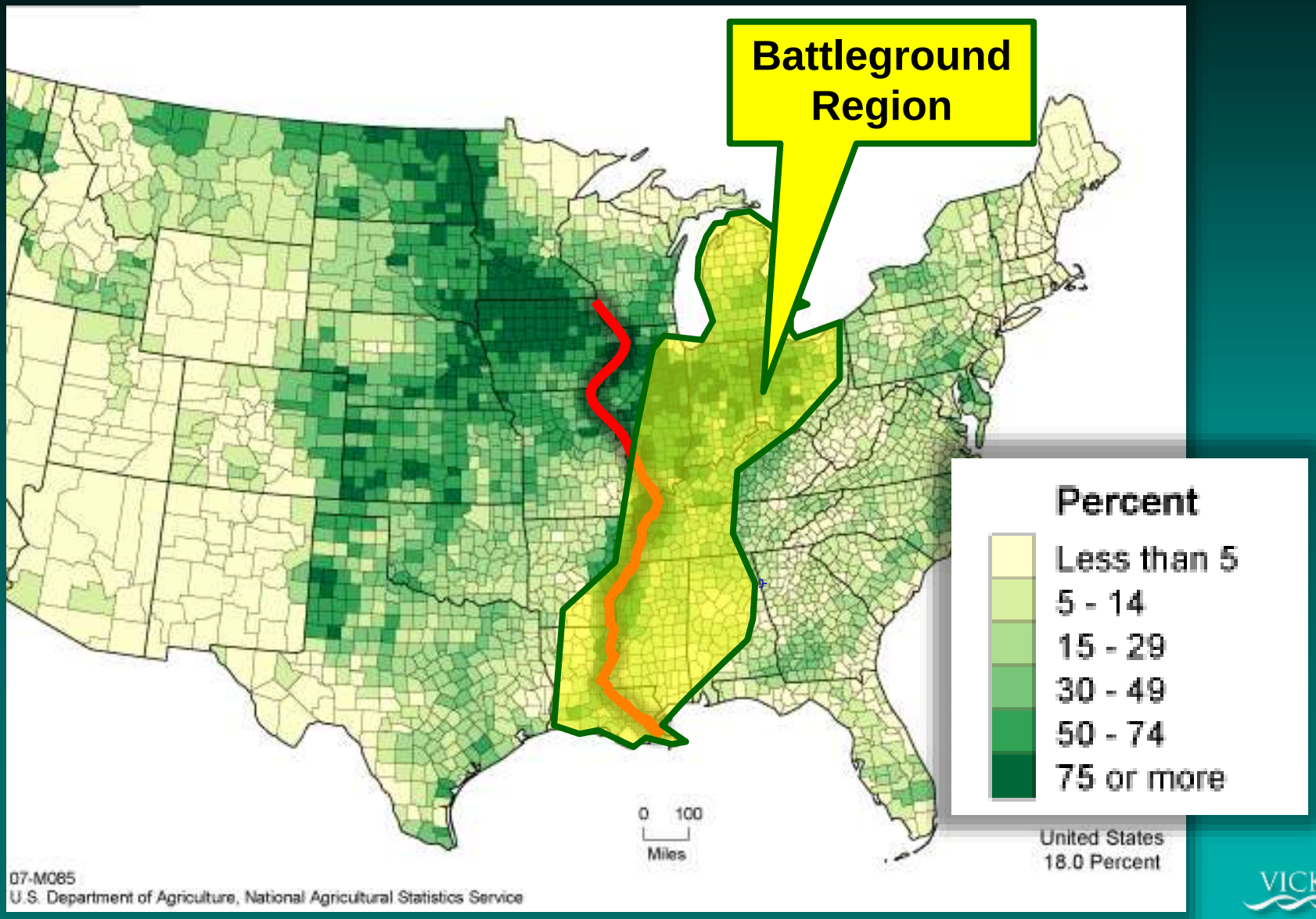
New Container Port Battleground Region

(Representing 15% of the US GDP)

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

North American Cropland Intensity

(Acres of Cropland as a percent of Land Area)



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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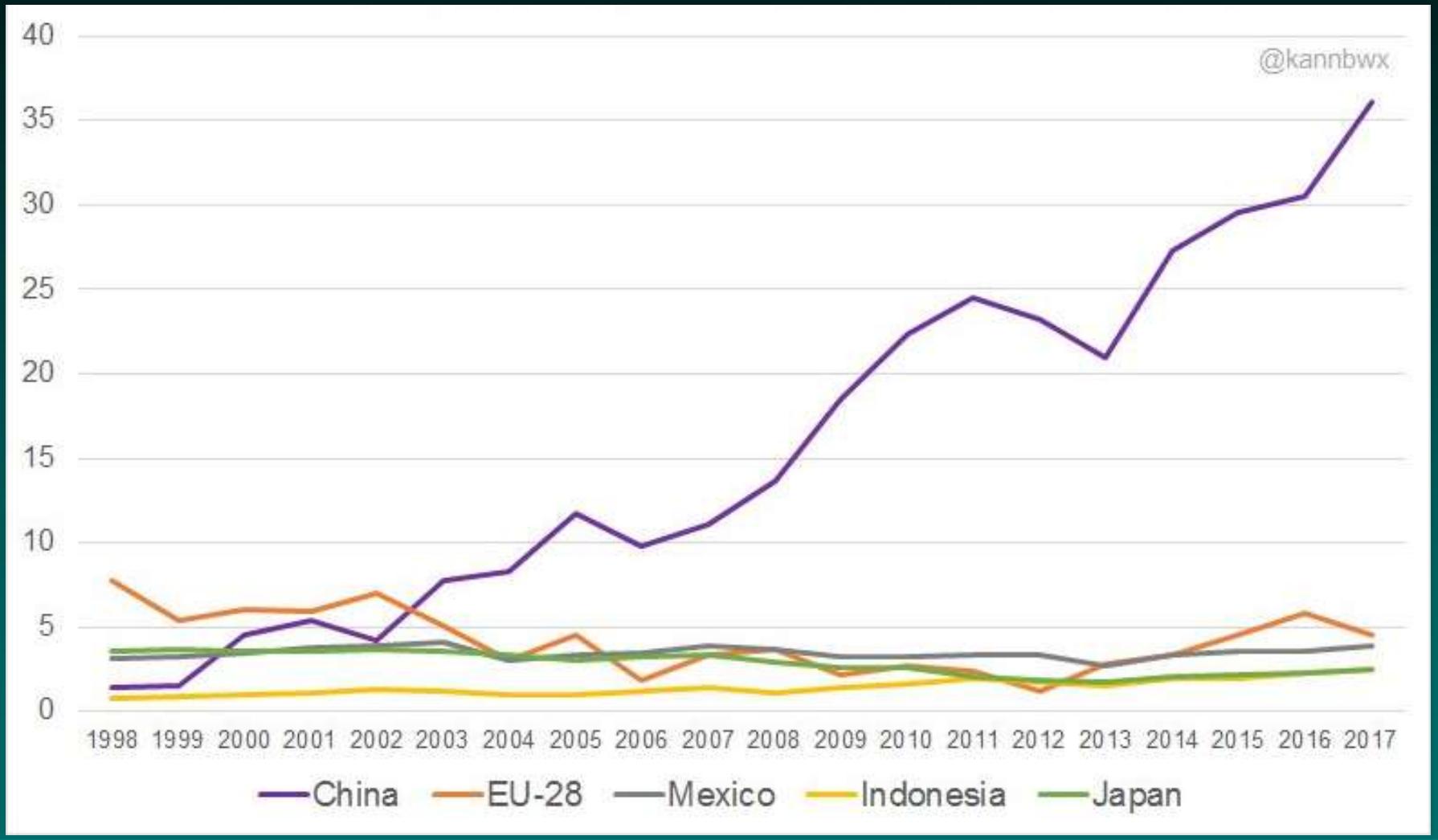
US Soy Exports – Top 5 Destinations

(Millions of Tons)



Source: Karen Braun@kannbwx - Global Agriculture Columnist at Thomson Reuters

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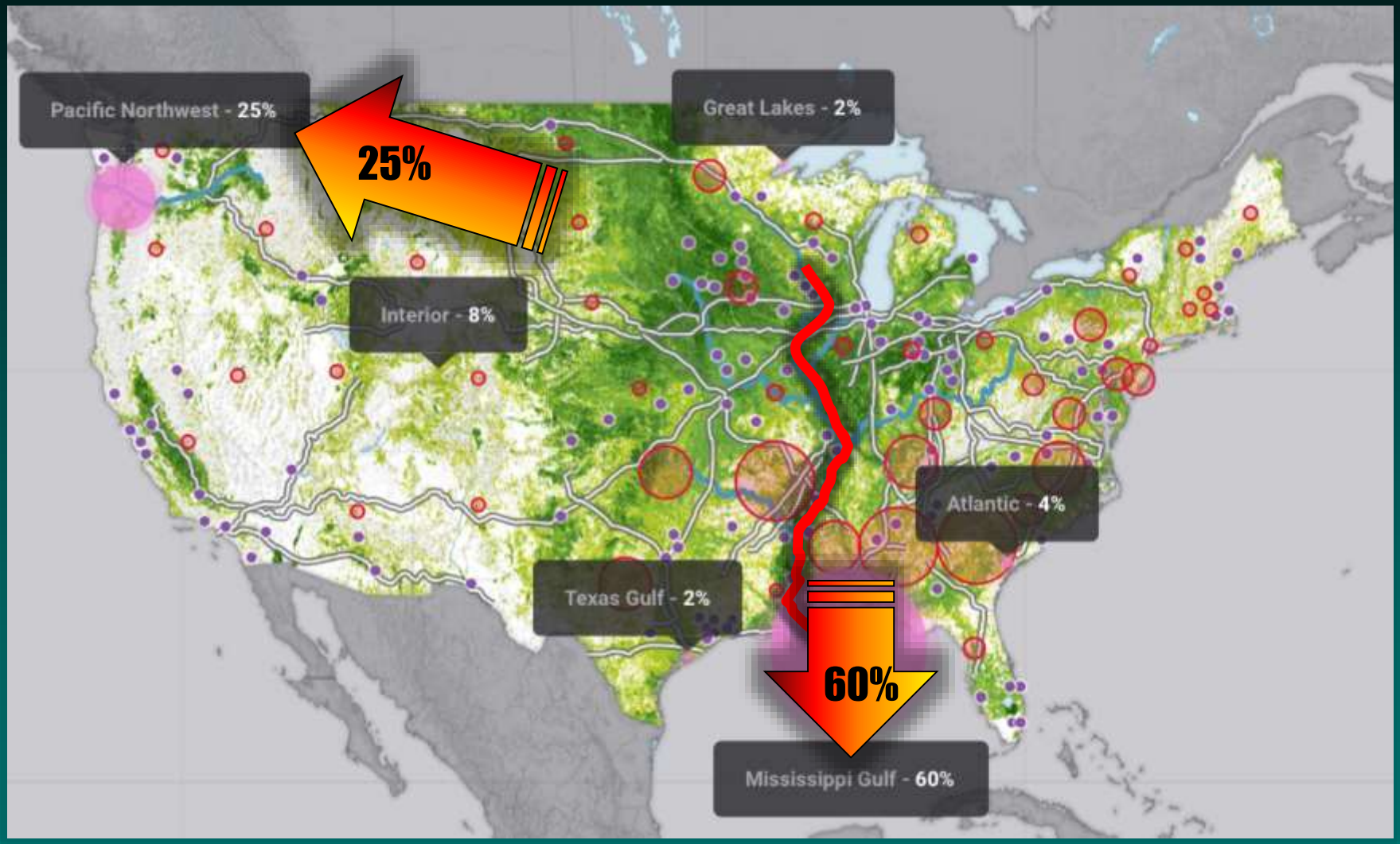
US Soybean Destinations (2016)

(Primary International Export Percentages)



Source: IIASA-IFPRI, USDA AMS, Gro Intelligence

China will be hard-pressed to find another country that can produce as large a volume of soybeans as American farmers. Brazil and Mexico are two other sources for soybeans, but they can't match the U.S. in capacity.

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Emerging Opportunities for Rail and Water

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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Mississippi River Deepening: Southwest Pass to Baton Rouge

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

The USACE in August 2018 signed the final economic justification report needed for the project.

"Two Phases in which 64 miles of the 254-mile portion from Baton Rouge to the Gulf of Mexico will need to be dredged.

Phase 1: Deepening the first 30 miles from Plaquemines to Venice – Two years to complete.

Phase 2: Deepening the 36-mile portion from Belmont Crossing to Baton Rouge – Two years to complete.

The other portions of the river don't need to be dredged because they are already at least 50 feet deep"

Source: Sean Duffy, Big River Coalition, told BlueWater Reporting in December 2018

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

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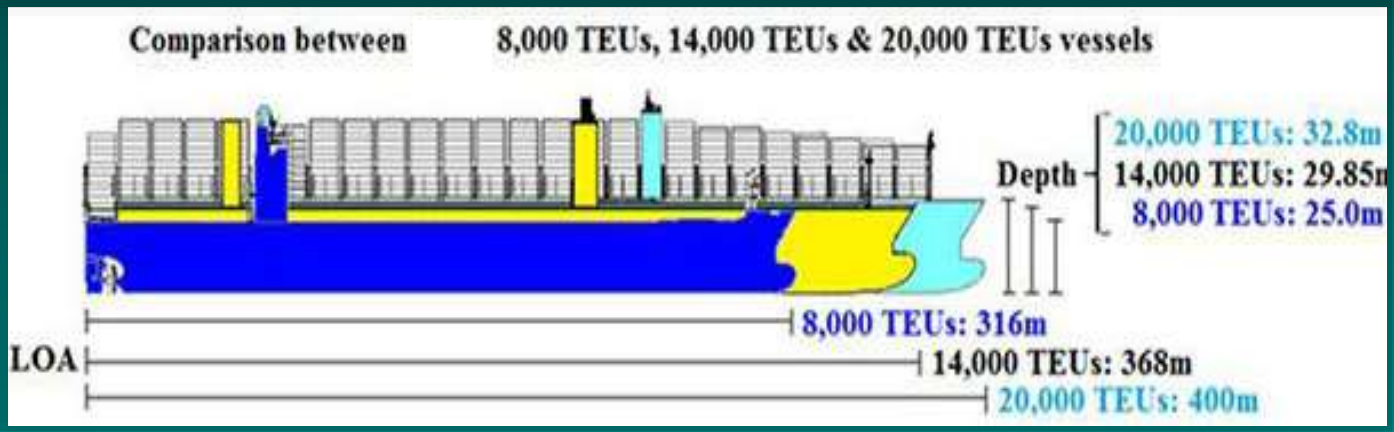
Historically the Largest Container Vessel to Call in the Lower Mississippi River was 8,000 TEUs with a Controlling Vessel Draft at 45 ft. (Eff. 47 ft)

Containership Size by Vessel Generation

Vessel Class	Capacity (TEU)	Containers Across	Draft (feet)	Beam (feet)	Length Overall (feet)	Air Draft (feet)
Panamax	4,000	15	40	106	965	117
Post-Panamax	7,000	17	49	144	1,100	138
Super Post-Panamax	9,000	19	50	158	1,200	159
Neo Panamax	13,000	20	50	160	1,200	164
Megaship	18,000	23	52	193	1,300	187



With Controlling Depths at 50 ft. - 53 ft. The Largest Current Container Vessels Could Reach 18,000 to 20,000 TEUs in the Lower Mississippi River

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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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It Is Not Inconceivable that by 2025 the Lower Mississippi Design Vessel May Well be a 14,500 to 20,000 TEU Container Ship

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Emerging Opportunities for Rail and Water

Emerging New Inland Waterway Vessel Technology & Up River Terminals

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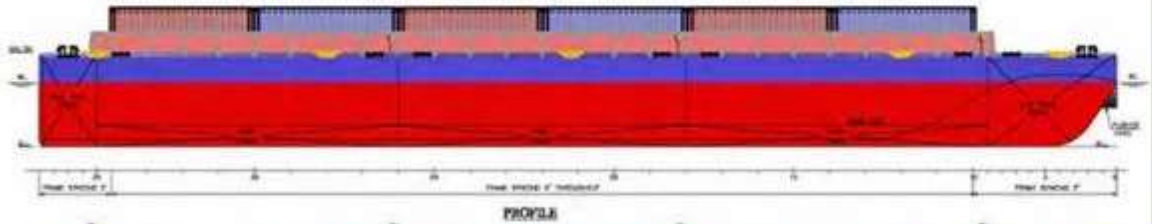
“Deck” Barge Loaded with Containers

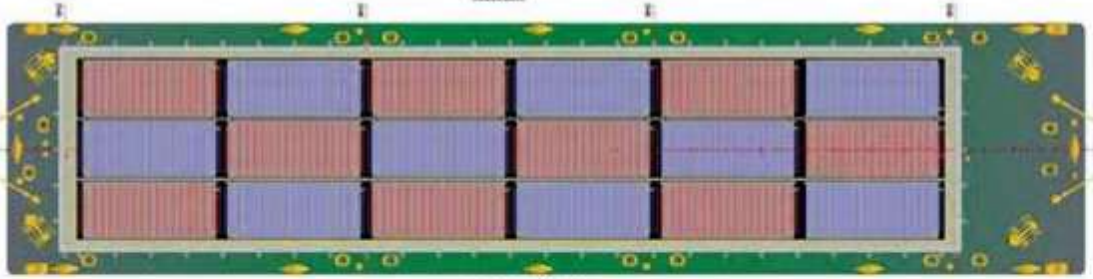
“Hopper” Barge Loaded with Containers

Source: USDOT Maritime Administration MARAD

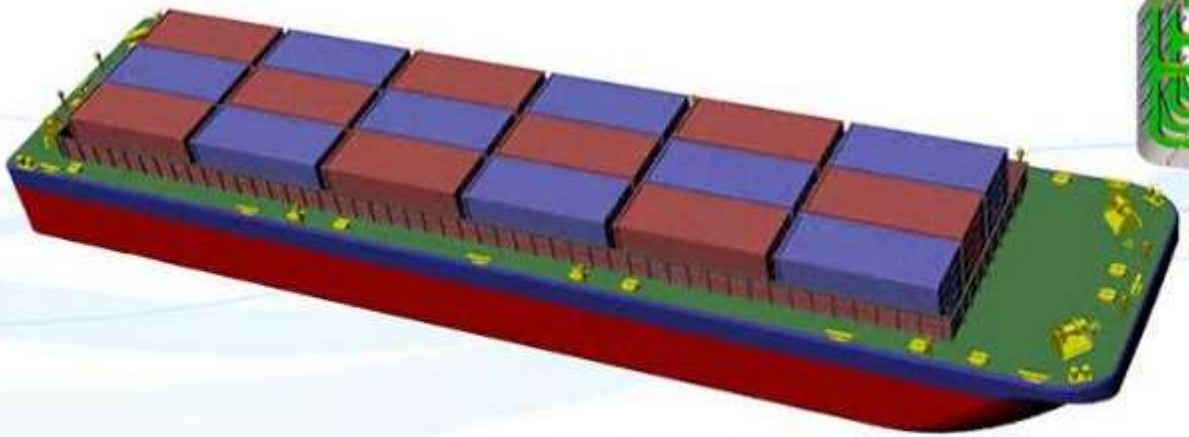
Customary Container on Barge (COB)



PROFILE



MAIN DECK PLAN



Length OA	:	150'-0"
Breadth Mld	:	35'-0"
Depth Mld	:	12'-6"
Draft	:	9'-0"
Type of Vessel	:	Double Skin Hold-Container Barge
No. of Containers	:	36 TEU
Max. Stack Weight	:	40T
Deadweight	:	2450 kip

Features

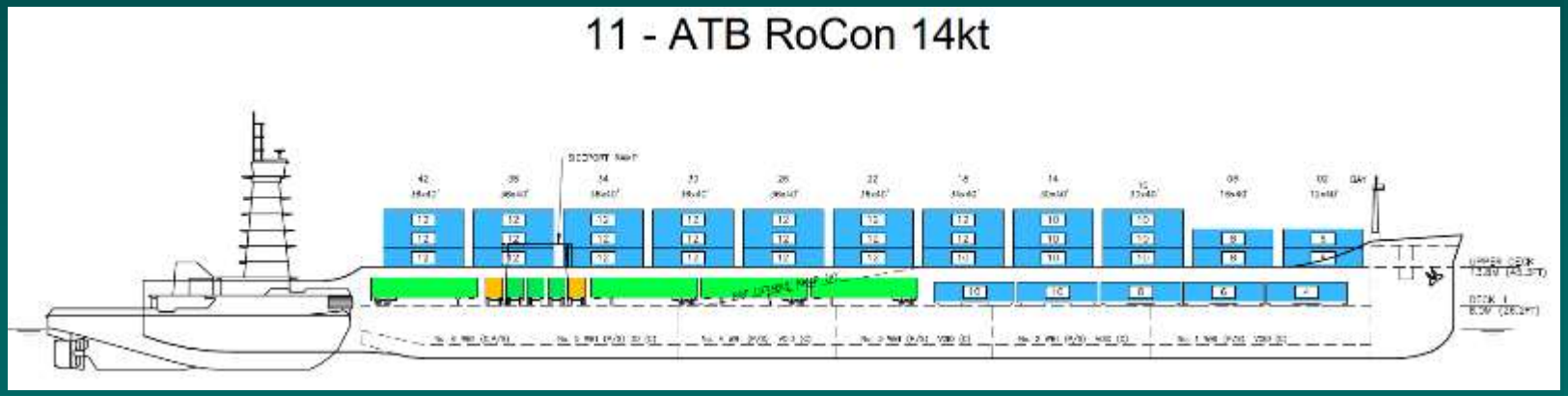
- Container stowage on-deck
- Highly fuel efficient transportation
- Ballast tanks optimized for Even keel loading/unloading

VICKERMAN

Virginia Port Authority SSS Route to Richmond, VA

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

VICKERMAN

Short Sea Shipping Expertise Today: European Common Market

Short Sea LNG Bunker Vessel

AMSbarge Containerkraanschip

(Port of Rotterdam)

Amsterdam
Barge Shuttle

Port of Hamburg Port Feeder Barge Concept

(168 TEU Capacity)

Port Feeder Barge Gmbh Port of Hamburg

Port Feeder Barge Gmbh
Port of Hamburg

PORT FEEDER BARGE GmbH
Managing Director:
Dr.-Ing. Ulrich Malchow

Yara Birkeland Autonomous Electric Container Vessel Operations

The all-electric container vessel Yara Birkeland (the joint project of Yara and technology company Kongsberg)

The Yara Birkeland will be the world's first fully electric and autonomous container ship. At 70m with a 100-150 TEU capacity, it will travel with remote pilotage by 2019 and **fully autonomous by 2020.**

Yara Birkeland Autonomous

Zero Emission – No Ballast Vessel

Yara Birkeland Autonomous

Zero Emission – No Ballast Vessel

American Patriot Holdings (APH)
Prototype US Inland Container Vessel

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

VICKERMAN

American Patriot Holdings (APH)
Prototype US Inland 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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American Patriot Container Transport, LLC. (APCT) General Vessel Fleet Characteristics

LOA Feet	Beam Feet	TEU Capacity	Scantling Vessel Drafts
595	100	1696	10.0 ft.
772	100	2392	10.0 ft.
952	100	2960	10.0 ft.
1042	100	3244	10.0 ft.

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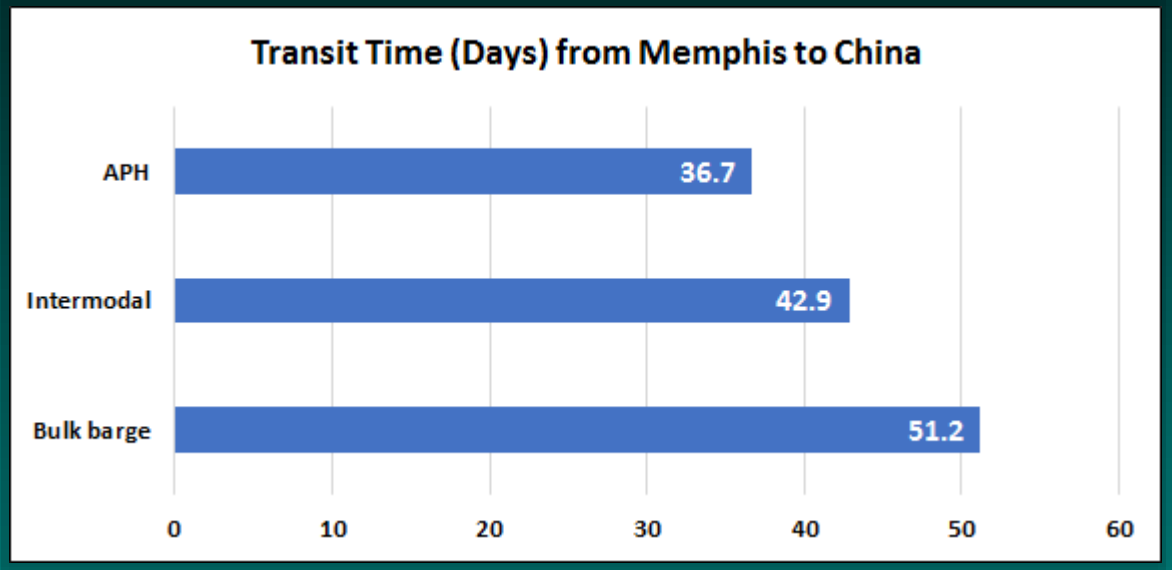
American Patriot Container Transport, LLC.
Hybrid 600 ft Lock Vessel Characteristics

LOA Feet	Beam Feet	TEU Capacity	Scantling Vessel Drafts
595	**100**	**937** - 4 Tier	**10.0 ft.**
595	**100**	**1,190** - 5 Tier	**10.0 ft.**
595	**100**	**1,443** - 6 Tier	**10.0 ft.**
595	**100**	**1,696** - 7 Tier	**10.0 ft.**
Speed: 18 mph, Fuel: LNG			
Vessel Range: 2000 miles			

VICKERMAN

Logistics Scenarios for the Transport of Agricultural Products From Memphis to China

("Containerized Exports via the Inland Waterway System: An Opportunity for Agriculture")



Cost (USD per Metric Ton) from Memphis to China	
APH	$104.86
Intermodal	$176.59
Bulk Barge	$75.69

Source: October 2018 Soy Transportation Coalition & Illinois Soybean Association (Informa's Agribusiness Consulting)

Inland Waterway Vessel Transfer to Ocean Container Transport

1824 TEUs to 3244 TEUs

Commercially Viable

Cargo Quantity Viability?

200 - 900 TEUs

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