TEXAS A&M UNIVERSITY GALVESTON CAMPUS

PORT OPERATIONS, ADMINISTRATION AND ECONOMICS

2. Economic, Social and Environmental Value of Seaports

MARA 416

Professor: Dr. Jean-Paul Rodrigue

Table of Contents

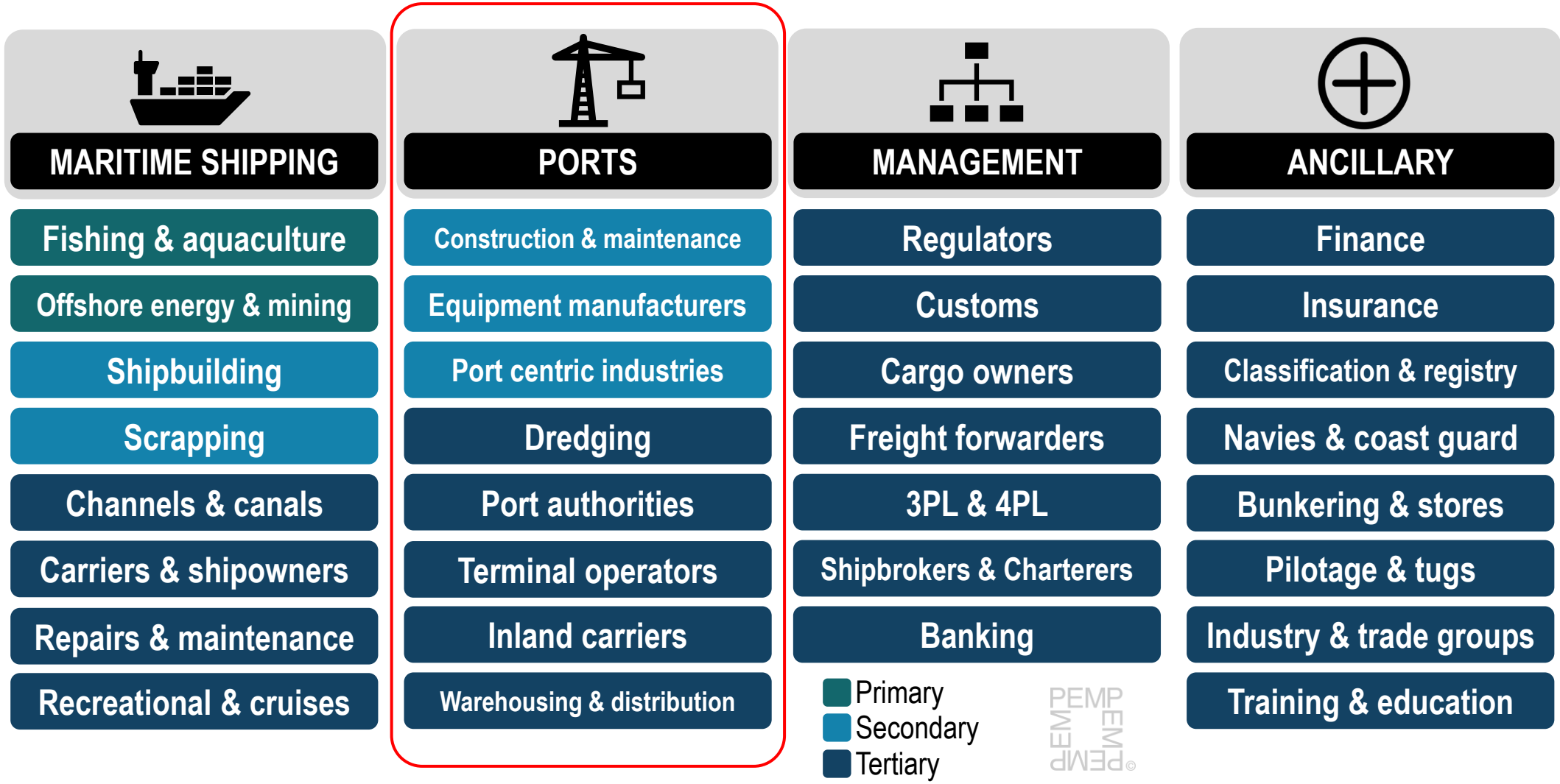
TEXAS A&M UNIVERSITY GALVESTON CAMPUS

PORT OPERATIONS, ADMINISTRATION AND ECONOMICS

A. Ports as Economic Catalysts

Read this section

Elements of the Maritime Industry



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The Port Industry

- Construction and maintenance.
  - Construction and engineering firms.
  - Highly capital-intensive.
  - Infrastructure and superstructure.
  - Usually considered mega-projects that take several years to complete.
- Equipment manufacturers
  - Equipment highly specialized for port use.
  - Cranes and cargo handling equipment (e.g., straddle carriers) designed to handle a single task.
  - Others are less specialized and more multipurpose, such as vehicles and forklifts.

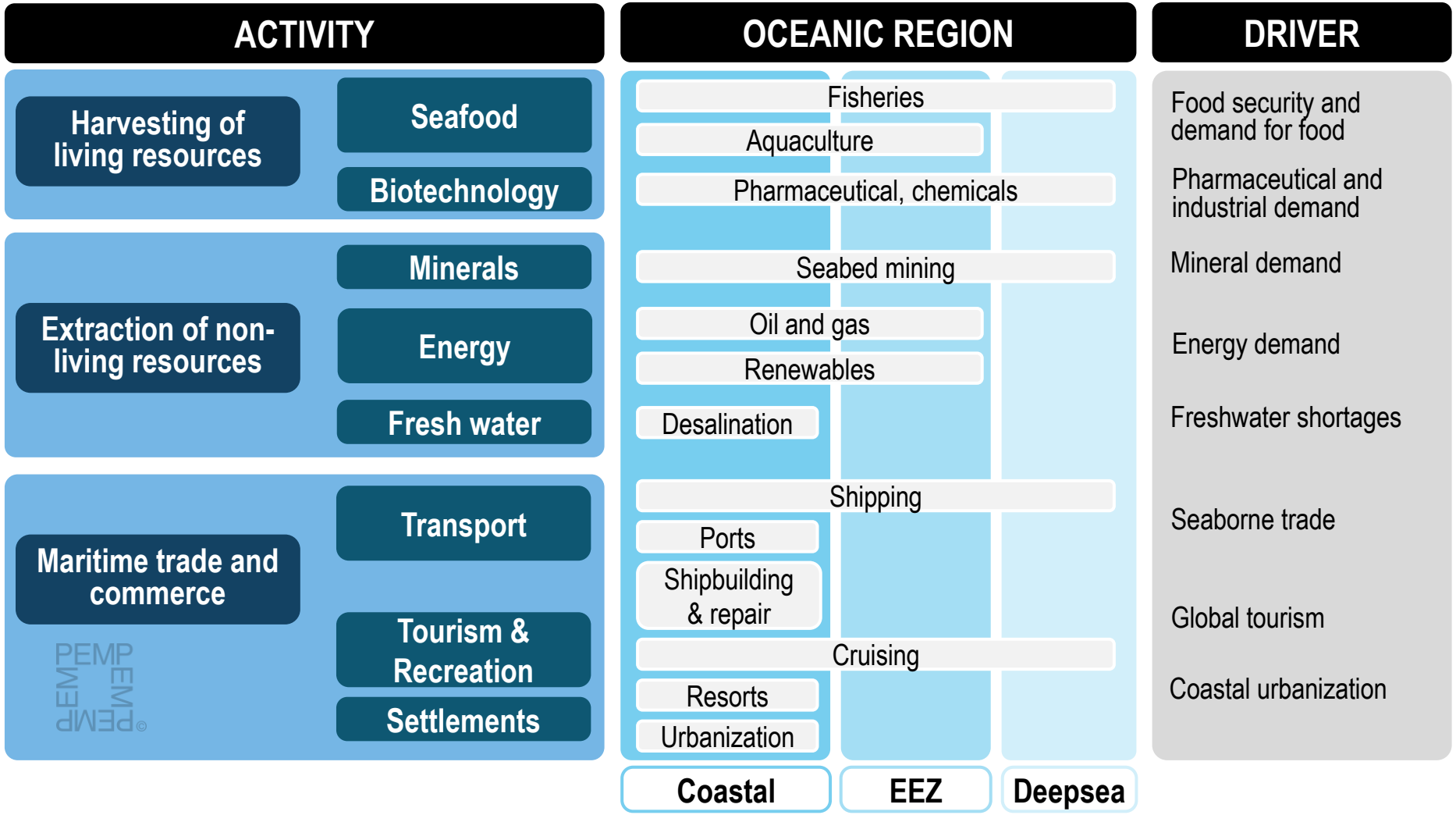
The Port Industry

- Port-centric industries
  - Important manufacturing complexes.
  - High material inputs such as shipyards, fish processing, petrochemicals, steelmaking, and automotive.
  - Benefit from the capacity to move and store heavy material inputs and outputs.
  - Connectivity provided to global markets.
- Dredging
  - Removal of materials through land reclamation and new access channels (capital dredging).
  - Maintain channels to a defined draft (maintenance dredging)
  - Land reclamation.
- Port authorities
  - Ports are generally publicly owned and subject to ownership and oversight by a managing agency.
  - Responsible for port land operation, lease, marketing, and development.
  - Lease terminals and real estate through concessions with defined terms and conditions.

The Port Industry

- Terminal operators
  - Entity responsible for the development, management, and operation of a port terminal.
  - Wide range of functions and specialized terminal operators.
  - Can own the facility or lease it as a concession from a port authority.
  - Usually part of a portfolio including operations in several ports along the same commodity.
- Inland carriers
  - Rail, truck, and barge companies carrying cargo to and from ports.
  - Hinterland and gates access (trucks) or dedicated terminal facilities (rail and barges).
- Warehousing and distribution
  - Storage and distribution activities related and port-centric logistics.
  - Tanks (for liquids such as oil), silos (for grains and chemicals), piles (for minerals), stacks (for containers), open spaces (for cars), and covered facilities (for warehouses).
  - Act as buffers between production and consumption.

The Blue Economy



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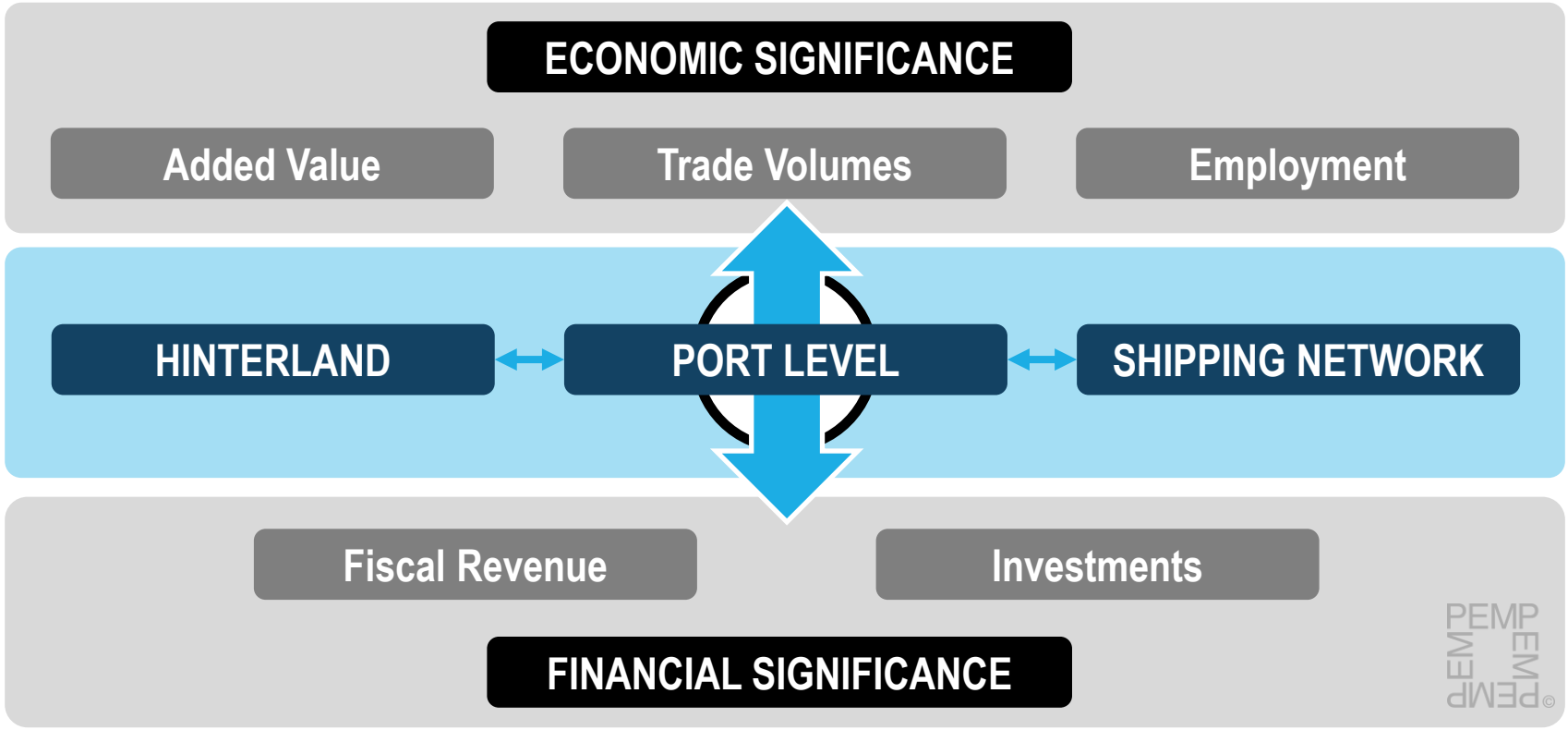
The Blue Economy

- Harvesting of living resources
  - Fishing ports, and adjacent processing facilities (storage, freezing, canneries).
  - Aquaculture (20-25% of fish harvested); ports to act as input providers (feed and equipment).
- Extraction of non-living resources
  - Ports as resource and energy transformation platforms.
  - World's largest petrochemical hubs are port complexes (Singapore, Ulsan, Houston, Rotterdam).
  - Mineral and coal complexes.
  - Renewable energy led to opportunities for procurement and maintenance platforms (wind farms).
- Maritime trade and commerce
  - Supporting trade flows and related activities (warehousing, manufacturing, and distribution).
  - Recreational function of ports, with harbor redevelopment (housing, commercial, museums).
  - Marinas and ports of call for cruises.

The Economic Significance of Ports



Port Economic Indicators

- Gross value-added
  - Contribution to the GDP (Gross Domestic Product) or GRP (Gross Regional Product).
  - Ports directly impact activities connected to them.
  - Range of indirect impacts on the entire ecosystem of economic activities.
  - Indirect impacts of ports on national and regional economies became increasingly important.
- Employment
  - Expressed in full-time equivalents (FTEs).
  - How port activities contribute to employment creation.
  - Wide range of employment is indirectly related to port activities.
- Trade volumes and values
  - Importance of ports in international trade.
  - Export and import focus.
  - Same volume and trade composition can support different economic structures.

Port Financial Indicators

- Fiscal revenue
  - How port activities contribute to the taxation income within their jurisdictions.
  - Ranging from national to municipal governments.
  - Justify the public expenses supporting port activities, particularly infrastructure.
- Investments
  - Public and private sectors in port activities over a given period.
  - Port superstructure and infrastructure are capital-intensive and require constant maintenance.

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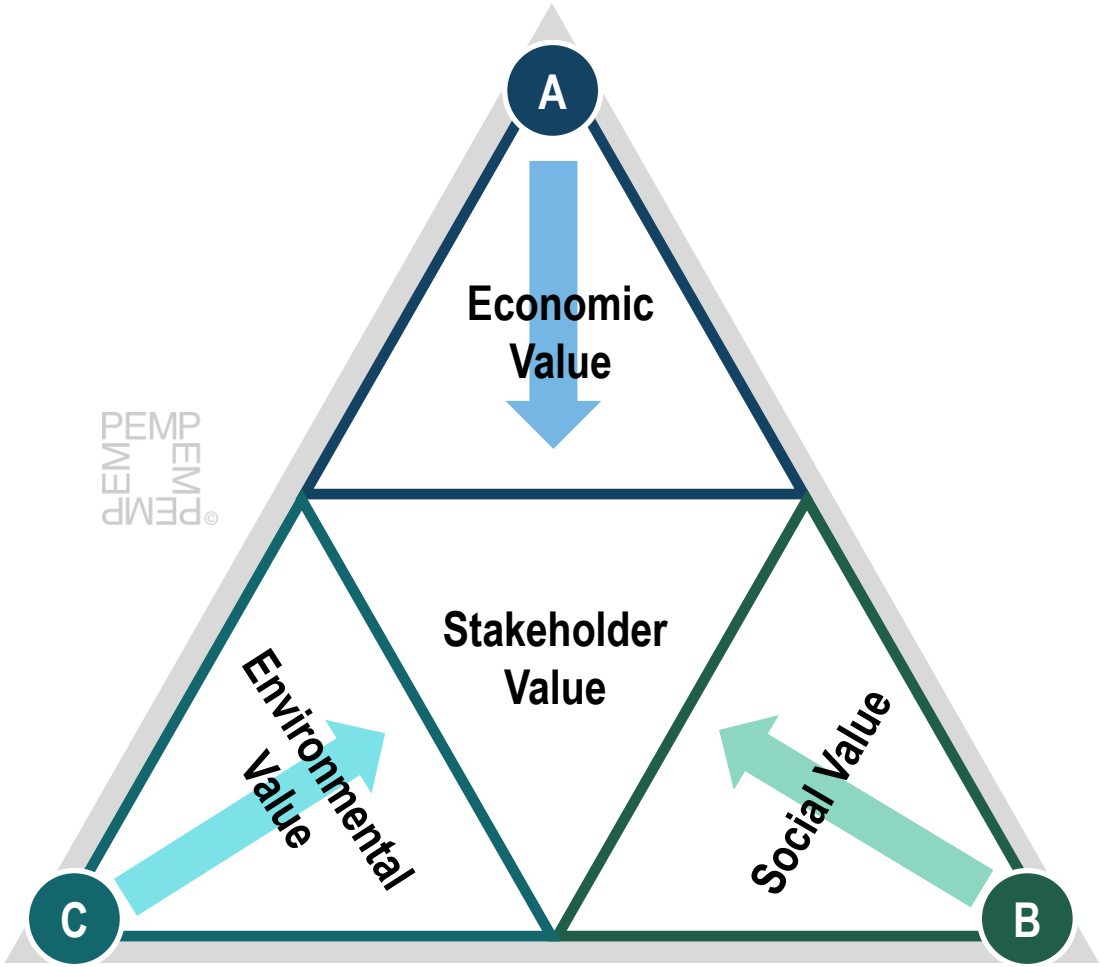
B. Ports and Economic Change

Read this section

The Port as a Value Proposition



A. COMMERCIAL PORT

- Direct and indirect economic benefits
- Support for economic activities
- Competitiveness

B. SOCIAL PORT

- Community support (recreation)
- Employment generation
- Source of tax revenue

C. NATURAL PARK PORT

- Environmental externalities
- Congestion

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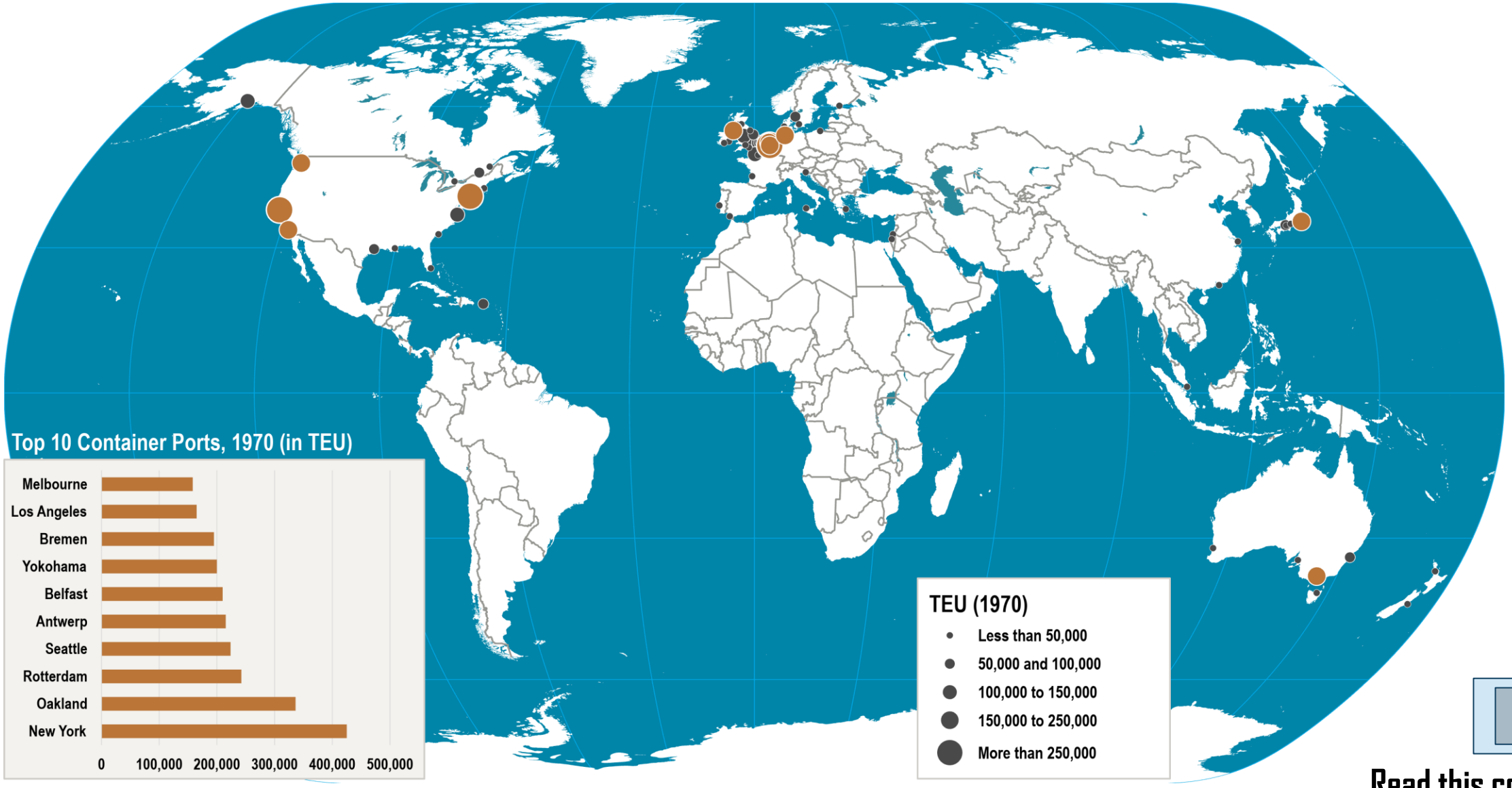
Ports and Economic Change

- Economic changes
  - Seaborne trade has increased substantially.
  - Redistribution of manufacturing to low-cost locations (outsourcing).
  - Ongoing economic growth.
  - Importance of logistics for organizing complex distribution system.
  - Global evolution of container ports indicative of the driving force of offshoring and regional economic development.

The Dawn of Containerization: 1970



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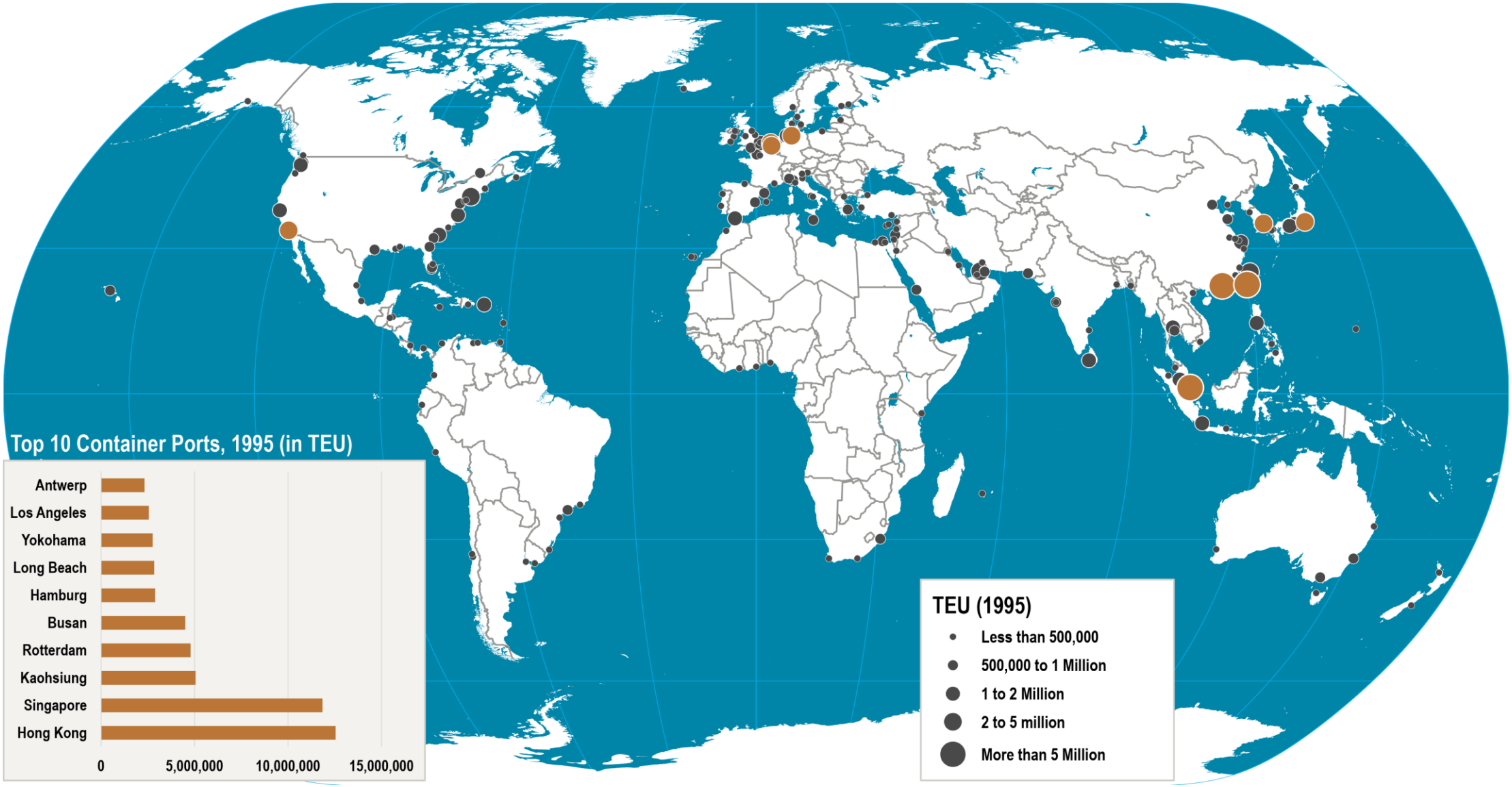
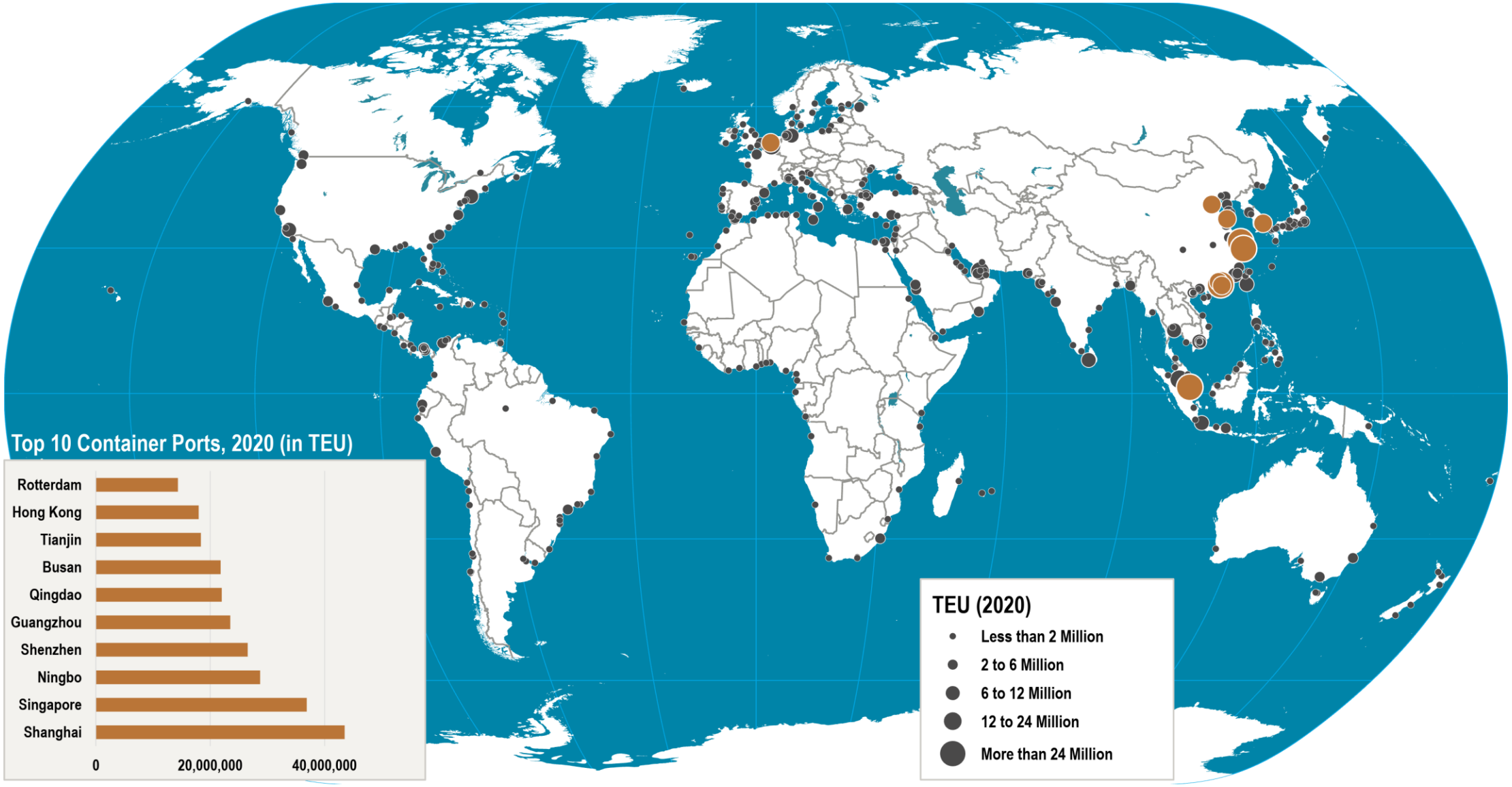
Containerization Coming to Age: 1995



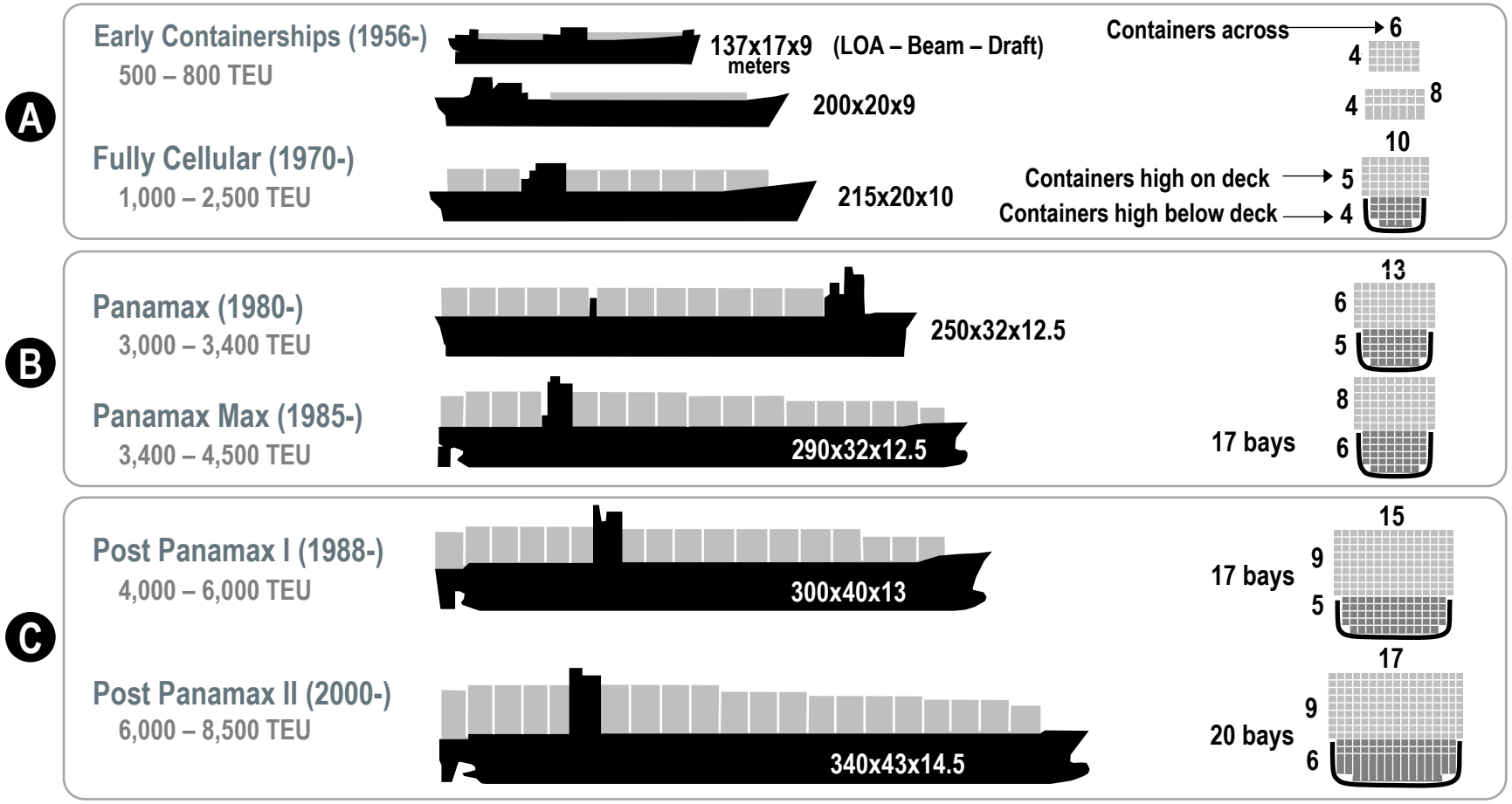
Peak Containerization: 2020



Ports and Economic Change

- Technical changes
  - Growth in ship size to better achieve economies of scale.
  - Growing level of ship specialization (containerships, bulk carriers, car carriers, and even cruise ships) requires dedicated port terminal facilities.
  - Automation.
- Organizational changes
  - Controlled by large shipping companies and terminal operators.
  - Strategic alliances as well as mergers and acquisitions.
  - Vertical and horizontal integration.

Evolution of Containerships



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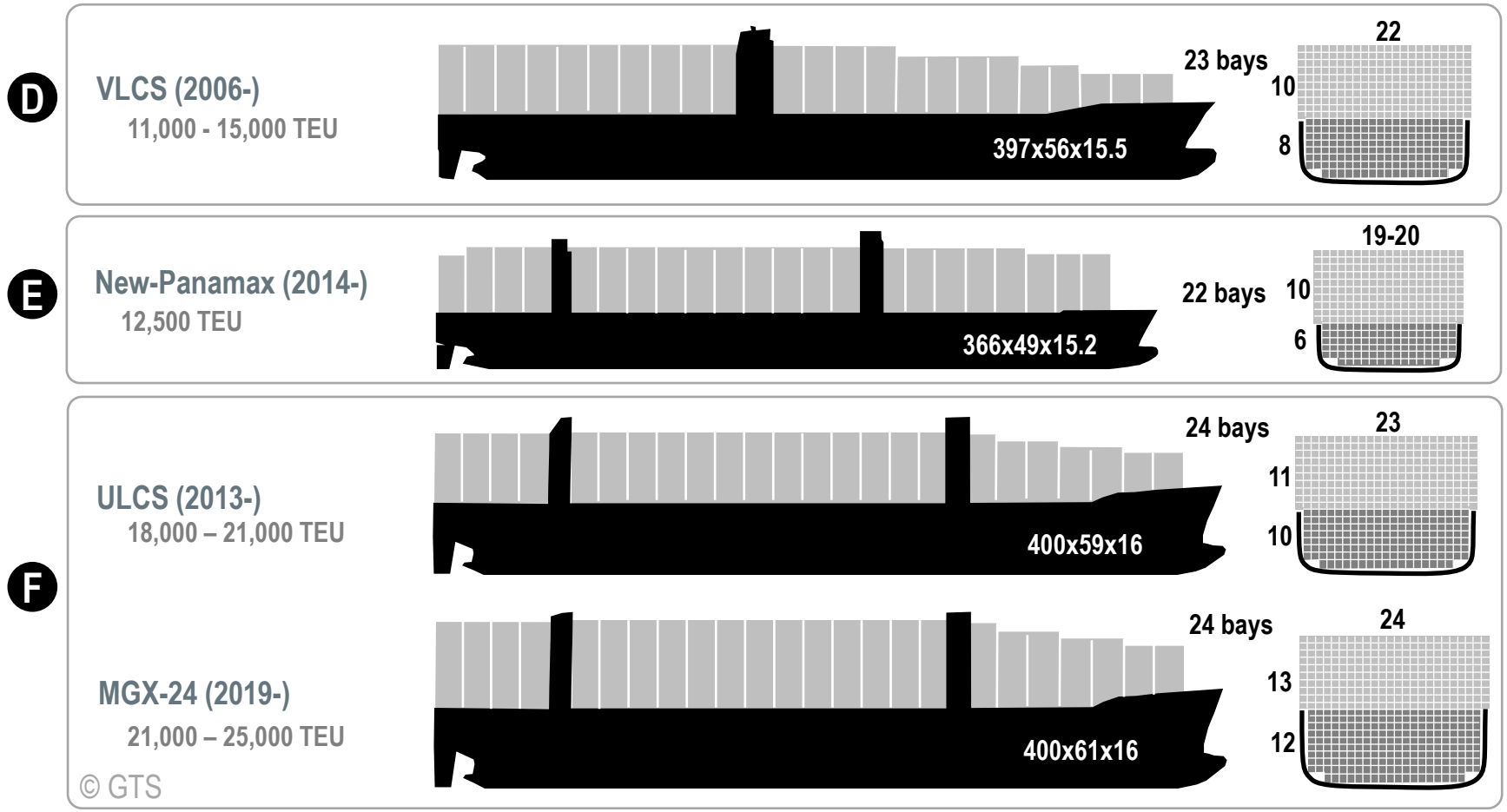
Evolution of Containerships



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C. Port as Generator of Added Value

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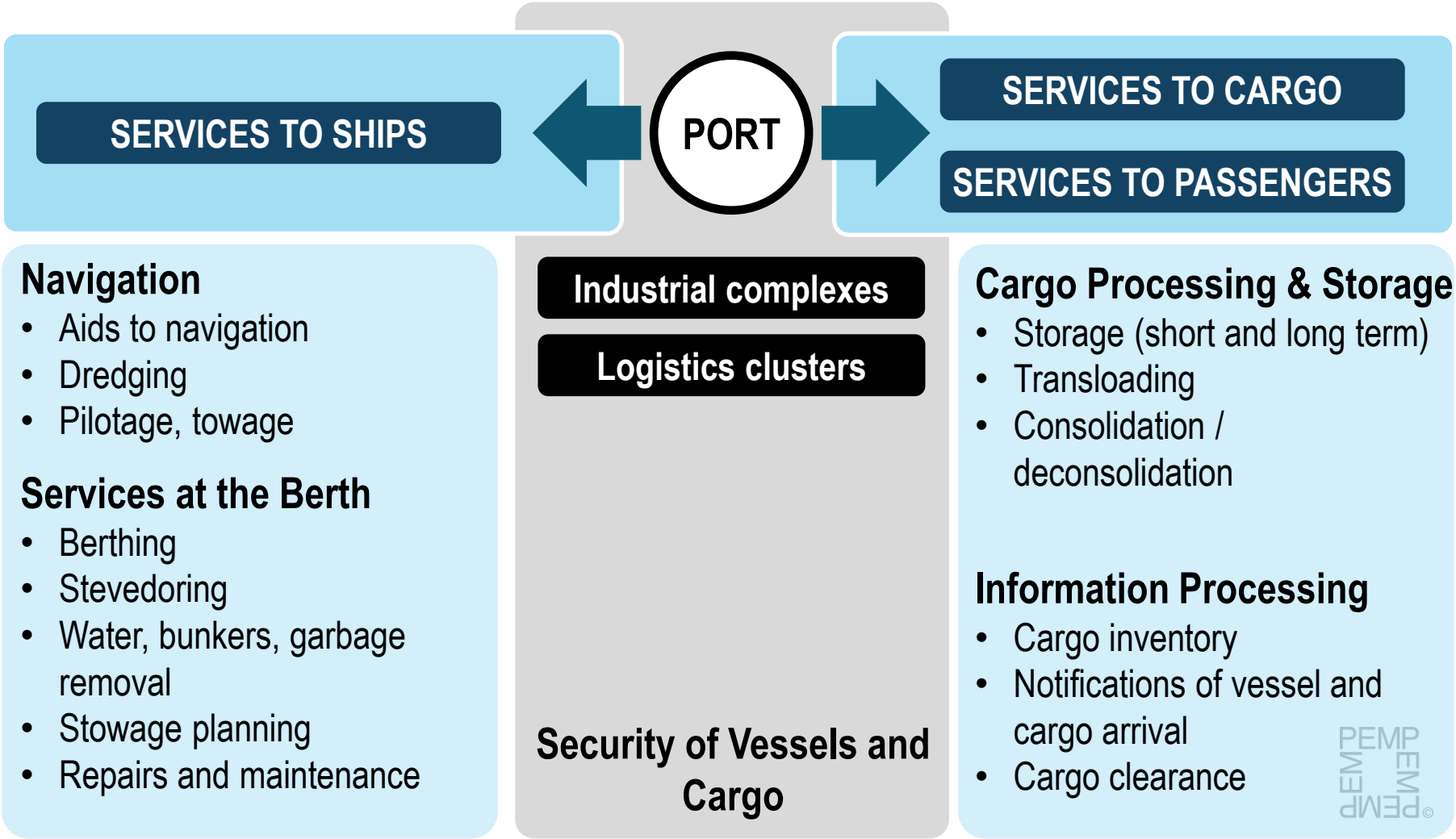
Transport and Cargo Handling Functions of a Port



Generation of Socioeconomic Benefits

- Direct and indirect added value
  - External spill-over effects of ports can be substantial.
  - Economic benefits of port activities are expanding from the local port system toward a much larger economic system.
  - Geographical dispersion of economic effects:
    - Risk of limited local added-value activities linked to transit cargo.
    - Risk of limited local industrial and logistics cluster.
    - Local employment limited cargo handling, ship services, and inland transport operations.

Development of logistics zones

- Containerization
  - Development of logistics zones in the vicinity of seaports; port-centric.
  - At inland locations along the main corridors towards the hinterland.
  - Range of added value activities (low end to high end)
  - Low-end activities may involve storage, packaging, labeling, handling, and transportation.
  - High-end activities may involve customization, customs and trade documentation, and quality control.
  - The port remains the main factor for these logistics sites.

Port Competitiveness

- National and regional competitiveness
  - Allows access to markets and resources that would otherwise not be readily available.
  - Performance of ports influences the cost structure and availability of goods.
- National or regional effects
  - Broader economic landscape and international trade.
  - Part of national economic development strategies.
  - Providing infrastructure.

Employment Generation

- Direct and indirect employment
  - Extend beyond the initial round of employment generated by that activity.
  - Regional economic composition effect.
  - Complex employment effect.
  - Shipping lines:
    - Global employment: ship crews and headquarters.
    - Local employment: shipping agencies.
  - Terminal operators:
    - Local employment in terminals.
    - Global employment in headquarters.

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D. The Public Image of Ports

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Disconnection and Conflicts

- *Seaports often suffer from a negative public image, mainly due to their environmental impacts and the disconnection between cities and their activities.*
- Public perception
  - Considers port areas desolate, dangerous, dirty, and unattractive, characterized by buildings with low aesthetics and large machinery emitting noise and air pollutants.
  - People might feel disconnected from ports.
  - Ports cannot take broad public support for granted.
- Conflict of interest
  - Confrontations related to port development and operations.
  - Occur when community groups perceive a clear imbalance between the benefits.
  - Costs for the local community of having larger ports.
  - Road congestion, intrusions on the landscape, noise and air pollution, and the use of scarce land.

Social and Environmental Considerations

- Port-related public policies
  - Urban planning and expansion, safety, security, and sustainability.
  - Demonstrate environmental value to ensure community support.
- Social value of ports
  - Support a wide variety of community events and projects through sponsorship.
  - The indirect social contributions that most benefit local communities.
  - Invest in training and education programs.
  - Forms of social commitment are an important part of the success of ports, linking commercial responsibility to social acceptability and accountability.

Social and Environmental Considerations

- Improving Public Image
  - External communications policies and public events and festivities
    - Open Port Days.
  - Convince the general public of the importance of ports
    - Presenting figures on employment effects and added value.
  - Adopt a green port management strategy
    - Mitigating externalities such as energy consumption, the emissions of pollutants, and waste disposal.
  - Stakeholder relations management
    - Development of good relations with all parties concerned.
    - Port expansion plans or redevelopment/regeneration plans focusing on older port areas (i.e. waterfront redevelopment).

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E. The Port-City Interface

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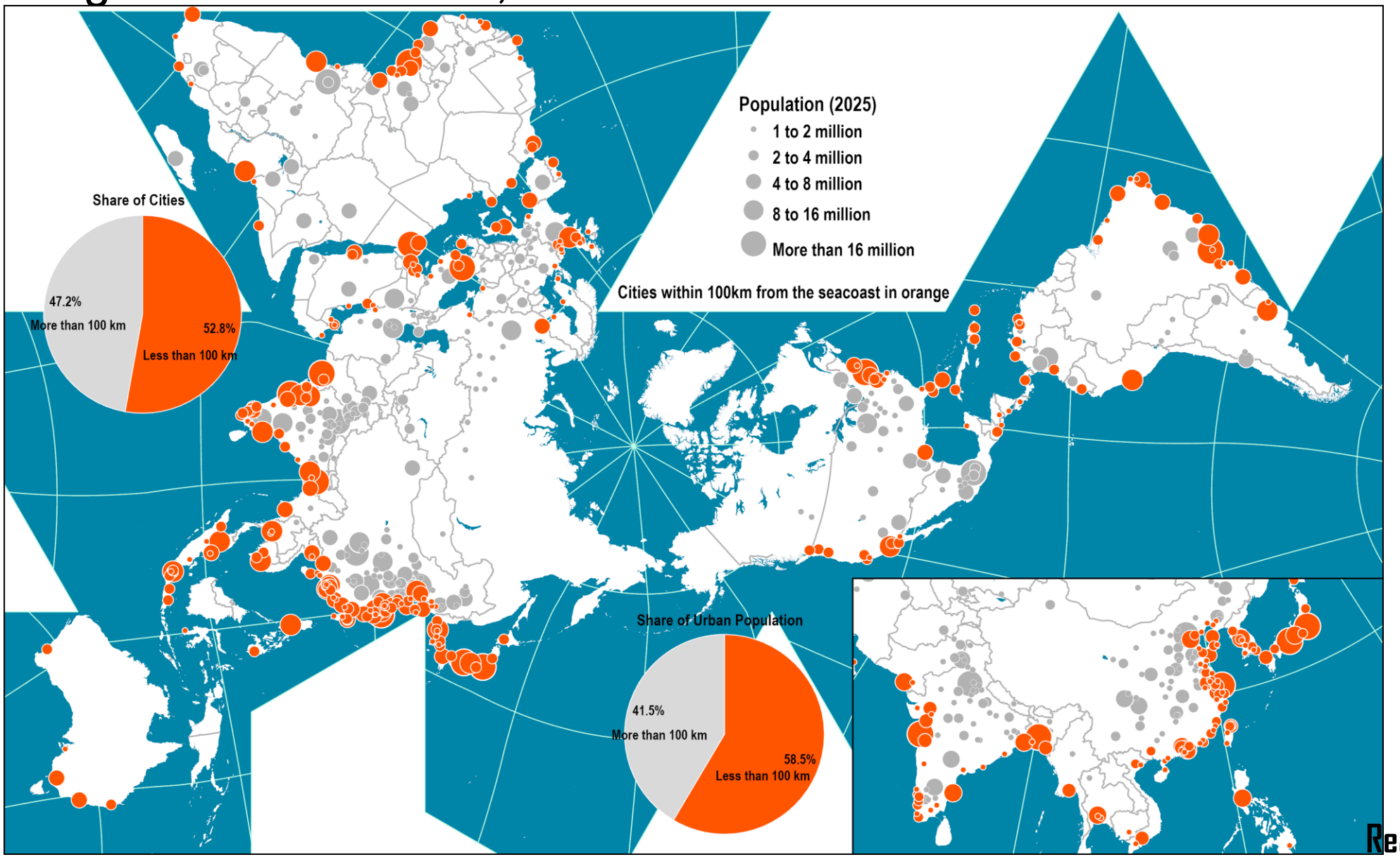
The Port and the City

- The geography of cities
  - Strong propensity to locate along the coastline.
  - Alluvial plains suitable for agriculture and population concentrations.
  - Associated with access to trade networks.
  - 513 cities with populations above 1 million in 2025.
  - 271 (52.8%) located within 100 km of a coastline.
  - 58.5% of the global urban population.

World's Largest Coastal Cities, 2025



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Waterfront Redevelopment

- Waterfront redevelopment programs
  - Respects the maritime heritage of the port:
    - Cultural component.
  - Link between the city and the port can revive the public acceptance of ports.
  - Bring new jobs to derelict port areas.
  - Public and private investments to revitalize older port areas.
  - Multifunctional areas:
    - Housing, hotels, maritime heritage projects, sports, recreation, tourism, and local commerce.
    - Residential, recreational, commercial, retail, service, and tourist facilities.
    - Mixed to create a broad range of employment opportunities.
  - Recreational areas
    - Yachting harbors and marinas.
    - Watersport areas and theme parks.

Waterfront Redevelopment

- Cruise industry
  - Most cruise terminals located close to the city center.
  - Reinforce the maritime link between cities and ports.
  - Reflect attractiveness to tourists
  - Expenditure by passengers from visiting cruise ships.
  - Cruise passengers may also spend time in the metropolitan area before or after their voyages.
  - Services to cruise vessels:
    - Pilotage, tugs, provisions, fuel, crew shore leave, passenger services, inspections, immigration.
  - Inland transportation:
    - Air, private car, bus, transit, taxi, and parking.

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F. The Greening of Ports

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The Environmental Impact of Ports

- What is a Green Port?
  - A port that seeks to minimize its environmental impact.
- Environmental externalities
  - Associated with industrial activities having notable environmental impacts.
  - Port planning and management increasingly align with sustainable development initiatives.
- Environmental impact of terminals
  - Pollution related to port construction and maintenance.
  - Air emissions related to ship operations and terminal handling equipment.
  - Noise associated with cargo handling operations.
  - Environmental effects and potential congestion associated with landside operations of barges, rail, and trucks.

Range of Actions for Green Ports

SHIPPING

- Reduce operational emissions.
- Deploy low and non-carbon alternative fuels such as LNG.
- Green port dues (ESI).
- Shore power supply.

PORT OPERATIONS

- Electrification and energy transition.
- Windmills and solar in ports.
- Green concession policy.
- Carbon capture and storage.
- Ecologies of scale.

INLAND LOGISTICS

- Synchromodality.
- Inland terminals and port-hinterland concepts.
- Spread traffic in time and space.
- Pipeline networks.

Green Initiatives

- Reducing operational ship emissions in ports
  - Decreasing waiting times and vessel turnaround times.
  - Traffic management systems.
- Provision of shore power
  - Onshore Power Supply (called cold ironing).
  - Seagoing vessels at berth utilize shore power for their auxiliary engines instead of bunker fuel.
  - Most prevalent in the cruise and ferry industries.
- Alternative ship fuels
  - Bunkering facilities for vessels that use alternative fuels (LNG).
  - Potential use of methanol and ammonia as ship fuels, as well as battery-powered vessels for shorter distances.
- Low-emission or zero-emission quay and yard equipment
  - Electrification.