Project Documents

Inputs for the future Greater Caribbean's new Maritime Strategy

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UNITED NATIONS

ECLAC

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Introduction

In 2014, Maritime & Transport Business Solution (MTBS), an international finance and business strategy consultant in port business solutions, with the assistance of their partner Dynamar B. V., delivered the 'Study on Port and Maritime Strategies for the Greater Caribbean'.

For the 2014 document, transport was a key focus of its strategy in order to support the modernisation, harmonisation and rationalisation of the policies and infrastructure required for transport services in the region. ACS wished to acquire data and elements of analysis on the development of maritime container traffic in the "Greater Caribbean", including transhipment and existing or projected port infrastructure to handle the container traffic. The Study has analysed the Caribbean container transport market and the port facilities in the Caribbean. The former document has the following contents. After the Executive Summary and Introduction, the 2014 study included three main parts: Part A. Conclusions and Recommendations; Part B. Assessment of container transport and port facilities; and Part C. Overview of Ports and Services. The Table of Contents of the above-mentioned study can be found in Annex 1.

The current study will update the data content in the 2014' study, and will also bring new topics, such as: Presence of Global Terminal Operators in the Caribbean, share of exports, imports, ports' performance and connectivity, and current issues.

The Caribbean is a key hub for the global maritime routes, constituting a relevant area for international trade. For its strategic location in the shipping sector, the Caribbean serves as a connection point for different regions and continents.

Due to the notorious disruption and profound alteration of the normal supply chain flow due to the COVID-19 pandemic the world is facing, shipping operations has been associated to the diversity and simultaneity of threats and risks. It is necessary to understand the sector and the risks and threats that surround it, in order to be prepared for the complex landscape that the maritime port sector is facing, as well as for possible future events.

To that end, the current study seeks to strengthen regional and sectoral cooperation on maritime transport and shipping operations in container ports, resulting in inputs for a maritime strategy.

In addition of being a very important transit, transhipment and service route for global trade, the maritime strategy for the Caribbean basin also aim to improve the functioning of the supply chain for the progress of the region and the Caribbean countries - being an important objective of this study.

The study comprises 77 ports in the Caribbean basin and the Gulf. For Panama, the Pacific coast was included in the study.

It is important to notice that in some cases, data is very difficult to be collected, so the sample of ports will be different for each section of this document.

From the methodologic point of view, a quantitative analysis will be envisaged for this study, to verify results empirically by means of research. The aim will be to identify the status of infrastructure, facilities, services and movements of terminal and container ports that surround the Caribbean basin and/or influences it directly.

I. Organizations involved

A. The Economic Commission for Latin America and the Caribbean

The Economic Commission for Latin America (ECLA) -the Spanish acronym is CEPAL- was established by Economic and Social Council resolution 106(VI) of 25 February 1948 and began to function that same year. The scope of the Commission's work was later broadened to include the countries of the Caribbean, and by resolution 1984/67 of 27 July 1984, the Economic Council decided to change its name to the Economic Commission for Latin America and the Caribbean (ECLAC); the Spanish acronym, CEPAL, remains unchanged. ECLAC, which is headquartered in Santiago, Chile, is one of the five regional commissions of the United Nations. It was founded with the purpose of contributing to the economic development of Latin America, coordinating actions directed towards this end, and reinforcing economic ties among countries and with other nations of the world. The promotion of the region's social development was later included among its primary objectives.

The Infrastructure Services Unit, which is part of the International Trade and Integration Division, has been the team designated by ECLAC to provide the technical assistance agreed with the Association of Caribbean States, and is therefore responsible for this report.

B. The Association of Caribbean States

With the aim of promoting consultation, cooperation and concerted action among all the countries of the Caribbean, in 1994 was signed the Convention Establishing the Association of Caribbean States (ACS). The ACS comprises 25 Member States and three Associate Members. Eight other non-independent Caribbean countries are eligible for associate membership.

The objectives of the ACS are enshrined in the Convention and are based on the following: the strengthening of the regional co-operation and integration process, with a view to creating an enhanced economic space in the region; preserving the environmental integrity of the Caribbean Sea which is regarded as the common patrimony of the peoples of the region; and promoting the sustainable development of the Greater Caribbean.

The ACS currently accounts with 35 Contracting States, Countries and Territories of the Greater Caribbean to enhance cooperation within the region, an initiative aimed at building upon obvious geographic proximity and well-documented historical linkages. As stated in the Convention Establishing the ACS, its primary purpose is to be an organization for "consultation, cooperation and concerted action" for its member countries. Its framework provides a forum for political dialogue that allows Members the opportunity to identify areas of common interest and concern that may be addressed at the regional level, and the solutions for which can be found through cooperation. The ACS Membership has identified 5 areas of concern for the attention of the Association:

i. The preservation and conservation of the Caribbean Sea. The preservation and conservation of this natural resource is a mandate of primordial importance for the ACS; a manifestation of the duty of all Caribbean citizens to protect this very tangible shared birth right.

ii. Sustainable Tourism. The importance of the tourism industry to the economic development of all the Members of the ACS transcends questions of physical size or language.

iii. Trade and Economic External Relations. The ACS provides a framework for the dialogue and activity necessary to further advance economic integration and intra-regional trade and investment, thereby improving the economic competitiveness of the Greater Caribbean region.

iv. Natural Disasters. The continued vulnerability of all countries and territories of the Greater Caribbean to the physical ravages and economically crippling consequences of natural disasters is a theme of the utmost importance on the regional agenda.

v. Transport. The proper functioning of efficient and viable intraregional air and maritime routes not only facilitates closer intraregional relations but represents a fundamental base in the achievement of cooperation in the aforementioned areas.

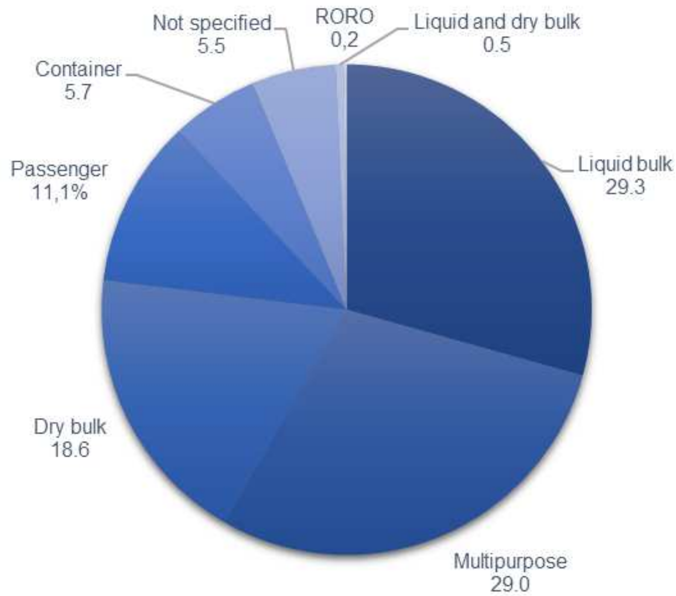
II. Geographical nodes in the Greater Caribbean basin

Usually, very different definitions of the Caribbean are found. In this case, the study uses the one known as the Greater Caribbean. The Greater Caribbean basin, which encompasses the Caribbean coastline of northern Latin America, the island nations and jurisdictions in the Caribbean Sea, and the Mexican and the United States coastlines of the Gulf of Mexico, has an area of approximately five million square kilometres, about twice the size of the Mediterranean Basin. Some 50 million people live in this region, including those of large metropolitan areas such as Caracas (Bolivarian Republic of Venezuela), Cartagena (Colombia), Havana (Cuba), Santo Domingo (Dominican Republic), Miami and Houston (United States), and San Juan (Puerto Rico). 32 countries and jurisdictions (dependencies of sovereign states – France, the United States, the Netherlands, the United Kingdom) are either partly or completely within the Greater Caribbean. This vast area, which extends as far east as the Guianas and the Lesser Antilles, as far north as the Bahamas and Florida, as far west as Texas and the Mexican states of Veracruz and Tamaulipas, and as far south as the Caribbean coastlines of Panama, Colombia, and Venezuela (Bolivarian Republic of), is home to a diverse set of population densities, ethnicities, languages, religions, and histories. It also has vastly different political regimes and stages of industrial and economic development.

The port structure of the Caribbean[1] is large and heterogeneous. Great share of the terminals is for dry and liquid bulk, representing a total of 48.5% of the Caribbean coast, 29.0% of multipurpose, and 5.7% for only containers. Figure below displays the share per type of terminals in the Caribbean coast.

1 For the list of terminals by type, the authors included the countries and territories located and/or with terminals located in the Caribbean Sea. For this reason, the list of countries and territories is bigger than the one considering the Greater Caribbean.

Figure 1
Share of terminals per type in countries, only terminals located in the Caribbean coast were considered.
(In percenteges)



Sources: UN Economic Commission for Latin America and the Caribbean; various port authorities and port operators.

As previously mentioned, the authors accounted all terminals located in the Caribbean coast. The full list is displayed in the following table.

Table 1
Terminals by type, in the Caribbean coast

Count+A1:J39ry	Container	Passenger	Liquid bulk	Dry bulk	Liquid and dry bulk	Multipurpose	RORO	Not specified	Total
Anguilla		1				1			2
Antigua and Barbuda	1	2	1	1					5
Aruba	1	1	1						3
Bahamas	3	6	6	4					19
Barbados		1	2	1					4
Belize	1		1	1		2			5
Bermuda	1	2	1			1			5
Bonaire			1	1		1			3
British Virgin Islands		4				3			7
Cayman Islands						3			3
Colombia			23	17		31		1	72
Costa Rica						2			2
Cuba	2	1	6	5		11		20	45
Curaçao	1	2	3	1		1			8
Dominica		1				2			3
Dominican Republic	1	4	10	6		9			30
Grenada	1	1	4			1			7
Guadeloupe	1		1	2		3			7
Guatemala						2			2
Haiti	1	1	1	3		12			18
Honduras	3	3	7	1		3			17
Virgin Islands		3	1			5			9
Jamaica	1	4	4	6		2			17

Count+A1:J39ry	Container	Passenger	Liquid bulk	Dry bulk	Liquid and dry bulk	Multipurpose	RORO	Not specified	Total
Martinique	2	3	3	1		2			11
Mexico	4	10	38	20	3	19	1	1	96
Montserrat						2			2
Nicaragua						2			2
Panama	3		7	1		7			18
Puerto Rico	3	2	10	3		5			23
Saint Kitts and Nevis		3	3			1			7
Saint Lucia		2	1			3			6
Saint Maarten						1			1
Saint Vincent and the Grenadines	2	2		2		3			9
Saint Barthélemy						1			1
Trinidad and Tobago		2	8	7		6			23
Turks and Caicos Islands		1				3			4
Venezuela (Bolivarian Republic of)			21	21		12		9	63
Total	32	62	164	104	3	162	1	31	559

Sources: UN Economic Commission for Latin America and the Caribbean; various port authorities and port operators.

Above mentioned disparities extend as well to maritime transport, given the relative centrality of some of the major hubs – whether because of their location or the population centres they serve – and the relative periphery of others. Following the lines of the 2014 study, the current study takes containerised cargo as the main consideration.

The Greater Caribbean has, by our determination, approximately sixty container seaports, of which some, such as Colón, Cartagena, Miami and Houston are port hubs with more than one terminal operator each. As follows is breakdown of the Greater Caribbean container seaports, divided according to `Tier': Tier 1 ports handled at least one million TEUs[2] in the last available calendar year, Tier 2 of at least 100 thousand TEUs but less than one million, and Tier 3 fewer than 100 thousand TEUs.

Table 2
Assortment of container ports in the Greater Caribbean Basin, according to tier

Tier 1	Tier 2	Tier 3
Colón (CCT, MIT, Cristóbal), Panama	Altamira, Mexico	Bridgetown, Barbados
(Balboa, PSA), Panama	New Orleans, US	Turbo, Colombia
Cartagena Bay, Colombia	Puerto Cortés, Honduras	Georgetown, Guyana
Houston, United States	Santo Tomás de Castilla, Guatemala	Dégrad des Cannes, French Guiana
Kingston, Jamaica	Puerto Barrios, Guatemala	Barcadera (Oranjestad), Aruba
San Juan, Puerto Rico	Río Haina, Dominican Republic	Georgetown, Cayman Islands
Jacksonville, United States	Mariel, Cuba	Tuxpan, Mexico
Caucedo, Dominican Republic	Santa Marta, Colombia	Maracaibo, Venezuela (Bolivarian Republic of)
Veracruz, Mexico	Port of Spain,	Coatzacoalcos, Mexico
Limón/Moín, Costa Rica	Trinidad & Tobago	Providenciales, Turks & Caicos
Miami, United States	Jarry/Baie-Mahault, Guadeloupe	Campden Park Container Port, St. Vincent & the Grenadines
Everglades, United States	Puerto Cabello, Venezuela (Bolivarian Republic of)	Guanta, Venezuela (Bolivarian Republic of)
Freeport, Bahamas	Point Lisas, Trinidad & Tobago	San Andrés, Colombia
	Fort-de-France, Martinique	El Guamache, Venezuela (Bolivarian Republic of)
	Progreso, Mexico	Arlen Siu, Nicaragua
	Barranquilla, Colombia	Puerto Morelos, Mexico
	Tampa Bay, United States	Guajira, Colombia

[2] Twenty-foot equivalent unit (TEU).

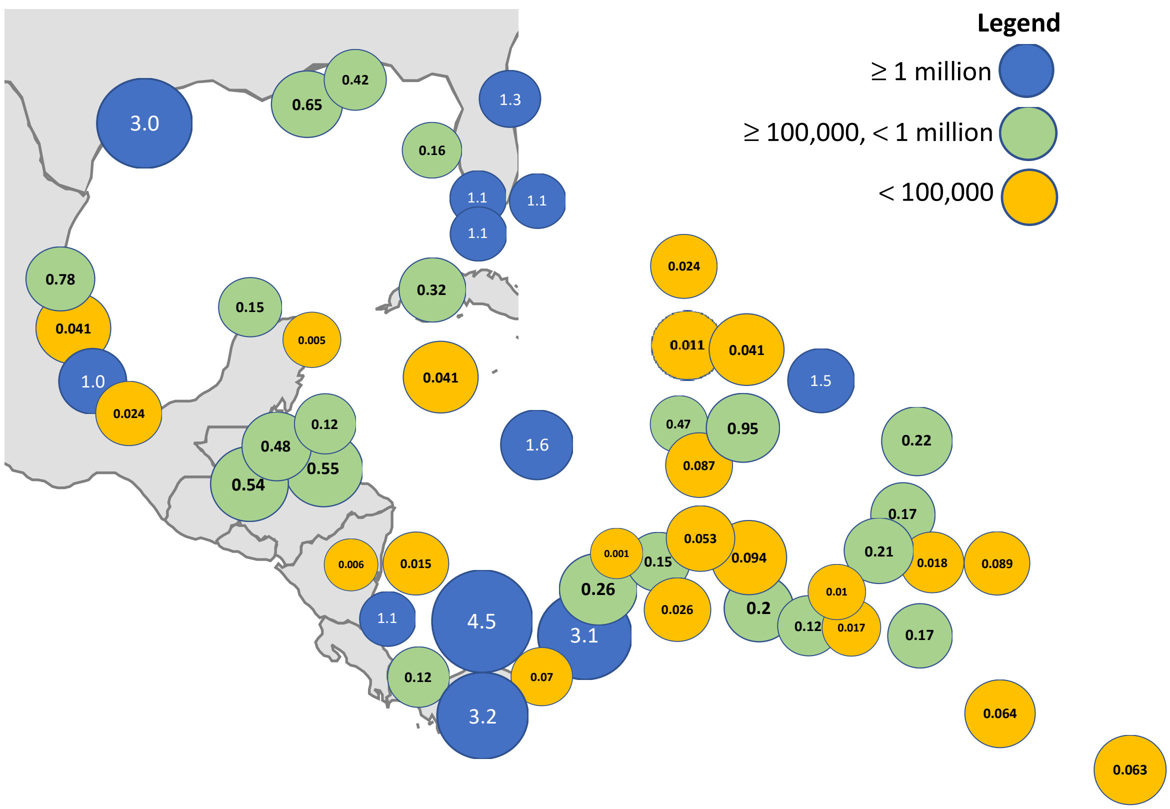
Tier 1	Tier 2	Tier 3
	Puerto Castilla, Honduras	
	Bocas Fruit (Almirante), Panama	
	La Guaira, Venezuela (Bolivarian Republic of)	
	Willemstad, Curaçao	
	Santo Domingo, Dominican Republic	
	Puerto Plata, Dominican Republic	
	Manzanillo, Dominican Republic	

Sources: UN Economic Commission for Latin America and the Caribbean; various port authorities and port operators. Note: Port Everglades in the United States had a throughput in 2020 lower than one million TEU. Nevertheless, it has capacity for more than one million and the previous years handled more than a million, that is way it is considered in the Tier 1 list.

As might be expected, information for each container terminal is more widely available for the largest, that is, those which handled at least one million TEUs in 2020. Information for Tier 2 ports is also fairly complete. Tier 3 ports, however, are considerably less well documented than those in the other categories.

The total handling capacity of container seaports in the Greater Caribbean exceeds 40 million TEUs, as reported by port authorities and port operators. In terms of throughput however, the data reveal a utilization rate of about 60%. Throughput in 2020 reached 25.3 million TEUs, of which 19.7 million were in the 11 Tier 1 ports, 5.2 million in the Tier 2 ports, and the rest in Tier 3, as can be seen in map 01.

Picture 1
Assortment of container ports in the Greater Caribbean Basin: Throughput in 2020 (in millions of TEUs)



Sources: United Nations Economic Commission for Latin America and the Caribbean (UN-ECLAC); various port authorities and port operators.

Figure 2
Throughput in 2020 of container seaports in the Greater Caribbean Basin (thousands of TEUs). Information is displayed from smallest to largest

Sources: United Nations Economic Commission for Latin America and the Caribbean (UN-ECLAC); various port authorities and port operators.
Note: Data from Mariel, Cuba is from 2019.

A. Profiles of tier 1 container terminals

This section contains profiles of the main port terminals in the Greater Caribbean Basin, selected for having an annual handling capacity of at least one million TEUs. Each of the 16 profiles contains aerial images of the terminal facility in addition to a table listing with the following key characteristics: handling capacity, 2020 throughput and utilization rate, total area and container storage area, nautical depth, total quay length, number of berthing positions, and number of cranes according to type. In case 2020 data is not available, 2019 data is used instead.

1. Colón, Panama

Located at the northern terminus of the Panama Canal, the Port of Colón consists of three container terminals: Colón Container Terminal, or CCT, operated by Evergreen Group; Manzanillo International Terminal, or MIT, operated by SSA Marine; and Cristóbal, operated by Panama Ports Company, a subsidiary of Hutchison Port Holdings (HPH).

Table 3
Caribbean coast, Panama, port characteristics

Port characteristics	
Handling capacity	7.9 million TEUs
Throughput 2020	4.45 million TEUs
Utilization 2020	56.40%
Total area	377.3 hectares
Container storage area	91.8 hectares
Nautical depth	16.2 meters
Total quay length	4756 meters
Berthing positions	12
Panamax cranes	9
Post-Panamax cranes	36
Mobile harbour cranes (MHC)[3]	0

Source: Authors, based on port authority and ports webpage data.

[3] In large terminals mobile harbour canes are used as a back-up for conventional dock cranes, to handle special loads and when additional terminal capacity is required.

Picture 2
Caribbean coast, Panama

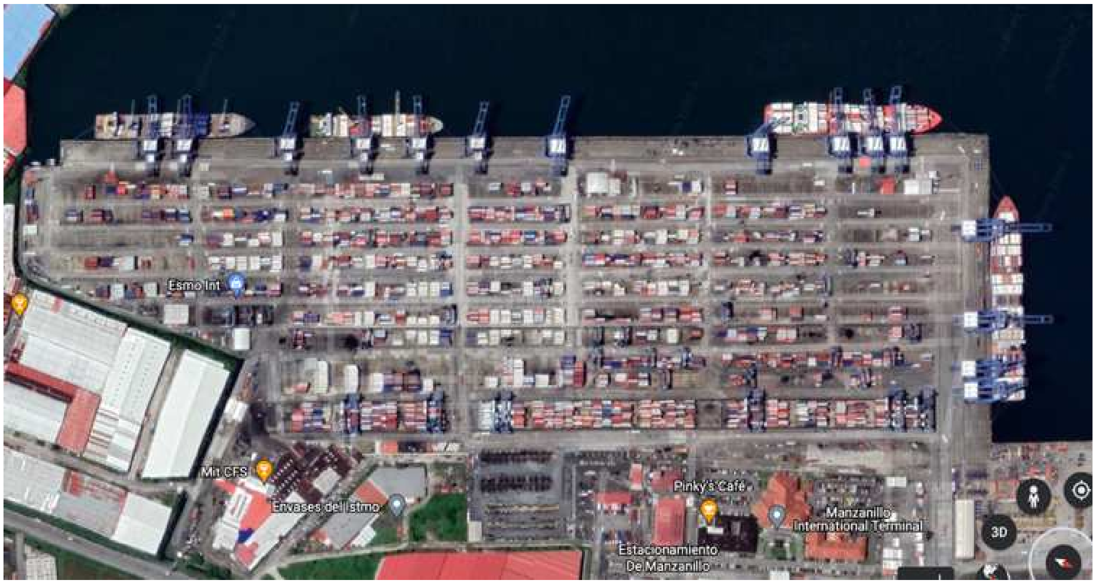
Source: Google Earth.

Table 4
Manzanillo International Terminal (MIT), Panama, port characteristics

Port characteristics	
Handling capacity	3.5 million TEUs
Throughput 2020	2.66 million TEUs
Utilization 2020	76.10%
Total area	160 hectares
Container storage area	52 hectares
Nautical depth	16.4 meters
Total quay length	2528 meters
Berthing positions	6
Panamax cranes	0
Post-Panamax cranes	19
Mobile harbour cranes (MHC)	0

Source: Authors, based on port authority and ports webpage data.

Picture 3
Manzanillo International Terminal (MIT), Panama



Source: Google Earth.

Table 5
Colón Container Terminal (CCT), Panama, port characteristics

Port characteristics	
Handling capacity	2.4 million TEUs
Throughput 2020	714,000 TEUs
Utilization 2020	29.80%
Total area	74.3 hectares
Container storage area	27.8 hectares
Nautical depth	16.5 meters
Total quay length	1258 meters
Berthing positions	3
Panamax cranes	5
Post-Panamax cranes	8
Mobile harbour cranes (MHC)	0

Source: Authors, based on port authority and ports webpage data.

Picture 4
Colón Container Terminal (CCT), Panama

Source: Google Earth.

Table 6
Port of Cristóbal, Panama Ports Company, Panama, port characteristics

Port characteristics	
Handling capacity	2 million TEUs
Throughput 2020	1.07 million TEUs
Utilization 2020	53.90%
Total area	143 hectares
Container storage area	12 hectares
Nautical depth	15.8 meters
Total quay length	970 meters
Berthing positions	3
Panamax cranes	4
Post-Panamax cranes	9
Mobile harbour cranes (MHC)	0

Source: Authors, based on port authority and ports webpage data.

Picture 5
Port of Cristóbal, Panama Ports Company, Panama

Source: Google Earth.

2. Panama Pacific coast

The southern entrance of the Panama Canal has a complex of port facilities. The two main ones are the Port of Balboa (operated by Panama Ports Company, a subsidiary of Hutchison Port Holdings), and the PSA Panama International Terminal, operated by the Port of Singapore Authority. Together, they handled 3.2 million TEUs in 2020, second in the Greater Caribbean Basin to the Port of Colón. Total Panamanian throughput in 2020 exceeded 7.6 million TEUs.

Table 7
Pacific coast, Panama, port characteristics

Port characteristics	
Handling capacity	6.5 million TEUs
Throughput 2020	3.16 million TEUs
Utilization 2020	48.60%
Total area	244.5 hectares
Container storage area	65 hectares
Nautical depth	16.6 meters
Total quay length	2854 meters
Berthing positions	8
Panamax cranes	8
Post-Panamax cranes	28
Mobile harbour cranes (MHC)	0

Source: Authors, based on port authority and ports webpage data.

Picture 6
Pacific coast, Panama

Source: Google Earth. (date !!!) ídem for all pictures

Panama Pacific coast: Port of Balboa, Panama Ports Company

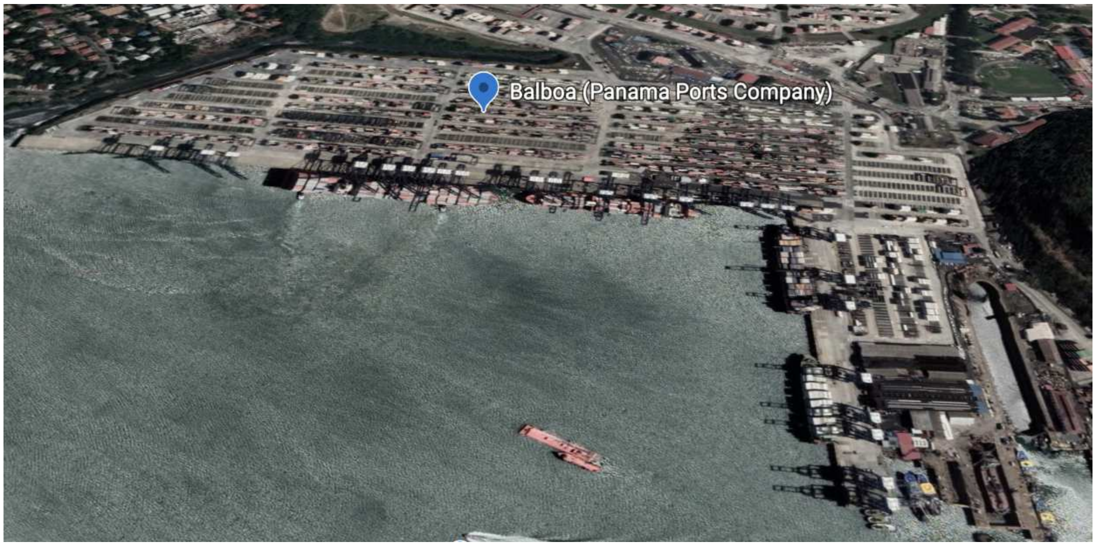
Located at the eastern edge of the Panama Canal's Pacific terminus, the Port of Balboa is the single largest container terminal in Panama both in terms of handling capacity and in terms of surface area. It is operated by Panama Ports Company, a subsidiary of Hutchison Port Holdings, which also operates the Port of Cristóbal at the Canal's Caribbean entrance, in Colón.

Table 8
Port of Balboa, Panama Ports Company, Panama, port characteristics

Port characteristics	
Handling capacity	4 million TEUs
Throughput 2020	1.96 million TEUs
Utilization 2020	49%
Total area	182 hectares
Container storage area	40 hectares
Nautical depth	17 meters
Total quay length	1714 meters
Berthing positions	5
Panamax cranes	8
Post-Panamax cranes	17
Mobile harbour cranes (MHC)	0

Source: Authors, based on port authority and ports webpage data.

Picture 7
Port of Balboa, Panama Ports Company, Panama



Source: Google Earth.

Panama Pacific coast: PSA Panama International Terminal

PSA International, based in Singapore, has a global array of investments in port facilities, of which six are in Latin America and the Caribbean, and one is in the Greater Caribbean Basin Region, namely, PSA Panama International Terminal, also known as Rodman Port from the name of the area once managed by the US military. PSA Panama is located directly opposite the Port of Balboa, at the western edge of the Panama Canal's Pacific entrance.

Table 9
PSA Panama International Terminal, Panama, port characteristics

Port characteristics	
Handling capacity	2.5 million TEUs
Throughput 2020	1.2 million TEUs
Utilization 2020	48%
Total area	62.5 hectares
Container storage area	25 hectares
Nautical depth	16.3 meters
Total quay length	1140 meters
Berthing positions	3
Panamax cranes	0
Post-Panamax cranes	11
Mobile harbour cranes (MHC)	0

Source: Authors, based on port authority and ports webpage data.

Picture 8
PSA Panama International Terminal, Panama

Source: Google Earth.

3. Cartagena, Colombia

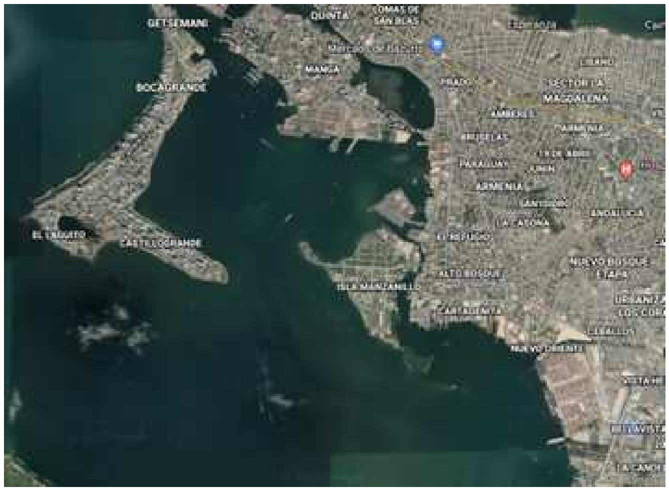
Located within the Bay of Cartagena, Colombia's main container port consists of two terminals: Sociedad Portuaria de Cartagena and Contecar. Located 329 nautical miles from Colón, the Caribbean entrance of the Panama Canal, the Port of Cartagena has emphatically benefited from the Canal expansion. US$850 million were invested in upgrading its facilities in order to accommodate increased volume in preparation for the expansion. According to its own data, 60% of the cargo traded between Colombia and the United States is handled through Cartagena.

Table 10
Bahía de Cartagena, Colombia, port characteristics

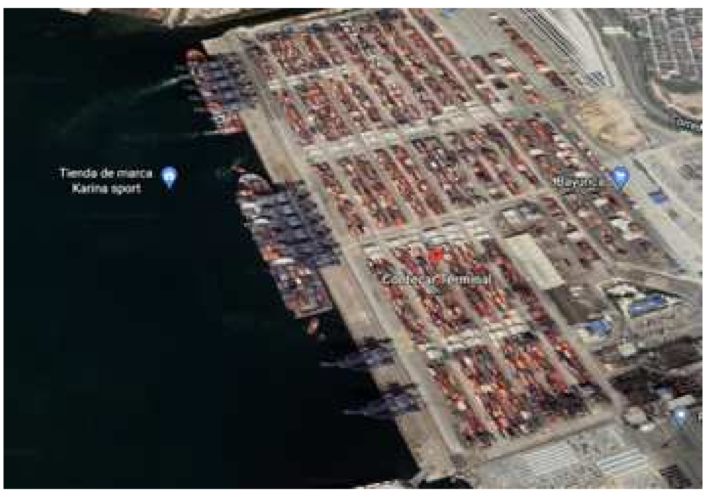
Handling capacity	5.2 million TEUs
Throughput 2020	3.13 million TEUs
Utilization 2020	60.20%
Total area	172 hectares
Container storage area	115 hectares
Nautical depth	16.5 meters
Total quay length	1700 meters
Berthing positions	6
Panamax cranes	0
Post-Panamax cranes	19
Mobile harbour cranes (MHC)	2

Source: Authors, based on port authority and ports webpage data.

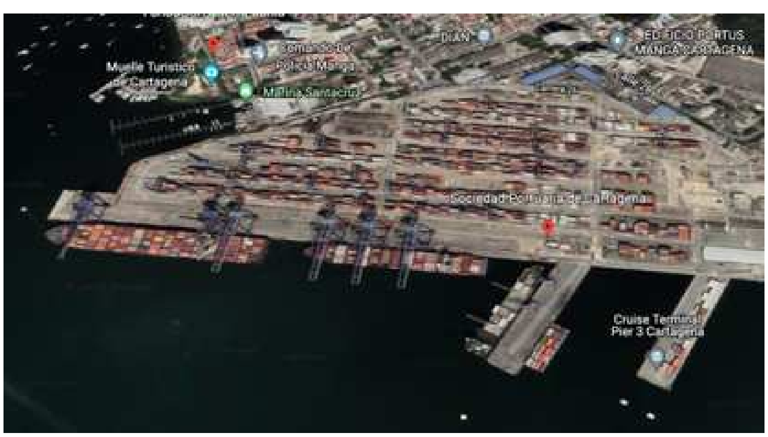
Picture 9
Bahía de Cartagena, Colombia



Source: Google Earth.



Source: Google Earth.



Source: Google Earth.

4. Houston, Texas, United States

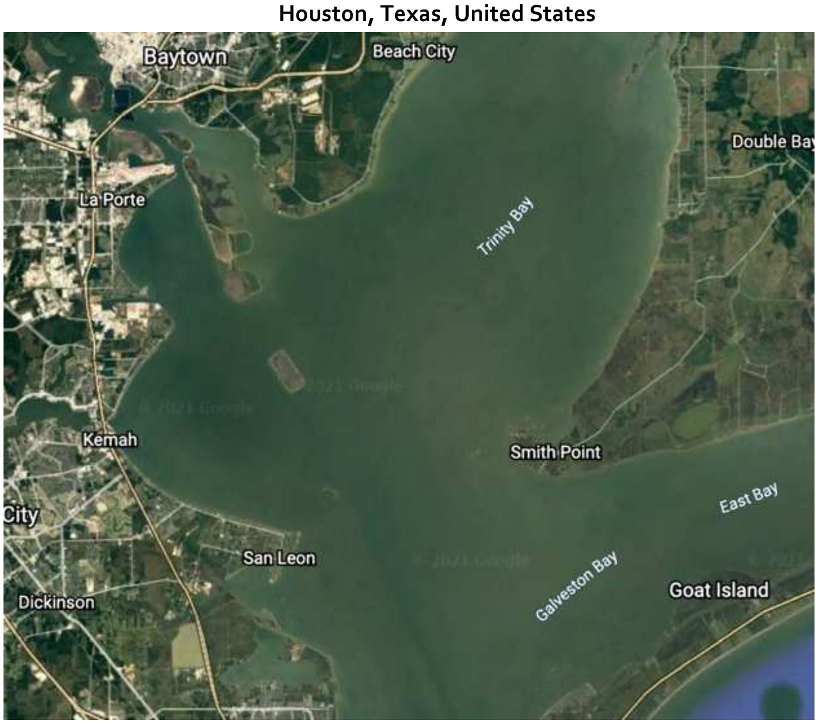
Located at the southwestern edge of the Houston city limits, the Port of Houston's two main container terminals – Barbours Cut Terminal and Bayport Container Terminal – are each within Galveston Bay, approximately 43 kilometers away from the Gulf of Mexico.

Table 11
Houston, Texas, United States, port characteristics

Port characteristics	
Handling capacity	3.4 million TEUs
Throughput 2020	3 million TEUs
Utilization 2020	87.90%
Total area	281.3 hectares
Container storage area	152 hectares
Nautical depth	14.1 meters
Total quay length	3048 meters
Berthing positions	10
Panamax cranes	2
Post-Panamax cranes	24
Mobile harbour cranes (MHC)	0

Source: Authors, based on port authority and ports webpage data.

Picture 10
Houston, Texas, United States



Source: Google Earth.

Picture 11
Bayport Container Terminal, Houston, Texas, United States

Source: Google Earth.

Picture 12
Barbours Cut Terminal, Houston, Texas, United States

Source: Google Earth.

5. Kingston, Jamaica

Table 12
Kingston, Jamaica, port characteristics

Handling capacity	3.2 million TEUs
Throughput 2020	1.6 million TEUs
Utilization 2020	50.40%
Total area	102 hectares
Container storage area	47 hectares
Nautical depth	14.7 meters
Total quay length	2400 meters
Berthing positions	7
Panamax cranes	0
Post-Panamax cranes	16
Mobile harbour cranes (MHC)	0

Source: Authors, based on port authority and ports webpage data.

Picture 13
Kingston, Jamaica

Source: Google Earth.

6. San Juan, Puerto Rico

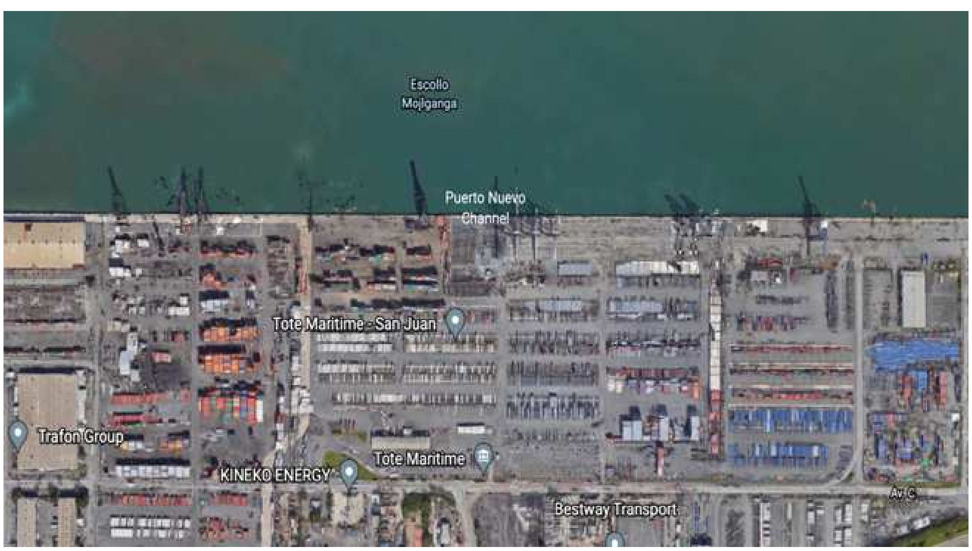
Located within the Bay of San Juan, on the North-eastern edge of Puerto Rico, the Port of San Juan's main container terminal is the Puerto Nuevo complex.

Table 13
San Juan, Puerto Rico, port characteristics

Handling capacity	2.2 million TEUs
Throughput 2020	1.5 million TEUs
Utilization 2020	67.70%
Total area	13.9 hectares
Container storage area	10.2 hectares
Nautical depth	12.2 meters
Total quay length	2400 meters
Berthing positions	8
Panamax cranes	11
Post-Panamax cranes	0
Mobile harbour cranes (MHC)	0

Source: Authors, based on port authority and ports webpage data.

Picture 14
San Juan, Puerto Rico



Source: Google Earth.

7. Jacksonville, Florida, United States

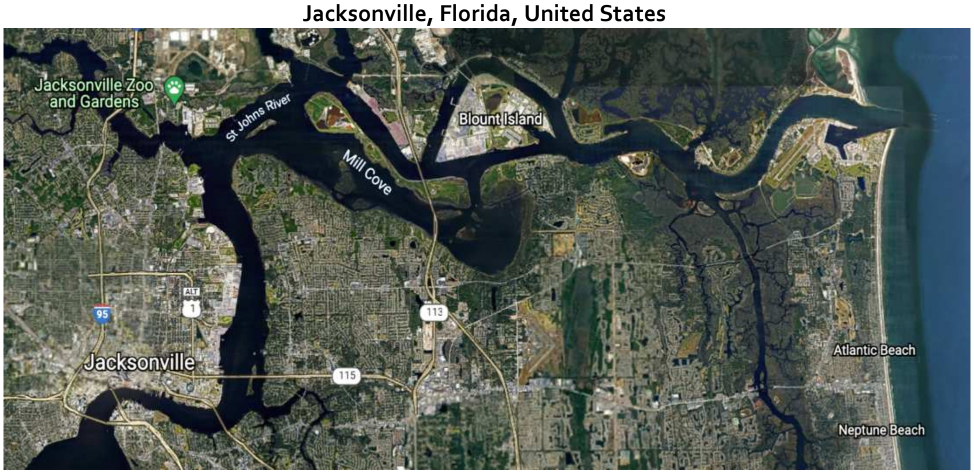
The Jacksonville Port Authority, or Jaxport, is responsible for a complex of three port facilities – Blount Island, Talleyrand, and Dames Point. The complex is located on Florida's northeast, on St. John's River, between 14 and 23 kilometres from the Atlantic Ocean.

Table 14
Jacksonville, Florida, United States, port characteristics

Handling capacity	2.8 million TEUs
Throughput 2020	1.3 million TEUs
Utilization 2020	47.10%
Total area	644 hectares
Nautical depth	12 meters
Total quay length	5144 meters
Berthing positions	17
Panamax cranes	10
Post-Panamax cranes	9
Mobile harbour cranes (MHC)	0

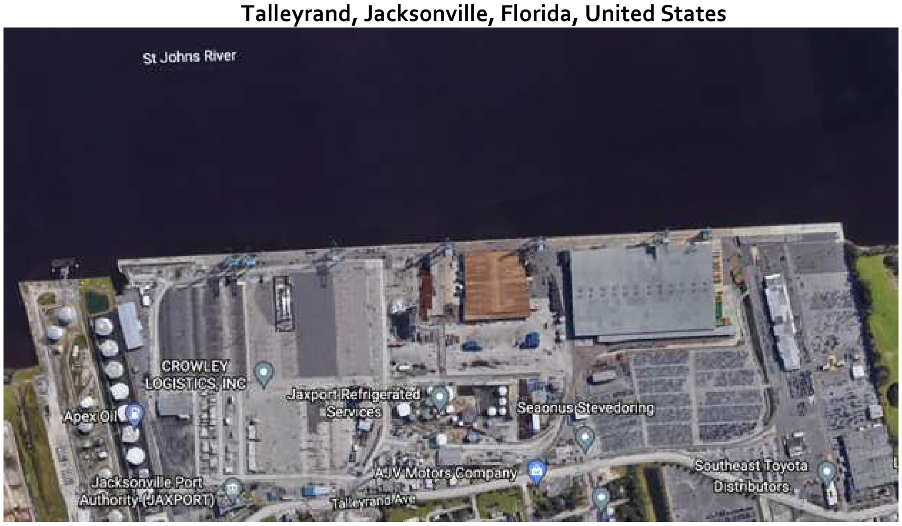
Source: Google Earth.

Picture 15
Jacksonville, Florida, United States



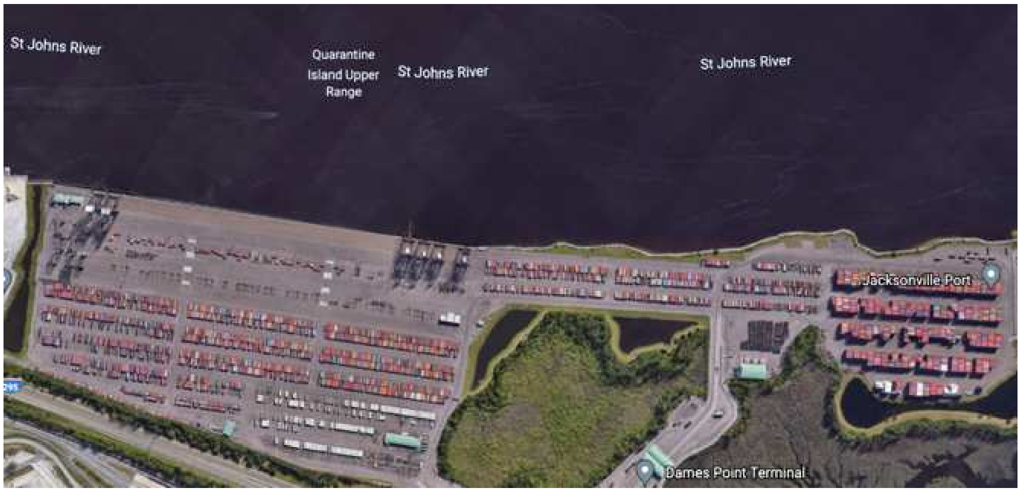
Source: Google Earth

Picture 16
Talleyrand, Jacksonville, Florida, United States



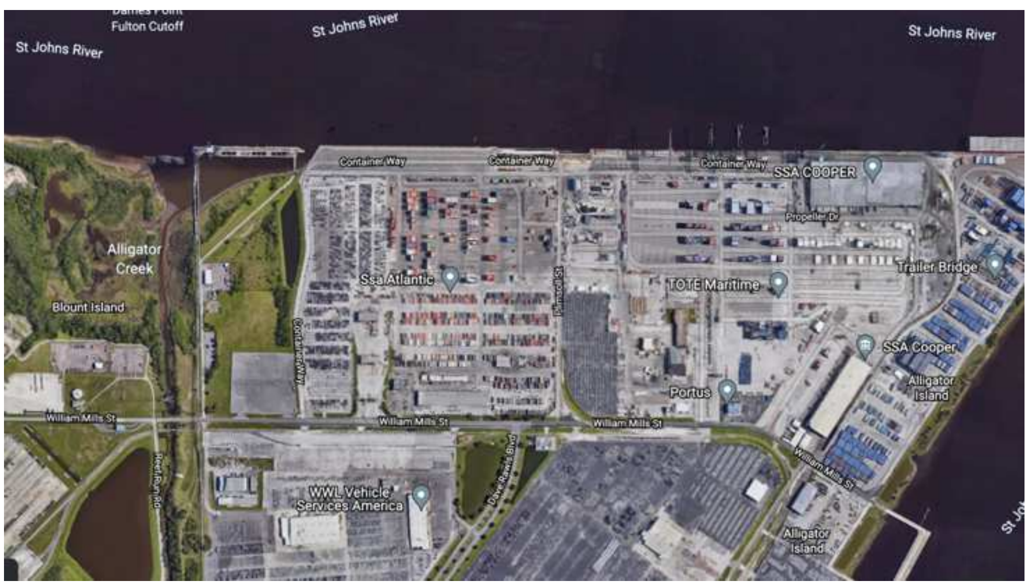
Source: Google Earth.

Picture 17
Dames Point, Jacksonville, Florida, United States



Source: Google Earth.

Picture 18
Blount Island, Jacksonville, Florida, United States



Source: Google Earth.

8. Puerto Limón/APM, Costa Rica

The Moín Container Terminal (MCT), operated by Maersk's APM Terminals, is located on an artificial island in Limón Province, on Costa Rica's Caribbean coast. It was inaugurated in February 2019 and has an area of 80 hectares.

Table 15
Limón/APM, Costa Rica, port characteristics

Handling capacity	1.3 million TEUs
Throughput 2020	1.1 million TEUs
Utilization 2020	87.00%
Total area	80 hectares
Container storage area	40 hectares
Nautical depth	14.5 meters
Total quay length	650 meters
Berthing positions	2
Panamax cranes	0
Post-Panamax cranes	6
Mobile harbour cranes (MHC)	0

Source: Authors, based on port authority and ports webpage data.
Note: The current capacity is close to full capacity (87.00%). For phase 2A, it includes capacity to handle four times the size of the ships it currently handles. In later stages, the largest design ship, new Panamax with 13,000 TEUs (today maximum 8,500), may be received.

Picture 19
Limón+APM, Costa Rica

Source: Google Earth.

9. Miami, Florida, United States

Port of Miami, on Dodge Island in Miami-Dade County in Florida, touts its operations as being a top contributor to the city's economy. It is an important trade centre between the US and Latin America and the Caribbean, which according to its statistics accounted for 46% of the port's market share in 2020, followed by Asia with 33%. The port has three container operations: Port of Miami Terminal Operating Company (POMTOC), Seaboard Marine, and South Florida Container Terminal.

Table 16
Miami, Florida, United States, port characteristics

Handling capacity	2 million TEUs
Throughput 2020	1.07 million TEUs
Utilization 2020	53.40%
Total area	210 hectares
Container storage area	125 hectares
Nautical depth	15.8 meters
Total quay length	3478 meters
Berthing positions	7
Panamax cranes	0
Post-Panamax cranes	13
Mobile harbour cranes (MHC)	0

Source: Authors, based on port authority and ports webpage data.

Picture 20
Miami, Florida, United States

Source: Google Earth.

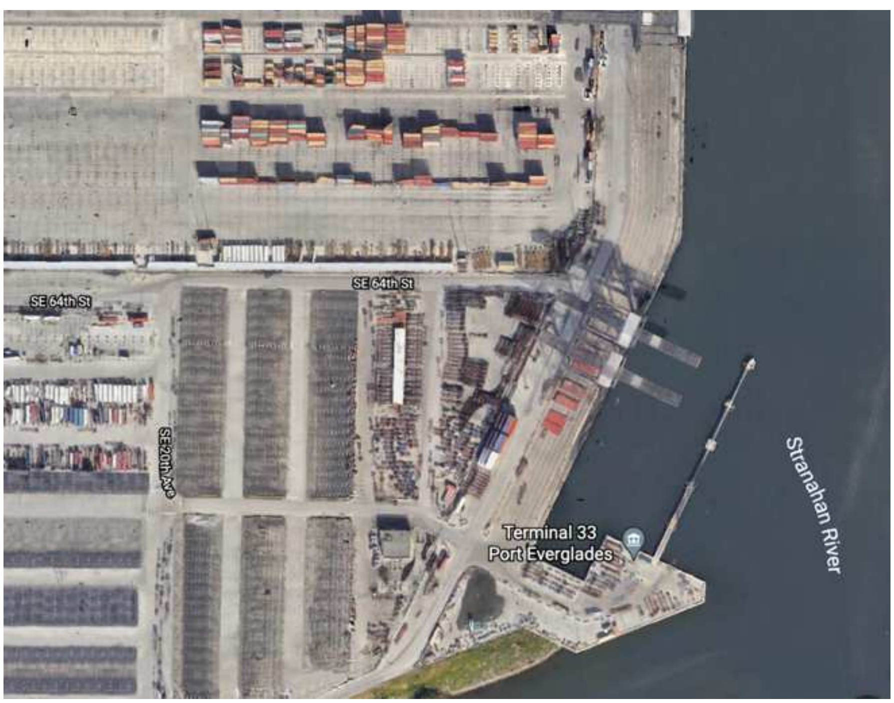
10. Everglades[4] , Florida, United States

Table 17
Everglades, Florida, United States, port characteristics

Handling capacity	1.48 million TEUs
Throughput 2019*	1.05 million TEUs
Utilization 2019*	71.20%
Container storage area	131 hectares
Nautical depth	12.5 meters
Total quay length	2112 meters
Berthing positions	4
Panamax cranes	1
Post-Panamax cranes	10
Mobile harbour cranes (MHC)	1

Source: Authors, based on port authority and ports webpage data.

Picture 21
Everglades, Florida, United States



Source: Google Earth.

[4] Information not available for 2020.

11. Freeport, Bahamas[5]

Table 18
Freeport, Bahamas, port characteristics

Handling capacity	1.5 million TEUs
Throughput 2019*	1.05 million TEUs
Utilization 2019*	70.00%
Container storage area	57 hectares
Nautical depth	16 meters
Total quay length	1036 meters
Berthing positions	4
Panamax cranes	0
Post-Panamax cranes	10
Mobile harbour cranes (MHC)	0

Source: Authors, based on port authority and ports webpage data.
Note 1: Current capacity is close to full capacity (70.00%).
Note 2: In the Bahamas, they are servicing liners only, with pre-purchased windows; a spot ship has no chance of being serviced. Moreover, this limits the possibility of growth of the port.

Picture 22
Freeport, Bahamas

Source: Google Earth.

5 Information not available for 2020

12. Veracruz, Mexico

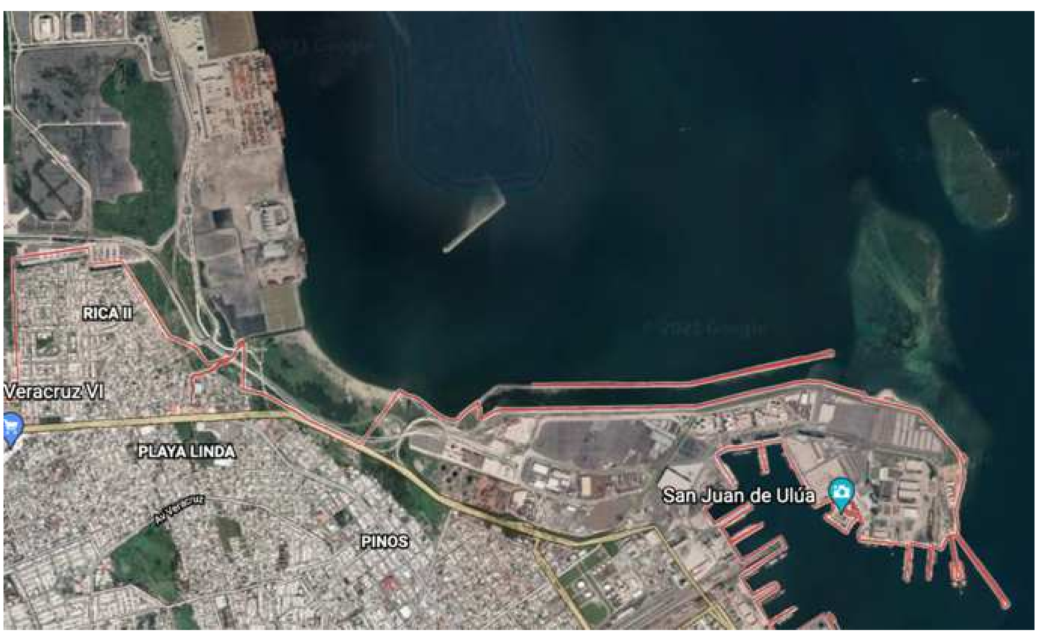
The Port of Veracruz, located in Mexico's eastern coast on the Gulf of Mexico, is the country's third largest container terminal. It is part of an infrastructure network that helps it serve south and central Mexico. The terminal itself, operated by Internacional de Contenedores Asociados de Veracruz (ICAVE), is part of Hutchison Ports.

Table 19
Veracruz, Mexico, port characteristics

Handling capacity	1.2 million TEUs
Throughput 2020	1 million TEUs
Utilization 2020	83.80%
Total area	42 hectares
Nautical depth	15.5 meters
Total quay length	700 meters
Berthing positions	2
Panamax cranes	7
Post-Panamax cranes	0
Mobile harbour cranes (MHC)	0

Source: Authors, based on port authority and ports webpage data.
Note 1: Note: Current capacity is close to full capacity (83.80%).
Note 2: Note 2: In Veracruz, they are servicing liners only, with pre-purchased windows; a spot ship has no chance of being serviced. Moreover, this limits the possibility of growth of the port.

Picture 23
ICAVE, Veracruz, Mexico



Source: Google Earth.

Picture 24
Hutchison Ports, Veracruz, Mexico

Source: Google Earth.

13. Caucedo, Dominican Republic

Located at Punta Caucedo, a peninsula the southeastern edge of the outskirts of Santo Domingo, within a logistical complex that includes Santo Domingo's international airport 4.5 kilometers away and a large free trade zone to the north, the Port of Caucedo is the largest container terminal in the Dominican Republic. It is operated by DP World.

Table 20
Caucedo, Dominican Republic, port characteristics

Handling capacity	1.68 million TEUs
Throughput 2020	950,000 TEUs
Utilization 2020	56.60%
Container storage area	80 hectares
Nautical depth	15.2 meters
Total quay length	922 meters
Berthing positions	4
Panamax cranes	0
Post-Panamax cranes	6
Mobile harbour cranes (MHC)	2

Source: Authors, based on port authority and ports webpage data.

Picture 25
Caucedo, Dominican Republic

Source: Google Earth.

B. Summary of 1, 2 & 3 tier ports profiles of tier 1 container terminals

Table 21
Tier 1 terminals

Port	Country/ Jurisdiction	Subregion	Area (hectares)	Capacity ('000 TEU)	Throughput ('000 TEU)	Utilization (%)	Nautical depth	Berthing positions	Quay length	TEU/m quay	Panamax cranes	Post-Panamax cranes	MHC	Total cranes	TEU/crane
Balboa (Panama Pacific)	Panama	Panama-Pacific coast	182	4,000	1,960	49	17	5	1,714	1,144	8	17	-	25	78,400
PSA (Panama Pacific)	Panama	Panama-Pacific coast	63	2,500	1,200	48	16	3	1,140	1,053	-	11	-	11	109,091
Panama Pacific coast (all terminals)	Panama	Panama-Pacific coast	245	6,500	3,160	49	17	8	2,854	1,107	8	28	-	36	87,778
CCT (Colón)	Panama	Panama-Caribbean coast	74	2,400	714	30	17	3	1,258	568	5	8	-	13	54,923
MIT (Colón)	Panama	Panama-Caribbean coast	160	3,500	2,663	76	16	6	2,528	1,053	-	19	-	19	140,158
PPC (Colón)	Panama	Panama-Caribbean coast	143	2,000	1,077	54	16	3	970	1,110	4	9	-	13	82,846
Panama Caribbean coast (all terminals)	Panama	Panama - Caribbean coast	377	7,900	4,454	56	16	12	4,756	937	9	36	-	45	98,978
Bahía de Cartagena (SPRC & CTC)	Colombia	Colombia-Caribbean coast	172	5,200	3,128	60	17	6	1,700	1,840	-	19	2	21	148,952
Houston	United States	Gulf	281	3,400	2,989	88	14	10	3,048	981	2	24	-	26	114,962
Kingston	Jamaica	Caribbean	102	3,200	1,542	48	15	7	2,400	643	-	16	-	16	96,375

Port	Country/ Jurisdiction	Subregion	Area (hectares)	Capacity ('000 TEU)	Throughput ('000 TEU)	Utilization (%)	Nautical depth	Berthing positions	Quay length	TEU/m quay	Panamax cranes	Post-Panamax cranes	MHC	Total cranes	TEU/crane
San Juan	Puerto Rico	Caribbean	14	2,200	1,443	66	12	8	2,400	601	11	-	-	11	131,182
Jacksonville	United States	US Atlantic	644	2,752	1,295	47	12	17	5,144	252	10	9	-	19	68,158
Caucedo	Dominican Rep.	Caribbean	80	1,680	1,169	70	15	4	922	1,268	-	6	2	8	146,125
Veracruz	Mexico	Mexico - Gulf coast	42	1,200	1,144	95	16	2	700	1,634	7	-	-	7	163,429
Limón/ Moín	Costa Rica	Central America - Caribbean coast	80	1,300	1,138	88	15	2	650	1,751	-	6	-	6	189,667
Miami	United States	Gulf	210	2,000	1,067	53	16	7	3,478	307	-	13	-	13	82,077
Everglades	United States	Gulf	131	1,480	945	64	13	4	2,112	447	1	10	1	12	78,750
Freeport	Bahamas	Caribbean	57	1,500	1,050	70	16	4	1,036	1,014	`-	10	-	10	105,000
Total or average			2,191	33,812	21,364	67	15	83	28,346	973	40	149	5	194	118,638

Source: Authors, based on port authority and ports webpage data.

Table 22
Tier 2 terminals

Port	Country/ Jurisdiction	Subregion	Area (hectares)	Capacity ('000 TEU)	Throughput ('000 TEU)	Utilization (%)	Nautical depth	Berthing positions	Quay length	TEU/ m quay	Panamax cranes	Post-Panamax cranes	MHC	Total cranes	TEU/ crane
Altamira+ Tampico	Mexico	Mexico - Gulf coast	3075		682		12.2	5	1317	518	8	2	0	10	68200
New Orleans (Port NOLA)	United States	Gulf	26.3	840	649	77.26	13.7	2	609	1066		6	0	6	108167
Puerto Cortés	Honduras	Central America - Caribbean coast	34	1000	551	55.10	14.5	3	1150	479	0	3	3	6	91833
Santo Tomás de Castilla	Guatemala	Central America - Caribbean coast	12.4		537		11	3	914	588	0	0	5	5	107400
Puerto Barrios	Guatemala	Caribbean	10	630	480	76.19	14	2	760	632	0	0	3	3	160000
Río Haina	Dominican Republic	Caribbean	25	600	474	79.08	12	4	2800	169	2	0	2	4	118622
Mariel	Cuba	Caribbean	54.9	800	322	40.25	17.9	2	702	459	0	4	0	4	80500
Santa Marta	Colombia	Colombia - Caribbean coast	8	300	259	86.33	15	1	320	809	0	2	0	2	129500
Port of Spain	Trinidad & Tobago	Caribbean	142	700	236	33.71	12	3	812	291	2	2	1	5	47200
Jarry/Baie-Mahault	Guadeloupe	Caribbean	70		224		14.5	4	600	373	0	4	0	4	56000
Puerto Cabello	Venezuela (Bolivarian Republic of)	Venezuela - Caribbean coast	59	900	200	22.22	10.7	7	1790	112	0	0	5	5	40000
Point Lisas	Trinidad & Tobago	Caribbean	23.33	250	170	68.00	12.8	3	645	264	2	0	2	4	42500
Fort-de-France	Martinique	Caribbean	16	250	169	67.60	14	2	450	376	0	3	0	3	56333

Port	Country/ Jurisdiction	Subregion	Area (hectares)	Capacity ('000 TEU)	Throughput ('000 TEU)	Utilization (%)	Nautical depth	Berthing positions	Quay length	TEU/ m quay	Panamax cranes	Post-Panamax cranes	MHC	Total cranes	TEU/ crane
Progreso	Mexico	Mexico - Gulf coast	11.5		149		9.7	2	490	304	1	0	2	3	49667
Barranquilla	Colombia	Colombia - Caribbean coast	12	180	147	81.67	12.5	6	1058	139	0	0	5	5	29400
Tampa Bay	United States	Gulf	16.2	300	141	47.00	13.1	3	2591	54	0	5	1	6	23500
Puerto Castilla	Honduras	Central America - Caribbean coast			118		13		225	0				0	
Bocas Fruit (Almirante)	Panama	Panama - Caribbean coast	4		117		12	2	312	375	0	0	2	2	58500
La Guaira	Venezuela (Bolivarian Republic of)	Venezuela - Caribbean coast	22	1200	115	9.58	15.2	2	693	166	0	6	0	6	19167
Willemstad	Curaçao	Caribbean		120	94	78.33	12.2	2	460	204	2	0	0	2	47000
Santo Domingo	Dominican Republic	Caribbean	18		87		9.1	10	2310	38	0	0	0	0	
Puerto Plata	Dominican Republic	Caribbean			41		12	1	291	139	0	0	1	1	40513
Manzanillo	Dominican Republic	Caribbean		300	11	3.53	16	2	227	47	0	0	0	0	
Port au Prince	Haiti	Caribbean	10	100			12	3	620	0	0	0	3	3	0
Cap Haitien	Haiti	Caribbean					17	3	465	0	0	0	1	1	
Total or average			3649.63	8470	5972.702	55.06	13.12		22611	304	17	37	36	68	65429

Source: Authors, based on port authority and ports webpage data.

Table 23
Tier 3 terminals

Port	Country/ Jurisdiction	Subregion	Area (hectares)	Capacity ('000 TEU)	Throughput ('000 TEU)	Utilization (%)	Nautical depth	Berthing positions	Quay length	TEU/ m quay	Panamax cranes	Post-Panamax cranes	MHC	Total cranes	TEU/ crane
Bridgetown	Barbados	Caribbean			89									0	
Turbo	Colombia	Colombia - Caribbean coast			70										
Georgetown	Guyana	Caribbean			64									0	
Dégrad des Cannes	French Guiana	Caribbean	23		63		7		565	0	0	0	2	2	
Barcadera, Oranjestad	Aruba	Caribbean	13		53		11		250	0	1	0	0	1	0
Georgetown-Cayman	Cayman Islands	Caribbean			41									0	
Tuxpan, VER.	Mexico	Mexico - Gulf coast	15.6		41									0	
Maracaibo	Venezuela (Bolivarian Republic of)	Venezuela - Caribbean coast	50		26		12							0	
Coatzacoalcos	Mexico	Mexico - Gulf coast			24										
Providenciales	Turks and Caicos	Caribbean			24										
CPCP (Campden Park Container Port)	St. Vincent & the Grenadines	Caribbean			18									0	
Guanta	Venezuela (Bolivarian Republic of)	Venezuela - Caribbean coast			17										
San Andrés	Colombia	Caribbean			15										
El Guamache	Venezuela (Bolivarian Republic of)	Venezuela - Caribbean coast			10										
Arlen Siu	Nicaragia	Central America-Caribbean coast			6										
Puerto Morelos	Mexico	Mexico – Culf coast			5										

Port	Country/ Jurisdiction	Subregion	Area (hectares)	Capacity ('000 TEU)	Throughput ('000 TEU)	Utilization (%)	Nautical depth	Berthing positions	Quay length	TEU/m quay	Panamax cranes	Post-Panamax cranes	MHC	Total cranes	TEU/ crane
Guajira	Colombia	Colombia - Caribbean coast			1										
Road Bay	Anguilla	Caribbean													
The Valley	Anguilla	Caribbean												0	
St. John's	Antigua & Barbuda	Caribbean												0	
Nassau	Bahamas	Caribbean	22.9				8.2		365	0	0	0	3	3	0
Big Creek	Belize	Caribbean													
Belize City	Belize	Caribbean	25				9		66.5	0			2	2	0
Kralendijk	Bonaire	Caribbean					12.1		120					0	
Roseau	Dominica	Caribbean													
Boca Chica	Dominican Republic	Caribbean					7.6		615	0				0	
St. George's	Grenada	Caribbean	5.3				8.6		335					0	
Montego Bay	Jamaica	Caribbean												0	
Little Bay	Montserrat	Caribbean													
El Bluff	Nicaragua	Central America - Caribbean coast					5		160	0				0	
Port of Charlestown	Saint Kitts and Nevis	Caribbean													
Castries	Saint Lucia	Caribbean													
Vieux Fort	Saint Lucia	Caribbean					2.3		163	0				0	
Philipsburg	Saint Martin	Caribbean													
Port of St. Maarten	Saint Martin	Caribbean					10.5		540	0	0	0	2	2	0
Basseterre	St. Kitts & Nevis	Caribbean	16.2				11		121					0	
Paramaribo	Suriname	Caribbean												0	
Total or average			171	0	567		8.69		3301	0	1	0	9	10	0

Source: Authors, based on port authority and ports webpage data.

III. Global fleet: evolution of vessel sizes

The growth in the size of container ships has been continuous, especially in the last 15 years. This process, which has a strategic implication for the shipping business and for port planning and related activities, is not only oriented to the main world trade routes, but also to the north-south routes.

This section of the document will analyse the mechanics of the increase in the size of ships worldwide and the factors that explain it, and then estimate the arrival projections of the current largest ships in South America (SA), nevertheless, it can be used as an approach for the Caribbean[6], in order to facilitate port planning.

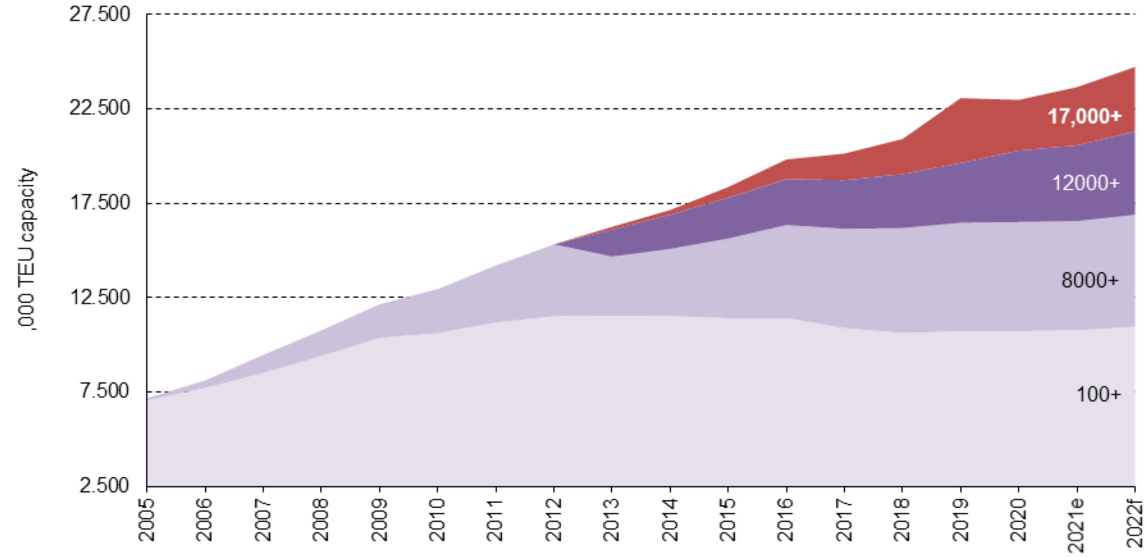
A. Large container ships are part of major trends in the container shipping industry

The phenomenon of ships growing in size cuts across the main trends in the container shipping industry over the past 15 years. These include gigantism, separation between trade and fleet expansion, volume volatility, shipping oversupply and market concentration, among others.

Figure 03 shows the evolution of container ship gigantism between 2005 and 2022f; note that vessels up to 11,999 show a stagnation or decline since 2015, when the scene becomes dominated by those over 12,000.

[6] The Panama Canal imposes restrictions on the size of vessels, the shore side infrastructure of Caribbean ports. Vessels larger than 12,000 TEU are destined for traffic with higher demand or simply for transhipment terminals.

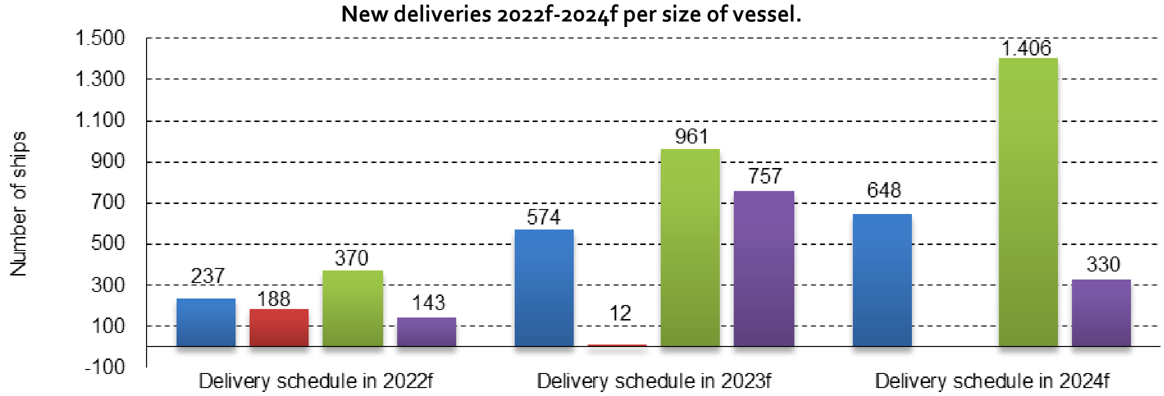
Figure 3
Gigantism, evolution 2005-2022f - (b)



Source: authors, based on Clarkson. Notes: e is for estimated; and f is for forecast.

Figure 4 shows the dominance of the larger vessels, through shipbuilding orders to be delivered during 2022 to 2024.

Figure 4
New deliveries 2022f-2024f per size of vessel.



	Delivery schedule in 2022f	Delivery schedule in 2023f	Delivery schedule in 2024f
100-7999	237	574	648
8000+	188	12	
12000+	370	961	1.406
17000+	143	757	330

Source: authors, based on Clarkson. Notes: f is for forecast.

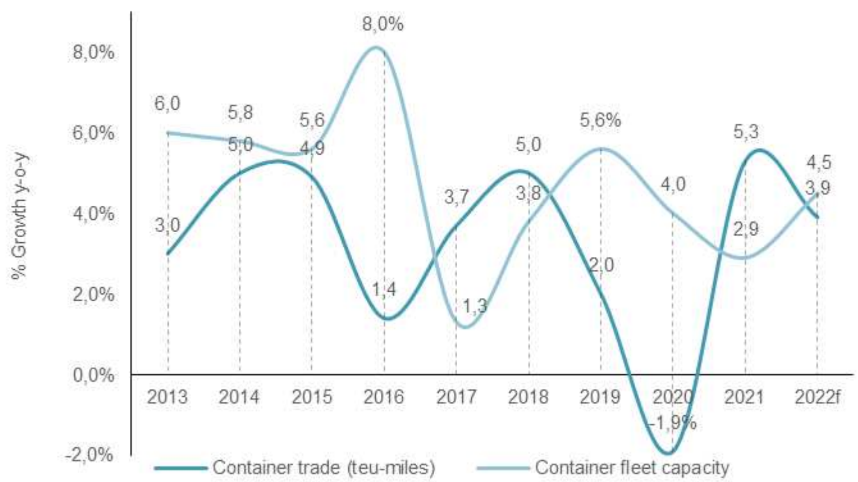
Figure 04 shows that 25% of the building orders, in terms of number of vessels, are vessels over 12,000 TEU (20% are vessels above 17,000 TEU). The 25% of new arrivals make up 67% of the world ordered fleet in terms of nominal capacity. Under these conditions, by early 2022, 15% of the total fleet will be in the 17,000+ range and in 2023, 33% is forecasted to be 17,000+ range.

The decoupling is the result of the combination of fleet over-expansion (figure 06) with the high volatility of seaborne trade (figure 05). Note that the sum of the areas between the capacity and trade curves (fig in nominal capacity grew at a compound annual growth rate (CAGR) of 5.5% but seaborne trade grew at 3.8% up to 2019 (considering times before the pandemic).

Figure 5
Volatility of seaborne trade, year-on-year growth, from 2013 to 2022f
(In percentages)

Source: authors' calculation, based on information from Clarkson.

Figure 6
Fleet over capacity, year-on-year growth, from 2013 to 2022f
(in percentages)



Source: authors' calculation, based on information from Clarkson.

The high degree of industry concentration is a very important current condition. It is the result of the process of mergers, acquisitions and alliances that has recently taken place and for which gigantism is possibly functional.

Concentration has accelerated since 2009 and especially contemporaneously with decoupling, volatility and overcapacity. Today, the 3 major alliances account for more than 80% of the world's container shipping capacity.

Among the trends currently characterising the container shipping industry, the increase in vessel size is among the main ones. The pace of increase has also been remarkable: ships have grown faster than expected just a few years ago, when hardly anyone would have imagined that a 24,000 TEU vessel would be sailing right now.

Shipping has historically been accompanied by high uncertainty, linked to the multiplicity of interacting factors in the industry (social, political and economic). Today, the high degree of interdependence caused by globalisation can result in a single event, limited to a single actor or market, triggering a situation of massive impact (including various crises), until a new equilibrium is reached. Such interdependence is clearly exemplified by the current pandemic, which has a strong impact on maritime transport.

In the past few years, we have seen major economic disturbances, as the 2008-2009 financial crises, the pandemic of the COVID-19 in 2020[7], and the most recent one, Russia invaded Ukraine on 24 February and the war is still going on, with potential to reshape the balance in shipping. There have been many other events before, exogenous to shipping, which suddenly forced substantial changes in routes, commercial practices or even in the configuration of ships themselves. The two breakdowns of the Suez Canal, the first in 1956 with the closure of transits, and the one in 1967, which led to the appearance of supertankers, are two commonly recognised events. The construction of the Panamax vessel in 1972 which was a milestone in size for container ships; the first and second oil crises in 1973 and 1979, among other events, also figure in a possible - not exhaustive - list of historical facts. Among other authors, Cipoletta Tomassian and Sanchez (2009) and Stopford (2009) show the impact of economic events in relation to shipping, while Gómez Paz (2013) produces a historical series of events.

Regardless the disruption potential of crises and how they can directly negatively impact global shipping, there is clearly a contradiction between capacity and demand. As shown in figures 04 and 05, the contradiction between capacity and demand indicates that globally there was more capacity than demand. The contradiction is that during the COVID-19 pandemic there was less capacity than demand, although the evidence (see graphs 04 and 05) shows that there was more capacity in May 2020 than demand, but then the shipping lines claimed the opposite.

A few years later, and ahead of the appearance of the 18,000 TEU Triple E Maersk Mc-Kinney Møller (2013), 7 years after the Emma Maersk (around 14,000 TEU), the prediction of larger ships had different visions: there was a downward trend in trade and an increase in ship ordering (UNCTAD, various issues), the implications for ports (Penfold, 2017), and transport infrastructure such as the new set of locks in the Panama Canal, etc. All these factors seemed to soften the trend, but large ports such as Rotterdam in the Netherlands and Le Havre in France, adapted their designs to the new large ships, while other factors began to gain importance, such as the concentration of shipping lines, economies of scale, lower shipbuilding prices and the trend towards more sustainable ships, factors that favoured the growth trend of large container ships.

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7 On March 11th, 2020, the World Health Organization (WHO) has declared that COVID-19 can be characterized as a pandemic.

B. The factors conditioning the growth of large container ships are diverse

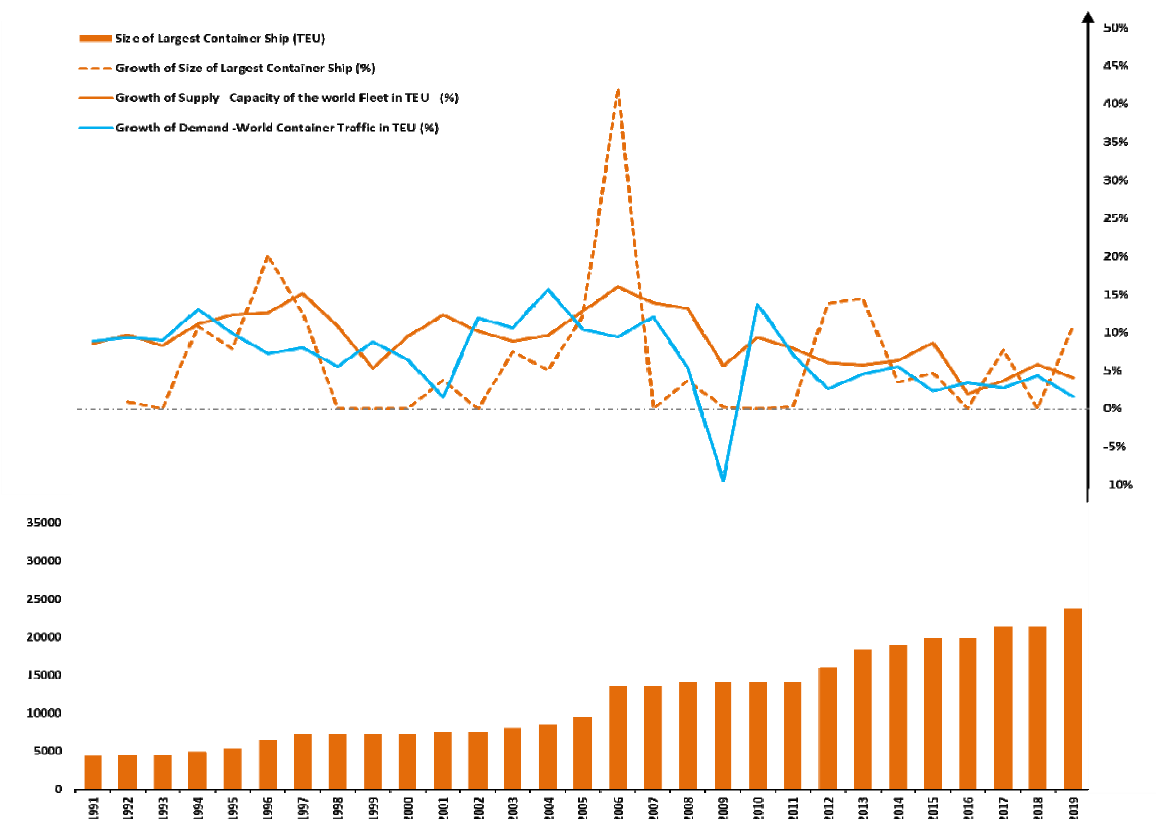
A study carried out between 2008 and 2013, based on a prospective method based on a semi-quantitative Delphi methodology and a quantitative model, predicted future scenarios and found that the size of ships was limited mainly by the depth of the channels and the draft in port, and that other factors such as the new measures to limit CO_2, oil prices, certain economic magnitudes, costs per unit of transport and the concentration of shipping companies, drove the trend towards larger ships, breaking the balance between supply and demand (Gómez Paz, 2013). The methodology applied is validated and focuses on the factors that drive or slow down the trend towards the growth of large container ships; in addition to the scenarios resulting from applying the methodology, a dynamic model was created, which allows the variables to be modified in a simple and objective manner and to observe how the scenarios change.

In Latin America, the arrival of 400 m long ships is expected on the West Coast of South America (Portal Portuario, 2020). A study by Sanchez and Perrotti (2012) already estimated the arrival of large vessels in Latin America, noting that large vessels sailing on the main routes need progressively fewer years to reach the South American coasts. The study estimated the arrival of a 13,500 TEU vessel earlier between 2017 and 2019, which was corroborated by the arrival of these from 2017 onwards. Aspirations for larger vessels are ever present. Wijnolst (1999) encouraged thinking about large container ships, such as the Malacca-Max (limited by the draught of the Strait of Malacca). Progress was made in the enlargement of the vessels, including technological improvements. In 2008 the South Korean shipyard STX announced that they had designed a 22,000 TEU vessel, in 2011 it was rumoured that Maersk would order 18,000 TEU vessels, and 20,000 TEU vessels by 2014 (Alphaliner, 2011).

All these estimates of large vessels have been exceeded, and today vessels of up to 24,000 TEU are sailing, adapted to today's technology and constraints. Alphaliner (2019) distinguishes the largest significant vessels and the number of vessels in his series, totalling 89 vessels between 18,000 and 24. 000 TEU, being mostly vessels of MAERSK (35%), MSC (20%), COSCO (19%), EVERGREEN (12%), MOL (7%) and UASC (7%); he also highlights that a total of 32 "MGX-24" or Megamax-24 vessels (vessels with 24 rows in 61.5 m beam) are commissioned for HMM, MSC and CMA-CGM. It is also noted that the vessels in service of between 18,000 and 24,000 TEU indicated have a length of 400 m, a beam between 58.6 m and 61.5 m and a draught between 16 and 16.5m. The MSC GÜLSÜN represents a milestone, in addition to exceeding in size with its capacity of 23,756 TEU it incorporates new technologies to avoid accidents, space optimisation and protection of the ocean and the environment (Russo, 2018).

Gómez Paz (2013), finds a consensus view of experts on the factors that they agree will limit and condition the growth trend of large ships in the future. In order to arrive at this view, the paper begins with a pre-prospective analysis of the factors that have influenced the growth trend of large ships in the past. One of its first results is figure 07 -updated to 2019- which shows the trend in demand -traffic-, capacity -fleet- and size of container ships. This shows the main jumps in vessel size, which occurred 2 years after demand - container traffic in TEU - exceeded supply - nominal fleet capacity measured in TEU. However, it can be seen that this rule ceased to apply at some point, so it is reasonable to assume that there are other factors influencing the trend. Figure 07 also depicts the periods of surpluses and deficits that lead to overcapacity, as shown in figure 06. It also shows acquisitions and alliances that occur in coincidence with the jump in vessel size.

Figure 7
Increase in vessel size in relation to the variation between supply (fleet) and demand (traffic).



Source: Own elaboration based on (Gómez Paz, 2013), (Clarkson, various issues), (Alphaliner, 2011, 2014, 2014, 2019 and 2020), Barry Rogliano Sales (various issues). Notes: 1. The most distinguished acquisitions and alliances are indicated; 2. Total fleet corresponds to the fleet in service and out of service; 3. the capacities of the vessels are estimated; 4. In 2012 the CMACGM vessel Marco Polo enters service.

In the pre-prospective analysis, various factors are identified and characterised using mind maps and timelines. The results indicated, as the main constraint, with the highest probability of conditioning and the greatest influence on the trend, nautical access, dock depth and air draught and economic uncertainties, mainly; on the other hand, with a medium probability of conditioning but a lower probability of being a constraint, factors related to the environment, the price of fuel and the lack of technology and innovation were highlighted. The factors that remained in the final vision, with a lower probability of being limiting and conditioning, were maritime security, the productivity of other sub-systems and global conflicts. Other factors to be taken into account were also consulted in successive rounds, from which the concentration of shipping lines and changes in consumption, among others, emerged.

In 2020, it was found that the visions were maintained, reinforcing the issues related to the environment. Following the Sustainable Development Goals (SDGs), the International Maritime Organization (IMO), (2018), adopted an initial strategy of reducing greenhouse gases from ships, specifically a reduction in total emissions caused by shipping of at least 50% by 2050 (compared to 2008). In the face of these regulations and considering LNG as a possible solution, Dalian Shipbuilding Industry Company and DNV-GL signed an agreement to develop a 23,000 TEU LNG-fuelled vessel (DNV-GL, 2018); and on the other hand, CMA-CGM is operating its 23,000 TEU CMA CGM Jacques Saade vessel, sister to nine others, powered by liquefied natural gas (LNG), for delivery in 2020 (CMA-CGM, 2019).

The main driver for ordering larger ships is to reduce the energy needed to transport each individual container, greater energy efficiency reduces costs and helps minimise CO_2 emissions, which improves profitability and reduces the environmental impact of global supply chains as indicated by Russo (2018). As to whether ships can grow larger, quoting another author, he gives an answer that he considers significant: "Technically speaking, there are no fundamental physical constraints, and from an operational point of view, a business case could certainly be made. The barrier, however, is shore-side infrastructure: we are approaching the maximum size that ports can handle".

Stopford (2019) points to three factors pushing the maritime industry into a new era: digital technology, a reordering of the transport system and environmental emissions, and for these constraints he puts forward strategies to adapt. Penfold (2017) focuses on the demands on ports: environmental, technical to accommodate large vessels, automation, political and economic factors. It is perceived that ports are adapting to the trends, UNCTAD (various editions), analyses investment projects that were carried out between 2017 and 2019, and highlights their objectives aligned to developing and improving infrastructure. A port benchmark to distinguish is the Tuas Next Generation Port project, undertaken by the Maritime and Port Authority of Singapore (MPA Singapore), with a vision of a smart, safe, green and community-oriented port, and a design to berth large container ships in the long term, with a depth of 23 m (MPA Singapore, 2020).

Haralambides (2019) recounts in detail, the economies of scale in ships and the diseconomies of scale that occur in ports and landside. But it is not all landside, Wei and Hui (2019) posit that in addition to inland traffic, there is traffic at sea that needs to be considered. Ge et al. (2019) assesses under what economic, operational and environmental conditions and expectations, lines are likely to decide to increase vessels from 18,000-20,000 TEU to 25,000 TEU and arrives at those economies of scale are generated in 25,000 TEU vessels, except under conditions of low occupancy factor and low freight rates.

The demand for cargo that feeds container traffics from one point to another has an impact on shipping. In the results of the aforementioned study, Ge et al. (2019) the occupancy factor is influenced by fleet capacity and traffic volume, so it is to be noted that a drop in traffic demand would probably impact on the vessel occupancy factor and probably generate another scenario. Not so long ago - prior to the 2008 crisis - one remembers pictures with lots of moored out-of-service vessels and the application of slow steaming by shipping lines.

The view on "economies of scale" also has other edges that are valuable to take into account. Sánchez and Wilmsmeier (2017) review the traditional analysis of maritime transport; concepts of economy of scale, scope and density are applicable to the current characteristics of maritime transport, where the transport services offered by the lines range from different types of containers with different rates, to different geographical scopes, with increasingly larger units and an oversupply, Vessel Sharing Agreement (VSA) to generate economies in services, the line's position in negotiations with ports, among other factors that put old myths of the maritime industry behind them. All these dynamics generate new challenges for the ports: on the one hand, an increasing size of ships is observed, but not the same relation in growth of port movement, which implies investments in infrastructure and superstructure; on the other hand, new business opportunities are generated, requiring investments to provide new services. New challenges that ports are facing in order not to run the risk of losing a service, which leads to considering greater financial and operational risks in port planning.

Defined economies of scale as one of the "ingredients", which together with concentration and cyclical effects (supply/demand interaction), for Wilmsmeier, Sánchez and González (2017) are part of a cocktail "before the hangover". They explore and discuss future challenges and present the need to monitor the behaviour of alliances. The undertow will expand differently geographically, a global concentration that will have a greater impact on secondary and tertiary routes. They highlight the importance of formulating integrated international, regional and national policies and regulations, and port and infrastructure planning, with a vision beyond logistics chains that considers production, financing and marketing.

A factor of major concern is vertical integration, which occurs when shipping companies expand into terminal operations and logistics operations. Integrations are questioned by Brooks, Vanelslander and Sys (2019) and Haralambides (2019) who present views on the matter, and especially by Sanchez and Chauvet (2020) who advance on governance issues, infrastructure concession contracts, public-private partnerships and their main characteristics, and competition advocacy; where the importance of institutions and mechanisms to prevent anti-competitive behaviour is highlighted. The study warns about the risks of vertical integration. Indeed, there are incomplete concession contracts that did not consider the current situation and institutions may not be prepared to solve conflicting problems when renegotiating a contract, which could lead to anti-competitive behaviour and outcomes that affect development and welfare.

C. When might the next big ship appear?

Quantitative forecasting is a task with many uncertainties, which is why flexible infrastructure development plans have been proposed for many years already, UNCTAD (1985) mentions the importance of flexible plans: "A key principle in planning seaport facilities, therefore, is that development plans should be as flexible as possible to allow a prompt response to changing demand". Taneja et al. (2010) propose Adaptive Port Planning (APP), which aims to close the gaps in traditional planning and thus achieve "flexible port infrastructures". Van Dorsser, Taneja and Vellinga (2018) present a new approach to develop a shared vision for the future of the Port of Rotterdam. Simulation has also taken off in the planning, renovation and modernisation of port terminals and waterways, allowing for optimisation, minimisation of infrastructure investments, while maintaining efficiency and safety (Gomez Garay, 2014).

Gómez Paz (2013) allows, in an objective way that combines pre-prospective analyses and the "expert vision" that identify the factors that will condition the growth trend of ships in the coming years and a quantitative model, to identify the factors that will promote, slow down or limit the growth of ships. The initial objective was to look for a likely scenario, however, the trend of the factors conditioning the trend of ship growth fluctuated continuously, and different scenarios were found, so it was decided to convert the quantitative model into a "predictive game". This contains a control panel with historical information summarised by periods and a scenario selection control, by modifying the trend of the factors that condition the growth trend of the vessels, a possible scenario is obtained with a different vessel size, with the indication of the factors that limit the growth trend of the vessels, thus converting the model from static to dynamic.

In summary, the dynamic "predictive game" model visualises a current situation that moves to a future situation, which may be possible and desirable, based on a probable and coherent evolution of the conditioning factors that, according to expert judgement, will act on the growth trend of ships. Both methodologies, the dynamic quantitative model "predictive game" and the Delphi method "expert vision" are combined and validated.

The model is run for different growth trends, and it is observed how an expectation in the trend of a variable that would condition the growth of large ships can bring forward or delay the appearance of a larger ship on a timeline. It can be seen that in 2011, indicators related to the growth of the economy - traffic demand - could be a factor that would slow the growth of ships, a perception influenced by the lack of expectation that the economy would grow, however this perception was modified in 2013 and the model showed growth in the economy as a factor that would encourage the trend in the growth of ships, generating an anticipation in the appearance of a larger ship.

The "predictive game" identified the following as the main factors encouraging the trend towards larger ships: concern for the environment, a positive estimate of growth in the economy, and technological advances translated into savings per unit of transport. He also identified the strong concentration of shipping companies that condition the trend; and the adaptation to new logistical requirements and the need to improve the productivity of cranes, which are driving the trend. On the other hand, investment in major infrastructure works for navigation and access - port, canal and strait access - stand out as factors limiting the trend towards larger vessels.

The growth of container ships will depend on the interaction of the different conditioning factors and the new relationships between them. Dynamic forecasting tools that integrate different expert visions and that, on a historical and predictive basis, can provide guidance on global trends, are a support tool to foresee new factors and future scenarios, and dynamically anticipate them.

D. When will the next generation of container ships arrive in the Caribbean?

As previously mentioned, in this section, the data presented estimates the arrival projections of the current largest ships in South America, nevertheless, it can be used as an approach for the Caribbean, in order to facilitate port planning. Large ships are attracted to the larger ports in the Caribbean, especially in the Caribbean basin, changing the composition of the fleet accessing the Caribbean. For instance, if Cartagena in Colombia attracts a so-called ¨giant¨ ship, that ship will circulate in the Caribbean and in one way or another it will change the scenario in the Caribbean.

In this section, the econometric models estimated to predict the arrival of large vessels in the region, crucial information for efficient port planning, are presented. The models presented here are updated versions of Sánchez and Perrotti (2012), where the objective is to estimate the arrival of post-Panamax vessels to the South American coasts, using the nominal capacity of the vessels (measured in TEU) as the dependent variable. In addition, an alternative model has been incorporated with length (LOA) as the dependent variable.

The variables used in the models are: TEU (Twenty Foot Equivalent Unit), represented as Max in models 1 and 2: it consists of the capacity of the vessels measured through the amount of TEU it can carry. Length, Max in model 3: is the dimension of a vessel taken between the two outermost points of the vessel, used to determine the space required for berthing. Port Activity (Pa): represents the amount of cargo served in the ports on the east and west coasts of South America, measured in TEU. As a demand derived from economic activity, it shows a high correlation with GDP. Gap: Denotes the difference - in percentage - between the maximum size (in TEU or LOA) of ships arriving in South America and those sailing simultaneously on the main trade routes. This variable captures the cascading effect that takes place when new vessel sizes on the main routes push part of the older fleet to secondary routes (e.g. Latin America). The cascade effect works in practice like a coin cascade (or waterfall) machine, where the entry of a new coin (new ships) pushes and spills other coins (older ships) into the coin bucket (secondary routes).

To address the objective of the study, two models were tested. Model 1 is a pooling model that includes dynamic behaviour through the incorporation of the lagged dependent variable, while Model 2 is a pooling model that incorporates the error correction mechanism.

It is important to recall the advantages of pooling models (Podesta, 2000), namely 1) they mitigate the problem of few observations that can occur for both the cross-section and the time series. Generally, when there are few observations, the total potential number of explanatory variables exceeds the degrees of freedom. With pooling models this condition is alleviated, due to the joint use of cross-sectional and time-series variables, which allows for testing a larger number of predictors in the context of multivariate analysis. 2) These models allow for investigation within variables, deepening the one-dimensional study of time series or cross-sectional analysis. Some characteristics of cross-sectional series tend to remain invariant over time. Therefore, analysis that includes space and time dimensions tends to present greater variability of information compared to individual time series or cross-sectional analyses. 3) A third advantage is that pooling models use all available cross-sectional series over time. This advantage is due to the fact that a pooling model uses all available cross-sectional series.

The estimation results show statistical significance for all parameters of both equations in Model 1 of at least 90% confidence interval. For Model 2, with the exception of the individual effects of the east coast parameter, all other parameters also show significance of at least 90% confidence interval.

The following assumptions were applied to models 1 and 2 in order to make the 18,000 TEU ship arrival projections for South America. See tables 24 and 25.

Table 24
Assumptions applied to the estimates (average annual growth in different scenarios)
(in percentages)

Scenario	West Coast Port activity	East Coast Port activity	West Coast Gap	East Coast Gap
Historical	6	4	3	5
Positive	7	5	3	5
Negative	5	4	3	5
Negative_2	3	3	3	5

Source: Estimated by Alejandra Gómez, Ricardo Sánchez & Daniel Perotti.

The results of the projections by model, coast and scenario are summarised below:

Table 25
18,000 TEU ship arrival forecasts results

East coast			West coast		
Scenario	Model 1	Model 2	Scenario	Model 1	Model 2
Historical	2028	2029	Historical	2024	2025
Positive	2027	2028	Positive	2024	2024
Negative	2029	2029	Negative	2025	2025
Negative_2	2030	2031	Negative_2	2027	2026

Source: Estimated by Alejandra Gómez, Ricardo Sánchez & Daniel Perrotti.

In turn, for the use of length as the dependent variable, a model similar to Model 2 was used (i.e. a pooling model that includes the dynamics through the lagged dependent variable). The parameters show statistics with acceptable significance levels (above 90% confidence interval).

To make projections of vessel arrivals assumptions were made, where the gap is in terms of differences in lengths, the following table shows the assumptions used for model 3.

Table 26
Assumptions applied to the model (average annual growth in different scenarios)
(in percentages)

Scenario	Port activity West coast	Port activity East coast	West coast gap	East coast gap
Historical	6	4	-7	-2
Positive	7	5	-7	-2
Negative	5	4	-7	-2
Negative_2	3	3	-7	-2

Source: Estimated by Alejandra Gómez, Ricardo Sánchez & Daniel Perrotti.

According to each coast and scenario, the forecast arrival years are as follows (see table 27):

Table 27
400 m vessel arrival forecasts results

Scenario	West Coast	East coast
Historical	2021	2022
Positive	2021	2022
Negative	2021	2022
Negative_2	2022	2022

Source: Estimated by Alejandra Gómez, Ricardo Sánchez & Daniel Perrotti.

E. Reflections about vessels size expectations

The world is facing the COVID-19 pandemic, the impacts of which are unprecedented in the last 120 years and are widely affecting trade and shipping. Drewry (2020) notes that "the only certainty is the volatility between supply and demand"; in the days since the outbreak, shipping lines have applied blank sailings and are expected to continue to do so, and it is still too early to know how the pandemic will ultimately impact. Added to this is the sudden drop in the price of oil, a consequence of a price war, creating a storm of variables that modify, interrelate and generate new scenarios to be adapted in the short term.

In addition to the massive impact of the pandemic on the industry's demand, the hardest shock will be reflected on the supply side. In particular, some port infrastructure improvement projects are expected to suffer some delays, so it should be noted that the scenarios presented will be biased towards the negative ones to the detriment of the historical ones. However, the effects are most likely to be temporary and delays may be observed, but not a profound change in behaviour towards gigantism.

Gigantism recognises important milestones, in 2006 with the appearance of the EMMA MAERSK -15,500 TEU-, in 2013 with the TRIPLE E MAERSK series -18,000 TEU-, and in 2019 with the MSC GÜLSUN -23,756 TEU-, which already falls into the MGX-24 category. This trend has not been aliened to Latin America, which has seen, by cascade effect, vessels currently reaching 14,200 TEU with a length of 367 metres arrive on its shores.

The container fleet, and the industry's commercial practices, have been changing, not only in terms of capacity, but also in terms of technology, in the search for environmental sustainability objectives and improvements in operational and commercial efficiency: new fuel alternatives, container management, cost reduction, digitalisation, rate differentiation and collaborative practices, such as alliances and VSA. The lines have also extended their business towards vertical integration, encompassing in addition to ocean freight services, the management of specialised port terminals and hinterland distribution. However, such changes, in particular the appearance of larger vessels on the main routes leads to a cascading of vessels to secondary and tertiary routes, creating new challenges for ports, which, in order to adapt and not lose services, are forced to invest in equipment, infrastructure and superstructure to be able to respond to the challenge of larger vessels, and port authorities are confronted with new roles and objectives.

Beyond gigantism, there is a new global context: new services, with a large scope and a strong concentration, which bring new challenges to ports, especially to ports that are affected by ship cascades from other routes, high investments in infrastructure and the development of new businesses. The impact reaches the port, and affects the entire logistics chain, extending to production, which affects sustainable development.

Different methodologies have been presented that estimate the arrival of large ships within this decade and what the determining factors for the growth of large ships will be in the future, highlighting factors that limit the trend related to port infrastructures and shipping lanes, and others that drive the trend towards the growth of large ships related to environmental requirements.

The methodology applied in Sánchez and Perrotti (2012), the determinants for the arrival of the world's current large ships have been studied, with the main determinants being the level of economic activity and the effect of cascading. Two alternatives have been included in the measurement of ship size: a) nominal capacity, with a target of 18,000 TEU capacity ships, estimated to arrive from 2027 on the east coast and 2024 on the west coast; b) length size, with a target of 400 m ships, forecast to arrive in 2021 on the west coast and in 2022 on the east coast of Latin America.

It should be clarified here that the timing differences between the two projections that seek to shed light on the same phenomenon have to do with technical issues, since 400 m vessels vary in nominal capacity from 15,500 TEU to 23,700 TEU, so that the arrival of larger vessels does not contradict the arrival of larger TEU capacity vessels in subsequent years. However, from the point of view of port planning, it is of utmost importance to take into account the projections of the length model, as it determines the physical needs for berths, facilities and equipment.

On the other hand, and according to the model of Gómez Paz (2013), it is possible to assume that the growing trend of container ships will also continue at international level, although it is highlighted that the current pandemic may attenuate the slope of the same during the coming years.

It has also been pointed out that the phenomenon of larger vessels has been responsible for the decoupling of trade and fleet capacity, and that these developments have been contemporaneous with the concentration of the industry. These issues raise questions about the explanations usually cited to justify concentration, such as the search for economies of scale (Sanchez and Wilmsmeier 2017).

Pandemic also generates different reactions from the shipping industry, as could be observed. While it would be bold to offer a conclusive opinion, it appears that the financial resolution of the current crisis may significantly alter the degree of concentration in the industry, and through this, the speed of growth and expansion in the size of fleets globally (and with its respective impact on the region).

Faced with the dynamism of the globalised world, anticipating with flexible short, medium and long-term plans, together with the formulation of integrated international, regional and national policies and regulations, will allow maintaining and even increasing productivity, while softening the shocks produced by the crisis.

IV. Market issues: vertical and horizontal integration

Across time, the maritime sector has undergone through continuous change. Shipping alliances have been on the spotlight in the past few years due to the rapid evolution and straighten of these alliances. The groupings that have evolved have been quite complex, and in some cases, companies have merged through acquisition and then joined larger alliances, or have entered an alliance, only later to merge (Slack et al., 2002).

Whereas in the past shipowners and ports used to compete with one another, the competitive struggle is now increasingly unfolding at the level of logistics chains. Today, market players are selected not so much for their stand-alone competitiveness but based on whether or not they belong to a successful maritime logistics chain. This explains why certain market players are continuously trying to gain greater control over these chains, including through vertical and horizontal alliances, mergers, and acquisitions. This contribution considers in greater detail these concerted efforts to increase market power through extensive integration (van de Voorde & Vanelslander, 2010).

This chapter will present the evolution of shipping alliances, especially in the last years, and the presence of Global Terminal Operators (GTOs), focused in the Caribbean.

A. Alliances' evolution among shipping lines

The liner shipping industry during the last decades was driven in expansionist strategies which found their symbol in the ever-increasing vessel sizes and geographical reach of companies' activities.

The current situation of the liner shipping industry is to a certain extent self-inflicted. The sector has found a response in mergers and alliances paired with other measures. The current scenario faces weaker demand growth, huge growth in ship size followed by much bigger shipping lines and few alliances, great pressure in port infrastructure to win market share, lower returns due alliances and verticalization. Shipping industry is now for big players —if not the biggest only.

Analysing the shipping lines alliances and their share in the global market, plus terminal property, we present the first analysis for empirical evidence to show that the powerful shipping lines alliances are also dominating the terminal property.

Along the years, the whole maritime industry has changed, getting more and more complex. The industry is evolving, but not in a balanced or fair way, shipping lines turned into huge and powerful alliances. Since 1995, when the first alliance was stablished, the concentration of share market and are turning the maritime industry into an industry of huge players.

Follow, a double phenomenon in which has important effects on the requirements of port services and the market organization. First, the continuous process of mergers, acquisitions and alliances by shipping lines, followed by the accelerated growth of the vessel size, as previously described.

The following figure shows the alliances evolution from 1992 to 2021.

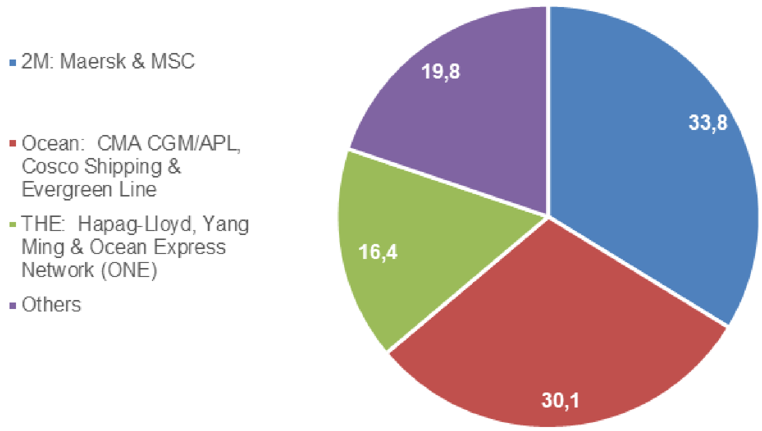
Table 28
Evolution of the business structure of the shipping industry

1992	2012	2013	2014	2015	2016	2017	2019	2021
APL	**Green Alliance - CKYH**	**P3 Alliance**	**2M Alliance**	**G6 Alliance**	**2M Alliance**	**Ocean Alliance 27.46%**	**Ocean Alliance 26.33%**	**Ocean Alliance 30.1%**
	Cosco	MSC	MSC	APL	MSC	Cosco	Cosco	Cosco
Choyang	Yang Ming	Maersk	Maersk	OOCL	Maersk	Evergreen	Evergreen	Evergreen
	K Line	CMA CGM	**G6 Alliance**	HMM	**CKYHE Alliance**	CMA CGM	CMA CGM	CMA CGM
CMA CGM	Hanjin	**G6 Alliance**	APL	MOL	Cosco	**2M Alliance 22.27%**	**2M Alliance 24.34%**	**2M Alliance 33.8%**
	MSC	APL	OOCL	**2M Alliance**	Yang Ming	MSC	MSC	MSC
Cosco	Maersk	OOCL	HMM	MSC	Evergreen	Maersk	Maersk	Maersk
	Grand Alliance	HMM	MOL	Maersk	K Line	**THE Alliance 21.03%**	HMM	**THE Alliance 16.4%**
CSAV	Hapag Lloyd	MOL	**CKYHE Alliance**	**CKYHE Alliance**	Hanjin	Hapag Lloyd - UASC	**THE Alliance 15.51%**	Hapag Lloyd - UASC
	NYK	**Green Alliance**	Cosco	Cosco	**G6 Alliance**	Yang Ming	Hapag Lloyd - UASC	Yang Ming
CSCL	OOCL	**CKYH & Evergreen**	Yang Ming	Yang Ming	APL	K Line	Yang Ming	ONE
	New World Alliance	Cosco	Evergreen	Evergreen	OOCL	MOL	ONE	
Delmas	APL	Yang Ming	K Line	K Line	HMM	NYK	ZIM	
	MOL	Evergreen	Hanjin	Hanjin	MOL	ZIM		
DRS - Senator	HMM	K Line	**O3 Alliance**	**O3 Alliance**	NYK			
	CMA CGM	Hanjin	CMA CGM	CMA CGM	Hapag Lloyd			
Evergreen	Evergreen	CSCL	CSCL	CSCL	**O3 Alliance**			
	G6 Alliance*	CSAV	UASC	UASC	CMA CGM			
Hanjin	Hapag Lloyd	Hamburg Sud	ZIM	ZIM	CSCL			
	NYK	ZIM			UASC			
Hapag Lloyd	OOCL				ZIM			
	APL							
HMM	MOL							
	HMM							
K Line	CSCL							
	ZIM							
Maersk	Hamburg Sud							
	CSAV							
MSC								
MOL								
Nedlloyd								
NOL								
Norasia								
OOCL								
P&O								
Sealand								
Torm Liner Service								
UASC								
Yang Ming								
Zim								

Source: Economic Commission for Latin America and the Caribbean (ECLAC), based on data from Blue Water Reporting until 2019 and Alphaliner onwards.

In 2021, three alliances combined together held 80.3% of the world containerised seaborne trade market share, as can be seen in figure 08 below.

Figure 8
Market share of the three shipping alliances in 2021, measured by TEU capacity
(in percentages)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), based on Alphaliner data.

This concentration is primarily due to the economies of scale inherent to shipping activity. Economic development is unevenly distributed geographically, and consequently trade expansion is relatively concentrated. For example, the density of trade between Asia and North America allows the use of large container ships, with significant unit savings compared to other ocean routes.

This phenomenon is multiplied in turn by the particular nature of the demand for transport services and logistics structures in general, since their usefulness for the user lies not so much in each individual pair of origins and destinations, but in the set of interconnected connections. Their attractiveness grows with their density, a phenomenon technically known as 'network economies', which gives significant competitive advantages to operators who obtain critical densities in the set of origins and destinations served.

Economies of scale and network economies together imply a natural tendency towards business concentration, for international transport. However, this does not necessarily equate to market power, in the sense of oligopolistic pricing abuse by shipping lines. Competition based on lower prices and better-quality services, to the benefit of consumers, is still possible if these markets are contestable, i.e., if there are no barriers to entry for new competitors (as air transport experience shows).

This is where the indivisibility of infrastructures is a relevant obstacle: potential competitors must enjoy the same access facilities to port facilities as those guaranteed to existing incumbents. And ports are not "infinitesimal": geography is by definition finite, and investments in port terminals also entail significant sunk costs and periodic maintenance expenses.

B. The presence of Global Terminal Operators

Terminals can be divided in three main categories, such as stevedores, hybrids and carriers. By means of definition, a stevedore terminal operator is a company that has container terminal operations as its core business and invests in container terminals for expansion and geographical diversification; carrier terminal operator is a company with container shipping as its principal business, but has a network of terminals to serve this liner shipping activity; and finally, hybrid terminal operator is a company that has container shipping as its main activity, but has a separate business unit for terminals (Drewry, 2007).

According to Drewry (2021), in 2015, stevedores had the biggest slice of the cake, operating 71% of total global throughput, hybrids 20%, and carriers 10%. In 2020 the scenario changed, with stevedores operating 51%, hybrids 42% and carriers 7% of global throughput.

The key trend has been the growth of the operators classified as hybrids – in 2020 this comprised APM Terminals, TIL, CMA CGM (including CMA Terminals and Terminal Link) and China Cosco Shipping. The gain is partially accounted for by the reclassification of APMT as a hybrid operator following its change in strategy in 2017 which saw a shift in direction from AP Moller to seek far greater alignment between APMT and Maersk's liner shipping operations. The global stevedores grouping, which include PSA, HP, DPW and China Merchants, among others, have reduced their dominance of the market, with the key factor being increased partnerships with carriers (including those affiliated with the global hybrids). The combination of slower market growth and the increased size / scale of terminals needed to service deep sea, has pushed the stevedores to work more closely with shipping lines to mitigate volume risk and share the financial commitments associated with major port developments. The operators classified as global carriers have seen a steady erosion in their share of the market, mainly due to divestment of assets to financial sector players. This looks set to fall further in 2021 with K Line's sale of ITS (Long Beach/Tacoma) in late 4Q20 and NYK's exit from Maher Terminals (New York) in 2Q21, both carriers selling their respective shareholdings to Macquarie (Drewry, 2021).

Following, figure shows the evolution of global throughput operated by type of operator in 2015 and 2020.

Figure 9
Global throughput by type of operator, 2015 and 2020
(in percentages)

Source: authors, based on Drewry, Global Container Terminal Operators Global Terminal Industry – Performance and Prospects, 2021.

In the Caribbean, global container port capacity is projected to increase in 2025 by 5%, and globally, 13%. While 75% utilisation at a port or terminal level is not sufficiently high to be of major concern, at a global level this expectation of a tightening of port capacity in a market that is currently plagued by congestion due to supply chain imbalances is a cause for concern.

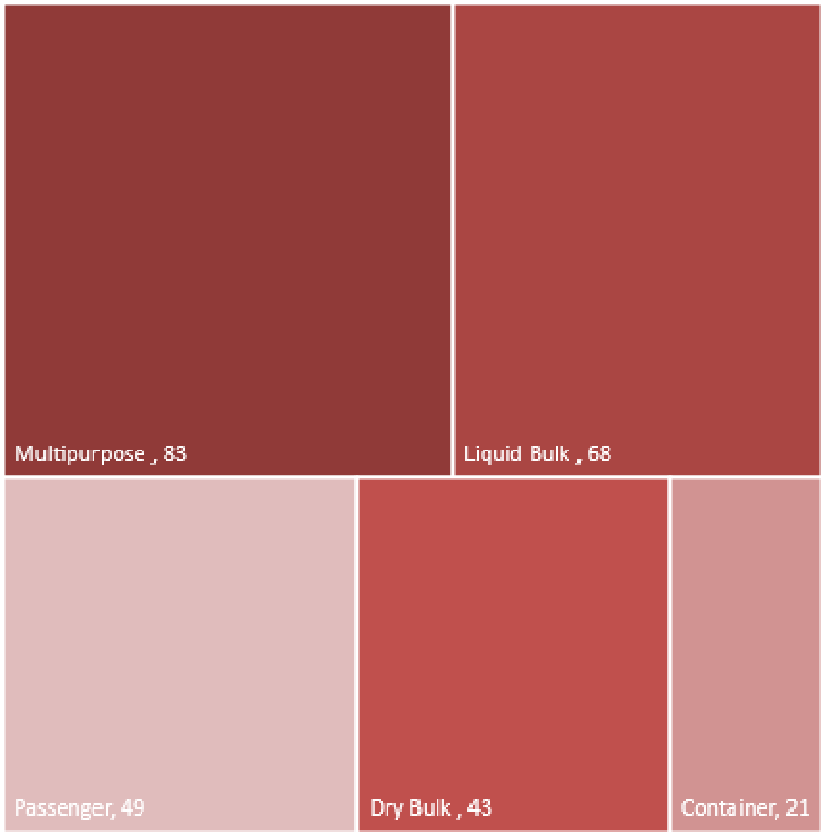
Table 28
Global throughput, capacity and utilisation in millions of TEU forecast by region, 2020 and 2025f

	Throughput 2020	Capacity 2020	Utilisation 2020 (%)	Throughput 2025f	Capacity 2025f	Utilisation 2025f (%)
Central America and the Caribbean	25.6	46.3	55%	29.7	48.5	61
East Coast South America	13.4	25.5	53%	17.6	27.2	65
West Coast South America	10.1	19.6	52%	14.2	20.6	69
East Coast North America	26.3	41.8	63%	36	49.1	73
Gulf Coast South America	6.5	9.6	68%	8.5	11.2	76
West Coast North America	34.6	58.8	59%	41.3	63.3	65
North Asia	65.7	104.3	63%	77.8	112.4	69
Greater China	253.3	300	84%	335.9	346.3	97
Southeast Asia	111.8	158.5	71%	144.7	178.5	81
North Europe	61.3	103.5	59%	74.1	111	67
Global total	793	1,190	67%	1,011	1,344	75

Source: authors, based on Drewry, Global Container Terminal Operators Global Terminal Industry – Performance and Prospects, 2021.
Note: F is for forecast.

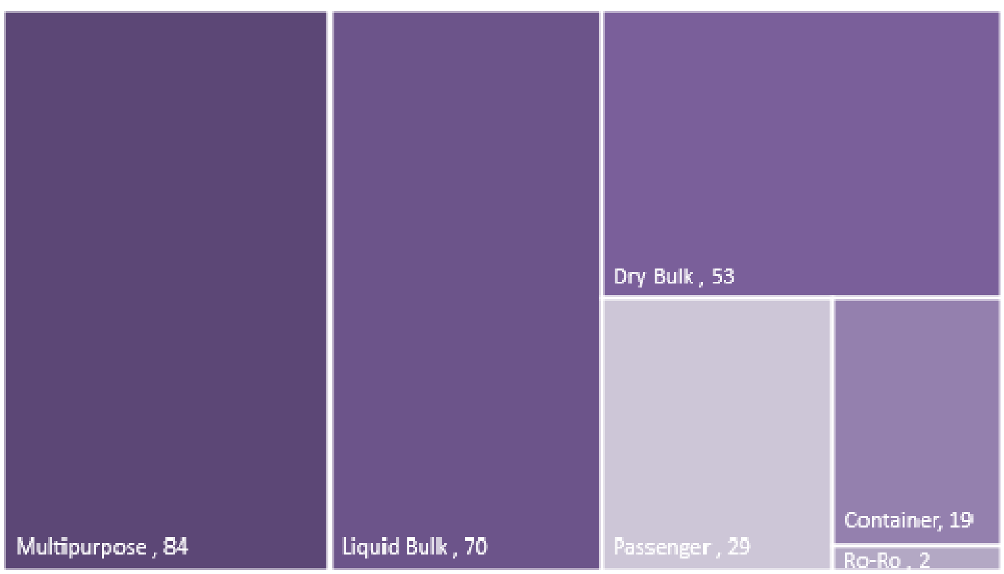
According to information regularly collected by Drewry (2021) is worrying. Their statistics define a GTO/ITO (Global Terminal Operator/International Terminal Operator) as a port operator that operates significant container terminal facilities in at least two different world regions. These large stevedoring companies accounted for 48.2% of global container throughput (measured in TEUs) in 2020, distributed among 21 players (in 2010 the equivalent figures were 43.8% of throughput among 23 players).

Figure 10
Number of terminals by type in the Caribbean



Source: Ricardo J. Sánchez, presentation at "The economy and ports of Latin America: New Reality, challenges and vision for the future", CIP/OAS, AAPA, ECLAC and RedPBIP International, Santiago, August 2020.

Figure 11
Number of terminals by type in Mexico and Central America

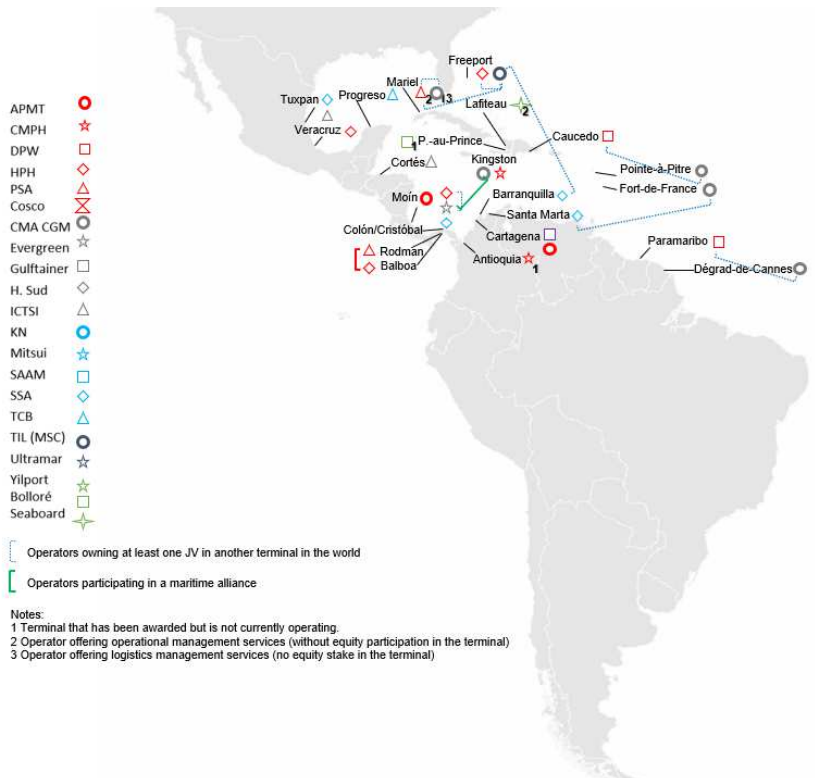


Source: Ricardo J. Sánchez, presentation at "The economy and ports of Latin America: New Reality, challenges and vision for the future", CIP/OAS, AAPA, ECLAC and RedPBIP International, Santiago, August 2020.

The global container terminal sector has developed over time into the mature and established market. The total number of port terminals managed by GTOs, 40% already belong to the three existing global shipping alliances, in a growing and dangerous process of vertical integration between shipping and port operators. Strictly speaking, the progressive shaping of shipping lines as general logistics forwarders threatens to expand vertical integration within hinterlands, incorporating rail networks, road operators, strategic warehousing and retail distribution.

The rapid development of the port sector in the late 1990s and early 2000s is understood in the context of a political willingness, and economic necessity to transfer infrastructure investment to the private sector, strong underlying market growth and technological shifts in shipping that changed the type and scale of terminal facilities needed. In the mid-2000s the high returns being achieved by operators in established markets saw an influx of financial sector investors (Drewry, 2021). While many M&A deals focus on individual portfolios, the tried and tested route to growth for several of the leading GTOs was acquiring other major operators. However, while there has been a degree of consolidation across the sector, this has not been to the same extent as seen in the container shipping market.

Picture 26
Global Terminal Operators (GTO) presence in the Caribbean, 2020



Source: Economic Commission for Latin America and the Caribbean (ECLAC), updated up to 2020 based on Drewry 2021 data.

C. Maritime services and routes currently operating in the Caribbean (overseas and intra-Caribbean services)

This section shows maritime services and routes currently operating in the Caribbean, and the evolution of vessels operated on a given route, nominal capacity and number of services. The following ports were selected to represent the Caribbean: Veracruz in Mexico, Manzanillo in Panama, and Port of Spain in Trinidad.

The following sequences of figures show the average monthly sum in TEU of vessels deployed per service, the total sum in TEU of vessels deployed per service during the year, the average monthly maximum TEU of vessels, and the average monthly TEU of vessels, from 2012 to 2020 in the indicated service. For the sum of the capacity of each vessel deployed in a given period, last week of each month, it is assumed that all services have a weekly frequency.

Table 29

Monthly sum in TEU of vessels deployed per service, total sum in TEU of vessels deployed per service during the year, average monthly maximum TEU of vessels, average monthly TEU of vessels, from 2012 to 2020, Veracruz, Mexico, Intra-Caribbean service

	Average monthly sum in TEU of vessels deployed per service	Total sum in TEU of vessels deployed per service	Average monthly maximum TEU of vessels	Average monthly TEU of vessels
2012	7,725	386,243	2,196	2,080
2013	9,081	581,195	2,245	2,064
2014	10,133	435,708	2,286	2,184
2015	7,090	290,700	1,947	1,871
2016	6,161	246,420	1,743	1,670
2017	7,853	298,402	1,921	1,821
2018	6,241	224,670	1,709	1,599
2019	6,588	237,172	1,608	1,479
2020	7,336	212,755	1,638	1,587

Source: Blue Water Reporting, 2013-2022. Note: The intra-Caribbean service includes all services which, in addition to calling at the port under analysis, call at a port of United States Gulf coast, Mexico Gulf coast, east coast of Central America (ECCA) and north coast of South America (NCSA). In addition to the east coast of North America (ECNA) ports of Port Everglades, Palma Beach and Miami (do not call at east coast of South America (ECSA), NCSA other than Port Everglades, Palma Beach and Miami, in the United States, and do not call at the west coast of north America (WCNA)).

Table 30
Monthly sum in TEU of vessels deployed per service, total sum in TEU of vessels deployed per service during the year, average monthly maximum TEU of vessels, average monthly TEU of vessels, from 2012 to 2020, Veracruz, Mexico, Intra-East Coast America service

	Average monthly sum in TEU of vessels deployed per service	Total sum in TEU of vessels deployed per service	Average monthly maximum TEU of vessels	Average monthly TEU of vessels
2012	35,231	739,850	4,919	4,656
2013	35,480	851,517	5,062	4,672
2014	36,043	1,153,371	5,252	4,646
2015	39,400	1,182,000	5,561	5,115
2016	28,116	1,180,866	4,793	4,156
2017	29,885	1,404,587	4,932	4,217
2018	35,006	1,680,269	5,325	4,807
2019	36,589	1,756,288	5,613	5,006
2020	36,291	1,741,969	5,395	4,871

Source: Blue Water Reporting, 2013-2022. Note: The intra-east coast America service includes all services which, in addition to calling at the port under analysis, call at an ECSA or ECNA port (excluding Port Everglades, Palma Beach and Miami in the United States, which are considered intra-Caribbean, if Savannah and Jacksonville in the United States are included) (not calling on the WCNA).

Table 31
Monthly sum in TEU of vessels deployed per service, total sum in TEU of vessels deployed per service during the year, average monthly maximum TEU of vessels, average monthly TEU of vessels, from 2012 to 2020, Veracruz, Mexico, Overseas service

	Average monthly sum in TEU of vessels deployed per service	Total sum in TEU of vessels deployed per service	Average monthly maximum TEU of vessels	Average monthly TEU of vessels
2012	25,999	25,999	4,266	3,870
2013	27,203	27,203	4,519	4,091
2014	27,785	27,785	4,627	4,219
2015	27,627	27,627	4,565	4,284
2016	30,680	30,680	4,703	4,486
2017	35,502	35,502	5,888	5,342
2018	37,548	37,548	6,207	5,634
2019	37,497	37,497	5,942	5,419
2020	40,301	40,350	6,267	5,576

Source: Blue Water Reporting. Note: Overseas service includes all services which, in addition to calling at the port under analysis, call at a port in Asia or Europe, in addition to the Americas (in other words: call at a port other than the Americas, in addition to calling at the Americas).

Table 32

Monthly sum in TEU of vessels deployed per service, total sum in TEU of vessels deployed per service during the year, average monthly maximum TEU of vessels, average monthly TEU of vessels, from 2012 to 2020, Manzanillo, Panama, Intra-Caribbean service

	Average monthly sum in TEU of vessels deployed per service	Total sum in TEU of vessels deployed per service	Average monthly maximum TEU of vessels	Average monthly TEU of vessels
2012	3,752	386,411	1,598	1,507
2013	3,878	473,055	1,652	1,584
2014	3,666	553,599	1,547	1,513
2015	3,490	558,448	1,634	1,586
2016	4,129	635,842	1,747	1,684
2017	4,310	629,279	1,774	1,713
2018	4,329	670,991	1,891	1,833
2019	4,699	732,966	1,975	1,886
2020	5,102	790,778	2,031	1,913

Source: Blue Water Reporting, 2013-2022. Note: The intra-Caribbean service includes all services which, in addition to calling at the port under analysis, call at a port of United States Gulf coast, Mexico Gulf coast, east coast of Central America (ECCA) and north coast of South America (NCSA). In addition to the east coast of North America (ECNA) ports of Port Everglades, Palma Beach and Miami (do not call at east coast of South America (ECSA), NCSA other than Port Everglades, Palma Beach and Miami, in the United States, and do not call at the west coast of north America (WCNA)).

Table 33

Monthly sum in TEU of vessels deployed per service, total sum in TEU of vessels deployed per service during the year, average monthly maximum TEU of vessels, average monthly TEU of vessels, from 2012 to 2020, Manzanillo, Panama, Intra-East Coast America service

	Average monthly sum in TEU of vessels deployed per service	Total sum in TEU of vessels deployed per service	Average monthly maximum TEU of vessels	Average monthly TEU of vessels
2012	8,231	321,025	1,745	1,617
2013	9,638	433,693	1,818	1,616
2014	11,059	530,841	2,032	1,802
2015	10,755	580,795	2,139	1,883
2016	9,013	450,644	2,189	2,010
2017	11,211	650,247	2,495	2,294
2018	11,065	796,667	2,493	2,357
2019	11,232	887,323	2,769	2,540
2020	12,496	924,732	3,035	2,826

Source: Blue Water Reporting. Note: The intra-east coast America service includes all services which, in addition to calling at the port under analysis, call at an ECSA or ECNA port (excluding Port Everglades, Palma Beach and Miami in the United States, which are considered intra-Caribbean, if Savannah and Jacksonville in the United States are included) (not calling on the WCNA).

Table 34
Monthly sum in TEU of vessels deployed per service, total sum in TEU of vessels deployed per service during the year, average monthly maximum TEU of vessels, average monthly TEU of vessels, from 2012 to 2020, Manzanillo, Panama, Intra-East West Coast America service

	Average monthly sum in TEU of vessels deployed per service	Total sum in TEU of vessels deployed per service	Average monthly maximum TEU of vessels	Average monthly TEU of vessels
2012	15,501	201,518	3,113	2,715
2013	19,131	229,570	3,534	3,188
2014	21,987	439,738	4,154	3,664
2015	23,274	232,743	4,460	3,879
2016	N/A	N/A	N/A	N/A
2017	3,888	19,440	1,296	1,296
2018	3,888	46,656	1,296	1,296
2019	4,310	51,715	1,533	1,437
2020	5,342	64,098	1,875	1,781

Source: Blue Water Reporting. Note: Intra-East West Coast America service includes all services which, in addition to calling at the port under analysis, call at a port on the west coast.

Table 35
Monthly sum in TEU of vessels deployed per service, total sum in TEU of vessels deployed per service during the year, average monthly maximum TEU of vessels, average monthly TEU of vessels, from 2012 to 2020, Manzanillo, Panama, Overseas service

	Average monthly sum in TEU of vessels deployed per service	Total sum in TEU of vessels deployed per service	Average monthly maximum TEU of vessels	Average monthly TEU of vessels
2012	34,906	5,794,414	3,935	3,708
2013	36,595	7,026,330	3,988	3,760
2014	37,340	6,571,864	3,993	3,755
2015	37,627	6,471,886	4,027	3,790
2016	40,868	6,784,029	4,412	4,140
2017	42,864	6,086,625	4,892	4,531
2018	48,878	8,455,949	5,413	5,068
2019	51,074	9,142,181	5,686	5,289
2020	51,166	8,237,781	5,759	5,288

Source: Blue Water Reporting. Note: Overseas service includes all services which, in addition to calling at the port under analysis, call at a port in Asia or Europe, in addition to the Americas (in other words: call at a port other than the Americas, in addition to calling at the Americas).

Table 36
Monthly sum in TEU of vessels deployed per service, total sum in TEU of vessels deployed per service during the year, average monthly maximum TEU of vessels, average monthly TEU of vessels, from 2012 to 2020, Port of Spain, Trinidad, Intra-Caribbean service

	Average monthly sum in TEU of vessels deployed per service	Total sum in TEU of vessels deployed per service	Average monthly maximum TEU of vessels	Average monthly TEU of vessels
2012	34,906	5,794,414	3,935	3,708
2013	36,595	7,026,330	3,988	3,760
2014	37,340	6,571,864	3,993	3,755
2015	37,627	6,471,886	4,027	3,790
2016	40,868	6,784,029	4,412	4,140
2017	42,864	6,086,625	4,892	4,531
2018	48,878	8,455,949	5,413	5,068
2019	51,074	9,142,181	5,686	5,289
2020	51,166	8,237,781	5,759	5,288

Source: Blue Water Reporting. Note: The intra-Caribbean service includes all services which, in addition to calling at the port under analysis, call at a port of United States Gulf coast, Mexico Gulf coast, east coast of Central America (ECCA) and north coast of South America (NCSA). In addition to the east coast of North America (ECNA) ports of Port Everglades, Palma Beach and Miami (do not call at east coast of South America (ECSA), NCSA other than Port Everglades, Palma Beach and Miami, in the United States, and do not call at the west coast of north America (WCNA)).

Table 37
Monthly sum in TEU of vessels deployed per service, total sum in TEU of vessels deployed per service during the year, average monthly maximum TEU of vessels, average monthly TEU of vessels, from 2012 to 2020, Port of Spain, Trinidad, Intra-East Coast America service

	Average monthly sum in TEU of vessels deployed per service	Total sum in TEU of vessels deployed per service	Average monthly maximum TEU of vessels	Average monthly TEU of vessels
2012	8,833	212,002	1,858	1,705
2013	11,144	445,772	1,953	1,687
2014	14,101	662,742	2,326	1,952
2015	7,865	235,940	1,640	1,453
2016	4,799	67,180	1,320	1,168
2017	8,057	161,131	2,117	1,932
2018	9,371	224,915	2,422	2,177
2019	8,589	206,137	2,412	2,053
2020	10,607	169,704	3,009	2,578

Source: Blue Water Reporting. Note: The intra-east coast America service includes all services which, in addition to calling at the port under analysis, call at an ECSA or ECNA port (excluding Port Everglades, Palma Beach and Miami in the United States, which are considered intra-Caribbean, if Savannah and Jacksonville in the United States are included) (not calling on the WCNA).

Table 38
Monthly sum in TEU of vessels deployed per service, total sum in TEU of vessels deployed per service during the year, average monthly maximum TEU of vessels, average monthly TEU of vessels, from 2012 to 2020, Port of Spain, Trinidad, Overseas service

	Average monthly sum in TEU of vessels deployed per service	Total sum in TEU of vessels deployed per service	Average monthly maximum TEU of vessels	Average monthly TEU of vessels
2012	30,434	669,556	3,314	3,021
2013	32,714	785,140	3,394	3,146
2014	33,287	798,894	3,389	3,193
2015	33,997	815,922	3,476	3,223
2016	29,013	551,239	3,576	3,049
2017	11,995	143,940	2,339	1,999
2018	11,995	143,940	2,339	1,999
2019	11,995	143,940	2,339	1,999
2020	10,186	122,232	2,139	1,698

Source: Blue Water Reporting. Note: Overseas service includes all services which, in addition to calling at the port under analysis, call at a port in Asia or Europe, in addition to the Americas (in other words: call at a port other than the Americas, in addition to calling at the Americas).

V. Cargo handling & port performance

It is common knowledge that the container is a vector of production and distribution (Rodrigue and Notteboom, 2008) which has transformed transportation and caused it to evolve through time, paving the way for the creation of the modern logistics industry. As pointed out by Rodrigue, Comtois and Slack (2006) the most notables' benefits are the following: standardization of transport of products, flexibility of usage, computerized tracking management, lower transport costs, storage, and security (containers can only be opened at the origin, destination, or in customs).

Current container trade trends have generated a stress situation, caused by the high level of competition in the sector, pressure to improve infrastructure and invest in technology, dwindling profit margins and very sluggish global growth in container volumes. While this has enabled shipping companies to rationalize and improve their operations (once a certain rate of utilization has been attained), the phenomenon may have introduced supply chain inefficiencies. Ports are forced to persistently upgrade their infrastructure and operate with lower yields, and they face heavier pressures on quayside and container yard productivity.

Despite a succession of economic crises in the 1990s[8], and the recent pandemic of COVID-19, containerization continued apace until the outbreak of these crisis, at which point its behaviour changed.

The literature (for example, Peters, 2001; Rodrigue and Notteboom, 2009; and Wilmsmeier, 2014, among others) has traditionally explained the advance of containerization in terms of three essential factors:

- **Organic growth**: related directly to economic and commercial activity, this growth factor is explained by the variation in cargo volumes, driven by two key factors. Firstly, the globalization of the economy has the effect of increasing world merchandise trade by more than the growth of world production, and multiplying the number of journeys made

[8] The Asian crisis and subsequent problems in other emerging markets.

by parts and final products in containers. As correctly predicted by Peters (2001), the trend towards cheaper labour would continue in the twenty-first century, moving industry to new locations, which has been happening until recently. Another factor that determines the organic growth of containerization is the progressive liberalization of trade, which has been strongly influenced by the successive rounds of the General Agreement on Tariffs and Trade (GATT) and later by the World Trade Organization (WTO).

- **Induced growth**: driven by network economies, and by the prevalence of container transhipment traffic, which directly impacts both port throughputs and the number and size of the ships needed to handle the global container trade.

Complementing the idea put forward by Peters, other authors have related induced growth to three phenomena: trade imbalances, transhipments and empty containers. Trade imbalances have given rise to empty container flows, creating opportunities to fill empty backhaul movements. This is particularly the case for international container flows in North America. Moreover, the efficiency of port transhipments has improved, and inland transportation services, which were previously dominated by trucking, have begun to stabilize. Lastly, container cabotage significantly reduces the costs involved in repositioning empty containers; maritime operators will be able to forge relationships with inland transport operators, who move their equipment to where it is needed at no cost, while the operator can make free use of the box. It is also worth noting that trade growth has a direct impact in terms of reducing inventory costs, thus contributing to induced growth.

- **Growth driven by technological change**: containers also shifted the handling of cargo in bulk towards a mechanized handling of cargoes of diverse types and dimensions that are placed into boxes of standard sizes, thereby facilitating international trade (Rodrigue, Comtois and Slack B, 2006) and greatly reducing labour requirements in cargo handling.

Containers have transformed the way trade is done, contributing to what is now known as logistics and to the benefits it brings to international trade. Notwithstanding the ups and downs of international trade.

The concern —or caution— in relation to containers is due to their importance in global trade, since the logistics industry moves millions of containers around the world every year, making it possible to transport all types of goods from one country to another. Since 2012, there has been a sharp slowdown in the rate of growth of container traffic, which, due to various factors, both positive and negative, explains the slow growth of recent years. On the positive side, there is organic, induced and technological growth.

A. Container evolution throughput in the Caribbean from 2010-2020

Maritime shipping in the Caribbean benefits from its physical geography. For its strategic location, some ports in the Caribbean play an essential role as transhipment hubs, which consequently, impacts port throughput (section 5.3 will show in more details the transhipment incidence in ports).

The region connects many maritime routes and continents, such as mainline east-west services from Asia to the United States, East and Gulf Coast after transiting the Panama Canal, and services strings connecting the west coast of South America (WCSA) to Europe, and the north-south services with east coast of South America (ECSA).

In the last decade, from 2010 to 2020, the sample of ports from Tier 1 grew 30.7%. Bahía de Cartagena, Colombia, presented the most impressive growth, from a throughput of 1,581 million TEU in 2010 to 3,127 million TEU in 2020, representing a growth of 97.7%. Another impressive case is the

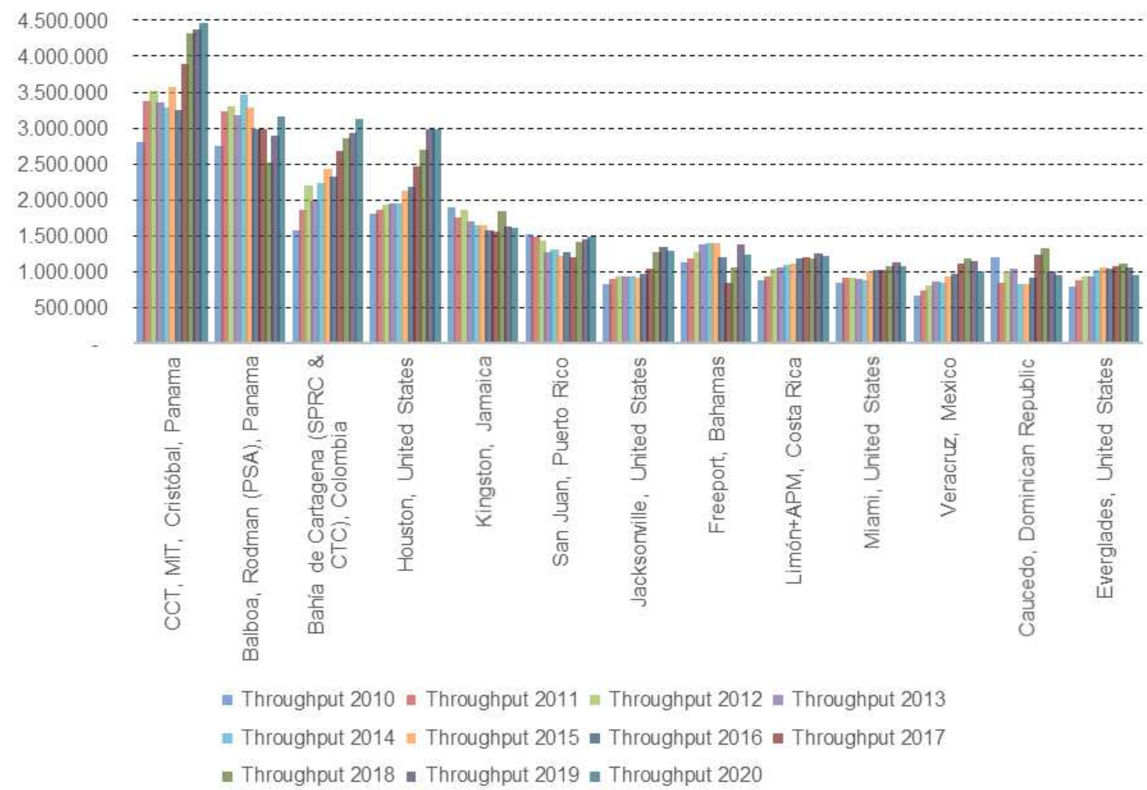
Caribbean coast of Panama, comprised by CCT, MIT and Cristóbal, handling the highest throughput in the Caribbean, passing from 2,810 million TEU in 2010 to 4,454 million TEU in 2020, with a growth of 58.8%.

In 2020, activity in container terminals and ports in Latin America and the Caribbean has changed in 2020 compared to 2019, with a view to analysing the effects of the COVID-19 pandemic on international shipping trade in the region. The forementioned ports, Bahía de Cartagena, Caribbean coast of Panama, and Balboa and PSA in Panama were one of the few exceptions that presented growth in 2020 compared to 2019 – mostly because of their transhipment incidence.

The performance of transhipment in the Caribbean was possibly affected by attempts by shipowners to balance supply and demand and efforts to ensure their own survival (Barleta & Sánchez, 2021). Such measures may damage the structures of logistics networks and competition and may even hinder a recovery in foreign trade in Latin America and the Caribbean, which is usually a net importer of international prices and has no modal options for its foreign trade. At the country and territory level, however, declines in port activity have been widespread, with the exception of Panama, primarily owing to changes in international transhipments. The difference between the international container trade and port movements appears to come from other port, operational and transhipment movements, including the movement of empty containers, offsetting the fall in international container trade (Barleta & Sánchez, 2021).

Next figure shows the timeseries of container port throughput in TEU of Tier 1 during the last decade.

Figure 12
Timeseries of container port throughput in TEU of Tier 1, from 2010 to 2020



Source: Economic Commission for Latin America and the Caribbean (ECLAC), based on port official data. Note: Only ports with availability of historic data from 2010 to 2020 were considered.

Next table shows the interannual growth variation of Tier 1 ports:

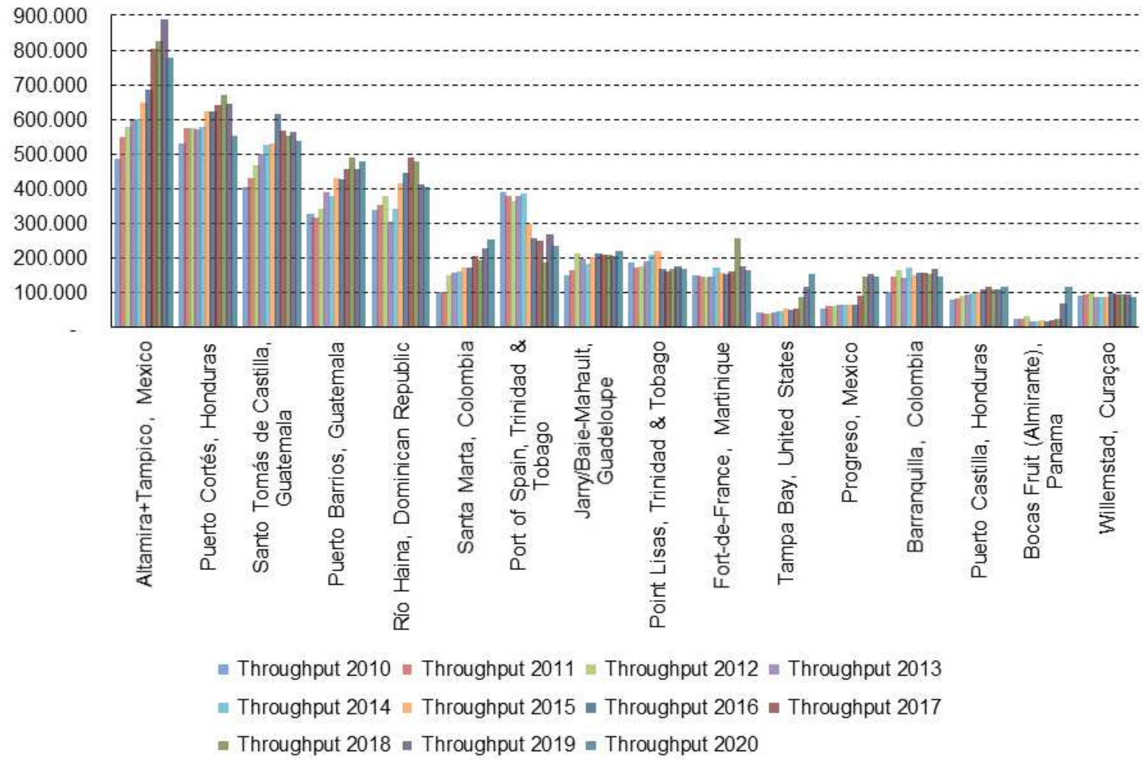
Table 39
Interannual growth variation on container port throughput of Tier 1, in TEU, from 2010 to 2020
(in percentages)

	Variation in throughput 2011/2010	Variation in throughput 2012/2011	Variation in throughput 2013/2012	Variation in throughput 2014/2013	Variation in throughput 2015/2014	Variation in throughput 2016/2015	Variation in throughput 2017/2016	Variation in throughput 2018/2017	Variation in throughput 2019/2018	Variation in throughput 2020/2019
CCT, MIT, Cristóbal, Panama	20.0	4.4	-4.6	-2.1	8.8	-8.9%	19.4%	11.1	1.3	1.7%
Balboa, Rodman (PSA), Panama	17.2	2.2	-3.5	8.8	-5.0	-9.2	-0.1	-15.6	15.0	9.1
Bahía de Cartagena (SPRC & CTC), Colombia	17.2	19.0	-9.9	12.6	8.3	-4.2	15.2	6.9	2.4	6.6
Houston, United States	3.0	3.0	1.4	0.1	9.2	2.4	12.7	9.8	10.6	0.1
Kingston, Jamaica	-7.1	5.6	-8.2	-3.9	0.9	-5.2	-0.5	17.5	-11.3	-0.9
San Juan, Puerto Rico	-2.7	-4.1	-10.8	3.0	-6.5	3.9	-5.6	17.2	3.3	2.6
Jacksonville, United States	8.9	2.6	0.3	1.1	-2.3	5.8	6.7	23.0	5.2	-3.1
Freeport, Bahamas	5.7	7.5	7.9	1.5	0.0	-14.3	-29.1	23.5	30.9	-10.4
Limón+APM, Costa Rica	5.3	12.7	0.8	3.4	1.7	6.2	1.9	-1.0	5.0	-2.7
Miami, United States	7.0	0.3	-0.9	-2.7	15.0	2.0	-0.8	6.2	3.4	-4.8
Veracruz, Mexico	10.1	10.5	7.6	-2.3	10.0	3.6	15.7	5.3	-2.7	-12.1
Caucedo, Dominican Republic	-29.2	17.0	3.8	-19.5	-0.5	11.1	34.5	7.8	-25.0	-4.8
Everglades, United States	11.1	4.8	0.4	9.3	4.7	-2.2	3.8	2.9	-5.0	-10.2

Source: Economic Commission for Latin America and the Caribbean (ECLAC), based on port official data. Note: Only ports with availability of historic data from 2010 to 2020 were considered.

With the exception of Port of Spain in Trinidad and Tobago, ports of Tier 2 have a low incidence of transhipments in container ports. This partially explains that these ports are more vulnerable when exposed to crises, such as the pandemic of the COVID-19, in which most of ports of Tier 2 were negatively affected. Nevertheless, the ports considered in this sample, combined together presented an average growth of 75.0% from 2010 to 2020 – a bigger growth compared to the ports of Tier 1. Next figure shows the timeseries of container port throughput in TEU of Tier 2 during the last ten years.

Figure 13
Container port throughput of Tier 2, in TEU, from 2010 to 2020



Source: Economic Commission for Latin America and the Caribbean (ECLAC), based on port official data. Note: Only ports with availability of historic data from 2010 to 2020 were considered.

Next table shows the interannual growth variation of Tier 2 ports:

Table 40
Interannual growth variation on container port throughput of Tier 2, in TEU, from 2010 to 2020

(in percentages)

	Variation in throughput 2010	Variation in throughput 2011	Variation in throughput 2012	Variation in throughput 2013	Variation in throughput 2014	Variation in throughput 2015	Variation in throughput 2016	Variation in throughput 2017	Variation in throughput 2018	Variation in throughput 2019
Altamira+Tampico, Mexico	12.2	5.7	3.3	0.3	8.	5.8	17.3	2.7	7.8	-12.6
Puerto Cortés, Honduras	8.4	-0.6	-0.3	1.3	7.9	-0.4	3.3	4.5	-4.0	-14.4
Santo Tomás de Castilla, Guatemala	6.5	8.7	6.6	5.1	0.8	16.1	-7.8	-2.1	2.0	-5.0
Puerto Barrios, Guatemala	-2.8	7.7	13.7	-2.4	13.8	-0.9	6.5	7.4	-6.9	5.3
Río Haina, Dominican Republic	3.6	7.5	-19.0	12.0	21.2	6.5	9.9	-1.9	-14.2	-1.0
Santa Marta, Colombia	1.9	44.2	6.3	0.6	6.9	-0.1	21.4	-6.3	17.8	10.8
Port of Spain, Trinidad & Tobago	-2.3	-3.7	4.2	1.1	-22.4	-13.5	-2.5	-25.6	44.4	-12.7

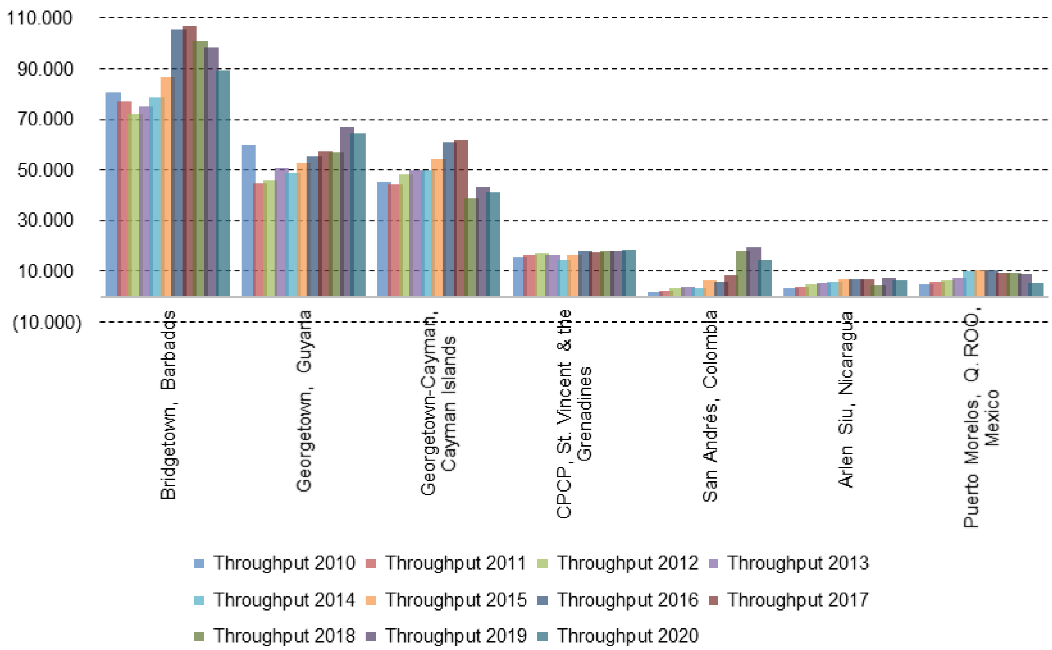
	Variation in throughput 2010	Variation in throughput 2011	Variation in throughput 2012	Variation in throughput 2013	Variation in throughput 2014	Variation in throughput 2015	Variation in throughput 2016	Variation in throughput 2017	Variation in throughput 2018	Variation in throughput 2019
Jarry/Baie-Mahault, Guadeloupe	9.7	28.3	-6.5	-7.2	9.8	5.1	-1.1	-0.6	-0.8	6.4
Point Lisas, Trinidad & Tobago	-8.8	2.4	9.3	8.3	6.2	-23.9	-3.7	5.2	2.6	-2.8
Fort-de-France, Martinique	-2.3	-2.4	3.0	16.1	-7.4	-3.6	4.6	61.1	-31.1	-7.7
Tampa Bay, United States	-11.6	0.6	6.5	11.3	20.1	-12.4	13.8	54.8	33.2	34.2
Progreso, Mexico	9.7	3.7	1.1	1.0	3.2	0.3	34.6	60.4	4.7	-3.8
Barranquilla, Colombia	42.6	11.3	-12.8	21.6	-13.6	5.8	0.2	-3.4	9.5	-13.4
Puerto Castilla, Honduras	6.0	5.5	6.5	1.2	5.8	6.5	8.4	-8.4	0.7	7.6
Bocas Fruit (Almirante), Panama	8.1	32.7	-47.9	6.1	17.3	-18.3	11.8	33.7	151.0	71.4
Willemstad, Curaçao	0.5	5.4	-11.8	2.0	0.9	9.2	-4.4	3.0	-2.7	-5.1

Source: Economic Commission for Latin America and the Caribbean (ECLAC), based on port official data. Note: Only ports with availability of historic data from 2010 to 2020 were considered.

Tier 3 ports are not necessarily small in area nor economy, as Mexican ports and Georgetown in Guyana. Tier 3 ports often serve a small domestic market, which make them more vulnerable to natural hazards and external shocks. What they have in common is to be developing countries and their remoteness from the main global trade routes, as main services will primarily attend ports of Tier 1 and 2.

It is important to mention that access to data from Tier 3 ports is more difficult. These ports usually serve a domestic market, and they are not port of big ports competition. The lack of access to data is not worrying for competitors, but locally, since it gets difficult to monitor, review and in many cases, participate in the decision-making processes carried out by the port authority. Following, figure 13 shows the timeseries of container port throughput in TEU of Tier 3 during the last decade.

Figure 14
Container port throughput of Tier 3, in TEU, from 2010 to 2020



Source: Economic Commission for Latin America and the Caribbean (ECLAC), based on port official data. Note: Only ports with availability of historic data from 2010 to 2020 were considered.

Next table shows the interannual growth variation of Tier 3 ports:

Table 41
Interannual growth variation on container port throughput of Tier 3, in TEU, from 2010 to 2020
(in percentages)

	Variation in throughput 2010	Variation in throughput 2011	Variation in throughput 2012	Variation In throughput 2013	Variation in throughput 2014	Variation in throughput 2015	Variation in throughput 2016	Variation in throughput 2017	Variation in throughput 2018	Variation in throughput 2019
Bridgetown, Barbados	-4.2	-6.3	3.8	4.7	10.3	21.8	1.7	-5.7%	-2.5%	-9.1
Georgetown, Guyana	-24.8	1.7	11.4	-4.4	8.4	4.4	4.5	-1.0	17.3	-4.1
Georgetown-Cayman, Cayman Islands	-2.2	10.0	3.0	0.2	9.1	11.2	2.0	-37.4	11.1	-4.1
CPCP, St. Vincent & the Grenadines	5.5	2.5	-1.6	-11.6	11.6	11.6	-4.0	3.5	0.6	1.2
San Andrés, Colombia	29.3	26.1	23.4	-14.8	81.9	-6.9	50.0	106.0	8.7	-24.8
Arlen Siu, Nicaragua	25.3	18.0	14.0	10.8	11.5	2.7	2.4	-37.2	70.8	-18.3
Puerto Morelos, Q. ROO, Mexico	26.6	9.8	12.3	36.1	6.6	0.3	-11.6	0.8	-5.7	-41.9

Source: Economic Commission for Latin America and the Caribbean (ECLAC), based on port official data. Note: Only ports with availability of historic data from 2010 to 2020 were considered.

B. Share of exports & imports at container ports in the Caribbean in 2019-2020

Exports and imports give a picture of how countries and territories have fared. It is important to analyse the year-over-year variation of imports, since many countries in the Caribbean need imported goods for domestic consumption. Biggest ports have tendency to have higher transhipment incidence and lower trade – exports and imports – incidence.

Following, exports and imports incidence on port throughput during 2019 and 2020 for ports of Tier 1-3.

Table 42
Exports and imports incidence related to port throughput, Tier 1, in TEU, 2019 and 2020
(in percentages)

Port, Country/Jurisdiction	Share of exports in 2019	Share of exports in exports 2020	Share of exports in imports 2019	Share of exports in imports 2020
CCT, MIT, Cristóbal, Panama	2.5	2.1	6.4	4.9
Balboa, Rodman (PSA), Panama	2.0	1.2	4.5	2.9
Bahía de Cartagena (SPRC & CTC), Colombia	7.0	7.0	11.6	9.8
Houston, United States	41.2	40.0	41.7	43.1
Kingston, Jamaica	9.3	8.4	9.5	9.0
San Juan, Puerto Rico	13.2	15.2	49.8	48.3
Caucedo, Dominican Republic	9.4	9.6	32.3	31.3
Veracruz, Mexico	27.5	28.2	47.8	46.8
Limón+APM, Costa Rica	41.9	40.5	15.9	18.0
Everglades, United States	n/a	36.3	n/a	31.6
Freeport, Bahamas	37.1	34.1	38.2	34.4

Source: Economic Commission for Latin America and the Caribbean (ECLAC), based on port official data. Note: For trade, containers that were full in both directions —export and import— were analysed, except Bahamas and Jamaica, in which data were not available disaggregated.

Table 43
Exports and imports incidence related to port throughput, Tier 2, in TEU, 2019 and 2020
(in percentages)

Port, Country/Jurisdiction	Share of exports in 2019	Share of exports in exports 2020	Share of exports in imports 2019	Share of exports in imports 2020
Altamira+Tampico, Mexico	40.7	43.5	37.3	38.4
Puerto Cortés, Honduras	39.6	37.9	40.1	40.3
Santo Tomás de Castilla, Guatemala	37.9	37.2	34.3	31.4
Puerto Barrios, Guatemala	34.8	33.5	20.8	21.9
Río Haina, Dominican Republic	19.3	18.6	50.0	46.6
Santa Marta, Colombia	35.1	33.5	11.9	9.0
Port of Spain, Trinidad & Tobago	6.6	5.5	30.7	34.6
Jarry/Baie-Mahault, Guadeloupe	36.7	38.2	40.7	40.5
Puerto Cabello, Venezuela (Bolivarian Republic of)	15.2	12.3	51.2	47.9
Point Lisas, Trinidad & Tobago	27.4	28.9	35.8	35.1

Port, Country/Jurisdiction	Share of exports in 2019	Share of exports in exports 2020	Share of exports in imports 2019	Share of exports in imports 2020
Fort-de-France, Martinique	23.7	20.3	43.3	42.6
Progreso, Mexico	45.0	45.3	16.5	14.9
Barranquilla, Colombia	28.5	31.5	42.1	38.3
Tampa Bay, United States	48.9	49.0	51.1	51.0
Puerto Castilla, Honduras	49.9	49.2	17.8	20.3
Bocas Fruit (Almirante), Panama	46.4	33.4	10.1	12.1
La Guaira, Venezuela (Bolivarian Republic of)	3.8	6.9	47.4	0.7
Kingstown, Saint Vincent and the Grenadines	0.2	0.2	0.5	0.5
Willemstad, Curaçao	n/a	42.2	n/a	37.8

Source: Economic Commission for Latin America and the Caribbean (ECLAC), based on port official data.

Table 44
Exports and imports incidence related to port throughput, Tier 3, in TEU, 2019 and 2020
(in percentages)

Port, Country/Jurisdiction	Share of exports in 2019	Share of exports in exports 2020	Share of exports in imports 2019	Share of exports in imports 2020
Bridgetown, Barbados	7.2	7.0	40.4	43.4
Turbo, Colombia	60.5	34.0	16.9	7.5
Georgetown, Guyana	46.3	46.0	53.7	54.0
Barcadera, Oranjestad, Aruba	0.0	0.0	49.0	48.6
Georgetown-Cayman, Cayman Islands	49.5	49.1	50.5	50.9
Tuxpan, VER., Mexico	36.3	49.5	12.1	7.1
Maracaibo, Venezuela (Bolivarian Republic of)	1.2	3.2	22.1	23.4
Coatzacoalcos, Mexico	50.4	50.0	3.0	1.1
Providenciales, Turks and Caicos	48.9	47.4	51.1	52.6
CPCP (Campden Park Container Port), St. Vincent & the Grenadines	0.8	0.7	3.4	3.3
Guanta, Venezuela (Bolivarian Republic of)	20.7	10.7	44.6	43.7
San Andrés, Colombia	0.2	0.4	14.7	11.5
El Guamache, Venezuela (Bolivarian Republic of)	4.6	6.9	30.5	30.7
Arlen Siu, Nicaragua	44.0	39.0	39.7	41.4
Puerto Morelos, Q. ROO, Mexico	16.4	24.4	48.2	42.9
Guajira, Colombia	0.8	5.8	40.0	45.2

Source: Economic Commission for Latin America and the Caribbean (ECLAC), based on port official data.

C. Share of transhipments at container ports (and other movements) in the Caribbean in 2019-2020

Ports of Tier 1 in the Caribbean play an essential role as transhipment hubs, consequently as container shipping networks.

Transhipment enables traffic consolidation and the related scale economies in ship size, rationalization of shipping routes and adjustment of ship capacity to traffic density and expanding the number of ports covered by the shipping network (Rodrigue & Ashar, 2015).

Following, transhipment incidence on port throughput during 2019 and 2020 for ports of Tier 1-3.

Table 45
Transhipment incidence related to port throughput, Tier 1, in TEU, 2019 and 2020
(in percentages)

Port, Country/Jurisdiction	Share of transhipment in 2019	Share of transhipment in 2020
CCT, MIT, Cristóbal, Panama	86.9	90.0
Balboa, Rodman (PSA), Panama	89.7	93.0
Bahía de Cartagena (SPRC & CTC), Colombia	72.2	73.0
Kingston, Jamaica	81.2	82.6
San Juan, Puerto Rico	1.2	1.2
Caucedo, Dominican Republic	55.5	55.8
Veracruz, Mexico	29.0	28.7
Freeport, Bahamas	24.6	31.4

Source: Economic Commission for Latin America and the Caribbean (ECLAC), based on port official data.

Table 46
Transhipment incidence related to port throughput, Tier 2, in TEU, 2019 and 2020
(in percentages)

Port, Country/Jurisdiction	Share of transhipment in 2019	Share of transhipment in 2020
Santo Tomás de Castilla, Guatemala	3.6	4.6
Puerto Barrios, Guatemala	8.9	10.4
Río Haina, Dominican Republic	7.4	7.6
Santa Marta, Colombia	18.1	23.7
Port of Spain, Trinidad & Tobago	40.4	36.1
Jarry/Baie-Mahault, Guadeloupe	22.6	21.3
Point Lisas, Trinidad & Tobago	8.9	9.1
Fort-de-France, Martinique	16.6	9.4
Bocas Fruit (Almirante), Panama	0.0	17.2
Willemstad, Curaçao	18.3	20.0

Source: Economic Commission for Latin America and the Caribbean (ECLAC), based on port official data.

Table 47
Transhipment incidence related to port throughput, Tier 3, in TEU, 2019 and 2020
(in percentages)

Port, Country/Jurisdiction	Share of transhipment in 2019	Share of transhipment in 2020
Bridgetown, Barbados	14.1	9.8
Barcadera, Oranjestad, Aruba	1.0	1.4

Source: Economic Commission for Latin America and the Caribbean (ECLAC), based on port official data.

D. Expansion of the Panama Canal and transhipment incidence

Following a plebiscite, the Panama Canal Authority embarked in 2007 on a nearly decade-long expansion program that added a third set of locks to the waterway. Inaugurated in June 2016, at a cost of US$5.25 billion, the Canal's volumetric capacity increased threefold.

Its expansion has opened routes for other market segments, such as liquefied natural gas exports from the United States to Northeast Asia, one of 180 routes in 1920 ports worldwide that are linked to Panama.

The economic repercussions go far beyond Panama. The Canal's influence on larger markets can be seen in Colombia, about 10 percent of Colombia's total trade transit the Canal. But throughout the rest of the hemisphere, the expansion prompted extensive retooling of ports infrastructure to accommodate greater vessels, from Chile to the United States Atlantic coast.

As concerns the Greater Caribbean basin, several port terminals in the region undertook infrastructure upgrades due to the Canal expansion program. They include the following:

Port of Houston, United States: In August 2021 the Port of Houston signed a partnership agreement with the US Army Corps of Engineers to widen and deepen the Houston Ship Channel, a 46-kilometer natural waterway which connects the city of Houston to the Gulf of Mexico. The project is intended to last three years and to cost US$1.1 billion, consisting of eight stages.

Port of Miami, United States: Prior to the completion of the Canal expansion program and in preparation for the larger vessels expected as a result of it, Port of Miami undertook a dredging and widening project in its harbour. The port's nautical depth was increased from 13.4 meters to 15.8 meters.

Port Everglades, United States: Port Everglades has undertaken a dredging project to deepen its navigational channel from 12.5 to 14.6 meters.

Jacksonville Port Authority, United States: Jaxport's Strategic Plan 2020-2025 specifically refers to the Panama Canal expansion as the key reason to deepen its navigational channel from its current 12 meters to 14.3 meters: "Critical to attracting new container vessel service and new container volumes is the completion of the deepening of the Jacksonville harbour to [14.3 meters] from its current depth of [12 meters]. This will enable JAXPORT to accommodate cargo transported by the larger post-Panamax vessels currently calling the US East Coast following the 2016 expansion of the Panama Canal, as well as even larger vessels transiting the Suez Canal".

APM Terminals (APMT) Moín, Costa Rica: APM Terminals, a subsidiary of Maersk, obtained a 33-year concession in 2011 from the Costa Rican government to build and operate a container terminal near in Caribbean province of Limón. The project was valued at nearly US$1 billion and its initial phase was completed in 2019. It has an annual capacity for 1.3 million TEUs and a nautical depth of 14.5 meters.

DP World Caucedo, Dominican Republic: In 2016 DP World completed a dredging project at its terminal at Caucedo, near the Dominican capital of Santo Domingo, deepening its navigational channel from 13.5 to 15.2 meters.

Kingston, Jamaica: The Port of Kingston, since 2016 operated by CMA CGM Group, began a refitting project in 2016 to increase the terminal's berthing capacity to over 2400 meters, its channel depth to over 15 meters, and the instalment of up to 18 gantry cranes in order to bring its handling capacity to 3.6 million TEUs.

Freeport Container Port, Bahamas: At 16 meters – one of the deepest ports in the Greater Caribbean Basin – the Freeport Container Port in the Bahamas is undergoing a development plan in several stages that seeks to increase its berthing space from 1030 meters to over 3800 meters. In doing so it will increase its annual handling capacity from its current 1.5 million TEUs to 6.7 million TEUs. The terminal is operated by Hutchison Ports.

Cartagena Bay, Colombia: Because of the Panama Canal Expansion, Cartagena's two container terminals – the Sociedad Portuaria Regional de Cartagena (SPRC) and Contecar – underwent an investment program between 2014 and 2017 that increased its navigational depth from 14 meters to

16.5 meters, its total number of gantry cranes from 12 to 21, in addition to more than doubling its yard area. The port's total annual handling capacity was increased from 3 million to 5.2 million TEUs.

E. Ports' performance

The information presented thus far yields an overall photograph of the present state of container terminals in the Greater Caribbean Basin, a greatly diverse region. It does not, however, address the matter of port performance. For that we must turn to information that allows us to compare terminals in the Greater Caribbean to those of other regions. For that we turn to The Container Port Performance Index: A Comparable Assessment of Port Performance (CPPI). Published in May 2021 as a collaboration between IHS Markit and the World Bank, the CPPI draws on the rich resources of both institutions to produce a methodology that captures the quality of container terminals across the world.

1. In the authors' own words:

"The CPPI is intended to identify gaps and opportunities for improvement that will ultimately benefit all stakeholders—from shipping lines to national governments to consumers. [It serves] as a reference point for key stakeholders in the global economy, including national governments, port authorities and operators, development agencies, supranational organizations, various maritime interests, and other public and private stakeholders in trade, logistics, and supply chain services. The joint team intends that the methodology, scope, and data, will be enhanced in subsequent annual iterations, reflecting refinement, stakeholder feedback, and improvements in data scope and quality. This first iteration of CPPI utilizes data up to the end of the first six months of 2020 (June 30) and includes ports that had, within a six-month period in the prior twelve months, a minimum of 10 valid port calls." "The index points used to construct the ranking reflect...an aggregate of the performance of the port, weighted relative to the average, across call and vessel size. Accordingly, the score can be negative, where a port compares poorly to the average in one call size and vessel size category, particularly if they do not have an offsetting positive score(s) in other cell(s)."

Out of 351 port terminals have been taken into account in this CPPI, 36 are in the Greater Caribbean. 13 of these are in the Caribbean proper, eight in the US, four in Central America, three in the Gulf coast of Mexico, in Panama, and in Colombia, and two in Venezuela (Bolivarian Republic of).

Table 48
CPPI for individual ports in Greater Caribbean

Port name	Sub-Region	Index points
Cartagena, Colombia	Caribbean coast	52
Caucedo, Dominican Republic	Caribbean coast	30
Balboa, Panama	Pacific coast	27
Colón, Panama	Caribbean coast	25
Veracruz, Mexico	Gulf coast	18
Altamira, Mexico	Gulf coast	17
Jacksonville, United States	Gulf coast	17
Puerto Limón, Costa Rica	Central America, Caribbean coast	16
Fort-de-France, Martinique	Caribbean coast	15
Point-a-Pitre, Guadaloupe	Caribbean coast	14
Miami, United States	Gulf coast	14

Port name	Sub-Region	Index points
Puerto Barrios, Guatemala	Central America, Caribbean coast	11
Mobile, United States	Gulf coast	10
Santa Marta, Colombia	Caribbean coast	9
Port Everglades, United States	Gulf coast	8
Puerto Cortés, Honduras	Central America, Caribbean coast	7
Gustavia, Saint Barthélemy	Caribbean coast	5
Rio Haina, Dominican Republic	Caribbean coast	5
San Juan, Puerto Rico, United States	Caribbean coast	5
Barranquilla, Colombia	Caribbean coast	3
Point Lisas, Trinidad & Tobago	Caribbean coast	2
Nassau, Bahamas	Caribbean coast	0
Philipsburg, Sint Maarten	Caribbean coast	0
Port Freeport, United States	Gulf coast	0
Mariel, Cuba	Caribbean coast	-1
Tampa, United States	Gulf coast	-1
Santo Tomás de Castilla, Guatemala	Central America, Caribbean coast	-2
Freeport, Bahamas	Caribbean coast	-6
Puerto Progreso, Mexico	Gulf coast	-8
Houston, United States	Gulf coast	-9
New Orleans, United States	Gulf coast	-9
Port of Spain, Trinidad & Tobago	Caribbean coast	-11
Cristóbal, Panama	Caribbean coast	-14
Kingston, Jamaica	Caribbean coast	-23
La Guaira, Venezuela (Bolivarian Republic of)	Caribbean coast	-28
Puerto Cabello, Venezuela (Bolivarian Republic of)	Caribbean coast	-34

Source: Container Port Performance Index, IHS/World Bank, 2021.

As for the rest of the world, the Greater Caribbean fairs better than the average for Latin America & the Caribbean, for North America, for Oceania, for Africa, for Russia and Central Asia, and for Europe, but worse than East & Southeast Asia, South Asia, and the Middle East and Gulf States:

Table 49
CPPI for each world region

Region	Average index points
East & Southeast Asia	37
Middle East	18
South Asia	18
Latin America and the Caribbean	3
Europe	1
United States and Canada	-8
Russia and Central Asia	-11
Oceania	-15
Africa	-55

Source: Container Port Performance Index, IHS/World Bank, 2021.

Table 50
CPPI for each Greater Caribbean

Greater Caribbean subregions	Average index points
Colombia Caribbean coast	21
Panama Caribbean coast	13
Mexico Gulf coast	9
Central America Caribbean coast (except Panama)	8
Caribbean Islands	7
United States Gulf coast	4

Source: Container Port Performance Index, IHS/World Bank, 2021.

F. Ports' connectivity

Another basis for comparison is connectivity, which has been measured consistently on an annual basis by the United Nations Conference on Trade and Development (UNCTAD) through its Liner Shipping Connectivity Index (LSCI). Its stated objective is to capture a particular terminal's "level of integration into global shipping networks", which in turn captures countries' or cities' "access to world markets" through the regular import and export of manufactured goods.

UNCTAD's LSCI data set is larger than the one used for the CCPI, scoping 915 container terminals, 100 of which are in the Greater Caribbean Basin: 48 in the Caribbean proper, 16 in the US, nine in Venezuela (Bolivarian Republic of), eight in Panama, seven in the Central American Caribbean coast, seven in the Gulf coast of Mexico, and five in Colombia. The LSCI generates a value of 100 for the most connected port.

As follows are the LSCI's results for 2020, according to subregion within the Greater Caribbean and the Greater Caribbean compared with the rest of the world:

Table 51
UNCTAD LSCI for each Greater Caribbean subregion

Subregion	Score
Panama	22
Colombia Caribbean coast	15
United States Gulf coast	14
Mexico Gulf coast	10
Central America Caribbean coast (except Panama)	9
Caribbean islands	8
South America Caribbean coast (others)	4

Source: Liner Shipping Connectivity Index, UNCTAD, 2021.

Table 52
UNCTAD LSCI for each world region

Region	Score
China	30
United States and Canada	17
World total	13
Latin America and the Caribbean	12
United Kingdom	12
Korea and Japan	12
Europe	12
South & Southeast Asia	11
Indian Subcontinent & Middle East	11
Africa	10
Oceania	8

Source: Liner Shipping Connectivity Index, UNCTAD, 2021.

G. Dwell time in ports

Furthermore, using combined data from UNCTAD and from the United States Bureau of Transportation Statistics (BTS) enables to compare container performance between region through another measure: dwell times. Dwell time is a key indicator of port efficiency, it is the amount of time which cargo or ships spend within a port.

According to Marine Traffic (2019), there are seven factors that impact on dwell time: berths, waterside access, channels, terminals, supply chain connections, cargo and container storage and chassis depots, and the weather.

Considering that container vessels operate on schedules, any delay or problem that occurs in the port, directly affects the whole service. The shorter the dwell time, the lower the vessel and marine terminal operating costs.

The information as follows is presented in terms of average days container vessels remain at ports in a particular country or jurisdiction. Thus, for instance, if the score for a particular country or jurisdiction is 1.0 it means that, on average in 2020, vessel dwell time across that area's ports was one day. If the score is 0.5, it means vessel dwell time was half day, and so forth. As can be gathered from the table at the right, the fastest performance in terms of container dwell time is held by Dominica (0.23 days), Saint Kitts and Nevis (0.33 days), Saint Vincent and the Grenadines (0.34 days), and Sint Maarten (0.4 days), whereas ports in French Guiana, Venezuela (Bolivarian Republic of), Nicaragua, Cuba, Curaçao and Suriname are reported as having dwell times of over one (1) day.

At the subregional level, Colombian and Caribbean islands terminals collectively report the fastest average dwell times, followed by Central America (not including Panama), Panama, Mexico, the US Gulf ports, the Guianas and Suriname, and Venezuela (Bolivarian Republic of).

Worldwide, the Greater Caribbean region fairs reasonably well (0.75 days) comparatively, second only to Europe (0.7 days), but better than the Latin American & Caribbean average (0.82 days) and better than the world average (1.12 days). Please see below:

Table 53
Dwell times in Greater Caribbean Basin

Country/juristriction	Subregions	Median dwell time (days)
Dominica	Caribbean coast	0.2
Saint Kitts and Nevis	Caribbean coast	0.3
Saint Vincent and the Grenadines	Caribbean coast	0.3
Cayman Islands	Caribbean coast	0.4
Sint Maarten (Dutch part)	Caribbean coast	0.4
Honduras	Central America (except Panama)	0.4
United States Virgin Islands	Caribbean coast	0.4
Saint Lucia	Caribbean coast	0.4
Barbados	Caribbean coast	0.4
Grenada	Caribbean coast	0.4
Trinidad and Tobago	Caribbean coast	0.5
Costa Rica	Central America (except Panama)	0.5
Colombia	Colombia	0.6
Belize	Central America (except Panama)	0.6
Dominican Republic	Caribbean coast	0.6
Guatemala	Central America (except Panama)	0.6
Aruba	Caribbean coast	0.6
Martinique	Caribbean coast	0.7
Guadeloupe	Caribbean coast	0.7
Panama	Panama, both coasts	0.7
PuertoRico	Caribbean coast	0.8
Mexico	Mexico, boath coasts	0.8
Haiti	Caribbean coast	0.8
Jamaica	Caribbean coast	0.8
Guyana	South America, Caribbean coast (other)	0.9
United States, Gulf coast*	US Gulf*	1.0
Suriname	South America, Caribbean coast (other)	1.0
Cuba	Caribbean coast	1.2
Curaçao	Caribbean coast	1.2
Nicaragua	Central America (except Panama)	1.2
Venezuela (Bolivarian Republic of)	Venezuela (Bolivarian Rep. of)	1.7
French Guiana	South America, Caribbean coast (other)	2.6

Sources: UNCTAD; US Bureau of Transportation Statistics, 2021.
Note: United States data only available for 2019.

Table 54
Dwell times for each Greater Caribbean subregion

Subregion	Median dwell time (days)
Colombia, Caribbean coast	0.6
Caribbean islands	0.6
Central America Caribbean coast (except Panama)	0.7
Panama Caribbean coast	0.7
Mexico Gulf coast	0.8
United States Gulf coast	1.0
South America, Caribbean coast (other)	1.6

Sources: UNCTAD; US Bureau of Transportation Statistics, 2021.
Note: United States data only available for 2019.

Table 55
Dwell times for each world region

Region	Median dwell time (days)
Europe	0.7
Greater Caribbean	0.7
East & Southeast Asia	0.8
Oceania	0.9
South America	1.0
World	1.1
Middle East	1.2
Russia and Central Asia	1.2
North America	1.4
South Asia	1.5
Africa	2.1

Sources: UNCTAD; US Bureau of Transportation Statistics, 2021.
Note: United States data only available for 2019.

VI. Emerging issues

The emergence of COVID-19 has hit world trade hard, which was already showing almost a decade of low dynamism after the financial crisis of 2008-09. Maritime traffics, worldwide, suffered negative effects, especially during 2020 (but continues to affect it).

Despite the generalised fall in international maritime transport, the opposite behaviour was observed in relation to freight rates, while trade fell, freight rates rose substantially, which is counter intuitive.

In 2020, between January and February, the busiest ports had positive year-on-year variations compared to 2019. This indicates that the year had started with good trade performance; however, from March onwards, when COVID gained momentum, the impact of the pandemic started to be felt in the vast majority of ports in the region. It is worth mentioning that the impact was also due to the fact that ports around the world applied restrictive measures to contain the spread of the COVID-19 virus. Such restrictions were extended or reduced in duration, coverage and geographical scope, depending on the evolution of the pandemic.

Globally, between January to August 2020 compared to 2019, trade decreased by -5.0%,

In the Caribbean, there was a fall of -4.9 % in 2020 compared to 2019, the largest declines in trade occurred in Panama, with a fall of -15.1% on the Caribbean coast and -30.4% on the Pacific coast. In Central America, the Caribbean coast showed stronger declines relative to the Pacific coast, with a fall in container trade of -5.7 % and an increase, the only one of the subregions, of 3.1 % on the Pacific coast. In Mexico, the fall on the Gulf coast was -9.8 % and on the Pacific coast was -8.0 %. South America recorded a -0.2% drop-in port trade activity in 2020.

A. Despite falling seaborne trade, freight rates continue to rise

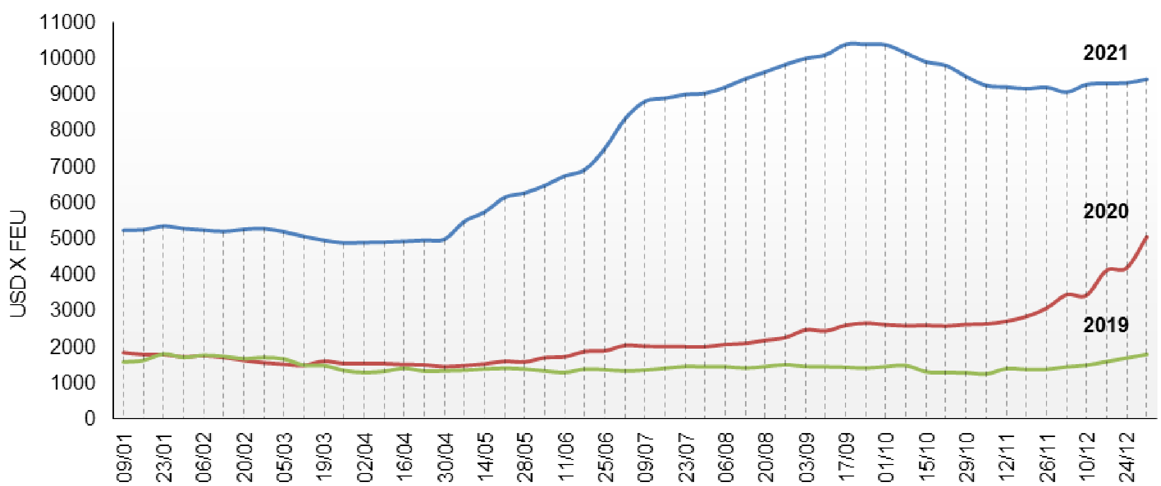
Ocean container freight rates follow the opposite flow of port movement, continuing to rise as trade suffers declines and slowly recovers. Recent market developments are a strong indicator that concentration has strengthened over the last few years, and that this is reflected in the behaviour of ocean freight rates in this pandemic year and could affect supply and demand conditions and constitute an additional barrier to entry for competitors.

Globally, freight rates behaved counter-intuitively: they rose as demand fell. This is a demonstration of the industry's ability to manage quantities and prices in an oligopolistic manner.

Globally, seaborne container trade in 2020 was lower than in 2019. However, freight rates grew already from January 2020, being always above those of 2019 (with the exception of April, which reached the same levels as in 2019), reaching an increase of up to 182% in December 2020 compared to the same date in 2019. In February 2021 it reached 240% higher than compared to February 2020. Meanwhile, trade in December 2020 grew 4% compared to December 2019 and 16% in February 2021 compared to February of the previous year. In other words, freight rates continue to rise, while trade, after falling during 2020 compared to 2019, managed a recovery, but remaining at early 2019 levels. In 2019, the average world freight rates per FEU were USD 1,457.00. From July 2020 onwards, the value exceeded USD 2,000.00, reaching levels of USD 10,361.00 in October 2021, 616% higher than in the same period in 2019 and 298% higher than in the same period in 2020.

Next figure below shows the monthly evolution of the level of world seaborne freight rates from January 2019 to December 2021, in USD per FEU

Figure 15
Monthly evolution of the level of world seaborne freight rates from January 2019 to December 2021
(in USD per FEU)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), based on Drewry data.
Note: Considering this is a situation out of the ordinary, the authors considered data from 2021, because this is an alarming issue that is happening currently.

Freight rates to the US East Coast[9], which also serve the route to the main Caribbean ports, have experienced a slight decrease only in the first two months of 2020, before starting to show positive variations with respect to freight rates in 2019 from March onwards. The year-on-year variation in freight rates on this route is particularly notable from August 2020, when there was a variation of 47.9% compared to the same month in 2019. In October 2020 the variation peaks, with an increase of 95.5% compared to the previous year. In July 2021, freight rates reached a 186% increase compared to July 2020.

Since the rapid expansion of COVID-19, the entire supply chain has suffered a major disruption characterised by multiple bottlenecks along the supply chain, widespread delays and bottlenecks at port terminals, lack of containers for loading goods, shortages of sea and river warehouses and supply cuts from the usual sources, which led to random production interruptions due to the lack of industrial inputs, parts and pieces, and the unprecedented increase in maritime freight rates.

The phenomenon has a variety of causes, some transitory and others structural. Faced with the pandemic and on a global scale, ports established rigorous inspections and added detailed interventions by the sanitary authorities, with specific control and quarantine procedures for ships that implied delays, and in some cases complete suppression of activities, such as the temporary closure registered by some important port terminals in China.

On a global scale, on the other hand, the confinement and the generalised fear of the new disease caused an initial marked retraction in consumption, especially of services, in the markets. Once the health protocols were in place and vaccination was launched, economic activity recovered strongly, driven by the previously restricted demand (pent-up demand).

Faced with the initial drop in demand, economic agents reduced inventories of final products and inputs to a minimum, and the sudden recovery quickly surpassed these levels: aggregate retail stocks in the United States meant 33 days of sales in June 2021 versus 43 in February 2020.The jump in US demand for imports from Asia caused the main bottlenecks, as the trade imbalance concentrated empty containers on US shores, given the lower number of return trips. This unleashed an intense process of box-hoarding along the entire trade chain: shipping lines diverted vessels from Europe for the sole purpose of adding 'blank shipments' to the transport of empty containers to Asia.

There is a structural feature here which requires further study: according to various sources, between 50% and 75% of the containers used in international trade belong to the shipping lines, and most of the rest to leasing companies which may also constitute holding companies with the main carriers.

The determining structural feature, however, is the very concentration of the shipping market. The information surveyed shows a marked contraction of regional container trade between April and September 2020 compared to the previous year, with a cumulative annual decline of -2.9%. Ocean freight rates between China and South America, however, showed an average annual increase of 24.4%, implying a December-December variation of 106.8%.

The price boom has implied record profitability for shipping lines in 2021. The top 10 publicly listed container shipping companies are on track for a record $115 billion to $120 billion in profit in 2021, representing a rose of 56.1% in 2021[10].

Such large increases in freight rates, even with contracting volumes as in 2020, require some analytical explanation, beyond the original Covid-19 disruption. Firstly, the marked concentration of carrier supply in the container market, reduced to three main corporate conglomerates, stands out.

9 Freight rates to the United States are used as a benchmark for imports from Asia Pacific to Central America.

10 World Markets Daily, based on Alphaliner data, 2021.

The described conformation of the shipping and port markets does not allow for optimism regarding a reversal of the rise in transport costs for the immediate future, if one also considers the continuity of the operational delays imposed by the prevention of COVID-19 and the incipient process of 'decarbonisation' of maritime transport, which will probably add initial costs.

A relevant way of conceptualising the consequences of a continued increase in the cost of international transport is to equate it with a generalised rise in trade barriers: its likely consequence will be the disintegration of cross-border production chains, lower economies of scale, a decline in productive efficiency on a global scale, and higher real costs across the board.

Perhaps one conclusion of the present analysis is that public policies and regulations aimed at promoting competition by restricting vertical integration between shipping companies and port terminals would contribute significantly to minimising such damage.

B. Pandemic, supply chains and transport markets

Since the outbreak of COVID-19, supply chains have suffered major disruptions such as congestion at port terminals, lack of containers for loading goods, shortages of sea and river warehouses and supply cuts from the usual sources. All this has led to production interruptions in various industries due to the lack of inputs, parts and pieces and the unprecedented increase in maritime freight rates. This picture recognises several causes, some transitory and others structural.

The main transitory factor behind the global maritime logistics disruptions is the COVID-19 pandemic. To cope with it, ports around the world established stringent inspections and specific control and quarantine procedures for ships. These measures led to delays, and in some cases even entailed the suppression of activities, such as the temporary closure of major port terminals in China. Also, on a global scale, the containment and fear of the pandemic's advance led to a sharp drop in consumption, especially of services. Once health protocols were in place and vaccination processes started, economic activity recovered strongly. Faced with the initial drop in demand, economic agents reduced inventories of final products and inputs to a minimum, and the sudden recovery quickly surpassed these levels: aggregate retail stocks in the United States meant 33 days of sales in June 2021 versus 43 in February 2020, demonstrating the decline in stocks. The jump in US demand for imports from Asia caused the main bottlenecks, as the trade imbalance concentrated empty containers on US shores, given the lower number of return trips. This triggered an intense process of container hoarding all along the chain: shipping lines diverted vessels from Europe for the sole purpose of adding 'blank sailings' to the transport of empty containers to Asia.

On the structural side, various sources report that between 50% and 75% of the containers used in international trade belong to the shipping lines, and most of the rest to leasing companies which could also constitute holding companies with the main carriers[11].

The decisive structural feature, however, is the aforementioned concentration of the shipping market as a whole. This concentration is primarily due to the economies of scale inherent in shipping. Economic development is unevenly distributed geographically, and as a consequence trade expansion is relatively concentrated. For example, the density of trade between Asia and North America allows the use of large container ships, with significant unit savings compared to other ocean routes. This phenomenon is in turn multiplied by the particular nature of the demand for transport services and

[11] More information: https://www.mundomaritimo.cl/noticias/como-opera-la-identificacion-de-los-propietarios-de-los-contenedores-a-traves-de-sus-codigos

logistics structures in general, since their usefulness to the user lies not so much in each individual pair of origins and destinations, but in the set of interconnected points. Their attractiveness grows with their density, a phenomenon known as 'network economies', which gives significant competitive advantages to operators who obtain critical densities in the set of origins and destinations served.

Economies of scale and network economies together imply a natural tendency towards business concentration, in particular for international transport. However, this does not necessarily equate to market power, in the sense of oligopolistic pricing abuse by shipping lines. Competition based on lower prices and better-quality services is still possible if these markets are contestable, i.e. if there are no barriers to entry for new competitors (as air transport experience shows). This is where the indivisibility of infrastructures is a relevant obstacle: potential competitors must use the same access facilities to port facilities as those guaranteed to existing shipping lines. Moreover, ports are not 'infinitesimal': geography is by definition finite, and investments in port terminals involve significant sunk costs and recurrent maintenance expenses.

In light of the above considerations, the information regularly collected by Drewry is worrying. Their statistics define a GTO/ITO (Global Terminal Operator/International Terminal Operator) as a port operator that operates significant container terminal facilities in at least two different world regions. These large companies accounted for 48.2% of global container throughput (measured in TEUs) in 2020, spread across 21 players. In 2010 the equivalent figures were 43.8% of the throughput distributed among 23 players, which is evidence of increasing market concentration over the last decade. Of the total number of port terminals managed by GTO, 40% now belong to the three existing global shipping alliances, in a growing and dangerous process of vertical integration between shipping and port operators. Strictly speaking, the progressive shaping of shipping lines as general logistics forwarders threatens to expand vertical integration towards the interior of countries, incorporating rail networks, road operators, strategic warehouses and retail distribution.

The described configuration of the shipping and port markets does not allow for optimism regarding a reversal of the rise in transport costs for the immediate future, considering also the continuation of operational delays imposed by the pandemic and the incipient process of decarbonisation of maritime transport, which is likely to add upfront costs. A continued increase in the cost of international transport is equivalent to a generalised increase in trade barriers, with likely consequences including the disintegration of cross-border supply chains, reduced economies of scale and a decline in global production efficiency. From the present analysis it is possible to conclude that public policies and regulations aimed at promoting competition by restricting vertical integration between shipping companies and port terminals would contribute significantly to minimising such damage.

The COVID-19 pandemic hit Latin America and the Caribbean hard, exposing some pre-existing problems, such as lack of infrastructure and regulatory and facilitation problems, among others, alerting the region to the need for a sustainable economic recovery, when production and exports will depend, to a large extent, on the integrity of logistics capacity to regain international competitiveness.

Overall, the current outlook is for a slow recovery. The container shipping sector in Latin America and the Caribbean suffered in 2020 from the consequences of the pandemic via a marked decline in imports and exports. The fall in imports reflects the decline in consumption of goods in the region but is also related to the decline in national industrial capacities with fewer imports of inputs needed to produce, consume or re-export.

Thinking longer term in a more optimistic scenario (understood as the absence of resurgences or the extension of an effective vaccination), an economic recovery as suggested by the current reality - which shows a change in trend - raises the possibility that the territorial reorganisation of world production will begin to occur more rapidly. This would lead the countries of the region to rethink industrial strategies, but, at the same time, it could imply changes in the regular transport networks in all their modes.

In the case of the container shipping sector, the process of industry concentration seems to continue to consolidate, as well as vertical integration both upstream and downstream. This will lead to a rethinking of competition issues on a case-by-case basis, due to the risk of market dominance.

VII. Conclusions and recommendations

In the Bahamas and Veracruz, as mentioned in the document, they are servicing liners only, with pre-purchased windows; a spot ship has no chance of being serviced. Moreover, this limits the possibility of growth of the port. They will have to be very active in improving their processes to remain competitive.

Regarding the "predictive game" of when the next big ship will come and its relation with port planning, it has been imposed to build or develop new terminals with continuous linear metres and without breaks, so that in the future if the "design ship" changes, where there were

three berthing sites there can be only two, but without the need to modify the infrastructure and only adapting the manoeuvring or sailing and berthing manual (considering -eventually- a dredging).

The barriers to entry for new entrants to the maritime transport market are evident today, if we add to this a certain opacity in the market (such as, for example, the financial statements of some shipping companies, except for their board of directors). It is necessary to set up an institutional framework that deals with and is concerned with the issue. Even more so if hybrid operators go from having 20% of the terminal operation market to 42% and growing.

With reference to the presence of GTOs, the same phenomenon is starting to occur in the terminal operators' market. The GTOs "negotiate" with the three alliances for port services on all routes, which allows them not only to improve their numbers, but also to put out of business local operators with smaller backbones and less bargaining power, and then (and only by chance) to acquire them at a lower price than they once had in the market, which is at least worrying, because of its future implications.

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Annexes

Annex 1
List of abbreviations used in this Report

AAPA	:	American Association of Port Authorities
ACS	:	Association of Caribbean States
APP	:	Adaptive Port Planning
BTS	:	Bureau of Transportation Statistics
CAGR	:	Compound Annual Growth Rate
CCT	:	Colón Container Terminal
CIP	:	Inter-America Commitee on Ports (from its original acronym in Spanish
CIP	:	Inter-America Committee on Ports (from its original acronym in Spanish)
CMA-CGM	:	Compagnie Maritime d'Affrètement & Compagnie Générale Maritime
EBIT	:	Earnings before interest and taxes
ECCA	:	East Coast Central America
ECLA	:	Economic Commission for Latin America
ECLAC	:	Economic Commission for Latin America and the Caribbean
ECNA	:	East Coast of Norh America
ECSA	:	East Coast South America
FEU	:	Forty-two (feet) unit
GATT	:	General Agreement on Tariffs and Trade
GTO	:	Global Terminal Operatos
HPH	:	Hutchison Port Holdings
ICABE	:	Internacional de Contenedores Asociados de Veracruz
IMO	:	International Maritime Organization
ITO	:	International Terminal Operator
LNG	:	Liquefied Natural Gas
MCT	:	Moín Container Terminal
MHC	:	Mobile Harbour Cranes
MIT	:	Manzanillo International Terminal
MPA	:	Maritime and Port Authority
MSC	:	Mediterranean Shipping Company
MTBS	:	Maritime & Transport Business Solution
NCSA	:	North Coast of South America
OAS	:	Organization of American States
RoRo	:	Roll-on/Roll-off
TEU	:	Twenty-two (feet) unit
UN	:	United Nations
UNCTAD	:	United Nations Conference on Trade and Development
US	:	United States
USD	:	United States Dollar
WCNA	:	West Coast of Nort America
WCSA	:	West Coast South America
WHO	:	World Health Organization
WTO	:	World Trade Organization