



TEXAS A&M UNIVERSITY
GALVESTON CAMPUS.

INTRODUCTION TO THE MARITIME INDUSTRY

8. Port Authorities and Terminal Operators



MARA 205

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INTRODUCTION TO THE MARITIME INDUSTRY



A. Seaports

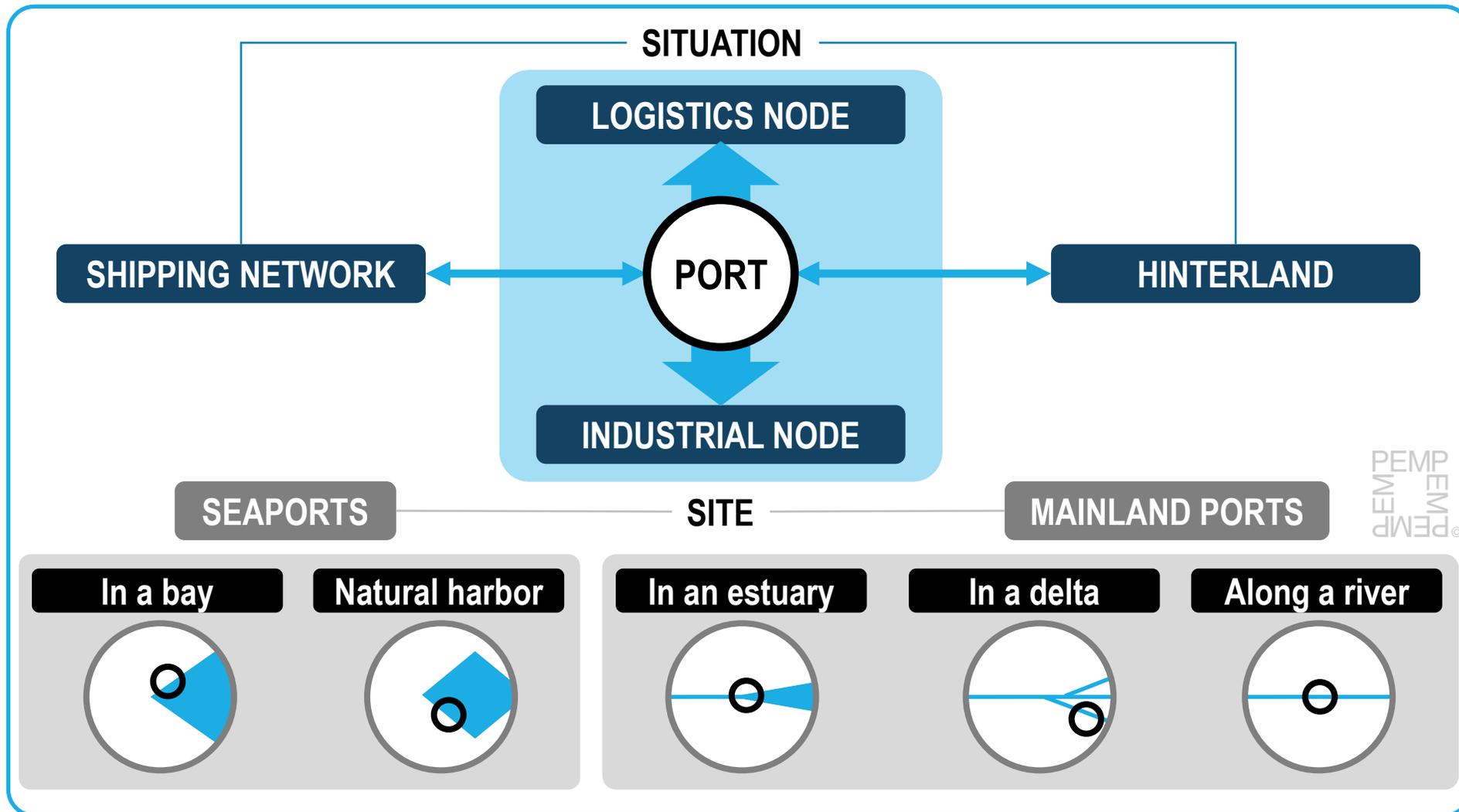
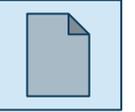
Defining the Seaport

- Seaport

- More than just a place where ships can anchor and dock.
- Logistic and industrial node in global supply chains with a strong maritime character.
- Act as an interface between maritime and inland systems of circulation.
- A functional and spatial clustering of activities linked to transportation, transformation, and information processes.

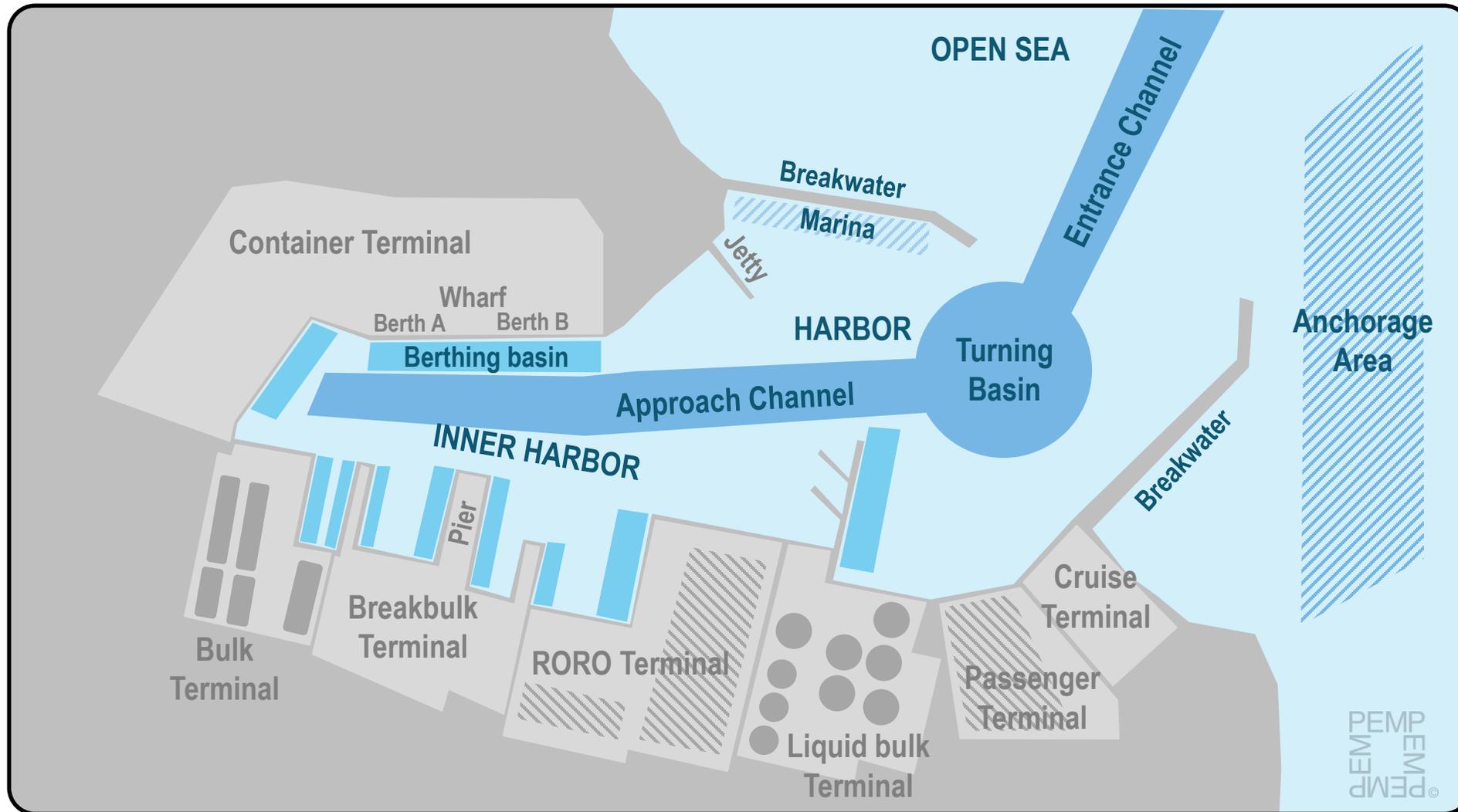
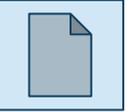
Defining the Seaport

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Main Physical Elements of a Port

Read this content



Physical Elements of a Port

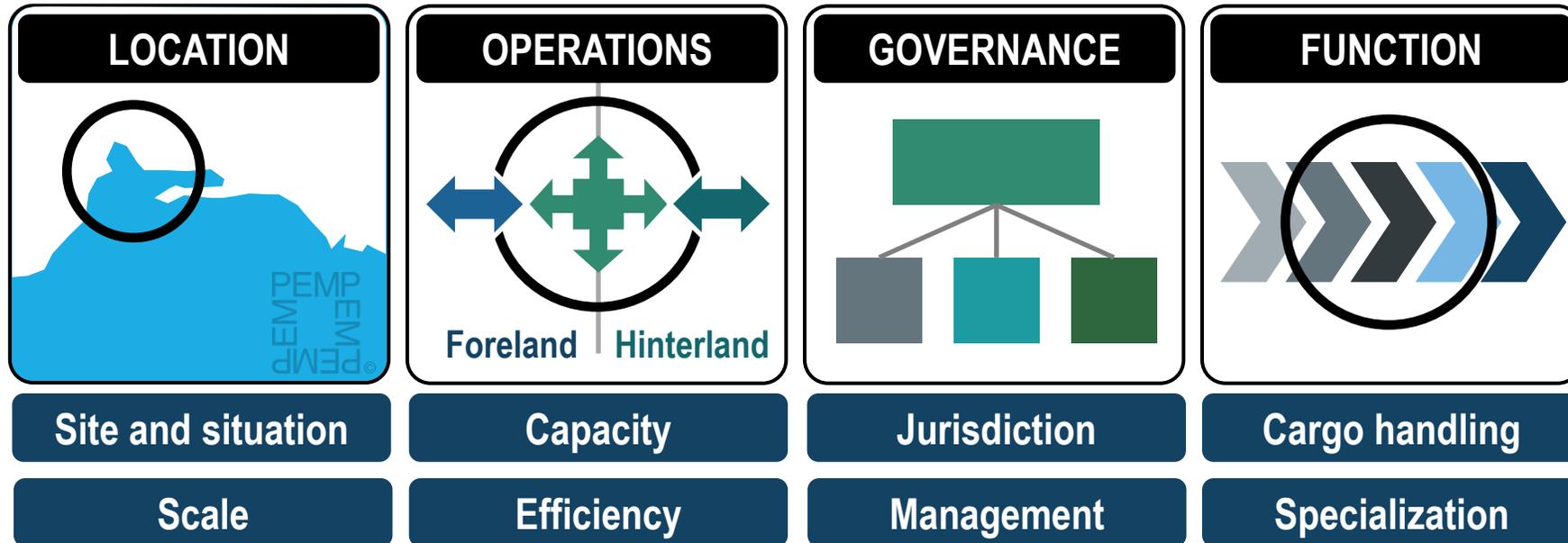
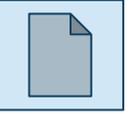
- Harbor
 - A shelter, either natural or artificial, for ships.
- Anchorage area
 - A designated area where ships can anchor while waiting for an available berth.
 - Well-defined with buoys and with the ability to be serviced for stores and bunkering.
- Breakwater
 - Permanent structures extending into the sea to protect the harbor against tides, currents, waves, wind, and storm surges.
- Navigation channel
 - Ship access channels dredged to allow ships to enter the harbor.
 - Controlled depth and movements are usually assisted by pilots and tug boats.
- Turning basin
 - A circular area allowing for the vessels to turn around and maneuver into the harbor.

Physical Elements of a Port

- Berthing basin
 - A dredged area next to a berth that allows a ship to be moored safely.
 - Important to ensure that ships of specific capacity and length can safely berth.
- Berths (or docks).
 - Docking structures with defined length and lateral capacity to support berthing and mooring operations.
- Wharves
 - One or more berths aligned parallel to the shore.
- Piers
 - Docking structures extending into the sea and that are extensions of the terminal facility.
- Jetties
 - Docking structures extending into the sea and that serve the sole purpose of loading (unloading) cargo.

How to Look at Ports: Port Dimensions

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Types of Seaports

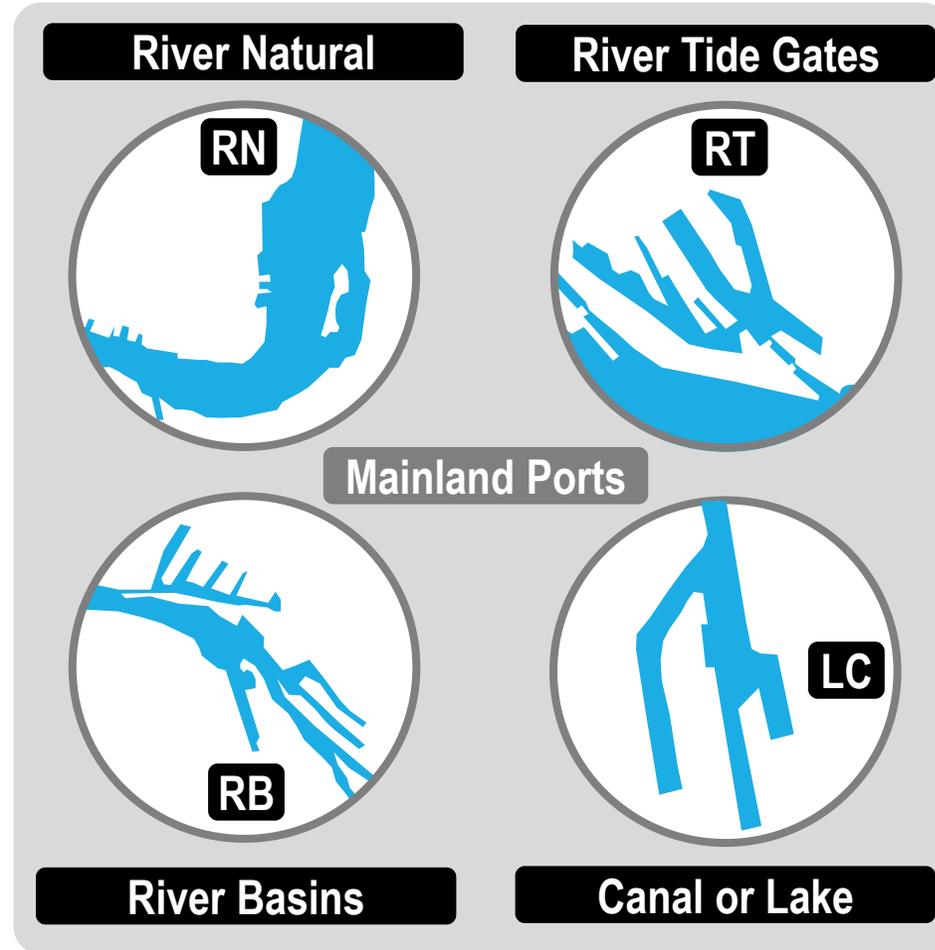
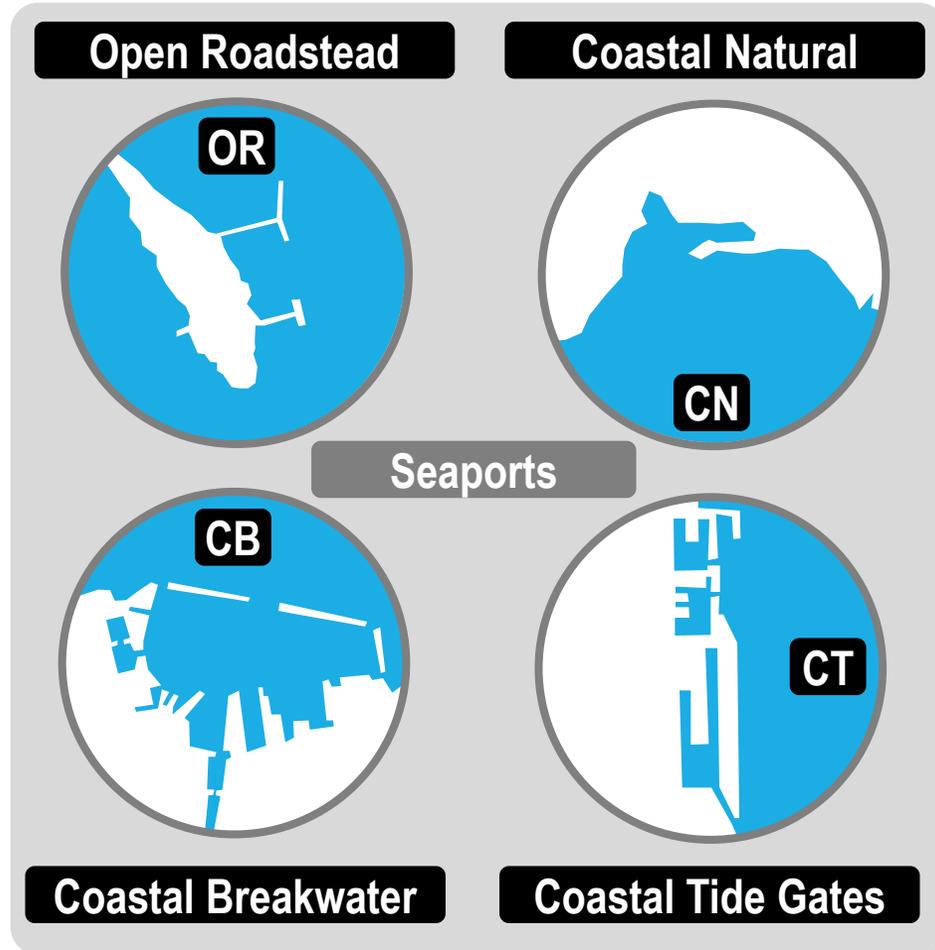
- Scale

- Port size in terms of its area, annual cargo throughput, the size of its hinterland, the number of shipping services it is connected to.
- Associated with its economic and commercial importance.
- Large ports tend to be diversified, while small ports are mainly specialized.

- Geographical context

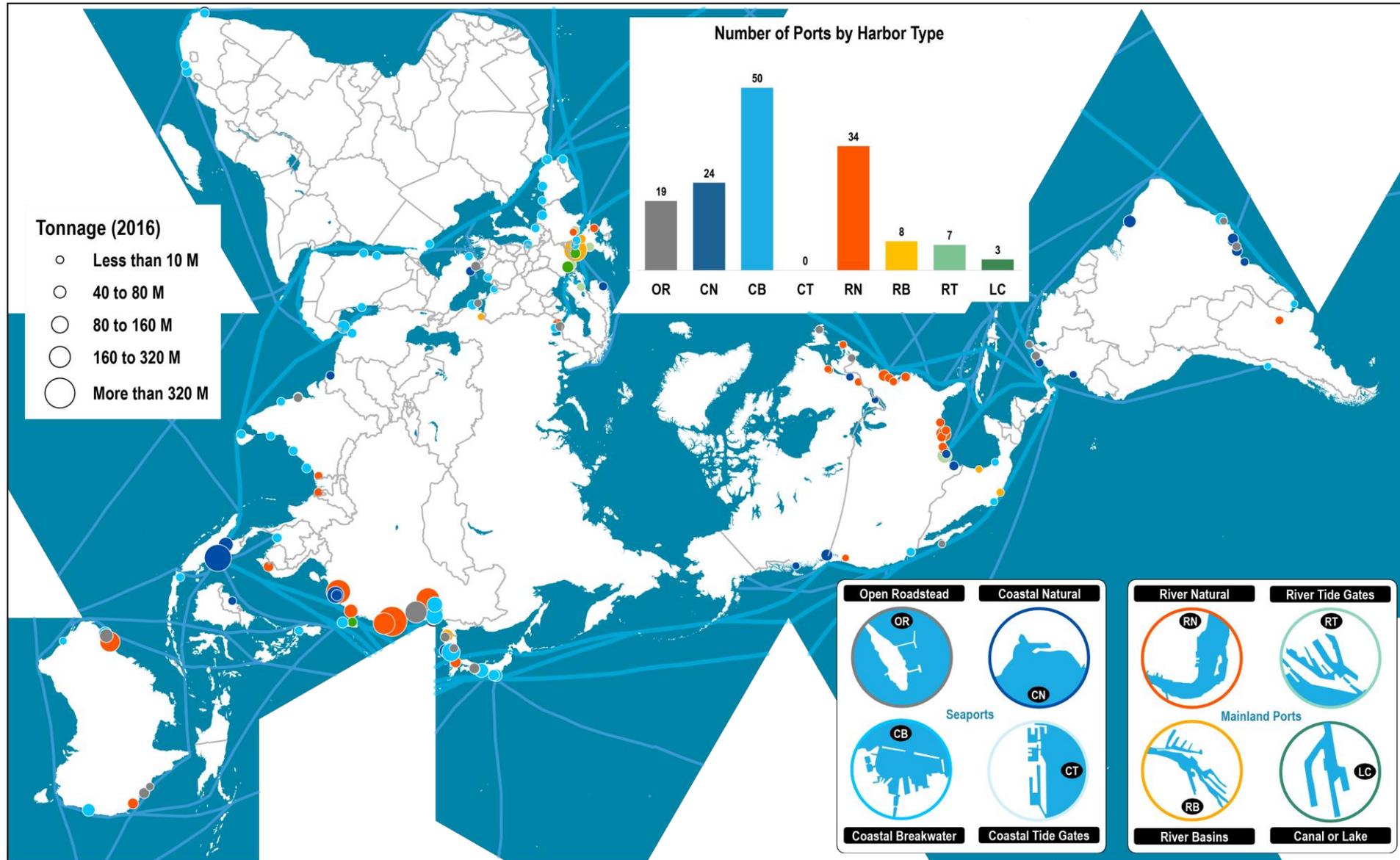
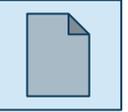
- Port site and situation.
- Locational setting of port sites and their harbors.
- Many port sites have natural advantages, while others need to be improved with dredging and landfills.
- Some are entirely artificial creations.
- A port site is fixed in space, its situation is relative to the main shipping lanes and hinterland.

Harbor Types



Harbor Types

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Types of Seaports

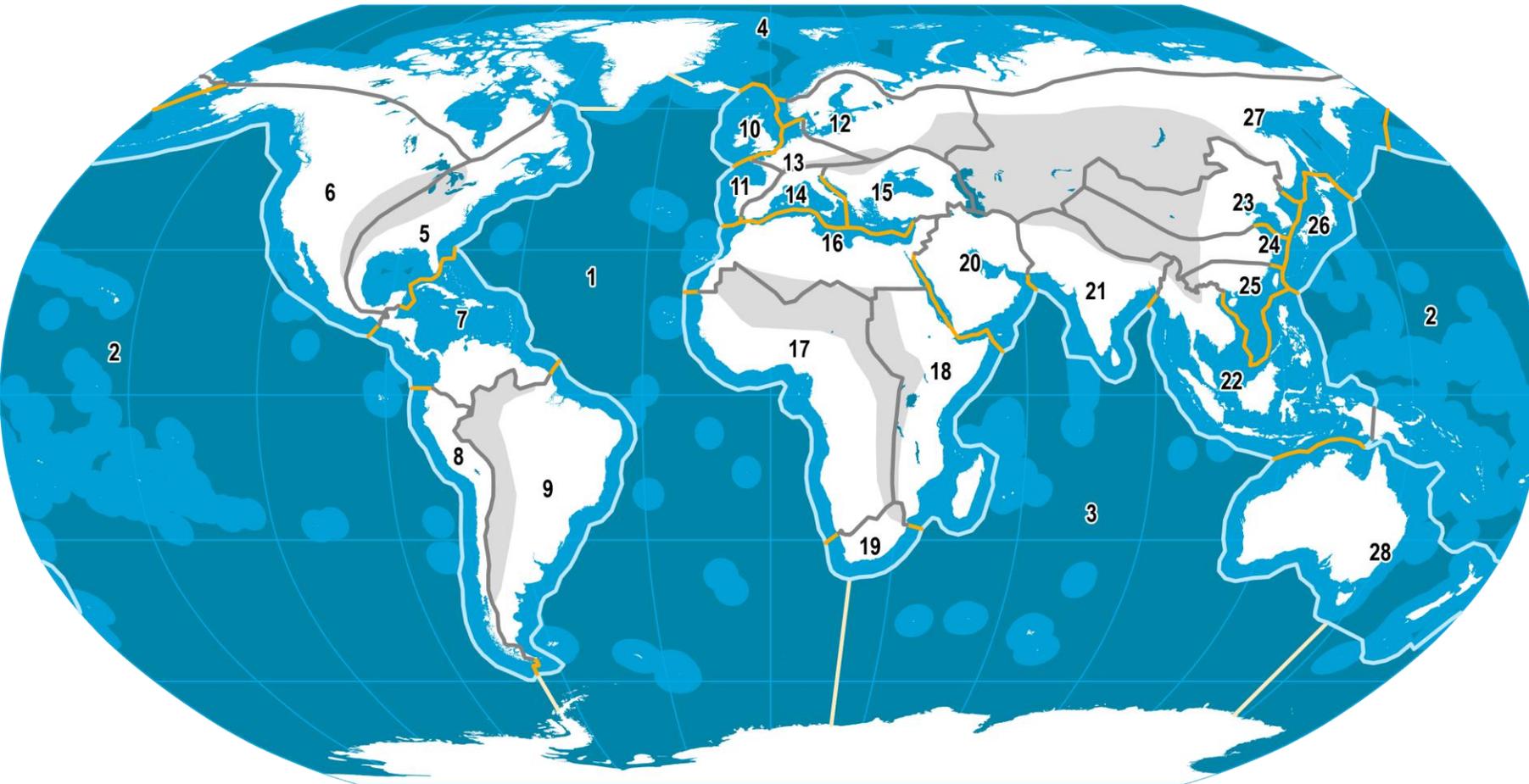
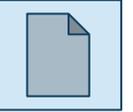
- Governance and institutional settings
 - Land ownership and the roles of institutional arrangements between the public and private sectors.
 - Many ports are publicly owned but have terminals operated by private organizations.
- Port functions
 - Range of services offered by the port, such as cargo handling, logistics, and distribution, industry, and maritime services.
 - Subject to competitive pressures.
- Specialization
 - Refers to the cargo handled.
 - Containers, conventional general cargo, liquid bulk, dry bulk, or roll-on-roll-off cargo.
 - Some ports are specialized in handling passenger traffic, namely cruise ships and ferries.
 - Port-centric industries such as steel plants, energy plants, automotive, or chemical industries.
 - Logistics activities are an important contributor to port specialization.

Port Ranges

- Definition
 - A group of ports situated along the same seashore and potentially sharing access to a hinterland.
- Multi-port gateway region
 - A group of ports in proximity competing for the same port calls and hinterland.
 - A smaller geographical scale than a container port range.

Major Maritime Ranges

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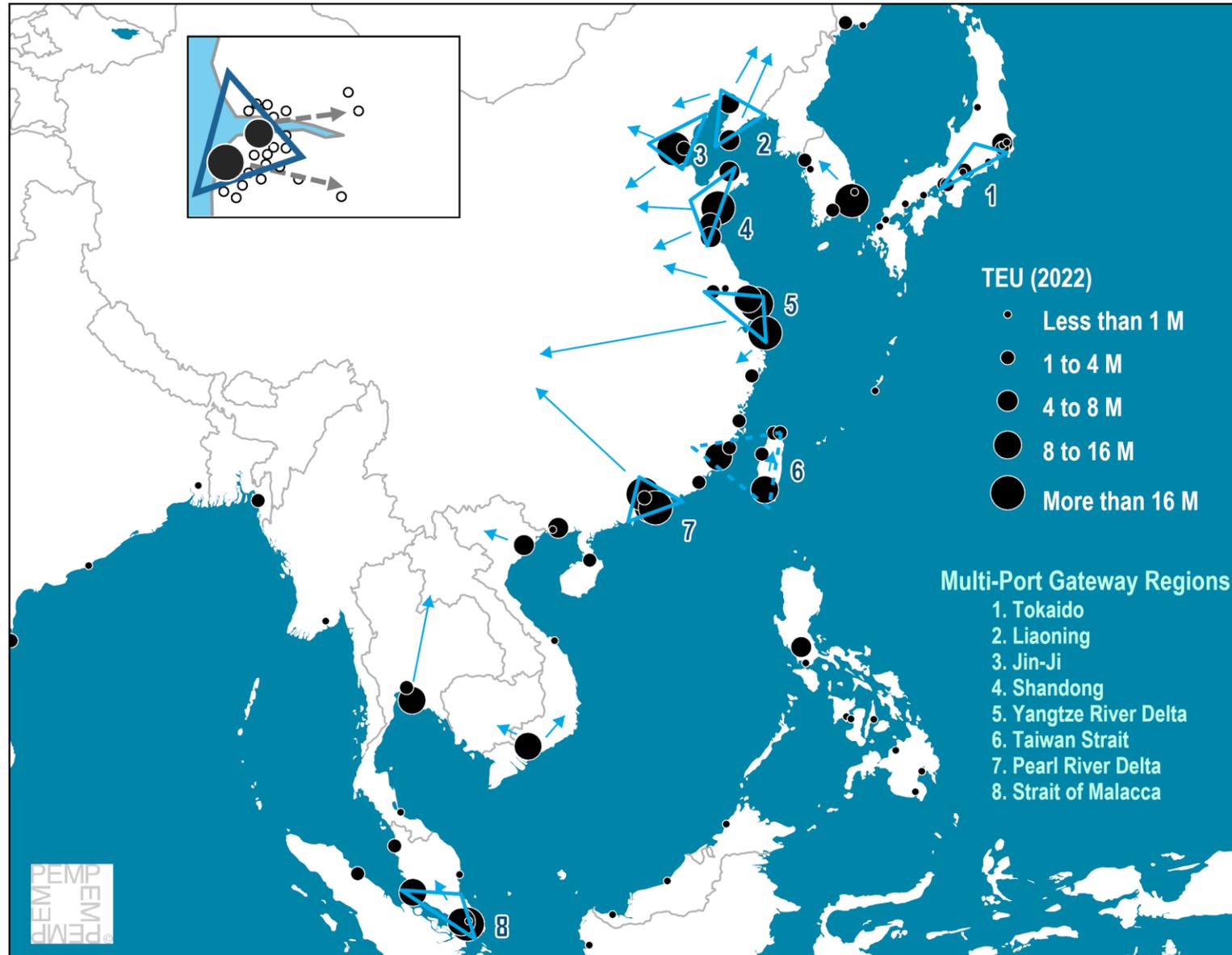


Main Maritime Ranges

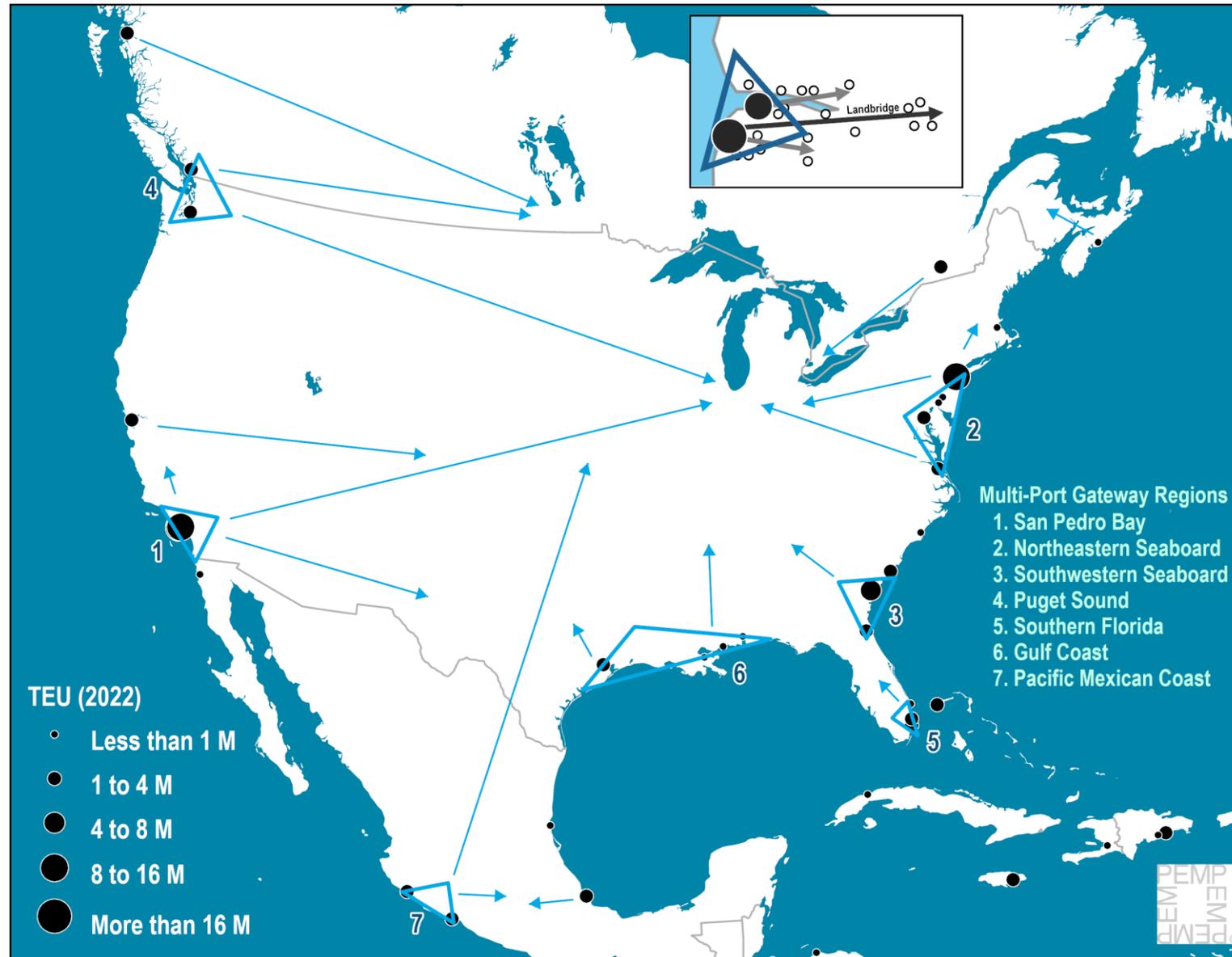
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|------------------------------|-----------------------------|
| 1. Atlantic | 18. East African Coast |
| 2. Pacific | 19. South Africa |
| 3. Indian | 20. Middle East |
| 4. Arctic | 21. South Asia |
| 5. North American East Coast | 22. Southeast Asia |
| 6. North American West Coast | 23. Yellow Sea |
| 7. Caribbean Basin | 24. Central China |
| 8. South American West Coast | 25. Southern China / Taiwan |
| 9. South American East Coast | 26. Japan |
| 10. British Isles | 27. Russian Far East |
| 11. Atlantic Europe | 28. Oceania |
| 12. Baltic | |
| 13. Northern Europe | |
| 14. West Mediterranean | |
| 15. East Mediterranean | |
| 16. South Mediterranean | |
| 17. West African Coast | |

- Oceanic Boundary
- Maritime Boundary
- Inter-Range Boundary
- Hinterland Boundary
- Exclusive Economic Zone
- Contestable Hinterland

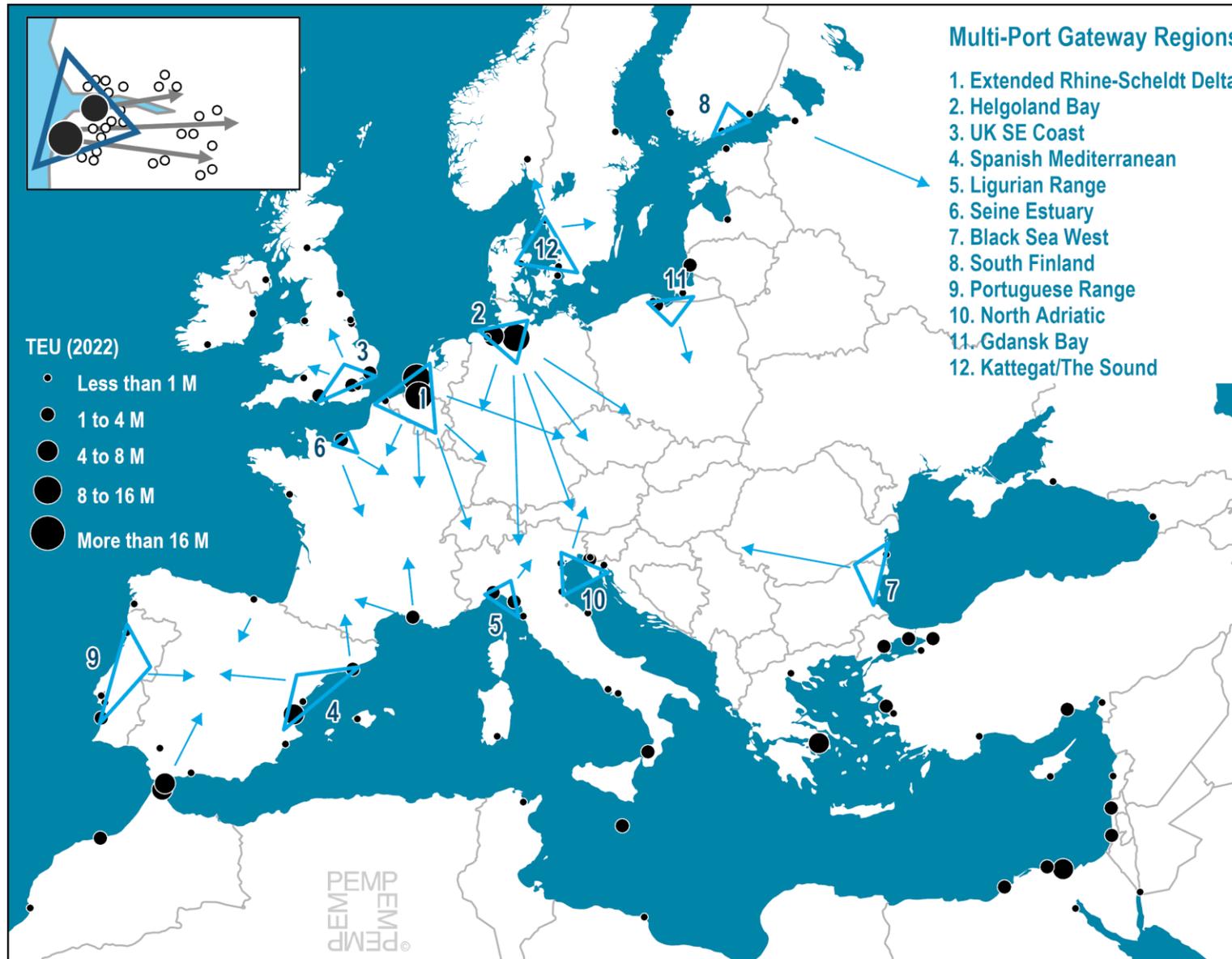
The East Asian Container Port System and its Multi-port Gateway Regions



The North-American Container Port System and its Multi-Port Gateway Regions



The European Container Port System and its Multi-port Gateway Regions





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B. Port Authorities

Port Authority: A Definition

- Port Authority

- A public or a private entity that, whether or not in conjunction with other activities, under national law or regulation is empowered to carry out:
 - Administration.
 - Development.
 - Management.
 - Operation of the port land and infrastructure (occasionally).
 - The coordination and control of port operation activities.

Port Authority: A Definition

- Rationale

- Need to manage property rights in waterfront areas.
- The need to plan port development.
- The provision of public goods, which, like navigation safety, cannot be denied to users who refuse to pay while consuming services that are unlikely to be provided by the market.
- The need to take into account both positive and negative externalities.
- The need to promote the efficiency of local monopolies in port services provision, which have the potential to generate economic rents.

The Function of Port Authorities

- Landlord
 - Manages the port assets under its jurisdiction.
 - The provision of infrastructure, such as piers and the dredging of waterways.
 - Done with public funds that port authorities are able to levy.
- Regulator
 - Sets the planning framework.
 - Fees, subcontracting services, and safety.
 - Enforcement of national and port-related rules and regulations.
- Operator
 - Provides day-to-day services to ships (e.g. pilotage and towage) and merchandise (e.g. loading/unloading and warehousing).

Emerging Paradigm in the Roles of Port Authorities

Read this content 

CONVENTIONAL PORT AUTHORITY ROLES

- LANDLORD**
 - Planning and management of port area.
 - Provision of infrastructures.
- REGULATOR**
 - Planning framework.
 - Enforcement of rules and regulations.
- OPERATOR**
 - Cargo handling.
 - Nautical services (pilotage, towage, dredging).

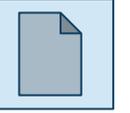


EXPANDED PORT AUTHORITY ROLES

- LANDLORD**
- REGULATOR**
- OPERATOR**
- Cluster Governance**
 - Service Efficiency
 - Logistical Integration
 - Infrastructure and Growth Management
 - Port-City Integration
- Types of Involvement**
 - Conservator
 - Facilitator
 - Entrepreneur
- Terminal Operator(s)**
 - Leases
 - Concessions

The Main Activities of Landlord Port Authorities

Read this content



Traffic Management



- Vessel traffic management (fast turnaround, security, reliability).
- Management of inbound and outbound inland traffic.
- Partnership with barge, rail and truck operators for inland distribution.

Area Management



- Develop transport infrastructures.
- Provide space for port-related activities (expansion or reconversion).
- Rationalize land use.

Customer Management



- Attract new customers.
- Retain existing customers (satisfaction).
- Find new added value activities.

Stakeholder Management



- Influence regulation.
- Relations with local, regional and national public agencies.



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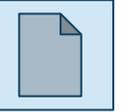
INTRODUCTION TO THE MARITIME INDUSTRY



C. Terminals

Types of Port Terminals

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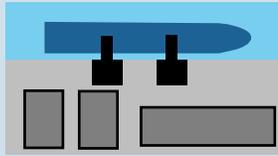
PORTS

TERMINALS

GENERAL CARGO

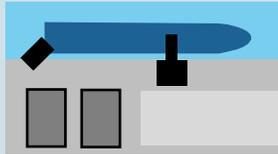
Unitized Cargo

Break Bulk



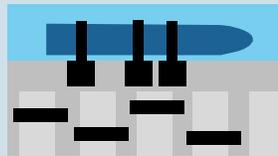
- General warehouses (Drums, bags, pallets, boxes)
- Lift-on/lift-off (1.0 day average port time)
- 7% of tonnage

Neo Bulk



- Parking spaces and warehouses (Lumber, paper, steel, vehicles)
- Lift-on/lift-off, roll-on/roll-off (1.0 day average port time)
- 5% of tonnage

Containerized



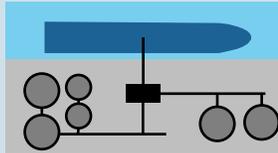
- Paved yards (Containers)
- Lift-on/lift-off (0.9 days average port time)
- 13% of tonnage

BULK CARGO

Loose Cargo

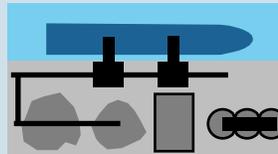
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Liquid Bulk



- Storage facilities (Petroleum, LNG, chemicals, vegetal oils)
- Pumps and pipelines (1.1 to 1.3 days average port time)
- 35% of tonnage

Dry Bulk

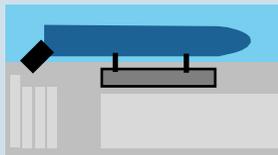


- Open or covered stacks (Coal, iron ore, grains, bauxite, sand)
- Grabs / suction and conveyors (2.7 days average port time)
- 40% of tonnage

PASSENGERS

People and Vehicles

Ferry & Cruise



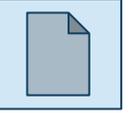
- Parking spaces, waiting queues, and terminals
- Roll-on/roll-off, gangways (Less than 0.5 days average port time)

Breakbulk Terminals

- Terminals reflecting market segmentation; storage sheds and storage areas.
- Project cargo
 - Power generation equipment (generators, turbines, wind turbines, equipment for the oil and gas industry), mining equipment, building and construction equipment, brewery tanks, silos, and heavy machinery.
- Iron and steel products
 - Coils, plates, steel bars, slabs, plates, steel wire, pipes, and tubes.
- Forest products
 - Including wood and paper products.
- Parcels
 - Malt, fertilizer, sugar, and rice.
- Reefer vessel trades
 - Fruits and meat.

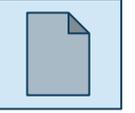
Steel Wires in a Warehouse, Port of Halifax (Breakbulk)

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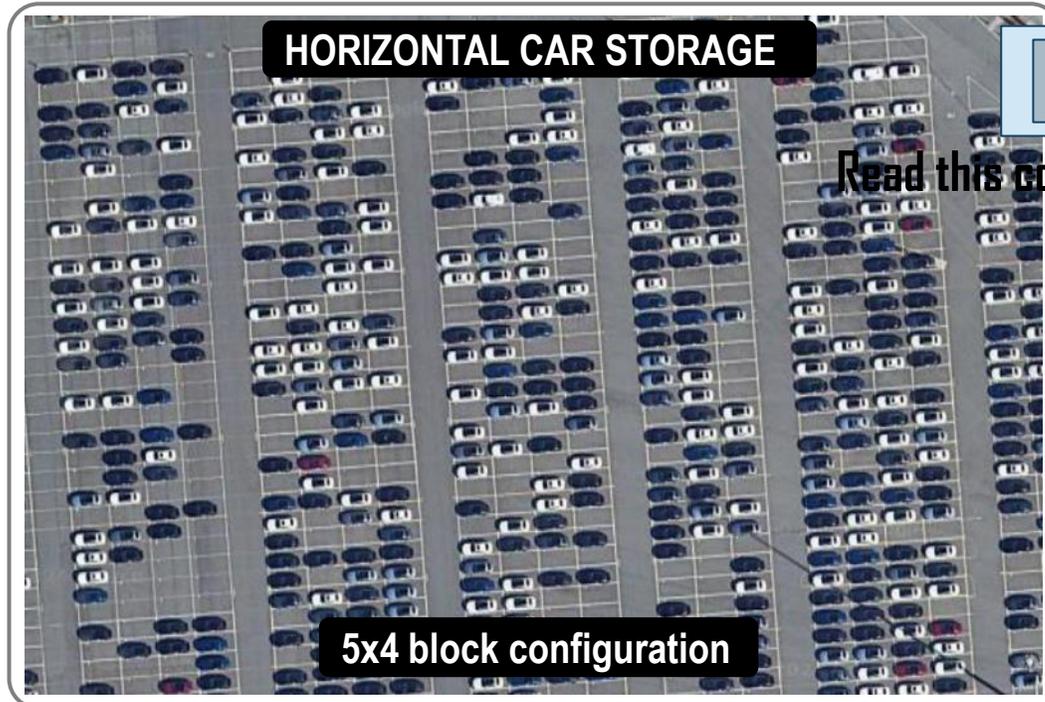
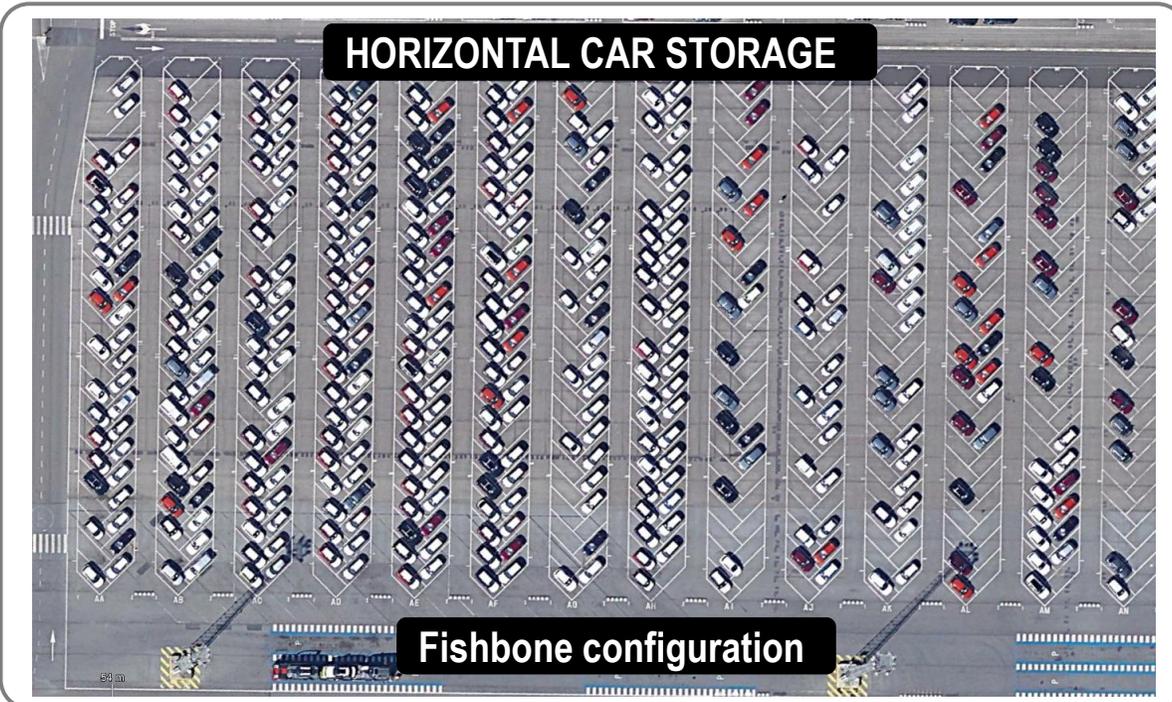
Wind Turbines as Break Bulk Cargo

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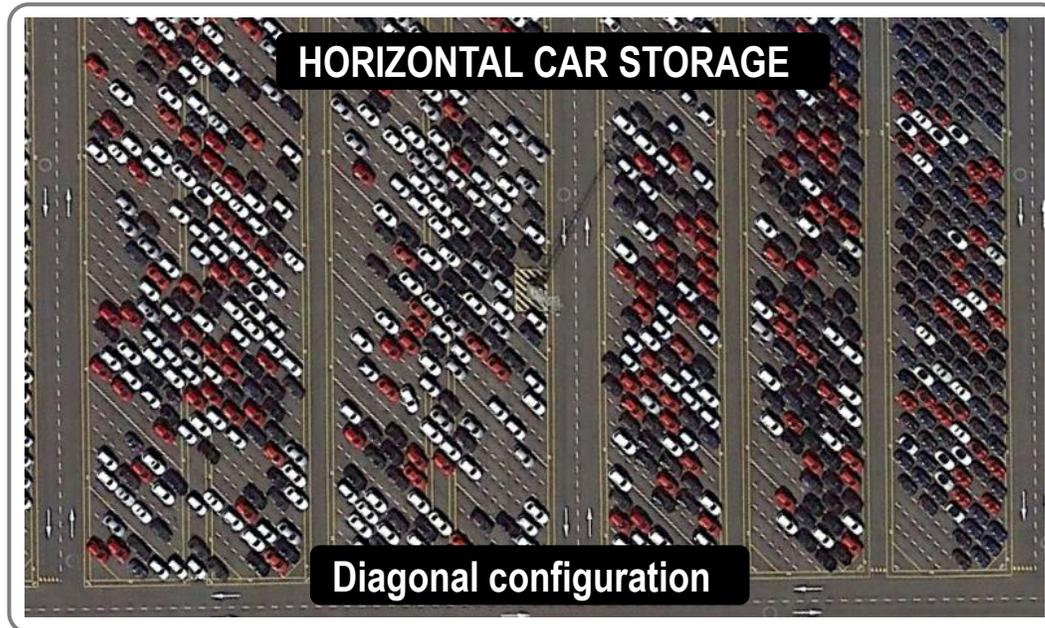
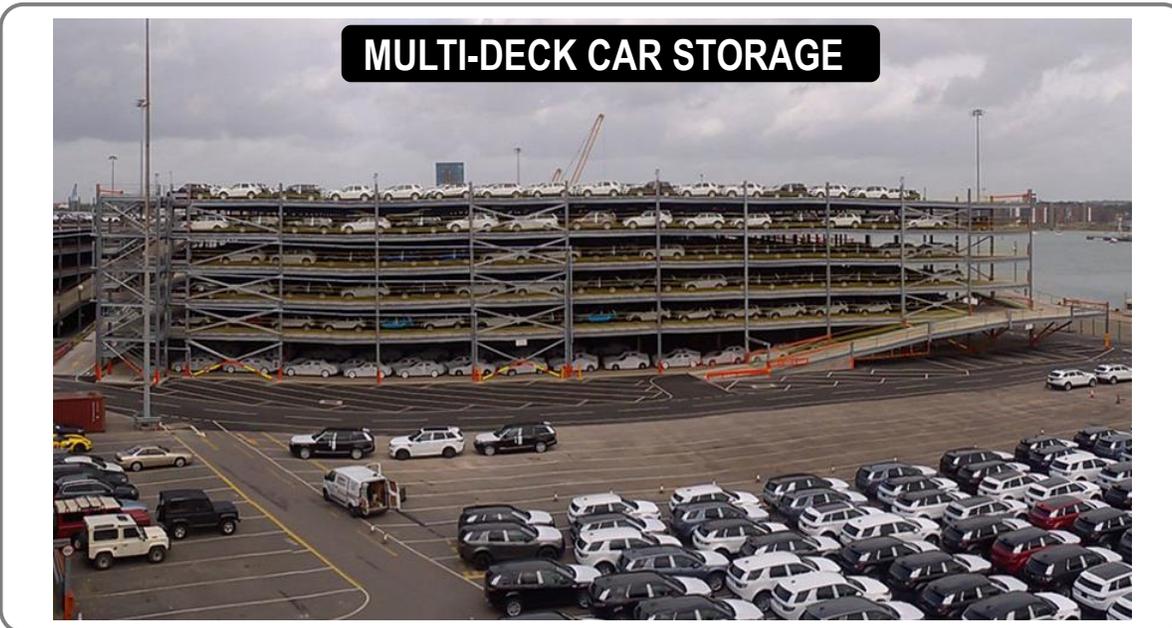


Neo Bulk / RORO Terminals

- Quays
 - Depends on the type of ramp the visiting vessels.
 - In most cases, a straight quay wall is sufficient.
 - When the vessel uses a bow or stern ramp, the quay wall might have a small outward extension to facilitate vessel handling.
- Terminals
 - Car terminals usually cover large surfaces.
 - Vans bring dock workers on board, after which they each pick a car to be driven down the ramp and parked on a designated spot in the yard.
 - Yard is designed as a large parking area with small distances kept between cars.
 - Parking configurations are deployed to maximize the productivity of terminal land without limiting access to the parked vehicles.



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Container Terminals

- Definition

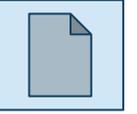
- A terminal facility specializing in the transshipment, handling, and temporary storage of containers.
- Between at least two transportation modes.
- Footprint including quays, yard areas, equipment such as cranes and other support facilities, including administrative and maintenance buildings and warehouses.

- Constraints

- Available land footprint that will limit terminal capacity, particularly yard storage.
- Nautical profile of the site that will command the maximum ship size and the number of ships that can be serviced at a given time.
- Needed infrastructures and superstructures and their capital investments.
- Available transport infrastructures supporting the connectivity of the terminal with its hinterland.

Modal Separation in Space: Europa Terminal in Antwerp

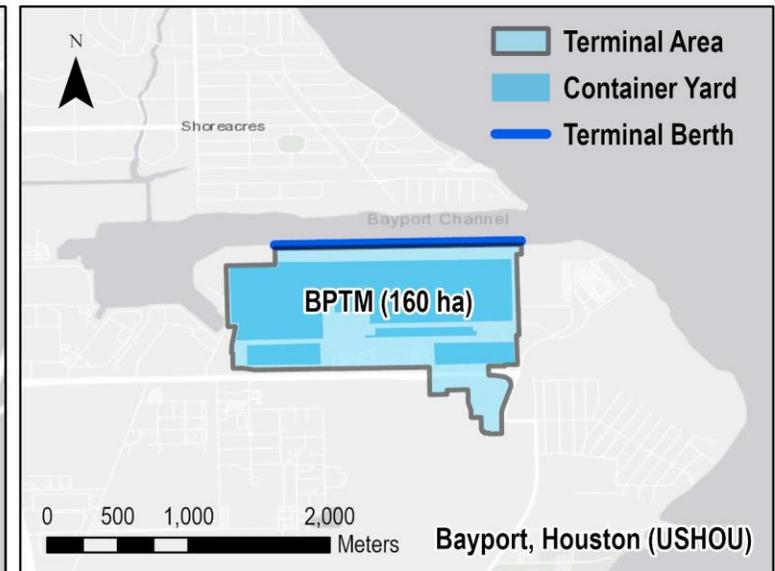
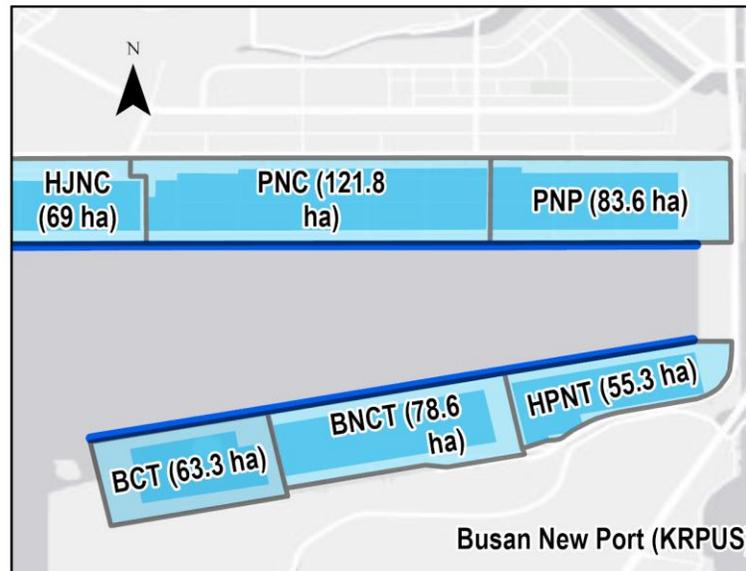
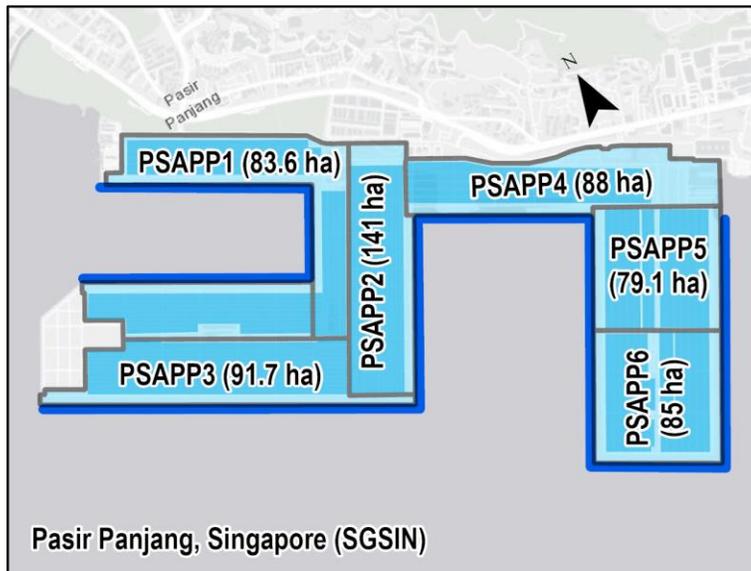
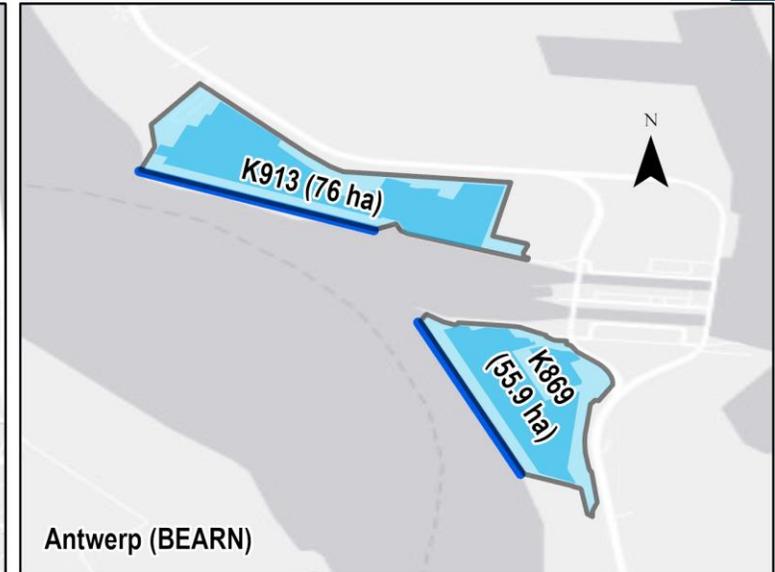
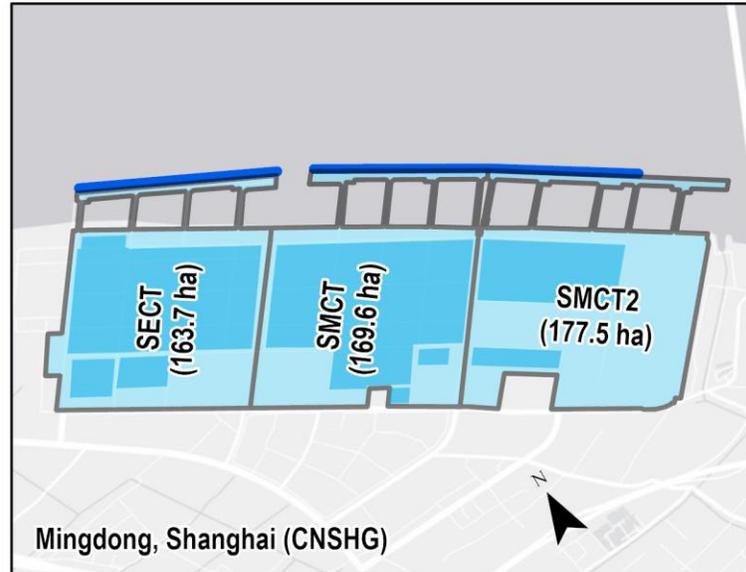
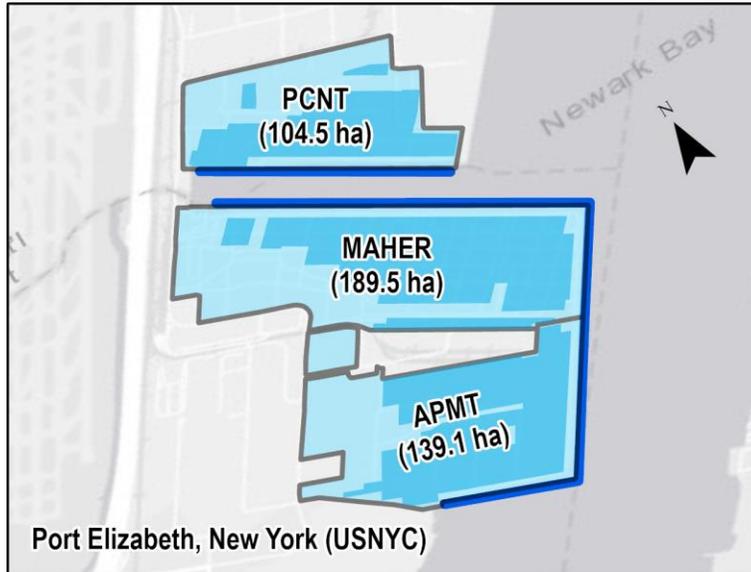
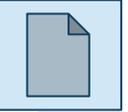
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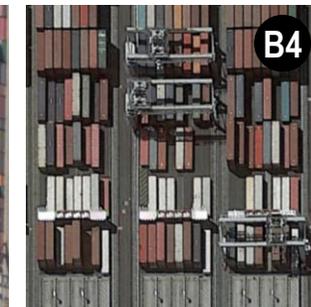
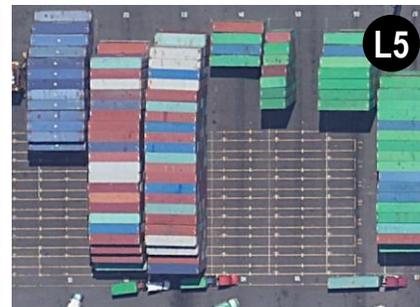
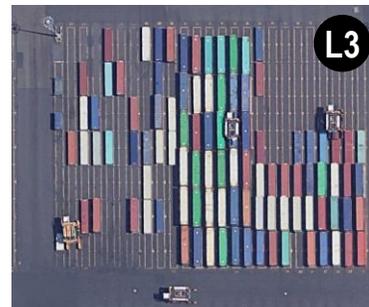
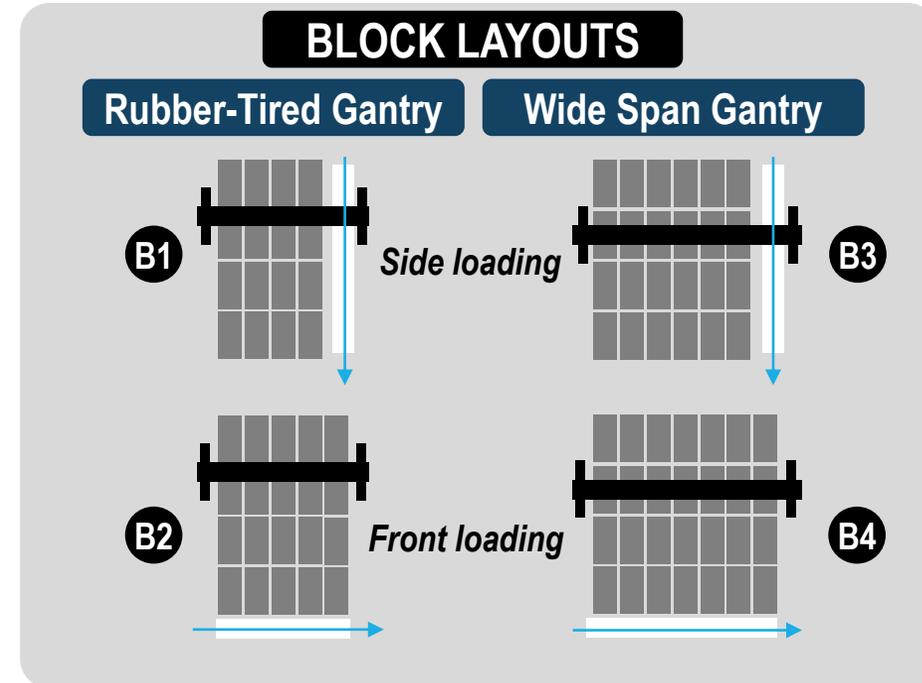
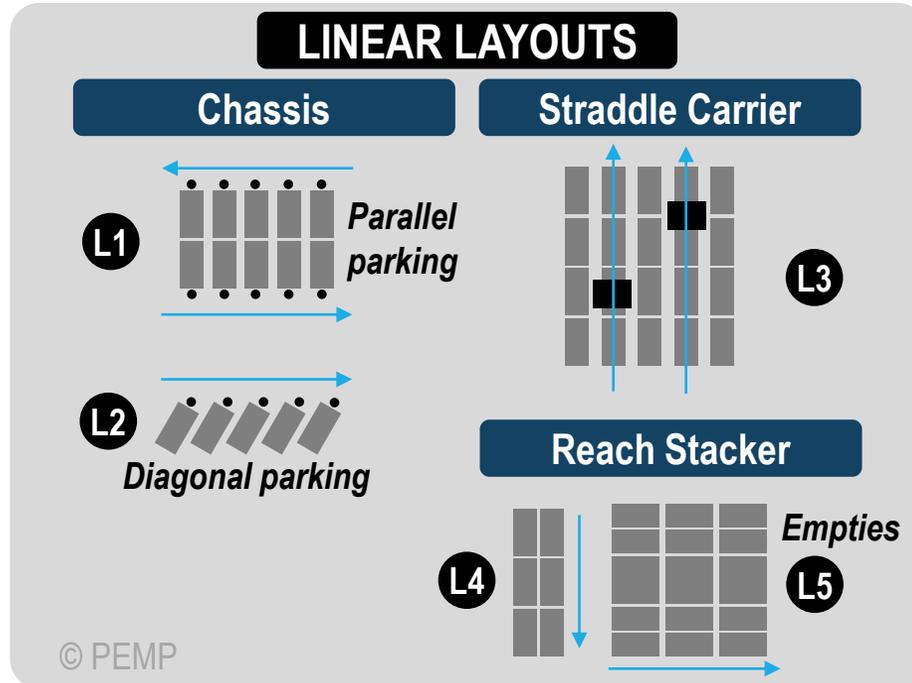
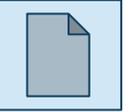
Terminal Footprint, Selected Container Ports

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The Configuration of Container Yards

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Conventional Intermodal Port Terminal Equipment



STRADDLE CARRIER

- Circulate over container piles.
- Can go over stacks up to 3 containers.
- Density of 500 to 750 TEU per hectare.



RUBBER-TIRED GANTRY

- High storage densities (1,000 TEU per hectare).
- Difficult moving between stacks.
- High acquisition; low operating costs.



FRONT-END LOADER

- Use top container anchor points.
- Handle most containers.
- Can reach stacks up to 3 containers in height.



RAIL-MOUNTED GANTRY

- Highest storage density (wide span; +1,000 TEU per hectare).
- Lowest operating costs.
- Fixed to rail tracks.



REACH STACKER

- Flexible side loaders.
- Can reach stacks up to 3 full or 5 empty containers.
- 500 TEU per hectare.



PORTAINER

- Load and unload containerships.
- Various sizes (Panamax and Super-Panamax).

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Liquid Bulk Terminals

- Definition

- Designed to handle crude oil, oil products, LNG, and LPG.
- Special equipment such as loading hoses or loading arms.
- Consists of a piping assembly with moveable pipes.
- Loading arms can be installed on jetties or regular quay walls.
- Liquid bulk terminals tend to use jetties as berth areas.
- Yard usually contains a mix of tank storage facilities and other technical installations, such as pump stations.
- Many liquid bulk terminals are directly connected by pipeline to chemical or petrochemical production sites.

Port of Houston Oil Terminal

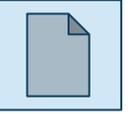


Dry Bulk Terminals

- The issue of directionality
- Export terminals
 - Synchronized with the inland transport system (mostly rail-based) that connects the mining areas to the terminal.
 - Try to limit stocks but must keep a large stock to support commodity trade pricing.
 - Handle a limited number of material types.
 - Location is a compromise between hinterland and maritime accessibility.
- Import terminals
 - Usually handle multiple types and grades of major bulks, stockpiles of bulk material.
 - Terminal surfaces are quite large to avoid cross-contamination between stockpiles.
 - Rely heavily on rail and barge (where available) for hinterland transportation.
 - Terminal planning is quite challenging as vessels usually arrive randomly.

Import-Oriented Dry Bulk Terminal: EMO Rotterdam

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Examples of Grain Terminals



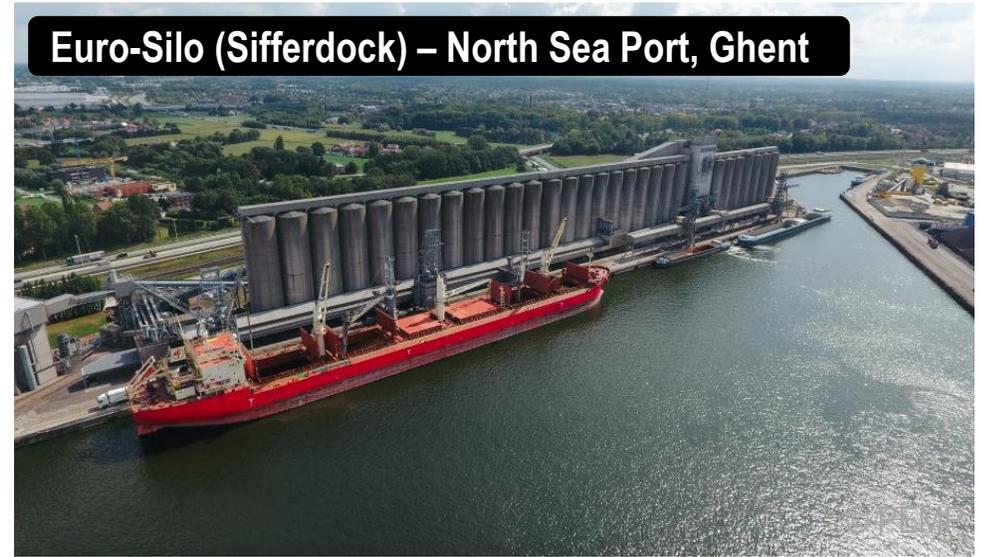
Viterra terminal - Montreal



COFCO terminal - Dalian



Grain terminal – Prince Rupert



Euro-Silo (Sifferdock) – North Sea Port, Ghent

Cruise Terminals

- Definition

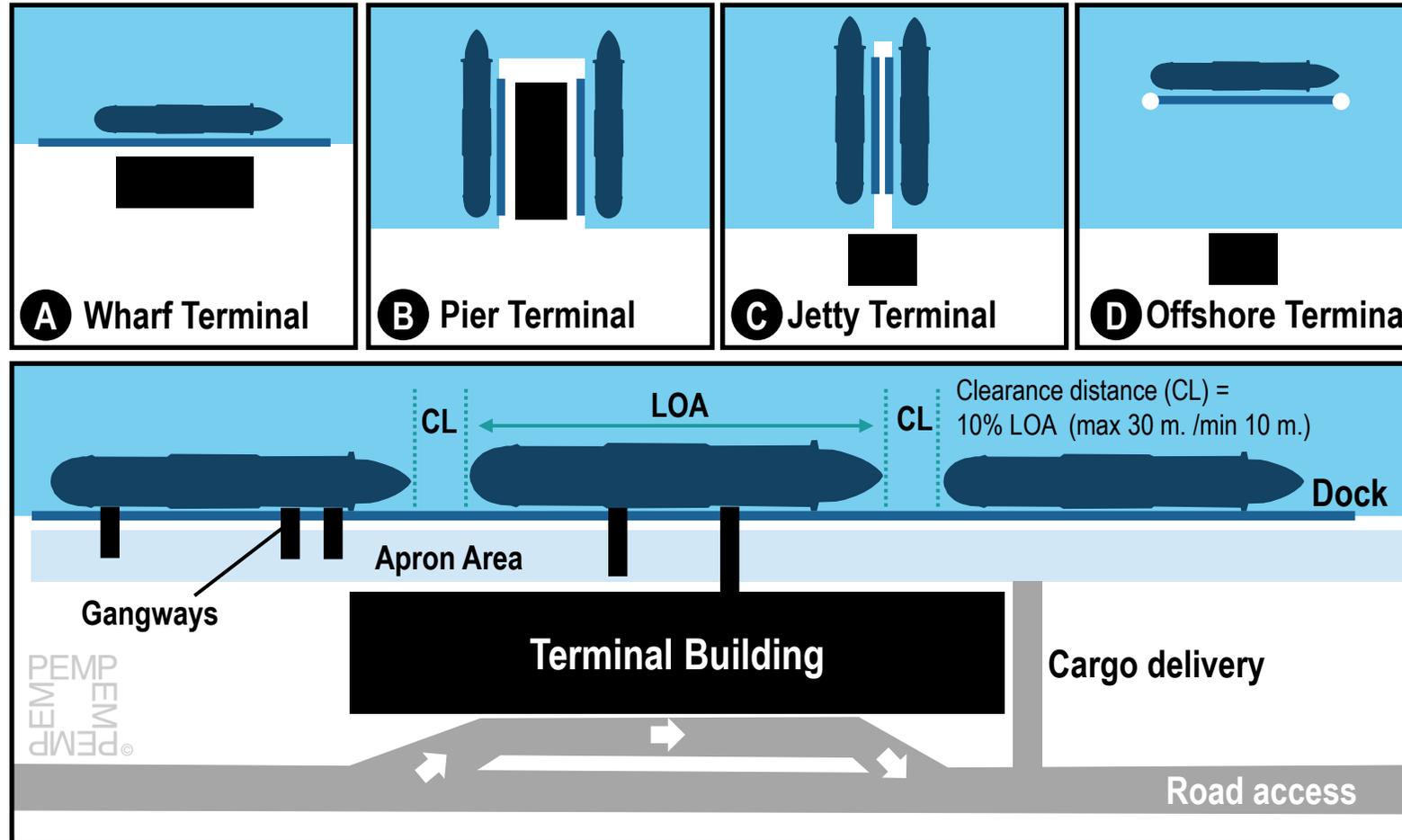
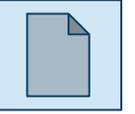
- Serve the requirements of cruise vessels and their passengers.
- Integrated with transport, tourism, and the urban planning strategies of the port city and nearby destinations.
- Fulfill minimum requirements for draft, berthing lines, and navigation channels for cruise ships.
- Provisions for various spaces, including the apron area, terminal building, and ground transportation.
- Connectivity to the city, car parking, and public transport facilities are particularly important.

- Home port

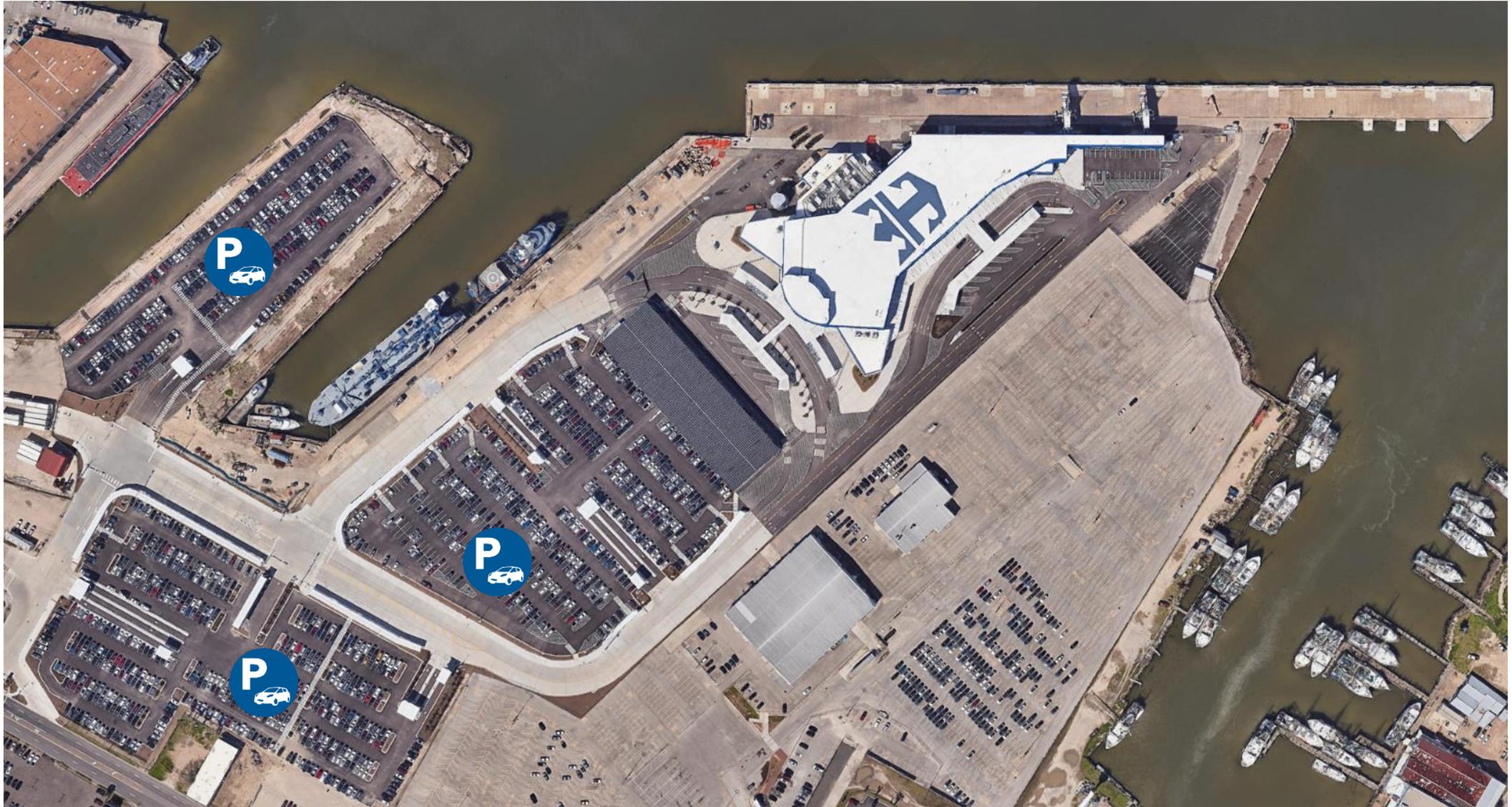
- Requires quick turnaround.
- Provisions and bunker.
- Baggage handling.
- Similar to an airport terminal.

Cruise Terminal Configuration

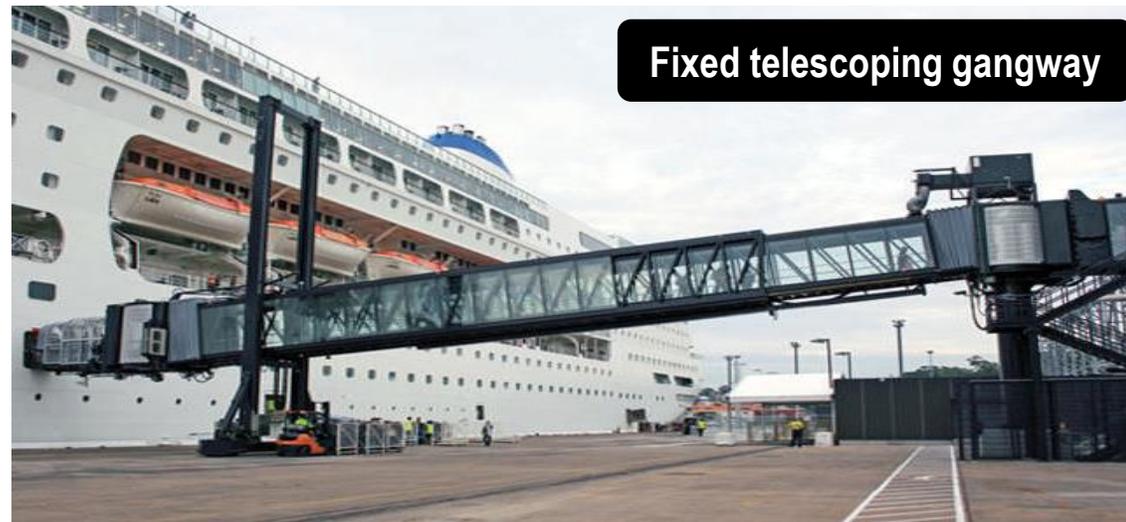
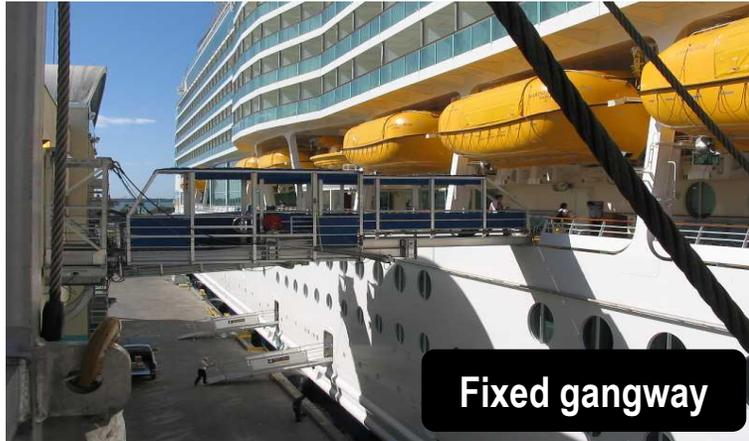
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Royal Caribbean Galveston Cruise Terminal (Pier Terminal)



Types of Cruise Gangways





TEXAS A&M UNIVERSITY
GALVESTON CAMPUS.

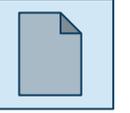
INTRODUCTION TO THE MARITIME INDUSTRY



D. Terminal Operators

Typology of Global Port Operators

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STEVEDORES

Horizontal integration

Port operations is the core business; Investment in container terminals for expansion and diversification.

Expansion through direct investment.

Public: PSA, HHLA, China Merchants Port Holdings.

Private: Eurogate, HPH, ICTSI, SSA.

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CARRIER-LINKED

Vertical integration

Maritime shipping is the main business; Investment in container terminals as a support function.

Expansion through direct investment or through parent companies.

Public: COSCO.

Private: MSC, APMT, Evergreen.

FINANCIAL HOLDINGS

Portfolio diversification

Financial assets management is the main business; Investment in container terminals for valuation and revenue generation.

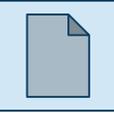
Expansion through acquisitions, mergers and reorganization of assets.

Public: DP World (Sovereign Wealth Fund).

Private: Ports America (AIG), Macquarie Infrastructure (Fund).

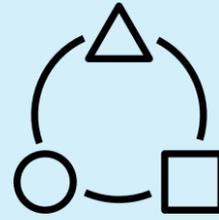
Value Propositions behind the Interest of Equity Firms in Transport Terminals

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ASSET (Intrinsic value)

- Terminals occupy premium locations (waterfront).
- Globalization made terminal assets more valuable.
- Traffic growth linked with valuation.
- Same amount of land generates a higher income.
- Terminals as liquid assets.



DIVERSIFICATION (Risk mitigation value)

- Sectoral and geographical asset diversification.
- Mitigate risks linked with a specific regional or national market.

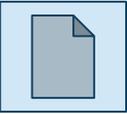
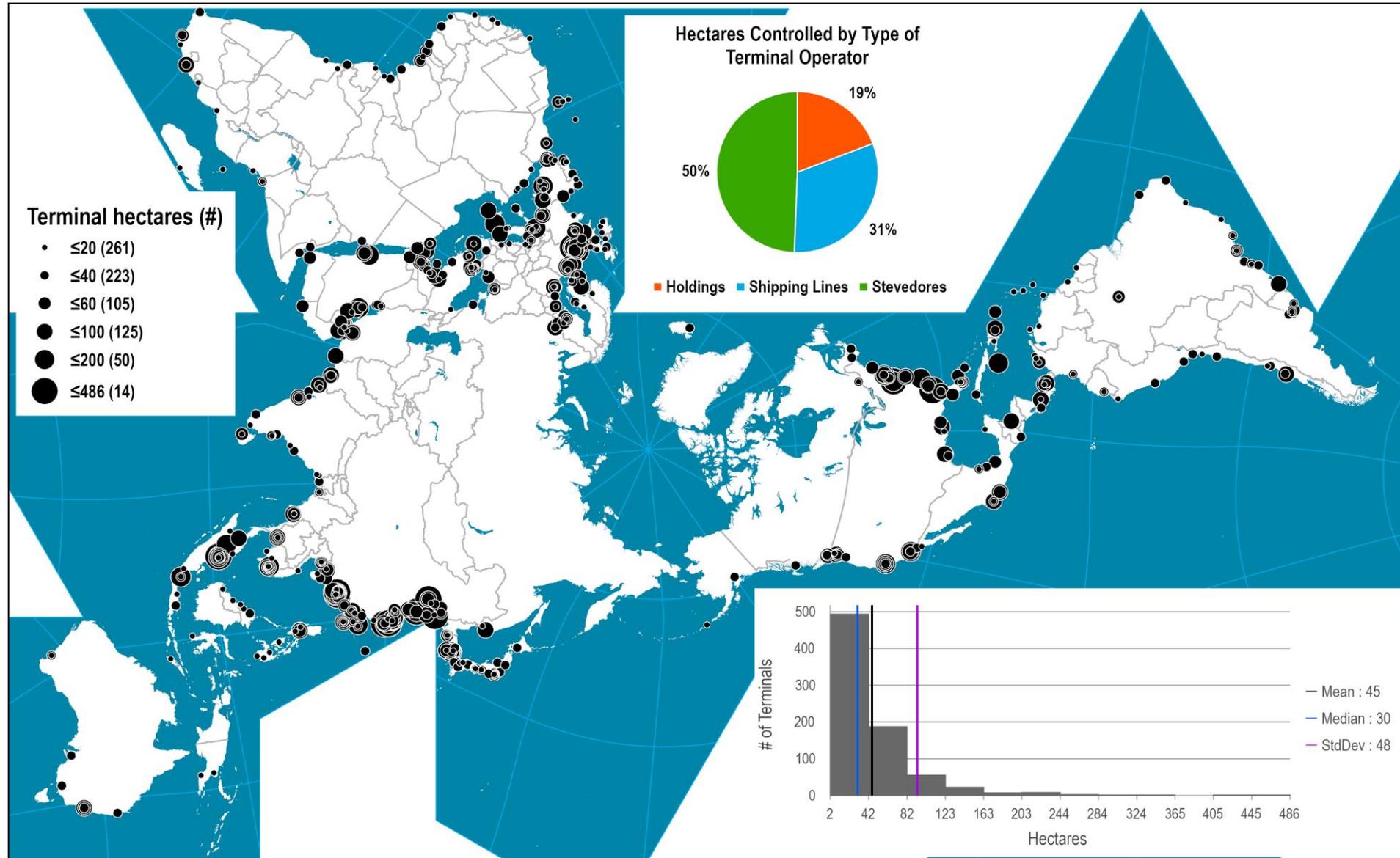


SOURCE OF INCOME (Operational value)

- Income (rent) linked with the traffic volume.
- Constant revenue stream with limited, or predictable, seasonality.
- Traffic growth expectations result in income growth expectations.

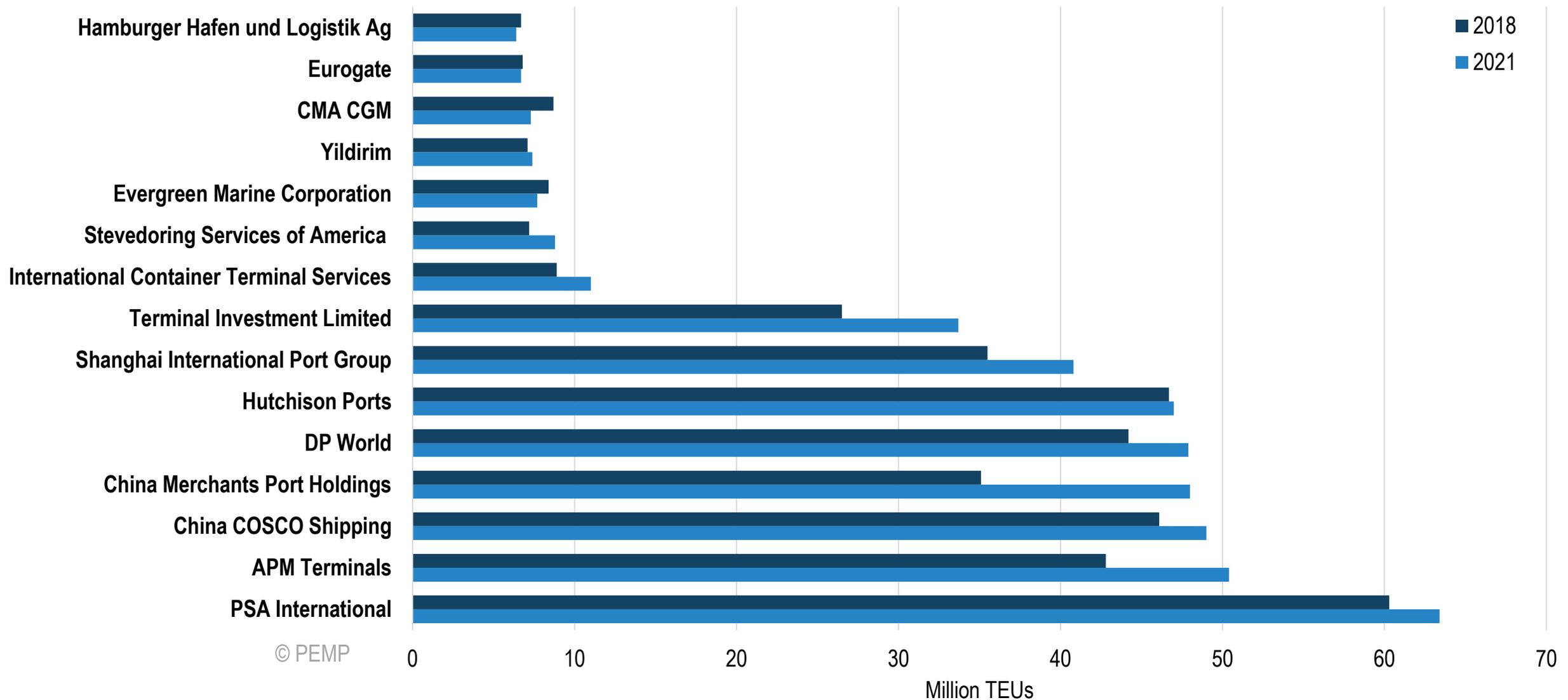
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Footprint of Container Terminal of the World's Major Terminal Operators, 2021



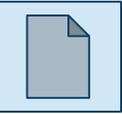
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Largest Global Container Terminal Operators by Equity-Based Throughput, 2018-21



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The Cruise Portfolio of Global Ports Holdings



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