



Center for Secure and Resilient Maritime Commerce

Developing a Resiliency Framework for Regional Freight Platforms

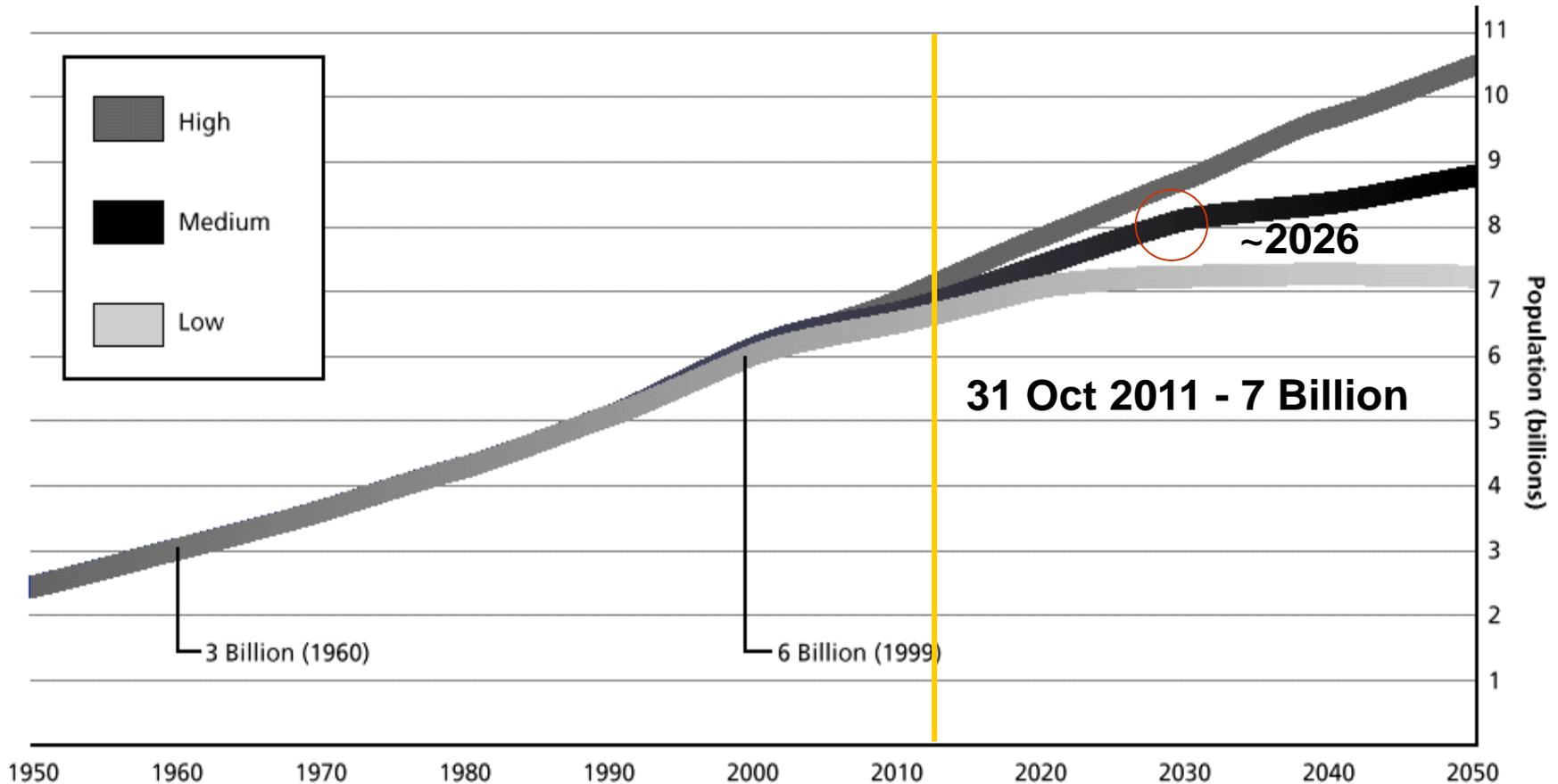
T. Wakeman, H. Gajjar, J. Ramirez-Marquez,
and H. Salloum

Stevens Institute of Technology
Center for Secure and Resilient Maritime Commerce

Trade & Transport Trends

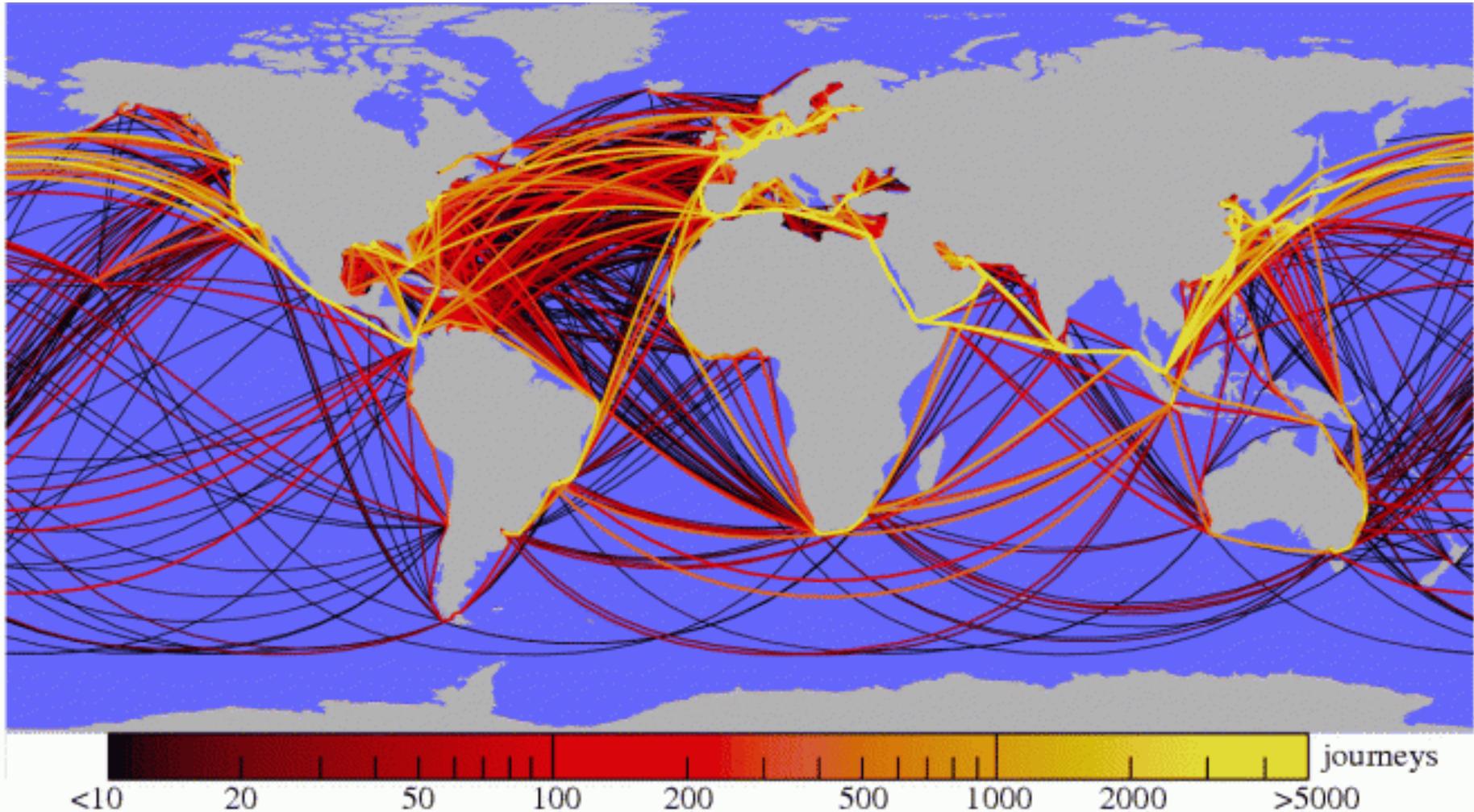
- Continuing global population/trade growth
- MTS consolidation (liner services merging)
- Global supply chain integration
- Changing trade patterns and markets
- Expanding economies of scale/scope
- Business driver of service reliability
- Emerging regional freight platforms (RFP)
- Are RFPs a resiliency strategy?

World Population Growth 1950 to 2050 (projected)



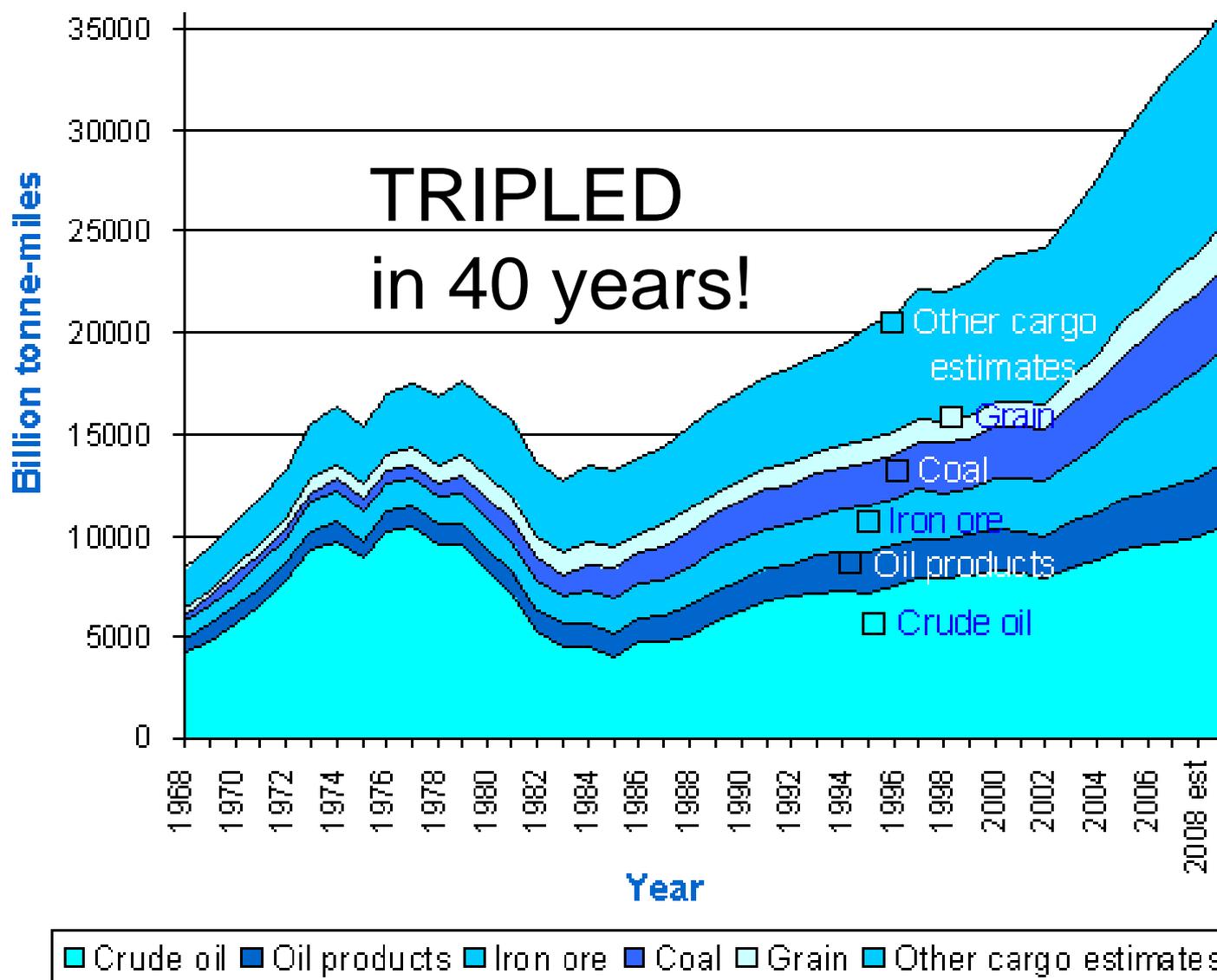
Source: United Nations. 1998. *World Population Prospects (The 1998 Revision)*.

Shipping Grows with Trade



(Source: Kaluza, Kolzsch, Gastner, and Blasius (2010) "The complex network of global ship cargo movements" *J. Royal Society: Interface*)

Global Seaborne Shipping 1968-2008



(Source: <http://www.marisec.org/shippingfacts/worldtrade/volume-world-trade-sea.php>)

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Marine Transportation System

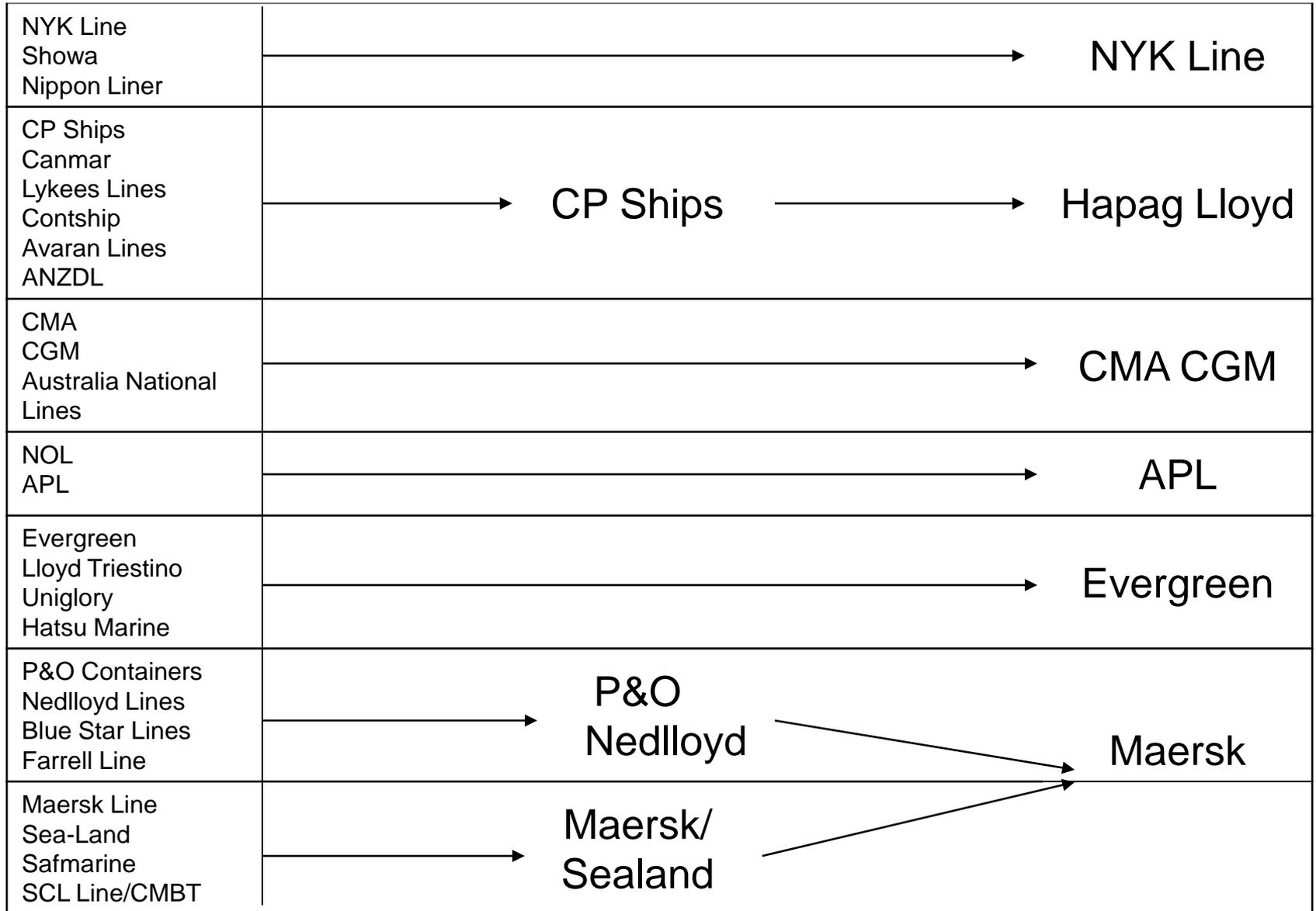
The Marine Transportation System (MTS) consists of vessels, waterways, ports, and intermodal landside connections, which allow the various modes of transportation to move people and goods to, from, and on the water... **and its character is changing.**

Global Terminal Acquisitions

Date	Terminal	Acquirer	Price (\$million)	Volume (TEUs)	Price TEU	Multiple
Sept 04	CSX World Terminals	DP World	1,142	3,300,000	\$346	14
Jan 06	P&O Ports	DP World	6,800	22,500,000	\$302	16
Nov 06	OOIL Terminals	Ontario Teacher's Pension Plan	2,400	2,570,000	\$935	27
Dec 06	Halterm	Macquarie	157.5	210,000	\$750	23
Feb 07	Montreal Gateway	Morgan Stanly	409.5	995,000	\$515	23
Mar 07	Maher Terminals	Deutsche Bank	2,300 (?)	1,900,000	\$1,053	~40 (?)

Source: *After* B. Cashon, Oct. 2010, AAPA Terminal Conf.

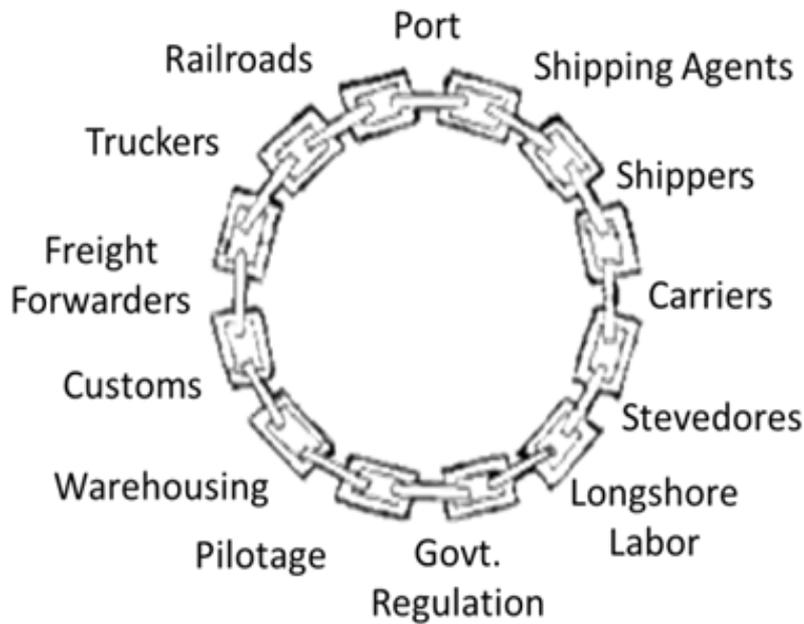
Carrier Consolidation from 1970 to 2010



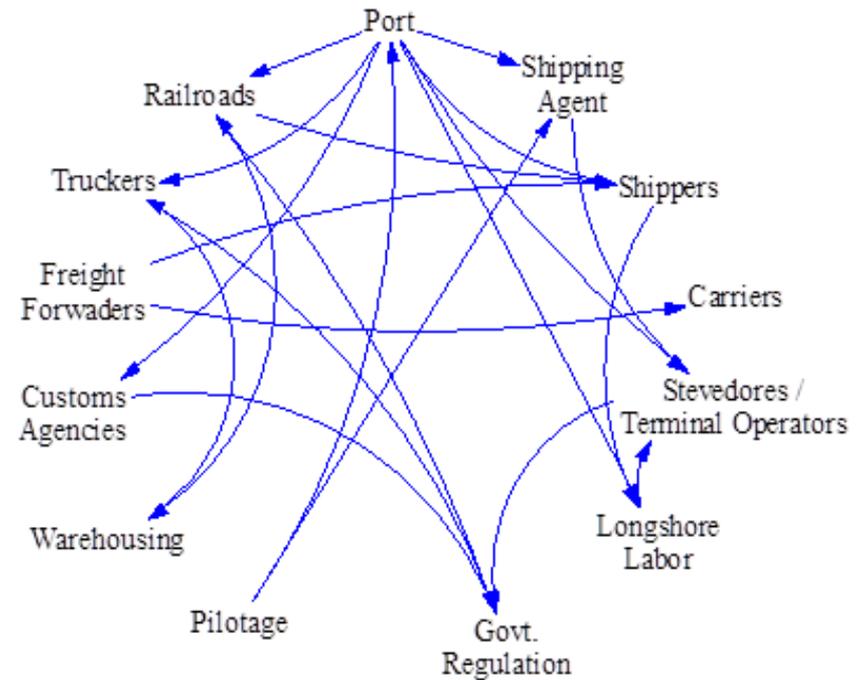
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Integration of Supply Chain Relationships

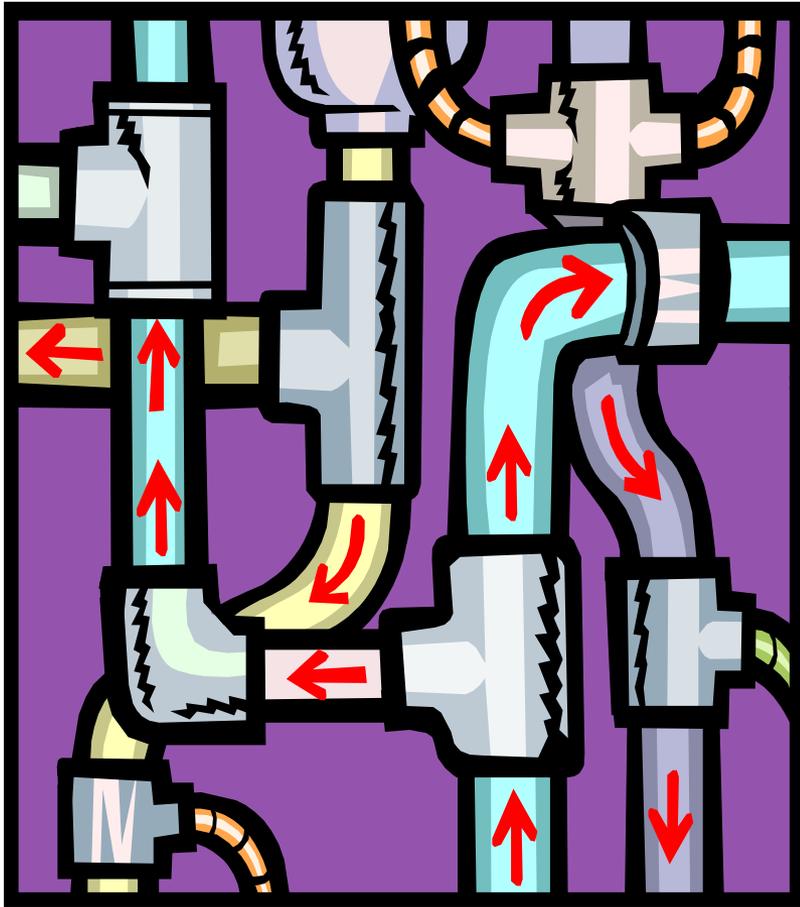


Traditional Supply Chain Model



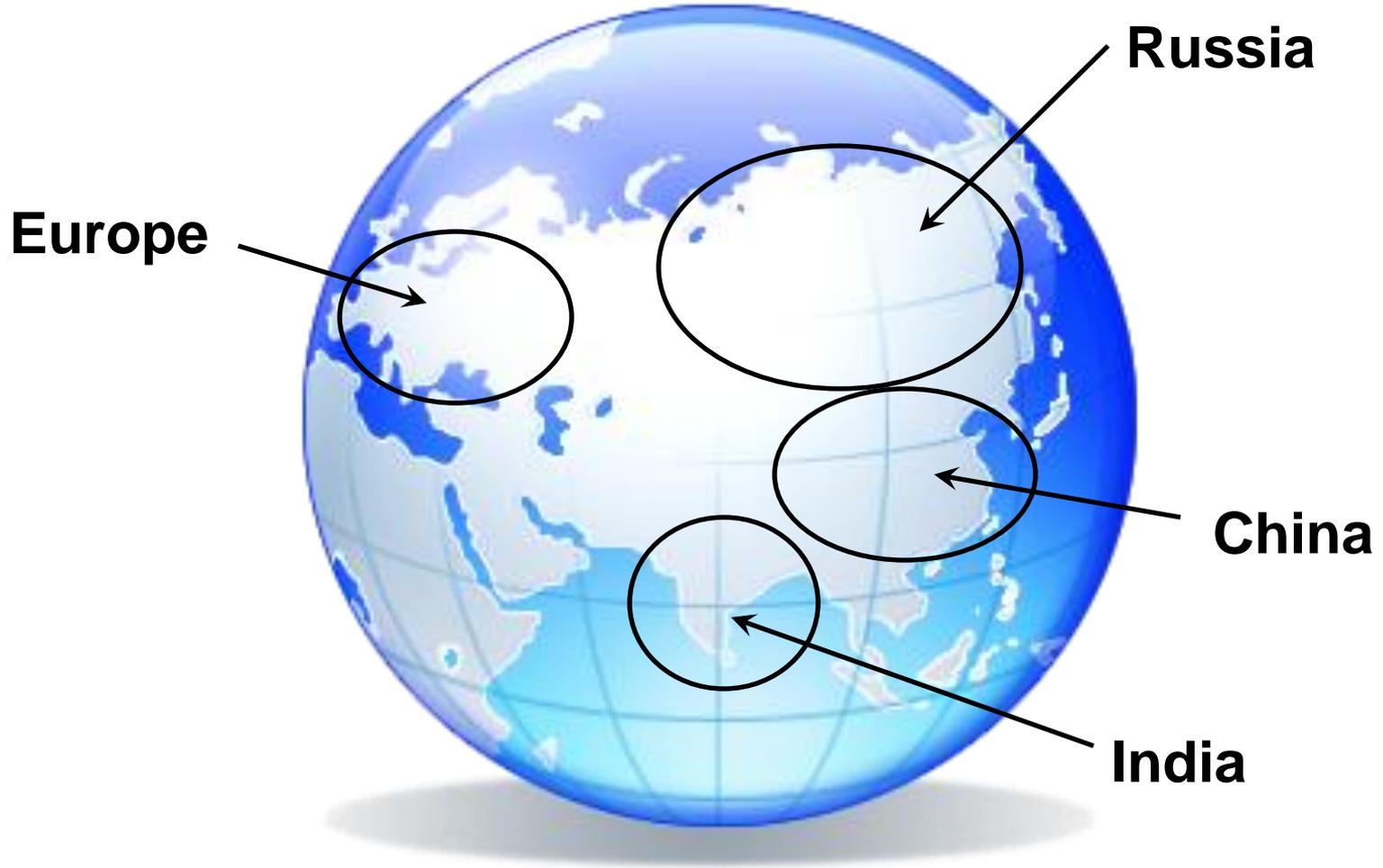
Logistics Network Model

From “Point-to-Point” Movement to Continuous Flow Pipelines

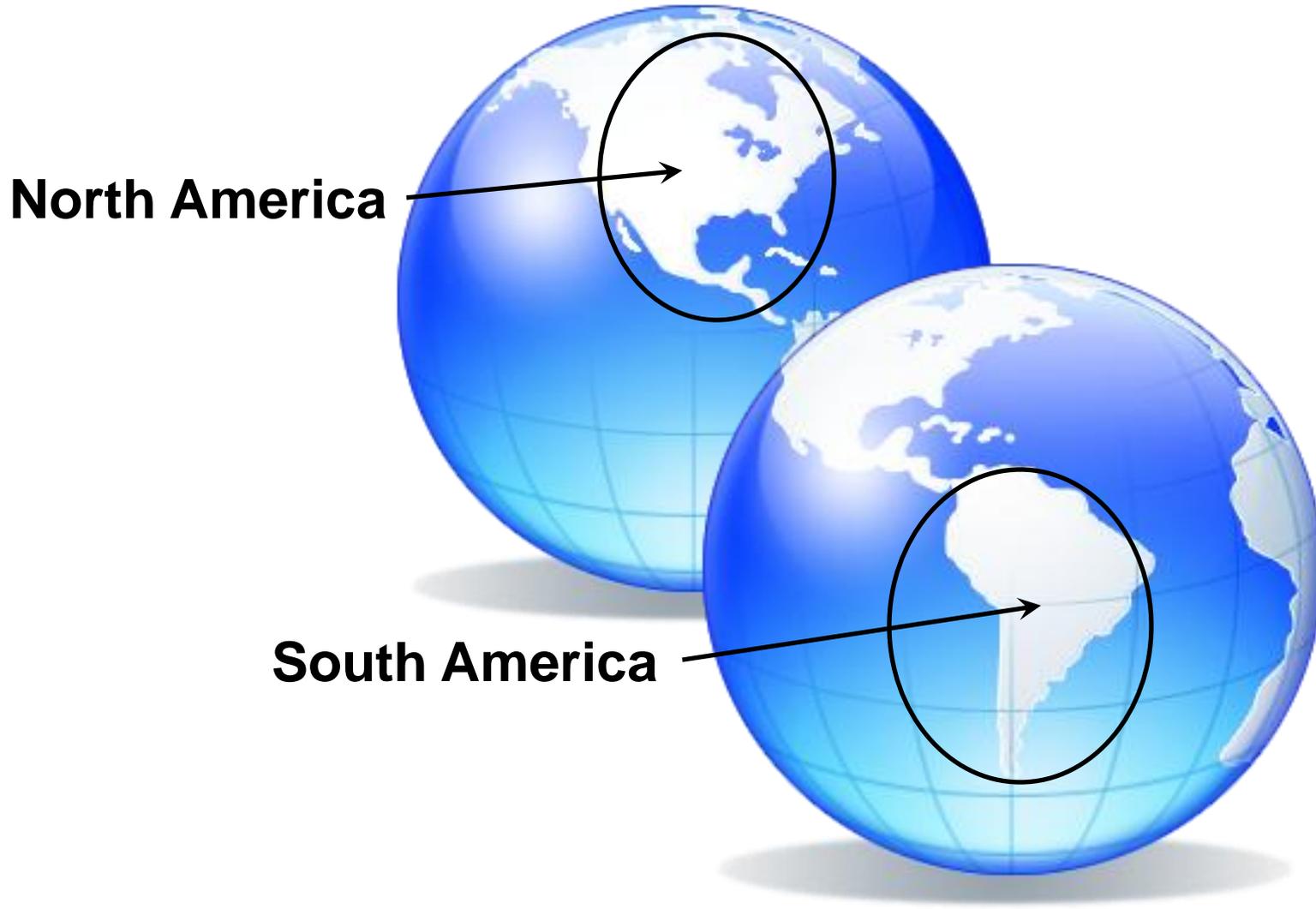


- Freight transportation is a “systems” issue and must be seen from a regional/national mobility perspective.
- The “logistics system” include waterways and terminals as well as landside access and distribution centers.

Four Mega-Trading Blocks



Two Mega-Trading Blocks



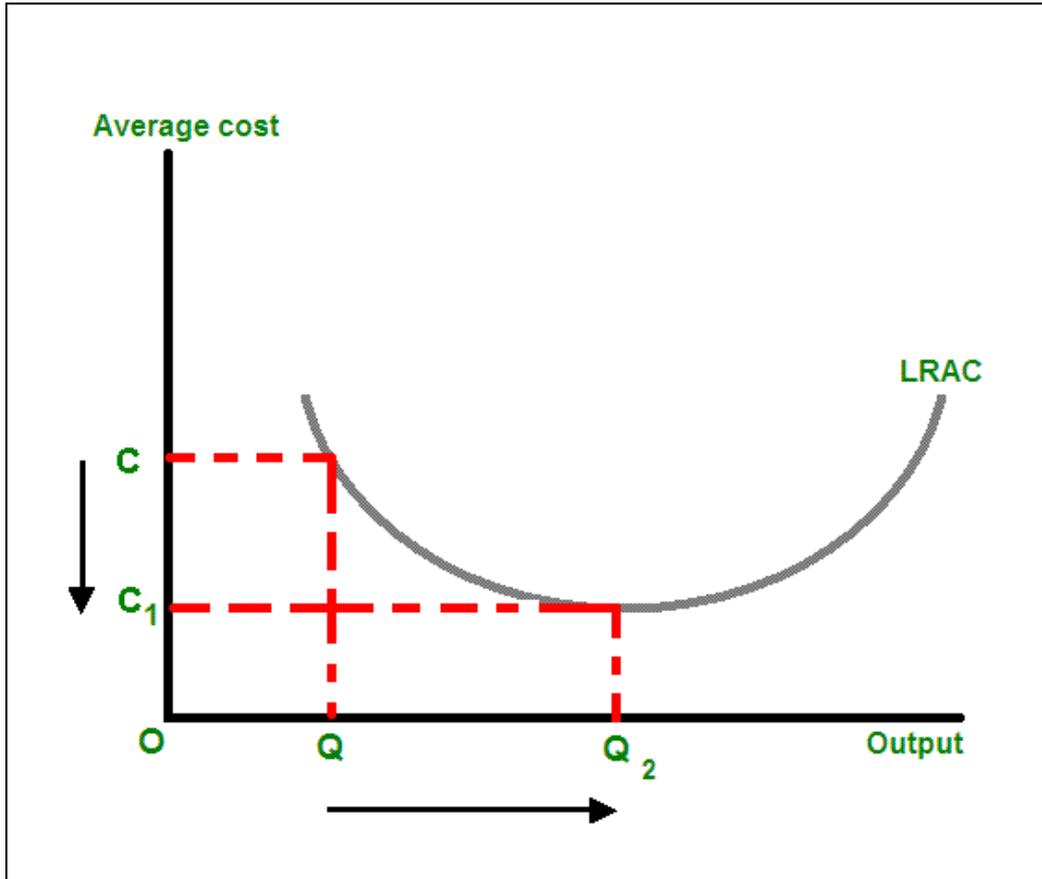
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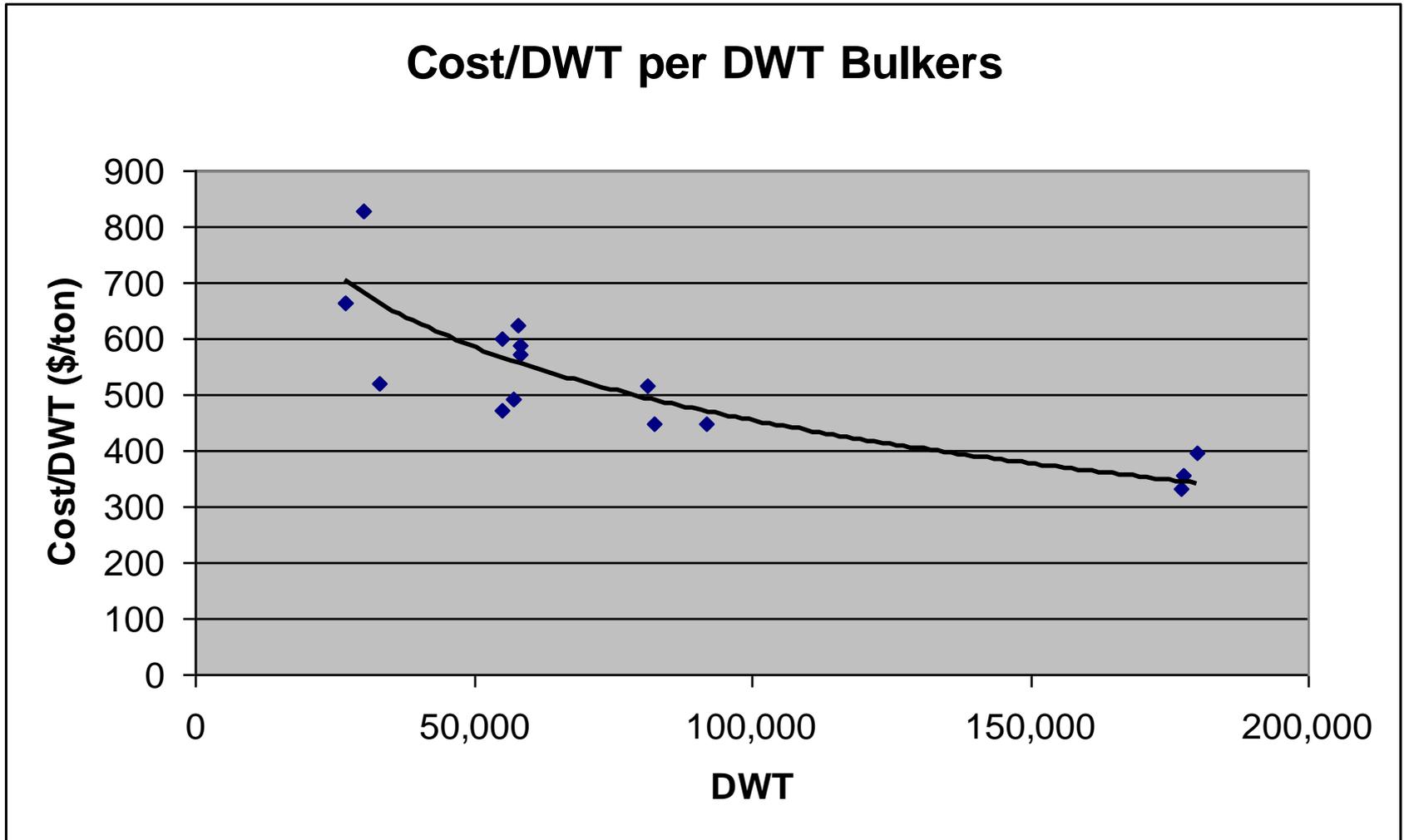
1996 Generation “Regina”
& 2006 Generation “Emma”

Economies of Scale



As quantity of production increases from Q to Q₂, the average cost of each unit decreases from C to C₁.

Cost of Construction



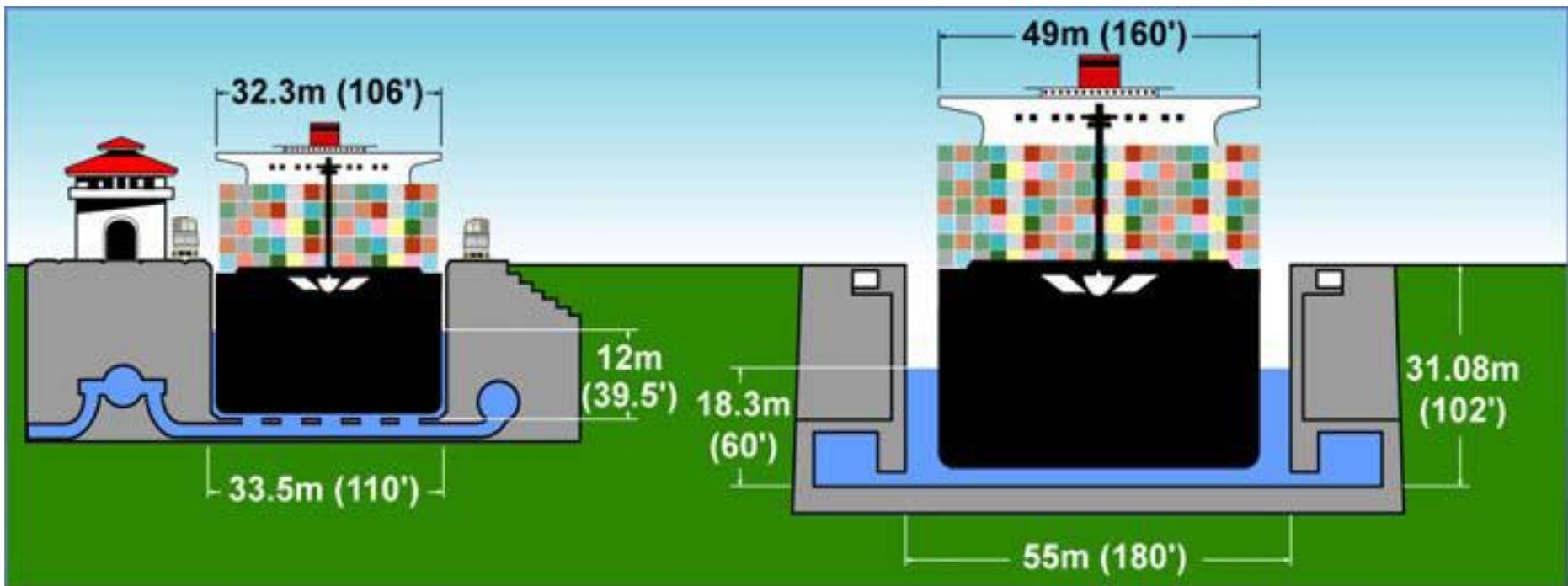
Source: Tradewinds Sales and Purchase Data, November 2009

14k Ship with Eight Gantry Cranes



Source: DPW_Daniela_14k.jpeg²⁰

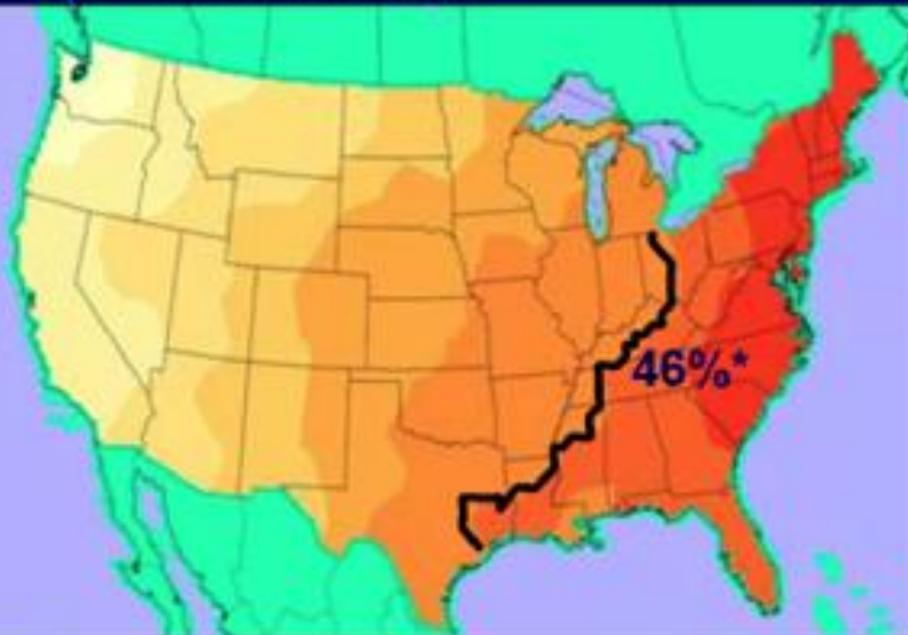
Bigger Ships Mean Bigger Infrastructure - New **\$5B** Panama Canal Expansion Opens in 2014



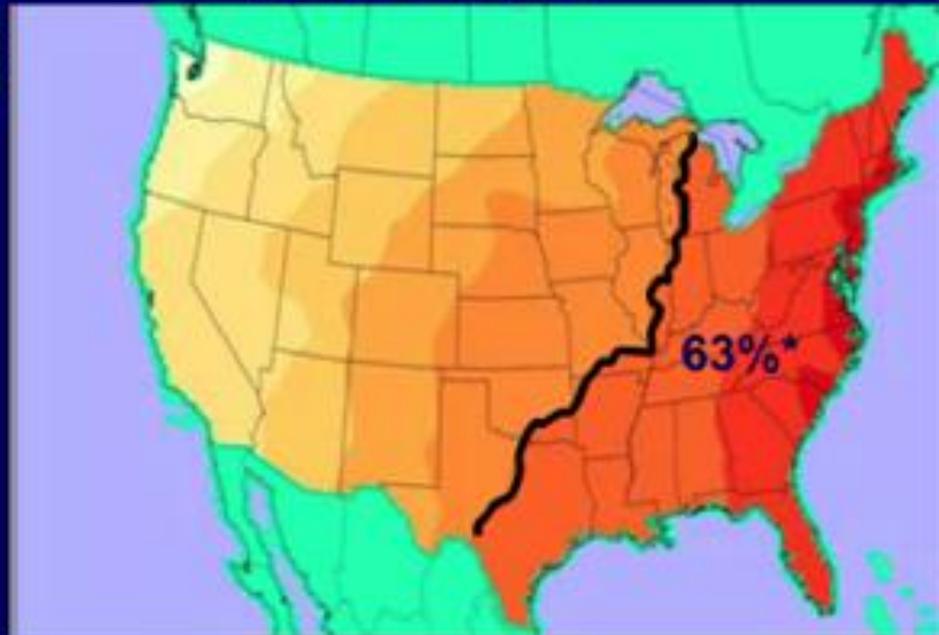
Total excavation = 133 MCM
Original 1914 construction = 205 MCM

Cost Advantage Comparison with 4000/8000 TEU Ships

4000 TEU ship



8000 TEU ship



- Left of the black line = West Coast has the cost advantage
- Right of the black line = East Coast has the cost advantage

(Source: Worley Parsons, Richard West)

East Coast ports reportedly investing more than \$6 billion for expansions...

- Demand for increased capacity
- Driven by ships/expansion of the Panama Canal
- Port & intermodal infrastructure issues
 - Availability of deep water and air draft
 - On-dock intermodal container transfer facilities
 - Seamless road and rail connectivity to nation
 - Access to warehouse & logistics centers
- Increasing business focus on system reliability

Trade & Transport Trends

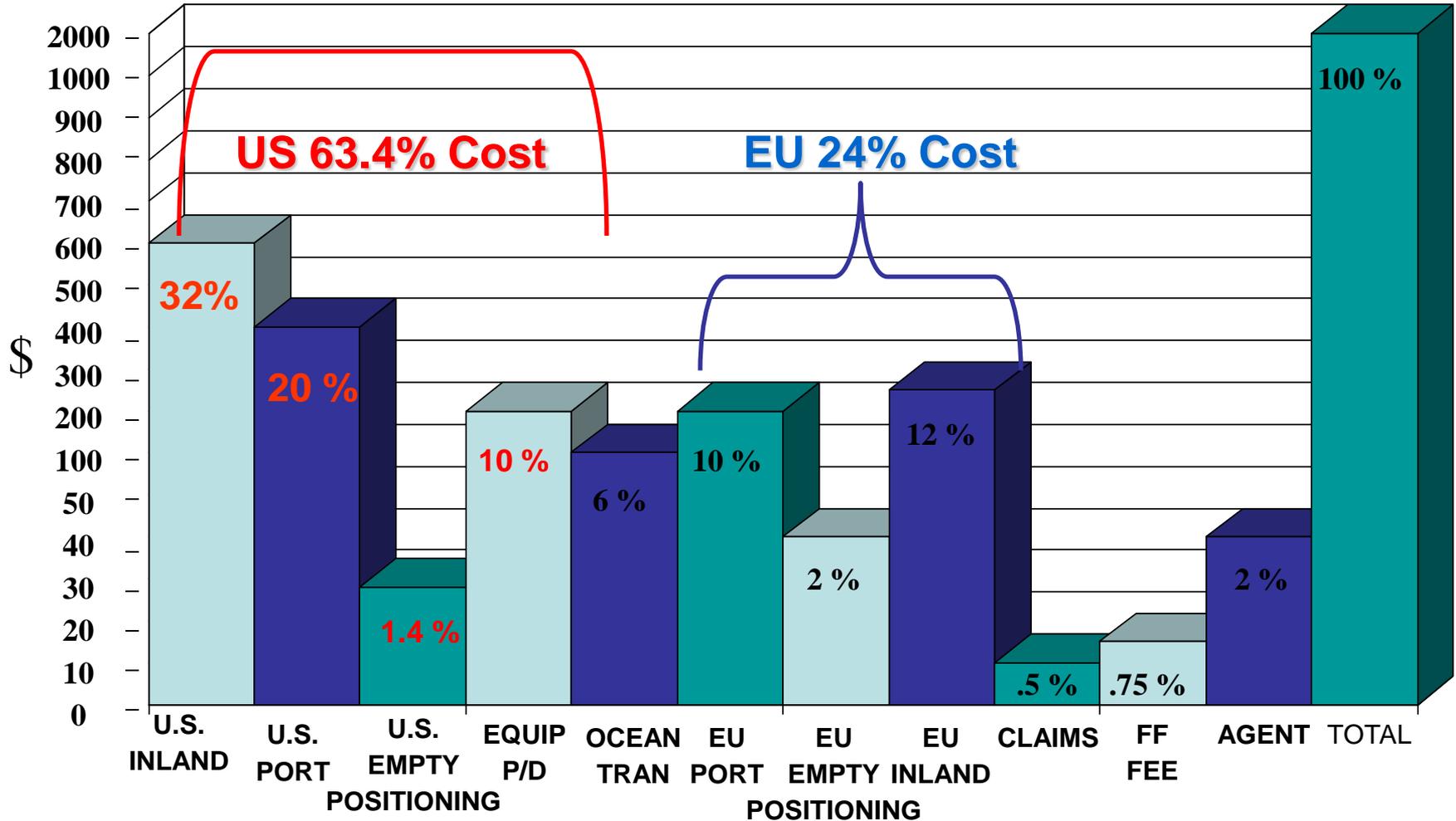
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National Export Initiative



- In 2010, President Obama launched the National Export Initiative (NEI), which aims to *double exports over the next five years*.
- This initiative is envisioned to significantly *increase the volume of American products entering the global marketplace*.
- Beyond the export of service sector products, these exports include agricultural goods, manufactured products, and natural resources.
- The President declared that *exports are important to boost the U.S. GDP, reduce the trade deficit, and help stimulate job creation*.

U.S. Exports Transport Cost from Midwest to Northern Europe



Cargo Owners' Demands from their Logistics Networks

- Competitive costs
- Velocity to the point of sale
- Reliability in cargo delivery

...and Reliability is KING!

If cargo moves from its current route because of poor performance to a new route, it almost never returns.

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A large container ship is docked at a port, with several cranes visible on the left side. The ship is dark blue and red, and is loaded with colorful containers. A seagull is flying in the sky above the ship. The background shows a body of water and distant hills.

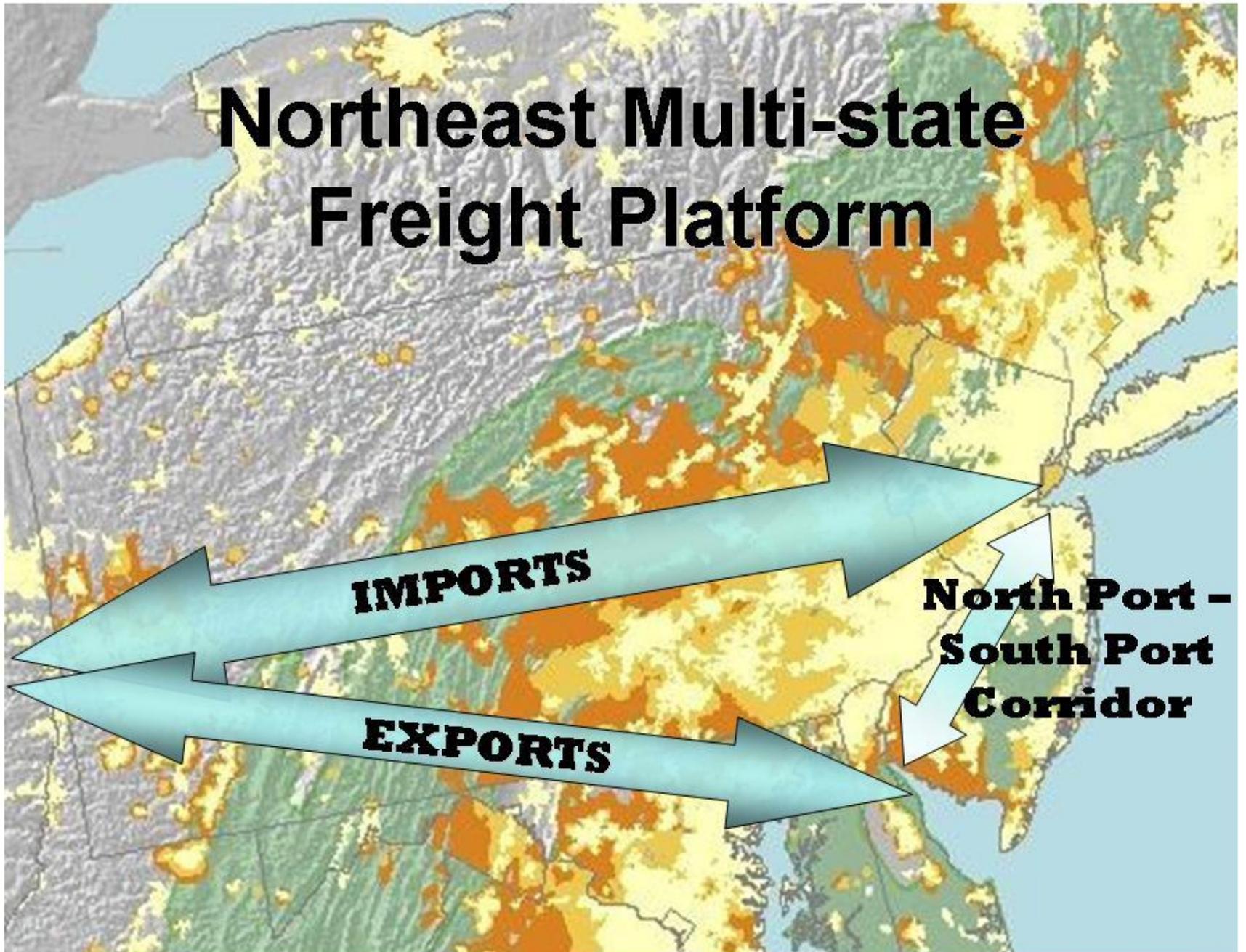
Planning for International (Import and Export) & Domestic Freight Movement

Northeast Multi-state Freight Platform

IMPORTS

EXPORTS

**North Port -
South Port
Corridor**



Economies of Scope or “Bigger is Better”

- Regional Freight Platforms serve expanded *geographic scopes beyond historic tributary cargo flows* to gain logistic efficiencies.
- These transport and distribution networks have redundant infrastructure and distribution capabilities available to *enable the existing supply chain to absorb a shock or disruption without crippling the chain’s ability to meet regional customer’s needs.*
- There will be competition among components.

Formation of a “Port Pole”

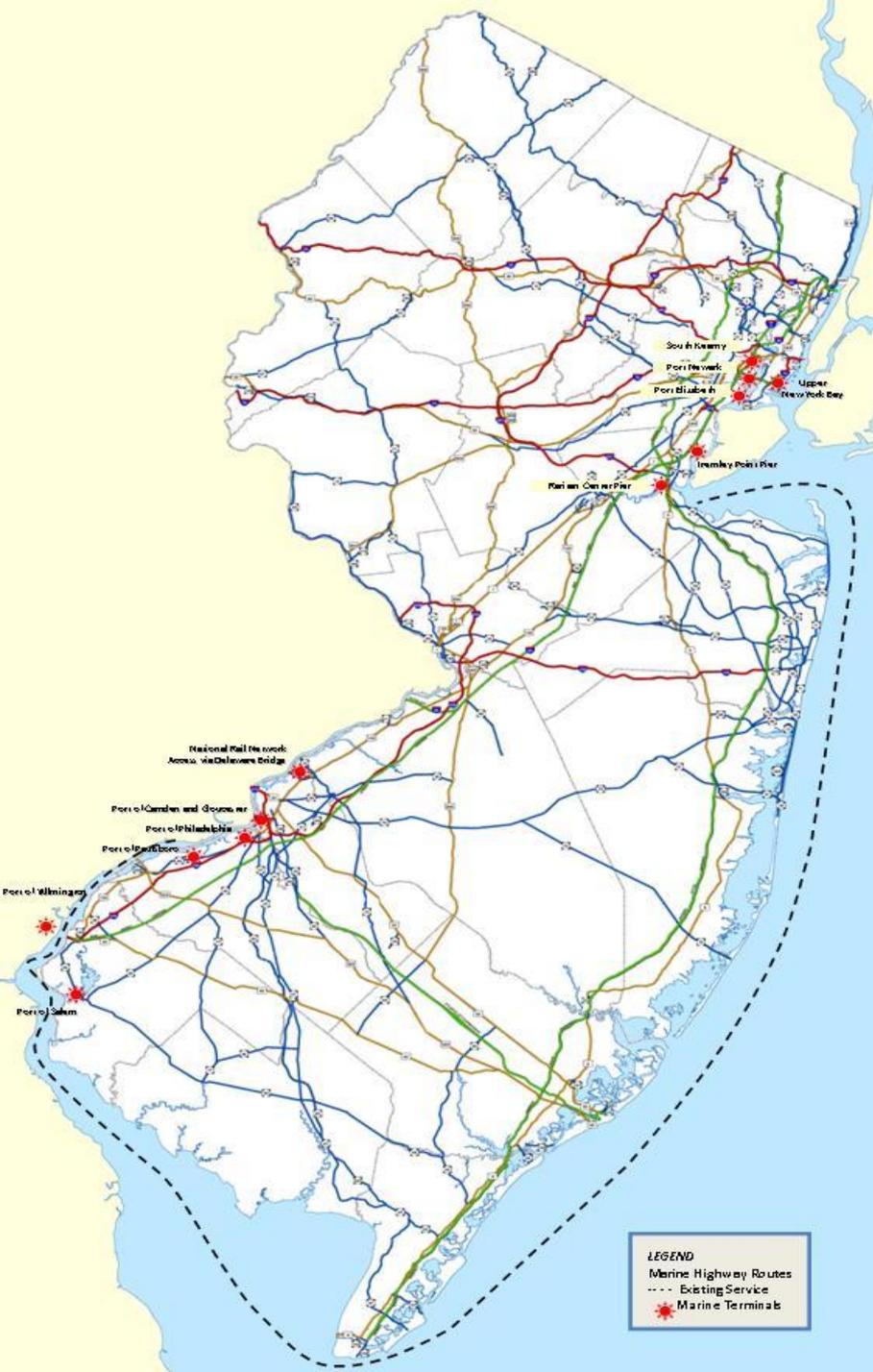
- A “Port Pole” is a Regional Freight Platform of collaborating ports that attract cargo because of their combined capacity, *enhanced resiliency to shocks*, and ability to contribute value through economies of scope and scale.
- Examples of existing port poles include the LA(16)-LB(17) port complex, ports of Rotterdam(9)-Antwerp(13), and ports of Hamburg(11)-Bermerhaven(19).

Creating a New Port Pole ...or RFP

- Collaborations among the Port of New York and New Jersey with the Delaware River

Ports of Wilmington-Philadelphia-Camden

could form a new port pole that serves the Northeast, Midwest and the nation.



Two Gateways – One Port

- **North Port** (PANYNJ) is the import gateway... moving containerized goods quickly into the region and the hinterlands... and connects to:
- **South Port** (W-P-C) is the bulk cargo and container export gateway... making use of available local land and labor resources in Wilmington, Philadelphia and South Jersey region to increase efficiency.

New Jersey Freight Flows

**More than 600 million
tons!**



- 199 Million Tons entering the State
- 126 Million Tons moving through the State
- 131 Million tons moving within the State
- 165 Million Tons leaving the State

Presented to:
US Maritime Administration



Application for Designation of

The New Jersey Marine Highway Platform

As a

Marine Highway Project



Submitted by:

NJ Department of Transportation

June 11, 2010



New Jersey's Proposed Marine Highway & Regional Freight Platform

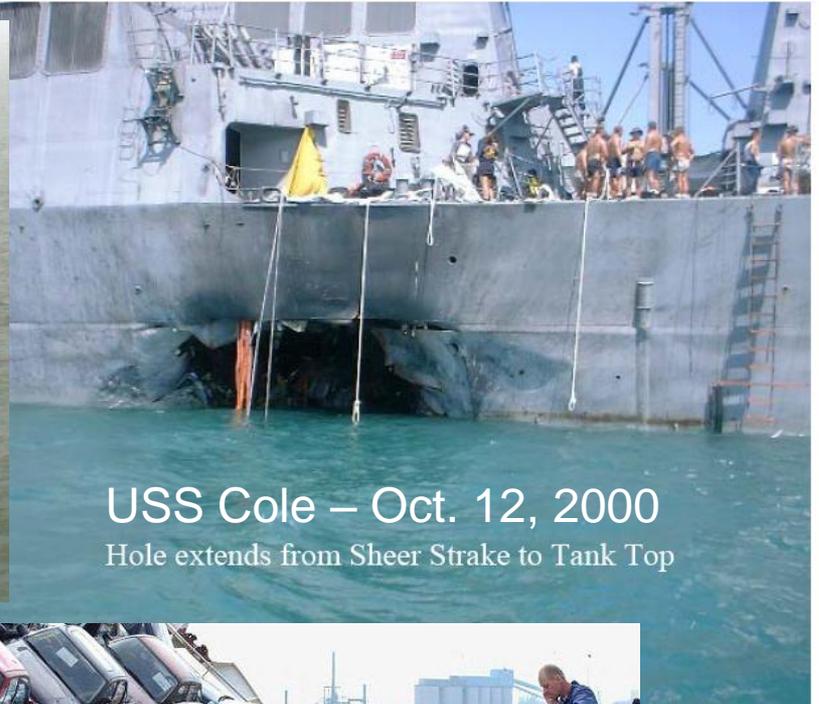
- Upper New York Bay (Jersey City Hub)
- Newark Bay (Elizabeth Hub)
- Edison/Linden (Raritan/Linden Hub)
- Camden/Gloucester/Paulsboro (C/P Hub)
- Salem (Salem Hub)

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DISRUPTIONS!

MSC Chitra, Mumbai, India (2010)



USS Cole – Oct. 12, 2000
Hole extends from Sheer Strake to Tank Top



Earthquakes: Port Au Prince



Car Float, 2009

MTS



Vessels



Waterways



Terminals



Intermodals



Users

Port Security

Protection
(Detect, Deter, Defend)

Physical

- Guns
- Gates
- Guards

Technological

- Sensors
- Networks

Resilience
(Consider, Mitigate)

Proactive Approach

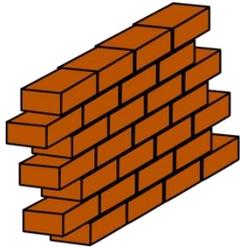
- Before disruption

Reactive Approach

- After disruption

Balancing Security from Disruptions and Free Movement of Cargo at Ports

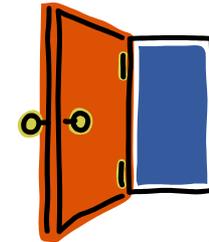
Most Protection
No Danger
Stops all Movement



How to achieve the optimum?



No Protection
No Cost
Extremely Vulnerable



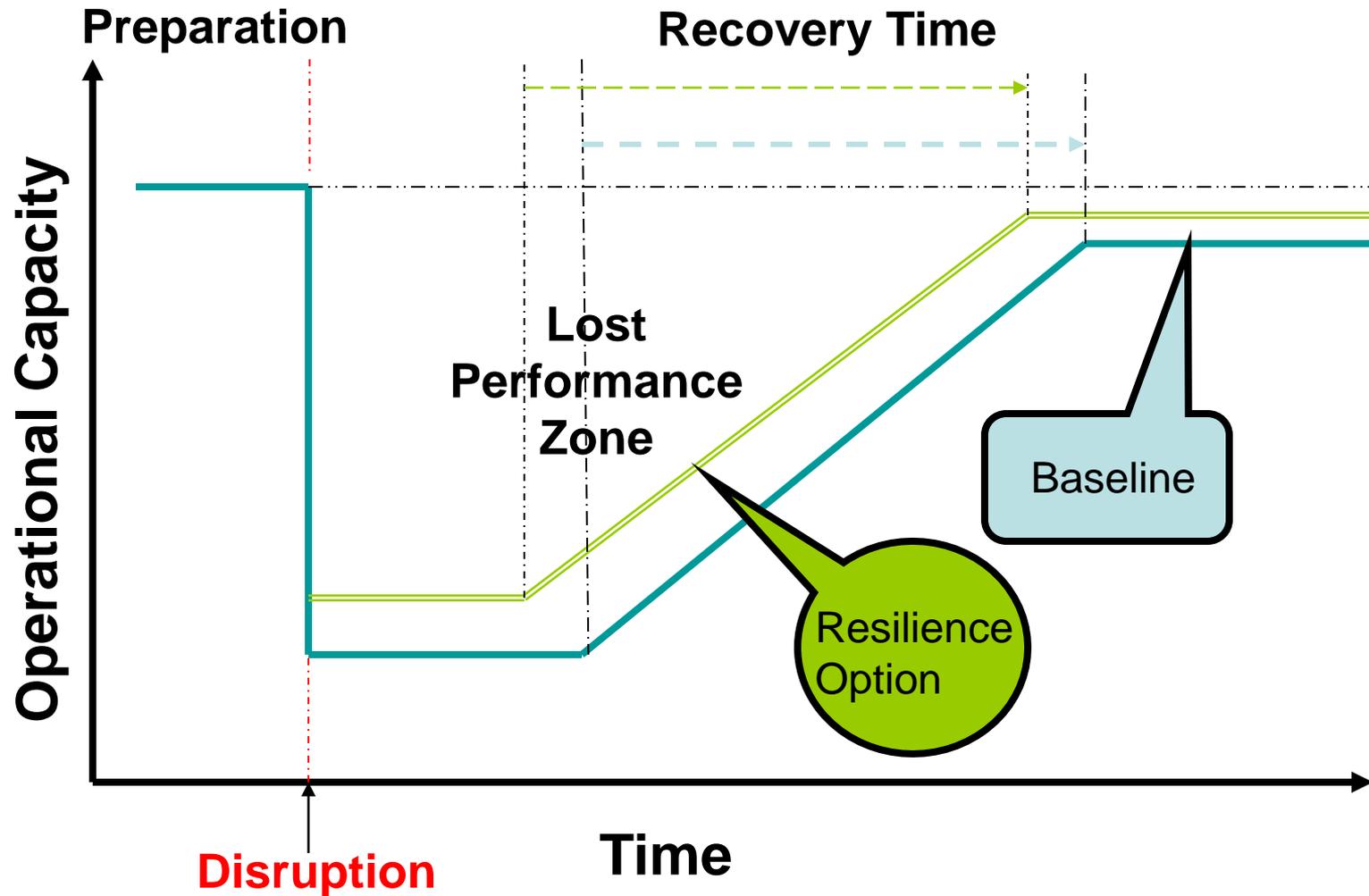
If you cannot afford to protect it,
what can you do to make it
resilient?

What is Resilience?

Resilience is the ability of a system to provide and maintain an acceptable level of service in the face of various major disruptions and challenges to normal operations.



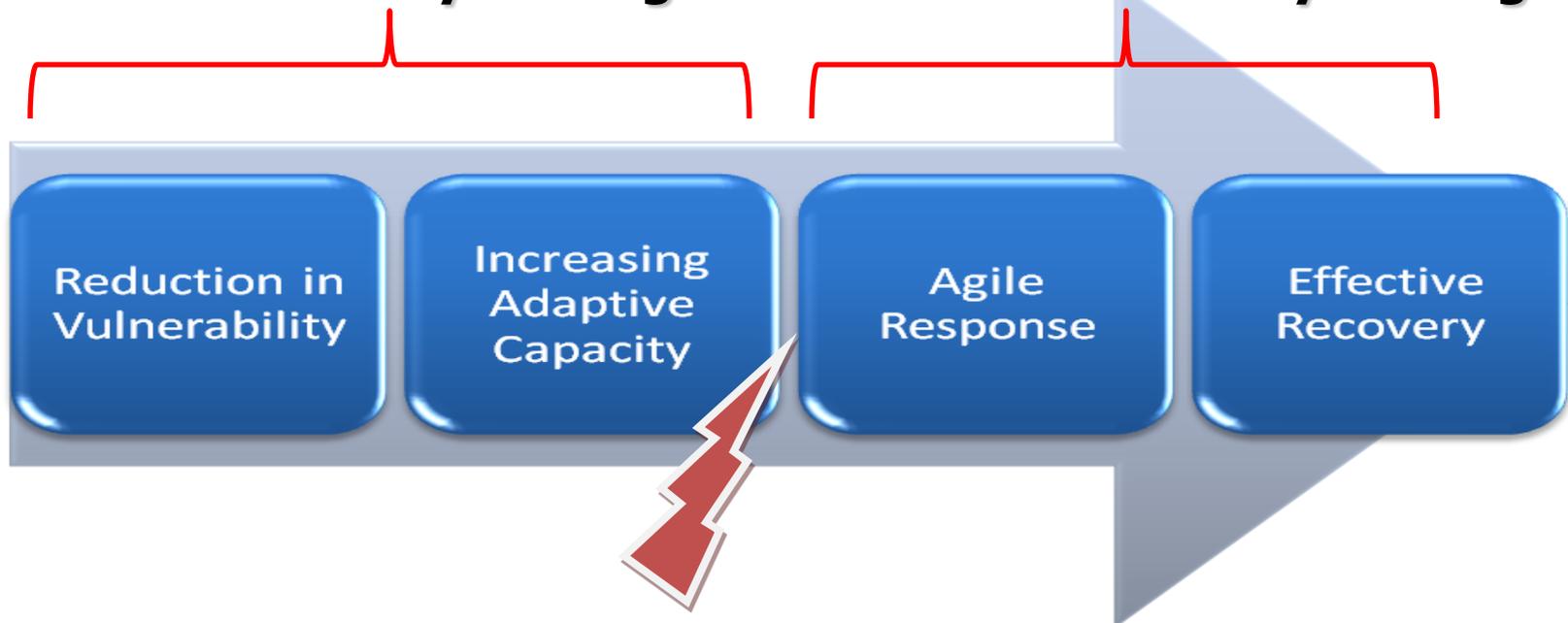
Resiliency Curve



Proactive and Reactive Resiliency Strategies

Proactive Resiliency Strategies

Reactive Resiliency Strategies



Disruption / Catastrophic Event

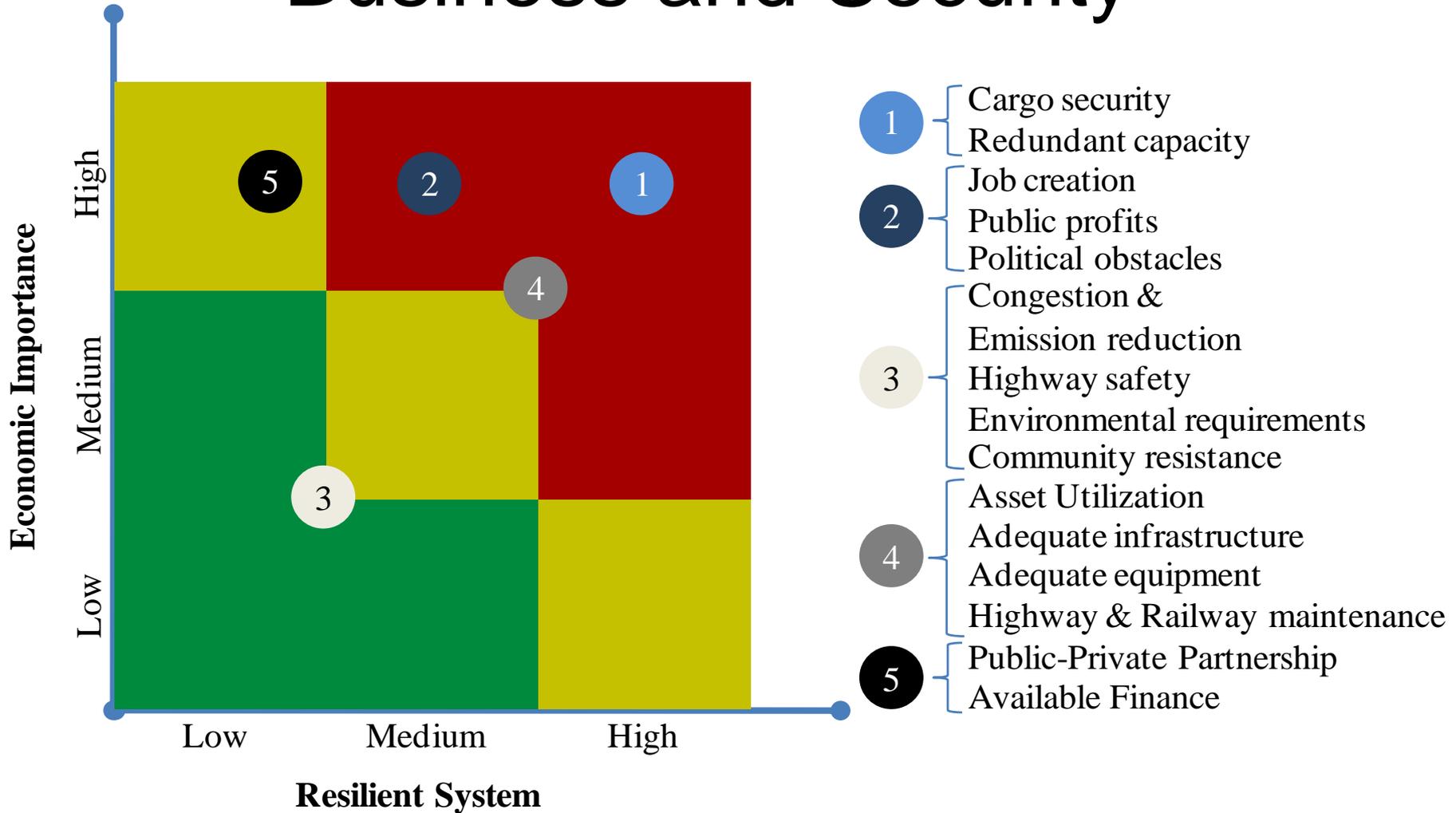
Developing a Modeling Framework

- Define the system
 - Delineate network boundary
 - Identify Unit of Benefit and FOM
- Scenario Analysis
 - Define baseline conditions of current state
 - Determine business model
 - Identify possible disruptive scenarios
- Determine action measures and effects

Selecting Model Parameters

- **Unit of Benefit**
 - Cargo Throughput
- **Figure of Merits**
 - Cargo Security
 - Redundant Capacity (and hence Resiliency)
 - Capacity Alternatives
 - Job creation/retention
 - Reduction in congestion
 - Reduction in emissions
 - Asset utilization
 - Highway safety
 - Public-private partnership
 - Profits

Assessing Impact of RFP on Business and Security



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Answer: YES

Any Questions?

