CONTRIBUTIONS TO PLANNING THE CONSOLIDATION OF HUB PORTS IN BRAZIL

November 2024

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INTRODUCTION

Despite the improvements arising from the port reforms implemented in Brazil in the past three decades, particularly as concerns productivity and capacity gains associated with private-sector investments in port terminals, **the inefficient sectoral planning and management model of public ports** has not been properly addressed and may be regarded as the industry's main bottleneck at this point. The increasing difficulty unlocking and implementing relevant projects are notorious, in an environment where planning, coordination between actors and the predictability of public agents' actions are key to attracting investments and mobilizing resources in an optimized and harmonious manner.

More specifically, the topic of **planning and consolidation of hub ports** in Brazil requires meticulous care on the part of Port Authorities and those responsible for the port sector's planning and policies, as it involves a need for intra- and inter-port organization, a need for material investments to overcome existing gaps, and above all, organization and predictability. Instead, in today's scenario, transportation and industry planning fail to address the matter. **This immobility does not appear to be a valid policy choice**.

Given this context, **A&M Infra** and **Navarro Prado Advogados**, together with **APM Terminals**, have drafted this propositive article to enrich and provide guidance for relevant discussions on port planning and on different policies, enabling the pursuit of necessary changes/improvements to industry plans, master plans, PDZs, waterway infrastructure projects (including concessions/PPPs) and more, **based on a structured view of the concepts discussed.**

The topic is quite extensive and this article does not intend to be exhaustive. Its central purpose is to define a set of boundary conditions, guidelines and parameters that policymakers should pursue in terms of port infrastructure and operations **to effectively enable structuring an efficient hub ports dynamics in Brazil**

A&M Infra's team has extensive experience in strategic studies, market studies, project structuring and public sector regulatory topics, having recently incorporated Terrafirma Consultoria and its entire consulting staff. Similarly, **Navarro Prado Advogados's** team has extensive experience in project structuring and regulatory topics in the port industry. The authors' recent experience includes a series of projects associated with planning and regulatory aspects of the port industry and other infrastructure industries.

SUMMARY

EXECUTIVE SUMMARY

In an environment as dynamic as the port industry, **long-term planning is a particularly challenging exercise**. On the one hand, large infrastructure investments require **predictability to enable long-run amortization**. On the other hand, the dynamism of the shipping industry, subject as it is to constant topical crises and deep reconfigurations, demands **quick response and flexible arrangements** to adapt ports to new paradigms. Therefore, structuring projects require carefully orchestrated actions to create the necessary conditions for effective implementation. This is the backdrop for the discussion surrounding the implementation of **hub ports** in Brazil.

The maritime container shipping industry, in particular, is characterized by intense competition in a commodified market with little differentiation between players – *"a slot is a slot"*. This translates into typically small margins, making marginal cost (i.e. cost per container) reduction key to survival. This is why in the past 25 years **shipping companies' strategies have focused on the pursuit of economies of scale**, the most obvious of which has been the adoption of **ever-increasing vessel size and capacity**.

Ship growth has gone hand in hand with a global trend to organize liner services according to a **hub-and-spoke model**. For mega-ships to operate at high occupancy rates and with reduced times at port, stops are limited to the most important ports (hubs), which concentrate transshipment volumes intended for smaller ports (spokes) – these, in turn, are served by smaller cabotage ships.

With the constant growth of ships, global transshipping almost tripled between 1980 and 2010 (from 11% to 29% of total port throughput). This trend fuels a constant debate on: (i) **whether, and how, ports should attempt to adjust** (e.g., increasing approach channel depth, reinforcing structures, updating equipment); and (ii) **how to plan for such a transformation in the face of the unpredictability** surrounding transshipment flows that depend on each shipping company's strategy.

Inevitably, **Brazil too is exposed to this global trend** – albeit to a lesser degree, as it holds a peripheral position on the maritime trade map (relatively small volumes, distance from the main shipping routes, to name just a couple of factors). Historically, there has been an 8-15 year lag between the advent of a new class of ships on the main routes (e.g., Asia-Europe) and the beginning of their operations in Brazil. Still, a **growing lag** can be seen between the advent of the 366-meter class of ships in Europe (e.g., 2006 in Rotterdam) and their full operation on routes reaching Brazil. Indeed, a 2016

study by the University of São Paulo commissioned by Santos' Port Authority forecast that, absent waterway access constraints, these ships should be operating regularly in Santos by 2018.

The fact that the first occasional berthings of 366-meter ships at Brazilian ports began to take place in early 2024 – although our main ports are not yet ready for them to operate at full capacity – confirms shipping companies' trend to allocate these assets to higher-volume routes along the East Coast of South America (ECSA). Furthermore, it suggests a mismatch in the provision of the required infrastructure to receive these vessels, as dictated by the dynamics of the industry and the economic rationale of ship allocation. Unlocking operations of the "366 class" will require a series of adjustments to the port industry and the organization of liner services – which may lead to the consolidation of regional hubs along the Brazilian coast that will concentrate transshipment flows towards other Brazilian and South American ports.

Given this brief background for context, we find (as explained ahead) that:

I. Significant room exists to consolidate hub ports in Brazil and for the resulting growth in transshipment operations, once certain relevant gaps are addressed;

II. Implementing a hub-and-spoke dynamics may yield material benefits in terms of reduced shipping costs and increased liner service reliability; and

III. The transport industry's planning and policy should include steps intended to enable the implementation of hub ports in Brazil and address dynamic-specific concerns.

I.
SIGNIFICANT ROOM EXISTS TO CONSOLIDATE HUB PORTS IN BRAZIL

The container port market developed sharply in Brazil since the late 1990s (CAGR in excess of 10%), driven by the advent of specialized terminals since the first lease agreements. Since 2011, with a relatively consolidated market, **transshipment operations have seen rapid growth:** in 5 years, they increased from 6% to approximately 19% of total port throughput, a level that has remained steady since then. This coincided with the entry into operation of 300 to 340-meter ship classes along the ECSA.

Notwithstanding, space remains for a significant change in this dynamics, as:

- The main services operating along the Brazilian coast **still rely on a point-to-point rationale**, with an average 5.6 port calls in the country, with double calls at Santos in a majority of cases; and
- Not all ECSA ports are expected to adjust to serve 366-meter ships, so that a significant portion will be served by feeder services from **one or more regional hubs**.

To understand the changes that can be expected from the consolidation of one or more hubs in Brazil, one may assess the possible scenarios along two dimensions. First: **what ports can potentially play the hub role?** In the world's main markets, regional hubs are **ports with rather developed hinterlands**, with significant gateway cargo volume to "anchor" the presence of a wide range of Deep-Sea services. Thus, the **"natural candidates" to Brazilian hubs** include ports like Santos (a favorite, as it answers for 40% of domestic volumes and is the only one called by virtually every Deep-Sea line sailing the ECSA), Paranaguá, Itapoá, and the Itajaí-Navegantes complex. Note that other dynamics (e.g., the consolidation of "local hubs" due to the proximity to specific routes) may come into play, depending on the various shipping companies' specific strategies and positioning.

Second, **potential volumes to be concentrated at the hub(s)** may be estimated based on the demand from ports that would cease to be called by Deep-Sea services (assuming that higher-volume tradelane services – i.e. Asia, North America and Mediterranean – services may adopt a hub-and-spoke dynamics with large vessels). One must therefore consider, in addition to volumes from Brazilian ports, the demand from the ports of Buenos Aires and Montevideo – as, in addition to existing waterway access restrictions, eliminating the 2 to 3-day trip to the Plate could enable sizeable cost savings. Therefore, in a **conservative scenario** (consolidating one Asian and one Northern European service), we estimated that **total additional transshipment throughput might be approximately 2 million TEU** (in 2023 volumes). In a **bolder scenario**, where the largest services along the main tradelanes adopt a hub-and-spoke mode, **total additional transshipments might reach approximately 4.6 million TEU** – almost twice as much as in 2023. In such a scenario, the average transshipment incidence at Brazilian ports would increase from 19% to 30-40%.

This reconfiguration of container flows will have various effects and require adaptation on the part of the ports consolidating as hubs, from the cabotage/feedering market, and from the port industry's institutional and regulatory environment itself. Thus, discussion of the new dynamics requires understanding the **gaps to be addressed at the various levels:**

i. In the **port environment**, the gaps are more obvious, and directly concern access for large ships and the operation of additional transshipment volumes, which divide into three aspects:

- **Waterway infrastructure**, with access channel improvements to address more than just the required draft, but also less frequently discussed items (e.g., width to enable ship crossing);
- **Waterway operation**, as a hub port must be able to serve frequent mega-ship berthings predictably, rapidly and at cadence, and their full-load entry may require special operations or create additional bottlenecks, with technical solutions to be evaluated locally;
- **Dynamic-appropriate terminals**, with materially increased productivity and handling capacity, so as to absorb significant additional volumes while maintaining acceptable occupancy.

ii. In the **cabotage market**, with the increased feedering demand from the new hubs, the following will require attention:

- **Operating capacity**, with substantial fleet increase being likely needed to enable the new dynamics;
- **Line organization and dynamics**, restructuring lines to serve the various ports at appropriate frequencies and transit times.

Shipping companies themselves will address these aspects, with little interface with planning, but it is worth assessing the presence of

- **Potential fleet growth bottlenecks**, such as vessel chartering constraints (which, in an initial assessment, "BR do Mar" addresses) or the availability of specialized labor in sufficient numbers.

iii. In **industry planning and regulatory environment**, the planning instruments at the various spheres must address the topic, with a particular focus on the possible and required contracting arrangements; and appropriate treatment of potential concerns (e.g.: competition), as discussed below.

II.

IMPLEMENTING THE HUB-AND-SPOKE DYNAMICS MAY GENERATE MATERIAL BENEFITS

Because they are a means-activity by nature, transport infrastructure projects are usually driven by **cost reductions**. As noted, adopting hub-and-spoke services enables optimized use of mega-ships, reducing the duration of their port calls and maximizing the share of time they spend loaded and sailing. To estimate the dimension of scale gains, we built a simplified model that simulates a liner service's operation and calculates its main cost components: vessel chartering/acquisition, bunker use, port costs, and transshipment/feedering of volumes concentrated at hubs.

We simulated a generic service between Asia and the East Coast of South America, in two configurations. Solution 1, analogous to the existing **point-to-point** services, employs 300-meter, 9,000-TEU ships, with 8 calls at 5 ECSA ports (Santos, Paranaguá, Itapoá, Buenos Aires and Montevideo), resulting in a cost per unit of 408 USD/TEU. Solution 2 assumes a **hub-and-spoke** service with 366-meter, 13,000 TEU ships, with a single ECSA call (at Santos) and serving other ports by means of feeder services, achieving 357 USD/TEU. That is, **using large ships under a hub-and-spoke model could enable a transport cost reduction of about 13%**. *(The estimated amounts are shipper-incurred costs, and not freight prices. Even so,* **one can reasonably assume that a significant share of gains will be passed on to cargo**, *as has been the case historically, given the industry's competitiveness and the need to ensure high levels of vessel occupancy.)*

Admittedly, adopting a hub-and-spoke rationale raises concerns associated with a potential increase in the transit time of containers using feeders, as the transit time of cargo may represent a significant economic cost. On the other hand, one must also consider **two possible**

operational gains under the "new model: (i) the improved coordination between Deep-Sea and feeder berthing windows under the hub-and-spoke model should **reduce layover times at the hub** (which is currently 5-7 days at Brazilian ports); and (ii) minimizing the number of calls for the main Deep-Sea service should **reduce the risk of delays and prevent impacts of unforeseen events from propagating** along all subsequent calls. Introducing these two effects in the above simulation shows that the transit times are quite similar between the two solutions, with a maximum increase of about 2 days (with potential transit-time reductions for cargo from specific ports, depending on the each service's peculiarities).

Therefore, the hub-and-spoke model may provide benefits aside from reduced costs: improved service **resilience** in the face of potential incidents, and **reliability** as concerns fulfillment of the original schedule. Furthermore, by more efficiently connecting feeder ports to the hub, it can increase the **connectivity** of smaller ports with the various destination tradelanes/ports.

III.

TRANSPORT PLANNING SHOULD PROVIDE FOR THE IMPLEMENTATION OF HUB PORTS IN BRAZIL

Although a "diffuse perception" exists in the industry that hubs consolidation is possible in Brazil, **the national logistics planning policy currently ignores the subject.** Since, as argued so far: (i) **Brazil has a vocation for the development of regional hubs**, but gaps need to be bridged on various dimensions, and (ii) **foreign trade chains can derive benefits** from hub-and-spoke solutions, **and transport infrastructure planning instruments at their various levels should consider solving and concatenating actions to enable their development.**

Given the functions and objectives provided for in Decree No. 12.022/2024, which institutes the **Integrated Transport Plan ("Planejamento Integrado de Transportes" – PIT)** and its governance spheres, we understand that planning instruments (from the most central to the local) should:

- **National Logistics Plan:** indicate the country's need to adjust to the shipping industry's global trend towards hubs consolidation and support potentially strategic ports;
- **Port Sector Plan**: indicate potential additional transshipment volumes, driving discussions on strategic projects and the means to bring them about;
- **Master Plans:** forecast each port's/complex's expected transshipment volumes and gaps; and
- **PDZs:** indicate means to effectively implement hubs, given local specificities.

On the other hand, there is less clarity on the means to implement projects in such a manner as to pursue the required convergence of all stakeholders within the Brazilian institutional and regulatory environment. Initially, given the **predictability vs. flexibility dichotomy** found in the port-shipping company relationship, **long-term investment arrangements** for ports and/or access infrastructure, allocated in part to shipping companies (through their terminal-operator subsidiaries) appear to be an appropriate means to ensure incentives alignment between the parties. These commitments might be combined with **regulatory tools already provided for** in the existing legal framework (such as properly adjusted selection criteria and/or contract parameters focusing on **the predictability of and direct incentives to transshipment volumes**, as seen in ports worldwide).

Furthermore, **operational and financial aspects exist** in association with the implementation of hub ports: (i) close coordination between Deep-

Sea and feeder services and the berthing windows offered by terminals is key for the hub-and-spoke operation to develop optimally for all cargo; (ii) transshipment volumes tend to be more volatile and their operation less profitable, so that independent terminals tend to not prioritize them. These factors, together with increased volume predictability, lead to a **natural verticalization in hub port structuring.** Indeed, the presence of vertically integrated operators is a global trend, seen in a majority of the main hub ports around the world.

Notwithstanding, this phenomenon generates concerns surrounding the effects of vertical integration on the port market, particularly along two (somewhat interdependent) dimensions: potential **competitive** impacts; and potential impacts associated with **supply-demand mismatch** across terminals within a single port environment.

In the former case, concerns about **possible anti-competitive conduct** arise from the ability of, and/or incentives for, shipping companies to engage in market-closing conduct, for which State oversight is required as a remedy. About this, it should be noted that, in addition to the strict regulations governing the Brazilian port industry, with terminals bound to provide non-discriminating access to their capacity, competition in the shipping market (i.e., the presence of different alternative shipping companies on the various routes) tends to minimize risks. Thus, vertical integration is not problematic *per se*, although risks may exist that justify the use of contract-based mechanisms to monitor, control and sanction such conduct (as antitrust authority CADE has found repeatedly). Additionally, no convictions exist[1] concerning the use of the port infrastructure to close markets, which only occurs in hypothetical exercises.

By its turn, the discussion of a potential **supply-demand mismatch** arises from the very framework of port management and the presence of some level of Public Sector control over entry into the industry. Notwithstanding, the port industry's legal/institutional framework is explicitly oriented towards increased competition by means of investments in capacity supply, as per Law No. 12.815/2013. Therefore, "capacity supply management" and any measures to ensure a healthy competitive environment must derive from the **predictability** that long-term investments require, rather than from barriers against new projects/entrants, and **ultimately in pursuit of benefits for user** (i.e., improved efficiency and lower prices). From the public-interest view, it is always better to risk creating some short-term excess capacity than to unduly restrict it – which is natural when it comes to infrastructure investment cycles. The Public Authorities should welcome new investment projects associated with enabling hub ports, as they would be in any port globally operating under the Landlord model. The discussion should address "***how***" (and not "*whether*") to implement: that is, a project's features and how to adjust them to the reality of the Port at hand.

[1] APM Terminals and Maersk operate in scores of countries and are unaware of any case where antitrust authorities opposed actual cases of container terminal integration.

01

MARITIME INDUSTRY AND HUB PORT ORGANIZATION: CONTEXT AND CONCEPTS

To begin with, it is key to recognize that the consolidation of hub ports arises from demands associated with the shipping industry and maritime containerized cargo transportation, as well as the respective operational strategies. Understanding the industry's characteristics and dynamics is crucial to understanding the context and, subsequently, how the topic affects discussions in the specific case of Brazil.

The maritime container shipping industry is dynamic and subject to constant and material changes, and organizing shipping in terms of a hub-and-spoke rationale is part of the rising trend towards the pursuit of efficiency, due largely to economies of scale. This pursuit generates a worldwide demand for port adaptations, which requires concatenated actions to create conditions for effective implementation. This is the context in which the discussion about the implementation of hub ports in Brazil takes place.

1.1
THE MARITIME CONTAINER SHIPPING INDUSTRY IS ORIENTED TOWARDS INCREASING SPECIALIZATION, CONSOLIDATION, AND THE PURSUIT OF SCALE AND EFFICIENCY GAINS

The shipping industry is **extremely volatile and cyclical** by nature due to its high sensitivity to several factors associated with the industrial microeconomy (e.g., volatile commodity prices, productive seasonality, harvest cycles, etc.) and the macroeconomy of international relations (e.g., global crises, political cycles, revolutions, wars, etc.).

From among the many particular traits that make shipping a *sui-generis* industry, **demand-side inelasticity** stands out. That is, since the cost of transport generally represents a fraction of the price of goods, freight price oscillations (even if significant) do not tend to create material changes in demand. Give this inelasticity and generally speaking, **freight levels vary as a function of the supply** of vessel capacity.

When it comes to containers, the dynamics of transport is given by liner services: the service is rendered regularly, with determined service frequency and transit times, on a previously programmed itinerary that requires well defined berthing windows at ports of call. This creates a great demand for **predictability, concatenation and reliability**, which leads to significantly homogeneous services provided by the various shipping companies. According to Haralambides (2019), containerization led to a **"commodification" of maritime shipping services,** as shipping companies generally operate vessels with similar capacity and technologies, call at the same ports at similar frequencies, and charge reasonably similar freight prices as a result of the supply-demand balance on each route. *"Thus, for the shipper, a slot is a slot and (...) he should normally care little if his container arrived in Rotterdam on a Maersk or NYK ship. He should also care little if his container arrived in Vienna through Hamburg, Rotterdam or Antwerp"* [2]. The pursuit of service quality differentiation depends on whether the competitors can offer better predictability and reliability than the others, offering services that better meet clients' needs, calling at their preferred ports and designing their routes with the lowest transit time possible.

In addition, this is a highly competitive market, with low margins on the temporal average (since, given the previously discussed volatility, high margins are typically short-lived in the industry). In 1995-2016, when TEU volumes nearly quadrupled, the container shipping industry's average failed to match its cost of capital (2.6% ROIC)[3]. In this market, **variable cost is essential for survival**, enabling withstanding low freight prices in depressive periods, making scale gains a key variable.

Historically, shipping companies responded to these financial pressures with supply-control agreements – the so called "freight conferences", which regulated the available capacity and prices charged. In the last 25 years, the practice largely fell by the wayside and **shipping companies' strategies began to focus on the pursuit of cost-cutting "levers".** The most obvious of these is the adoption of **vessels of increasingly large size and capacity**, pursuing economies of scale by means of the dilution of fixed costs (e.g., construction/chartering, crew, fuel, etc.) and technological updates, such as improved energy efficiency and the use of "green" fuels. As Figure 1, below, shows, this effect can be significant – and was certainly one

[2] Haralambides, H.E. *Gigantism in container shipping, ports and global logistics: a time-lapse into the future*. Maritime Economics & Logistics 21, 1–60 (2019).
[3] Source*: TT Club / McKinsey – Brave new world? Container transport in 2043 (2017).* "Of course, averages deceive. (...) [Even so,] for container liners, average returns for the top players were still less than the cost of the capital invested, with only a small number of global players or, alternatively, companies focused on "niche" trade routes able to squeeze out a return; a commoditised product and a mismatch between capacity additions and demand growth have proven a recipe for low returns."

of the main drivers behind the boom in container ship size between the mid-1990s and the early 2010s[4].

Finally, it should be noted that to effectively reap these gains, one must make sure that ships will operate most of the time above a certain minimum occupancy level, which is in line with certain trends observed in recent decades:

i. Shipping companies have increasingly resorted to **operational capacity-sharing arrangements** like SCAs, VSAs, and strategic alliances[5] as a means to share volumes and optimize asset usage, while maintaining individualized commercial actions. According to the *International Transport Forum*[6], these arrangements contribute to the pursuit of economies of scale and scope, addressing the two main aspects of competition for shipping companies: low prices and extensive geographic coverage;

ii. The pursuit of economies of scale to enable navigating excess capacity supply and the shipping market's periodical crisis cycles has naturally pushed towards an **industry consolidation drive** involving mergers and acquisitions[7];

iii. The operation of larger ships, together with the need for improved speed and efficiency at ports, has led to verticalization on the part of shipping companies, with investments in **port terminals and, later, along the chain**, with the provision of inland transport services, distribution centers, and integrated logistics solutions.

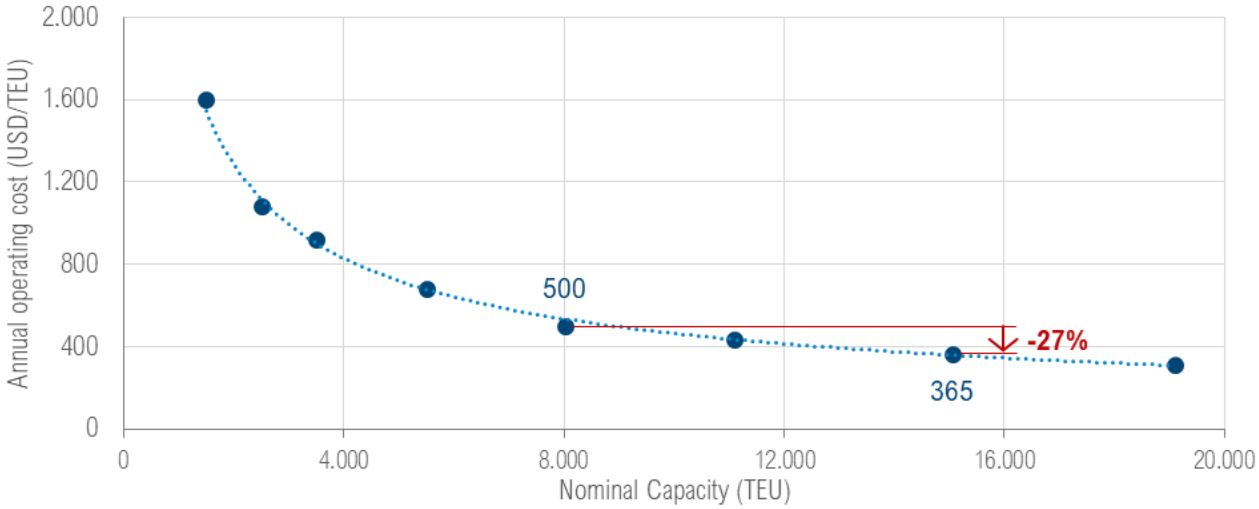


Figure 1: Annual operational cost per TEU of capacity (Source: adapted from OECD/ITF, The Impact of Mega-Ships, 2015)

[4] Between 1995 and 2013, three significant leaps forward took place in terms of the capacity of the largest container ship in operation, from ships of approximately 5,000 TEU (and length, or LOA, under 300 m) to almost 20,000 TEU (and 400 m LOA). The trend has been holding, and the first ships with capacity above 24,000 TEU began operating in 2022.
[5] Slot Charter Agreements (SCAs) are agreements under which a ship operator assigns some of its capacity so that other shipping companies may increase their coverage in the market at hand. Vessel Sharing Agreements (VSAs) are agreements under which a group of shipping companies collaborate to meet the demand on certain routes by sharing ships they own or operate and jointly optimizing a line's/service's schedule and calls. Alliances are broader cooperation agreements between shipping companies, under which asset sharing by a group of shipping companies applies to a series of large volume lines/services (e.g., Asia-Europe, Asia-North America, Europe-North America).
[6] OECD/ITF, *The Impact of Alliances in Container Shipping*, International Transport Forum, Paris (2018).
[7] According to Alphaliner data, at the turn of the 21st century, the 10 largest shipping companies controlled less than 50% of the world's container ship capacity; by 2024, the figure had reached 85% (with the 4 largest concentrating almost 60%).

1.2
ORGANIZING MARITIME TRANSPORT ACCORDING TO A HUB-AND-SPOKE RATIONALE ALIGNS WITH THIS DYNAMICS AND HAS BECOME WIDELY DISSEMINATED WORLDWIDE

Shipping companies' constant pursuit of economies of scale/scope and efficiency gains (as well as other benefits, such as improved service reliability, improved average vessel usage, and lower emission levels, as this article will discuss ahead) naturally affects the organization of the liner services they provide and the demand for port services and infrastructure. The clearest effect of this has been the establishment, in recent decades, of hub ports in several regions globally, following the trend towards concentrating Deep-Sea volumes on services with higher capacity vessels.

Two basic models exist for serving the demand for container transportation in a given region, as shown in Figure 2, below. The first (and most obvious) involves **point-to-point** connection, where regular trips call at all ports in the region and each container travels a single maritime trip from the port of origin to the port of destination. In the **hub-and-spoke** model, on the other hand, the deep-sea trip calls at a single port (hub) where all containers originating from/destined to the region are loaded/unloaded. Other ports' (spokes) hinterland cargo is transshipped and distributed by smaller ships between their port of origin/destination and the hub – therefore, each container may travel two maritime trips (the deep-sea leg and the cabotage or feeder leg).

The consolidation of hub ports is therefore directly related to the increasing size of ships. As previously discussed, large-capacity vessels can provide relevant economies of scale **as long as they operate at high occupancy rates and with reduced time in port**. To this end, the number of calls is reduced, limiting berthing to the more important ports, which begin to concentrate volumes. Haralambides (2019) notes that *"it is cheaper to 'shuttle' between hubs with a bigger ship and then distribute, rather than call directly at smaller ports, with smaller ships, serving a smaller demand"*. Thus, as vessel sizes continuously increased, global transshipment incidence[8] almost tripled between 1980 and 2010, from 11% to 29% of total port throughput, according to Rodrigue and Ashar (2015)[9].

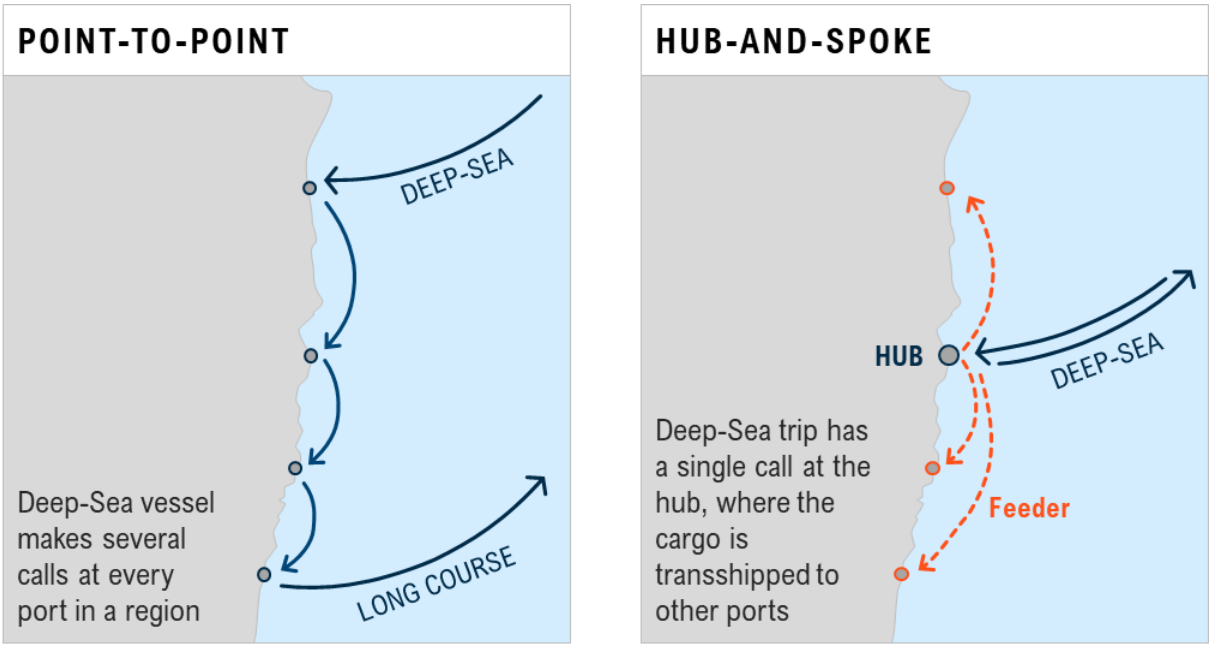


Figure 2: Illustrative comparison of the point-to-point and hub-and-spoke models

[8] A port's transshipment incidence is given by the number of transshipments performed (each transshipped container is handled twice, for unloading and loading) divided by the port's total handling movements.
[9] Rodrigue, J-P., Ashar, A. *Transshipment Hubs in the New Panamax Era: The Role of the Caribbean*, Journal of Transport Geography (2015).

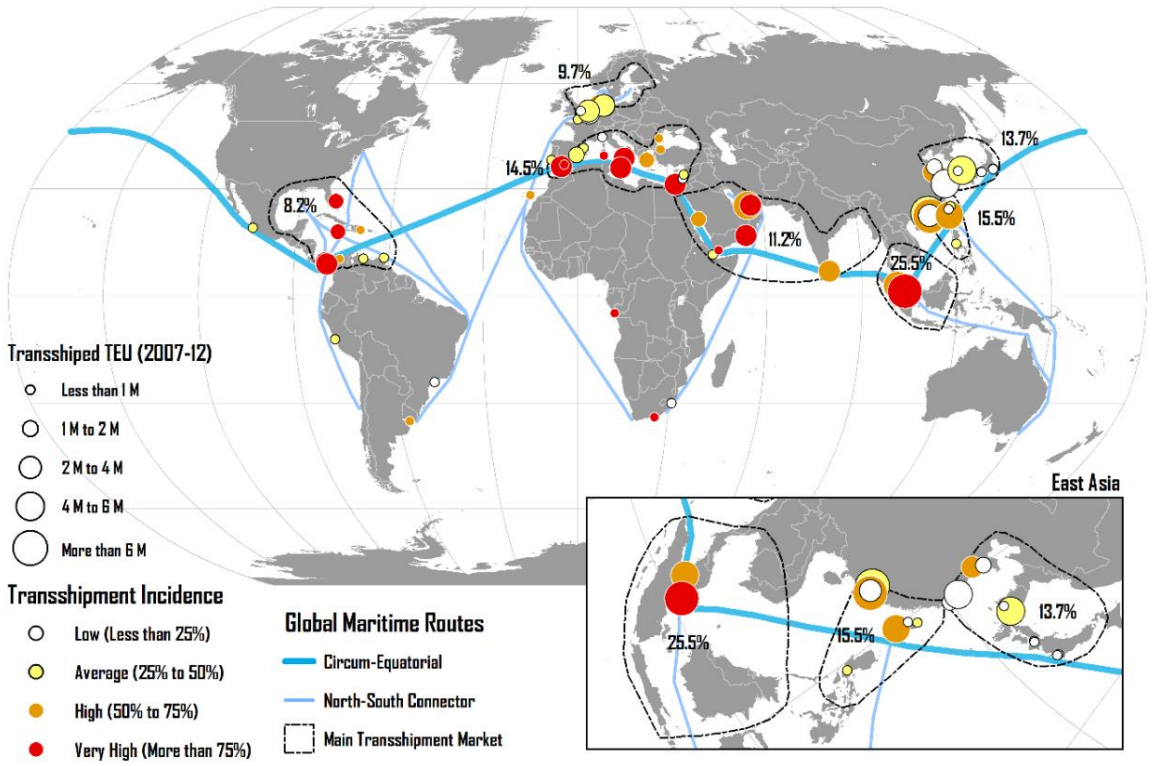


Figure 3: Overview of transshipment incidence at different ports around the world according to their geographical position (Source: Rodrigue and Ashar, 2015, reproduced from https://www.porteconomics.eu/)

Hub ports may be categorized by the incidence and type of transshipment they perform, both of which are a function of their location relative to the major foreign trade axes. Regions along the major East-West routes, such as the Strait of Malacca (between the Indian and Pacific oceans), the Mediterranean, and the vicinity of the Suez and Panama canals concentrate ports with transshipment incidence rates of 75-90%, as to the ports of Singapore, Tanjung Pelepas (Malaysia) and Gioia Tauro (Italy). These ports, referred to as **pure transshipment hubs**, display significant occurrence of transshipment operations between different Deep-Sea services to increase network connectivity and/or decrease the transit time of specific cargo (*relay* and *intersection transshipment*).

By their turn, regions at the ends of routes, such as East Asia and North Europe, concentrate **regional hubs**, with transshipment incidence between 30% and 50%, as illustrated by Hong Kong, Rotterdam, Antwerp and Hamburg. These ports serve an extensive hinterland of their own, in addition to concentrating transshipment volumes intended for smaller ports outside of the major deep-sea flows. Figure 3, above, illustrates the distribution of hubs with different transshipment incidence rates around the world, showcasing the distinction described above.

1.3 SHIPPING COMPANY-PORT INTERFACE: ADJUSTING PORTS TO THE DYNAMICS OF SHIPPING REQUIRES DELICATE COORDINATION BETWEEN INDUSTRIES WITH OPPOSITE PROFILES

As seen, intrinsic features of the maritime container shipping industry (i.e., low margins, high competition, sensitivity to gains of scale, etc.) drive moves on the part of shipping companies that create impacts on and demands for the port industry, such as the need for additional capacity, efficiency, and up-to-date assets (i.e., modern infrastructure and equipment). This interface bares an apparent conflict between the two.

On the one hand, the **port** – like every infrastructure industry – demands **high investments** to implement, adapt and modernize

its assets. These investments, as a rule, are only enabled by compensating private-sector capital over many years and/or through public subsidies associated with national sovereignty policies, fostering economic growth, etc. Thus, they are fundamentally dependent on **stability and predictability** to justify contract terms and long-term public policy. Shipping, on the other hand, is a fundamentally volatile industry where high-level industry trends and moves, and the particular strategies of various shipping companies create **medium-run needs that may significantly alter the demand for port infrastructure and services**.

It is no surprise that the port-shipping interface is the subject of constant debate: **can/should ports keep up with (or even anticipate)** the constant demand for adaptation to larger and larger ships? **How to plan for the necessary investments in the face of the unpredictability** surrounding transshipment flows that will depend on each shipping company's strategy vis-à-vis the shipping industry's financial and competitive pressures?

BOX 1: NEW CLASSES OF CONTAINER SHIPS AND CHALLENGES FOR THE ADAPTATION OF PORTS

The introduction of the Post Panamax II vessel class (or Sovereign Class), starting in 1997, represented a sizeable leap relative to the largest container ships in operation at that point in time, in terms of capacity (~8,000 vs. 5,000 TEU), length (340 vs. 300 m), beam (43 vs. 40 m) and draft (14.5 vs. 13 m). These vessels, according to Rodrigue (2024)*, posed an infrastructure challenge to many ports, since they demanded substantial investments in dredging to deepen channels/berths and acquiring Ship-To-Shore cranes with longer horizontal span and higher productivity. Less than 10 years later – a certainly shorter interval than the required amortization period of said investments –, in 2006, the first class of VLCS (Very Large Containerships), Emma or E-Class, began operations, representing a new leap: capacity of up to 14,000 TEU, 397-meter length, 56-meter beam and 15,5-meter draft.

(*) Rodrigue, J-P (2024), The Geography of Transport Systems, 6th Edition: Routledge.

1.4

BRAZIL, TOO, IS EXPOSED TO THESE GLOBAL TRENDS – ALBEIT TO A LESSER DEGREE, GIVEN THE COUNTRY'S PERIPHERAL POSITION ON THE MARITIME TRADE MAP

The shipping industry's typical traits that have been driving the exponential growth of container ships along the main trade routes inevitably exert a similar effect on Brazil. However, the manner and pace at which this growth reflects on the "secondary" routes that reach our country are influenced by the **peripheral position** that we hold in the maritime trade panorama – both economically (i.e., comparatively small volumes) and geographically (i.e., the distance from the major shipping routes).

The entry of new ships into routes that call on Brazil takes place by means of two processes: new ships purchased specifically for the route, or fleet migration between routes. In the latter case, the **introduction of increasingly large ships into the main routes leads to a "cascading effect"**, with the reallocation of ships to secondary routes like those that call on Brazil and the East Coast of South America. Several factors cause the vessels calling on Brazilian ports to lag behind the main routes: shipped volumes, port capacity, port infrastructure (draft, equipment, etc.), subsidy policies, ease of funding, etc.

A comparative analysis of the evolution of the container ship fleets serving Santos and Rotterdam – **both of which are "end of the line" ports with extensive hinterlands and regional hub potential/role** – enables observing this effect. Historically, large ships began to call on the Port of Santos 8-15 years after they began operating at Rotterdam. In Figure 4 below, the blue line shows, on the horizontal axis, the size of the largest ships calling on Rotterdam since 1990, and, on the vertical axis, the volume that the port handled in the respective year. The red line is analogous for the Port of Santos[10].

[10] Note that no clear connection exists between the handling volumes and ship size. Throughput today at Santos is similar to Rotterdam's in 1990, but the largest ship there is similar to the largest at Rotterdam in 2006.

The figure shows that the largest container ship classes calling at Santos (capacity between 10,000 and 13,000 TEU, corresponding to ship LOAs between 300 m and 340 m) **are not among the largest to operate at Rotterdam**, which "skipped" straight from 9,000 TEU ships in the early 2000s to ships approaching 15,000 TEU (366 m LOA) from 2006[11]. This shows how much more difficult it is for regions with smaller volumes to mobilize the required investments for larger ships to enter.

As a result, a **growing lag** exists between the full entry into operation of 366 m ships into the main East-West routes and the lines that call on Brazil. Indeed, a 2016 University of São Paulo study[12] pointed out even then that, **absent waterway access infrastructure restrictions, ships with 13-15 thousand TEU capacity (366 m LOA) should be present in Santos by 2018**, 12 years after their entry into Rotterdam. Furthermore, if the trend held, it was estimated that ships with capacity in excess of 15,000 TEU (400 m LOA) should be present at the Port of Santos from 2025.

The fact that the first sporadic[13] berthings of 366 m ships began in early 2024 confirms shipping companies' tendency to allocate these assets to the larger volume routes on the East Coast of South America (ECSA). Unlocking the operation of this ship class will require a series of adjustments to the port and maritime transport industry – **and may, for example, result in the consolidation of regional hubs to concentrate transshipment flows** to other ports in Brazil and the East Coast of South America. As this article will show next, the move is similar to the expressive growth of transshipment rates in Brazil seen in 2010-2015, which coincided with a leap in the size of the largest ships off our coast (see Figure 4).

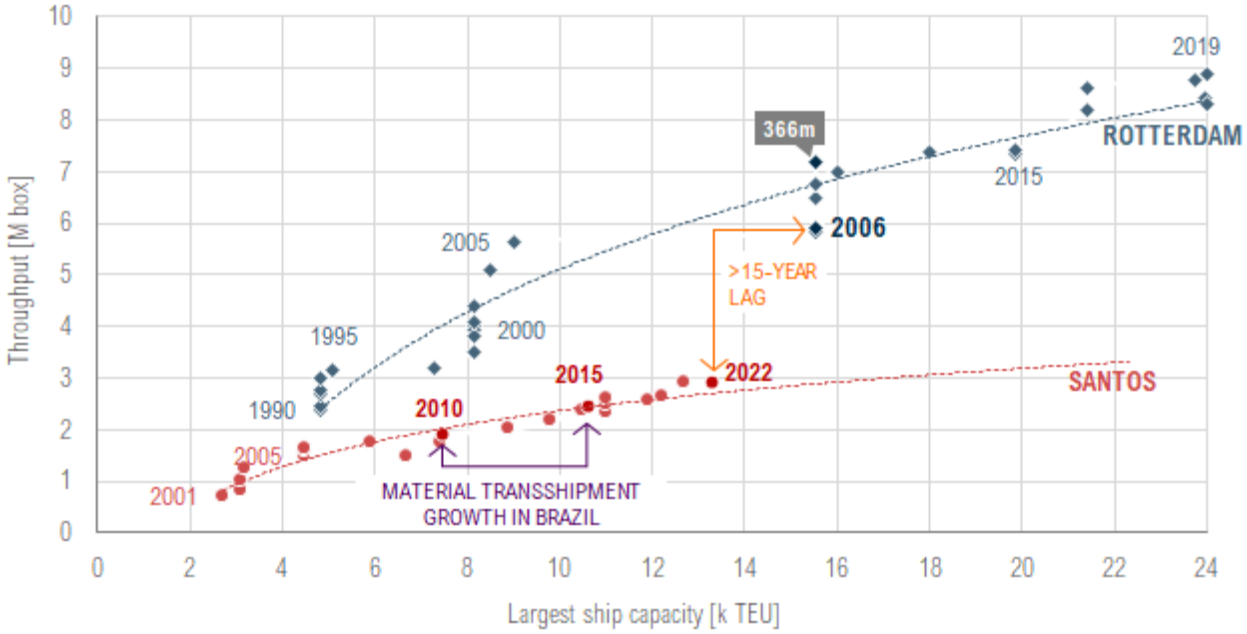


Figure 4: Evolution of the maximum vessel calling at Rotterdam and Santos (Source: A&M Infra analysis of SPA data, Praticagem de Santos, Port of Rotterdam, Alphaliner, OECD)

[11] Obviously, ships between 300 and 366 m do operate at Rotterdam, but largest classes began operating simultaneously.
[12] CEGN-USP, *Plano Diretor de desenvolvimento da infraestrutura do canal de acesso do Porto de Santos* (2016-2018). The study was commissioned by the former Companhia Docas do Estado de São Paulo, and partners at A&M Infra were involved.
[13] Note that, although 366 m ships began to call on the Brazilian coast in 2024, the country's main ports still lack the conditions (draft in particular) for them to operate fully loaded. The allocation of these ships to routes reaching Brazil is probably associated with the availability of idle ships in the fleets of one or more shipping companies, underscoring the point that it makes sense, from the viewpoint of the shipping industry, to allocate these ships to routes including Brazil.

02

OVERVIEW OF THE BRAZILIAN MARKET AND GAPS TO BE ADDRESSED

So far, we have covered the broader context of the maritime container shipping industry and how it drives moves on the part of shipping companies that shape the demand for port infrastructure, consolidating hub ports. We also saw that Brazil holds a peripheral position in this context, both in terms of foreign trade flows and in terms of the large shipping routes – limiting the country's vocation to the development of one or more regional hubs. This enables attempting to identify the elements of likely scenarios for a future hub ports dynamics in Brazil, in addition to mapping obstacles and gaps to be overcome so that this dynamic can be fostered.

2.1 CHARACTERIZATION OF THE BRAZILIAN CONTAINER PORT MARKET AND OPERATIONAL DYNAMICS

The Brazilian container handling market developed sharply since the late 1990s, boosted by the advent of specialized terminals and high operational efficiency with the first wave of terminal leases in the country. Indeed, in the first decade of the 2000s, the volume of containers handled at Brazilian ports increased by more than 10% annually on average. Starting in 2011, with the market already reasonably consolidated, there has been **rapid growth of transshipment operations**: in 5 years, they went from approximately 6% to almost 19% of total port throughput, a level that has held steady since then.

This increase in transshipment incidence took place precisely when ship classes with LOAs between 300 m and 340 m began to sail along the ECSA. Despite this, liner services operating along the Brazilian coast **are still organized according to a point-to-point service rationale.** Analysis of Datamar data for 2023 shows that the main services, which handled 75% of Deep-Sea cargo of the main tradelanes (Asia, North Europe, Mediterranean, and North America), call on an average 5.6 ports in Brazil. This suggests that the development seen so far reflects **specific dynamics of certain lines** (e.g., Maersk's Far East ASAS services transships at Santos Argentinian and Uruguayan volumes from/to Europe shipped by the Bossanova service, which does not call on the Plate) and/or **operational restrictions of certain ports** that ceased to directly receive Deep-Sea calls (e.g., limited waterway access at Vitória, which began to be served mainly by feeders from Santos and Rio de Janeiro in 2013). Aside from the large number of ports of call along the coast, 8 of these services have a double call at Santos to load the maximum possible export cargo before the deep-sea return trip.

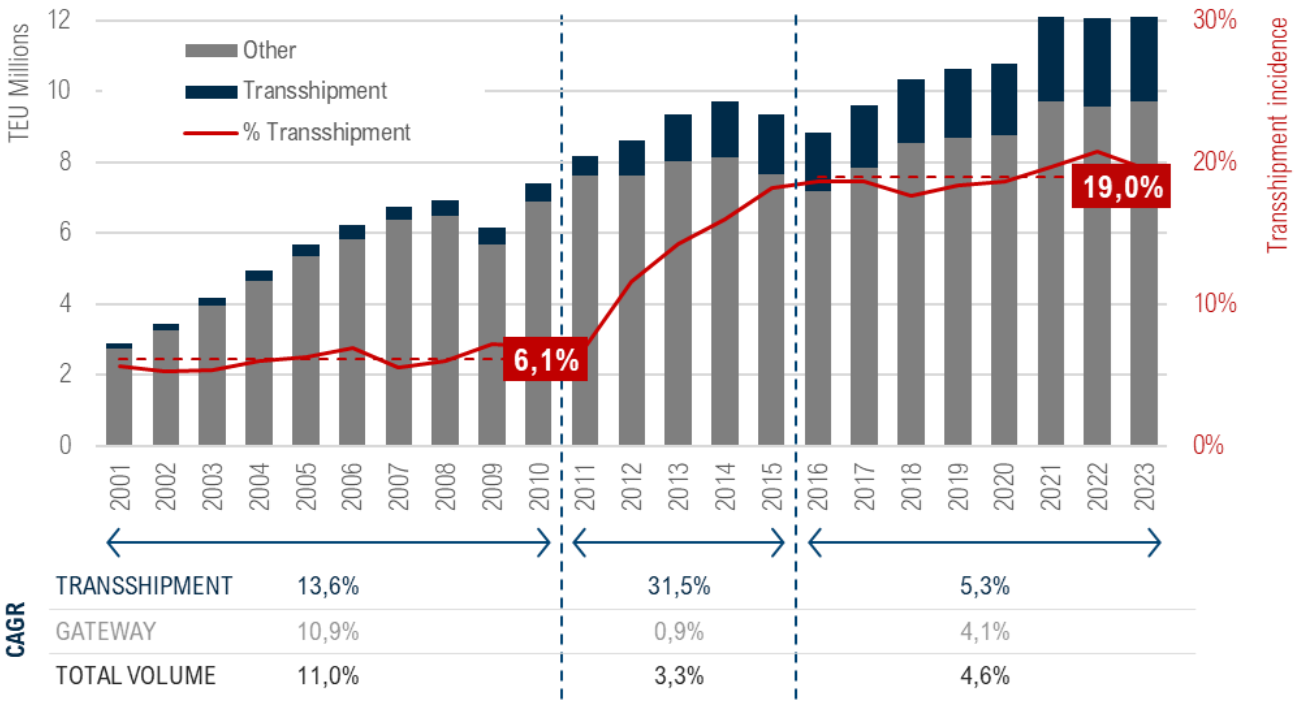


Figure 5: Evolution of the Brazilian container handling market and transshipment incidence (Source: A&M Infra analysis based on ANTAQ and SPA data)

In addition to historically answering for approximately 40% of container handling in Brazil, **Santos has in the past 10 years answered for more than half of Brazil's transshipment throughput**. Indeed, the port has, in the last decade, seen transshipment rates averaging almost 30%, close to the rates seen in North Europe's regional hubs. Other ports with significant transshipment operations in Brazil includes those that house operators associated with shipping groups, such as Itapoá (Aliança/ Maersk), Portonave (TiL-MSC) and, more recently, Pecém (APMT-Maersk) and Rio de Janeiro (TiL stake in MultiRio), which show better coordination capacity between investment in shipping and in ports.

2.2 POSSIBLE CONSOLIDATION SCENARIOS FOR BRAZILIAN PORTS AS REGIONAL HUBS

To understand the changes that can be expected from the consolidation of one or more hubs in Brazil, we can assess potential scenarios on two dimensions: (i) ports **deemed as candidates to a hub role**; and (ii) **volumes with the potential for concentration** and transshipment at hubs.

2.2.1 What are the likely Brazilian hubs?

Observation of the main markets worldwide where consolidated regional hubs exist (transshipment rates around 50%) **shows that ports with significantly developed hinterlands stand out**, so that there is considerable gateway cargo volume simultaneously with a relevant presence of Deep-Sea services. According to Rodrigue and Ashar (2015), *"such ports usually became hubs after shipping lines made the decision to use them as such. In many cases, the hinterland traffic acts as an anchor to transshipment traffic, thus calling the port enables capturing additional traffic of other ports not directly called by these lines"*.

Thus, the main **"natural candidates" for the regional hub role** include ports like Santos, Paranaguá, Itapoá and the Itajaí-Navegantes complex – responsible for almost 70% of domestic container throughput in 2023. The Port of Santos naturally stands out due to its standing as the main port complex in Brazil (the only one called by almost every liner service sailing the ECSA) and its proximity with the largest production and consumer center in Brazil. Even so, factors like the positioning of verticalized players, the potential for significant capacity expansions and ease of waterway access improvements may lead to arrangements benefitting other ports from the viewpoint of specific shipping companies and/or services.

Figure 6 summarizes the main factors making these ports regional hub candidates, and the respective risks and/or concerns, if any.

	SANTOS	PARANAGUÁ	ITAPOÁ	ITAJAÍ-NAVEGANTES
2023 Volume	4.78 M TEU	1.25 M TEU	1.07 M TEU	1.33 M TEU
Location	• Close to the country's largest productive/consumer center (~30% of GDP)	• Competes with Santos for some of the hinterland and with SC terminals for other parts of it	• Competes for some of Paranaguá's volumes • Close to the SC industrial/ exporter center	• Tradition in refrigerated cargo (meat) exports • Closer to the Plate (1 day's sailing less vs. Santos)
Infrastructure	• Capacity expansions will be needed even without hub, with few areas available • Channel should be dredged to 17 m, but arrangement (public works + PPP) remains unclear	• Access channel concession project under assessment provides for dredging to 17 m in the short to medium run (~5 years)	• Future capacity expansion phases planned • Access channel (public) needs adjustments under an as-yet undefined arrangement	• Doubts as to the feasibility of material expansions • Uncertain solution for channel adjustment
Services/ Players	• Concentrates almost all liner services sailing the ECSA • Presence of verticalized and "white flag" terminal operators	• Has increased liner services provision (incl. cabotage) • Only terminal is operated by independent player, but plans are in place for (private) additional capacity	• Extensive connectivity with the various tradelanes and cabotage services thanks to the presence of a large shipping company as an equity partner	• Navegantes: private terminal with large shipping company as equity partner • Itajaí: uncertain contract arrangement for long-term expansion and operation

Figure 6: "Natural candidates" for consolidation as regional hubs in Brazil

In addition to one or more regional hubs, other ports may serve as **"local hubs"**, attracting Deep-Sea calls due to their location relative to specific service routes and concentrating transshipment volumes from nearby ports – as seen in Figure 7 (b), below. The most immediate example of such potential local dynamics is the concentration of services from North America and the Gulf of Mexico (ECNA/US Gulf), Mediterranean and North Europe intended for the Brazilian North/Northeast at ports like Salvador, Suape or Pecém.

Other ports are less likely to take on the role of hubs because of various restrictions. The Port of Rio de Janeiro, for example, has good waterway access conditions, but its proximity to São Paulo, among other factors (chief among which are limited capacity and limited areas for the development of sizeable expansions), stands as a hurdle. The Port of Rio Grande, given its location, would be a good spot for transshipping volumes intended for the Plate Basin, but adverse weather factors (like strong winds, waves and fog), which may cause the port to shut down for hours or days, stands as a significant obstacle against its development as a hub. Then there are the various Private Terminal projects along the coast (e.g., Imetame Aracruz, Porto Central etc.) whose actual implementation lacks predictability, even if they may be viable through investments/ partnerships with shipping companies. Note that the concentration of transshipment volumes is necessarily associated with each shipping company's commercial and operational strategy. Thus, **it is to be expected that different ports may consolidate as regional or local hubs**, serving different shipping companies and even specific service/tradelanes.

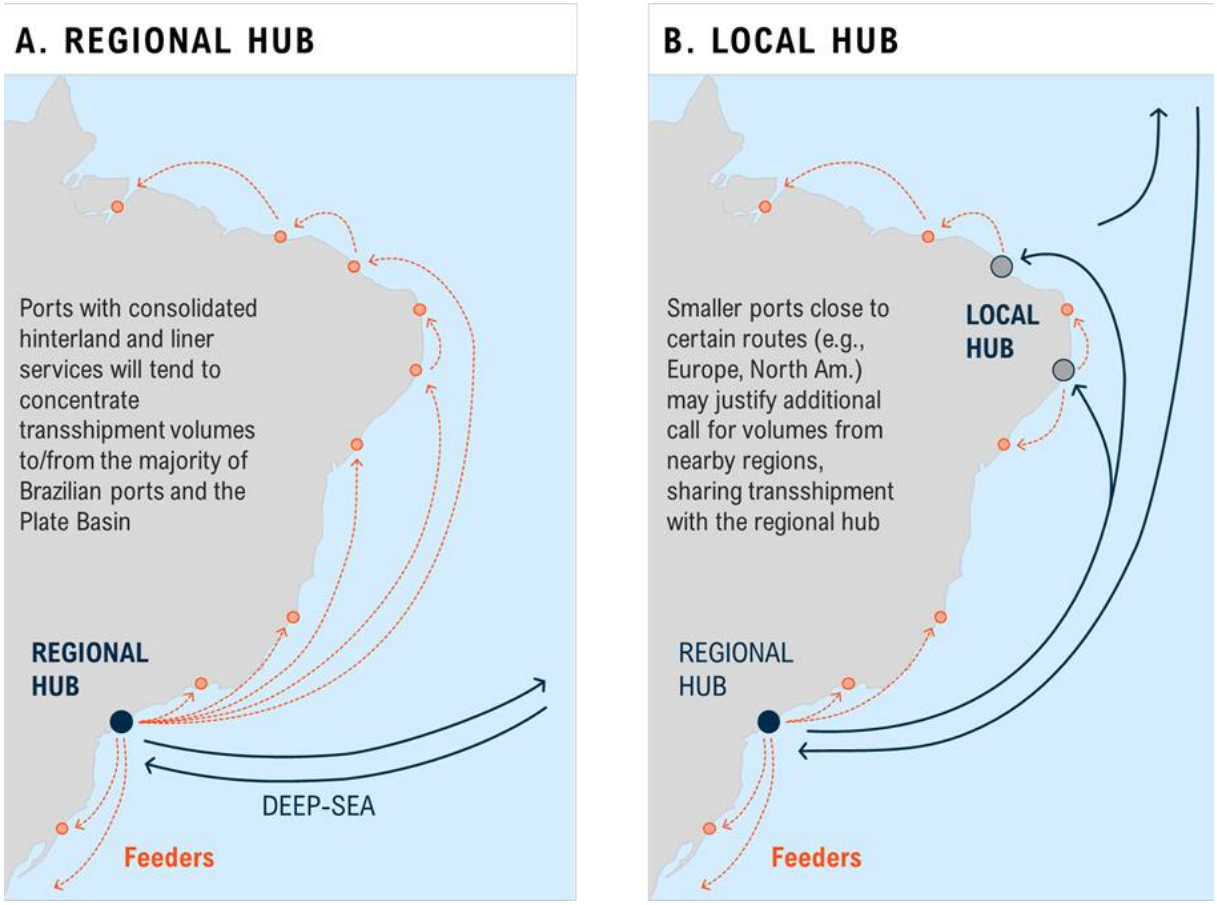


Figure 7: Possible dynamics leading to the consolidation of regional and local hubs along the Brazilian coast

2.2.2 What potential demand might be concentrated at the hub(s)?

To estimate potential transshipment volumes, one must consider the dynamics of shipping services. Based on Datamar and Solve Shipping data, we surveyed the volumes handled on the East Coast of South America for each operating liner service. Note that services with greater volume and sailing greater distances, such as those connecting the ECSA with Asia, North Europe and the Mediterranean, tend to use higher capacity vessels and would probably be the first to implement new ship classes and transshipment volume concentration strategies under a hub-and-spoke model. Table 1, below, summarizes the total volumes and ships used by each tradelane's main services.

	Asia	N. Europe	Mediterr.	US/Gulf	ECNA	S. Am
2023 Volume (x 1,000 full TEU)	2,458	1,257	899	909	451	429
Average ship capacity (TEU)	10,870	10,090	9,140	6,225	6,431	4,200
Number of services	5	5	2	3	2	6

Table 1: ECSA Volumes (Brasil + Plate) and average ship capacity for the main services/tradelanes[14]

i. Concentrating volumes from Brazilian ports

The first tranche of potential transshipment volumes for future hubs lies in the demand from Brazilian ports ceasing to be called by Deep-Sea ships[15]. To estimate this demand, each service's volume was segregated by ECSA port of origin/destination. The total containers to be transshipped for a certain service is given by the sum of volumes from ports that such a service would cease to call (i.e., total service volume minus hub volumes).

In a **conservative scenario**, we assume that only one service from Asia and one from North Europe (the one with the highest volume for each tradelane) would concentrate their calls on a single hub – resulting in **total additional transshipment throughput[16] of approximately 1 million TEU**. In a **bolder scenario**, where the seven major services of the top tradelanes adopt a hub-and-spoke organization, this might lead to **total additional transshipments of almost 3 million TEU** (in this case, most likely distributed across 2 or 3 hubs). Table 2 summarizes these results.

Scenario		Asia	N. Europa	Mediterr.	TOTAL
"Conservative"	**# services concentrated**	1	1	-	**2**
	Total transshipments[17] (TEU 1,000)	675	400	-	**1,075**
"Bold"	**# services concentrated**	3	2	2	**7**
	Total transshipments (TEU 1,000)	1,170	785	850	**2,805**

Table 2: Transshipment volumes concentration scenarios (as of 2023) for Brazilian ports[14]

[14] Source: A&M Infra analysis based on Datamar and Solve Shipping data, 2023 volumes.
[15] In this respect, it is worth emphasizing that, even if the cease to be called by Deep-Sea ships, feeder ports would not cease to handle their hinterlands' volumes – import volumes in particular, which require bonded storage services and are an important source of revenues for terminals.
[16] On the number of port movements, it is worth clarifying that containers handled in direct deep-sea calls undergo a single movement, loading (export) or unloading (import), at the port of origin/destination. When they are transshipped, each container will undergo two additional movements at the hub (e.g., for import cargo: unloading from the Deep-Sea vessel and subsequent loading on the feeder service to the final destination).

ii. Capturing transshipment volumes from Plate ports

Another likely short-term move on the part of shipping companies is to reduce the number of deep-sea lines calling the Plate Basin ports (Buenos Aires and Montevideo). In addition to draft restrictions along the lengthy access channels leading to these ports, ships from the main Asian services already operate with reduced occupancy at ports south of Santos – so that eliminating the 2-3 days' sailing to the Plate might provide significant costs reduction. Assuming implementation scenarios similar to the foregoing produces **Plate transshipment potential between 1 and 2 million TEU**, as Table 3 shows.

Scenario		Asia	N. Europa	Mediterr.	TOTAL
"Conservative"	**# services concentrated**	1	1	-	2
	Total transshipments[17] (TEU 1,000)	460	470	-	**930**
"Bold"	**# services concentrated**	3	2	2	**7**
	Total transshipments (TEU 1,000)	880	795	170	**1,845**

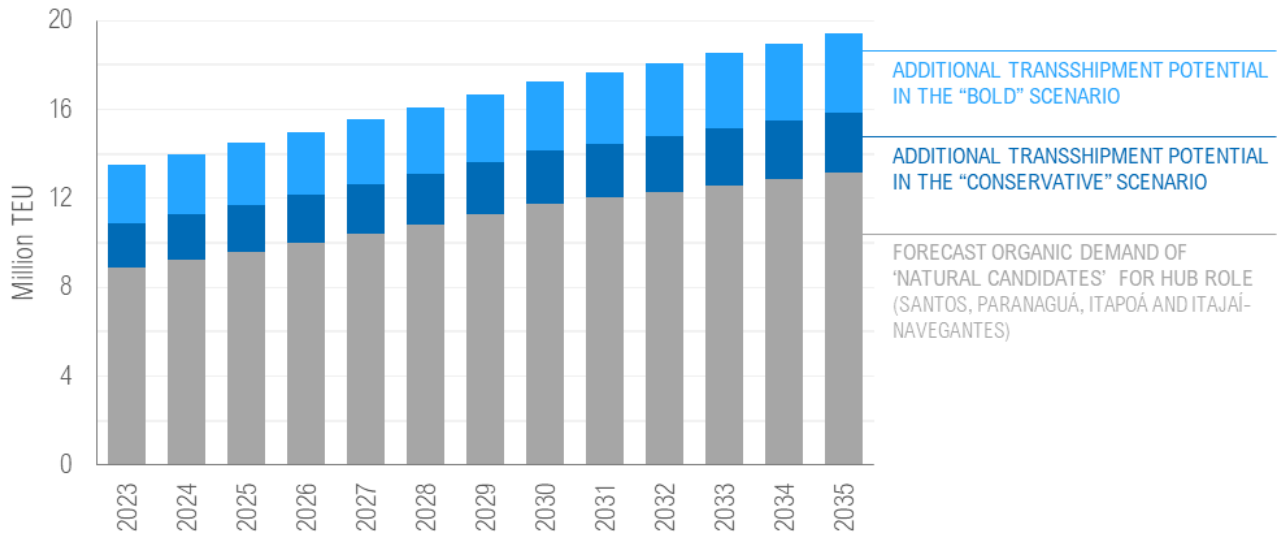
Table 3: Transshipment volumes concentration scenarios (as of 2023) for Plate ports[14]

Given the below scenarios and volumes, consolidating one or more hub ports in Brazil would mean a potential addition of **up to 4.6 million TEU in transshipments**, in 2023 volumes. For comparative purposes, total transshipment throughput in Brazil was approximately 2.4 million TEU in 2023 – that is, assuming the bolder scenario for the implementation of the hub port dynamics, transshipment volumes in Brazil might **triple**. This would mean increasing the average transshipment incidence of Brazilian ports from today's 18% to 30-40%.

Figure 8, below, compares the magnitude of the estimated additional transshipment potential with volumes forecast in the existing Port sector planning documents for the ports this study regards as "natural candidates" to the role of hubs. Under the "bold" scenario, total additional transshipment throughput is significant: approximately 50% of the expected "organic" volume.

Note that the above volumes are estimates for the maximum demand for transshipments that might consolidate at hubs along the Brazilian coast, and assumes that market distribution (i.e., the market share of the main shipping companies, Brazilian cargo origin/destination mix, etc.) will remain largely unchanged. As observed, the manner of implementation of hub ports in Brazil will crucially depend on the various shipping companies' strategies (including whether or not to reconfigure their services), the effective availability of access infrastructure, and handling capacity at the various ports/terminals, among other gaps to be discussed briefly next.

[17] The total transshipments shown consider the two port movements performed per container, in addition to an average 25% of empty containers. In the "conservative" scenario, for the purposes of volume estimation, we assumed that the hub would be Santos. The "bold" scenario assumed Santos as one hub and adopted as the second hub's volume the average of the other candidates to the role of regional hub (i.e., Paranaguá, Itapoá and Itajaí-Navegantes).



The graph attempts to reflect the view of existing port planning instruments, whose forecasts tend to be conservative. Since the existing Master Plans were drafted in 2016-'17, we adopted, wherever possible, more recent studies published or made available to the public by ANTAQ or the PAs. In other cases, forecasts were updated based on the historical volumes handled at each port in 2023 and the annual growth rates as provided in the Plans. Potential additional transshipment volumes as of 2023 were estimated based on the scenarios introduced in item 2.2 of this article and forecast using a CAGR equal to the total organic volumes of the hub candidate ports. Sources: Master Plans for the Port Complexes of Santos, Paranaguá and Antonina, São Francisco do Sul and Itajaí, ANTAQ Statistical Almanac, Port of Santos PDZ, Public Hearing No. 02/2024-APS, Port of Paranaguá Channel Concession Study (Public Hearing No. 07/2023-ANTAQ), Port of Itajaí Concession Study (Public Hearing No. 03/2024-ANTAQ).

Figure 8: Forecast "organic" volumes for hub candidates and estimated additional transshipment potential

2.3
CHALLENGES AND NECESSARY ADJUSTMENTS FOR THE CONSOLIDATION OF REGIONAL HUBS IN BRAZIL

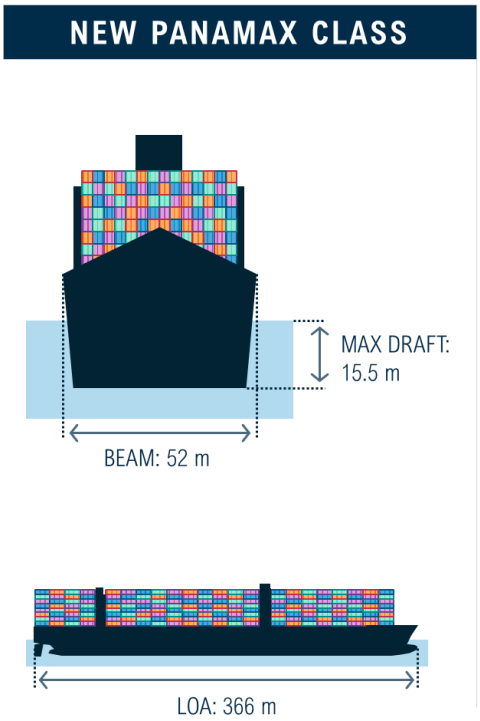
So far, this article argues that Brazil has the potential to develop regional hubs to concentrate material transshipment volumes (and, as discussed ahead, this dynamic may bring about positive economic and operational results). Such a reconfiguration of container flows in the region will have a variety of impacts and will require adaptation on the part of any concentrating ports that may consolidate as such, of the cabotage/feedering market, and of the industry's institutional and regulatory environment itself. Therefore, any discussion of the planning and potential implementation of the new dynamics must involve mapping the **existing gaps to be addressed at the various spheres**.

The gaps present in the port environment are most obvious, as they directly concern access for large ships and the handling of additional transshipment volumes. They may be organized according to three aspects:

- **Waterway infrastructure**. The need to deepen the main Brazilian ports has become pacified in recent years. However, access channel adjustment must be driven towards **servicing vessel-types**, and go beyond providing sufficient depth to allow access to fully loaded new ship classes. Analysis must include elements such as width and slopes in order to enable ship crossings, anchoring/waiting spots along lengthy channels, curve radiuses and maneuvering basins compatible with the turning of large ships, elimination of nighttime restrictions to the access of these vessels, and more. Recent studies concerning Port and channel concessions have left optimizations such as these to the future concession holders (whose incentives may not be aligned with the best design from the operational viewpoint).
- **Waterway operation**. In addition to physical bottlenecks, operational aspects of access channels also require adjustments. A hub port must be able to absorb frequent mega-ship berthings with appropriate predictability, speed and cadence. Dredging channels to a depth of 17 meters (as has been discussed in

the cases of Santos and Paranaguá, for example) becomes less obvious if the access of fully loaded 366 m ships will require special operations that will halt channel traffic for a long time – effectively reducing waterway access capacity. This requires carrying out systematic maneuverability studies and enshrining access rules to balance safety and agility so that each berthing will occupy the channel for the lowest time possible, with minimal impact on other port operations.

Figure 9, next, summarizes the waterway infrastructure and operation restrictions currently found at the main container handling ports in Brazil.



NON-EXHAUSTIVE		SANTOS	PARANAGUÁ	ITAPOÁ	ITAJAÍ-NAVEGANTES
LARGEST SHIP	LOA x beam (m)	366 x 52	368 x 52	350 x 48.9	350 x 48.5
	Draft (m)	13.5 w/o tide 14.5 w/ tide	12.3	10.5 w/o tide 11,0 w/ tide	12.6
Restrictions against night maneuvering?		NO	NO	YES	YES
Restrictions against ship crossing?		YES	YES	YES	YES
Other restrictions		2 pilots, 4 tugs, wind/current limits, ferry service interruption	2 pilots, 4 tugs, wind/current limits	2 pilots if beam > 46.9; 3 tugs	2 pilots if beam > 46.9; 4 tugs

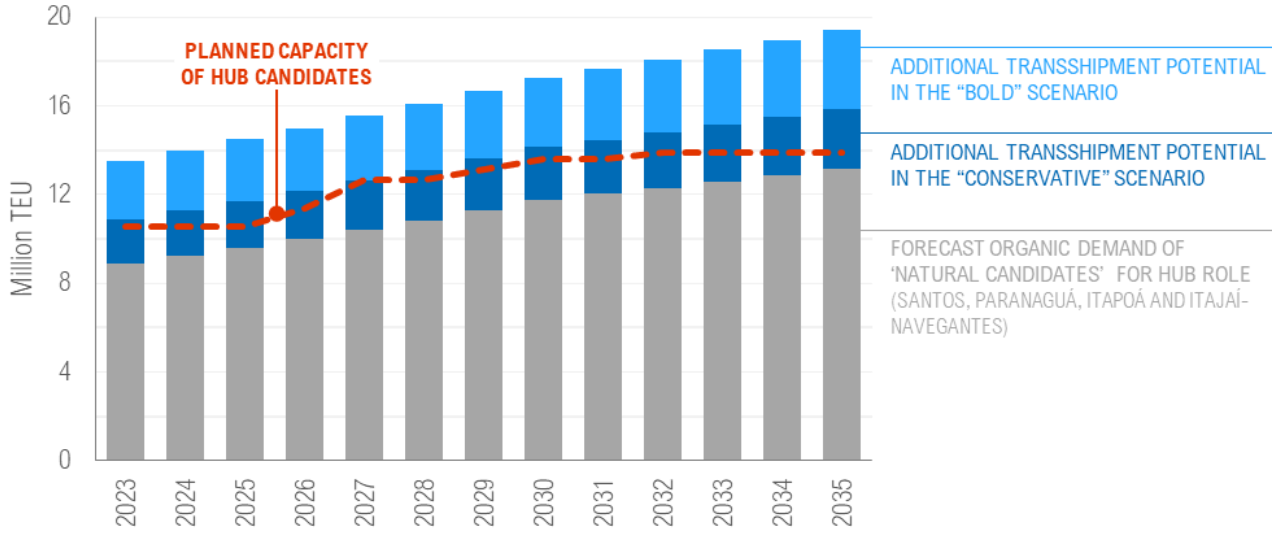
Source: access and docking standards available from the websites of Port Authorities and Port Captaincies

Figure 9: Characteristics of the New Panamax class and access restrictions for large ships at some of the main container ports in Brazil

- **Port handling structure**. The potential hub(s) in Brazil will have to undergo material handling capacity increases to absorb significant additional transshipment volumes while maintaining appropriate occupancy levels[18]. In addition, concentrating these volumes will certainly mean handling large call sizes at every berthing: a 366 m ship with 15,000 TEU nominal capacity making a single call on the East Coast of South America will have to perform approximately 14,000 movements[19] per berthing at the hub (vis-à-vis a maximum of approximately 3,000 movements at Santos under the existing dynamics). This implies the need for Ship-To-Shore cranes that are compatible with these ships and in sufficient number to enable operation at high productivity levels. Furthermore, because Deep-Sea vessels will lie in berth for longer periods of time (given their large call size) and there will be a need for additional cabotage/feeder ship calls, the terminals intended for transshipment operations must be able to accommodate a sufficient number of ships simultaneously. For illustrative purposes: berthing one 366 m ship

[18] The most frequently found figure in the relevant literature is up to 65-70% of calendar hours with berth occupation for a terminal to maintain service levels (as given by average waiting times) within the desired range. This desired occupancy may vary depending on certain factors, in particular the number of berths (terminals with more berths can support higher occupancy levels).
[19] Considering 80% occupancy of the nominal capacity and an average 1.70 TEU/box yields: 0.80 x 15,000/1.70 = ~7,000 import containers unloaded and a like number of export containers loaded per trip.

(Asia/Europe hub-and-spoke service), one 300 m ship (point-to-point service for another tradelane) and two 210 m ships (cabotage/feeder) would require a quay length of approximately 1,200 meters – only a single terminal in Brazil currently has this infrastructure. The large volume of transshipments would also change the operational profile of terminal yards, with a need for sufficient area and equipment to ensure efficient coordination of transshipment flows across different vessels, meeting peaks and minimizing impacts on total cargo transshipment times. Figure 10 compares the estimated "organic" volumes of additional transshipment against the expected capacity of ports regarded as hub candidates, showing that, under the existing plans, there will not be sufficient and consistent idle capacity in the medium run to enable concentrating transshipment volumes at Brazilian hub ports.



The graph attempts to reflect the view of existing port planning instruments, whose forecasts tend to be conservative. Since the existing Master Plans were drafted in 2016-'17, we adopted, wherever possible, more recent studies published or made available to the public by ANTAQ or the PAs. In other cases, forecasts were updated based on the historical volumes handled at each port in 2023 and the annual growth rates as provided in the Plans. Potential additional transshipment volumes as of 2023 were estimated based on the scenarios introduced in item 2.2 of this article and forecast using a CAGR equal to the total organic volumes of the hub candidate ports. Sources: Master Plans for the Port Complexes of Santos, Paranaguá and Antonina, São Francisco do Sul and Itajaí, ANTAQ Statistical Almanac, Port of Santos PDZ, Public Hearing No. 02/2024-APS, Port of Paranaguá Channel Concession Study (Public Hearing No. 07/2023-ANTAQ), Port of Itajaí Concession Study (Public Hearing No. 03/2024-ANTAQ).

Figure 10: Organic volumes and additional transshipment potential vs. expected capacity of hub candidates

The change in rationale for deep-sea lines will also materially impact the cabotage market, with increased demand for feeder services from the new hub(s). The main potential gaps include:

- **Capacity/operating fleet.** The Brazilian container cabotage market reported significant growth in the 2010s, from 423 thousand TEU in 2011 to 1.22 million TEU in 2021 (11.2% CAGR vs. 2.5% for Deep-Sea), including "pure" cabotage and feeder volumes, according to data from the Brazilian Association of Cabotage Shipping Companies (ABAC). Even so, it is estimated that cabotage currently captures only a relatively small share of its potential market[20], and may keep up significant growth in the medium run. Add to this the increment in feeder volumes arising from the concentration of transshipment volumes and the total demand for cabotage shipping (+Mercosur) may more than double with the consolidation of one or more hub ports. The existing fleet of the four container cabotage companies includes 29 ships and just over 90 thousand

[20] A&M Infra analysis based on ANTAQ cabotage data and EPL's 2017 cargo matrix data suggests that cabotage would be competitive for approximately 7.7% of interstate flows of containerized cargo, with 1.3% captured at this time (that is, approximately 1/6 of the potential).

TEU in nominal capacity (as Figure 12 ahead shows in detail).

For an early estimate of the number of cabotage ship calls needed to absorb the additional feeder volumes, assume that these ships' average call size at the hub will be approximately 2,000 movements (twice the current figure observed at Santos[21]). Adopting the "conservative" results described in item 0 above, there would be approximately an additional 1 million TEU[22] to be transported by feeder services, requiring almost 300 new cabotage calls[23]. This would mean an increase of at least 60% from Santos as of 2023, as Figure 11, below, summarizes. Assuming that: (i) the **size of cabotage ships is not expected to increase materially**, as they need to serve smaller ports with smaller volumes; and (ii) the **existing fleet is certainly not operating with sufficient idle capacity** to absorb such a significant increase in demand, **one may conclude that the Brazilian fleet will need to grow significantly to enable the new dynamics**. Assuming that the existing fleet is operating at appropriate occupancy (and, therefore, a linear annual calls-to-ship count ratio), **approximately 20 new ships** (for a cabotage fleet of almost 50 ships) will be needed to enable the hub-and-spoke dynamics under the "conservative" scenario.

- **Service organization and dynamics**. The supply of container cabotage lines will have to restructure to properly serve the new flows between hub(s) and feeder ports. The volume of some will justify the creation of dedicated shuttles with no intermediate calls to minimize cargo transit time – as will very likely be the case of the Plate ports. In other cases, ports with less substantive volumes may be served by regionalized "circular" feeder services, which will probably be more efficient than the existing cabotage lines sailing large distances along most of the Brazilian coast, with the ships effectively under full load for some stretches. Ultimately, the new cabotage/feedering dynamics will be the product of each shipping company's strategic decisions, with little coordination with public planning or policy. In the existing scenario, where all container cabotage companies are arms of global shipping company's groups (see Figure 12, below), one may imagine that this reorganization will take place within the context of the broader optimization to be carried out by each shipping company serving the ECSA, in order to provide solutions at least equivalent to the current status.

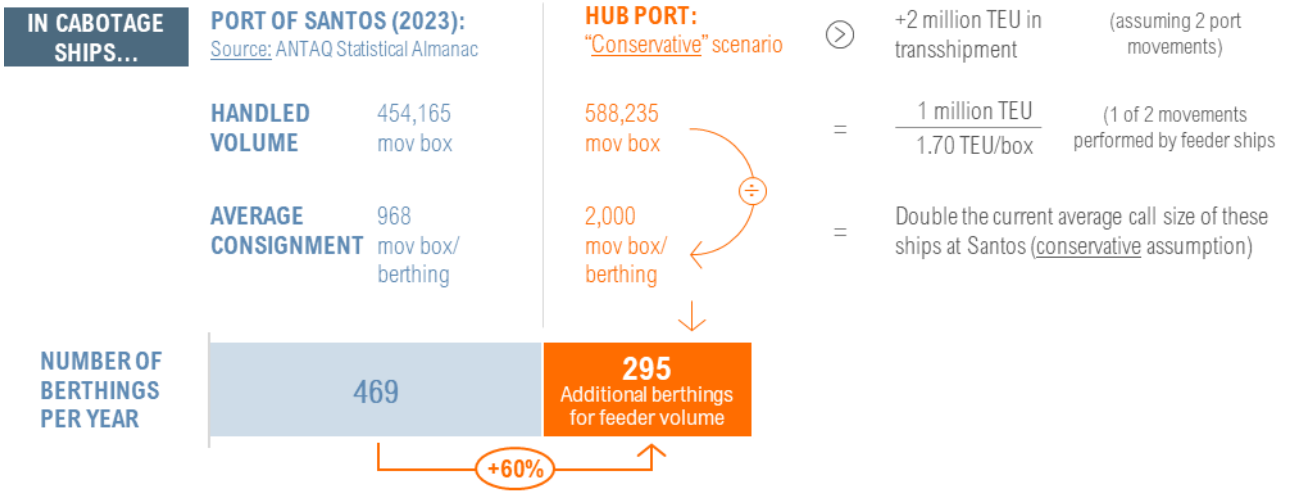


Figure 11: Estimated number of additional cabotage ship calls necessary to meet the expected feeder demand

[21] According to ANTAQ data, 469 cabotage ships called at Santos in 2023, with an average of just over 950 containers handled in each berthing.
[22] In the "conservative" scenario, considering Brazil and Plate volumes, we estimate a total 2 million TEU, assuming 2 movements (loading/unloading) at the hub. Cabotage demand is half as much (one of two movements).
[23] Considering 1 million TEU, a ratio of 1.70 TEU/box and 2,000 box/berthing: 1,000,000/(1.70 x 2,000) = 295 berthings.

CABOTAGE COMPANY	GLOBAL SHIPPING COMPANY	# SHIPS	CAPACITY		
			TOTAL	AVERAGE	MAXIMUM
ALIANÇA	MAERSK	9	35,000 TEU	3,900 TEU	5,500 TEU
log-in	msc	9	24,700 TEU	2,700 TEU	3,500 TEU
MERCOSUL LINE	CMA CGM	7	18,800 TEU	2,700 TEU	3,800 TEU
Norcoast	Hapag-Lloyd	4	13,300 TEU	2,700 TEU	2,800 TEU
		29	**91,800 TEU**	3,200 TEU	5,500 TEU

Figure 12: Positioning of shipping companies and capacity of the Brazilian cabotage fleet

- **Possible bottlenecks facing fleet expansion.** The need to expand cabotage companies' fleets/capacity may face certain obstacles. Although cabotage is protected on behalf of Brazilian Shipping Companies ("Empresas Brasileiras de Navegação"[24] – EBNs) (pursuant to Law No. 9.432/1997), The Cabotage Shipping Stimulus Program ("Programa de Estímulo ao Transporte por Cabotagem" – "BR do Mar"), instituted in 2022 by Law No. 14.301, added flexibility by allowing EBNs to constitute fleets by means of chartering subject to less restrictive hypotheses. Thus, assuming that fleet-building restrictions are duly addressed, skilled labor becomes a relevant concern. BR do Mar rules provide for a mandatory share of Brazilian crew members on cabotage vessels, but the training of Merchant Naval Officers, which the Brazilian Navy controls, may become a bottleneck. Indeed, according to a recent study by CILIP-USP[25] and Fundação Vanzolini, the limited number of vacancies and the lengthy training period may result in a shortage of thousands of officers by 2030. The lack of skilled workers may increase operating costs and compromise safety in Brazilian maritime operations, affecting not only cabotage but also important industries, such as oil and gas exploration and production. This aspect, like others, such as the cost of fuel and the industry's taxation, should be the subject of careful consideration on the part of public authorities to encourage the growth of navigation and development of the country's connectivity.

The consolidation of hub ports in Brazil will also depend on the creation of the required conditions in policy planning and the institutional/regulatory environment. These aspects will be addressed in greater detail in Chapter 4, and include:

- Provision, under centralized and local planning instruments, for the consolidation of hubs and additional transshipment volumes that they may potentially capture;
- The potential creation of contract-based mechanisms to incentivize/direct the concentration of transshipment flows at certain ports/terminals; and
- The creation of mechanisms for the convergence of shipping companies' strategy and demand and the need for long-term investments and policies in the light of potentially volatile demand.

[24] As seems appropriate for an "end of the line" market, to prevent the availability of a sufficient and appropriate cabotage fleet from becoming exposed to variations in the international market's conditions.
[25] Center for Innovation in Logistics and Port Infrastructure, associated with the Naval Engineering Department of the Escola Politécnica da Universidade de São Paulo.

03

RESULTS AND IMPACTS OF THE DEVELOPMENT OF HUB PORTS IN BRAZIL

Transport infrastructure planning and decisions involving project planning and implementation involve multi-dimensional analyses that are often highly complex. At the level of the discussion of comprehensive and strategic policies that this study intends, it is understood that the appropriate approach is to show that relevant benefits are present (as well as the actors that will likely absorb them) and the ensuing costs, in addition to identifying existing risks and possible means of mitigation.

3.1
THE HUB-AND-SPOKE DYNAMICS SHOULD PRODUCE A DECREASE IN TRANSPORT COSTS THAT COMMERCE CHAINS MAY ABSORB

As they are means-activities by nature, transport infrastructure projects as a rule are driven mainly by **cost reductions**. In the case at hand, maritime transport is a significant cost component for the foreign trade chains of containerized cargo, justifying efforts to optimize the logistics system leading to cost reductions that can be reaped by the various value chains.

As Chapter 1 discusses, the pursuit of economies of scale has been central to the organization of the maritime shipping industry – particularly so in the case of container liner services, driving moves such as vertical integration and consolidations, in addition to the trend of increasing vessel sizes. In this sense, the adoption of hub-and-spoke solutions enables optimizing the use of large vessels, reducing their layovers and maximizing the share of time they spend loaded and at sea.

To assess the impact of this change in rationale, we built a simplified model that simulates a liner service's operation in terms of ship size and count, total duration of each round trip, the sequence of ports of call, and transshipment needs. These inputs enable calculating the service's main cost components[26]: ship acquisition/chartering, bunker consumption, port costs, and feedering. The model simulates a generic service between Asia and the ECSA, similar to those currently in operation, calling at Santos, Itapoá, Paranaguá, Buenos Aires and Montevideo, using ships with 300 m LOA and 9,000 TEU. In the initial solution, with point-to-point service (**Solution 1**), the average cost per TEU shipped was estimated at 408 USD.

For the sake of curiosity, eliminating the Plate calls as mentioned in Chapter 2 while maintaining the same vessel type would lead to a cost reduction of approximately 5%, to 390 USD/TEU (considering the cost incurred with feedering to Buenos Aires and Montevideo). Finally, implementation of a service with a single ECSA call (the example considers Santos as a hub), using 366 m ships with 13,000 TEU capacity (**Solution 2**), could enable a **cost reduction of approximately 13%** compared with Solution 1, down to 357 USD/TEU (considering one dedicated feeder service for the Plate and another for Paranaguá and Itapoá).

If such a solution were to be adopted for the main services connecting the ECSA and Asia (as in the "bold" scenario defined in Chapter 2), total savings might be as high as R$ 600 million annually by 2030[27]. It should be noted that this does not include a similar effect for the remaining tradelanes, for which the cost reduction was not quantified.

Figure 13 illustrates the solution adopted and the estimated cost in each scenario:

[26] Note that the estimated values do not include indirect costs and expenses (e.g., corporate overhead, commercial staff etc.), and so they have probably been underestimated. Even so, it is expected that the relative behavior of costs in USD/TEU across the various scenarios/solutions may be representative of the effects perceived by shipping companies.
[27] The three main Asia-ECSA services that the "bold" scenario considers handled a total 1.7 million loaded TEU in 2023. Assuming a 3% annual growth rate, this would reach 2.1 million TEU. Thus, the annual savings enabled by the hub-and-spoke solution would be 2,100,000 TEU x 51 USD/TEU x 5.50 R$/USD = R$ 590 million.

Assumptions: (1) Weekly calls for all services. (2) Each ship operates at 85% of nominal capacity for Deep-Sea trips. (3) The hub-and-spoke solution assumes that the operation involving the Deep-Sea ship with large call sizes reaches 200 MPH productivity, compatible with international hubs. (4) Unit cost is calculated based on the total operational cost and the number of containers shipped on a round trip (i.e., twice the ship's effective capacity).

Figure 13: Simulated solutions for a generic Asia-ECSA service and respective costs

It is worth emphasizing that **the model's estimated values are the costs incurred by shipping companies** while operating the service, and not the freight prices charged to shippers. Still, it stands to reason that a material share of the gains will be passed on to the cargo, based on two factors. First, as seen in Chapter 1, the shipping industry is characterized by narrow margins and homogeneous maritime shipping services provided by the various shipping companies – so that freight price will always be crucial for competitiveness. In addition, economies of scale have historically been passed on to freight prices as a means to ensure that ships operate at the required high occupancy levels.

3.2
THE ISSUE OF TRANSIT TIME AND OTHER POTENTIAL BENEFITS TO CARGO: RESILIENCE, RELIABILITY, CONNECTIVITY

Adopting a hub-and-spoke rationale immediately raises concerns about a possible increase in the transit time of cargo whose final destination is not the hub itself. This would be mainly as a result of a period between the Deep_sea vessel's operation and that of the feeder service, during which the transshipment cargo will remain in the hub's yard. At Brazilian container terminals today, the layover of transshipment cargo is typically 5-7 days.

This issue is certainly relevant as the economic cost associated with the cargo's transit time can be significant – due, for example, to the need for larger inventory to offset the unavailable volumes and the impacts of potential production chain delays. Therefore, a hub-and-spoke solution with lower operating costs but increased transit time might lead to a net increase in the total economic cost compared with a point-to-point service. The magnitude of this economic cost can be estimated based on the price of the cargo and on the cost of capital associated with the chain at hand. Assuming average containerized cargo value at 45,000 USD/TEU[28] and cost of capital at 12% p.a., we find an economic cost associated with the transit time of cargo of approximately 15 USD/TEU.day[29].

Indeed, using the model shown above to compare the transit time results for each port in the hub-and-spoke solution (**Solution 2**) relative to the direct service solution (**Solution 1**) shows an increase in cargo transit time for all ports – except for Santos, which is the example's hub. The increment varies from +3.6 to +6.6 days, as Figure 14 below shows.

However, this comparison assumes that (i) the average layover time of transshipment containers at the hub will remain unchanged, and (ii) there will be no scheduling delays along the various calls made. Therefore, two possible operational gains exist compared with the theoretical "base scenario":

i. Reduced layover time

The extended layover time (5-7 days on average) that containers currently experience at the transshipment year is a result of a low level of coordination between Deep-Sea and feeder operations. This is probably due to factors such as the merely incidental (rather than structural) occurrence of transshipment operations and the distribution of transshipped containers by regular cabotage services (instead of dedicated feeder lines), leading to increased difficulty "matching" berthing windows.

TRANSIT TIME (days)		DIRECT	HUB-AND-SPOKE	TRANSIT TIME CHANGE
SANTOS (HUB)	Import	26,8	26,8	+0,0
	Export	26,3	26,3	+0,0
PARANAGUA	Import	29,0	33,6	+4,6
	Export	28,7	35,2	+6,6
ITAPOA	Import	30,0	35,2	+5,2
	Export	29,7	33,3	+3,6
PRATA	Import	34,5	38,1	+3,6
	Export	33,5	37,9	+4,4

Santos layover	6
Plate delay	0

Figure 14: Transit time change by port in the simulated Asia-ECSA service (base scenario)

[28] Source: Datamar. Average FOB value per TEU for the main Asia and Europe services in Brazil in 2021 and 2022.
[29] This is consistent with estimates found in literature, although possibly on the conservative side. Noteboom (2006), for example, estimated an average €14/TEU.day, considering opportunity and depreciation costs.

For competitive hub-and-spoke services to be viable, they will have to reduce as much as possible the impact on the transit time of the affected cargo. Therefore, shipping companies will tend to require from terminals a windows schedule that enables significantly reducing layover times. Large global hubs actually operate "negative windows", where the connection of transshipment containers between the Deep-Sea service and feeders takes place on the same day (i.e., layovers are measured in hours rather than days). It is worth noticing that **this kind of efficiency gain is typical of terminals operated by vertically integrated players**, thanks to the ability to closely coordinate between terminal window scheduling and the schedules of ships on the various tradelanes.

A decrease in layover time leads to a similar decrease in the transit time of feeder ports' cargo. Figure 15, below, shows (compared with the results shown in Figure 14, above) the impact of a **decrease from six to three days** in the example described above. In this scenario, the largest increase in transit time drops from +6.6 to +3.6 days (Paranaguá export cargo), and some cargo will experience increases of less than one day. In an even bolder scenario, with one-day layover, the average transit time of all transshipped cargo would be at least in line with that of the direct solution.

TRANSIT TIME (days)		DIRECT	HUB-AND-SPOKE	TRANSIT TIME CHANGE
SANTOS (HUB)	Import	26,8	26,8	+0,0
	Export	26,3	26,3	+0,0
PARANAGUA	Import	29,0	30,6	+1,6
	Export	28,7	32,2	+3,6
ITAPOA	Import	30,0	32,2	+2,2
	Export	29,7	30,3	+0,6
PRATA	Import	34,5	35,1	+0,6
	Export	33,5	34,9	+1,4
			(lower times)	

Santos layover	3
Plate delay	0

Figure 15: Transit time variation by port in the simulated Asia-ECSA service (assuming decreased layover times)

ii. Increased service schedule reliability

The second positive effect of adopting a hub-and-spoke model concerns the impact of potential delays at one or more ports on the service's overall schedule. Data from Solve Shipping show that, from January 2022 to December 2023, more than 40% of regular container service calls at Brazilian ports experienced some delay compared with the respective schedules. Furthermore, over 10% of all calls were omitted.

Delays and omissions may take place as a consequence of several factors, such as adverse weather conditions preventing access to certain ports, terminal congestion or low productivity, or even shipping company decisions intended to optimize a ship's instant profitability[30]. Regardless of a delay's underlying cause, given the liner service's regularity, these incidents tend to cause a **"ripple effect", propagating along the subsequent scheduled calls** and leading to new delays and omissions. This may increase congestion at certain ports, with impact on other services – and, in extreme cases, affect other links of the logistical chains (i.e., land transport, inventories, production chains). Therefore, a key benefit of the hub-and-spoke model lies in

[30] Shipping companies may occasionally choose to reduce speed on a stretch or omit a scheduled call to reduce fuel consumption if, for example, the expected volume at a certain call is low.

(i) reducing the number of Deep-Sea service calls, which becomes less exposed to the risk of delays, and (ii) "insulating" the effects of any feeder port delays, preventing their impact from propagating along every subsequent point of call.

Figure 16, below, shows the results of the introduction into the simulation above of a **two-day delay in accessing the Plate Basin**, which may take place, for example, due to draft restrictions along the access channels.

TRANSIT TIME (days)		DIRECT	HUB-AND-SPOKE	TRANSIT TIME CHANGE
SANTOS (HUB)	Import	26,8	26,8	+0,0
	Export	28,3	26,3	-2,0
PARANAGUA	Import	29,0	33,6	+4,6
	Export	30,7	35,2	+4,6
ITAPOA	Import	30,0	35,2	+5,2
	Export	31,7	33,3	+1,6
PRATA	Import	36,5	40,1	+3,6
	Export	35,5	39,9	+4,4
		(higher times)		

Santos layover	6
Plate delay	2

Figure 16: Transit time variation by port in the simulated Asia-ECSA service (assuming delay in the Plate call)

It is worth noting that, in the direct service solution, the Plate delay will cause a 2-day increase in the transit time of the cargo at all of the service's subsequent calls (i.e., second calls at Itapoá, Paranaguá and Santos, where export containers are loaded), as shown by the values in red. On the other hand, for the hub-and-spoke service, such a delay would only affect cargo from the Plate itself. From the viewpoint of shippers, therefore, by "insulating" the effects of incidents, the hub-and-spoke service enables **improved service resilience against incidents and reliability of fulfillment of the original scheduling**.

Finally, Figure 17, below, shows the simulation's transit time results when overlapping the two effects mentioned.

TRANSIT TIME (days)		DIRECT	HUB-AND-SPOKE	TRANSIT TIME CHANGE
SANTOS (HUB)	Import	26,8	26,8	+0,0
	Export	28,3	26,3	-2,0
PARANAGUA	Import	29,0	30,6	+1,6
	Export	30,7	32,2	+1,6
ITAPOA	Import	30,0	32,2	+2,2
	Export	31,7	30,3	-1,4
PRATA	Import	36,5	37,1	+0,6
	Export	35,5	36,9	+1,4
		(higher times)	(lower times)	

Santos layover	3
Plate delay	2

Figure 17: Transit time change by port in the simulated Asia-ECSA service (assuming reduced layover and delay in Plate)

We observe that the hub-and-spoke solution's transit times become very close to the direct service's, with a maximum increase of approximately 2 days. Depending on each service's specific traits – number and order of ports of call, presence or absence of double calls, etc. – there may even be a decrease in cargo transit time for some ports and directions under the hub-and-spoke solution (e.g., exports loaded at Santos and Itapoá, in the example shown).

Note that, aside from the operational and service-scheduling impacts as described above, there are also **additional contingency-related costs** that shipping companies incur by providing extra calls, warehousing, higher fuel costs (to increase vessel speed), cargo repositioning, and other actions intended to mitigate the impacts of delays and omissions. Although these costs are not directly passed on to cargo owners, they represent an economic cost for the system that the hub-and-spoke solution can reduce and that the model shown in item 3.1 has not quantified.

Finally, by more efficiently connecting feeder ports to the hub, (with dedicated shuttles and/or increased frequency, more agile transshipment at the hub, and more reliable Deep-Sea service), the model also tends to **enhance the connectivity of smaller ports with the various tradelanes/destination ports**. The trade-off to be assessed is between using the feeder service or a land transport leg for direct loading at the hub, probably at a higher cost. In this respect, an analogy can be drawn with the airline industry, where smaller airports can offer flights to a wider range of destinations based on connections at large international hubs.

3.3
THERE ARE REMEDIES AVAILABLE AGAINST POSSIBLE RISKS AND NEGATIVE IMPACTS, IF EFFECTIVE

Notwithstanding the potential benefits arising from the consolidation of hub ports in Brazil, there are risks that must be mapped so that, should they materialize, means of mitigation can be evaluated and provided for in public policy, where applicable. Two risks appear most material in industry discussions – although, as posed ahead, no justification exists to deem them as hurdles against the consolidation of hubs in Brazil:

i. The risk that the **advent of verticalized hubs will lead to increased concentration in the port and shipping markets**, with the potential to reduce the choice of services available and, ultimately, lead to higher prices and losses for commerce chains; and

ii. The risk of **"local losers" emerging: specific ports and/or chains that cannot reap the benefits discussed** (due, for example, to insufficient volumes to enable feeder with satisfactory frequency), remaining "tied" to a sub-optimal logistical solution.

Initially, as concerns potential anti-competitive conduct on the part of players with high market shares, that may characterize a dominant position, it is worth mentioning that shipping company-terminal verticalization does not, in and of itself, create the conditions for abuse. For this reason, as Chapter 4 will discuss, such a concern should not be addressed by means of the creation of *ex-ante* barriers against verticalization, as typical anti-trust authority remedies will apply in the event of actual breach.

As for the risk that certain chains and/or ports will endure losses associated with sub-optimal logistical solutions (e.g., increased transit time), the answer lies in the competitiveness of the maritime shipping market. Different shipping companies will pursue varying strategies structuring their service, attempting to differentiate from others and stand out as the best possible choice for importers and exporters, respond to ship supply restrictions, or attempt to capture market share from competitors, among many other factors. Therefore, they may or may not choose to concentrate transshipment volumes at a hub or establish their hubs at different ports or in different regions.

Generally speaking, a certain feeder port's cargo may choose between at least two paths:

A hub-and-spoke service whose cost/ freight will possibly be lower and whose promised transit time will possibly be longer (but more predictable/reliable)

versus

A direct service, with possibly higher cost/freight and possibly shorter transit time (but more subject to delays and incidents)

Depending on various factors, such as the type and value of goods, their origin/destination, required refrigeration or other special steps, etc., certain cargo types will prioritize different aspects when choosing a service – and will therefore prefer one or the other alternative.

Shipping companies, by their turn, will adopt strategies in line with their commercial vision and available assets (ships and terminals), so that a shipping company structuring its services according to the hub-and-spoke model will leave room for others to capture volumes that prioritize direct service. A recent example of this dynamics was seen in the Brazilian market with the creation of a service connecting with Asia and featuring a direct call at the Port of Salvador[31], serving, for example demands from exporters in the state of Bahia that needed a solution with shorter transit times.

3.4
OTHER BENEFITS

In addition to benefits specifically affecting the maritime shipping industry, diffuse impacts, or impacts on other chain stakeholders are also expected:

- **Port/Port Authority.** The increase in throughput (berthings of Plate cargo, which currently skips Brazil, and additional transshipment operations to other ports in Brazil) should generate an increase in revenues for the affected PAs, associated with tariffs for the use of infrastructure and any variable lease arrangements under the applicable agreements. To illustrate, considering the additional transshipment volumes estimated in Chapter 2 and the current revenue parameters (tariff structure and variable leases) for the Port of Santos, we estimate that the additional revenues might reach approximately R$ 60 million/year under the "conservative" scenario, and up to R$ 160

[31] See news story: *"Terminal de contêiner de Salvador terá linha com grande navio direta para a Ásia"* – Agência iNFRA. https://agenciainfra.com/blog/terminal-de-conteiner-de-salvador-tera-linha-com-grande-navio-direta-para-a-asia/ (viewed August 7th, 2024).

million/year under the "bold" scenario (assuming 2023 volumes)[32].

- **Reduced CO2 Emissions**. The use of large capacity ships with more advanced technological content for the Deep-Sea trip (90% of the distance sailed) may enable material decreases in bunker oil consumption and, consequently, in greenhouse gas (GHG) emissions per container shipped. In addition, it may bring the demand for low-carbon fuels to the Brazilian coast.
- **Naval industry and ancillary industries**. Frequent calls by large ships (366 m) and the increase in cabotage ships/trips may generate a demand for docking/maintenance capable of justifying investments in the specialized naval construction industry. It might also create scale such as to enable structuring a ship bunkering industry, making room for Brazil to stand as a producer/exporter of green fuels for shipping, for example.
- **Optimized dredging investment.** With appropriate planning, organizing the shipping market according to a hub-and-spoke model would enable rationalizing dredging investments at one or a few ports, in a planned manner, preventing redundant and/or poorly allocated investments without the expected return in the form of berthings/demand.

[32] The increase in PA revenues was estimated based on three tranches:
(i) revenue gains in Tariff I due to the larger size of Deep-Sea ships. This assumes that ships will go from an average 110,000 DWT (9,000 TEU) to 170,000 DWT (15,000 TEU), and that calls will continue to be weekly (conservative scenario: 2 services x 52 weeks = 104 calls/year; bold scenario: 7 services x 52 = 364 calls/year);
(ii) revenue gains in Tariff I due to the increased number of cabotage/feeder ship calls. This assumes an average 50,000 DWT and average call size of 2,000 movements/call for these ships. This, in the conservative scenario (1 million additional feeder TEU) would yield 1,000,000/(1.70 x 2,000) = 295 additional berthings; in the bold scenario (2.3 million additional feeder TEU), there would be 2,300,000/(1.70 x 2,000) = 677 additional berthings; and
(iii) variable lease associated with additional transshipment volumes. This was calculated based on the number of containers (i.e., half the movements) transshipped in each scenario and the average variable amounts as provided in lease agreements with BTP and Santos Brasil (approximately R$ 44/container).

04

CRITICAL ASPECTS FOR POLICY PLANNING AND IMPLEMENTATION

This chapter focuses on how port planning, at its various levels, could or should address the topic of hub port implementation; and, furthermore, how regulatory and competition-related aspects should be addressed for the effective implementation of the chosen policies.

4.1
THE LOGISTICS PLANNING POLICY SHOULD ADDRESS THE SOLUTION AND CONCATENATION OF ACTIONS TO ENABLE HUB PORTS IN BRAZIL

In general terms, a port's dynamic environment and rapid changes – as well as economic, logistical and technological uncertainties arising from an outside environment that presses the port for changes –, together with infrastructure that features long-term maturity and amortization, make planning a rather challenging proposition.

More specifically, the maritime container shipping industry is dynamic and subject to frequent and relevant changes, requiring constant adjustments from ports around the world. Organizing shipping in line with a hub-and-spoke rationale is part of the pursuit of efficiency, which may be largely affected by economies of scale and generates demands for adaptation on the part of ports, which requires concatenating actions so that the appropriate conditions may emerge.

As discussed, **Brazil has the potential to develop regional hubs to concentrate transshipment volumes for other Brazilian ports and along the East Coast of South America, but must overcome significant gaps on various dimensions to this end (in particular, port infrastructure), some of which must be addressed by the Public Sector.**

Due to the relevance of the topic – including potential downstream impacts, the need for public authorities to monitor results, and the need to optimize investments to ensure efficient allocation – **it is important for the topic to be part of transport infrastructure planning instruments at the various spheres,** or risk failing to capture potential benefits. The current scenario, where industry plans fail to address the topic, appears particularly inadequate: **immobility is not a rational policy choice – the decision to pursue (or not to pursue) development of hub ports should be a compass, reaping benefits and adjusting policies as needed.**

The Brazilian port system's existing governance is structured with a high level of centralization, which reflects also on planning instruments. The Federal Executive recently enacted Decree No. 12.022/2024, which systematizes various instruments intended for the Integrated Transport Plan ("Planejamento Integrado de Transportes" – PIT)[33].

Figure 18, below, summarizes the various planning instruments concerned with the port industry, as well as a suggestion of how they should address the subject of hub ports.

It therefore befalls the various levels of industry planning: (i) to embrace adjusting Brazil to the trend of hub consolidation as an objective, indicating strategic/candidate ports (**PNL**); (ii) to map potential transshipment volumes and identify key projects (**PSPort**); (iii) to identify/forecast expected volumes, gaps and other particular traits of each port/complex (**PMs**); and (iv) indicate concrete means/projects to enable hub dynamics at each specific port (**PDZs**).

[33] Note that an ongoing effort is underway to concatenate documents and decision-making spheres that has not yet been fully addressed. Centralized documents coexist with particular traits of the port industry's planning process, as Portaria No. 61/2020-MINFRA remains in place, defining as port policy instruments the Master Plans, PDZs and PGO – the latter two being also provided for in Law No. 12.815/2013 and Law No. 10.233/2001, respectively.

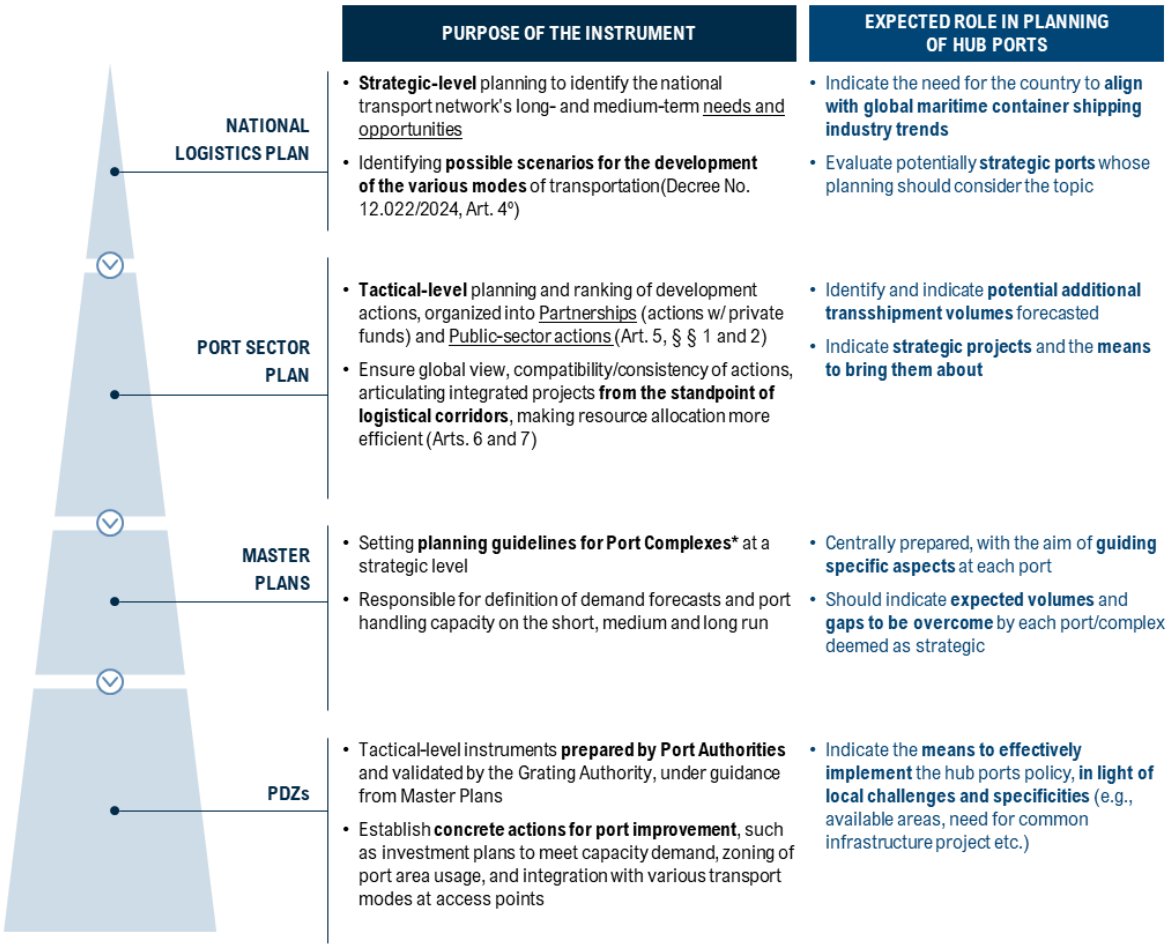


Figure 18: Summary of various planning instruments and their means of addressing the subject of hub ports

On the indication of "strategic ports" in federal-level planning instruments: please note that ports not indicated by central planning could and should attempt to gain the traits needed to join the dynamics and compete for these flows (e.g., by means of arrangements/partnerships with specific shipping companies), **creating competition that is expected to be beneficial for the ecosystem in general**. Thus, these ports' PDZs might indicate expected volumes, manner of adjustment in terms of area usage and occupancy, and infrastructure investments, so that planning documents may be updated and revised, preventing double counting.

What stands out, then, is that recent years **saw the establishment of a new integrated planning framework that specifically drives planning at the national level from the angle of logistics corridors, enabling, and even guiding, the concentration of efficiency-oriented investments.** In this context, **public policy** that takes account of Brazil's potential continental leadership when it comes to establishing one or more hub ports not only can be articulated within the boundaries of existing planning instruments (and, obviously, **explicitly recognizing this under the PNL**), but must also be consistent with the transport policy guidelines set forth in the local law[34].

[34] Such as Law No. 12.379/2011 which, on addressing the National Transport System ("Sistema Nacional de Viação" – SNV), names as one of the objectives of the Federal Transport System, which includes the ports subsystem, to meet large goods flows under efficiency regime, by means of strategic export and supply corridors (Article 4, item IV); or Law No. 10.233/2001, which, on addressing the restructuring of water and land transport, named as general guidelines both the physical integration and conjugation of operations for more economical and safer inter-modal handling, and prioritizing action programs and investments associated with the strategic axes of national integration, domestic market supply, and exports (Article 12, items II and III).

4.2
PUBLIC POLICY INTENDED TO ENABLE HUB PORTS MUST CONSIDER THE DYNAMIC'S PECULIAR TRAITS

While some clarity exists as concerns the motivators for policies meant to enable hub ports and the possible means to plan Brazilian ports with this in mind, the same cannot be said of the means to pursue convergence of all stakeholders within the institutional and regulatory environment, due to particular traits of the port industry and of the hub-and-spoke dynamics that must be addressed.

BOX 2: POLICIES TO INCENTIVIZE CONCENTRATION OF TRANSSHIPMENT VOLUMES IN ASIAN PORTS

Faced with very low growth rates in the decades of 2000 and 2010, if compared to their Chinese counterparts, ports in neighboring Asian countries that saw their position as regional hubs threatened deployed a series of policies aimed at reinforcing their competitivity and attracting new volumes, such as:

- **Kaohsiung (Taiwan):** reduction in terminal rent/lease values according to the scale/growth of container volumes, increases in transshipment throughput, and increased number of calls by the same shipping company;
- **Tokyo (Japan):** reduction in port dues and fees for equipment use for additional volumes relative to the previous year, reduced port dues for larger vessels and ships with mostly transshipment volumes, 50% reduction in import dues during the first year of operation of new liner services (+subsidies for maintaining 18-meter depth in berths and building ships for domestic feeder lines);
- **Busan (South Korea):** reduction of up to 99% of handling prices, reduced port dues levied on vessels to incentivize new routes/services, extended lease durations and reduced rent vales for terminals operated by JVs with foreign investors.

Adapted from: Yang, Y, Chen, S. (2015) Determinants of global logistics hub ports: Comparison of the port development policies of Taiwan, Korea, and Japan, Transport Policy, Vol. 45

On the one hand, (i) a **port** is an environment of **massive infrastructure investments** and long-term maturity and return, which **requires some predictability**; on the other, shipping is an industry that **adapts to volatility** and adjusts itself in line with the trade environment at the global level, which requires constant changes to its routes and lines organization and asset allocation strategy – and, therefore, **demands flexible contract/commercial arrangements**.

Out of several possible alternatives, the one that appears to ensure convergence and alignment of incentives across parties appears to involve **long-term investment arrangements** (in port infrastructure and even access infrastructure – for example, to enable larger ships to enter a channel), partly entrusted to shipping companies (usually by means of their terminal operator subsidiaries). This is due to the fact that it is desirable for the parties to ensure predictability for the port without, however, limiting shipping company decisions regarding strategic adjustments over time (avoiding, for example, regulatory/contract arrangements meant to guarantee volumes), which lies at the heart of the industry's activities and success.

Furthermore, within the relatively complex environment of incentives alignment, several tools that the existing regulations already provide for may be used:

- Various **regulatory mechanisms** exist that can be adopted in partnership/ lease instruments to help align incentives. For new port areas, or areas subject to re-bidding, innovations can be made to the **bidding judgment criteria**, adopting means that encourage using terminals to handle transshipment cargo, such as increased forecast capacity associated with container handing, and with transshipment cargo in particular; or other criteria that the regulatory framework does not yet provide for and yet to be developed[35]. Alternatively, or additionally, contract parameters with a similar intent can be adopted: lower variable leases for transshipment container handling (compared with gateway cargo), or specific minimum

[35] Regulatory innovations might take place by force of decree, insofar as judgment criteria are already provided for in Article 9 of Decree No. 8.033/2013, based on Article 6 of Federal Law No. 12.815/2013.

contracted handling of transshipment volumes (to be calibrated in the light of the specific traits of the market at hand so as not to create restrictions and undesirable inefficiencies).

It is worth emphasizing that this kind of distinctive regulatory/contract treatment or "incentive" for transshipment volumes has not featured in recent studies for new container terminal leases. Indeed, the treatment of the subject in planning instruments, contracts and tariff schedules lack uniformity. In fact, the opposite is the case: vague provisions or omissions lead to cases where transshipment volumes are double counted (i.e., at unloading and re-loading) for the purposes of variable lease payments, but a single time when it comes to determining Minimum Contracted Throughput – as illustrated by terminals in the Port of Rio de Janeiro.

- In general terms, **partnership instruments** may provide an interesting solution in certain cases – particularly those that display more specific contract instruments and formats than those provided by standard lease agreements –, with commitments associated mainly with long-term investments. In Brazil, public port managers usually limit themselves to the possibility of putting terminals up for bidding, and seldom evaluate alternative means of structuring projects alongside with the private sector, although several formats exist under the existing laws that enable pursuit of this convergence[36]. Noteworthy exceptions include relevant experiences on this front, such as the call for proposals that Cearáportos held for the development and implementation of a liquid bulk project at the Port of Pecém, or the establishment of the managing association of the Port of Santos Internal Railway ("Ferrovia Interna do Porto de Santos" – FIPS)[37]. It is worth noting that the reality of the port-shipping interface is constant worldwide, denoting the importance of pursuing creative partnerships and developing joint projects to achieve the intended objectives.

In addition, (ii) unique **operational aspects** exist involving the implementation of hub ports. As previous chapters show, the operation of hub terminals by players vertically integrated with shipping companies enables, for example, close coordination between the provision of berthing windows and ship scheduling for the various Deep-Sea and feeder services, thereby optimizing transshipment operations and minimizing the containers' layover time at the hub, reducing or eliminating impact on the cargo's transit time. Finally, (iii) aspects also exist in association with **terminals' financial structure**, as transshipment cargo is usually **less profitable and more volatile, so that terminals with high transshipment rates are financially more vulnerable**:

- According to Notteboom et al. (2019)[38], statistically, the volatility of demand at transshipment hubs is greater than in other container terminals due to the very dynamics of the shipping industry, as discussed above.
- For the same operational performance, terminals that focus mainly on transshipment handling tend to attain **significantly lower return levels compared with gateway and mixed terminals**. It has also been shown that these terminals are less capable of generating positive cash and revenues flow compared with gateway and mixed terminals[39].

[36] Brazilian law already provides sufficient flexibility for entry into partnerships, emphasis due on Article 28, paragraph 3, of the State-Owned Companies Law, in particular item II, which governs business opportunities and could be used as grounds for executing partnerships (by contract, or even equity deals) with shipping companies, building joint solutions and business arrangements to enable aligning incentives and overcoming the previously discussed trade-off between the Port Authority's need for predictability and shipping companies' need for flexibility.

[37] (i) Public Call No. 1/2017 selected Vopak as the holder of proven experience to serve as an equity partner of Cearáportos in a SPE intended to both develop projects and implement, operate and maintain liquid bulk handling and transport infrastructure and systems at the Port and Industrial and Port Complex of (CIPP). In this case, the partner's selection was based on a Business Plan analysis, considering factors such as expertise, project, market analysis, commercial strategy, investment capacity, efficiency, and adaptability. (ii) Santos Port Authority's (SPA) recent experience with the Port of Santos Internal Railway ("Ferrovia Interna do Porto de Santos" – FIPS), a partnership agreement between the SPA and associated railway companies was closely monitored by the Federal Union's Audit Court and was in a way validated thereby (q.v. TC 000.731/2022-6 – Ruling No. 1579/2022 – TCU – Full Panel). In fact, the TCU already has substantive case law on the application of Article 28, paragraph 3, which enables putting together a hub development partnership model between Port Authorities and shipping companies with sufficient legal security.

[38] Notteboom, T.E. et al. *The relationship between transshipment incidence and throughput volatility in North European and Mediterranean container ports*, Journal of Transport Geography (2019).

[39] Notteboom, T.E. et al. *Operational productivity and financial performance of pure transshipment hubs versus gateway terminals: An empirical investigation on Italian container ports*, Research in Transportation Business & Management (2023).

For these reasons, these volumes are usually overlooked by non-verticalized terminals so that these three factors – and the means to address them – **lead to a model where verticalization tends to be natural**. Notwithstanding, the issue of verticalization raises other concerns regarding its effects on the port and shipping markets – as discussed next.

4.3 THE POTENTIAL CONSEQUENCES OF VERTICALIZATION ASSOCIATED WITH HUB PORTS SHOULD NOT PREVENT INDUSTRY PLANNING FROM CONSIDERING MEASURES TO ENABLE THEM

The verticalization of container terminals by shipping companies is a global phenomenon that arises from the pursuit of increased logistical integration and, ultimately, efficiency and cost reductions, based on a legitimate economic rationale. Indeed, the UNCTAD's *Review of Maritime Transport 2023*[40] pointed out that *"vertical integration involving liner operators and terminals can promote the development of transshipment hubs, attract volumes and stimulate feedering services".*

Thus, an estimated half of the planet's 100 busiest terminals already have shipping companies as shareholders[41]. Figure 19 shows that the world's top ports (by volume handled) include terminals where shipping companies individually or jointly hold equity shares[42]. Indeed, the world's nine largest shipping companies hold equity stakes in over **200 terminals**, with capacity in excess of **400 million TEUs**.

Although the port industry's integration is a global trend and a reality of the shipping industry, relevant discussions exist surrounding the potential effects of this verticalization. Initially, we attempt to split the discussion into two somewhat interdependent topics: **potential impacts on competition**; and potential impacts associated with **supply-demand mismatches** between terminals within the same port environment.

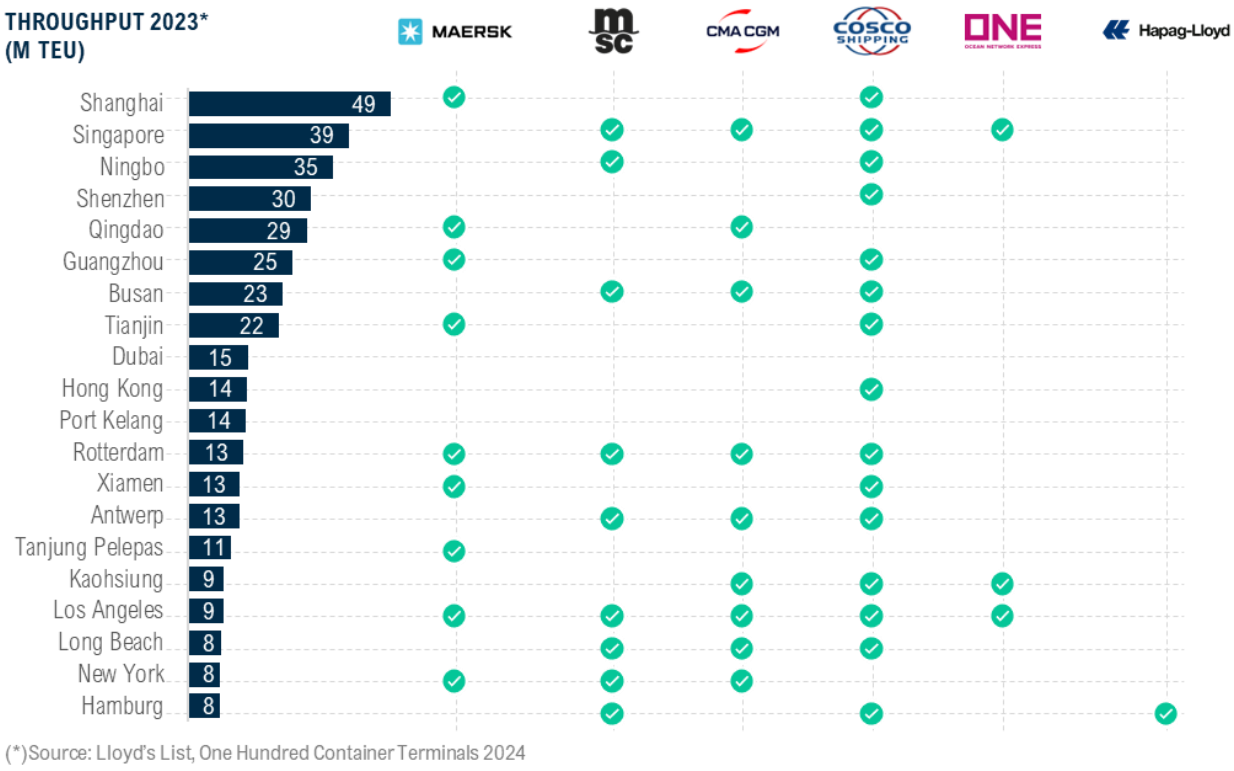


Figure 19: The world's main container hubs and equity interest of shipping companies in port terminal

[40] Available at https://unctad.org/publication/review-maritime-transport-2023.
[41] Statistics based on Drewry data, which does not include every terminal in the world.
[42] Each example does not necessarily indicate the same terminal or the same terminal management format.

4.3.1 Possible effects on competition must be monitored but do not justify ex-ante restrictions against the development of verticalized hub ports

As for concerns regarding potential anti-competitive conduct arising from shipping companies holding equity shares of container terminals, truly competition-related issues, where remediation requires State action, would arise from capacity or from incentives for shipping companies to engage in market closing conduct in a structure where they would be, to some extent, equity holders in port terminals.

In this respect, the following may be said:

- The Brazilian port industry is highly regulated and closely monitored by the ANTAQ, and terminals are usually bound by law or contract to provide non-discriminatory access to their port terminals.
- The presence of competition in the shipping market (that is, the presence of different shipping companies along the various main routes) – and, to an extent, in the port market as well, particularly as concerns ports or regions where several different terminals exist – tends to minimize the risk of and incentives for anti-competitive conduct.
- It is worth noting that, in the domain of Competition Law, structural issues associated with verticalization **have not been recognized by antitrust authorities in Brazil as subject to ex-ante State intervention**. As shown, the verticalized structure is already present at the world's largest terminals. In Brazil, the various structural analyses conducted by antitrust authority CADE[43] concluded that vertical integration is not a problem per se, and found no risk of market closure due to the above reasons, among others. The topic has not been analyzed by the CADE Judgment Panel, and the General Superintendent's Office, in topical analyses based on static market assessments (that is, considering the market's current conditions) at the time of the review, found potential competition risks in the event of verticalization associated with a new terminal tender that might be remedied by means of the adoption of contract-based monitoring, control and repression mechanisms[44], but not of ex-ante prohibition against shipping companies investing in container terminals.
- In addition, both ANTAQ and CADE have in place mechanisms to investigate and punish anti-competitive conduct and may even enact preventive measures with the appropriate timing to hinder market power abuse.
- Finally, it is worth emphasizing that any changes in market dynamics and potential competitive impacts of verticalization not effectively remedied by repression against anti-competitive conduct could ultimately be eliminated by undoing the verticalized structure: one instrument that CADE has available is to order a company to sell assets that generate undesirable impacts on a market's competitive environment (a port terminal, for example).

4.3.2 Concerns over potential supply-demand mismatches should not lead to restrictions against projects to consolidate hub ports

The issue of a potential mismatch between supply and demand arises precisely from the **effects that the addition of (material) new capacity may generate, given the uncertain nature of additional transshipment volumes**, as described above. Together with the natural trend towards verticalization that surrounds hub consolidation, this may lead to imbalanced occupancy of the various terminals in a given port environment, raising the question of whether – and how – port managers should handle the issue.

[43] For example, AC No. 08700.002350/2017-81; AC No. 08700.003956/2017-34; AC No. 08700.005868/2017-77.
[44] NT No. 10/2022/CGAA3/SGA1/SG/CADE.Item 2.3. Case 08700.004132/2022-49 – institutional Theme Study – CADE Technical Note as Inputs to ANTAQ in competitive studies on Terminal STS-10.

Thus, the topic must be approached within the broader context of port management organization itself and particularly how – and to what ends – Public Authorities may exercise some level of control over the entry of new players into the industry (be it though competition for the market, as in lease auctions, be it through the required authorization procedures applicable to private terminals).

In this respect, port management is **explicitly oriented** towards increasing competition by means of investments in capacity supply, pursuant to Law No. 12.815/2013. In fact, the port industry's landmark law explicitly defines increasing competition and improving the Country's development as objectives for the exploration of Organized Ports and port facilities, following guidelines to:

- Expand, modernize and optimize port facilities;
- Foster competition by means of incentives to private sector participation and guaranteed broad access to organized ports;
- Foster qualitative, efficient and reasonably priced activities, among others.

Therefore, given the natural characteristics of dearth of areas, the existence of competing demands for different types of cargo at various levels of capacity restriction, and the creation of costs distortion for the Country, the topic of "port supply management" must be addressed in line with the guidelines above so that the relevant objectives can be attained.

From the guidelines above (in particular improved efficiency and fostering competition in the industry), it follows that a healthy competitive environment must be protected to some degree[45]. Two provisos, however, must be made: (i) this must take place by means of **predictability** for long-term investments[46] and as concerns conditions for competition in the market, **not by simply restricting projects or creating barriers against new entrants**; and (ii) the pursuit of a "healthy competitive environment" must **ultimately be undertaken in benefit of the users** of a port (i.e., improved efficiency and lower prices for cargo owners), not investors positioned (or interested in taking a position) at a terminal.

In the wake of the increasing development seen in Brazil's infrastructure sectors, the port industry is now at a level of institutional and competitive maturity that allows for increasingly less dependence on State intervention to address any market problems. Indeed, recent discussions on the industry's legal and regulatory framework are driven towards increased flexibility and economic freedom for private enterprise investments and activity. Therefore, the pursuit of **predictability** must focus on clarity regarding the **rules and boundary conditions** where competition will take place, not to be confused with "market protection" and guaranteed return on investment[47] for existing terminals. That is, the predictability in question concerns the "rules of engagement", not actual results. In this sense, the Granting Authority's/Port Authority's actions in the domain of capacity supply management must be based on:

- **Clarity** as concerns the **boundary conditions for the assessment of a new lease's feasibility** (e.g., supply vs. demand, number of competitors, prices, etc.) when a tender is launched;

[45] Which, it should be clear, is not an explicit legal requirement.
[46] A conceptual justification for the pursuit of predictability lies in maximizing **long-term investments**. Although full flexibility for the awarding of new facilities may lead, at first, to an increase in short-term investments, a decrease in investments in the long run is to be expected, given the uncertainty surrounding the competitive environment (for example, there may be a decrease in competition, or lower values offered in new bids for leases) – and, more generally, an industry whose financial structure does not appropriately compensate the investments needed for it to develop.
[47] An assurance that is absent, it should be noted, even in industries that can more clearly be characterized as natural monopolies (in particular highways and railways).

- **Incentives to new projects** whenever they show prospects of generating improvements and added efficiency in cargo transport and/or handling;
- **Contract flexibility and safety** so as to enable adjustments in line with the regulatory environment in place – for example, by means of the waiver/ postponement of investment commitments made in the past when the rise of a new competitive outlook affects the feasibility/ need thereof.

It must be clear that, from the standpoint of public interest at hand, it is always better to run the risk of some excess capacity supply than to unduly restrict it – which would create deleterious bottlenecks that fly in the face of every legal guideline as mentioned above. This should be the operative guideline in the event of legitimate doubt as to how to proceed, at the risk of deteriorating the service provided to users. Note, in fact, that the very essential characteristics of infrastructure investments (i.e., high figures, lengthy implementation periods, "stepped" capacity additions) generate cycles of excess capacity at first, followed by adjustments in the medium run.

In the case at hand, new (and relevant) investment projects associated with enabling the hub port dynamics should be welcomed by the PA/Granting Authority – as they would be at any port worldwide operating under the Landlord model in place in Brazil. Instead of discussing **"whether"** to implement, the debate should address **"how"** *to implement*: that is, the specific traits of a project and how to adjust them to the reality and needs of the relevant Port or Port Complex. In fact, as applicable to any other port-related project, which must be shaped in view of market characteristics, regulatory environment, etc.

The development of a hub port project anywhere in the world is regarded as a **relevant opportunity** and treated as such by the executors of policy and the parties responsible for development. It can be no different in Brazil and, to a large extent, the legal and regulatory framework is already prepared to enable this.

We therefore conclude that: (i) public plans for the port/transport industry must necessarily consider the topic of hub ports consolidation in Brazil; (ii) the Organized Ports environment must have the flexibility and appropriate tools to pursue alignment of incentives and cooperation with shipping companies/operators to enable the successful implementation of hub ports.