2025 Review of maritime transport

Chapter IV

Port performance and maritime trade facilitation

The performance of ports – key transport nodes that facilitate trade – is pivotal to the competitiveness of maritime transport chains. Efficient port operations reduce delays, lower transaction costs and enhance the seamless movement of goods across international borders.

Global port activity continues to evolve, marked by modest growth in port calls for dry bulk carriers and stable trends in port calls for tankers and containerships in 2024. One factor attracting port calls is the provision of bunkering services for alternative fuels. The number of ports offering these services is growing, as seen in the steady expansion of LNG bunkering services in recent years.

Asian countries have further solidified their lead in liner shipping connectivity. Africa recorded the most significant improvement between June 2024 and June 2025; route reconfiguration caused by the Red Sea crisis contributed to this effect. Rising containership congestion and longer container handling times in 2024, however, strained operational efficiency in ports.

Efforts to advance gender inclusion in the port workforce are progressing, especially in managerial positions. Yet a persistent gender gap remains, particularly in male-dominated roles such as cargo handling and other operational positions. As digitalization and automation move forward, more opportunities for women are expected to emerge and should be capitalized upon.

United Nations

Port performance can be enhanced by trade facilitation measures, including improved transparency and communications among maritime transport stakeholders in both the public and private sectors. In the currently unpredictable global shipping landscape, marked by disruptions, trade facilitation initiatives are of greater relevance for ports. Developing and least developed countries have significant opportunities to enhance their maritime logistics and port efficiency through such measures, especially those using digital technologies. UNCTAD-aggregated data highlight how countries that have adopted port community systems (PCS), maritime single windows (MSW) and trade single windows (TSW) reduce the time for clearing goods through ports, leading to stronger trade facilitation and logistics performance.

Multilateral frameworks such as the IMO Convention on Facilitation of International Maritime Traffic (FAL Convention) and the WTO Agreement on Trade Facilitation are important catalysts to assist developing and least developed countries in implementing digital solutions to facilitate maritime trade and transport.

Public-private partnerships that involve all relevant stakeholders, such as national trade facilitation committees and other coordinating entities, are essential fora to cooperate and collaborate on the successful implementation of maritime trade and transport facilitation solutions. An effective cybersecurity strategy is vital to reduce potential cyberattacks on international maritime trade.

Key policy takeaways

Port performance

Ports should regularly assess performance using globally recognized indicators (UNCTAD, 2023) tailored to specific strategies, priorities and local conditions. This process helps to identify areas for improvement and strategic goals. Continuous benchmarking and performance measurement promote transparency and good governance.

By participating in the UNCTAD Port Performance Scorecard (UNCTAD, 2025a), ports gain access to a benchmarking tool to identify performance gaps and set measurable improvement targets.

Port performance should be measured over an extended period to reflect the capital-intensive characteristics of port infrastructure and superstructure. This long-term perspective steers performance assessments that capture the true impacts of investments and operational changes.

Reduce congestion and improve cargo handling performance

Ports can reduce congestion and improve cargo handling efficiency through a combination of technological upgrades, operational strategies and infrastructure improvements. This includes integrating data from shipping lines, customs and terminal operators, and advancing automation and improvements in yard and berth management.

Promote an inclusive workforce in ports

Governments and port authorities should implement inclusive workforce development programmes that combine targeted recruitment and mentorship initiatives aimed at increasing women's participation in operational and technical roles (such as the TrainForTrade Port Management Programme; see UNCTAD, 2025b). These programmes should align with digital transformation strategies.

Trade facilitation and digitalization

Countries should continue implementing the commitments of the IMO FAL Convention and WTO Agreement on Trade Facilitation, including on automation and digitalization. A particular priority is establishing MSWs in all ports to enhance information and data exchange in maritime trade.

Digital infrastructure and data collaboration can greatly increase the efficiency of ports and global supply chains and improve trade facilitation. Amid trade volatility, environmental pressures and regulatory demands, digital systems such as ASYHUB Maritime can provide Member States with a scalable, standards-aligned platform for resilient and transparent port operations. They also help promote inclusive, interoperable digital transformation across global maritime and border management.

Public-private partnerships in ports increase the efficiency of port operations in terms of the clearance of vessels and cargo, especially through collaborative platforms such as MSWs and PCSs. Coordinating entities such as national trade facilitation committees are essential in cooperation and collaboration between the public and private sectors.

Increasing use of information and communications technology tools in trade facilitation should be accompanied by a cybersecurity strategy to reduce risks and threats, including cyberattacks against international maritime trade.

A. Port performance

This section provides an overview of recent trends in global port activity and performance. It explores port call patterns up to 2024 and examines the growing appeal of ports that are well-equipped to service vessels using alternative fuels. Additionally, the section reports on trends in the Liner Shipping Connectivity Index (LSCI) and highlights the continued importance of Asian countries, which remained among the best connected nations at the country and port levels as of June 2025. The section also assesses the operational performance of ports, revealing stable turnaround durations as well as rising congestion and handling times in 2024. A consideration of some developments in 2025 factors in rising geopolitical tensions and shifting trade policies in major economies.

1. Modest growth in port calls

Stable port calls in 2024 with those by dry bulk carriers slightly increasing

Container ship port calls, after reaching their highest value of about 260,000 in the second semester of 2023, remained at a similar level through both semesters of 2024. Similarly, port calls by liquid bulk carriers stayed at similar levels in 2024 compared to previous years. Port calls by dry bulk carriers observed a moderate increase of 2 per cent during the first half of 2024 compared to the same period in 2023, and firmer growth of 4 per cent in the second half compared to the same period a year earlier.[1]

Port calls by passenger ships have consistently continued to rise over the last few years, seeing 5 and 2 per cent increases for the first and second semesters of 2024, respectively, compared to the same periods in 2023 (figure IV.1).

Asia's share of tanker and container ship port calls has grown

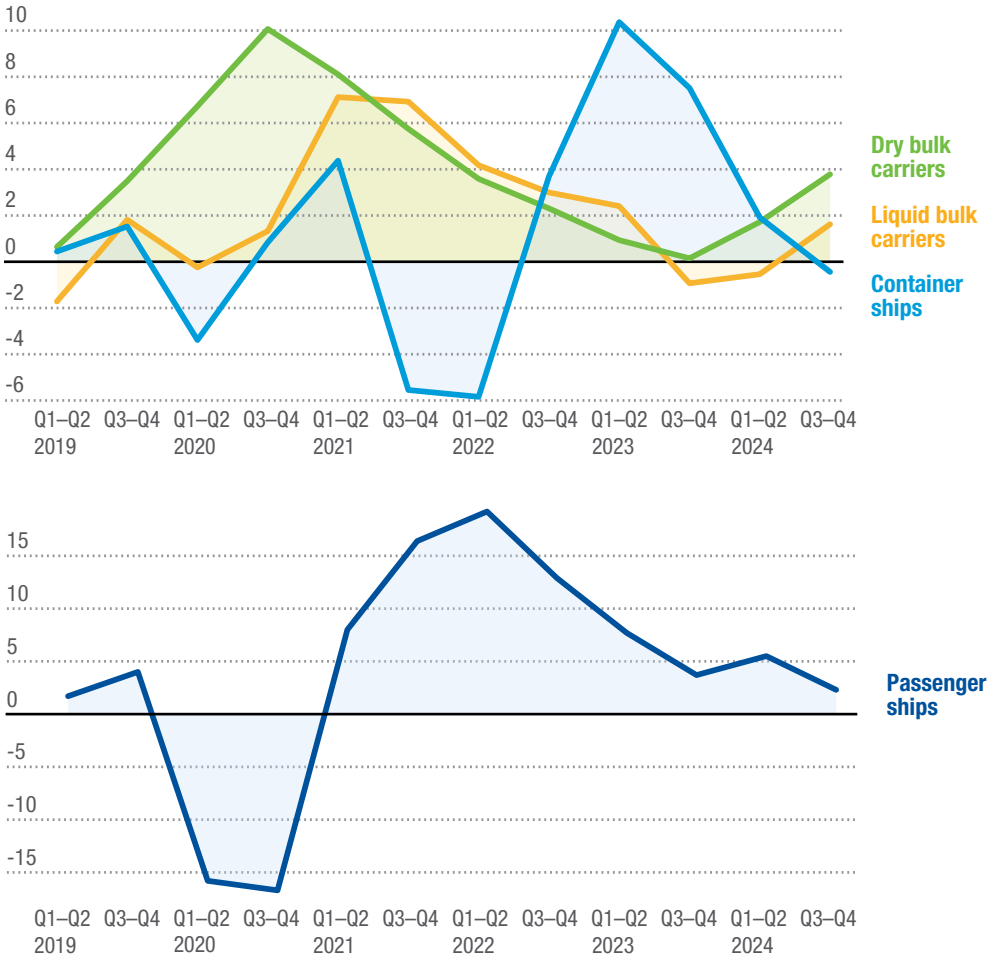
Tanker and container vessels predominantly call at ports in Asia and Europe, with these two regions collectively accounting for approximately 80 per cent of port calls for each of the two vessel categories. Port call trends over the past seven years reveal a geographic shift. Comparing data from the first half of 2018 to the second half of 2024, the share of container ship port calls in Europe declined from 21 to 17 per cent, while Asia experienced an increase from 59 to 63 per cent. This trend is even more pronounced for tankers, with Europe's share decreasing from 24 to 18 per cent, and that of Asia rising from 54 to 61 per cent (figure IV.2).

Trade policy shifts impacting ports

The tariffs announced by a major economy in 2025 and response measures by other countries (see chapters I and III), along with the introduction of port fees applicable to certain ships calling at ports in the United States (see chapter II) are expected to have implications for ports. By increasing costs, tariffs and port fees could cause shipping operators to consolidate routes, reduce frequency or redirect cargo to alternative hubs, with potential implications for maritime transport connectivity and competitiveness in regional and global trade.

[1] Due to the seasonality of port calls, it is convenient to look at year-to-year changes for each semester separately.

Figure IV.1
Total world port calls
(Year-to-year change, percentage)



Source: UNCTAD, based on data provided by Clarksons Research.

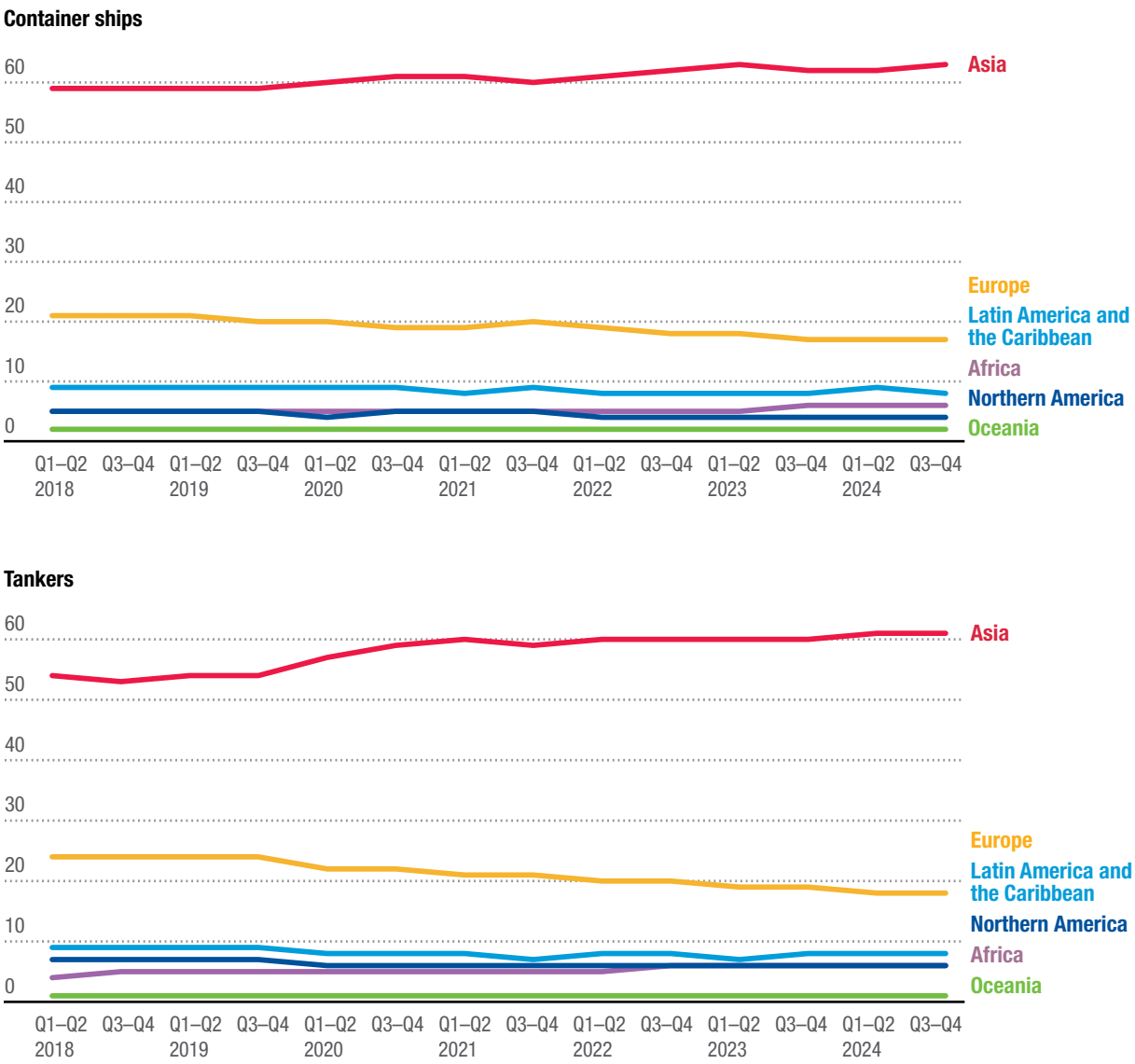
Note: Year-to-year changes are calculated for each semester separately. Vessels are restricted to 1,000 gross tonnage and above, excluding vessels without an IMO number. Port calls data are based on all instances of a vessel entering and leaving a defined port location, excluding cases where a vessel is not recorded as travelling at less than 1 knot, and combining multiple consecutive instances at the same port where the vessel has not left a buffered shape around the port or within the same day (in selected vessel sectors).

Attracting vessels powered by alternative fuels as part of a broader energy transition

As more shipping companies transition to alternative fuels to meet environmental regulations, they seek ports that offer reliable supporting infrastructure. This shift is part of a broader energy transition in the maritime sector, where decarbonization and sustainability are becoming central to operational strategies.

By investing in infrastructure for alternative fuels, ports not only support cleaner shipping but also position themselves as forward-looking hubs in the global logistics network. Ports that provide these services gain a competitive edge over others and are more likely to be included in shipping routes.

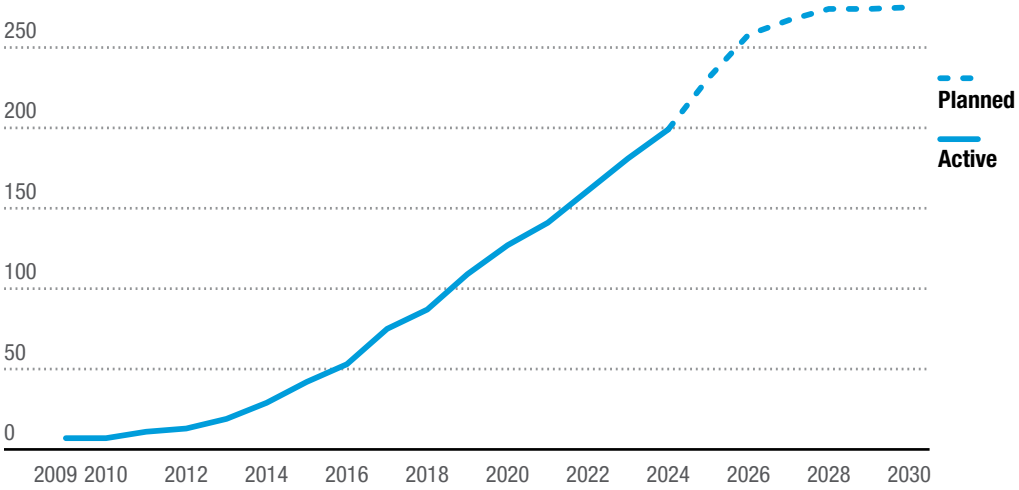
Figure IV.2
Port calls for container ships and tankers
(Percentage of total)



Source: UNCTAD, based on data provided by Clarksons Research.

Note: Vessels restricted to 1,000 gross tonnage and above, excluding vessels without an IMO number. Port call data are based on all instances of a vessel entering and leaving a defined port location, excluding cases where a vessel is not recorded as travelling at less than 1 knot, and combining multiple consecutive instances at the same port where the vessel has not left a buffered shape around the port or within the same day (in selected vessel sectors).

Figure IV.3
Ports providing LNG bunkering services
(Number)



Source: UNCTAD, based on data provided by Clarksons Research, May 2025.

Note: Number of active ports reportedly able to provide an LNG bunkering service. Planned ports include those that reported start-up dates for planned LNG bunkering facilities as of May 2025.

As one example, the number of ports offering LNG bunkering services continued to increase in 2024, reaching almost 200 ports, a figure expected to grow further in coming years (figure IV.3).

2. Liner shipping connectivity

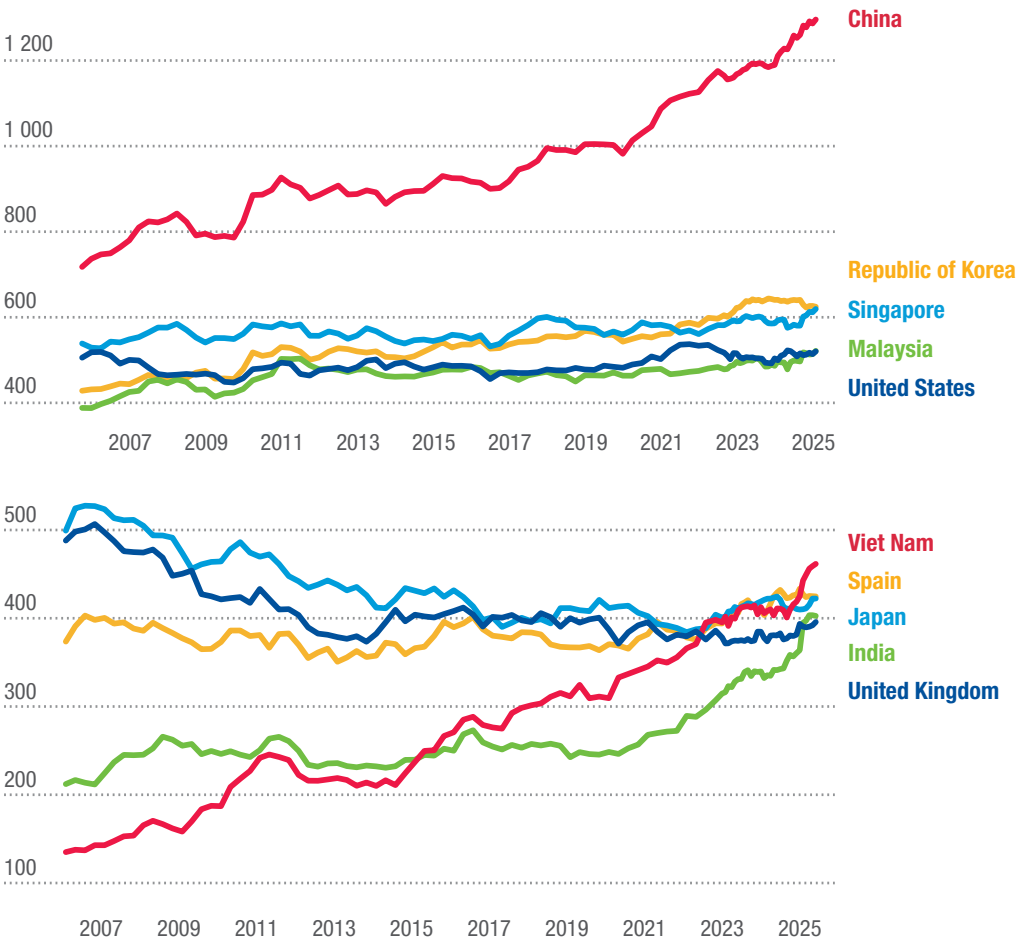
The LSCI, developed by UNCTAD and regularly featured in this publication, is an important indicator to assess how well countries, or individual ports, are integrated into the global network of containerized maritime transport. Enhanced connectivity contributes to supply chain resilience, enabling access to a broader range of trade routes and partners. This diversification reduces dependency on any single route or market, making it easier to adapt to disruptions.

Asian countries extend their lead in shipping connectivity; India breaks into the top 10

As of June 2025, 7 of the top 10 most connected countries, as measured by the LSCI, were in Asia. In order of connectivity, the top four were China, the Republic of Korea, Singapore and Malaysia. The remaining six were the United States, Viet Nam, Spain, Japan, India and the United Kingdom (figure IV.4).

From June 2024 to June 2025, India recorded the biggest increase in LSCI scores at an impressive 18 per cent. This was mainly driven by a surge in the maximum vessel size, which reached over 24,000 TEUs in the Mundra, Nhava Sheva and Vizhinjam ports, and an increase in deployed capacity. Viet Nam's LSCI jumped by 12 per cent, reflecting more direct calls and deployed capacity, while in China, the LSCI score rose by 7 per cent due to an expansion in deployed capacity.

Figure IV.4
Top 10 countries on the Liner Shipping Connectivity Index



Source: UNCTAD, based on data provided by MDS Transmodal, June 2025. See also the UNCTADstat Data Centre at https://unctadstat.unctad.org/datacentre/.

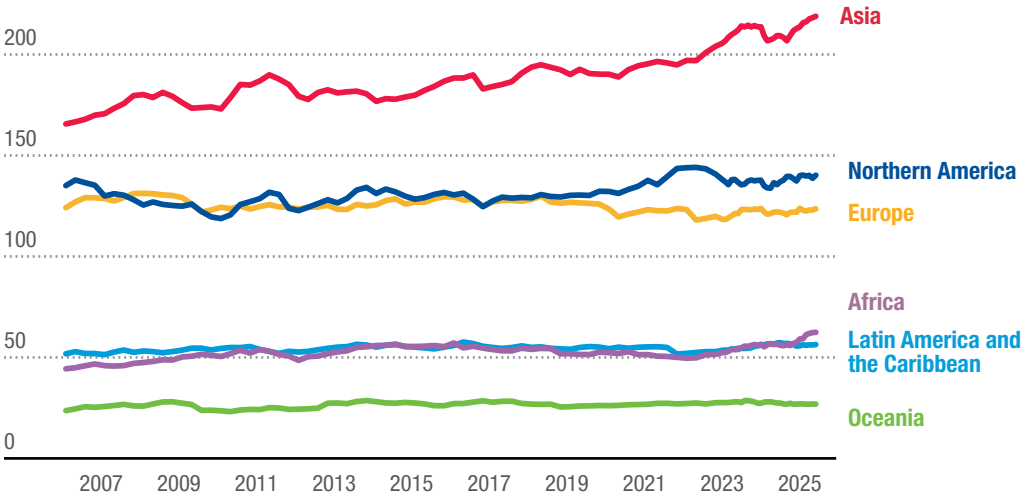
Note: The index is set at 100 for the average value of country connectivity in February 2023.

Africa and Asia increased liner shipping connectivity over the last 12 months

As of June 2025, from highest to lowest average connectivity, Asia, Northern America and Europe remained the best-connected regions globally, according to the LSCI. Africa recorded the most significant improvement from June 2024 to June 2025, however, with an average increase of 10 per cent. The route reconfiguration caused by the Red Sea crisis contributed to this expansion. Asia saw the second-best improvement over the same period; its LSCI score edged up 5 per cent (figure IV.5).

Among African nations, Cameroon, Mauritania and Namibia made the most notable progress. Cameroon saw a remarkable 54 per cent increase in its LSCI score. This was primarily driven by the port of Kribi, with a threefold increase in the maximum vessel size calling, from almost 9,000 to over 24,000 TEU. It saw similar growth in deployed capacity (Maritime Executive, 2025). Mauritania and Namibia followed, both with a 43 per cent increase.

Figure IV.5
Average Liner Shipping Connectivity Index value by region



Source: UNCTAD, based on data provided by MDS Transmodal, June 2025. See also the UNCTADstat Data Centre at https://unctadstat.unctad.org/datacentre/.

Note: The index is set at 100 for the average value of country connectivity in February of 2023. For countries with no liner shipping connections, values are assumed to be zero to better reflect lost connectivity. Countries with no liner shipping connections for the entire period are excluded from the averages.

3. Time and performance in port operations

In 2024, operational slowdowns, deteriorating cargo handling performance and deepening global logistics bottlenecks challenged ports.

Stable turnaround times but not for container ships

In 2024, most vessel categories maintained consistent median port turnaround times, similar to 2023. Dry bulk carriers averaged 2.7 days, dry breakbulk carriers 0.9 days and tankers 1.5 days. Container ships observed a noticeable uptick, however, reversing the prior downward trend to reach 0.8 days by the end of 2024 (figure IV.6).

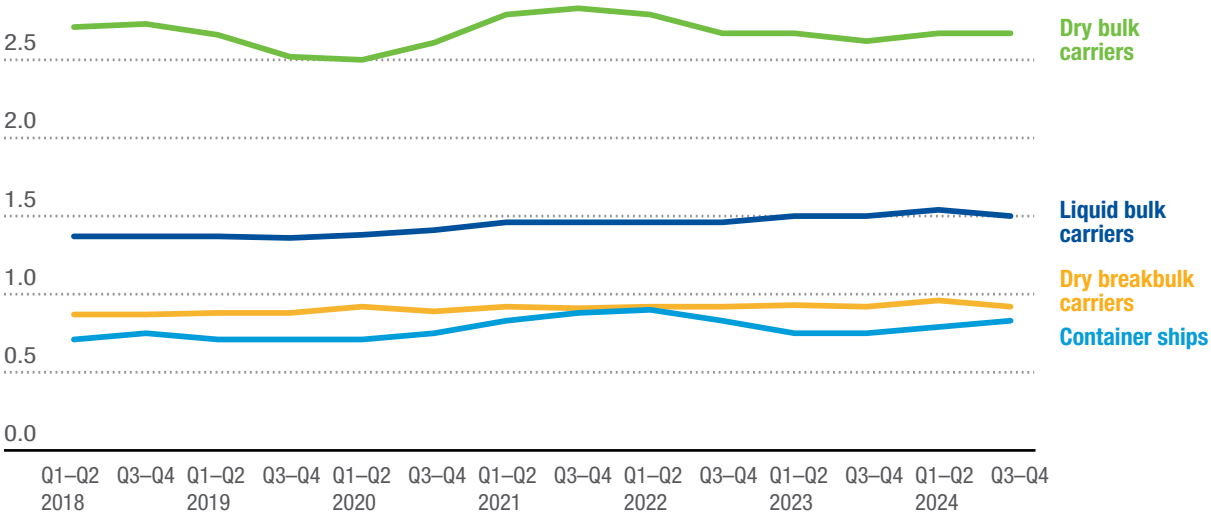
Port congestion is growing globally

In recent years, geopolitical disruptions, shifting trade patterns and capacity constraints have driven port congestion. One way to measure it is to examine vessel waiting time (i.e., the time between a vessel's arrival at the anchorage area and its berthing at the terminal). The average waiting time, after some easing in 2023, started to increase in 2024, reaching 6.4 hours on average in developed countries and 10.9 hours in developing countries in December 2024. This was up from 5.2 and 10.2 hours, respectively, in December 2023 (figure IV.7).

Container handling time is rising

Container handling efficiency can be assessed by examining the time required to move a container. This typically decreases with increases in call sizes due to the ability to run parallel operations, the presence of automation in major ports, and the generally faster nature of transshipment activities, which are more common in large calls. Container handling is also influenced by trade patterns, as ports primarily geared towards bulk cargo operations may exhibit lower performance in containerized cargo handling.

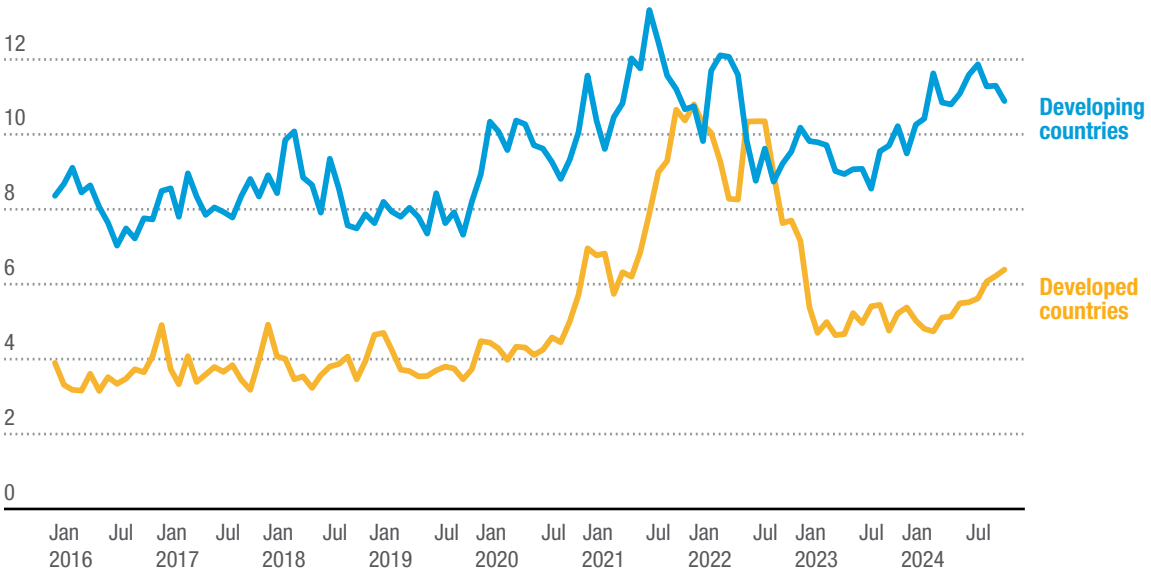
Figure IV.6
World median time in port
(Days)



Source: Clarksons Research, March 2025.

Note: Vessels restricted to 1,000 gross tonnage and above, excluding vessels without an IMO number. Port calls data are based on all instances of a vessel entering and leaving a defined port location, excluding cases where a vessel is not recorded as travelling at less than 1 knot, and combining multiple consecutive instances at the same port where the vessel has not left a buffered shape around the port or within the same day (in selected vessel sectors).

Figure IV.7
Average waiting time for container ships in port
(Hours)



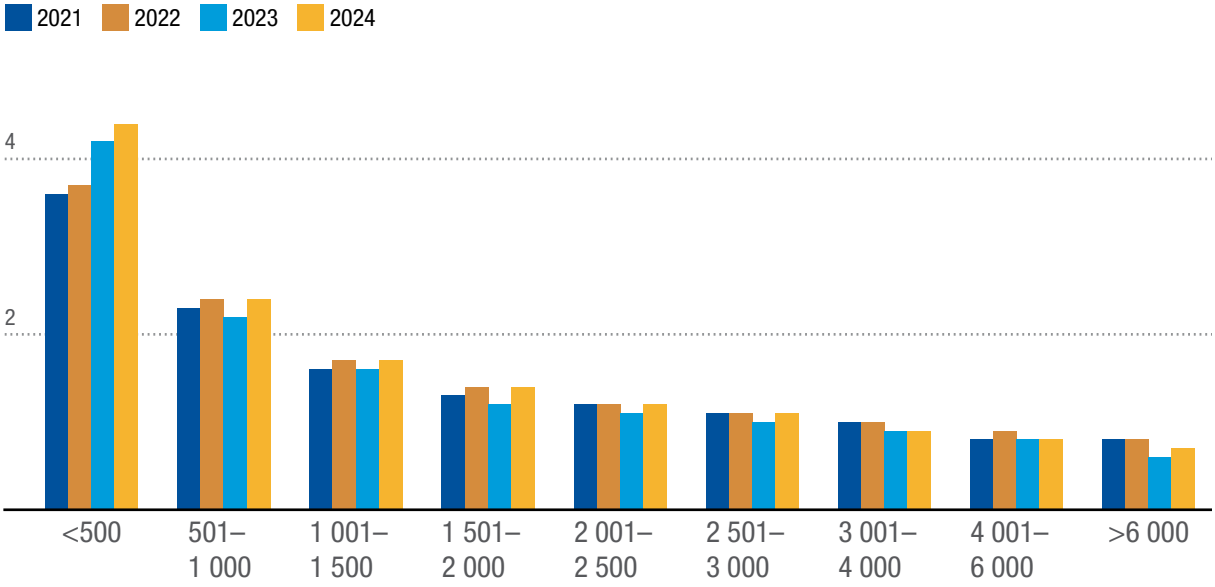
Source: Clarksons Research, March 2025.

Notes: Waiting time estimates are based on the time between the vessel first entering an anchorage associated with a port group (or a port where the vessel has not been seen in an anchorage shape) and it first entering a berth in the port.

In 2024, a noticeable slowdown took place. Among the top 25 economies by number of port calls, the average handling time increased across all categories. For the smallest call size category of under 500 container moves, performance has constantly dropped since 2021, reaching over 4 minutes and 20 seconds per container move in 2024 (figure IV.8).

Among the 25 economies, the highest performers in 2024 were all in Asia (table IV.1). Hong Kong, China achieved the fastest handling times across all call size categories, except for the largest (exceeding 6,000 container moves). Viet Nam was the top performer across all five categories above 2,000 moves, with China and Malaysia following closely and both showing the highest efficiency in three categories involving more than 3,000 moves. Other leading performers were Japan, Singapore and Taiwan Province of China.

Figure IV.8
Average time to move a container
(Minutes)



Source: UNCTAD, based on data provided by the S&P Global Port Performance Program, May 2025.

Note: Includes the top 25 economies by number of port calls. The figure contains nine call size categories based on the total number of containers moved during a port call, regardless of container size, ranging from under 500 moves (first category) to over 6,000 moves (last category).

Table IV.1
Average time to move a container per port call, top 25 economies, 2024
(Minutes)

Economy	<500	501–1 000	1 001–1 500	1 501–2 000	2 001–2 500	2 501–3 000	3 001–4 000	4 001–6 000	>6 000
China	3.5	2.0	1.3	0.9	0.8	0.7	0.6	0.5	0.4
United States	4.1	2.4	2.0	1.8	1.6	1.5	1.3	1.1	0.8
Singapore	3.6	1.8	1.3	1.0	0.9	0.8	0.7	0.6	0.4
Republic of Korea	2.8	1.6	1.2	1.0	0.8	0.8	0.7	0.6	0.5
Brazil	5.6	3.1	2.5	2.0	1.7	1.6	1.6	1.3	-
Malaysia	3.3	2.0	1.4	1.1	0.8	0.8	0.6	0.5	0.4
Spain	4.5	2.4	1.6	1.0	1.0	0.8	0.8	0.9	0.8
Japan	2.5	1.4	1.1	1.0	1.0	0.9	1.2	-	-
Germany	5.7	2.5	1.8	1.6	1.2	1.1	1.0	0.9	0.9
Belgium	4.9	2.7	1.8	1.4	1.1	1.0	1.0	0.9	0.9
Hong Kong, China	2.5	1.4	1.0	0.8	0.7	0.6	0.6	0.5	0.5
United Kingdom	4.8	2.7	1.8	1.5	1.3	1.1	1.1	0.9	0.8
United Arab Emirates	4.9	2.8	1.9	1.6	1.2	0.8	0.7	0.7	0.6
Taiwan Province of China	2.9	1.6	1.1	0.8	0.8	0.7	0.6	0.6	0.6
Panama	6.5	3.4	2.4	2.0	1.9	1.4	1.0	1.1	1.2
Türkiye	4.3	2.3	1.7	1.5	1.3	1.1	1.0	0.9	-
Kingdom of the Netherlands	7.4	3.3	2.1	1.6	1.3	1.1	1.0	0.8	0.7
India	3.5	2.3	1.3	1.0	0.8	0.8	0.8	0.7	-
Viet Nam	2.7	1.6	1.1	0.9	0.7	0.6	0.6	0.5	0.4
Australia	6.3	3.3	2.4	1.9	1.7	1.5	1.3	1.3	1.0
Italy	5.3	2.9	2.1	1.6	1.7	1.6	1.4	1.2	1.0
France	4.5	2.6	1.9	1.5	1.3	1.4	1.1	0.8	-
Thailand	3.8	2.5	1.3	1.0	0.9	0.9	0.7	0.7	0.6
Indonesia	4.4	2.2	1.7	1.3	1.1	1.0	0.9	0.9	-
Philippines	4.9	3.7	3.1	2.3	1.8	1.7	1.3	0.8	-
Average	**4.4**	**2.4**	**1.7**	**1.4**	**1.2**	**1.1**	**0.9**	**0.8**	**0.7**

Source: S&P Global Port Performance Program, May 2025.

Note: Includes nine call size categories based on the total number of containers moved during a port call, regardless of container size, ranging from under 500 moves (first category) to over 6,000 moves (last category).

In 2025, the United States proposed tariffs on Chinese-made cranes and other cargo-handling equipment. While the proposed tariffs are still undergoing consultations (see chapter II, box II.1), port operators have expressed concern that the proposals would increase the costs of much needed infrastructure upgrades (National Association of Manufacturers, 2025).

B. TrainForTrade Port Performance Scorecard

1. The need for and challenge of port performance

The port environment, much like international trade and maritime transport as a whole, is becoming increasingly volatile. Changing geopolitical dynamics, the inherently global nature of maritime logistics and the growing impacts of global disruptions demand that ports become more adaptable. To improve resilience and maintain business continuity, ports must evolve to respond to these complex and shifting challenges.[2]

In a changing environment, gaining insights into the operational landscape is crucial to understand how ports are proceeding towards their strategic goals. Performance monitoring is key to assess efficiency and effectiveness, support informed decision-making, and safeguard long-term resilience and competitiveness.

Each port is unique, yet all face similar challenges. Understanding how the port sector is responding and how individual ports perform in comparison to others provides a valuable perspective on the effectiveness of current strategies and policies. The complex nature of port operations and performance tracking, however, may make it difficult to identify the right indicators. Even more challenging is accessing timely and relevant data for meaningful comparisons.

A lack of global tools for benchmarking port performance and conducting meaningful analysis remains a consistent challenge for the port industry, despite growing need. Responding to the magnitude of the gap, ports participating in the TrainForTrade Port Management Programme network launched the Port Performance Scorecard (PPS) in 2012. This tool was designed to support performance measurement and help assess how participation in the network has contributed to each port's overall development (UNCTAD, 2025a and 2025b).

2. Leveraging the Port Performance Scorecard

Following a series of conferences and workshops, an effort guided by port managers for port managers, the TrainForTrade network helped to define a common set of 26 indicators. These address key areas of port management in six categories: finance, human resources, gender, vessel operations, cargo operations and the environment (table IV.2).

The PPS tool collects data in a secure and confidential manner, offering meaningful benchmarks at the global, regional and national levels. Each participating port receives a comprehensive scorecard, while aggregated data provide valuable insights into broader trends. The scorecard is periodically reviewed and enhanced with new analytical features, reflecting a commitment to continuous improvement.

The PPS covers 76 ports; 11 are in Africa, 15 in the Americas, 8 in Asia and 42 in Europe.[3] This diverse global sample reflects a wide range of port governance structures and operational models. As the network grows and more ports contribute data (box IV.1), benchmarking results, based on comparable data, have become increasingly robust and representative.

[2] One major challenge for ports is climate resilience and adaptation, yet measuring related performance is difficult due to the limited availability of data. For further information, see PIANC, 2024 and UNCTAD, 2017 and 2025c.

[3] The number of ports reporting data to the PPS platform is not the same each year. Data are presented without using missing data imputation.

Table IV.2
Median scores on the Port Performance Scorecard

	Indicator	2016	2017	2018	2019	2020	2021	2022	2023	2024
Finance	EBITDA/revenue (operating margin) (percentage)	49.7	44.8	50.4	46.2	44.3	45.5	44.1	45.7	47.9
	Labour/revenue (percentage)	19.0	19.0	18.0	19.1	23.8	21.3	19.5	19.2	18.9
	Vessel dues/revenue (percentage)	17.5	19.7	20.3	18.2	18.2	17.9	19.9	18.5	19.5
	Cargo dues/revenue (percentage)	28.3	27.8	24.3	26.3	26.3	25.9	24.1	22.3	21.7
	Concession fees/revenue (percentage)	20.0	19.8	20.8	22.5	24.4	23.6	21.0	22.0	25.6
	Rents/revenue (percentage)	3.1	2.7	3.4	2.8	3.3	2.8	3.6	2.3	1.0
Human resources	Tonnes/employee (thousands of tonnes)	33.9	37.2	45.5	42.6	37.9	45.9	44.9	37.9	37.3
	Revenue/employee (thousands of United States dollars)	164.3	155.0	175.0	199.0	178.0	225.4	247.8	222.9	184.3
	EBITDA/employee (thousands of United States dollars)	70.5	67.5	81.5	86.5	69.9	80.1	111.7	91.9	75.3
	Labour cost/employee (thousands of United States dollars)	35.0	36.5	39.4	40.9	41.2	44.6	43.5	44.9	43.4
	Training cost/wages (percentage)	0.8	1.0	1.1	0.8	0.3	0.3	0.3	0.5	0.5
Gender (female participation rate)	All categories (percentage)	12.4	12.9	15.7	15.2	15.9	17.3	17.7	18.1	18.6
	Management (percentage)	28.3	26.3	30.0	32.2	33.3	33.3	34.1	37.3	39.1
	Operations (percentage)	12.4	12.0	11.6	14.0	14.3	12.5	15.9	17.1	20.7
	Cargo handling (percentage)	0.0	3.1	5.9	1.3	0.0	1.0	0.5	1.2	1.7
	Other employees (percentage)	28.6	24.8	26.6	29.3	27.4	25.8	22.0	28.6	24.6
Vessel operations	Average waiting time (hours)	5.0	8.6	14.4	9.8	10.1	5.9	8.2	8.7	13.4
	Average gross tonnage per vessel (thousands of tonnes)	15.2	14.5	15.5	15.5	14.4	16.2	19.8	17.9	18.2
	Oil tanker arrivals (percentage)	6.9	8.2	8.5	9.2	11.0	11.4	9.3	7.7	7.3
	Bulk carrier arrivals (percentage)	7.0	6.9	7.2	7.1	7.6	7.7	7.8	8.4	7.1
	Container ship arrivals (percentage)	11.9	12.8	12.6	13.7	14.0	13.6	12.3	13.3	14.0
	Cruise ship arrivals (percentage)	2.3	2.6	2.2	1.6	0.2	0.4	1.6	2.7	3.4
	General cargo ship arrivals (percentage)	18.9	16.3	18.3	19.3	20.5	19.0	19.7	14.8	15.6
	Average of other ship arrivals (percentage)	14.2	12.0	20.3	15.7	14.7	11.2	13.8	14.7	13.0
Cargo operations	Average tonnage per arrival (all ships) (thousands of tonnes)	4.2	5.7	5.1	5.4	5.5	5.2	4.9	4.5	6.0
	Tonnes per working hour, dry or solid bulk	225.0	212.5	234.7	171.0	228.6	184.5	151.4	124.2	272.0
	Tonnes per hour, liquid bulk	472.3	221.6	171.1	154.0	150.0	201.8	242.7	93.8	113.5
	Container lifts per ship hour at berth	22.2	26.4	18.3	20.4	19.2	20.0	14.7	15.1	18.1
	Average container dwell time (days)	5.0	4.0	4.6	5.0	5.0	5.0	4.8	4.2	3.1
	Thousands of tonnes per hectare (all cargo)	53.5	52.4	49.3	52.7	49.7	49.6	50.6	54.4	52.2
	Thousands of tonnes per berth meter (all cargo)	1.6	2.0	2.3	2.3	2.0	2.1	1.9	1.5	1.2
	Thousands of passengers on ferries	192.0	259.2	183.4	204.9	59.4	67.6	195.0	290.3	211.2
	Thousands of passengers on cruises	21.4	23.9	31.8	28.1	0.9	1.5	18.4	26.1	26.7
Environment	Investment in environmental projects/ total CAPEX (percentage)	0.0	1.3	1.2	0.8	0.1	0.5	0.3	0.6	2.6
	Environmental expenditures/revenue (percentage)	0.0	0.2	0.2	0.7	0.3	0.2	0.5	0.2	0.2
	Number of entities reporting	54	60	63	64	63	70	70	55	52

Source: UNCTAD calculations, based on data from 76 ports reporting on the PPS, June 2025 (UNCTAD, 2025a).

Note: Data were summarized without using missing data imputation. EBITDA refers to earnings before interest, taxes, depreciation and amortization; CAPEX denotes capital expenditure.

This empowers port managers to compare performance against global standards and apply insights gained to set strategic objectives and align operations with international best practices.

Port performance should not be viewed in isolation. It should be assessed within a broader framework that includes environmental considerations, social dynamics and the port's relationship with the surrounding city. An example from the Port of Santander offers valuable insights into this integrated approach (box IV.2).

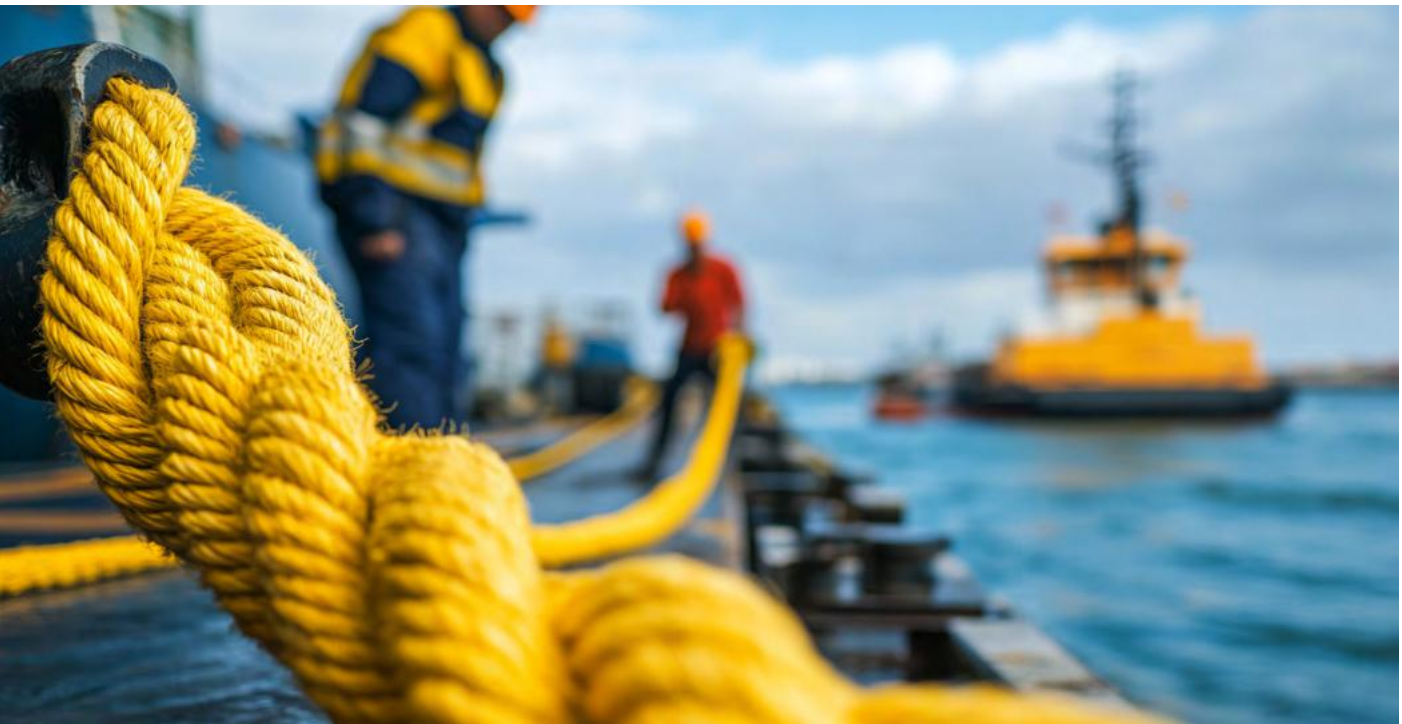
Box IV.1
The Spanish port system joins the Port Performance Scorecard

Since 2024, under a memorandum of understanding between Puertos del Estado and UNCTAD, the Spanish port system has been providing data on domestic ports to the PPS. This collaboration marks another milestone in the development of the scorecard, expanding the group of reporting ports by 28 Spanish port authorities in charge of 46 ports.

The Spanish port system comprises ports of different sizes, volumes and specializations. Among them are some of the major container ports in Europe (Valencia, Algeciras, Barcelona and Las Palmas), bulk ports (Gijon, Cartagena and Tarragona) and multipurpose ports (Santander, Bilbao and Malaga). Every year, they handle over 500 million tons or 55 per cent of all Spanish exports and 76 per cent of imports. They generate around 250,000 job opportunities and have an economic impact (direct, indirect and induced) of over 24 billion euros (Puertos del Estado, 2024 and 2025).

Since 2022, the Spanish port system has followed a strategic framework that focuses on three main areas – economic, environmental and social. These are broken down into more detailed strategic priorities, objectives and indicators to measure progress (Puertos del Estado, 2022). Benchmarking tools enable Spanish ports to evaluate their performance through comparison with ports in and outside the region.

Source: Puertos del Estado, based on cited sources.



Box IV.2
The quest for efficiency in the Port of Santander, Spain

The effectiveness of a sustainable seaport cannot be determined by its speed of operations alone. It is essential to consider its relationship with the surrounding city, including contributions to economic growth, urban health and climate resilience. For decades, ports functioned as an independent industrial sector isolated from urban areas. Today, the port-city environment should be considered an ecosystem that encompasses exchanges of goods, energy and data, all while upholding human well-being. The 2025–2030 Strategic Plan of the Port Authority of Santander aligns with this vision in accordance with the Strategic Framework of the Port System of General Interest. The plan outlines three dimensions – social, economic, and environmental – along with criteria for efficiency, safety, connectivity, digitalization, innovation, sustainability and transparency.

From an operational perspective, efficiency means shortening port calls and reducing costs. From a sustainability point of view, efficiency also means reducing negative impacts on the environment. Port electrification and the use of renewable energy sources, for example, help to reduce emissions while berthing. These initiatives, coordinated with urban planning, such as through renewable microgrids that supply the port and surrounding districts, help promote decarbonization in the logistics and residential sectors. The Port of Santander already offers bio-LNG for vessels and is expected to introduce its first shore power supply system. Furthermore, the port participates in the Bahía H_2 Offshore project to examine the offshore production of green hydrogen and ammonia for consumption and ship provisioning.

Smart port platforms monitor real-time maritime and land traffic to optimize traffic flow by managing the arrivals of trucks and trains and reducing congestion at access points. These “digital twins” can be integrated into local mobility systems to reprogramme traffic lights or redirect flows as needed. In line with this approach, the Port Authority of Santander is implementing predictive big data analytics to monitor the quality of air, water and soil. The system is designed to work with data from the Santander City Council.

Port-city committees, composed of port authorities, city councils, businesses and other stakeholders, help transform innovative ideas into tangible projects such as green corridors, low-emissions zones and parks on former docks. The Port Authority of Santander and the city council have established a joint project through the Permanent Port-City Forum, which was divided into three departments: Territorial and Infrastructure Development and Coordination, Social Cohesion and Smart Port District.

Measuring and communicating results upholds transparency, which in turn strengthens the port’s social legitimacy. Shared indicators – on the carbon footprint, air quality, logistics productivity and economic impact – demonstrate that sustained efficiency enhances competitiveness. A port city that uses an environmental and economic dashboard is more likely to foster trust, attract investors and serve as a strategic maritime hub.

In summary, to enhance efficiency as part of sustainable port management, it is crucial to promote the development and intersection of technological innovation, the energy transition, urban planning and public engagement. By bridging logistical and urban interests, port cities can foster a dynamic ecosystem that builds resilience to climate change and contributes to the sustainable future of the city.

Source: Port of Santander.

3. Resilient recovery and operational strength

Traffic trends over the last few years indicate that ports have yet to fully recover from COVID-19 pandemic and other supply chain disruptions. Port-related revenues are gradually returning to pre-crisis levels, as throughput across the network rebounds at a comparable rate (figure IV.9).

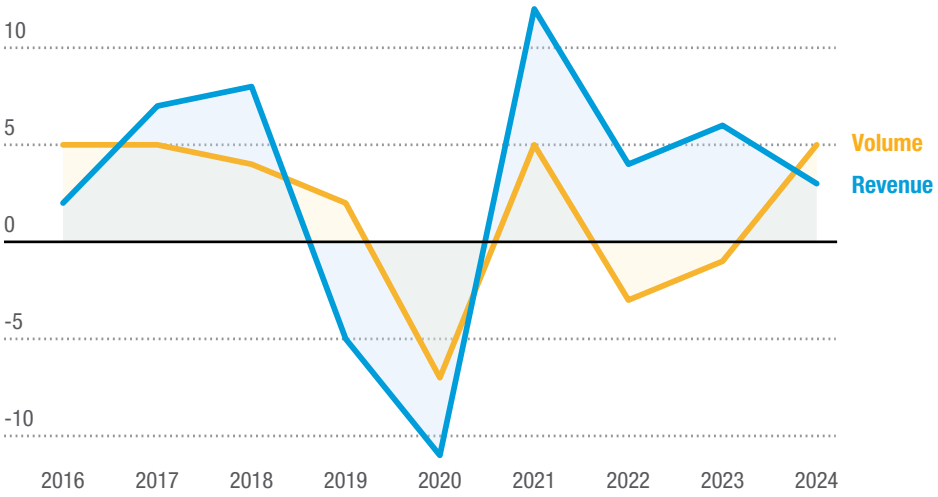
The operating margin – measured as earnings before interest, taxes, depreciation and amortization – has remained consistently strong within the TrainForTrade network, reaching 48 per cent in 2024 (figure IV.10). This reflects high operational efficiency, even amid fluctuating port throughputs. Such resilience signals that ports have a robust capacity to maintain operations and adapt effectively to disruptions and external shocks.

4. Evolving revenue streams and need for human capital investment

The landlord port governance model, where port authorities manage the infrastructure and private operators handle the port operations, is the predominant operating approach among ports under the PPS; over 60 per cent are structured this way.

This distribution aligns with the composition of revenue streams that support port financing. A significant portion of income, between 45 and 50 per cent, still comes from direct port dues, including charges on vessels and cargo. Yet there is a noticeable trend of growing contributions from concessions and property-related income, which represented 24 per cent in 2024 (figure IV.11). This long-term shift is linked to the increasing role of public-private partnerships in port operations, with responsibilities progressively transferred to private entities and an associated rise in investment.

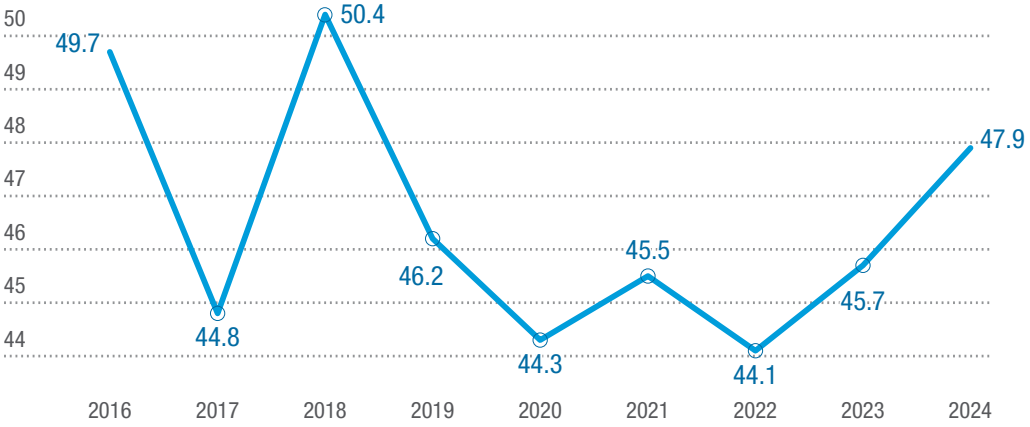
Figure IV.9
Median annual change in port volume and revenue
(Percentage)



Source: UNCTAD calculations, based on data from 76 ports reporting on the PPS, June 2025 (UNCTAD, 2025a).

Note: Volume and revenue values are calculated as median year-to-year percentage changes across all ports to minimize bias due to data availability from reporting ports. Data are summarized without using missing data imputation.

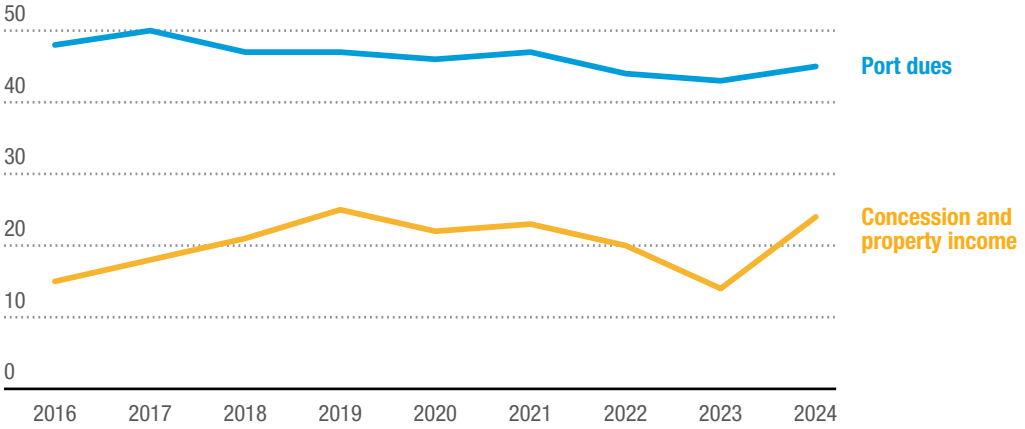
Figure IV.10
Median operating margin as a proportion of revenue
(Percentage)



Source: UNCTAD calculations, based on data from 76 ports reporting on the PPS, June 2025 (UNCTAD, 2025a).

Note: Operating margin is measured as earnings before interest, taxes, depreciation and amortization. Values are calculated as median year-to-year percentage changes across all ports to minimize bias due to data availability from reporting ports. Data are summarized without using missing data imputation.

Figure IV.11
Median port dues and concession and property income as a proportion of revenue
(Percentage)

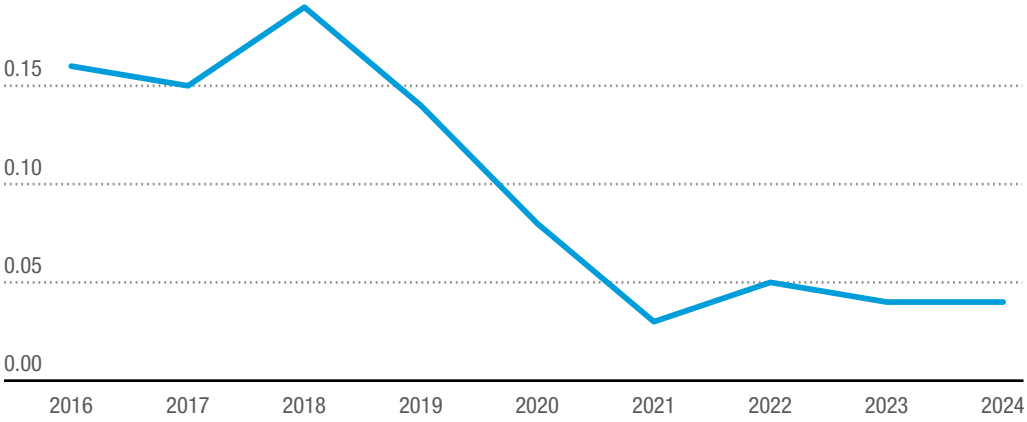


Source: UNCTAD calculations, based on data from 76 ports reporting on the PPS, June 2025 (UNCTAD, 2025a).

Note: Port dues comprise vessel and cargo dues. Data are summarized without using missing data imputation.

Ports are still rebuilding their investment in human capital, particularly in terms of training, which remains at 0.04 per cent as a proportion of revenue (figure IV.12). This marginal share might present a challenge, especially as the port workforce must rapidly adapt to upcoming demands driven by the energy transition, increasing digitalization and cybersecurity risks. Similar needs exist in the whole maritime sector; chapter II discusses the chronic shortage of skilled seafarers.

Figure IV.12
Median training costs as a proportion of revenue
(Percentage)



Source: UNCTAD calculations, based on data from 76 ports reporting on the PPS, June 2025 (UNCTAD, 2025a).

Note: Data are summarized without using missing data imputation.

5. Boosting women's participation in the port workforce

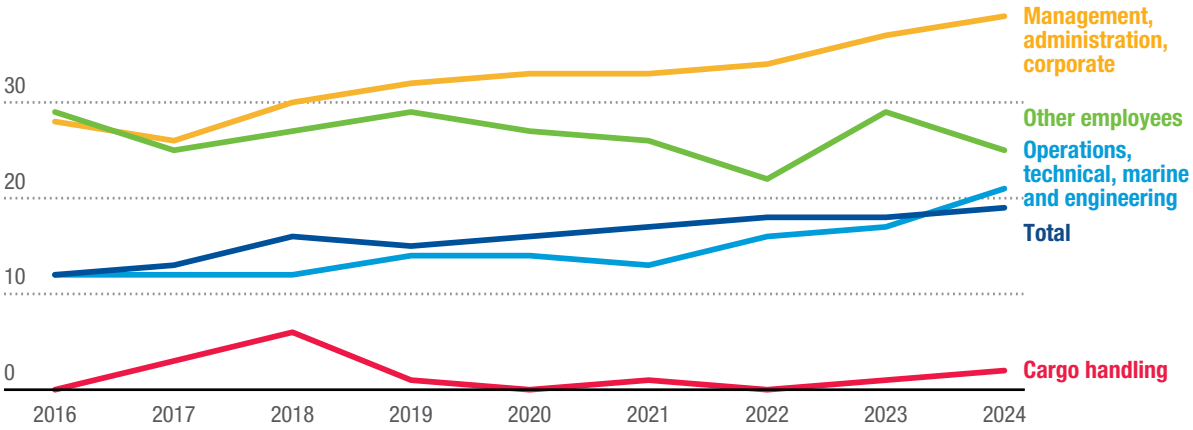
According to PPS data, while women remain underrepresented in most port-related occupations, there are signs of progress (figure IV.13). In 2024, women made up 19 per cent of the overall port workforce among reporting ports. In management and administrative roles, women held 39 per cent of positions, the highest share. In contrast, cargo handling remains the most challenging area for gender inclusion, with women accounting for only 2 per cent of the workforce.

Some progress, especially in managerial, technical, marine and engineering positions, may stem from programmes such as TrainForTrade (UNCTAD, 2025b), which has long supported the inclusion of women in port communities. By fostering an environment conducive to talent recognition and career growth, the programme has enabled many women to thrive. More and more participating ports are promoting staff who have earned the Port Management Certificate, reinforcing a merit-based approach. Over time, increased access to training for women has fostered the emergence of a new generation of top managers, contributing to a more balanced and inclusive workspace. The UNCTAD Port Management Series highlights these achievements through exemplary case studies from around the world, many authored or supervised by women.[4]

A persistent gender gap remains, however. There are significant opportunities to attract more women to the industry, particularly in male-dominated roles such as cargo handling and other operational positions beyond management and administration. With the move towards digitalized operations, options for women are expected to increase, helping to narrow the employment gap over time. The same pattern can be seen in the broader maritime sector, which includes both ports and shipping (box IV.3).

[4] See the website for the series. Available at https://tft.unctad.org/publications/port-management-series.

Figure IV.13
Women's median participation in port workforces
(Percentage)



Source: UNCTAD calculations, based on data from 76 ports reporting on the PPS, June 2025 (UNCTAD, 2025a).

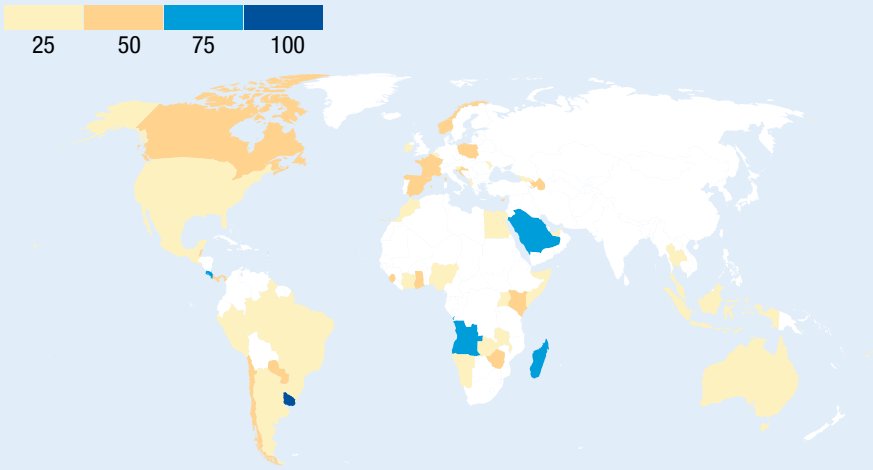
Note: Data are summarized without using missing data imputation.

Box IV.3
The need to address gender inequality in ports and shipping

The Women in Maritime Survey 2024, a joint initiative led by IMO and the Women's International Shipping and Trading Association (WISTA), highlights the persistent challenge of gender inclusion in the maritime industry (IMO and WISTA, 2024).

The survey collected data on the workforces of 88 IMO member States and 608 private sector organizations globally, covering almost 1 million professionals in a range of maritime roles. Female employees accounted for just under 19 per cent of the total workforce sampled (box map IV.3.1). They made up over 19 per cent of the public sector workforce and over 16 per cent in the private sector, excluding seafarers. Women comprised just 1 per cent of seafarers.

Box map IV.3.1
Share of women port staff in maritime administration and other institutions, 2024
(Percentage)



Source: UNCTAD calculations based on IMO and WISTA, 2024.

Note: Values for the 2024 survey are supplemented with data from the 2021 survey where available.

The report tracks women's representation in various roles and sectors. It found that women were more likely to work in newer sectors such as environmental, social and governance compliance and decarbonisation. Their participation in traditional sectors, including bunkering and legal services, was lower in 2024 than in the previous round of the survey in 2021 (IMO and WISTA, 2021). Female labour force participation also diverged by region. The Caribbean, Europe and the Pacific showed the highest female participation rates in both the public and private sectors, averaging between 22 and 27 per cent of the total workforce.

Gender equality in the maritime industry is far from being achieved due to numerous factors, such as negative stereotypes, insufficient family-friendly policies, workplace safety concerns and the gender pay gap. Challenges at sea are particularly pronounced, with insufficient protective gear designed for women, inadequate sanitary provisions and a lack of inclusive infrastructure. Safety remains a major concern (WISTA et al., 2022).

Designed to deliver real data on the state of gender diversity in maritime activities and to offer guidance on areas requiring attention, the Women in Maritime Survey also prioritizes the continuing need to create and nurture more inclusive environments. It adheres to Sustainable Development Goal 5, to achieve gender equality and empower all women and girls, and outlines strategies for inclusive recruitment, policies and leadership programmes that maintain a safe, supportive environment for women.

Source: WISTA, based on citied sources.

C. Maritime trade facilitation: Improving information and data collaboration

In times of uncertainty, disruption and port congestion, the importance of facilitated, efficient, sustainable and resilient maritime transport operations is ever more crucial. The need for transparency and predictability in maritime trade is even greater. Digitalization and information and communications technology increasingly contribute to the efficiency of maritime and ports systems by managing and exchanging information, which improves the flow of goods through ports.

1. Information and transparency are key in improving port and clearance efficiency

Port efficiency relies on collaborative information and data exchanges, among other core factors. Ports depend on receiving information related to vessels and shipments as early as possible prior to their arrival. Maritime authorities and customs and other border agencies can, on this basis, carry out relevant and efficient clearance and compliance controls. They can prepare for inspections of goods transiting through the port, towards releasing them for onward conveyance with minimum delays. A clear link exists between provisions on pre-arrival information exchange in international trade agreements and guidelines and the management of vessels arriving and leaving the port. Early information exchange supports more efficient management of shipments by port operators and border agencies, which reduces waiting and berth times and helps to avoid congestion.

Multilateral frameworks require technology in border and clearance procedures

The 1965 FAL Convention, as amended in 2022, is a key international legal instrument to facilitate maritime trade. Its main objectives are to prevent unnecessary delays in maritime traffic, aid cooperation among Governments, and secure the highest possible uniformity in formalities, document requirements and other procedures (IMO, 1965, articles III and IV). The annex of the FAL Convention, which was amended following a comprehensive review, includes standard 2.1.2, stipulating the obligation of public authorities to “develop procedures for the lodgement of pre-arrival and pre-departure information in order to facilitate the processing of such information for the expedited subsequent release/clearance of cargo and persons” (IMO, 2022).

The 2022 amendment, which entered into force on 1 January 2024, also makes it mandatory for public authorities to establish, maintain and use MSW systems for the electronic exchange of information required on the arrival, stay and departure of ships in ports. In addition, public authorities will need to combine or coordinate the electronic transmission of data so that information is submitted only once and reused to the maximum extent possible. As of June 2025, 42 countries had provided information on MSW implementation in the IMO Global Integrated Shipping Information System (IMO, 2025c). One example of a least developed country taking this step is Togo, with IMO assistance, for the Port of Lomé.[5]

IMO has adopted a number of specific initiatives to assist countries with MSW implementation. One of the main instruments is the IMO Compendium on Facilitation and Electronic Business. It provides guidance on harmonizing semantics and formats for all IMO-relevant information in the maritime domain, and compiles more than 950 data elements and 29 data sets. The latest version of the compendium, adopted by the FAL Convention Committee at its forty-ninth session in 2025 (IMO, 2025a), includes new data sets, such as the "Electronic Bunker Delivery Note", "Electronic Bill of Lading", "Transport of Dangerous Goods", "Container Inspection Programme" and "Fuel Consumption and CII Reporting".

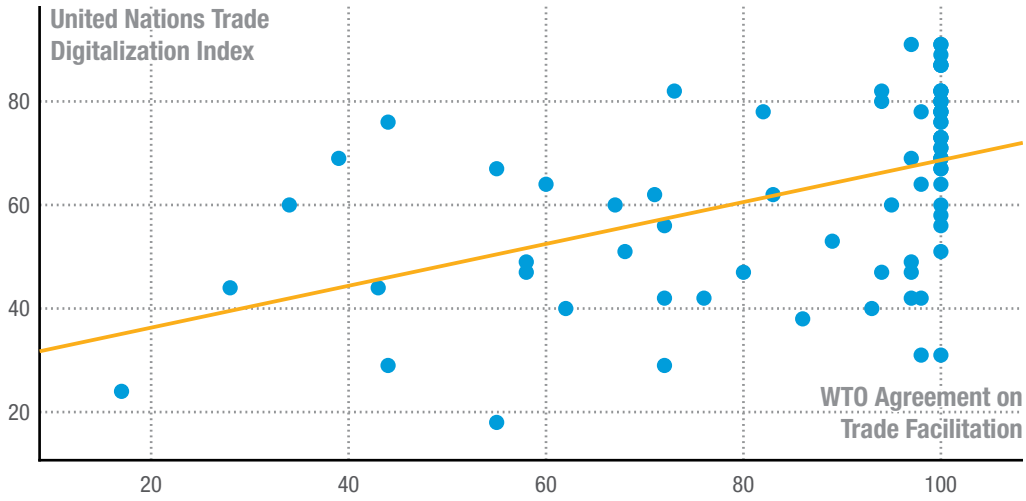
In parallel developments, article 10.4 of the WTO Agreement on Trade Facilitation obligates member States to implement TSWs to enhance import, export and transit procedures. To the extent possible, they should apply digital solutions such as the ones presented in box IV.4. Article 1 of the agreement requires providing transparent, accessible and up-to-date information to traders. Although it is not mandatory, many countries have decided to publish such trade information through centralized national trade portals attached to port systems. These show the value of communicating within port ecosystems and providing information to traders. The Abu Dhabi Port offers a good practice for information-sharing and transparency. It implemented a PCS in 2014 (Port of Abu Dhabi, 2025). In 2022, the TSW connected to Khalifa Port was upscaled to the Abu Dhabi Trade and Logistics Platform. It links to the Trade Information Portal and Abu Dhabi Export Gateway Portal.

While the importance of access to information seems evident, applying this principle consistently and sustainably in government agencies, in line with WTO and other requirements, requires financial and human capacities to implement, maintain and sustain information technology infrastructure and data. Many least developed countries, in particular, struggle to develop and operate such tools. Development partners can provide support through international expertise during the scoping process and assess the magnitude of financing needs for digital infrastructure. Under the Agreement on Trade Facilitation, article 1.2, on information available through the Internet, has among the lowest rates of implementation by the least developed countries, at only 56.8 per cent. TSWs in these countries have an implementation rate of only 37.8 per cent (WTO, 2025).

The United Nations Trade Digitalization Index (United Nations, 2023) shows a clear positive correlation with advances on the WTO Agreement on Trade Facilitation (figure IV.14).[6] Countries with lower Trade Facilitation Agreement implementation rates tend to have lower levels of trade digitalization. This finding supports the view that institutional and technological capacity is a key driver of progress in trade facilitation, particularly on electronic data exchange. Assistance and capacity-building, especially for the least developed countries, is essential.

[5] See more on the website of the Port of Lome, available at https://www.togo-port.net/.
[6] The index includes measures on paperless trade and cross-border paperless trade. See https://tdi.digitalizetrade.org/. The latest available data are from 2023.

Figure IV.14
Correlation between digitalization and trade facilitation
(Percentage)



Source: UNCTAD calculations, based on data from WTO, 2025; United Nations, 2023.

Note: Results are based on a data set including 85 countries. It was built by merging publicly available data on PCS and MSW implementation, compliance with the WTO agreement and logistics performance. It was restricted to developing and least developed countries with at least one international maritime port.

Box IV.4
Selected definitions of trade and customs information technology

Trade single window: "A facility providing trade facilitation that allows parties involved in trade and transport to lodge standardized information and documents with a single-entry point to fulfil all import, export, and transit-related regulatory requirements. Individual data elements should only be submitted once electronically" (UN-CEFACT, 2020).

Maritime single window: "A one-stop service environment that covers maritime and port administrative procedures, such as port entry/departure declaration, notice of security reports, and other related information between private sectors and public authorities nationwide. In other words, an MSW is a single window in the scope of maritime and port fields. Sometimes for some countries, an MSW may also serve as an NSW or trade single window/customs single window (TSW/CSW). Note that an MSW is called by different names in each area. For example, in ASEAN countries and Japan an MSW is called 'Port EDI system'» (IMO, 2025b).

Port community system: "A neutral and open electronic platform enabling intelligent and secure exchange of information between public and private stakeholders to improve the competitive position of the sea and airport communities; and optimizes, manages and automates port and logistics processes through a single submission of data and connecting transport and logistics chains" (IMO, 2025b).

Trade information portal: "An online tool aimed at improving transparency and supporting traders with completing trade-related requirements and formalities" (UNCTAD, 2022).

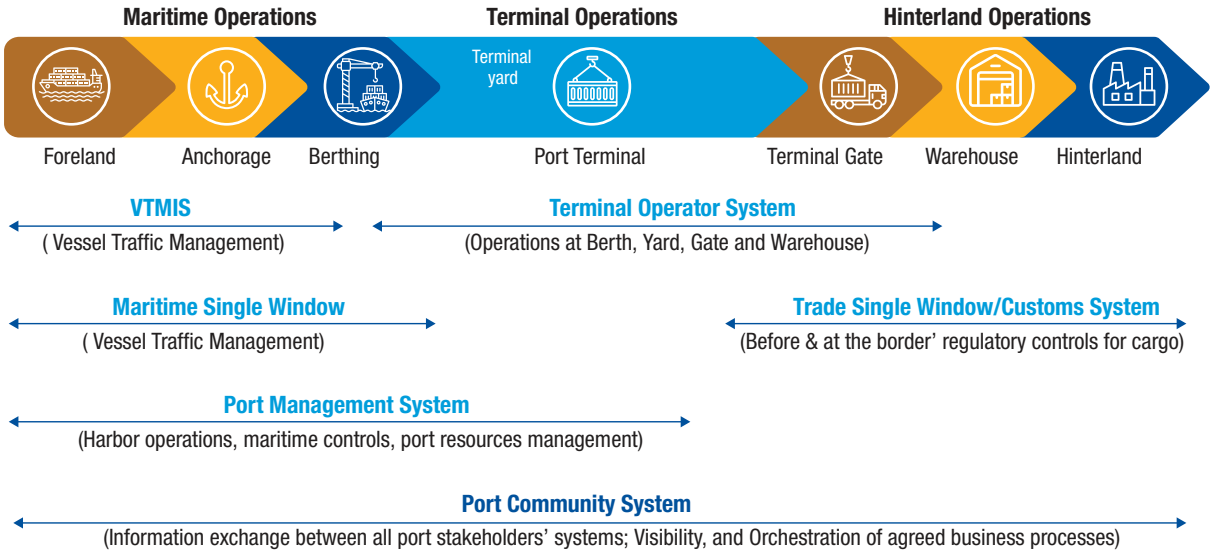
2. Data exchange, maritime single windows and port community systems

Data exchange is integral to all digital systems. In trade, administrative formalities are processed by customs and other border agencies, ideally via a TSW, prior to the arrival of goods at ports. In maritime transport, an MSW helps facilitate "ship clearance processes in ports for ships on international voyages in charge of the clearance of vessels" (World Bank and IAPH, 2023). A PCS manages the movement of cargoes at ports, and in some cases, beyond ports to the hinterland. As such, a PCS interconnects public and private stakeholders (port communities) based on holistic collaboration and cooperation. This covers business-to-business, business-to-government and government-to-business exchanges, and in some cases, government-to-government exchanges. Figure IV.15 illustrates the coverage of digital systems.

Information and data exchange are changing the business models of both maritime authorities and border agencies, encouraging more systematic change management and collaboration. Moreover, data exchange involves not only public agencies but also the business community (traders, shipping companies and logistics services). Public-private partnership is critical for port efficiency and maritime trade facilitation and may be supported by coordinating entities such as national trade facilitation committees.

Using new digital systems requires training staff from border agencies and allowing time to adapt to a new work environment. A change management strategy can guide a collaborative and holistic approach with other stakeholders, especially compared to past paper-based systems that were often managed by each agency in isolation. Continuous staff training programmes on new technologies respond to a constantly changing environment, as PORTNET in Morocco demonstrates (box IV.5).

Figure IV.15
Various operational management systems and their coverage



Source: World Bank and IAPH, 2023.

Box IV.5
The case of PORTNET in Morocco

In Morocco, PORTNET has implemented a PCS and MSW, linked to the TSW launched in 2008. The experience with the PORTNET single window is quite unique. It started in 2011 as an MSW, initially featuring three main modules: the maritime manifest, arrival notice and berth allocation request. In 2015, integration of the trade component began, progressively incorporating all government agencies responsible for issuing licenses, permits and authorizations.

Led by a high-level steering committee and technical committee composed of public and private sector representatives, including customs, a key partner in the project's success, PORTNET effectively manages all relevant operations and services related to trade facilitation. It improves the efficiency of the logistics chain and accelerates the passage of goods by automating procedures. It reduces risks and shortens processing times while enhancing visibility through statistics and reports.

PORTNET now manages 14 ports operated by the National Ports Agency, which supports foreign trade. Over time, it has evolved into a PCS incorporating business-to-business, business-to-government and government-to-business interactions. Platforms interface through electronic data exchanges, following international EDIFACT standards (United Nations rules on electronic data interchange for administration, commerce and transport), among others. Ongoing staff training through workshops and hands-on sessions bolsters practical understanding of new modules.

The single window currently offers over 120 services. For the PCS, it provides numerous services related to ship arrivals, operations and departures as well as elements necessary for coordinating and clearing goods and managing container movements within the ports. The platform integrates over 42 government agencies that issue licenses, approvals and authorizations required for import or export operations.

PORTNET handles over 5,000 transactions per day. In terms of customs declarations, approximately 70 per cent are for imports and 30 per cent for exports. The single window covers both maritime and air transactions, although maritime trade accounts for over 95 per cent of Morocco's imports and exports since the land border with the neighbouring country is closed. PORTNET's clients primarily include over 80,000 importers and exporters, over 99,000 users and approximately 1,800 customs brokers. In more than 95 per cent of cases, data are submitted only once.

Using the platform is mandatory, based on signing an agreement with the provider/agency to participate. For the maritime component, all standards align with the IMO Compendium on Facilitation and Electronic Business, which is integrated into the platform. Streamlined processes drastically reduce the time to obtain licenses and approvals. Real-time updates enhance transparency, which fosters trust in the system. Time-savings are evident in obtaining import licenses, where the paper-based procedure previously required approximately five days. The process now takes just three hours on average, eliminating numerous physical trips and cutting costs for businesses.

Crucial success factors have included strong community engagement among stakeholders, fostering a sense of belonging and collaboration among all participants, including importers, exporters, customs brokers, freight forwarders and government agencies. A comprehensive analysis of all foreign trade documents conducted by the Ministry of Trade and Industry at the beginning guided a streamlined and efficient process.

Source: IMO, 2025a.

Links between information technology, port efficiency and maritime trade facilitation

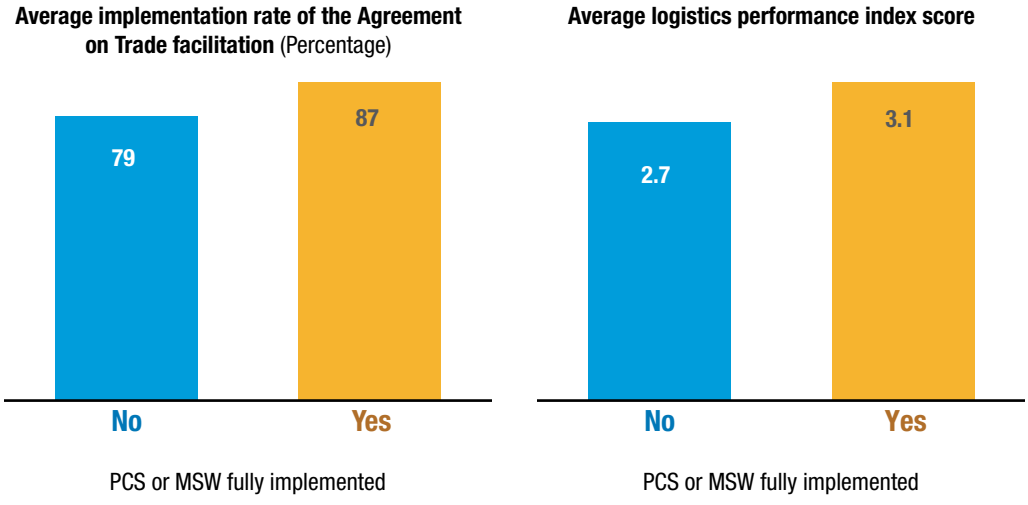
Using a sample of 85 countries with information on PCSs and MSWs, figure IV.16 compares countries that have and have not fully established a PCS and/or MSW. It presents both implementation rates on the WTO Agreement on Trade Facilitation and scores on the Logistics Performance Index (World Bank, 2023).

This preliminary research shows that countries with a PCS and/or MSW, on average, achieve significantly higher scores on trade facilitation implementation and most logistics and port performance indicators. Since the mandatory regulation on adopting an MSW is recent (January 2024), however, statistical findings are preliminary at this stage.

Among several countries and regions implementing a TSW, MSW, PCS or combination of these, examples from developing countries illustrating the benefits of a PCS include:

- India's PCS reduced ship turnaround time at major ports from 94 hours in fiscal year 2013–2014 to 48.06 hours in fiscal year 2023–2024, a 49 per cent reduction. Container dwell time dropped to 2.6 days in 2023, ship berth-day output improved by 52 per cent, and cargo handling capacity increased by 87 per cent in fiscal year 2023–2024 over 2014–2015.
- In Djibouti, the PCS reduced the number of manual processes from 9 to 5 and cut clearance time per consignment by 4–5 hours. An online booking now takes just 1–2 minutes, eliminating hours of queuing and manual paperwork. The terminal operator turnaround time has declined from 24 hours to 1 (World Bank, 2023; IPCSA, 2021).

Figure IV.16
Correlation between trade facilitation and port efficiency, and digital trade facilitation tools



Source: UNCTAD calculations, based on data from IMO, 2025a and the websites of the Agreement on Trade Facilitation, the World Bank Trade Logistics Performance Index and various ports.

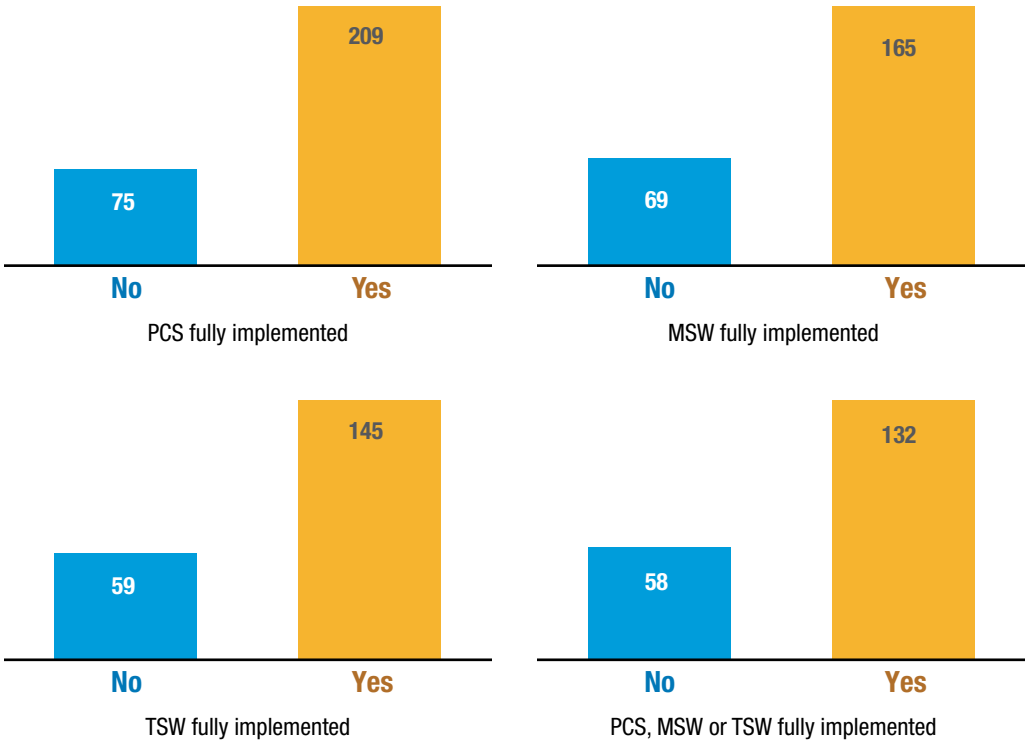
Note: Results are based on a data set including 85 countries. It was built by merging publicly available data on PCS and MSW implementation, compliance with the WTO agreement and logistics performance. It was restricted to developing and least developed countries with at least one international maritime port. Among the 85 countries, 31 have a PCS and/or MSW and 54 have neither, based on data available in 2023.

In Europe, the Port of Valencia in Spain and Haropa Port in France now use a port information system called S-WiNG, which is connected to the S)ONE PCS, illustrating the increasing digitalization of maritime activity.[7] PCSs have greatly improved trade facilitation at the entry to European Union territory, in compliance with European Union regulations that will apply from 15 August 2025[8] (European Union, 2010 and 2019).

Figure IV.17 shows how liner shipping connectivity at the country level, based on the LSCI in the first quarter of 2025, varies with the presence of a PCS, MSW or TSW in developing and least developed countries. On average, countries with such systems have significantly higher scores on the index than those without them, pointing to a strong association between digital trade facilitation tools and improved connectivity.

Figure IV.17
Correlation between connectivity and digital trade facilitation tools

Average liner shipping connectivity index



Source: UNCTAD calculations, based on data from IMO, 2025a and the websites of various ports.

Note: Results are based on a data set including 85 countries. It was built by merging publicly available data on PCS, MSW and TSW implementation. It was restricted to developing and least developed countries with at least one international maritime port. Among the 85 countries, 28 have a PCS, 44 have a MSW and 64 have a TSW fully implemented, based on data available in 2025.

[7] See the websites of the Port of Valencia, available at https://www.valenciaport.com/en/ports/valencia/the-port/; the Port of Haropa, available at https://www.haropaport.com/en; S-WiNG, available at https://www.havre-port.com/; and SOGET, available at https://www.soget.fr/en/sone-port-airport-community-system/./.

[8] Directive 2010/65/EU of the European Parliament and of the Council of 20 October 2010 on reporting formalities for ships arriving in and/or departing from ports of the Member States and repealing Directive 2002/6/EC Text with EEA relevance. Available at https://eur-lex.europa.eu/eli/dir/2010/65/oj/eng. Regulation (EU) 2019/1239 of the European Parliament and of the Council of 20 June 2019 establishing a European Maritime Single Window environment and repealing Directive 2010/65/EU. Available at https://eur-lex.europa.eu/eli/reg/2019/1239/oj/eng.

These results reflect a clear trend across multiple dimensions of trade facilitation and logistics performance. Namely, a holistic focus on trade and transport solutions and implementation tends to be more pronounced when digital systems are in place at the port. Data are not sufficiently pronounced, however, to establish a definitive causal relationship between port efficiency, liner shipping connectivity and digital systems, or to provide a basis for defining clear-cut policy implications without further econometric data.

3. New technologies and maritime traffic management

New technologies are increasingly integrated in digital port infrastructure

As indicated above, information technology and digitalization appear to advance port efficiency and improve procedures to clear goods at ports. Interoperable systems and processes among ports, regulatory agencies and the private sector enable the sharing of data and functionalities. Prior to the arrival of a vessel, information exchange, including the sea cargo manifest or export declaration, can bolster risk management by customs and other regulatory agencies. In general, technology enhances the transparency and efficiency of supply chains through more tailored responses by both port authorities and border agencies to goods entering a territory. It can reduce delays and expedite onward conveyance as well as the unloading and reloading of goods on other means of transport to the final destination.

While ports are essential links to global supply chains, a major challenge in the movement of goods through ports to the final destination is the cargo dwell time. A key indicator of port efficiency and supply chains, this refers to the total time cargo spends within a port or other intermediate points. It is measured from the time cargo arrives until it is cleared and dispatched. A long cargo dwell time results in delays, additional costs and product deterioration. Access to timely information allows better traffic management and reduces port congestion, expediting operational and administrative procedures and moving cargo swiftly through the port.

Digital technologies in maritime trade include, among others, electronic data interchange. Although not a new technology, it increases information-sharing between traders and border agencies. Advanced vessel traffic services, based on the automatic identification system, provide real-time vessel movement tracking, allowing better traffic management of arrivals and departures. More recently, using artificial intelligence and blockchain for port management has supported greater transparency and allowed encrypted data exchanges in real time (Innovez-one, 2024).

Most developing countries lag on artificial intelligence-powered technology

Developing countries, particularly the least developed countries, lag in accessing and applying artificial intelligence-powered technology. Although investments in digital port infrastructure have increased in recent decades, government agencies in these countries require more financial and technical assistance from private operators and development partners to benefit from technological progress, particularly in using artificial intelligence. UNCTAD has highlighted how less than a third of developing countries have artificial intelligence strategies. Most need to invest in digital infrastructure, capacity-building and strengthened governance to harness the potential of this technology for sustainable development (UNCTAD, 2025d).

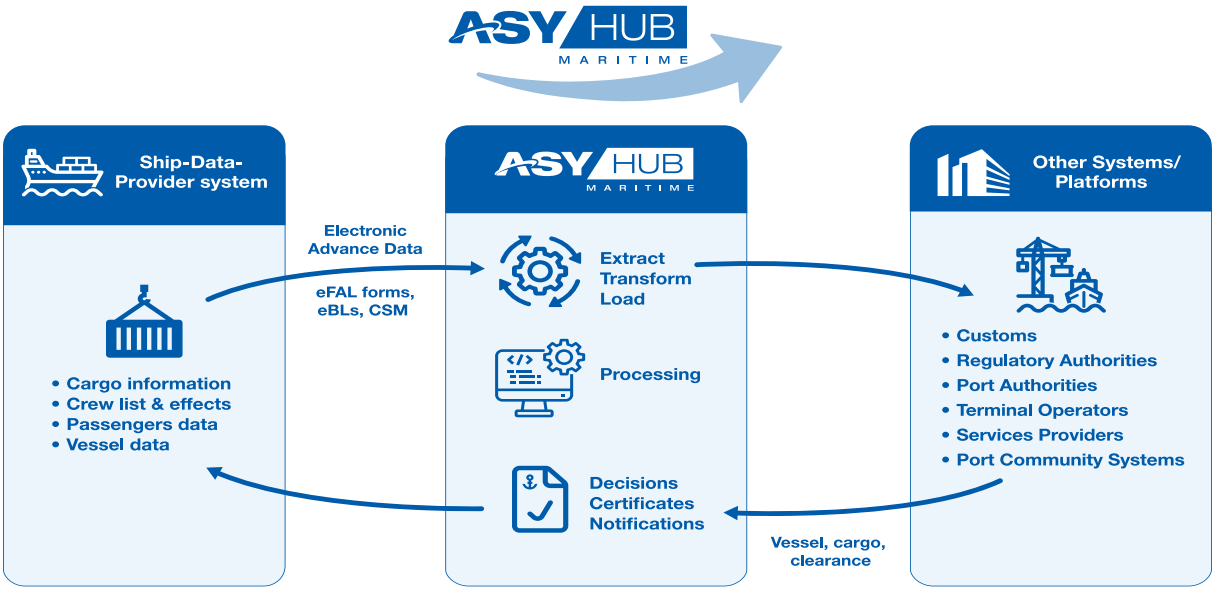
Maritime trade is threatened by cyberattacks

Digital infrastructure, while needed, comes with greater vulnerability to potential cyberattacks that could halt or affect port operations. Data on cargo loads need to be secured, an imperative that ports increasingly factor into their strategies. The Port of Los Angeles, which ranked sixteenth among the top container hubs in 2025 (SLG Logistics, 2025), has invested in an advanced system to prevent cyberrisks so that data sharing and collaboration can take place safely within its port community (Port of Los Angeles, 2025). In 2025, the North Atlantic Treaty Organization issued an alert on cyberthreats targeting maritime port infrastructure and called for urgent action to bolster port cybersecurity and resilience (NATO-CCDCOE, 2025).

4. Transforming port efficiency: The Automated System for Customs Data

The Automated System for Customs Data (ASYCUDA) is UNCTAD's largest technical assistance programme and the most widely implemented customs management system worldwide, with an operational presence in over 100 countries (UNCTAD, 2025e). ASYCUDA supports the modernization of customs procedures and trade-related information technology infrastructure. It offers a modular suite of interoperable digital systems that enhance risk management, transparency and efficiency at borders, while promoting paperless trade. Among its latest innovations is ASYHUB Maritime, a purpose-built digital platform supporting the electronic exchange of maritime data in alignment with evolving IMO requirements for MSWs (IMO, 2024).

Figure IV.18
Digital coordination for vessel, cargo and goods clearance via ASYHUB Maritime



Source: ASYHUB presentation delivered at the forty-ninth session of the IMO Facilitation Committee, London, 11 March 2025.

ASYHUB Maritime: A digital gateway for smarter port operations

Started in 2020, ASYHUB Maritime is a state-of-the-art, open and standardized platform allowing secure and structured electronic data exchange across all actors in the port call and ship clearance ecosystem (UNCTAD, 2025f). Fully interoperable with ASYCUDA World and other national systems, it connects customs, port authorities, immigration, health agencies, terminal operators, shipping lines and maritime agents. The platform operationalizes key elements of the FAL Convention and the IMO Compendium on Facilitation and Electronic Business, including the electronic submission of declarations for ship arrivals and departures listed in standard 2.1, from a) to g) (FAL Forms 1–7). Plans call for progressive inclusion of other declarations for ship arrival and departure listed in standard 2.1, from h) to m) (IMO, 2025a and 2025b). Figure IV.18 illustrates how ASYHUB Maritime integrates the functions of customs and port authorities, with a focus on regulatory clearances, including the processing of data such as eFAL (electronic Facilitation of International Maritime Traffic forms), eBLs (electronic Bills of Lading) and CSM (Cargo and Ship Manifest), as outlined in the ASYHUB platform overview.

Maritime logistics remain hampered by fragmented systems, manual processes and repetitive reporting, resulting in administrative inefficiencies and delayed cargo clearance. ASYHUB Maritime responds with a flexible integration framework offering automated system interfaces and user-friendly portals. Its core features include electronic declarations, advanced port call scheduling, real-time cargo and vessel tracking, and configurable risk assessment tools that enable pre-clearance analytics and more coordinated border management.

The system is specifically aligned with standard 1.3quin of the FAL Convention, which mandates the electronic exchange of data through MSW environments. It offers a scalable, cost-effective solution suitable for ports of all sizes. The platform's architecture incorporates cloud-based deployment and open-source tools, minimizing implementation costs while offering high levels of configurability (UNCTAD, 2025g).

Pilot implementation in developing economies

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Beyond trade facilitation, ASYHUB Maritime contributes to sustainability and institutional performance. It enables just-in-time port arrivals, reducing fuel consumption and emissions, while digital dashboards support transparency and auditability. By limiting physical paperwork and streamlining inspections through pre-arrival analytics, the platform supports climate-resilient and digitally enabled border management in line with UNCTAD's broader ASYCUDA strategy.

Since 2023, selected ASYCUDA user countries have piloted ASYHUB Maritime to assess its operational performance, technical interoperability and adaptability across diverse institutional and digital contexts. Deployments in Cambodia, Jordan, Sri Lanka and the Bolivarian Republic of Venezuela demonstrate the platform's effectiveness in enhancing trade facilitation in strategically positioned economies.

Cambodia was the first ASYCUDA user country to fully implement all ASYHUB modules, namely Maritime (along with Express and Postal), processing over 200,000 consignments and 3,000 maritime manifests in 2024 alone. Customs reported a 13.8 per cent revenue increase. In Jordan, the system was deployed at the Port of Aqaba, where it improved inspection scheduling and clearance times at the country's sole maritime gateway.

In Sri Lanka, a major Indian Ocean transshipment hub, ASYHUB Maritime contributed to a 57 per cent increase in customs revenue between 2023 and 2024, driven by improved pre-arrival processing and inter-agency coordination at the Port of Colombo. The Bolivarian Republic of Venezuela, situated near the Panama Canal, implemented the system at La Guaira Port to support a national MSW, replacing fragmented platforms with a unified digital interface.

Ongoing roll-outs in Albania and Madagascar illustrate the platform's versatility across institutional settings. Collectively, these deployments underscore the effectiveness of rules-based, pre-arrival processing in accelerating clearances and improving inspection selectivity.

5. The way forward

Digitalization and information technology infrastructure are game-changers in increasing predictability and transparency in maritime trade. Ports and border agencies are upgrading their systems, and in doing so, improving efficiency. Developing countries, however, particularly the least developed, often lack necessary financial and human capacities, even as some ports in the least developed countries have become major shipping hubs.

Due to recent tariff disruptions, the potential reconfiguration of global supply chains may lead to reshoring or near-shoring as well as an increase in the transshipment, reloading or repacking of goods diverted via countries with more attractive tariff arrangements. This may put greater pressures on ports and border agencies to institute goods and documentary compliance controls, such as to verify the origin of goods. It could in turn increase the time and costs to import and export, and might reduce gains in port efficiency and trade facilitation stemming from technology.

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