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Review of maritime transport

Staying the course in turbulent waters

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Note

The *Review of Maritime Transport* is a recurrent publication prepared by the UNCTAD secretariat since 1968 with the aim of fostering the transparency of maritime markets and analysing relevant developments. Any factual or editorial corrections that may prove necessary, based on comments made by Governments, will be reflected in a corrigendum to be issued subsequently.

This edition of the report covers data and events from January 2024 until June 2025. Where possible, every effort has been made to reflect more recent developments.

All references to dollars ($) are to United States dollars, unless otherwise stated.

"Ton" means metric ton (1,000 kg) and "mile" means nautical mile, unless otherwise stated.

Because of rounding, details and percentages presented in tables do not necessarily add up to the totals.

Two dots (..) in a statistical table indicate that data are not available or are not reported separately.

The terms "countries" and "economies" refer to countries, territories or areas.

Since 2014, the *Review of Maritime Transport* has not included printed statistical annexes. UNCTAD maritime statistics are accessible via the following links:

All data sets (maritime statistics): https://stats.unctad.org/Maritime

Merchant fleet by flag of registration: https://stats.unctad.org/fleet

Share of world merchant fleet value by flag of registration: https://stats.unctad.org/vesselvalue_registration

Merchant fleet by country of ownership: https://stats.unctad.org/fleetownership

Share of world merchant fleet value by country of beneficial ownership: https://stats.unctad.org/vesselvalue_ownership

Ship recycling by country: https://stats.unctad.org/shiprecycling

Shipbuilding by country in which built: https://stats.unctad.org/shipbuilding

Seafarer supply: https://unctadstat.unctad.org/datacentre/dataviewer/US.Seafarers

Liner shipping connectivity index: https://stats.unctad.org/lsci

Liner shipping bilateral connectivity index: https://stats.unctad.org/lsbci

Container port throughput: https://stats.unctad.org/teu

Port liner shipping connectivity index: https://stats.unctad.org/PLSCI

Port call performance (time spent in ports, vessel age and size), annual: https://stats.unctad.org/portcalls_detail_a

Port call performance (time spent in ports, vessel age and size), semi-annual: https://stats.unctad.org/portcalls_detail_sa

Number of port calls, annual: https://stats.unctad.org/portcalls_number_a

Number of port calls, semi-annual: https://stats.unctad.org/portcalls_number_sa

Seaborne trade: https://unctadstat.unctad.org/datacentre/dataviewer/US.SeaborneTrade

National maritime profiles: https://unctadstat.unctad.org/CountryProfile/MaritimeProfile/en-GB/008/index.html

Vessel groupings used in the *Review of Maritime Transport*

Group	*Constituent ship types*
Oil tankers	Oil tankers
Bulk carriers	Bulk carriers, combination carriers
General cargo ships	Multi-purpose and project vessels, roll-on roll-off (Ro-Ro) cargo, general cargo
Container ships	Fully cellular container ships
Other ships	LPG carriers, LNG carriers, parcel (chemical) tankers, specialized tankers, reefers, offshore supply vessels, tugboats, dredgers, cruise ships, ferries, other non-cargo ships
Total all ships	Includes all above-mentioned vessel types

Approximate vessel-size groups according to commonly used shipping terminology

Crude oil tankers

Ultra-large crude carrier	320,000 dwt and above
Very large crude carrier	200,000–319,999 dwt
Suezmax crude tanker	125,000–199,999 dwt
Aframax/long range 2 crude tanker	85,000–124,999 dwt
Panamax/long range 1 crude tanker	55,000–84,999 dwt
Medium-range tanker	40,000–54,999 dwt
Short-range/handy tanker	25,000–39,000 dwt

Dry bulk and ore carriers

Capesize bulk carrier	100,000 dwt and above
Panamax bulk carrier	65,000–99,999 dwt
Handymax bulk carrier	40,000–64,999 dwt
Handysize bulk carrier	10,000–39,999 dwt

Container ships

Neo Panamax	Ships that can transit the expanded locks of the Panama Canal with up to a maximum 49 m beam and 366 m length overall.
Panamax	Container ships above 3,000 TEUs with a beam below 33.2 m, i.e. the largest vessels that can transit the old locks of the Panama Canal.

Source: Clarksons Research Services.

Note: Unless otherwise indicated, the ships mentioned in the *Review of Maritime Transport* include all propelled seagoing merchant vessels of 100 gross tons and above, excluding inland waterway vessels, fishing vessels, military vessels, yachts, and fixed and mobile offshore platforms and barges (with the exception of floating production storage and offloading units and drill-ships).

The 12,000–14,999 TEU Neo-Panamax fleet includes some ships that are too large to transit the expanded locks of the Panama Canal based on current official dimension restrictions; the 15,000+ TEU Post-Panamax fleet includes some ships that are able to transit the expanded locks.

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Foreword

Global maritime transport has entered uncharted waters.

Not since the closure of the Suez Canal in 1967 have we witnessed such sustained disruption to the arteries of global commerce. Ships that once transited the Red Sea in days now sail for weeks around the Cape of Good Hope. Freight rates that were relatively stable for years now swing wildly from month to month. Supply chains we thought were resilient have proven fragile.

But this is not simply a story of disruption. As this year's *Review of Maritime Transport* documents, it is a story of transitions – technological, environmental, geoeconomic – converging at a speed that demands fundamentally rethinking how maritime transport operates.

Consider what we face today. The Suez Canal operates below normal capacity, at around 70 per cent below average tonnage transit levels in 2023. This year's developments around the Strait of Hormuz – a passage for about 34 per cent of global seaborne exports of oil – have drawn renewed attention to the need for sustained dialogue on maritime security. Disruption to port operations has also become chronic, not episodic.

These factors are already reshaping maritime trade patterns. While flows continued to expand by 2.2 per cent in 2024 over 2023, they have done so at a moderate pace – below the average recorded over the 20 years from 2003 to 2023. More telling still: maritime trade now travels significantly longer distances, with the average voyage haul having increased from 4,831 miles in 2018, to 5,245 miles in 2024, as security concerns redraw the map of global shipping. Seaborne trade in ton-miles increased by 5.9 per cent in 2024 on 2023, close to three times the increase in the volume of maritime trade. Distance is no longer geography; it is geoeconomics.

Yet alongside these immediate pressures, deeper shifts are reshaping the sector. The Net-zero Framework of the International Maritime Organization, set to be considered for adoption in October 2025, could reshape even further how ships are built, fuelled and operated. The orderbooks already tell this story: alternative fuel vessels now represent more than half of the ship tonnage of new orders, though over 90 per cent of the active fleet by tonnage still runs on conventional fuels. This gap between ambition and reality defines our challenge.

Meanwhile, automation and digitalization advances at breathtaking pace. Smart ports often process containers in minutes, not hours. Artificial intelligence systems predict congestion before it happens. Autonomous vessels are starting to move from concept to prototype. But each digital advance creates new vulnerabilities – cyberattacks on shipping are also on the rise. We are building tomorrow's infrastructure on today's security and regulatory foundations.

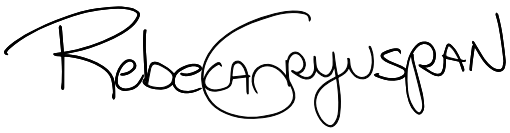
Who bears these costs? Developing countries now budget for freight costs that can change more in a week than they once did in a year. Small island developing States watch their import bills soar while their export competitiveness erodes. Landlocked developing countries sometimes pay transport costs three times the global average – and see that gap widen with each disruption. This cannot be our future.

The transitions ahead – to zero carbon, to digital systems, to new trade routes – must be just transitions. They must empower, not exclude. They must build resilience, not deepen vulnerability. And they must recognize that maritime transport is not merely ships and cargo; it is 1.9 million seafarers, most of whom come from developing countries and whose skills need updating, whose rights need protection, whose contribution needs recognition.

UNCTAD stands ready to support this shift. Through research that illuminates, technical cooperation that builds capacity and consensus-building that brings all voices to the table at the global, regional and national levels, we work to ensure that these transitions leave no one behind.

This *Review* offers more than data and analysis. It offers a framework for action. Sustainable and resilient practices that can withstand tomorrow's shocks. Regulatory updates that match the new technological reality and sustainability standards. Decarbonization pathways that are both ambitious and achievable. Investment in people, not just infrastructure. Trade facilitation that turns borders from barriers, into gateways.

Maritime transport has weathered disruptions before – wars, closures, economic crises. But never have so many transitions converged so quickly. The sector will adapt; it always does. The question is whether that adaptation will be managed or chaotic, inclusive or divisive, sustainable or merely survivable. This *Review of Maritime Transport* provides the evidence base for choosing wisely. The work begins now.



Rebeca Grynspan
Secretary-General of UNCTAD

Abbreviations

APLMA	Asia Pacific Loan Market Association
ASEAN	Association of Southeast Asian Nations
ASYCUDA	Automated System for Customs Data
Bunkers Convention	International Convention on Civil Liability for Bunker Oil Pollution Damage
CII	Carbon Intensity Indicator
CSW	Customs single window
dwt	Dead weight tonnage
EBITDA	Earnings before interest, taxes, depreciation and amortization
EDI	Electronic data interchange
EEXI	Energy efficiency existing ship index
ESG Criteria	Environmental, social and governance criteria
EU-ETS	European Union Emissions Trading System
EUA	European Union Allowances
FAL	Convention on Facilitation of International Maritime Traffic
FEU	40-foot equivalent unit
FOB	Free on board
GDP	Gross domestic product
GFI	Greenhouse gas fuel intensity
GTAP	Global Trade Analysis Project
HNS Convention	International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea
HS	Harmonized System
IAPH	International Association of Ports and Harbors
ICS	International Chamber of Shipping
IEA	International Energy Agency
ILO	International Labour Organization
IMF	International Monetary Fund
IMO	International Maritime Organization
IPCC	Intergovernmental Panel on Climate Change
IPCSA	International Port Community Systems Association
ITLOS	International Tribunal for the Law of the Sea

LLMC Convention	International Convention on Limitation of Liability for Maritime Claims
LMA	Loan Market Association
LNG	Liquefied natural gas
LPG	Liquefied petroleum gas
LSCI	Liner Shipping Connectivity Index
LSTA	Loan Syndications and Trading Association
MARPOL	International Convention for the Prevention of Pollution from Ships
MASS	Maritime autonomous surface ships
MLC	Maritime Labour Convention
MSW	Maritime single window
NAPs	National Action Plans
NATO-CCDCOE	National Atlantic Treaty Organization-Cooperative Cyber Defence Centre of Excellence
NFIDCs	Net food-importing developing countries
OECD	Organisation for Economic Co-operation and Development
OPEC	Organization of the Petroleum Exporting Countries
PCS	Port community systems
PIANC	World Association for Waterborne Transport Infrastructure
PPS	Port Performance Scorecard
Ro-Ro	Roll-on/roll-off
SCFI	Shanghai Containerized Freight Index
SDRs	Special Drawing Rights
SEEMP	Ship energy efficiency management plan
SITC	Standard international trade classification
TEN-T	Trans-European Network for Transport
TEU	20-foot equivalent unit
TSW	Trade single window
UN-CEFACT	United Nations, Centre for Trade Facilitation and Electronic Business
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
WISTA	Women's International Shipping and Trading Association
WTO	World Trade Organization

2025 Review of maritime transport

Chapter I

International maritime trade

In 2025, global maritime trade continues to navigate an environment marked by volatility, rerouted flows and uncertainty. Persistent geopolitical tensions and trade policy changes have altered shipping patterns, with many routes redirected away from traditional chokepoints.

While containerized trade is expanding, especially along extraregional corridors, East–West routes remain dominant, anchored by Asia's central role in global logistics. Supply chains are increasingly diversified, with more complex origin and destination networks emerging to manage rising uncertainty.

At the same time, energy-related trade is undergoing a structural transformation. Longer hauls and redirected flows are affecting tanker demand. Trade in critical minerals, vital to clean energy transitions, remains concentrated in a handful of exporters, heightening exposure to strategic and logistical chokepoints.

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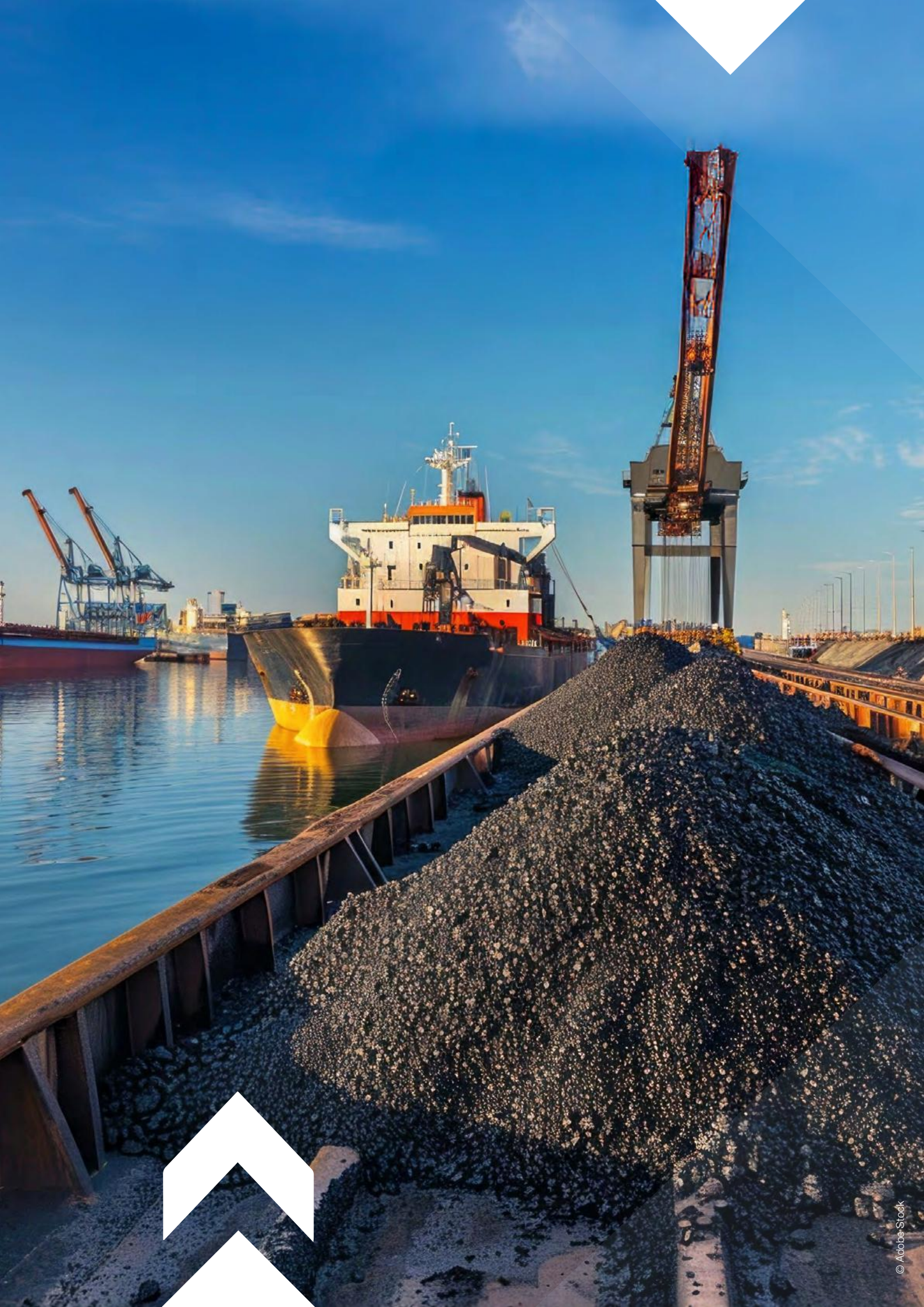


Key policy takeaways

- Persistent rerouting of maritime flows has heightened exposure to delays and rising costs, especially for structurally vulnerable economies such as the least developed countries and small island developing States. Strategic investments in corridor connectivity and transport infrastructure are key to mitigating these effects.
- Ongoing trade fragmentation and evolving industrial policies are reshaping global value chains and maritime trade patterns. These shifts risk marginalizing smaller economies from emerging trade corridors. Maritime transport policies should prioritize regional integration, strengthen port–hinterland connectivity, and support logistics capacity to enable diversified sourcing and reduce exposure to geographically concentrated trade flows.
- The changing geography of containerized trade calls for enhanced port competitiveness and coordination. Countries with the logistics capacity to manage diversified sourcing – efficiently handling goods from multiple origins – will be better positioned to attract trade and investment within reconfigured supply chains.
- In the energy sector, ports must prepare for longer hauls and a growing share of low-carbon industrial and energy-related cargoes. This requires future-ready infrastructure, including deeper berths, expanded storage, improved intermodal links and faster cargo handling.
- Expanding trade in critical minerals offers opportunities but also heightens supply chain risks. Policy responses should promote domestic processing, multimodal logistics and alignment with renewed industrial policies.

- In 2024 and 2025, seaborne trade has continued to adjust in response to geopolitical tensions, evolving maritime routes, and accelerating shifts in the global energy and industrial landscapes. Supply chain restructuring, technological adaptation and resilience-building are reshaping maritime trade patterns, with growing policy attention to energy security, sustainability and trade fragmentation.

- While global seaborne trade in 2024 experienced firm growth, supported by an easing of supply chain disruptions and improved performance in some developing regions, the outlook for 2025 suggests more modest growth or even stagnation in both overall volumes and ton-miles. According to UNCTAD projections, maritime trade volume is expected to expand by 0.5 per cent in 2025, with containerized trade increasing by 1.4 per cent. Over the medium term (2026–2030), total seaborne trade is projected to grow at an average annual rate of 2 per cent, while containerized trade is forecast to rise by 2.3 per cent.

- A combination of factors influences this trajectory. These include persistent macroeconomic uncertainty, sluggish global demand and continued disruptions along key shipping lanes. At the same time, deeper structural shifts – such as industrial policy changes, strategic subsidies and trade measures, supply chain diversification, increased demand for clean energy inputs, and the intensification of environmental and traceability standards – are redefining global trade dynamics and reshaping the maritime transport landscape.

- To further understand these evolutions, section A outlines trends in the demand for maritime transport services and analyses seaborne trade developments within the context of the global economy and international trade. It includes a forecast and outlook on future trends. Section B examines specific developments affecting trade in energy products and containerized goods. Section C explores seaborne trade in critical minerals.

A. Maritime trade flows: The big picture

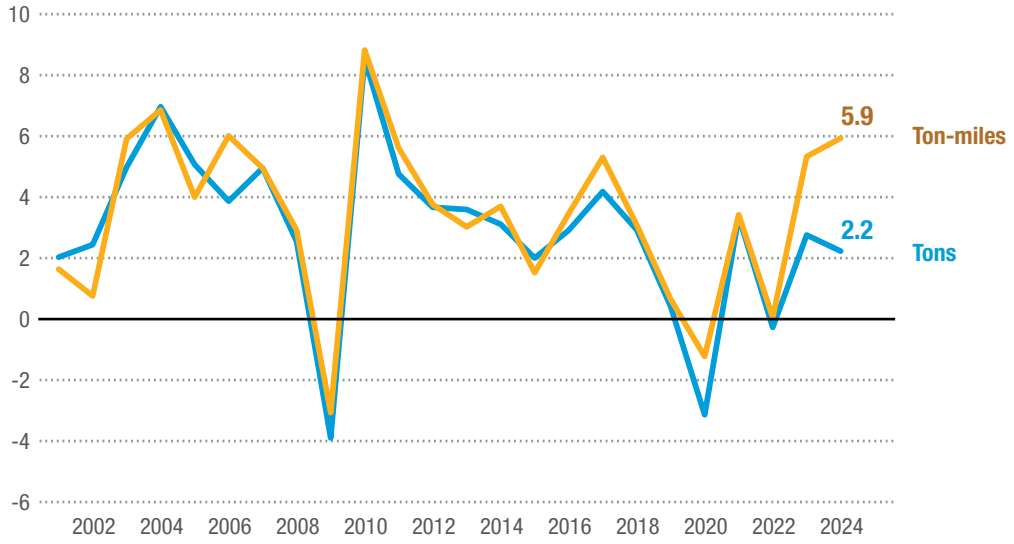
1. Seaborne trade volume growth remained steady while ton-mile growth reached a record in 2024

Maritime trade volumes reached 12,720 million tons in 2024, growing by 2.2 per cent (Clarksons Research, 2025a, July), exceeding the 2013–2023 average (1.8 per cent). This suggests positive momentum, yet the growth rate lagged the 2003–2023 average (2.9 per cent), indicating a longer-term deceleration in the expansion of global volume. Structural, cyclical and policy factors underpin this deceleration, encompassing the structural weakening of trade-to-GDP links, a slowdown in global value chain expansion, repeated economic shocks, rising trade barriers and policy instability, and geopolitical fragmentation (UNCTAD, 2024a; WTO, 2024).

Moderate growth in the global economy and resilient Chinese commodity demand supported seaborne trade volumes in 2024 (Clarksons Research, 2024 and 2025b), driven by robust growth in container and dry bulk shipping (see section B). Solid industrial demand, domestic mine output limitations and stockpiling activities amid softer commodity prices propelled Chinese dry bulk imports (particularly for iron ore, coal and bauxite) and steel exports (Clarksons Research, 2025b). Resilient consumer demand in the United States of America and strong trade flows from Asia to emerging economies also supported seaborne trade volume growth in 2024.

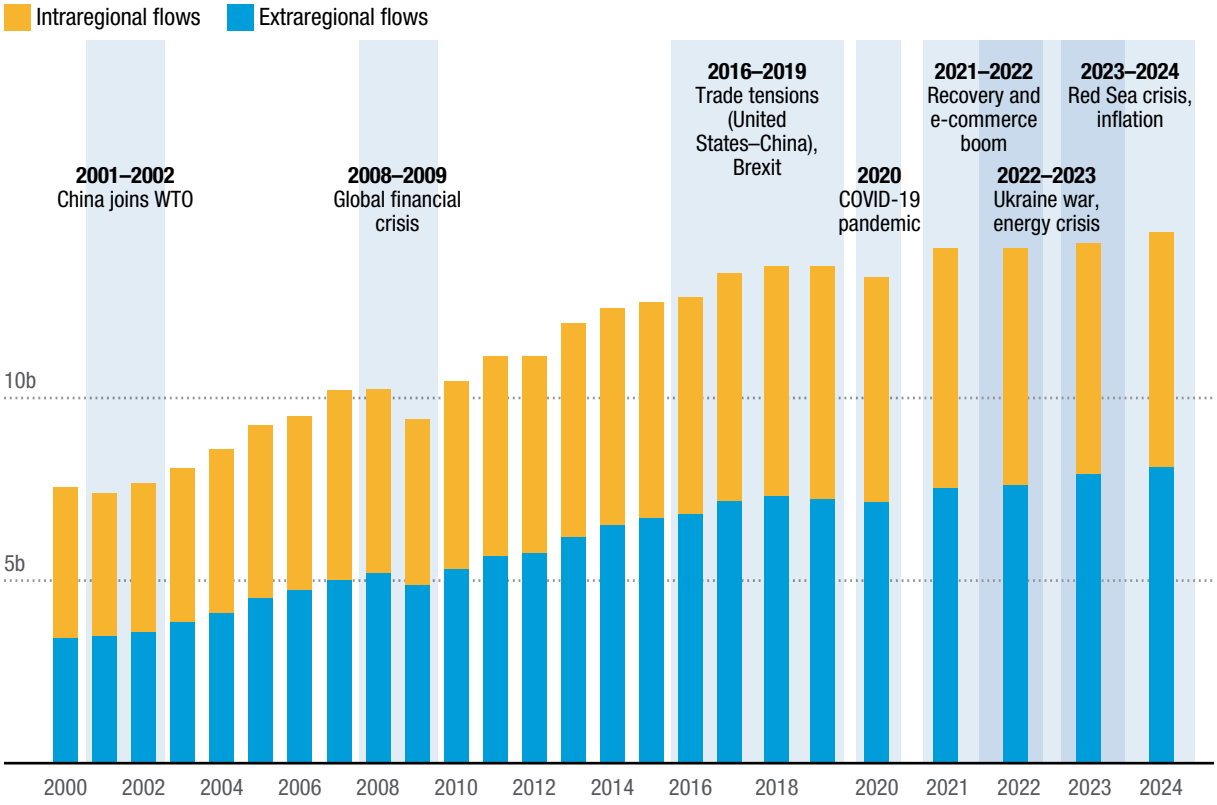
As global supply chains diversify and new consumption hubs emerge, maritime routes are becoming more regionally interconnected and globally distributed, which renders them more complex. Figure I.2 confirms that intraregional and extraregional trade have continued growing over the years.

Figure I.1
Seaborne trade growth
(Annual percentage change)



Source: UNCTAD calculations, based on Clarksons Research, 2025a, July.

Figure I.2
Intraregional and extraregional seaborne trade flows
(Billions of tons)



Source: MDS Transmodal, World Cargo Database, 12 June 2025.

Measured in distance-adjusted volumes, global seaborne trade reached 66,781 billion ton-miles in 2024, an increase of 5.9 per cent, marking the fastest pace of expansion since 2011 (figure I.1). The substantial growth in ton-miles was primarily due to extended voyage distances caused by logistical disruptions, particularly the Red Sea rerouting and, to a lesser extent, Panama Canal transit restrictions (until mid-2024). This effect was compounded by firm demand from major importing regions, such as Asia, which resulted in significant growth in the long-haul Atlantic trade and shifts in trade from the Russian Federation (Clarksons Research, 2024). These longer shipping routes resulted in greater distances travelled per unit of cargo, inflating ton-mile figures while contributing to higher transport costs, delays and greenhouse gas emissions. As such, the rise in ton-miles indicates the growing fragility and inefficiency of global supply chains, rather than a sign of robust trade expansion (UNCTAD, 2024a).

Crude oil exports came primarily from Brazil, Guyana and the United States to Asia (IEA, 2025d). United States exports of liquified natural gas (LNG), liquified petroleum gas (LPG) and ethane were also increasingly redirected towards Asia, with China and India accounting for most ethane demand (IEA, 2025b). Africa, particularly Guinea, made significant bauxite shipments to China, while coal exports from Colombia and the Russian Federation shifted towards longer-haul Asian buyers (IEA, 2024c and IEA, 2025e). At the same time, European importers increased their purchases of crude oil and refined products from the United States and the Middle East as they reduced reliance on Russian supplies (Eurostat, 2025).

This broad reorientation of trade flows, driven by both market dynamics and geopolitical shifts, led to longer voyage distances and rising ton-miles (Clarksons Research, 2025b and 2025c, July). See more on this issue in section B.

2. Policy uncertainty and continued disruption weigh on the global trade outlook in 2025 and beyond

The outlook for global seaborne trade in 2025 is increasingly complex and marked by downside risks. Continued policy volatility, geopolitical tensions (including Red Sea insecurity, the war in Ukraine, and tensions in the Middle East), and softer macroeconomic conditions are weighing on confidence and demand. As a result, both merchandise trade and maritime transport activity are projected to slow, with the outlook shifting markedly since early 2025.

The outlook remains subject to persistent uncertainty and downside risks due to subdued private consumption in some economies, a volatile global trade landscape and deteriorating investor sentiment (UNCTAD, 2025f). As of July 2025, global GDP was projected to grow by 3 per cent in 2025 (IMF, 2025b), an upward revision of 0.2 percentage points from the April 2025 forecast (IMF, 2025a).

As of 3 July 2025, global merchandise trade was projected to grow by 0.1 per cent in 2025 (WTO, 2025b). This reflects an improvement vis-à-vis an April projection of a 0.2 per cent contraction of merchandise trade in 2025 (WTO, 2025a), based on an adjusted scenario assuming that temporary measures, such as pauses on higher tariffs, remain in place past their expiration dates and that higher rates do not take effect. The introduction and subsequent suspension or modification of reciprocal tariff measures, as well as parallel trade negotiations, were central to the shifting trade outlook in 2025. A temporary surge in trade volumes in early 2025, driven by the frontloading of shipments in anticipation of tariff increases, is expected to fade in the second half of 2025 (United Nations, Department of Economic and Social Affairs, 2025a; UNCTAD, 2025e).

In a downside scenario that includes both the implementation of reciprocal tariffs and global spread of trade policy uncertainty, the contraction would deepen to 1.5 per cent, reflecting the impacts of these two factors (WTO, 2025a). The introduction of tariff measures (see chapter III and UNCTAD, 2025d) has been a pivotal factor influencing the 2025 trade outlook. These contributed significantly to the downward revision, with model-based estimates suggesting that without them, global trade could have expanded by 2.7 per cent (WTO, 2025a).

The escalation in tariff measures in early 2025 introduced renewed headwinds to global trade flows, particularly affecting small and vulnerable economies (UNCTAD, 2025d; United Nations, Department of Economic and Social Affairs, 2025a; WTO, 2025b). It could further threaten marginal gains made by least developed countries, small island developing States and landlocked developing countries. Some least developed countries, such as Cambodia, Lesotho, and Madagascar, could face some of the highest new United States tariffs, resulting in a loss of competitiveness, especially in textiles and agriculture, which could lead to a decline in vital exports and pose substantial risks to their development (UNCTAD, 2025b-g).

The global trade policy environment remains volatile and highly uncertain in the near term. The potential reintroduction of higher tariffs or the imposition of new sector-specific measures, particularly in high-tech, energy and transport-related sectors, continues to weigh on trade and investment planning (UNCTAD, 2025e and 2025f). While the temporary tariff pause has provided short-term stability, bilateral negotiations remain fragile, and the risk of renewed escalation is significant (IMF, 2025b; WTO, 2025b). Without a durable resolution, ongoing policy changes are likely to continue suppressing trade flows and delaying investment decisions well into the second half of the year.

The surge in ton-miles signals the growing fragility and inefficiency of global supply chains, rather than robust trade expansion

In this environment, maritime trade projections for 2025 have also been revised downward. In early 2025 (specifically, in February and March), global seaborne trade volumes were projected to grow by 1.4 per cent. By May 2025, they were projected to contract marginally by 0.1 per cent (Clarksons Research, 2025a, February, March and May). This notable reduction points to the increasingly complex and uncertain global trade environment.

UNCTAD forecasts that maritime trade volume will expand at an annual growth rate of 0.5 per cent in 2025, with containerized trade volume growing by 1.4 per cent. From 2026–2030, UNCTAD expects total seaborne trade to increase at an annual average of 2 per cent and containerized trade by 2.3 per cent (table I.1).

Distance-adjusted volumes (ton-miles) are projected to rise slightly in 2025, by 0.3 per cent (Clarksons Research, 2025a, July), following an exceptional surge in 2024 when Red Sea rerouting sharply increased voyage distances. That one-time spike has set a high base for comparison. Even if rerouting continues, the additional impact is expected to be minimal, as longer routes are already factored into operations. Meanwhile, a market recalibration is underway. Fleet capacity is outpacing demand in key segments, such as containers and product tankers, while macroeconomic conditions remain subdued, and trade patterns are shifting (including shorter LNG hauls and reduced demand from China). As a result, ton-mile growth is expected to slow across most shipping segments. A return to shorter trade routes later in the year – should rerouting unwind – would further reduce distance-adjusted demand while easing transport costs and emissions (Clarksons Research, 2025b and 2025c, July).

Several downside factors continue to weigh on maritime trade performance in 2025. Persistent trade policy uncertainty remains a key risk, alongside subdued industrial activity in major economies and weak Chinese demand for bulk commodities (UNCTAD, 2025e). Tighter global financial conditions and limited investment in trade-intensive sectors further constrain growth.

At the same time, some developments could support a marginal recovery. Trade diversion effects and new preferential trade agreements may offer opportunities for select developing countries (WTO 2025a and 2025b; UNCTAD, 2025b). These dynamics underscore the complexity of the current environment, where cyclical and structural forces are pulling in different directions, making the path to recovery uneven and fragile.

Table I.1
UNCTAD forecasts for international maritime trade
(Annual percentage change)

	Total seaborne trade in tons	Containerized trade in TEU
2025	0.5	1.4
2026	1.0	1.0
2027	2.2	2.5
2028	2.3	2.7
2029	2.2	2.7
2030	2.3	2.7

Sources: UNCTAD calculations based on Clarksons Research, 2025a, July; IMF, 2025b and UNCTAD World Seaborne Trade data.

Notes: Projections are derived from estimated seaborne trade elasticities relative to world gross domestic product (GDP), export volumes and investment-to-GDP ratio, and are informed by monthly seaborne trade data and annual global output forecasts. The forecast incorporates projected world gross domestic product and trade growth, as published in the July 2025 World Economic Outlook of the International Monetary Fund (IMF).

B. Maritime trade flows: Sector-specific developments

While reflecting the overall trends identified in section A, maritime trade flows in 2024 were also shaped by sector-specific dynamics. These developments have had uneven impacts on demand for maritime transport services, with some sectors experiencing sharp rebounds and others facing persistent headwinds (table I.2). The following analysis delves into the performance of containerized trade and the seaborne trade of energy commodities.

Table I.2
Mixed performance in international seaborne trade, 2024

Ranking	Growth in tons (percentage)	Growth in ton-miles (percentage)	Driving factors for selected commodities/sectors (iron ore, steel, forest products, chemicals and grain only)
Best-performing commodities/ sectors (top five)	1. LPG (+7.6) 2. Containers (+6.2) 3. Steel products (+5.2) 4. Iron ore (+3.5) 5. Coal (+3.3)	1. Containers (+17.6) 2. LPG (+11.2) 3. LNG (+12.2) 4. Oil products (+6.5) 5. Iron ore (+6.4)	☑ **Tons**: Surging Chinese steel products exports (steel). Solid Chinese steel production and healthy industrial activity (iron ore). ☑ **Ton-miles**: Increased supply and exports from Australia and particularly Brazil, supporting long-haul imports from China (iron ore).
Least-performing or declining commodities/ sectors (bottom five)	1. Crude oil (-1.5) 2. Oil products (-0.7) 3. LNG (+1.1) 4. Chemicals (+1.1) 5. Grain (+1.8)	1. Forest products (-1.6) 2. Grains (-0.7) 3. Crude oil (+1.6) 4. Chemicals (+3.6) 5. Steel products (+5)	**Tons and ton-miles** ☒ Lower Chinese imports due to the expansion of domestic petrochemical production capacity and limited European industrial activity (chemicals). ☒ Sharp decline in Brazilian exports, softer Chinese demand due to stockpiling and impacts of reciprocal tariffs by China on United States (grain).

Sources: UNCTAD calculations, based on Clarksons Research 2025a, July (first and second column), with container figure representing trade growth measured in TEUs, and Clarksons Research 2024, 2025a, 2025b and 2025d, March, May and June (last column).

1. Strong 2024 rebound in containerized trade

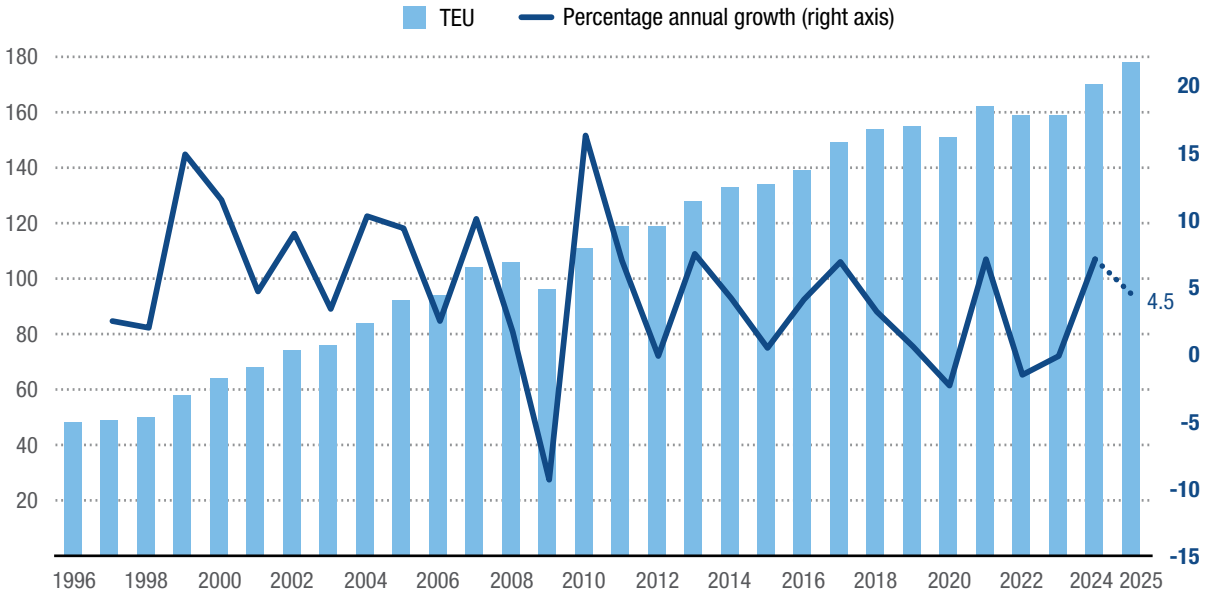
Robust volume growth and a surge in 20-foot equivalent unit (TEU)-miles in 2024; a cautious outlook for 2025

Global containerized trade volumes experienced firm growth in 2024, with volumes increasing more than 6 per cent (figure I.3), the second highest rate among all cargo types (see table I.2). Growth was driven by sustained consumer demand, particularly in the United States, and expanded flows to developing regions, especially those linking East Asia with Latin America and the Caribbean, the Indian subcontinent and Africa.

In 2024, all major East–West trade routes recorded solid growth. Trans-Pacific eastbound flows (linking East Asia and North America), East Asia–Europe westbound trade (connecting East Asia with Northern Europe and the Mediterranean) and transatlantic volumes (between Europe and North America) each registered notable year-on-year increases – up 14.7 per cent, 10.2 per cent and 5.2 per cent, respectively (table I.3).

Containerized distance-adjusted volumes also increased sharply in 2024, outpacing volume growth (figure I.4). A sharp rise in TEU-miles primarily stemmed from the continued rerouting of vessels away from the Red Sea, particularly on the East Asia–Europe trade route. The detour around the Cape of Good Hope added approximately 30 per cent to voyage lengths, contributing to an estimated 11 per cent increase in overall container TEU-mile demand (Clarksons Research, 2025b).

Figure I.3
The growth of global containerized trade volumes
(Millions of TEU and percentage annual change)



Source: MDS Transmodal, World Cargo Database, 12 June 2025.

Note: Figures for 2025 are trend-based projections, including trade data for Q1 2025.

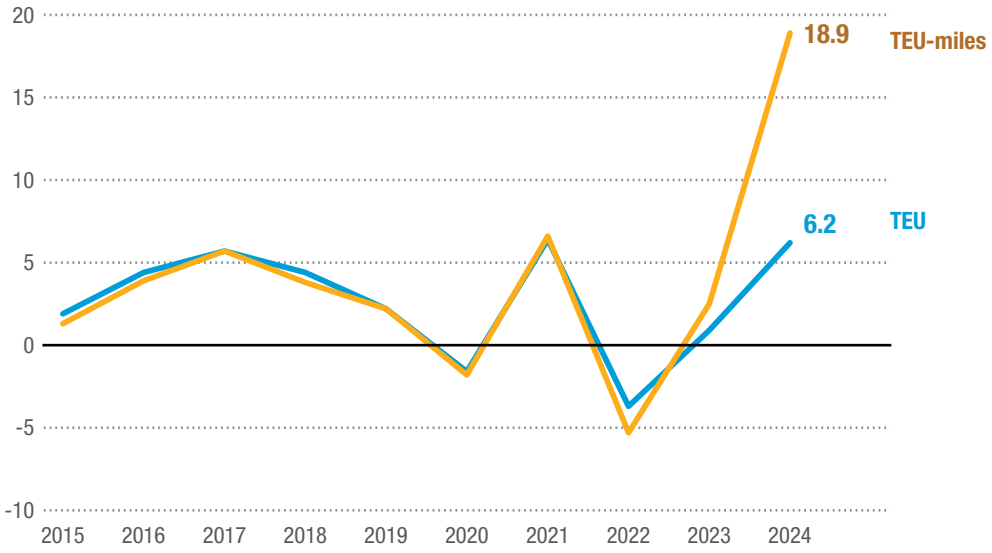
Table I.3
Containerized trade on major East–West trade routes

	Trans–Pacific			Asia–Europe			Transatlantic		
	Eastbound East Asia–North America	**Westbound** North America–East Asia	**Total**	**Eastbound** Northern Europe and Mediterranean to East Asia	**Westbound** East Asia to Northern Europe and Mediterranean	**Total**	**Eastbound** North America to Northern Europe and Mediterranean	**Westbound** Northern Europe and Mediterranean to North America	**Total**
	TEU (millions)								
2018	20.1	8.1	**28.2**	8.2	15.6	**23.8**	3.3	5.0	**8.3**
2019	19.5	7.6	**27.1**	8.4	16.1	**24.5**	3.2	5.2	**8.3**
2020	20.0	7.4	**27.4**	8.2	15.9	**24.1**	2.7	5.0	**7.7**
2021	23.8	6.4	**30.2**	7.8	17.0	**24.8**	2.7	5.6	**8.4**
2022	22.6	6.0	**28.6**	6.7	16.4	**23.1**	2.6	5.5	**8.1**
2023	20.8	6.2	**27.0**	6.6	16.6	**23.2**	2.5	4.9	**7.5**
2024	23.8	6.4	**30.2**	6.3	18.3	**24.7**	2.6	5.2	**7.8**
2025	24.2	6.2	**30.4**	6.4	19.8	**26.2**	2.8	5.4	**8.2**
	Annual change (percentage)								
2018–2019	-3.1%	-6.8%	**-4.2%**	2.9%	2.9%	**2.9%**	-4.3%	3.2%	**0.2%**
2019–2020	2.7%	-2.5%	**1.3%**	-2.4%	-1.1%	**-1.6%**	-14.8%	-2.4%	**-7.1%**
2020–2021	19.0%	-13.1%	**10.4%**	-5.5%	7.2%	**2.8%**	1.1%	12.3%	**8.4%**
2021–2022	-5.2%	-6.5%	**-5.5%**	-13.3%	-3.7%	**-6.7%**	-4.3%	-1.9%	**-2.7%**
2022–2023	-8.1%	3.6%	**-5.6%**	-2.4%	1.4%	**0.3%**	-2.4%	-11.0%	**-8.3%**
2023–2024	14.7%	2.5%	**11.9%**	-3.7%	10.2%	**6.3%**	3.6%	6.0%	**5.2%**
2024–2025	1.7%	-2.6%	**0.8%**	0.9%	7.9%	**6.1%**	8.5%	3.1%	**4.9%**

Source: UNCTAD calculations, based on MDS Transmodal, World Cargo Database, 12 June 2025.

As of 8 July 2025, UNCTAD projected global TEU volume growth for 2025 to be around 1.4 per cent (table I.1). Global TEU-mile growth is forecast to range between -0.4 and 2.4 per cent (Clarksons Research, 2025g and 2025h, May and June). TEU-mile growth, however, remains highly contingent on geopolitical developments. The base case assumes continued Red Sea rerouting of container vessels throughout 2025, sustaining the 11 per cent increase in average voyage distances. If rerouting begins to unwind later in the year, TEU-mile growth could slow further. While a return to shorter trade routes would ease transport costs and emissions, it would also reduce distance-adjusted demand. Added uncertainty around trade policy and a potential normalization of Suez Canal transits could further dampen growth prospects.

Figure I.4
Containerized trade growth by volume and distance-adjusted metrics
(Annual percentage change)



Source: UNCTAD calculations, based on Clarksons Research, 2025g.

Early 2025 momentum in trans-Pacific trade: Seasonal and policy-driven spikes

Containerized shipping on the trans-Pacific trade lane underwent three distinct phases of volatility in early 2025, shaped by seasonal and policy-driven dynamics:

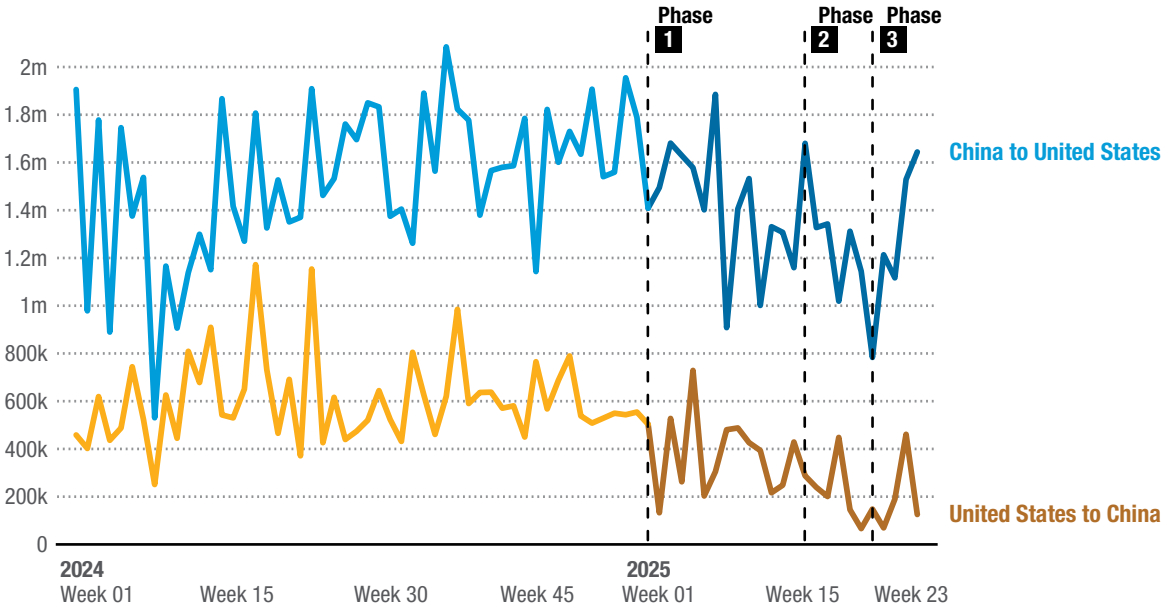
1. During the first quarter, shippers frontloaded cargo to avoid disruptions from the Chinese Lunar New Year and anticipated tariff increases. This drove a 10 per cent year-on-year increase in China–United States trade (Clarksons Research, 2025i).
2. In April and early May, as United States tariffs for Chinese imports rose to 145 per cent, volumes plummeted, prompting carriers to reduce capacity, which slashed weekly bookings by 60 per cent (Clarksons Research, 2025h, June).
3. A third phase began in mid-May with a 90-day China–United States tariff pause (lowering rates to 30 per cent), triggering a surge in bookings (more than doubling previous levels), although momentum has since begun to ease (Clarksons Research, 2025h, June).

Estimated cargo volumes loaded on vessels departing China closely mirror the three-phase pattern described above. In the first phase (Q1), weekly eastbound volumes rose steadily, peaking just before the Lunar New Year. In the second phase (April to mid-May), shipments dropped sharply, with eastbound volumes falling over 30 per cent below 2024 levels. In phase three (from mid-May), the temporary tariff pause spurred a marked rebound in eastbound flows. As shown in figure I.4, despite this late surge, cumulative volumes from January to 1 June 2025 (weeks 1–22) remained below 2024 levels, confirming a trade contraction.

Westbound flows (United States–China) showed no comparable recovery. Between 13 May and 1 June, volumes totalled just 916,000 tons, down from 1.93 million tons in 2024, highlighting a more than 50 per cent year-on-year decline.[1] Figure I.5 underscores the asymmetric effects of the tariff and the heightened sensitivity of trans-Pacific trade to policy shifts.

[1] Data provided by Marine Benchmark.

Figure I.5
Estimated Direct container vessel cargo volumes in China–United States trade
(Tons)



Source: Marine Benchmark (data for the period from 9 December 2024 to 1 June 2025).

Note: Marine Benchmark's methodology uses the draft for each vessel's voyage as a proxy to calculate the amount of cargo onboard.

Evolving trade geography

Growth in containerized trade in 2024 was observed across all major trade lanes, with the main East–West corridors – East Asia to North America, East Asia to Europe, and Europe to North America – recording the strongest expansion, at 8.8 per cent (table I.4). These routes remain the backbone of global container flows (figure I.5), confirming that the bulk of volume continues to move along the primary East–West trade corridors.

The geography of trade flows is evolving, however, with the share of non-mainlane flows rising. Among non-mainlane routes, South–South trade was the most dynamic in 2024, expanding by 8.7 per cent on the back of deepening links between East Asia and Latin America and between Africa and East Asia (Clarksons Research, 2025b and 2025h, June). Non-mainlane East–West flows increased by 5.7 per cent, supported by expanding trade between East Asia and the Indian subcontinent (table I.4).

The configuration of global supply chains is shifting as companies diversify sourcing and manufacturing locations in response to factors such as geopolitical tensions and supply chain disruptions. The growing emphasis on resilience in trade and supply chain strategies reflects not only the need to manage operational disruptions but also to navigate increasing trade policy uncertainty, which has become a key dimension of global risk exposure. As a result, there is a gradual move away from highly centralized, single-source models towards more distributed, multi-origin networks (OECD, 2025).

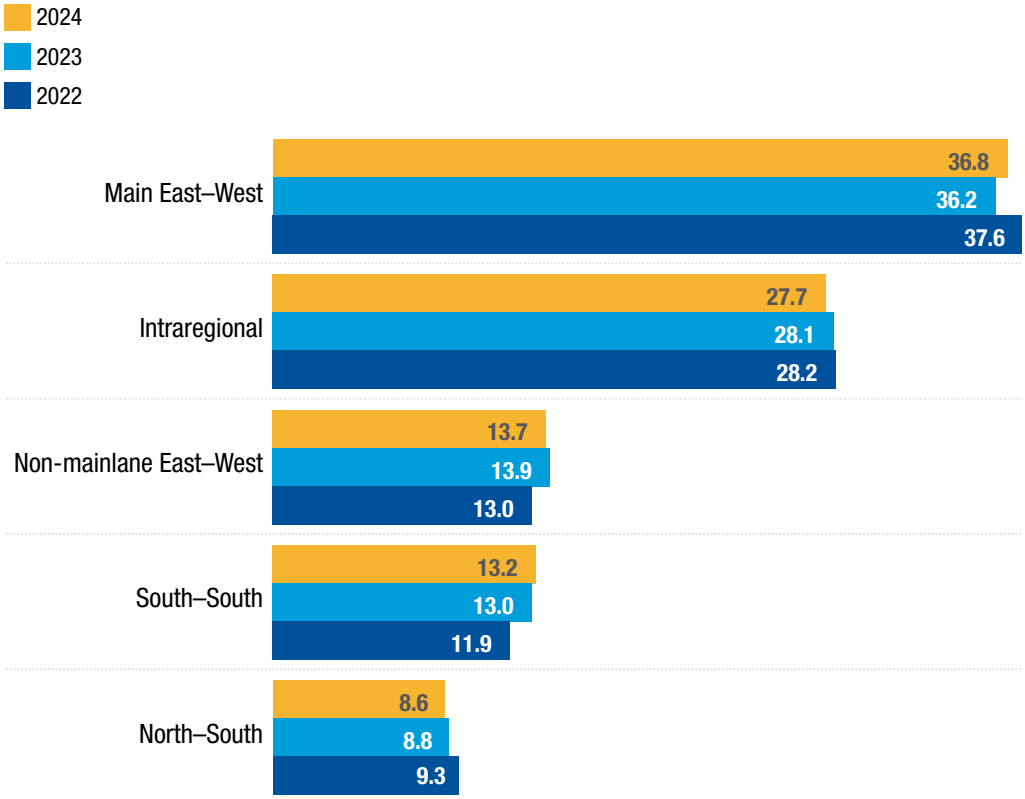
Table I.4
Containerized trade along mainlane and non-mainlane routes

	2018	2019	2020	2021	2022	2023	2024	2025 *(Forecast)*
TEU								
Main East–West routes	**60 323 986**	**59 850 921**	**59 214 191**	**63 388 805**	**59 837 420**	**57 640 638**	**62 687 591**	**64 831 893**
Other (non-mainlane) routes	**93 445 719**	**94 776 380**	**91 805 618**	**98 284 114**	**99 471 661**	**101 574 018**	**107 779 585**	**113 276 982**
Non-mainlane East–West	19 633 455	20 240 830	18 863 558	20 299 135	20 774 193	22 127 990	23 387 285	24 852 157
North–South	14 220 855	14 213 710	14 024 162	15 122 756	14 839 424	13 975 619	14 603 393	15 299 800
South–South	17 209 806	18 070 246	17 753 143	19 136 053	18 935 081	20 751 655	22 564 187	24 088 812
Intraregional	42 381 604	42 251 594	41 164 755	43 726 170	44 922 963	44 718 755	47 224 719	49 036 213
World total	**153 769 705**	**154 627 301**	**151 019 809**	**161 672 919**	**159 309 081**	**159 214 656**	**170 467 176**	**178 108 875**
Percentage change								
Main East–West routes	**4.9**	**-0.8**	**-1.1**	**7.1**	**-5.6**	**-3.7**	**8.8**	**3.4**
Other (non-mainlane) routes	**2.1**	**1.4**	**-3.1**	**7.1**	**1.2**	**2.1**	**6.1**	**5.1**
Non-mainlane East–West	-0.5	3.1	-6.8	7.6	2.3	6.5	5.7	6.3
North–South	3.1	-0.1	-1.3	7.8	-1.9	-5.8	4.5	4.8
South–South	2.4	5.0	-1.8	7.8	-1.1	9.6	8.7	6.8
Intraregional	2.9	-0.3	-2.6	6.2	2.7	-0.5	5.6	3.8

Source: MDS Transmodal, World Cargo Database, 12 June 2025.

Notes: Non-mainlane East–West trade involves East Asia, Europe, North America and Western Asia and the Indian subcontinent. North–South trade involves Europe, Latin America, North America, Oceania and sub-Saharan Africa. South–South trade involves East Asia, Latin America, Oceania, sub-Saharan Africa and Western Asia.

Figure I.6
Market shares of global containerized trade by route, 2024
(Percentage)



Source: MDS Transmodal, World Cargo Database, 12 June 2025.

Notes: Non-mainlane East–West trade involves East Asia, Europe, North America and Western Asia and the Indian subcontinent. North–South: trade involves Europe, Latin America, North America, Oceania and sub-Saharan Africa. South–South trade involves East Asia, Latin America, Oceania, sub-Saharan Africa and Western Asia.

East Asia, particularly China, remains a pivotal anchor in the global trade network, despite notable growth in exports from South-East Asia (Indonesia, Thailand, Viet Nam), South Asia (Bangladesh, India) and Mexico (ARC Group, 2024a and 2024b; Karaman and NNT, 2025; The Economic Times, 2024; Mexico News Daily, 2025).

2. Diverging energy trade dynamics: Short-term volatility, long-term transformation[2]

This section examines the short-term developments that impacted the seaborne trade of energy products in 2024, distinguishing between structural and temporary trends. It then presents an outlook for 2025.

[2] All figures cited in this section are based on Clarksons Research, 2025a, July.

Energy trade in 2024: Diverging trends across commodities

Following subdued growth in 2023, energy-related seaborne trade posted a mixed performance in 2024 (figure I.7). Crude oil shipments declined by 1.5 per cent in volume terms, reflecting the ongoing reorientation of global demand, attributed to production cuts by the Organization of the Petroleum Exporting Countries and its allies (OPEC+) and softer Chinese oil demand (Clarksons Research, 2025b). Ton-miles grew by 1.6 per cent, however, supported by longer trade distances linked to structural and geopolitical shifts, including persistent disruptions in the Red Sea and increased flows from Russian Federation to Asia. Refined petroleum products recorded a marginal drop in volume (-0.7 per cent), yet ton-miles expanded by a firm 6.5 per cent, underpinned by a significant rerouting of cargo away from the Red Sea (Clarksons Research, 2024).

Coal volumes increased by 3.3 per cent (figure I.8), reaching the highest number of tons since 1980. This was due to industrial stockpiling and strong demand from Asia, particularly China and India. An accompanying 5.9 per cent rise in ton-miles indicated longer routes, notably from Colombia and the United States to Asia (Clarksons Research, 2024).

The gas trade continued to grow, with LNG volumes rising by 1.1 per cent (figure I.8), albeit with less dynamic performance than in previous years.

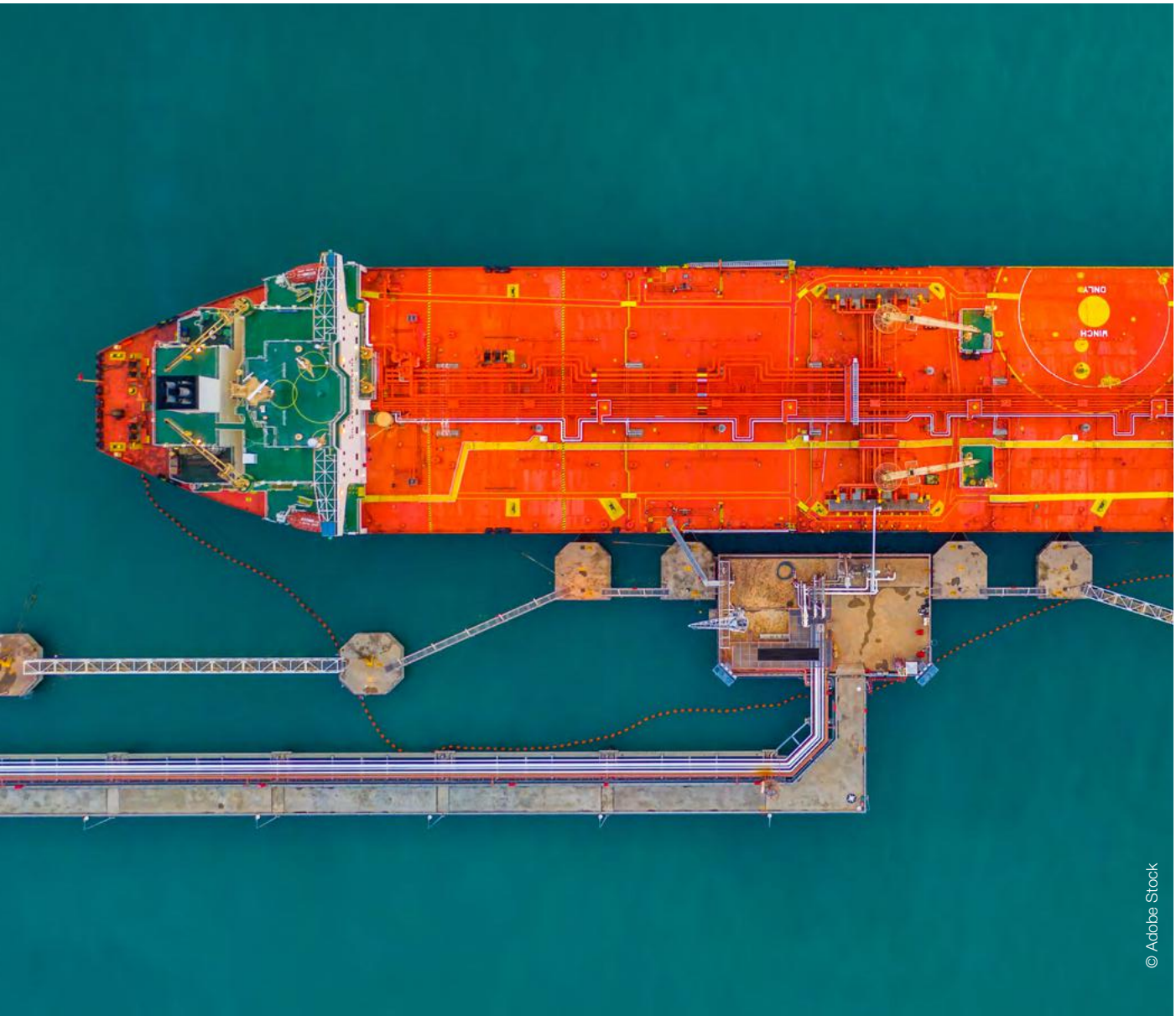
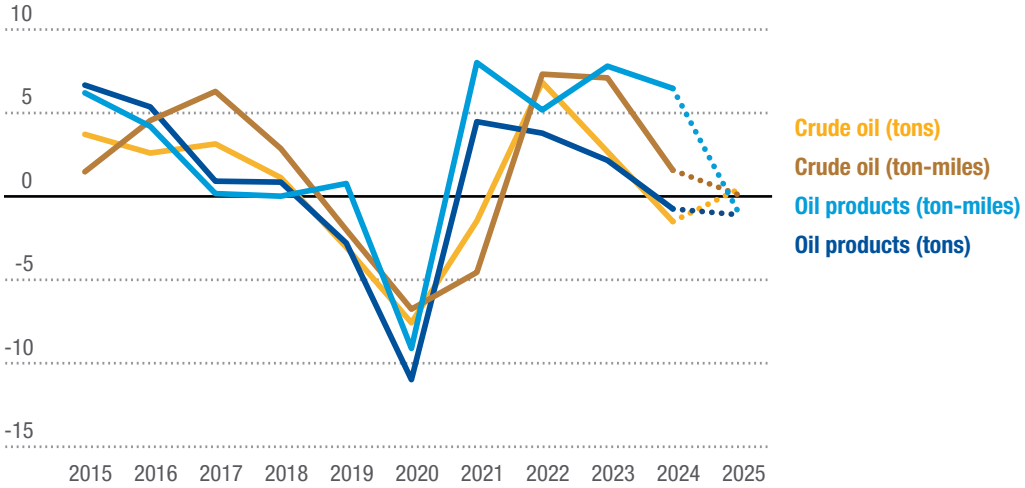


Figure I.7
Seaborne trade of oil and oil products
(Annual percentage change)

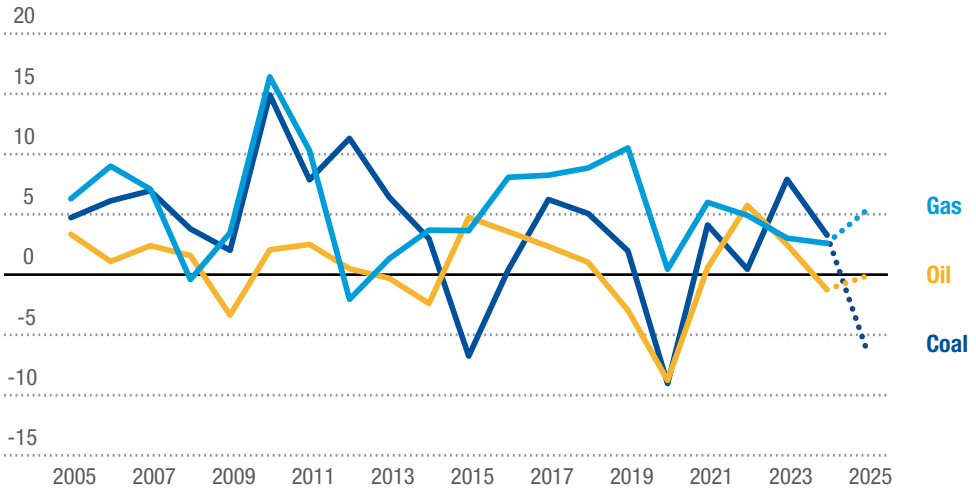


Source: UNCTAD calculations, based on Clarksons Research, 2025a, July.

Note: Figures for 2025 are forecasts.

This was due to a pause in new liquefaction capacity, infrastructure delays and a mild winter in Europe at the start of 2024 (Clarksons Research, 2024 and 2025b). In contrast, trade growth in ton-miles reached 12.2 per cent, reflecting expanded flows from Africa and the United States to Asia and Europe. LPG also saw strong gains, with volumes up 7.6 per cent and ton-miles rising 11.2 per cent, driven by robust United States and Middle East export growth, as well as strong demand, particularly in China and India (Clarksons Research, 2024 and 2025b).

Figure I.8
Seaborne trade of coal, LPG and LNG
(Annual percentage change in tons)



Source: UNCTAD calculations, based on Clarksons Research, 2025a, July.

Note: Figures for 2025 are forecasts.

Shifting energy trade
Volatility today, transformation ahead

Short-term rerouting drives 2024 surge

Extended voyage distances inflated ton-mile demand, especially for oil, gas, and refined products.

Structural shifts reshape energy flows

LNG expanded with new export capacity and Asia's growing demand, while sanctions redirected Russian oil and gas.

Fragile outlook for 2025

Seaborne trade expected to soften, with weak industrial activity and subdued volumes across key commodities.

Persistent disruption ahead

Red Sea insecurity and geopolitical factors likely to extend into 2026, reinforcing fragility in trade patterns.

Explaining 2024 trends: Short-term disruptions and structural shifts

Trends in 2024 reflected the interplay of temporary disruptions and longer-term structural realignments. On the short-term side, insecurity in the Red Sea and congestion at the Panama Canal led to widespread vessel rerouting, thereby inflating ton-mile demand, particularly for oil and gas products. Sanctions associated with the war in Ukraine contributed to the redistribution of Russian flows of crude oil, oil products and gas. This led to the replacement of flows to Europe with longer-haul sources, such as the United States and the Middle East, while Asia absorbed a growing share of Russian exports (IEA, 2024a; Clarksons Research, 2025e, April).

In parallel, structural changes continued to shape the underlying energy trade. LNG flows benefited from new export capacity in Africa and North America as well as growing demand in Asia. Recovering petrochemical demand, spearheaded by China, bolstered LPG growth (Clarksons Research, 2024).

Coal's temporary rebound in 2024 contrasted with its longer-term decline (box I.1), although rising flows from distant producers to Asia temporarily increased both volumes and distances. These developments occurred against a backdrop of persistent macroeconomic uncertainty, fluctuating energy prices and ongoing efforts to diversify energy supply sources.

Outlook for 2025: Softening volumes, fragile growth in ton-miles

Looking to 2025, energy seaborne trade is expected to grow at a slower pace, with volumes constrained by weak industrial activity and fragile demand conditions. Crude oil volumes are projected to increase by just 0.4 per cent, while oil products are set to decline by 1.1 per cent. LNG volumes are expected to rise by 5.8 per cent, supported by the gradual ramp-up of new liquefaction capacity.

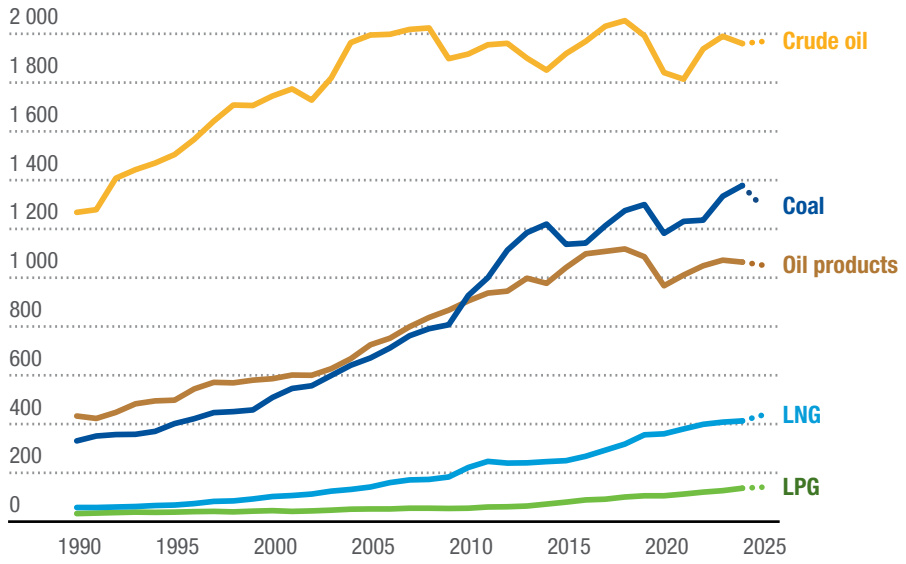
Growth in distance-adjusted trade is projected to moderate. Crude oil ton-miles are expected to rise slightly (0.1 per cent), while product ton-miles are projected to decline slightly (-0.9 per cent). LNG ton-mile growth is estimated at 1.2 per cent. These projections reflect a continuation of Red Sea disruptions through 2026 and the expected impact of trade policy changes, alongside continued geopolitical factors. Compared to 2024, when rerouting led to a marked increase in voyage distances, ton-mile estimates for 2025 reflect a more stable distance pattern across key shipping segments.

While short-term volatility is expected to persist, structural forces such as evolving trade networks, diversified energy partners and infrastructure expansions will continue to influence trade patterns. These shorter-term dynamics are unfolding within the context of longer-term shifts in energy trade flows, as explored in box I.1.

Box I.1
Long-term trends in the seaborne trade of energy commodities

Since 1990, crude oil has remained the dominant energy commodity in seaborne trade, although its growth in volume terms has plateaued since 2010. Coal volumes have increased steadily, overtaking oil products in the early 2010s. Oil products have expanded moderately with periodic fluctuations. The LNG trade has grown significantly, more than tripling since 1990, while LPG volumes have also risen. As of 2024, all five energy commodities cited in box figure I.1.1 recorded higher volumes than in 1990: Coal and oil products more than doubled, crude oil rose by approximately 40 per cent, LNG quadrupled and LPG nearly tripled.

Box figure I.1.1
Seaborne trade by energy commodity
(Volume in millions of tons)

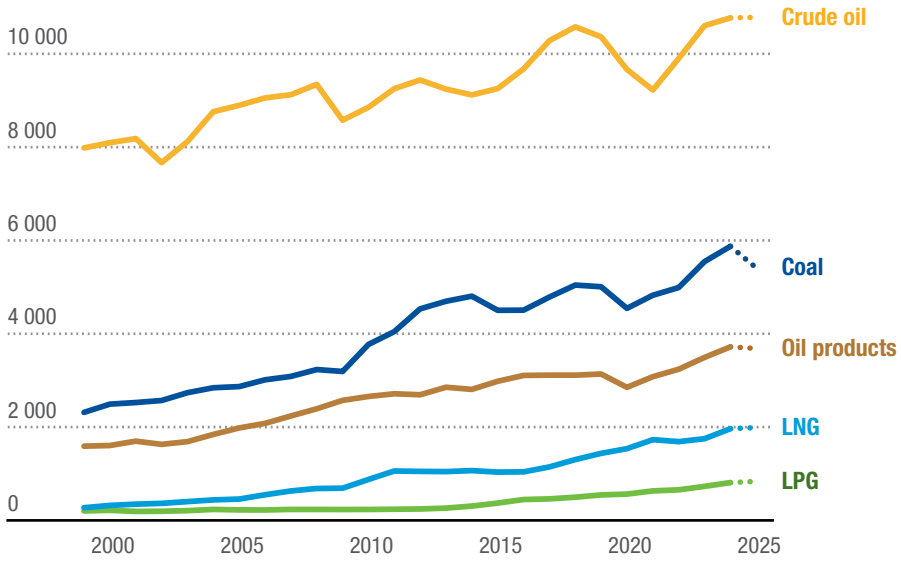


Source: UNCTAD calculations, based on Clarksons Research, 2025a, July.

Note: Figures for 2025 are forecasts.

When measured in ton-miles, crude oil has retained its lead, increasing from around 8 trillion in 1999 to over 10 trillion by 2024. Coal and oil products more than doubled over the same period. LNG experienced the sharpest growth, rising nearly tenfold, while LPG ton-miles increased more than fivefold (box figure I.1.2). These trends suggest not only rising volumes but also longer average transport distances for many energy commodities.

Box figure I.1.2
Seaborne trade by energy commodity
(Billions of ton-miles)



Source: UNCTAD calculations, based on Clarksons Research, 2025a, July.

Note: Figures for 2025 are forecasts.

Between 1990 and 2025, the seaborne energy trade underwent notable shifts in both physical volume and distance-adjusted terms. Crude oil volumes stabilized after 2010, but ton-mile growth was driven by longer trade routes linked to evolving refining hubs and demand in Asia, particularly in China and India. Coal and oil products grew steadily in volume and ton-miles, supported by persistent demand and broader trade linkages, especially across Asia. The most dynamic changes were observed in gas: The nearly tenfold surge in LNG ton-miles and fivefold rise in LPG reflected mounting demand in China, Japan and the Republic of Korea, and the rise of new suppliers in Africa (e.g., Mozambique, Nigeria) and North America (United States). These trends point to a more diverse and geographically dispersed energy trade, with gas gaining prominence and trade networks expanding in scope and complexity.

Such developments highlight a tension between short-term energy demand, especially for fossil fuels and long-term climate goals, as current seaborne trade appears at odds with global commitments to reduce greenhouse gas emissions.

Sources: Clarksons Research, 2025a, July; IEA, 2024a, 2025b and 2025c.

Note: Oil products refer to products derived from the processing of crude oil in oil refineries, which are typically transported on product tankers. These encompass naphtha, gasoline, jet fuel, middle distillates (diesel), fuel oil and vacuum gas oils. They do not include gases, lube oils and heavier products such as asphalt and paraffin wax.

C. Critical minerals reshaping maritime trade patterns

Critical energy transition minerals are essential for developing and deploying clean energy technologies and enabling the global shift to renewable energy. They are key to realizing Sustainable Development Goal 7 (affordable and clean energy) and vital to technologies such as batteries, wind turbines and solar panels. Commonly identified critical minerals include copper, lithium, cobalt, nickel, graphite, manganese and rare earth elements (UNCTAD, 2023b; IEA, 2024b; United Nations, Department of Economic and Social Affairs, 2025a and 2025b). UNCTAD published a comprehensive list of critical minerals in June 2025 (UNCTAD, 2025c).[3]

Most of these minerals, whether in raw or processed form, are shipped across the oceans from geographically concentrated producers to a broader base of industrial consumers. Seaborne trade thus serves as the backbone of mineral value chains, connecting resource-rich economies with global refining hubs and end users. The UNCTAD list of critical minerals (UNCTAD, 2025c) accounted for 31 per cent of global shipping volumes in 2023 (UNCTADStat, 2025).

Critical minerals such as iron ore, copper and zinc are transported primarily via bulk carriers in large, unpackaged volumes, a cost-effective, high-capacity model for long-distance shipments (UNCTAD, 2022). Processed minerals, high-value cargo and materials requiring enhanced security or traceability – such as lithium compounds – are increasingly shipped in containers (CSA Group, 2018). For hazardous or regulated materials, including rare earths, containerization allows specialized packaging and secure handling, in line with tighter supply chain requirements (International Safe Containerised Cargo Organisation, 2025).

This section explores how evolving trade patterns reflect the growing strategic importance of critical minerals, with a particular focus on copper and cobalt. It begins by examining how rising global demand is affecting maritime trade volumes and altering the composition of mineral flows. It then highlights how a small number of trade routes and processing hubs have become central to the movement of critical minerals. This is making the sector a focal point of geopolitical dynamics (IEA, 2025a) and propelling divergent policy responses on the import and export sides. The final part of the section considers the role of maritime logistics in enabling developing countries to seize opportunities in this rapidly evolving landscape, identifying key infrastructure, regulatory and coordination challenges that must be addressed.

A small number of trade routes and processing hubs now dominate critical mineral flows, **intensifying geopolitical and logistics challenges**

1. Drivers of trade expansion and growing strategic importance

The global energy transition and widespread adoption of clean energy technologies will primarily push the expansion of trade in critical minerals in the coming years. As countries accelerate the shift to low-carbon energy systems, trade in minerals such as lithium, copper, cobalt and graphite is growing rapidly.

[3] UNCTAD's list contains 60 critical raw and semi-processed minerals, mapped to 499 six-digit HS codes to support trade analysis. These minerals are categorized based on their relevance to the energy transition: (1) required (27 minerals) or essential for energy transition technologies — e.g., cobalt, copper, lithium, rare earth elements; (2) relevant (10 minerals) or indirectly important — e.g., iron ore and steel, palladium, zirconium and (3) other critical minerals (23 minerals) or broader strategic minerals — e.g., gold, gypsum, lead, silver. A full list is available at https://sdgpulse.unctad.org/critical-minerals/#annex2.

Mounting demand for clean energy technologies is driving unprecedented growth in maritime trade of critical minerals

The importance of critical minerals extends significantly beyond their vital role in climate action and the global energy transition, encompassing other strategic sectors such as semiconductors, digital technologies, aerospace and defence. Minerals are increasingly recognized as strategic inputs across both energy and broader industrial value chains (UN Secretary-General's Panel on Critical Energy Transition Minerals, 2024; United Nations, Department of Economic and Social Affairs, 2025b).

Mounting demand linked to clean energy technologies, industrial development and evolving supply chains is visible in long-term seaborne trade data. Figure I.9 visualizes critical minerals shipments experiencing strong long-term growth between 1994 and 2025[4] (nickel ore, 1,222.5 per cent; manganese ore, 711.2 per cent; copper concentrates, 634.2 per cent; and bauxite, 589.6 per cent). Seaborne trade in nickel ore experienced the most pronounced expansion, particularly after 2010.

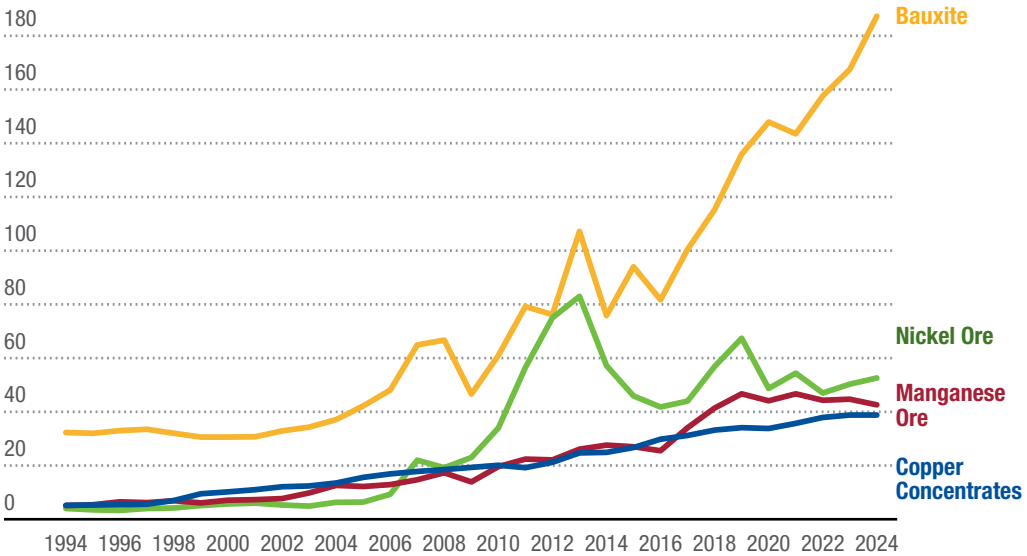
Manganese ore saw multiple surges, notably in 1996, 2003–2004, 2007–2008 and 2017–2019. Copper concentrates grew steadily, with notable accelerations in 1998–1999, 2005 and 2012–2013. Bauxite trade began rising more sharply from 2015 onward.

Demand for energy transition minerals is expected to nearly triple by 2030 and more than quadruple by 2040, with particularly steep growth anticipated in 2025–2035 (IEA, 2024b; UNCTAD, 2024b). For developing nations rich in critical mineral resources, skyrocketing demand creates a significant opportunity for increased export earnings, economic growth, poverty reduction and sustainable development.

2. Global seaborne trade trends: Insights from cobalt and copper

To better understand maritime trade trends in critical minerals, the following case study focuses on a selected set of Harmonized

Figure I.9
World seaborne trade of selected critical minerals
(Millions of tons)



Source: Clarksons Research, 2025j.

Note: Figures for 2025 are forecasts.

[4] Chosen based on the fastest growth rates throughout the period for which the Clarksons Research time series provides critical mineral seaborne trade data.

System (HS) codes representing two essential inputs for the energy transition: cobalt and copper.[5] The codes were selected based on three distinct stages of the mineral value chain (raw materials, semi-processed products and manufactured goods) using the Standard International Trade Classification (SITC). By applying this classification to disaggregated seaborne trade data, the case study tracks how maritime export flows of cobalt and copper have evolved over time and across processing stages, offering insights into emerging trade patterns, dependencies and value chain positioning. In this analysis, commodity data have been aggregated by stage, as detailed in table I.5.

Different patterns across critical minerals and stages of the value chain

Although seaborne trade volumes of both copper and cobalt have increased over the past two decades, reflecting sustained global demand, patterns vary at different stages of the mineral value chain. Raw copper (primarily in the form of concentrates) has long dominated global seaborne trade and continues to account for the largest share of maritime shipments (figure I.10). This trend reflects the structure of the global copper industry, where many producing countries focus on extraction while downstream processing takes place elsewhere. There has been sustained growth in semi-processed copper (e.g., cathodes, anodes and rods), showing gradual advances in midstream refining and smelting capacity in producing countries. Manufactured copper represents the smallest share of maritime volumes. Its trade has remained stable over time.

Over time, the copper trade has become more stratified. While raw copper still flows primarily from major producers such as Chile, Indonesia and Peru (UNCTAD, 2025h), semi-processed exports are led by countries including Chile, China, the Democratic Republic of the Congo, Japan and the Russian Federation (International Copper Study Group, 2020). This points to an evolving midstream capacity among industrialized and mineral-rich economies. Manufactured copper flows are more dispersed, with trade occurring among a broader set of economies, including Australia, Chile, China, Taiwan Province of China, Germany, India, Norway, Peru, the United States and Viet Nam.

Copper and cobalt seaborne trade:

Raw minerals still dominate seaborne trade, but semi-processed and manufactured flows reveal evolving trade patterns

Table I.5
Harmonized System codes for cobalt and copper, classified by mineral value chain stage

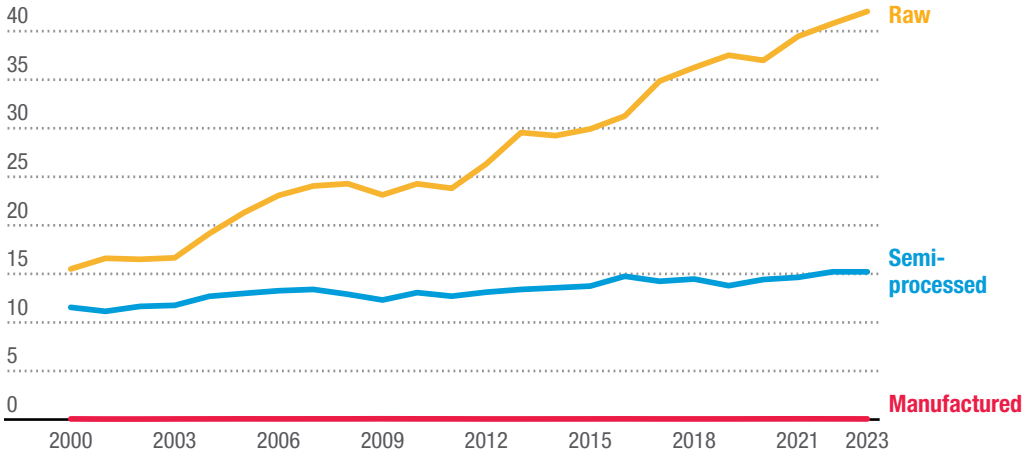
Stage of mineral value chain	Cobalt	Copper
Raw	260500	260300, 262030, 740100, 740100, 740400
Semi-processed	810520, 810530	740200, 740311, 740312, 740313, 740319, 740321, 740322, 740329, 740610, 740620, 740710, 740721, 740729, 740811, 740819, 740821, 740822, 740829, 740911, 740919, 740921, 740929, 740931, 740939, 740940, 740990, 741011, 741012, 741021, 741022, 741110, 741121, 741122, 741129, 741210, 741220, 740500
Manufactures	282200, 810590	282550, 282741

Source: UNCTAD.

Note: Codes correspond to the 2022 edition of the Harmonized System (HS2022).

[5] This case study uses data from the new UNCTAD Seaborne Trade data set (UNCTADstat, 2025; UNCTAD, 2025a) and the 2025 UNCTAD list identifying and categorizing critical minerals (UNCTAD, 2025c).

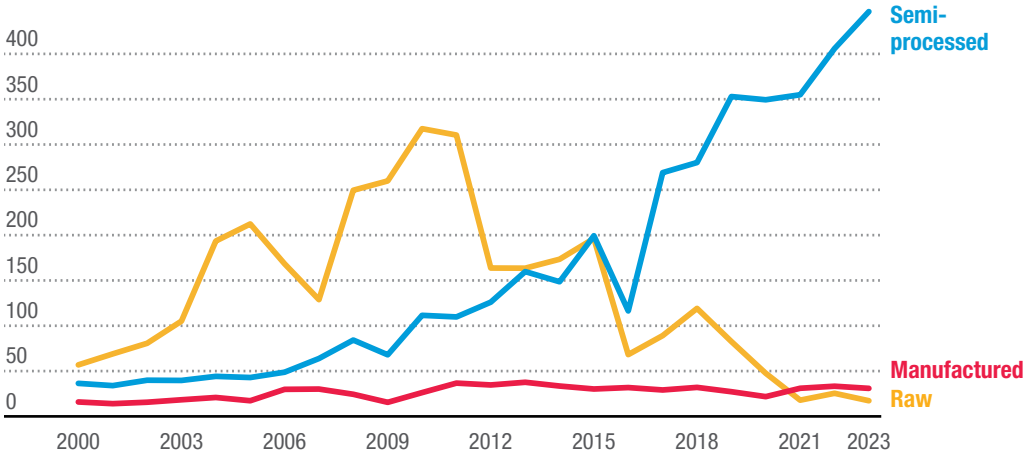
Figure I.10
Seaborne trade volumes of copper by stage of processing
(Millions of tons)



Source: UNCTAD, based on data extracted from the UNCTAD Seaborne Trade data set.

In contrast to copper, the seaborne trade of cobalt witnessed a shift in composition around 2015 (figure I.11). From 2000 to 2023, raw cobalt dominated maritime exports. Around 2015, however, the trade of semi-processed cobalt increased steadily, driven by several reinforcing factors. These included growing policy support for in-country benefits in major producing nations such as the Democratic Republic of the Congo (African Export–Import Bank, 2023; UNCTAD, 2023c); increased Chinese and international investment in local refining infrastructure, and a push for supply chain integration and cost efficiency by downstream industries (IEA, 2023 and 2024b; OECD-IEA, 2025). Meanwhile, manufactured cobalt products remained a small but stable share of seaborne flows throughout 2000–2023. Overall, the data suggest that most cobalt enters global supply chains after some value has already been added.

Figure I.11
Seaborne trade volumes of cobalt by stage of processing
(Thousands of tons)



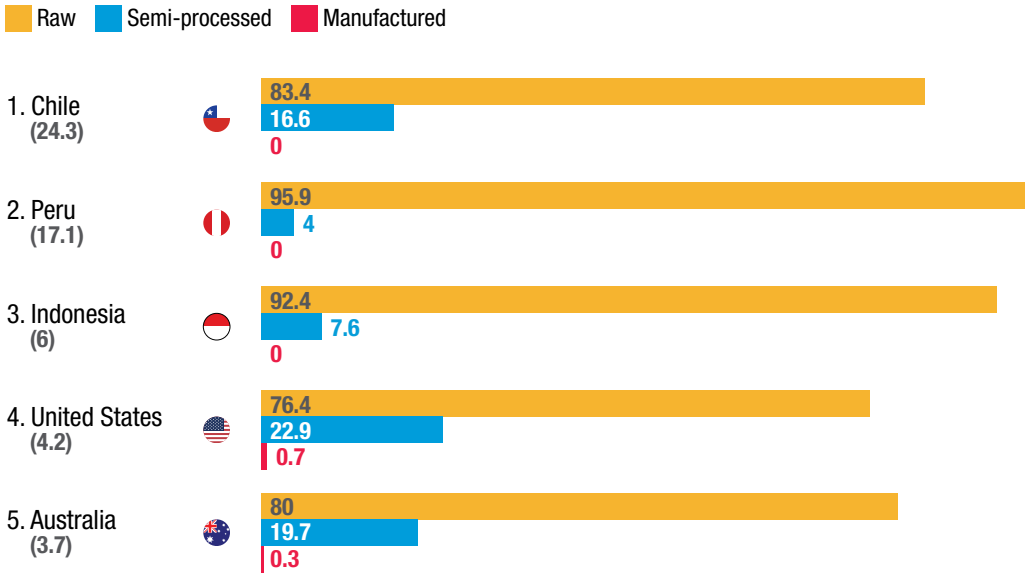
Source: UNCTAD, based on data extracted from the UNCTAD Seaborne Trade data set.

Trade concentration and strategic routes

Copper and cobalt show increasing concentrations in terms of trade routes and actors. For copper, the top five exporters accounted for 55.2 per cent of the global seaborne copper trade across all stages of processing in 2023. Raw material flows, i.e. unprocessed copper, are heavily concentrated from Chile and Peru to China (figure I.12). In contrast, Indonesia's exports are more diversified, encompassing, China as well as India, Japan and the Republic of Korea as top destinations (World Bank, 2024a).

China dominates import demand across all processing stages (figure I.13). Routes connecting Chile and Peru with China have expanded steadily over the past 20 years, demonstrating China's enduring centrality in the global copper value chain. These routes reflect increasing demand for raw and semi-processed copper in Asia, especially for industrial and energy transition use (Observatory of Economic Complexity, 2024; UNCTAD, 2025h). This centrality, however, also underscores the risk of dependency and supply chain vulnerability for downstream economies.

Figure I.12
Top five copper exporters by processing stage, 2023
(Percentage)

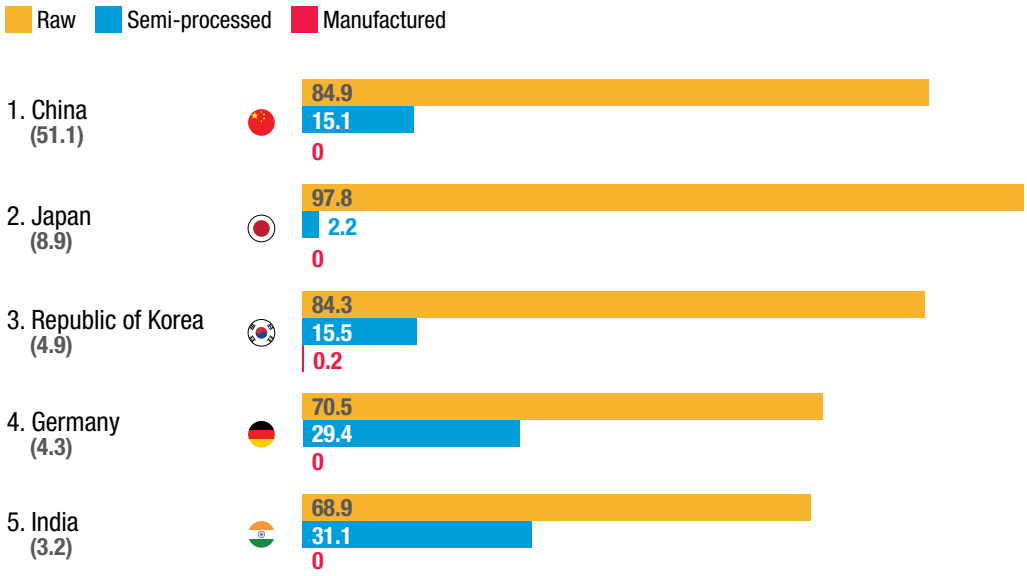


Source: UNCTAD, based on data extracted from the UNCTAD Seaborne Trade data set.

Notes: Percentages in parentheses after the country names indicate each country's share of global copper exports (all processing stages combined) in 2023.

Comparable figures for earlier years (2000–2022) show similar levels of concentration, confirming that the 2023 snapshot is representative of persistent structural patterns in copper trade flows.

Figure I.13
Top five copper importers by processing stage, 2023
(Percentage)



Source: UNCTAD, based on data extracted from the UNCTAD Seaborne Trade data set.

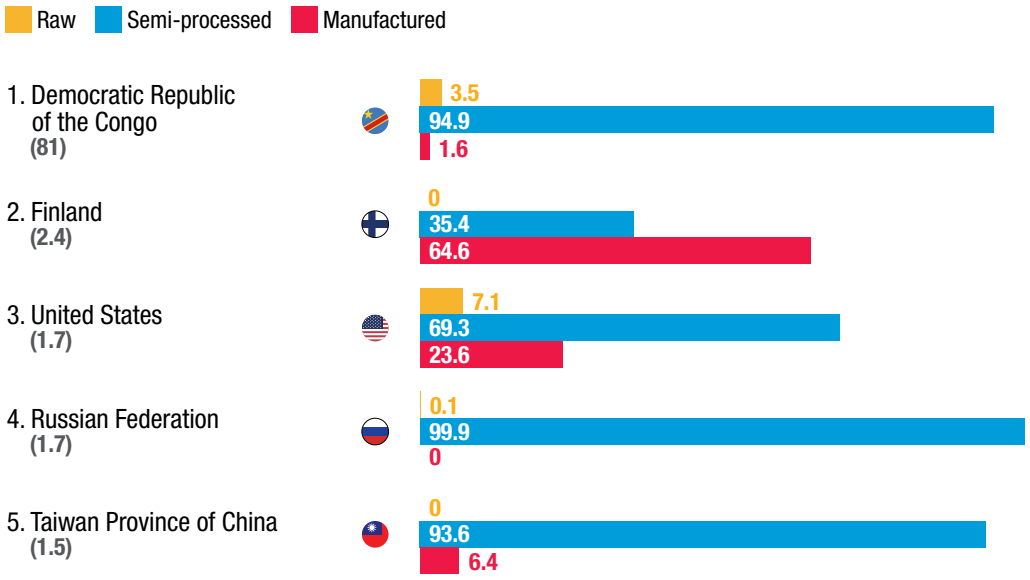
Note: Percentages in parentheses after the country names indicate each country's share of global copper imports (all processing stages combined) in 2023.

The Democratic Republic of the Congo accounts for **over 80% of global cobalt seaborne trade**

Cobalt seaborne trade remains highly concentrated and strategically oriented. In 2023, the top five exporters accounted for 88 per cent of global volumes, with the Democratic Republic of the Congo representing over 80 per cent (figure I.14) According to the UNCTAD Seaborne Trade dataset, the Democratic Republic of the Congo has been the dominant exporter since 2000, with its share rising from around 40 per cent in the early 2000s to more than 80 per cent in recent years, underscoring persistent and intensifying concentration. Strategic corridors have also intensified. The China–Democratic Republic of the Congo route has seen the sharpest growth, driven by China's investment in Congolese mining and its rise as a battery powerhouse (UNCTAD, 2025c; AidData, 2025). Other refining-linked flows (e.g., Belgium–China and Finland–Republic of Korea) highlight the emergence of midstream trade hubs serving industrial consumers (figure I.15).

These trends underscore how a limited number of maritime corridors and processing hubs underpin the global movement of copper and cobalt. For copper, flows from Chile and Peru to China dominate seaborne trade, while for cobalt, the Democratic Republic of the Congo supplies over four fifths of global exports, largely directed to China. Midstream hubs such as Belgium and Finland also play a role, refining and re-exporting cobalt to major industrial consumers. Together, these concentrated maritime corridors and processing hubs define the geography of copper and cobalt trade. Their dominance shapes market dynamics and underpins the structure of critical mineral supply chains (IEA, 2025a).

Figure I.14
Top five cobalt exporters by processing stage, 2023
(Percentage)

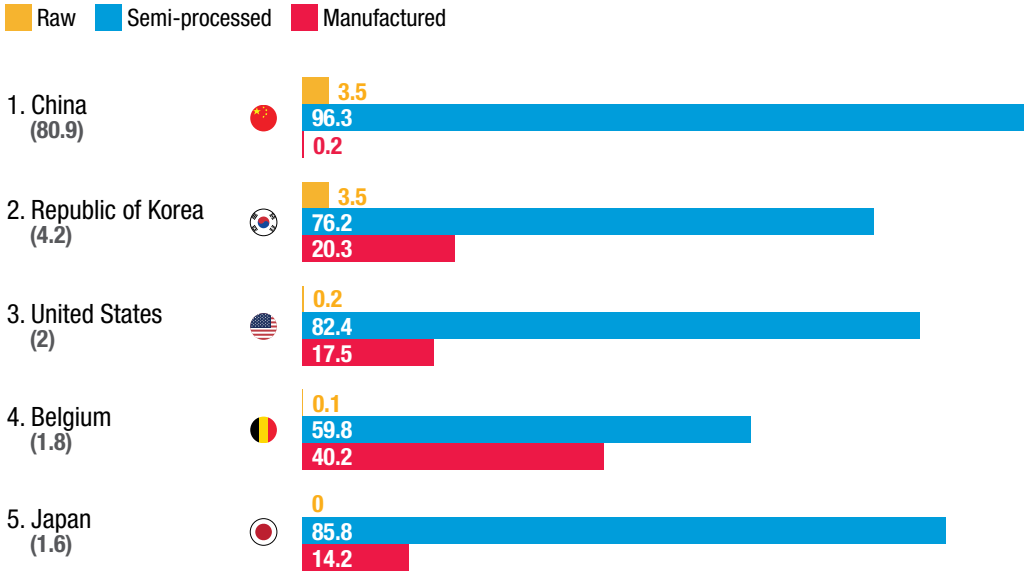


Source: UNCTAD, based on data extracted from the UNCTAD Seaborne Trade data set.

Notes: Percentages in parentheses after the country names indicate each country's share of global cobalt exports (all processing stages combined) in 2023.

Comparable figures for earlier years (2000–2022) show similar levels of concentration, confirming that the 2023 snapshot is representative of persistent structural patterns in cobalt trade flows.

Figure I.15
Top 5 cobalt importers by processing stage, 2023
(Percentage)



Source: UNCTAD, based on data extracted from the UNCTAD Seaborne Trade data set.

Note: Percentages in parentheses after the country names indicate each country's share of global cobalt imports (all processing stages combined) in 2023.

Policy shifts and maritime logistics: Implications for developing countries

Efficient maritime logistics are pivotal for developing countries **to harness the potential of critical minerals**

The concentration of trade in critical minerals along a limited number of supply corridors and a handful of countries dominating production and processing has heightened strategic dependencies. This has left global supply chains increasingly vulnerable, particularly amid recurring disruptions and shifting geopolitical dynamics (Atlantic Council, 2025; National Bureau of Asian Research, 2022). As a result, the trade in critical minerals has emerged as a focal point of strategic geopolitics, prompting wide-ranging policy shifts in importing countries aimed at securing long-term access to strategic mineral inputs.

In response, importing countries have undertaken a variety of policy changes aimed at securing long-term access to strategic mineral inputs. New legislative and industrial policy instruments include the United States' Inflation Reduction Act of 2022[6] and the European Union's Critical Raw Materials Act.[7] Both seek to diversify supply sources, promote domestic processing, and strengthen traceability and due diligence mechanisms. Strategic partnerships and bilateral cooperation frameworks designed to reduce overreliance on highly concentrated suppliers often accompany legislative efforts (IEA, 2025a).

On the export side, resource-rich developing countries are increasingly adopting measures to retain a greater share of the value generated from their critical mineral resources. Countries such as the Democratic Republic of the Congo, Indonesia and Zimbabwe have introduced export restrictions on unprocessed minerals, local content policies and targeted fiscal incentives. These measures aim to support domestic processing, encourage downstream investments and promote industrial upgrading (United Nations, Department of Economic and Social Affairs, 2025b).

In this evolving landscape, maritime logistics, encompassing port infrastructure, shipping services and trade facilitation systems, are pivotal for developing countries to harness the trade and development potential of critical minerals. Efficient logistics improve access to global markets and support efforts to diversify production and integrate into the higher-value segments of mineral supply chains (UNCTAD, 2023a). Yet many developing economies face persistent constraints, including high transport costs, limited port capacity and underdeveloped intermodal connectivity. These hamper their ability to move beyond raw material exports (UNCTAD, 2024b).

Addressing these challenges requires more than infrastructure upgrades. It demands strategic alignment between logistics development and industrial policy. Experiences from regions such as Suape in Brazil and the Lobito Corridor in Africa suggest that when port infrastructure is linked to targeted sectoral strategies (such as processing zones for chemicals, machinery or battery components in port-proximate zones), countries can attract investment, promote value addition and generate employment (UNCTAD, 2024c and World Bank, 2024b). Coordinating maritime logistics with broader industrial objectives creates conditions for structural transformation, allowing mineral-rich economies to leverage their resources for sustained, inclusive growth.

[6] Public Law 117-169. Available at https://www.congress.gov/bill/117th-congress/house-bill/5376/text. The Act remains in effect but has been subject to modification by the One Big Beautiful Bill Act, which became Public Law 119-21 on 4 July 2025. Available at https://www.congress.gov/bill/119th-congress/house-bill/1/text/enr.

[7] Regulation (EU) 2024/1252, which entered into force on 23 May 2024. For further details and the text of the regulation, see https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/green-deal-industrial-plan/european-critical-raw-materials-act_en.

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2025 Review of maritime transport

Chapter II

World shipping fleet and services

In 2024 and the first half of 2025, global shipping continued to navigate uncertainty and volatility amid ongoing disruptions in the Red Sea and Black Sea. Starting in 2025, new developments amplified existing challenges. These comprised trade policy shifts and tariffs; heightened geopolitical tensions posing fresh risks in the Strait of Hormuz, a critical maritime passage for the global energy supply; global regulations on decarbonizing shipping and accelerating its energy transition; and capacity imbalances in the global fleet, shipbuilding industry and ship recycling activities. Against this backdrop, global fleet capacity expanded by 3.4 per cent in 2024. This rate was on par with growth in 2023 but below the 5.1 per cent average of 2005–2024 and faster than demand.

Section A of this chapter sets out the latest developments in 2025, which are further disrupting shipping operations and intensifying unpredictability. Section B highlights key long-term trends shaping the profile and structure of the global fleet and related maritime business sectors, in particular, shipbuilding and recycling.

United Nations

Key policy takeaways

- Geopolitical tensions, disrupted shipping routes, shifting trade patterns, an accelerated decarbonization agenda and growing digitalization **are redefining the operational landscape of global shipping – and affecting its outlook**.

- **More than ever, the shipping industry, ports, logistics providers and shippers need to collaborate and coordinate action to effectively adapt to changing conditions, mitigate expanding risks and volatility, and leverage potential opportunities**. Collaboration in the shipbuilding industry is equally important given capacity imbalances and anticipated shifts in fleet demand.

- **Heightened uncertainty and unpredictability are forcing a rethink of shipping plans and strategies. Supported by enabling policy and regulatory frameworks, the shipping industry requires adaptation strategies, better planning and preparedness**. Carriers need to implement contingency and risk management plans; adjust ship routing decisions; enhance operational flexibility; and upgrade fleets to better handle rerouted traffic as well as changes in shipping and trading dynamics (e.g., regional short-haul or hub-and-spoke shipping networks).

- **Incentivizing active fleet renewal and boosting ship recycling activity to remove older tonnage while complying with sustainable and safe ship recycling requirements is necessary**. This requires larger scrapping capacity compliant with the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships and the European Union Ship Recycling Regulation. Actions may involve various stakeholders, including Governments, regulators, shipbuilders, shipowners, providers of ship finance and ship recyclers.

- **Addressing persistent labour shortages by promoting proactive and inclusive recruitment, especially by tapping the talent pool of women seafarers** is increasingly important. For the shipping industry, Governments and relevant regulatory agencies, it is crucial to attract qualified labour and safeguard the rights of seafarers. Labour will also need continued upgrading of skills.

- **Supporting the development and adoption of alternative fuels and related safety and security protocols and regulatory frameworks is critical**. Energy-saving technologies on ships would further advance decarbonization. Multistakeholder initiatives, such as the Green Shipping Corridors, should be accelerated. Funds that may be generated under a new IMO carbon pricing mechanism for international shipping, which will be considered for adoption by IMO member States in October 2025, could be channelled to support the transition. Governments, in collaboration with the shipping industry and relevant maritime workforce entities and recruitment agencies, should promote the training and upskilling of the workforce, on ships and onshore, to operate technologically advanced and alternatively fuelled ships.

- **The shipping industry should continue to leverage digital solutions and adapt related regulatory frameworks**. Mainstreaming smart and sustainable shipping practices through, for example, the efficient monitoring of navigation patterns, more transparency and robust predictive maintenance solutions will boost efficiency and sustainability while enabling regulatory compliance.

- **UNCTAD will continue supporting developing countries to better manage risks and seize opportunities for shipping and ports that may arise from shifting trade patterns and the evolving geography of transport and trade**. This includes, for example, the potential for ports in developing countries to benefit from transshipment activities due to potential changes in trade routes.

A. Recent developments rattling global shipping

1. Geopolitical tensions, volatile and rapidly shifting trade policy, and domestic shipbuilding revival plans add complexity and volatility to shipping

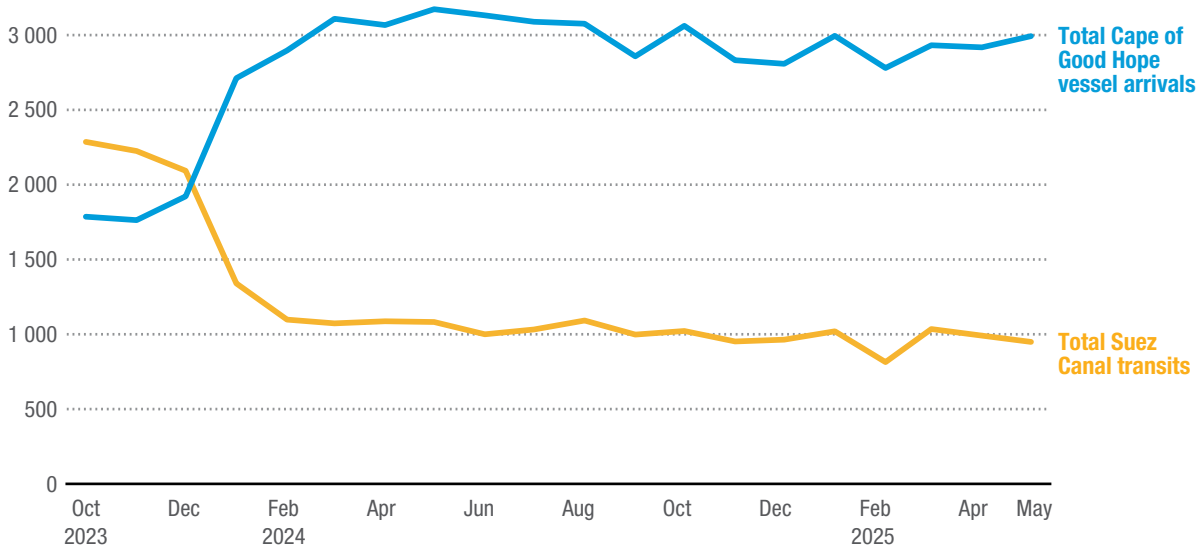
Geopolitical tensions and disrupted maritime chokepoints

In 2024 and the first half of 2025, global shipping grappled with rapidly shifting operating conditions driven by trade policy shifts and tariffs, geopolitical tensions, ongoing disruption to critical shipping routes, intensified pressure on the shipping industry to decarbonize and a restructuring in global container shipping alliances. In addition, the sector faces strengthened environmental sustainability targets and regulations, advances in technology, fleet renewal needs, and continued uncertainty over the decarbonization and energy transition.

New ship capacity continues to be delivered, especially in the container segment, while trade growth in some markets has slowed. This is reviving some concerns about a potential fleet capacity surplus and asset underutilization when distance-adjusted demand, which had absorbed surplus capacity over the past few years, eventually normalizes. Ongoing uncertainty around navigation in the Red Sea compounds these issues. Shipping continues to avoid the Suez Canal, with tonnage transit levels by early May 2025 still around 70 per cent below the 2023 average (figure II.1). Distance-adjusted demand, boosted by rerouting around the Cape of Good Hope, is expected to ease if and when the geopolitical tensions affecting the Red Sea fade away.

In 2024 and the first half of 2025, global shipping grappled with rapidly shifting operating conditions

Figure II.1
Monthly ship transits and arrivals for the Suez Canal and Cape of Good Hope
(Number)



Source: UNCTAD calculations, based on data from Clarksons Research, 2025b.

Conflict between the Islamic Republic of Iran and Israel in June 2025 exacerbated concerns about disruptions to maritime chokepoints, with eyes on the Strait of Hormuz. This international chokepoint is critical for the global oil trade. It is also relevant for containerized trade traffic as over 30 million TEU of containerized port traffic, based on UNCTAD data on container port throughput, takes place in the vicinity, reflecting large transshipment activity in the port of Jebel Ali (Dubai) (Notteboom et al., 2022). The Strait of Hormuz facilitates 11 per cent of global maritime trade volume in metric tons. This includes 34 per cent of seaborne oil exports and 30 per cent of LPG exports. By mid-June 2025, the strait saw an average of 144 ship transits a day; 37 per cent were tankers, 17 per cent were container ships and 13 per cent were bulk carriers (Clarksons Research, 2025a).

The potential closing of this critical maritime passage would halt the transit of 3,512 ships per month on average or over 42,400 ships per year (Clarksons Research, 2025b). It would particularly unsettle global oil and gas markets. At the time of writing, however, there was no indication of a threat or impact on commercial shipping using the strait. By the end of June 2025, ship transit patterns through the maritime passage had not shown any significant changes. Ship transits in gross tonnage remained within the usual ranges, bearing in mind normal day-to-day volatility (figure II.2). Depending on ongoing developments, however, the potential for disruption, resulting in increased shipping costs, delays and insurance premiums, cannot be excluded.

Alternative supply routes are limited, with pipeline capacity insufficient to offset potential maritime disruptions in the Strait of Hormuz and Red Sea. At the same time, potential changes in oil and gas sourcing patterns could increase voyage distances, transit times, shipping rates and ton miles as well as tanker and LNG fleet capacity requirements. With longer waiting times for transit, ship capacity could also be trapped in the Persian/Arabian Gulf, causing a supply-side crunch and the need for more ships.

Figure II.2
Monthly ship transits through the Strait of Hormuz
(Millions of gross tons)

Source: Clarksons Research, 2025b.

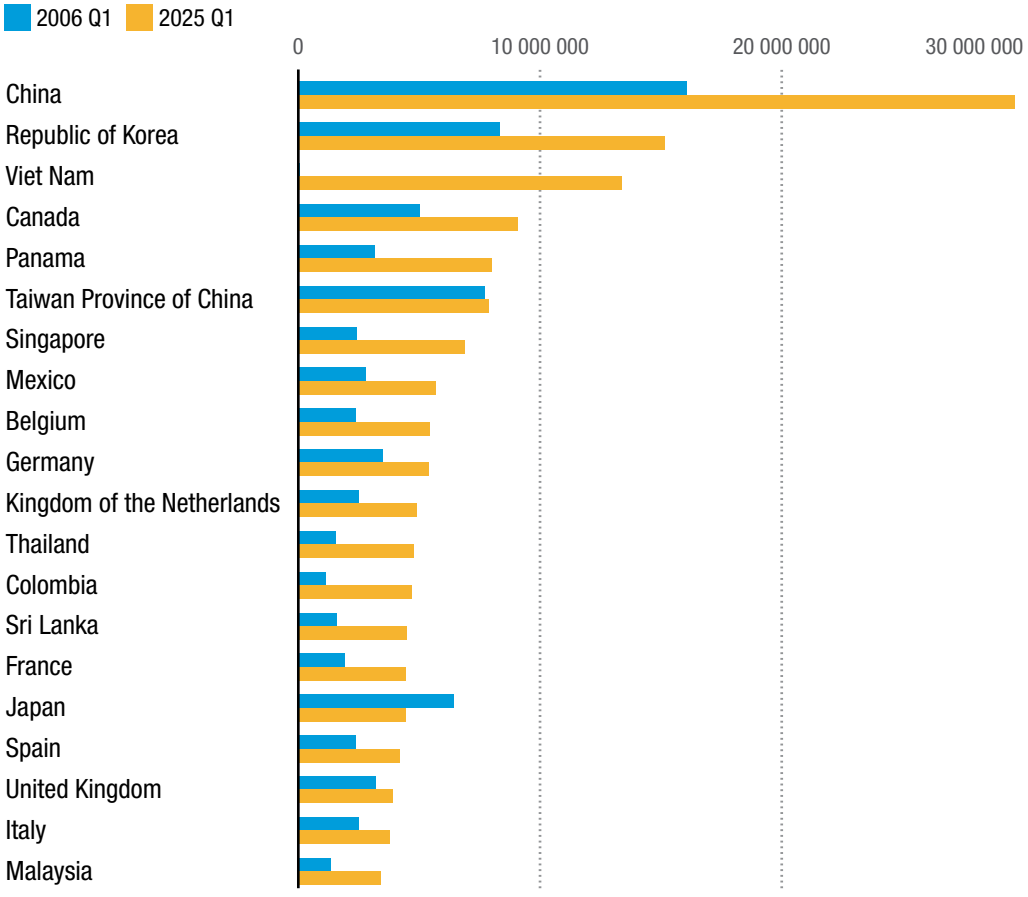
Trade policy and tariffs

Another new development exacerbating volatility and uncertainty is the introduction of new trade tariffs in the United States of America and the change in its trade policy since January 2025 (see chapter I).

Depending on further developments, the degree of exposure and the scope of responses by other countries, the implications for shipping could be significant, affecting demand for services and fleet capacity, and altering shipping networks, port call configurations and fleet deployment plans. In the past, for example, and amid the 2018 tariff escalation between China and the United States, Canada, India, Mexico, Thailand and Viet Nam all seized some rerouted trade flows. These developments reflect the reconfiguration of global value chains triggered by the new tariffs (United Nations, Department of Economic and Social Affairs, 2025). Figure II.3 shows how planned container capacity in TEU on routes bound to the United States has shifted during a period marked by changes in United States trade policy, including those introduced since 2018. Overall scheduled capacity increased despite shifts towards other countries. In 2025, China remained the primary source of scheduled container capacity.

The Implications for shipping could be significant, **affecting demand for services and fleet capacity**, and altering shipping networks

Figure II.3
Scheduled deployed capacity to the United States
(Number of TEU)

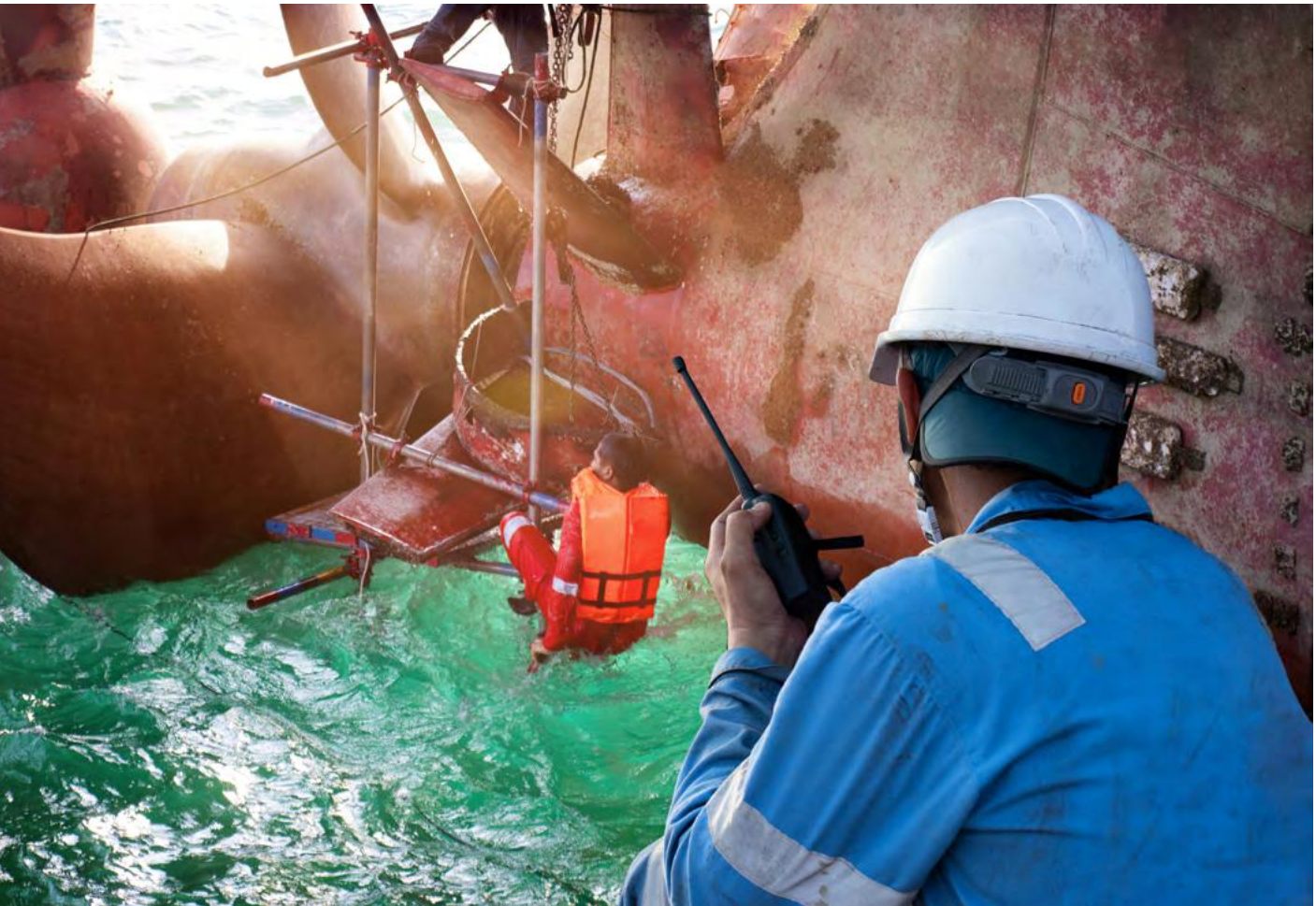


Source: UNCTAD calculations, based on data from the MDS Transmodal Containership Databank.

Immediately after new tariffs were announced on 2 April 2025, blank sailing (the skipping of scheduled port calls) increased, causing a reduction in container ship capacity. Blank sailing was reported on both the trans-Pacific and Asia–North America east coast trade lanes as shipments to the United States were either paused or cancelled. Over 80 blank sailings on the trans-Pacific route were reported in April, surpassing the 51 in May 2020 during the COVID-19 pandemic (Scan Global Logistics, 2025). Early indications from carriers and forwarders suggested a 30 to 50 per cent reduction in Chinese bookings (American Journal of Transportation, 2025). Container port throughput in China had fallen by 6.1 per cent by mid-April (The Wall Street Journal, 2025; Yanelli, 2025), while ports such as Los Angeles reported a 35 per cent dip in import volumes (Reuters, 2025; Pound, 2025). The drop in trade volumes was reversed when a 90-day pause on steep tariffs was announced; inventory restocking accelerated to make use of this period ahead of agreement on the final tariffs. Importers started to front-load and build inventories (LaRocco, 2025) with blank sailing adjusted to match increased demand.

Port fees and maritime transport services

In addition to tariffs that may have implications for international shipping, there is a shift in the United States towards domestic-focused industrial policy that promotes national shipbuilding and maritime transport. The Office of the United States Trade Representative has announced measures aimed at countering China's perceived dominance in global maritime logistics and shipbuilding, notably port fees targeting certain ships calling at ports in the United States. These include Chinese-owned or -operated vessels as well as Chinese-built vessels, subject to some exceptions, and foreign-built vehicle carriers. Box II.1. presents an overview of these measures.



Box II.1
United States port fees: Some key measures and proposals relevant to global shipping and shipbuilding

Following an investigation under section 301 of the Trade Act of 1974, as amended (United States of America, Office of the United States Trade Representative, 2025a), in February 2025, the United States Trade Representative published a number of proposed measures, including service fees and restrictions on certain maritime transport services. It subsequently conducted consultations on the proposals (United States of America, Office of the United States Trade Representative, 2025b) and, on 17 April 2025, announced action together with additional proposed measures that are still subject to consultations (United States of America, Office of the United States Trade Representative, 2025c).

Relevant action involves port fees, which apply to foreign ships calling at United States ports, with a focus on Chinese-linked shipping operators and fleets, as well as vessels built in China. In particular, while applicable fees are set at $0 for the first 180 days, "in the first phase, beginning on October 14, 2025, the following will be assessed: Fees on vessel owners and operators of China based on net tonnage, increasing incrementally over the following years; Fees on operators of Chinese-built ships based on net tonnage or containers, increasing incrementally over the following years; and Fees on foreign-built car carrier vessels based on their capacity. The second phase, beginning on April 17, 2028, includes certain limited restrictions on the maritime transport of LNG through requirements to use domestic vessels. The action provides for suspension of the restriction for entities ordering and taking delivery of a U.S.-built vessel".[a]

Fees imposed on operators of Chinese-built ships do not apply to U.S. government cargo or to the following Chinese-built vessels: "(i) U.S.-owned or U.S.-flagged vessels enrolled in the Voluntary Intermodal Sealift Agreement, the Maritime Security Program, the Tanker Security Program, or the Cable Security Program; (ii) vessels arriving empty or in ballast; (iii) vessels with a capacity of equal to or less than: 4,000 Twenty-Foot Equivalent Units, 55,000 deadweight tons, or an individual bulk capacity of 80,000 deadweight tons; (iv) vessels entering a U.S. port in the continental United States from a voyage of less than 2,000 nautical miles from a foreign port or point; (v) U.S.-owned vessels, where the U.S. entity owning the vessel is controlled by U.S. persons and is at least 75 per cent beneficially owned by U.S. persons; (vi) specialized or special purpose-built vessels for the transport of chemical substances in bulk liquid forms; and (vii) vessels principally identified as "Lakers Vessels" on CBP Form 1300, or its electronic equivalent" (United States of America, Office of the United States Trade Representative, 2025c).

In addition, the United States Trade Representative sought public comments on its proposed duties on ship-to-shore cranes and other cargo handling equipment, in line with the executive order of the President of the United States on restoring America's maritime dominance, of 9 April 2025 (United States of America, The White House, 2025). This includes a proposed additional duty of up to 100 per cent for imported ship-to-shore cranes produced in China or made of Chinese-sourced parts and components (United States of America, Office of the United States Trade Representative, 2025c).

The United States Trade Representative proposed further modifications of some measures on 6 June 2025,[b] which are subject to ongoing consultations (United States of America, Office of the United States Trade Representative, 2025d). Thus, port fees for foreign-built car carriers, previously based on the vessel's vehicle capacity and set at $150 per car-equivalent unit, are now being proposed at $14 per net ton. Clarification that roll-on/roll-off (Ro-Ro) vessels are included in the regulation impacting car carriers is also provided. The proposed modifications also allow exemptions from fees for car carriers or Ro-Ro vessels that are: (i) United States owned or registered and enrolled in the United States Maritime Security Program, (ii) owned, operated or chartered by the United States Government or (iii) carrying United States Government cargo. Another proposal is the elimination of a paragraph, retroactive to 17 April 2025, under which the United States Trade Representative may direct the suspension of LNG export licenses until statutory targets for the share of United States LNG exports to be carried on United States-built vessels have been met. At the time of writing, the United States Trade Representative was seeking comments until 7 July before finalizing any changes.

Source: UNCTAD secretariat, based on cited sources.

[a] See supplementary information provided at https://www.federalregister.gov/documents/2025/06/12/2025-10660/notice-of-proposed-modification-of-action-in-section-301-investigation-of-chinas-targeting-the.

[b] The proposed modifications relate to the service fee on vessel operators of foreign-built vehicle carriers and restriction on certain maritime transport services (United States of America, Office of the United States Trade Representative, 2025c, annexes III and IV).

For context, and as shown in table II.3, by 1 January 2025, China owned 14.4 per cent of the world fleet capacity. Chinese-built ships account for 23 per cent of the total fleet by number of ships (Clarksons Research, 2025c). At the start of 2025, China had about 64 per cent of the global orderbook by gross tonnage (Clarksons Research, 2025b).

According to a preliminary analysis by Clarksons Research, an estimated 7 per cent of United States port calls made by ships trading internationally in 2024 would fall under the proposed revised port fee scheme announced by the United States Trade Representative on 6 June 2025. This estimate refers to port calls in the United States that would be affected by United States Trade Representative measures, assuming proposed modifications, which are still subject to consultations, are adopted. This estimate refers to the applicability of port fees – i.e., how many port calls by internationally trading ships in 2024 would have potentially incurred a fee based on the vessel type, trading patterns, build country, owner/operator's nationality, etc. This includes the port fees for car carriers/ Ro-Ros, Chinese-built vessels, and Chinese-operated or -owned vessels. The estimate does not include calls by LNG carriers (Clarksons Research 2025d and 2025e). In this context, aggregate annual fees could range between $5 billion and $13 billion (Clarksons Research, 2025d). While indicative of the potential costs, all figures are theoretical and based on 2024 ship trading patterns. Actual totals will probably be lower considering the potential redeployment of vessels.

Figure II.4 highlights the degree of potential exposure of top carriers depending on the share of Chinese-built vessels in their respective fleets. MSC, the largest shipping operator by capacity, and Maersk both appear to be less exposed than CMA-CGM and COSCO, for example. Large carriers will probably be better positioned to mitigate the impact, while smaller niche carriers operating independently from alliances are likely to be more exposed and vulnerable.

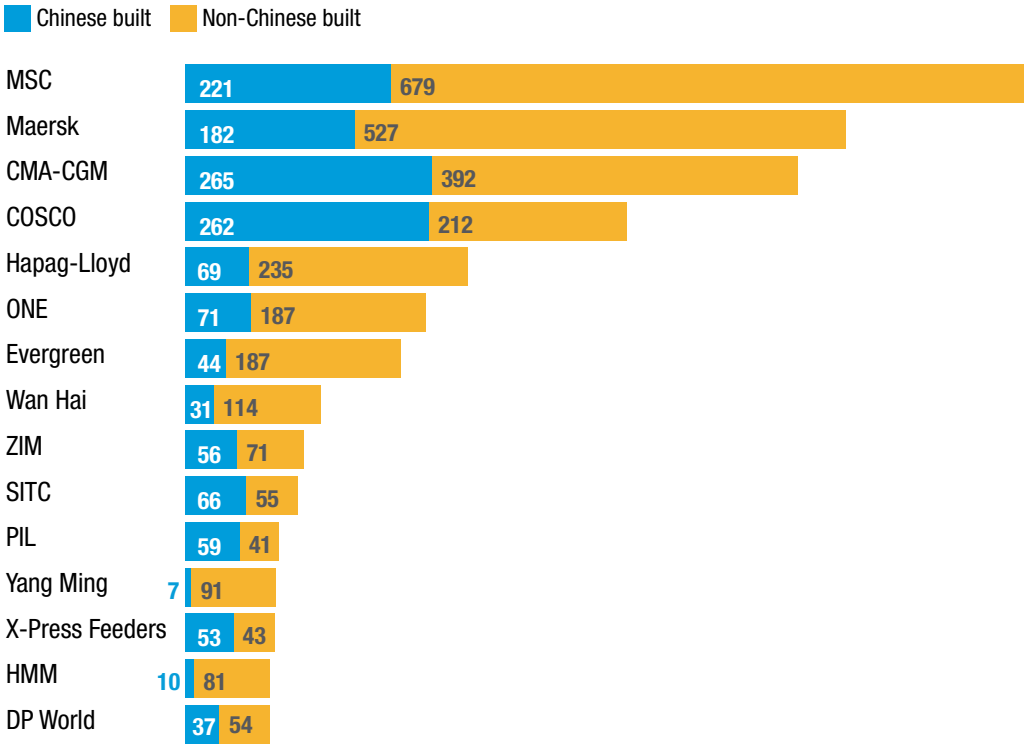
Other shipping segments are also expected to be affected by both the announced tariffs and the proposed port fees. Car carriers would be highly exposed to the port fees announced in April 2025, but these are still subject to change. There would be no potential for switching as the fees would apply to all foreign car carriers.

Carriers will seek to reduce exposure to the new measures through various response strategies. Those with diversified fleets, limited reliance on Chinese-built tonnage and operating as part of alliances are expected to have more flexibility when restructuring and configuring their shipping and port networks. Shipping operators will probably reorganize their fleets and move vessels that are associated with China away from trades originating or destined for the United States (BIMCO 2025; Trompiz 2025). Ships rerouted through alternative transshipment hubs could potentially generate benefits for some ports, such as in Canada, Mexico and the Caribbean. On the downside, these developments could also cause shipping costs and voyage times to increase. Carriers may seek to make use of vessel-sharing arrangements to move cargo to carriers that are not affected by the measure. Additionally, they could consider chartering ships not affected by the United States policy measures and exploiting the various exemptions provided (e.g., exclusion of smaller vessels and those arriving empty to load United States exports).

At this stage, it is too early to assess the impact of these fast-evolving policy measures on the global fleet and shipping services. Different outcomes, potentially pointing in diverse directions, could result from their combined effect. They could reduce global maritime trade volumes. At the same time, redirections in trade flows could mean longer distances travelled and more trade in ton-miles. Additionally, these measures may stimulate short-haul regionalized trades and compress distance-adjusted demand. Shorter hauls on regional trades may boost direct connections and the deployment of smaller vessels.

Large carriers will probably be better positioned to mitigate the impact

Figure II.4
Chinese and non-Chinese built ships in the total fleets of the top 15 liner operators
(Number)



Source: UNCTAD calculations, based on data from the MDS Transmodal Containership Databank as of May 2025.

Shipping may need to adjust operations, service offerings, capacity deployment patterns

In all cases, shipping may need to adjust operations, service offerings, capacity deployment patterns amid new trading and shipping dynamics.

Ship ordering patterns may also be affected, with the impact on Chinese shipbuilding likely to be limited in the short term. As set out in section B, since China has been expanding its role as a global shipbuilder, a rapid and immediate switch to other builders would be difficult.

2. Renewed interest in shipbuilding moves market shares into sharp focus

Shipbuilding has attracted attention recently with several countries considering the sector to be strategically important. A relatively small player in commercial shipbuilding, the United States averaged 0.04 per cent of global shipbuilding output in 2024 (UNCTAD, 2025) and only 0.1 per cent of the global orderbook by gross tonnage at the start of 2025 (Clarksons Research, 2025b). Together with the European Union (Sea Europe, 2024), the United States (Fritelli, 2023; Cichon, 2025) faces competition from Asian builders. The share by gross tonnage of ships registered under the United States' flag and operating internationally has declined since the 1980s, alongside growth in open registries such as Liberia, Panama and the Republic of the Marshall Islands (Clarksons Research, 2025e). The measures introduced by the United States since January 2025 (box II.1) also aim to enhance its competitiveness and reverse declining trends (Barber, 2025). Understanding the potential for shipbuilding to grow in the United States and elsewhere requires a closer look at general trends shaping the global shipbuilding industry and how key players compare (table II.1).

Table II.1
Overview of leading global shipbuilding countries

	Global shipbuilding output in 2024 (percentage of gross tonnage)	Some key features
China	54.57	The largest global shipbuilder by gross tonnage in 2024, leading in all commercial cargo carrying segments except for gas carriers where the Republic of Korea holds the majority share.
Republic of Korea	28.02	Second largest global shipbuilder by gross tonnage. Builds high-value, green and smart ships within the gas, container and tanker segments. A leader in the gas carrier segment.
Japan	12.56	A global leader in shipbuilding for many years and lost market share over time. It focuses on smart and green ships mainly in the bulk carrier segment with a presence in tanker and container segments.
Viet Nam	1.01	Builds bulk carriers, container ships and oil tankers.
Philippines	0.93	Builds mid-sized commercial vessels.
Italy	0.64	Specializes in building cruise ships, superyachts and high-end passenger vessels.
Germany	0.26	Leading in advanced ship engineering, particularly in luxury cruise liners, naval vessels and high-tech commercial ships.
Türkiye	0.12	Builds a mix of military and commercial ships, including specialized vessels.
India	0.06	Its shipbuilding industry is growing supported by government initiatives.
United States of America	0.04	A relatively smaller player in commercial shipbuilding but a global leader in naval and defense shipbuilding.
Norway	0.04	Leading in sustainable maritime practices and initiatives.

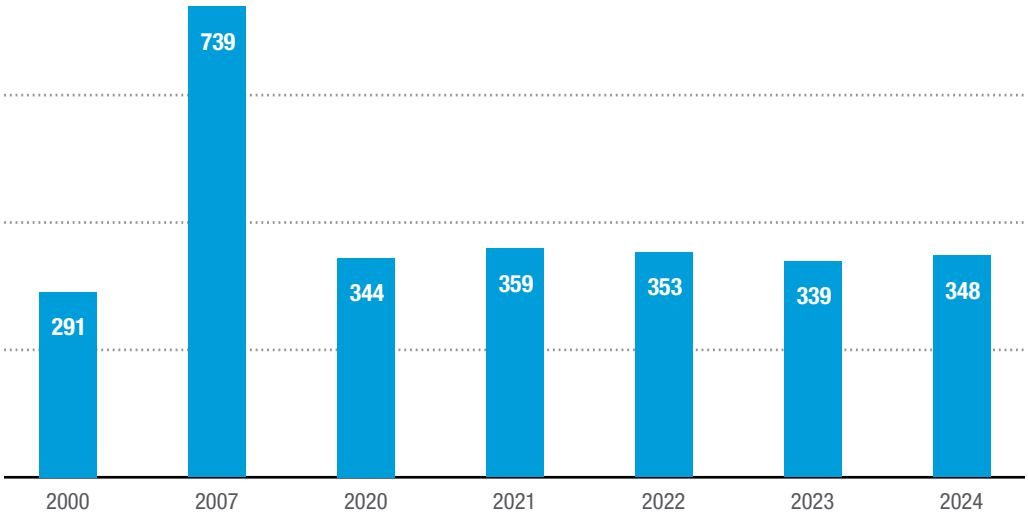
Source: UNCTAD calculations based on data from Clarksons Research. See also table II.6; data published at https://unctadstat.unctad.org/datacentre/dataviewer/US.ShipBuilding; BRS Group, 2025 and the specialized maritime press.

Assessing the number of shipyards and their capacity depends on wide-ranging factors, including the size and range of ships. Bearing this in mind, about 348 operational shipyards worldwide reportedly secured new contracts or completed deliveries in 2024 (figure II.5). This is half the peak of 2007 before shipyard consolidation (BRS Group, 2025). Certain ship types face constraints given a mismatch between shipyard capacity and output, and elevated new building prices and costs, including rising wages and supplier prices (BRS Group, 2025).

Over the years, China has emerged as a leading global shipbuilder. For the first time on record, China accounted for half of world shipbuilding output by gross tonnage in 2023. In 2024, this share increased to around 55 per cent. That same year, China accounted for 74.4 per cent of contracted gross tonnage. At the start of 2025, it had 63.7 per cent of the global orderbook by gross tonnage (Clarksons Research, 2025b). As of May 2025, 6 of the 10 leading shipyard groups were in China. Support through targeted industrial policy (OECD, 2021), available capacity, cost competitiveness and reliance on a comprehensive shipbuilding supply chain have helped China's shipbuilding expansion. The country also benefits from a domestic ship-owning sector that orders ships at Chinese yards. In 2024, China entered a new phase of shipbuilding expansion. Once this is complete, current global shipbuilding capacity is projected to grow by about 200 more ships per year, with total capacity rising to 1,700 ships per year (BRS Group, 2025).

Certain ship types face constraints given shipyard capacity limitations and high newbuilding prices

Figure II.5
Active shipbuilding facilities globally
(Number)



Source: UNCTAD calculations, based on data from BRS Group, 2025.

While Japan and the Republic of Korea have kept their strong positions in the high-value and high-tech segment of shipbuilding – gas, tanker and container ships, in that order – China is closing the gap. The gas segment is the only sector where China does not hold first place in market share for 2024 contracting. The current focus on strengthening national shipbuilding in the United States and other countries such as India, however, may have implications for China's future developments. For example, India announced the creation of a $2.9 billion maritime development fund for the long-term financing of the country's shipbuilding and repair industry, based on a public-private partnership model (Hellenic Shipping News, 2025). The Russian Federation is accelerating the development and renewal of its fleet with plans to add more than 1,600 domestically built ships by 2036 (Marine Insights, 2025). In the short term, China is well positioned as a leading shipbuilder. In the longer term, leading shipbuilders such as Japan and the Republic of Korea could regain some market share by leveraging technology and taking advantage of anticipated growth in demand for higher-value ships fitted with energy-saving technologies or running on low- or zero-carbon fuels. European countries – Finland, France and Italy – maintain a lead in the construction of cruise ships.

China, Japan and the Republic of Korea face a mismatch between their respective capacity and shares of the global orderbook. A total of 120 active Chinese yards accounts for around 45 per cent of global yard capacity and holds about 60 per cent of the orderbook. Shipyards in the Republic of Korea are currently constrained by labour issues, leading the Government to relax national immigration laws in 2023 (Republic of Korea, Ministry of Employment and Labour, 2022; Asian Development Bank Institute, ILO and OECD, 2024). In 2024, the Government of the Republic of Korea set up a shipbuilding training centre in Indonesia. Shipbuilders in the Republic of Korea are also investing abroad and outsourcing production to China, the Philippines and Viet Nam to expand their production base (Hellenic Shipping News, 2024; Kim and Kim, 2025).

Japan continues to lose market share to China and the Republic of Korea, while European shipyards contribute a smaller share, specializing in building cruise, niche or high-tech ships (Arias et al., 2020). Shipyards in the Philippines, Viet Nam and Taiwan Province of China have secured new orders.

The short-term outlook for the shipbuilding sector has become more uncertain. At this stage, immediate responses by the shipping and shipbuilding industries are likely to be influenced by announced port fees as well as changes in the trade policies of the United States and its trading partners. Shifts are difficult to predict given China's exceptionally strong shipbuilding position (Pan and Long, 2025). Meanwhile, the need for new, younger, more energy-efficient and alternatively fuelled ships will support the placement of new ship orders.

3. Liner operators are adjusting routes, service offerings and port call networks as container shipping alliances restructure

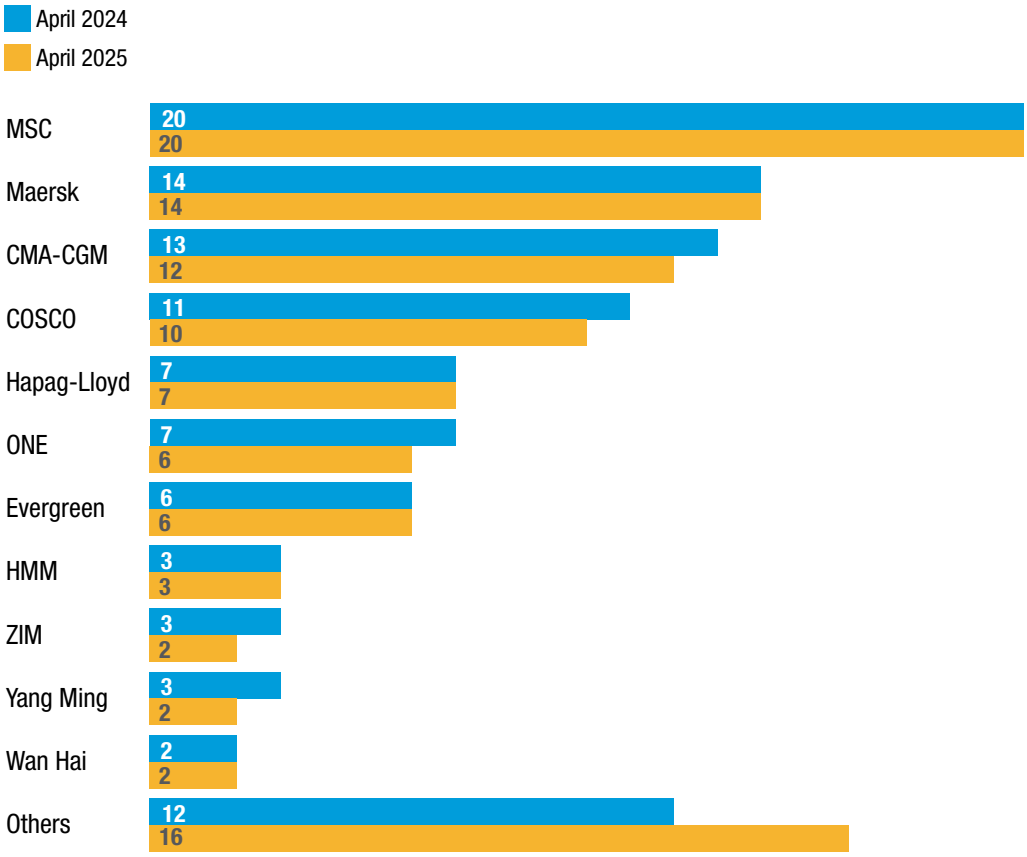
The global liner shipping market experienced a reshuffle in early 2025 that is now driving changes in market shares, ship capacity deployment patterns and service networks. The new Gemini Cooperation (Maersk and Hapag-Lloyd) and Premier Alliance (ONE, HMM and Yang Ming) became effective as of February 2025. The phase-out of 2M (Maersk and MSC) and THE Alliance (Hapag-Lloyd, ONE, HMM and Yang Ming) continued until completion in July 2025. The Ocean Alliance is the only alliance that continues to operate unchanged (CMA-CGM, COSCO, Evergreen and OOCL).

MSC, with a market share of 20 per cent of the global liner shipping capacity in TEU terms (figure II.6), is now the largest container carrier with a standalone global network operating outside the alliances. MSC increased its capacity by 17.1 per cent between April 2024 and April 2025 and is expanding its direct services. The three alliances and MSC are pursuing varying strategies and goals. Gemini Cooperation, for example, aims to achieve high schedule reliability and global network efficiency. Improved reliability also has potential to lower carbon emissions (such as by avoiding faster sailing speeds that result in waiting outside ports) and lower trade costs by reducing inventory expenditure.

The transition towards the new alliances structure (figure II.7) and network adjustments are causing uncertainty and short-term disruption. The disruption is expected to last several months until network adjustments are completed. For example, the ports of Antwerp, Hamburg and Rotterdam are facing congestion (Kelly, 2025). Some ports may benefit from increased calls, while others could lose direct connections. The impact of the restructuring could also affect ship capacity requirements, and the types and sizes of vessels chartered or ordered. Shifting deployment strategies could require more capacity or boost demand for specific ship types and sizes, such as larger vessels on feeder services in the case of Gemini Cooperation (Clarksons Research, 2025f). The ability to offer "greener" services is also important for carriers and their deployment requirements. While schedule reliability in global shipping remained steady in 2024, ranging between 50 and 55 per cent (percentage of on-time vessel arrivals based on a one-day grace period) (Sea-Intelligence, 2025), it improved in February 2025. As these were early days in the roll-out of the network, however, reported figures are preliminary.

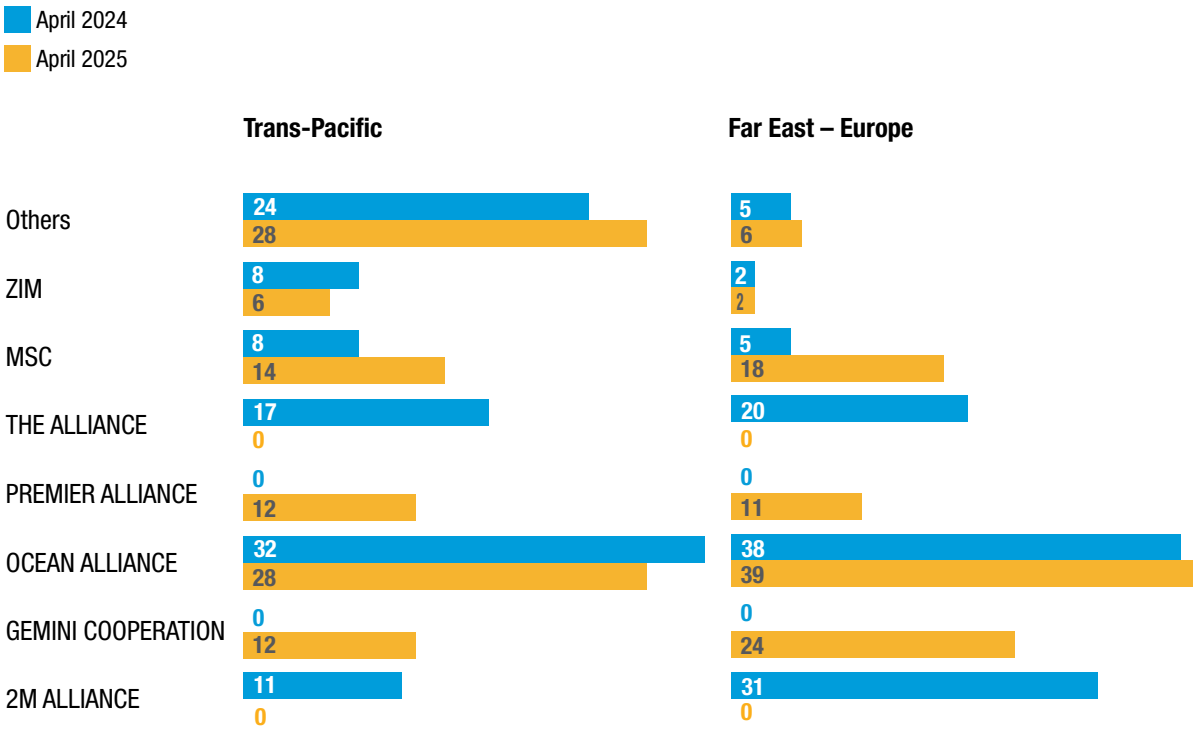
Global liner shipping market reshuffle in 2025 is driving changes in market shares, capacity deployment and service networks

Figure II.6
Shares of global liner shipping capacity of leading fleet operators
(Percentage of TEU)

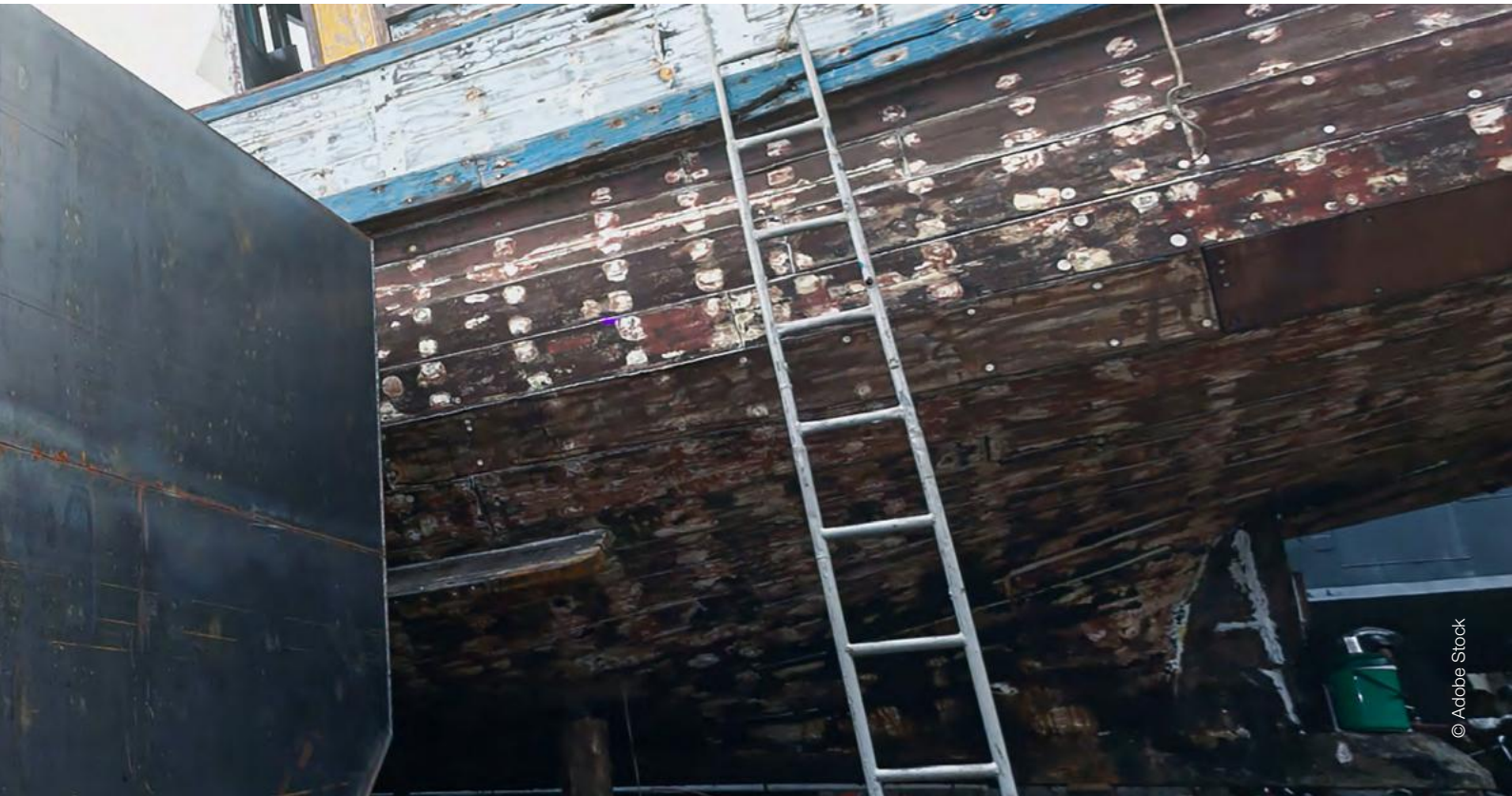


Source: UNCTAD calculations, based on data from the MDS Transmodal Containership Databank as of May 2025.

Figure II.7
Share of monthly scheduled capacity by alliance and operator
(Percentage of TEU)



Source: MDS Transmodal Containership Databank as of May 2025.



B. Global shipping fleet: supply, structure and trends

1. The list of top ship-owning nations and flag countries has remained broadly stable with some shifts in relative rankings

As of 1 January 2025, **Liberia, Panama and the Marshall Islands** remained the top three flag States

As of 1 January 2025, Liberia, Panama and the Marshall Islands remained the top three flag States, in that order, accounting for 45.1 per cent of total world capacity in dead weight tons, 16.2 per cent of the number of vessels (table II.2) and 36.1 per cent of the global fleet value (table II.4). The top 10 flag States accounted for 76.7 per cent of global capacity, 38.9 per cent of the number of vessels (table II.2) and 72.5 per cent of fleet value (table II.4). Many leading flag States are open registers, meaning they accept foreign-owned ships, have minimal nationality requirements and offer some benefits to shipowners. They include Liberia, which held the first position with a capacity share of 17.4 per cent. Panama ranked second (15.2 per cent) while the Marshall Islands came in third (12.5 per cent). Other ship registers, such as The Bahamas, Cyprus, Malta, Singapore, and Hong Kong, China are attractive global maritime centres and hubs. Amid renewed interest in shipping and shipbuilding, the United States is reportedly considering a proposal to create an international shipping registry in the U.S. Virgin Islands as part of efforts to enlarge the commercial shipping fleet flying the American flag (Saul and Renshaw, 2025).

The top three ship-owning nations by capacity were **Greece, China and Japan**

Among the top 10, the Maltese register recorded the largest growth in 2024, increasing by 10.4 per cent. The Bahamas, China, Greece, Marshall Islands and Panama saw small contractions in dead weight ton capacity registered under their flags.

Flag-hopping accelerated in 2024, with the average time between a ship being hit by sanctions and reflagging falling by half in 2025 (Diakun, 2025). Some minor flags have recently experienced rapid growth that is reportedly linked to the “shadow fleet”. This primarily comprises older tankers, including some not inspected recently, with substandard maintenance, unclear ownership and a lack of insurance, operating “to circumvent sanctions and high insurance costs” (IMO, 2023; UNCTAD, 2024).

In early 2025, the European Union (European Commission, 2025a), United Kingdom and United States introduced new sanctions affecting the “shadow” fleet. By May 2025, about 3 per cent of the world’s gross ship tonnage was subject to these sanctions (Clarksons Research, 2025g). Together, they could lead to changes in oil trade patterns and demand for tanker capacity, with buyers, especially refiners in Asia, looking for alternative sources, such as in Brazil, the United States and West Africa. Consequently, longer-haul voyages and demand for tanker capacity could increase.

The top three ship-owning nations by capacity were Greece, China and Japan, in that order, accounting for over 40 per cent of world fleet by dead weight tonnage, nearly one third by vessel count (table II.3), and 33.1 per cent by value (table II.4) The combined share of the top 10 ship-owning countries reached 67.3 per cent of global fleet capacity and 65.6 per cent of its value (table II.4). While Greece was the top ship-owning nation by capacity (16.4 per cent), Chinese owners held the largest share of the global fleet in dollar value (12.4 per cent). The combined shares of China and Hong Kong, China, would move China up to the first position (20.2 per cent) on the list of ship-owning nations globally.

Table II.2
Leading flags of registration, 1 January 2025

Rank	Flag of registration	Number of vessels	Share of world total vessels (percentage)	Dead weight tons (thousands)	Share of world total dead weight tons (percentage)	Average vessel size (thousands of dead weight tons)	Growth in dead weight tons 2024–2025 (percentage)
1	**Liberia**	5 562.0	4.9	424 063.1	17.4	76 242.9	3.8
2	**Panama**	8 572.0	7.6	371 300.7	15.2	43 315.5	-2.5
3	**Marshall Islands**	4 254.0	3.8	305 471.2	12.5	71 808.0	-1.0
4	**Hong Kong, China**	2 513.0	2.2	203 047.9	8.3	80 799.0	1.4
5	**Singapore**	3 098.0	2.8	152 344.1	6.2	49 175.0	8.2
6	**China**	10 288.0	9.1	137 064.4	5.6	13 322.7	-1.9
7	**Malta**	1 949.0	1.7	113 193.6	4.6	58 077.8	10.4
8	**The Bahamas**	1 251.0	1.1	70 462.8	2.9	56 325.2	-2.7
9	**Greece**	1 203.0	1.1	53 459.1	2.2	44 438.2	-4.8
10	**Japan**	5 200.0	4.6	43 827.9	1.8	8 428.4	2.8
11	**International Shipping Register of Madeira**	973	0.9	35 837.8	1.5	36 832.3	21.8
12	**Cyprus**	1 032.0	0.9	34 296.9	1.4	33 233.4	11.7
13	**Indonesia**	13 218.0	11.7	34 251.0	1.4	2 591.2	4.7
14	**Danish International Register of Shipping**	553	0.5	25 236.2	1.0	45 635.2	1.3
15	**Republic of Korea**	2 157.0	1.9	21 460.6	0.9	9 949.3	1.3
16	**Islamic Republic of Iran**	1 021.0	0.9	21 079.8	0.9	20 646.2	-0.2
17	**Isle of Man**	257	0.2	19 935.2	0.8	77 568.9	2.3
18	**Norwegian International Ship Register**	687	0.6	18 928.5	0.8	27 552.4	-6.2
19	**Barbados**	491	0.4	18 718.5	0.8	38 123.3	200.9
20	**India**	1 928.0	1.7	18 020.6	0.7	9 346.8	-2.2
21	**Saudi Arabia**	482	0.4	17 444.7	0.7	36 192.3	23.4
22	**Russian Federation**	3 007.0	2.7	14 785.9	0.6	4 917.2	22.3
23	**United States**	3 519.0	3.1	13 244.1	0.5	3 763.6	-0.2
24	**Viet Nam**	1 919.0	1.7	11 665.5	0.5	6 079.0	-11.8
25	**United Kingdom**	794	0.7	10 327.1	0.4	13 006.5	-2.9
26	**Malaysia**	1 813.0	1.6	9 773.1	0.4	5 390.6	4.1
27	**Antigua and Barbuda**	676	0.6	9 414.1	0.4	13 926.2	44.7
28	**France**	509	0.5	8 890.2	0.4	17 466.1	18.0
29	**Germany**	602	0.5	8 710.7	0.4	14 469.6	8.3
30	**Palau**	565	0.5	7 732.3	0.3	13 685.5	-2.2
31	**Italy**	1 212.0	1.1	7 225.9	0.3	5 962.0	-6.1
32	**Nigeria**	1 005.0	0.9	7 156.4	0.3	7 120.8	4.9
33	**Belgium**	184	0.2	6 873.7	0.3	37 357.1	-14.3
34	**Türkiye**	1 220.0	1.1	6 841.8	0.3	5 608.0	-4.9
35	**Kingdom of the Netherlands**	1 200.0	1.1	6 777.4	0.3	5 647.8	1.0
	Top 35 countries or territories	**84 914.0**	**75.5**	**2 268 863.2**	**93.0**	**27**	**2.4**
	World total	**112 501.0**	**100**	**2 439 830.8**	**100.0**	**22**	**3.4**

Source: UNCTAD calculations, based on data provided by Clarksons Research. See also https://unctadstat.unctad.org/datacentre/dataviewer/US.MerchantFleet.

Note: The table includes propelled seagoing merchant vessels of 100 gross tons and above. Dead weight ton figures for some individual vessels have been estimated.

Table II.3
World fleet ownership by capacity and flag of registration, 1 January 2025

		Vessels (number)			Carrying capacity (dead weight tons)				
	Country or territory of ownership	National flag	Foreign flag	Total	National flag	Foreign flag	Total	Foreign flag share (percentage of world total)	Capacity share (percentage of world total)
1	**Greece**	562	4 555	5 124	47 554 402	350 065 296	397 649 662	88	16.4
2	**China**	7 103	3 282	10 440	134 110 270	210 763 710	347 215 014	61	14.4
3	**Japan**	958	3 123	4 083	39 524 134	201 146 629	240 678 389	84	9.9
4	**Singapore**	1 358	1 527	2 922	71 301 599	81 844 936	153 428 741	53	6.3
5	**Hong Kong, China**	919	1 122	2 081	82 621 846	56 608 620	139 502 591	41	5.8
6	**Republic of Korea**	824	855	1 700	20 359 786	77 885 773	98 532 659	79	4.1
7	**Germany**	177	1 838	2 016	8 146 887	63 368 913	71 529 560	89	3.0
8	**Taiwan Province of China**	141	910	1 063	5 746 261	58 052 148	63 875 855	91	2.6
9	**United Arab Emirates**	142	1 434	1 598	648 895	55 699 303	57 431 043	97	2.4
10	**United Kingdom, including the Isle of Man**	328	941	1 275	8 352 748	48 054 580	56 990 614	84	2.4
11	**Bermuda**	-	425	426	-	53 683 102	53 743 656	100	2.2
12	**Norway**	938	837	1 777	16 435 489	35 609 247	52 175 429	68	2.2
13	**Türkiye**	404	1 743	2 159	6 209 585	43 920 400	50 184 717	88	2.1
14	**Switzerland**	12	737	749	767 211	46 467 757	47 234 968	98	2.0
15	**United States**	777	912	1 702	10 057 558	35 034 228	45 796 064	77	1.9
16	**Denmark**	385	412	797	20 983 825	21 314 142	42 297 967	50	1.7
17	**India**	915	318	1 244	17 201 926	19 639 071	37 066 599	53	1.5
18	**Indonesia**	2 450	155	2 617	29 335 545	3 889 225	33 276 506	12	1.4
19	**Monaco**	-	337	337	-	31 527 261	31 527 261	100	1.3
20	**Cyprus**	109	305	415	4 523 426	25 234 101	29 862 694	85	1.2
21	**France**	149	362	512	4 715 091	18 838 917	23 563 389	80	1.0
22	**Viet Nam**	905	295	1 211	10 818 902	8 736 861	19 589 404	45	0.8
23	**Belgium**	80	192	272	6 099 980	12 917 644	19 017 624	68	0.8
24	**Islamic Republic of Iran**	242	11	254	18 462 502	360 649	18 824 703	2	0.8
25	**Saudi Arabia**	197	109	309	17 308 289	1 207 828	18 521 234	7	0.8
26	**Kingdom of the Netherlands**	647	529	1 177	5 427 928	11 611 183	17 142 540	68	0.7
27	**Russian Federation**	1 558	151	1 718	12 715 370	2 612 913	15 352 972	17	0.6
28	**Brazil**	316	97	414	4 773 164	9 305 264	14 325 559	65	0.6
29	**Italy**	403	129	533	6 405 222	4 891 354	11 298 582	43	0.5
30	**Canada**	203	176	381	2 534 094	7 592 421	10 134 869	75	0.4
31	**Malaysia**	440	170	629	6 420 779	3 335 564	9 979 350	33	0.4
32	**Nigeria**	228	76	311	5 543 162	3 583 968	9 151 539	39	0.4
33	**Qatar**	45	89	134	532 535	6 953 026	7 485 561	93	0.3
34	**Oman**	3	65	68	518	7 327 268	7 327 786	100	0.3
35	**Bangladesh**	280	11	291	5 608 777	187 588	5 796 365	3	0.2
	Top 35 countries or territories by capacity share	**24 198**	**28 230**	**52 739**	**631 247 706**	**1 619 270 890**	**2 257 511 466**	**72**	**93**
	World	**27 264**	**31 135**	**60 275**	**665 352 417**	**1 692 281 019**	**2 419 546 107**	**70**	**100.0**

Source: UNCTAD calculations, based on data provided by Clarksons Research. See also https://unctadstat.unctad.org/datacentre/dataviewer/US.FleetBeneficialOwners.

Note: The table includes propelled seagoing vessels of 1,000 gross tons and above. The totals include vessels for which the flag is unknown. The sum of national and foreign flags equals the total. The foreign flag share as a percentage of the total is calculated as the share of vessels with a known flag.

Table II.4
Value of the world fleet by country of ownership and flag of registration, 1 January 2025
(Percentage share of total value in United States dollars)

	Country or territory of ownership	Percentage share of total value
1	China	12.4
2	Greece	10.6
3	Japan	10.1
4	United States	7.3
5	Singapore	5.6
6	Hong Kong, China	4.4
7	Norway	4.1
8	United Kingdom	4.0
9	Republic of Korea	3.7
10	Germany	3.4
11	Switzerland	2.7
12	Taiwan Province of China	2.4
13	Denmark	2.0
14	Bermuda	2.0
15	Kingdom of the Netherlands	1.9
16	United Arab Emirates	1.8
17	France	1.7
18	Brazil	1.7
19	Italy	1.4
20	Türkiye	1.4
21	Indonesia	1.1
22	India	1.0
23	Russian Federation	0.9
24	Cyprus	0.9
25	Monaco	0.8
26	Malaysia	0.7
27	Nigeria	0.7
28	Belgium	0.6
29	Saudi Arabia	0.6
30	Viet Nam	0.6
31	Canada	0.5
32	Sweden	0.5
33	Australia	0.4
34	Qatar	0.4
35	Angola	0.4
	Top 35 countries or territories	**94.5**
	Rest of the world	**5.5**
	Total	**100.0**

	Flag of registration	Percentage share of total value
1	Liberia	13.6
2	Panama	11.8
3	Marshall Islands	10.7
4	Bahamas	7.2
5	Singapore	6.6
6	China	6.4
7	Malta	6.3
8	Hong Kong, China	6.1
9	Norway	2.2
10	Greece	1.8
11	Japan	1.7
12	International Shipping Register of Madeira	1.5
13	Italy	1.4
14	Cyprus	1.4
15	Danish International Register of Shipping	1.3
16	Bermuda	1.2
17	Indonesia	1.1
18	United States	1.0
19	France	1.0
20	Republic of Korea	0.9
21	Russian Federation	0.9
22	United Kingdom	0.9
23	Kingdom of the Netherlands	0.8
24	Brazil	0.7
25	Isle of Man	0.7
26	Nigeria	0.6
27	Malaysia	0.6
28	India	0.6
29	Australia	0.5
30	Germany	0.5
31	Barbados	0.4
32	Antigua and Barbuda	0.4
33	Saudi Arabia	0.4
34	Türkiye	0.3
35	Viet Nam	0.3
	Top 35 flags	**93.4**
	Rest of the world	**6.7**
	Total	**100.0**

Source: UNCTAD calculations, based on data provided by Clarksons Research. See also https://unctadstat.unctad.org/datacentre/dataviewer/US.VesselValueByRegistration and https://unctadstat.unctad.org/datacentre/dataviewer/US.VesselValueByOwnership.

Note: The table includes vessels of 1,000 gross tons and above.

Japan and Singapore, the third and fourth leading global fleet owners, accounted for 9.9 per cent and 6.3 per cent of global capacity, respectively. Much of the capacity owned by the top 10 ship-owning countries is registered under foreign flags, except for Hong Kong, China, for which foreign-flagged ship capacity accounted for less than half of the beneficially owned fleet. European ship-owning nations on the top 10 list, other than Greece, included Germany with a share of 3.0 per cent and the United Kingdom with 2.4 per cent. Countries in Africa and Latin America continue to play minor roles as global shipowners.

2. New ship deliveries supported growth of the global fleet in 2024

As shown in table II.2, as of 1 January 2025, the global fleet comprised around 112,500 commercial vessels (including cargo and non-cargo ships), each at least 100 gross tons. The global fleet in dead weight ton capacity grew by 3.4 per cent (table II.5 and figure II.8). This was on par with the expansion rate of 2023. It was below the annual average of 5.1 per cent of the past two decades but faster than growth in maritime trade volume. Global capacity reached about 2.44 billion dead weight tons.

Table II.5
Trends in world fleet capacity by vessel type, 1 January 2025

Fleet composition by vessel type	Indicator	2024	2025	Change (percentage)
Bulk carriers	Dead weight tons (thousands)	1 006 329	1 036 158	3.0
	Share (percentage)	42.6	42.5	
Oil tankers	Dead weight tons (thousands)	665 472	669 842	0.7
	Share (percentage)	28.2	27.5	
Container ships	Dead weight tons (thousands)	331 567.4	363 759.1	9.7
	Share (percentage)	14.0	14.9	
Other types of ships	Dead weight tons (thousands)	271 141	282 651	4.2
	Share (percentage)	11.5	11.6	
Offshore supply	Dead weight tons (thousands)	89 507	91 334	2.0
	Share (percentage)	3.8	3.7	
Liquefied gas carriers	Dead weight tons (thousands)	93 907	100 462	7.0
	Share (percentage)	4.0	4.1	
Chemical tankers	Dead weight tons (thousands)	52 584	54 333	3.3
	Share (percentage)	2.2	2.2	
Other/n.a.	Dead weight tons (thousands)	26 326	27 576	4.7
	Share (percentage)	1.1	1.1	
Ferries and passenger ships	Dead weight tons (thousands)	8 818	8 947	1.5
	Share (percentage)	0.4	0.4	
General cargo	Dead weight tons (thousands)	85 809	87 421	1.9
	Share (percentage)	3.6	3.6	
World total	Dead weight tons (thousands)	**2 360 319**	**2 439 832**	3.4

Source: UNCTAD calculations, based on data from Clarksons Research.

Note: The table refers to propelled seagoing merchant vessels of 100 gross tons and above. Figures for dead weight tons for some individual vessels were estimated.

By capacity, bulkers remained the largest segment (42.5 per cent), followed by oil tankers (27.5 per cent).

Capacity expansion remained uneven, with a jump of 9.7 per cent for container ships and 7 per cent for liquified gas carriers. Gas carrier fleet growth was supported by the LNG carriers and, in particular the Qatar Energy LNG project. Bulker capacity increased by a moderate 3 per cent while general cargo ships and oil tankers saw capacity grow by 1.9 per cent and 0.7 per cent, respectively. Reflecting a shift towards smart and green shipping and changes in secondhand prices, the value of the global fleet rose to $1.52 trillion in June 2025 (Clarksons Research, 2025h).

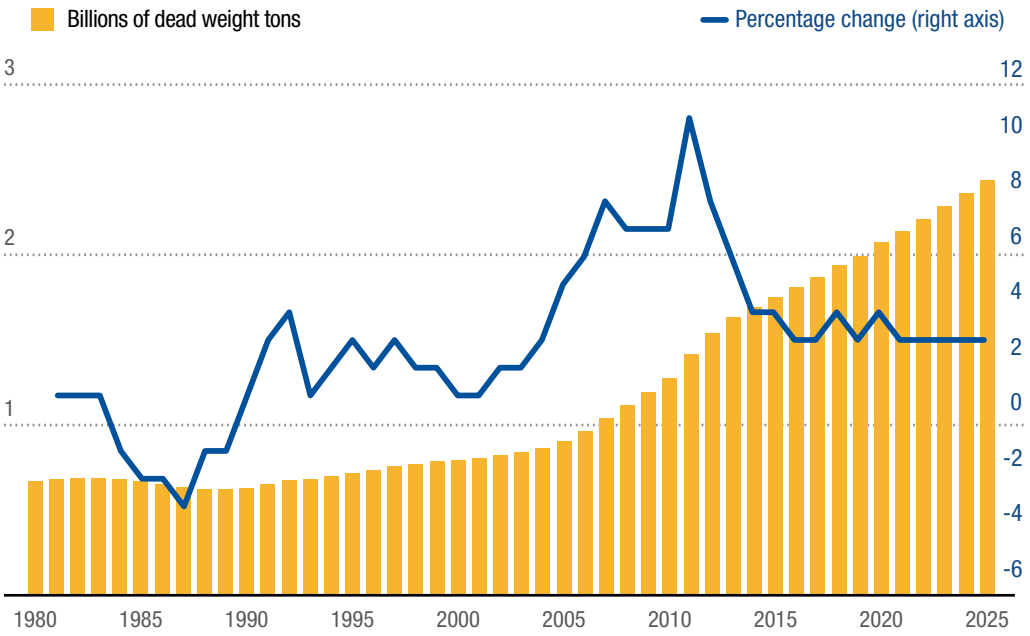
By April 2025, the global container ship fleet stood at 6,033 vessels, up 7.3 per cent over April 2024 and more than 23.1 per cent higher than April 2019 (MDS Transmodal, 2025). Total capacity reached 30.3 million TEU, rising by 10.1 and 42.9 per cent over the same periods, respectively.

3. Deliveries in 2024 reflected capacity ordered during the post-COVID-19 cash flow boom

Increased ship deliveries in 2024 largely reflected the active newbuild ordering activity of the past two years amid disruptions, favourable market conditions and firm earnings during the post-COVID-19 cash flow boom, especially in container shipping. The composition of the orderbook partly reflected fleet renewal plans, decarbonization goals and tighter environmental regulations. A key theme in 2024 was the lack of early delivery slots amid the booming newbuild market and elevated shipbuilding prices. Idle Chinese shipbuilding yards were reactivated to expand production.

Newbuilt ship tonnage ordered in 2024 increased by over 50 per cent compared to 2023 while the global orderbook rose by 10.2 per cent (Clarksons Research, 2025h).

Figure II.8
Global fleet capacity expanded in 2024 but at a rate below the long-term average

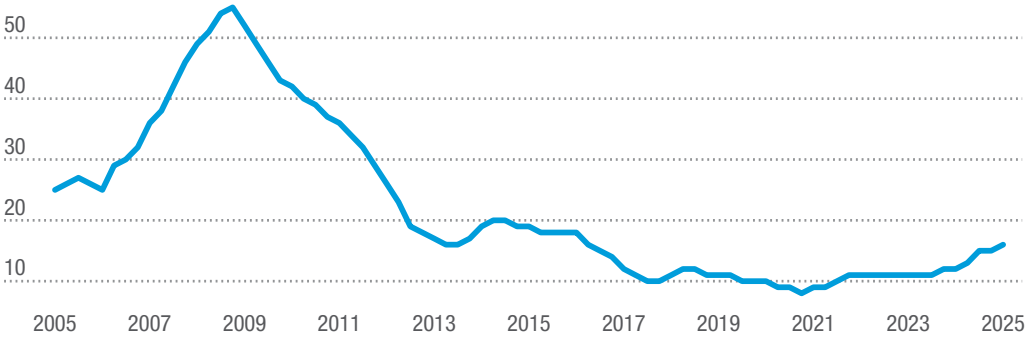


Source: UNCTAD calculations, based on data from Clarksons Research.

Ship ordering focused on dual-fuel vessels, especially in container shipping

At the start of 2024, the orderbook as a proportion of the global active fleet had reached 12.3 per cent against 11.1 per cent at the start of 2023. By early 2025, this ratio hit 15 per cent (figure II.9) and is relatively moderate by historical standards, especially when compared to 52 per cent in 2009 and 19 per cent in 2014 and 2015. Orderbook size as a percentage of the active fleet, however, varied by ship segment (figure II.10). The orderbooks of LNG carriers and container ships represented, respectively, 51.3 and 24.6 per cent of the global fleet by gross tonnage. Orderbooks of bulkers and oil tankers were lower, at just 10 and 7.5 per cent of the active global fleet, respectively. Ship ordering focused on dual-fuel vessels, especially in container shipping, with most capacity currently on order equipped to use alternative fuels. In 2024, gross tonnage on order was structured around container ships (29.4 per cent), bulkers (24.1 per cent), LNG carriers (16 per cent) and oil tankers (11.6 per cent) (Clarksons Research, 2025i).

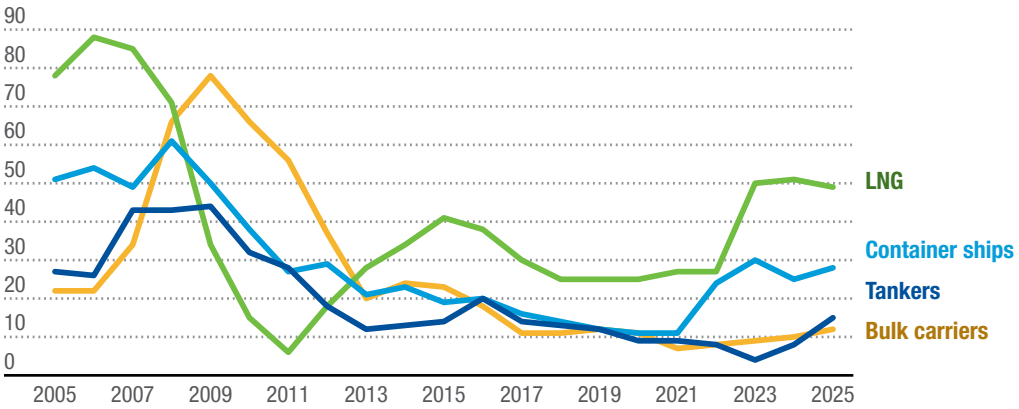
Figure II.9
Global ship capacity ordered
(Percentage of active fleet gross tonnage)



Source: UNCTAD calculations, based on data from Clarksons Research.

Note: The figure includes propelled seagoing merchant vessels of 100 gross tons and above.

Figure II.10
Types of ships ordered
(Percentage of global active fleet gross tonnage)



Source: UNCTAD calculations, based on data from Clarksons Research.

Note: The figure includes propelled seagoing merchant vessels of 100 gross tons and above. Shares of the orderbook as a percentage of the active fleet capacity are calculated in terms of dead weight tons for bulk carriers and tankers, TEU for container ships and cubic metres for LNG carriers. Data are as of the start of the period.

A total of 71.7 million gross tons was added to the active fleet in 2024 (table II.6). The number of vessels delivered increased by 8.8 per cent over 2023 while gross tonnage rose by nearly 10 per cent (compared to 15 per cent in 2023). Chinese yards delivered 54.6 per cent of tonnage while those in Japan and the Republic of Korea delivered 12.6 and 28 per cent, respectively.

Container ships dominated the deliveries landscape, accounting for 41.3 per cent of total gross tonnage delivered in 2024. Bulkers accounted for 26.6 per cent and liquified gas carriers for 12.2 per cent. Oil tanker tonnage delivered represented 5.1 per cent; general cargo ships accounted for only 2.7 per cent.

Table II.6
Deliveries of different types of newbuilt vessels, 2024

	China (thousands of gross tons)	Republic of Korea (thousands of gross tons)	Japan (thousands of gross tons)	Viet Nam (thousands of gross tons)	Philippines (thousands of gross tons)	Europe (thousands of gross tons)	Rest of the world (thousands of gross tons)	Total (thousands of gross tons)	Share (Percentage)
Bulk carriers	12 510 129	NA	5 729 387	148 469	666 846	NA	17 654	19 072 485	26.6
Container ships	16 577 611	11 325 793	1 735 128	NA	NA	NA	NA	29 638 532	41.3
Offshore supply	1 674 069	257 004	7 795	25 969	NA	358 042	83 236	2 406 115	3.4
Oil tankers	1 498 699	1 310 389	205 573	519 656	1 361	40 723	53 561	3 629 962	5.1
Gas garriers	1 710 487	6 817 843	220 425	NA	NA	NA	NA	8 748 755	12.2
General gargo	1 132 642	229 469	304 773	14 068	NA	141 729	142 995	1 965 676	2.7
Ferries and passenger ships	247 937	NA	19 773	3 170	NA	39 194	1 123 739	1 433 813	2
Chemical tankers	860 205	70 206	234 581	8 593	NA	18 842	9 678	1 202 105	1.7
Other	2 906 579	80 168	545 007	959	NA	26 142	34 685	3 593 540	5
Total	**39 118 358**	**20 090 872**	**9 002 442**	**720 884**	**668 207**	**624 672**	**1 465 548**	**71 690 983**	**100**
Share (percentage)	**54.6**	**28**	**12.6**	**1**	**0.9**	**0.9**	**2**	**100**	**0**

Source: UNCTAD calculations, based on data from Clarksons Research. See also https://unctadstat.unctad.org/datacentre/dataviewer/US.ShipBuilding.

Note: The table includes propelled seagoing merchant vessels of 100 gross tons and above.

4. Ship recycling levels touched historic lows, discouraged by firm market earnings, elevated newbuilding prices and, to some extent, limitations on ship recycling capacity

Ship recycling levels or scrapping remained low in 2024, on par with 2023 levels of around 6.3 million gross tons (table II.7) or 0.25 per cent of the active global fleet. Bulk carriers accounted for the largest share (32.4 per cent) of tonnage sold for scrap, followed by container ships (15.2 per cent), offshore supply vessels (12.8 per cent), oil tankers (12.1 per cent) and liquified gas carriers (11 per cent). Recycling levels will likely remain subdued in the short term but are expected to recover as market conditions moderate, secondhand prices fall, employment opportunities under the "shadow fleet" fade and fleet modernization intensifies against the backdrop of an ageing fleet.

In 2024, Bangladesh, India, Pakistan and Türkiye together accounted for 91.7 per cent of the global ship recycling market. While Bangladesh and India were in the lead, accounting for over 77 per cent of the market, Pakistan and Türkiye held smaller but still significant shares. Insufficient global ship recycling capacity at a time of high deliveries and an ageing fleet are a concern not only for the balance of supply and demand but also for timely fleet renewal in anticipation of increasingly tight environmental rules.

Capacity in the major recycling countries of Bangladesh, India and Pakistan is limited. Sustainable ship recycling requirements are adding pressure. The Hong Kong Convention, which requires ships to be scrapped in a safe and environmentally sound manner, entered into force on 26 June 2025.

Table II.7
Ship tonnage sold for scrapping, 2024

	Bangladesh (thousands of gross tons)	India (thousands of gross tons)	Türkiye (thousands of gross tons)	Pakistan (thousands of gross tons)	Denmark (thousands of gross tons)	Rest of the world (thousands of gross tons)	World total (thousands of gross tons)	Share (Percentage)
Bulk carriers	1 375.9	202.9	NA	400.6	NA	75.3	2 054.7	32.4
Container ships	203.5	584.9	113.6	14.5	NA	49.7	966.1	15.2
Offshore supply	187.2	289.6	14.9	1.1	310.7	9.1	812.5	12.8
Oil tankers	324.1	437.5	2.7	NA	NA	3.7	768	12.1
Liquefied gas carriers	400.6	289.9	NA	NA	NA	4.9	695.3	11
General cargo ships	214.2	128.7	135.2	38.5	5.5	43.8	565.9	8.9
Ferries and passenger ships	18.6	56.8	180.1	NA	0.8	10.7	267.1	4.2
Chemical tankers	2.1	46.6	NA	NA	NA	3.3	52	0.8
Other/n.a.	11.5	110.1	23	0.2	0.6	14.2	159.6	2.5
Total (thousands of gross tons)	**2 737.7**	**2 146.8**	**469.6**	**454.8**	**317.7**	**214.6**	**6 341.1**	**100**
Share (percentage)	**43.2**	**33.9**	**7.4**	**7.2**	**5.0**	**3.4**		

Source: UNCTAD calculations, based on data provided by Clarksons Research. See also https://unctadstat.unctad.org/datacentre/dataviewer/US.ShipScrapping.

Note: The table includes propelled seagoing vessels of 100 gross tons and above.

Fully implementing the new regulatory regime could potentially cause some bottlenecks in scrapping capacity, especially as scrapping is expected to increase significantly in the future, driven by accelerating decarbonization and fleet renewal trends. Yards in Bangladesh and India are likely to be compliant on the entry-into-force date (Leach, 2025). Progress in Pakistan has been more gradual.

The Convention marks a broadening of regulation in the ship recycling industry; for some time, the more stringent European Union Ship Recycling Regulation has applied only to European Union-flagged ships (see chapter V). The European Union has approved only 43 yards for recycling globally, none of which are in South Asia. Most of this capacity is in Türkiye (European Commission, 2025b). Going forward, demand for compliant ship recycling capacity is expected to rise with fleet renewal. New recycling facilities are currently in development, and European Union discussions around whether some yards in India could be approved under the Ship Recycling Regulation continue (Leach, 2025). Since 2019, foreign ship scrapping has been restricted in China, leading to more demands on ship recycling capacity in South Asia.

Seizing opportunities that may emerge from the fast-evolving maritime transport operating landscape, including to expand market shares and leadership in maritime businesses amid growing demands for environmentally sustainable ship capacity, developing countries could explore maritime business sectors beyond traditional areas of focus, build long-term capacity, and better align with sustainable development goals and the ocean economy (OECD, 2025). For example, countries involved in ship recycling could consider developing related activities such as ship repair, ship retrofitting, and, potentially, some shipbuilding. These sectors often share common facilities and show some infrastructure overlap (e.g., dry docks). With necessary adjustments, upgrades and reconfiguration, ship recycling yards could potentially be used for ship repair, retrofitting and conversion or even specialized shipbuilding (e.g., tugboats). The transition could be supported by strategic planning, investment incentives and an enabling regulatory framework, including under the Hong Kong Convention. The latter provides safety and environmental protocols that could facilitate an integrated approach to maritime business sectors.

5. Ship deliveries and recycling levels, demand prospects and ship routing patterns are shaping the balance between supply and demand

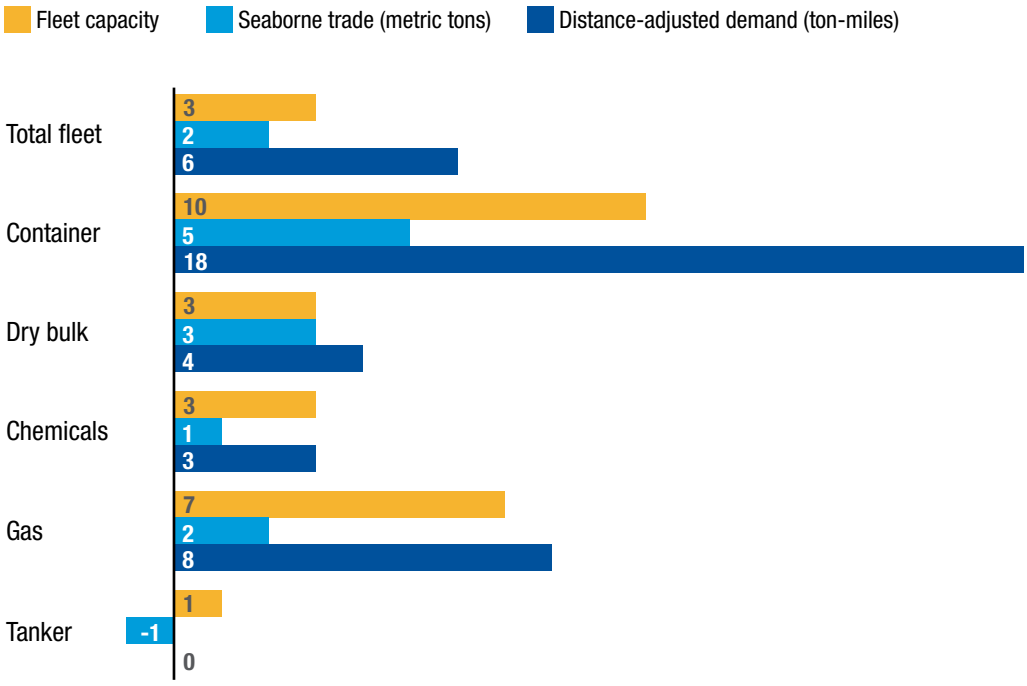
A mounting risk in the sector is market imbalance, with growth in ship capacity supplied, especially in container shipping, exceeding demand growth. Over the past few years, amid increased disruptions to shipping routes and maritime chokepoints as well as a 2021–2022 logjam in global logistics resulting from the COVID-19 pandemic, surplus capacity was absorbed by a growth in distance-adjusted demand and ton-miles. Between 2010 and 2024, demand as measured by maritime trade in metric tons increased by 37.5 per cent while global fleet capacity by dead weight tons jumped by 85 per cent. Over the same period, distance-adjusted demand rose by 53.2 per cent.

Overcapacity could emerge as potentially problematic, however, as global demand is expected to weaken and opportunities for continued employment of older tonnage start to fade away. Disruptions that temporarily inflated distance-adjusted demand are predicted to eventually end when their causes diminish. Rerouting ships on longer journeys has helped to absorb spare capacity, but, in an oversupplied market, even a small shift in demand can trigger significant market imbalances. Meanwhile, more ship capacity is being delivered, especially in some segments such as container ships, boosted by the elevated freight rates of the past few years, while ship scrapping levels remain low. The supply and demand growth mismatch is pervasive across all shipping segments, although not all are equally exposed (figure II.11). Increasing scrapping levels and implementing fleet capacity management, including by adjusting sailing speeds, optimizing routing patterns and idling capacity, will be crucial.

6. The global fleet continues to age despite new ship deliveries and orders

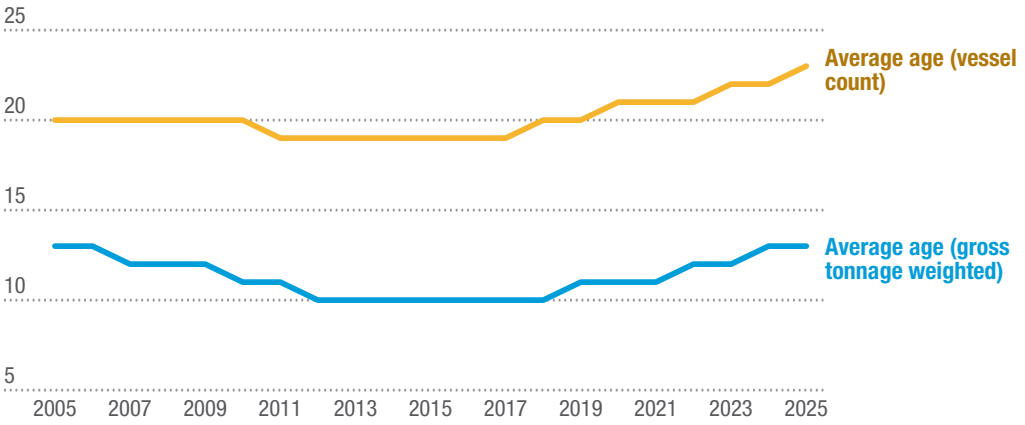
The global fleet is getting older. Weighted by gross tonnage, the global fleet was, on average, 12.6 years old in 2024, a 3.2 per cent increase over 2023. By vessel count, the fleet was 22.2 years old or 1.8 per cent older than a year earlier (figure II.12). In 2024, the fleet was more than three years older than it was a decade ago. Developing countries' share of dead weight ton capacity that is older than 20 years (21.1 per cent) was more than twice that of developed economies (9.3 per cent) (table II.8). Set against the current moderate orderbook measured as a proportion of the global active fleet and significantly low ship recycling levels, the pace at which the ageing fleet will be replaced remains uncertain.

Figure II.11
Growth rates in the supply and demand for ship capacity, 2024–2025
(Annual percentage change)



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

Figure II.12
Average age of the world fleet
(Years)



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

Table II.8
Age profile of the global fleet by types of ships and economies

Ship type (number per average size in dead weight tons)	Age group (years) 0–4	5–9	10–14	15–19	More than 20
Bulk carriers	76 698	83 403	77 951	64 698	53 228
Container ships	67 046	72 351	67 509	42 562	30 657
General cargo	6 853	5 549	6 951	5 014	2 784
Oil tankers	77 693	84 350	60 601	64 671	24 803
Other ship types	8 129	7 632	4 146	6 719	3 145

Developed economies		Age group (years) 0–4	5–9	10–14	15–19	More than 20	Average age (years) 2024	2025
All ships	Share of total ships (percentage)	11.1	13.6	18.1	15.7	41.5	22.5	22.9
	Share of dead weight tons (percentage)	18.9	23.3	30.5	17.9	9.3	11.4	11.8
	Average ship size (dead weight tons)	50 024.9	50 031.7	49 386.1	33 314.9	6 559.7		
Developing economies								
All ships	Share of total ships (percentage)	12.5	11.3	19.8	16.4	39.9	21.0	21.3
	Share of dead weight tons (percentage)	17.8	16.3	25.9	18.9	21.1	13.6	13.9
	Average ship size (dead weight tons)	3 782	10 673	13 611	39 543	9 205		

Source: UNCTAD calculations, based on data from Clarksons Research.

Note: The table includes propelled seagoing vessel of 100 gross tons and above. Dead weight tons for some individual vessels have been estimated. The average age of a dead weight ton is calculated as the sum of all products of the age and dead weight tonnage of a ship, divided by the sum of the dead weight tonnage of all ships.

Progress towards greening the fleet is underway but incremental, with orders for ships having dual fuel capabilities featuring prominently in the orderbook. Largely reflecting ongoing uncertainty over the fuels of the future, around 15 per cent of tonnage ordered was alternative fuel "ready" in May 2025. Beyond fuel uncertainty, tanker owners face additional doubts as the precise timing of peak oil demand remains elusive, with implications for future employment of tankers built today. As of May 2025, 8 per cent of the world fleet gross tonnage and 53 per cent of the orderbook by tonnage can run on alternative fuels (Clarksons Research, 2025h). In 2024, 36.6 per cent of tonnage on order was set to use LNG, followed by methanol, LPG and other fuels such as hydrogen.

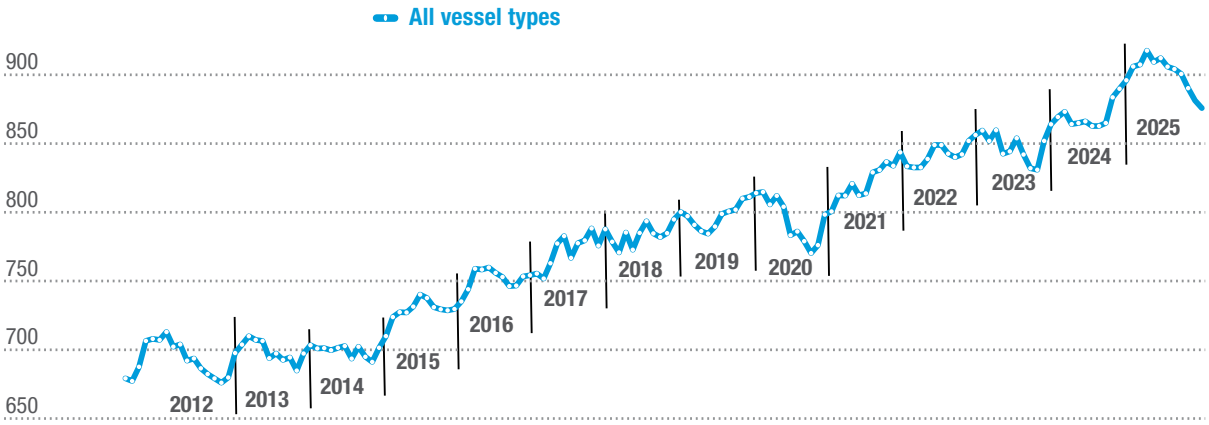
Other issues affecting the fuel transition and shaping the orderbook relate to the technological, safety and regulatory implications of new fuels. Their relative cost competitiveness remains a large factor. Adequate safety protocols, fit-for-purpose regulatory frameworks and active upskilling of the maritime transport workforce are necessary (Lloyd's Register, 2024). A growing challenge is the shortage of seafarers, which has been on the horizon for years. The expected need for some 90,000 additional trained officers by 2026 (International Chamber of Shipping and BIMCO, 2021) magnifies concerns over the future of global shipping. Shipowners and stakeholders, especially in countries that are leading suppliers of seafarers, need to invest in maritime graduates and professionals, promote inclusive recruitment, tap the talent pool represented by women, promote digital upskilling, and safeguard seafarers' rights and well-being (ILO, 2025; IMO, 2024). In 2024, women accounted for just 16 per cent (27,992) of the total surveyed maritime workforce of 172,691 individuals. Women seafarers remain vastly underrepresented, comprising only 1 per cent (2,223) of 211,750 active seafarers reported in the 2024 survey data (IMO and WISTA, 2025). There is a clear need for sustained efforts to improve gender diversity in the maritime workforce, including on board ships and in ports (see chapter IV).

7. Shipping carbon emissions continued to grow in 2024, but new International Maritime Organization midterm greenhouse gas reduction measures were agreed in 2025; their formal adoption may be imminent

Carbon emissions from shipping increased by an estimated 5 per cent in 2024 over 2023 (figure II.13), driven by continued ship rerouting and increased speeds. In the first half of 2025, a reduction in emissions was observed, probably reflecting slower sailing speeds, some operational improvements and the deployment of new ships.

Vessel speed trends were mixed. Average container ship speeds increased, especially in the largest sizes as vessels sailed faster to maintain service schedules (figure II.14). LNG carrier speeds also climbed in 2024 owing to disruption in key maritime chokepoints. For other vessel segments, speed generally remained steady or declined. In early 2025, speeds softened across fleet segments, with younger and more efficient ships running at slightly faster speeds compared to older units (Creedon, 2025).

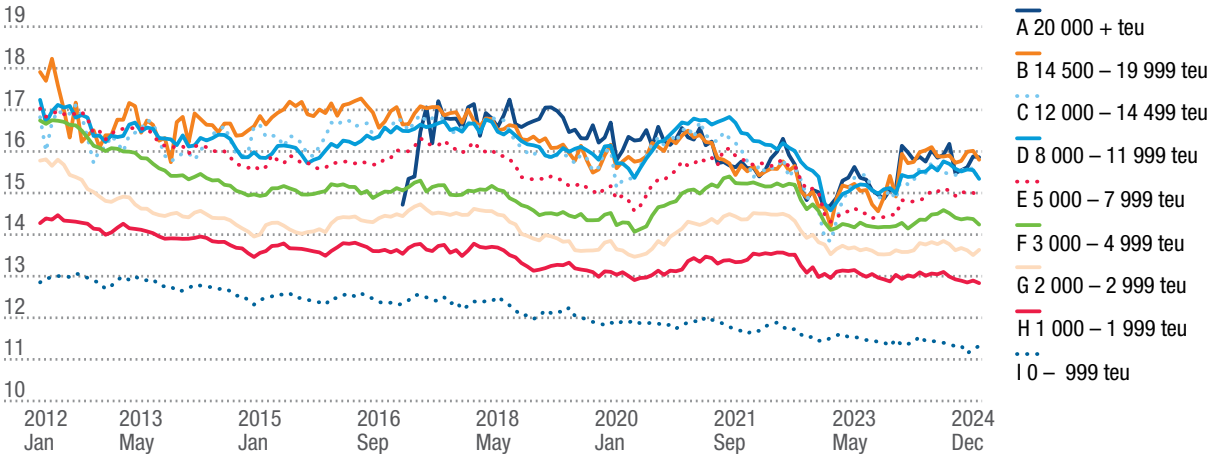
Figure II.13
Monthly annualized carbon dioxide emissions
(Millions of tons)



Source: UNCTAD calculations, based on AIS data from Marine Benchmark, 2025.

At the same time, the regulatory push for decarbonizing shipping continues. The IMO Marine Environment Protection Committee approved new midterm greenhouse gas reduction measures at its eighty-third session in April 2025 (see chapter V). The measures combine mandatory fuel intensity limits and a greenhouse gas pricing mechanism. They will be considered for adoption at an extraordinary session of the Committee in October 2025 before entering into force in March 2027, with a 1 January 2028 date of implementation. While it is too early to assess the outcomes, the new measures would likely help to increase the supply of alternative fuels and lower their prices, both of which remain key hurdles to uptake. Revenues to be collected would provide rewards to ships for greenhouse gas emissions avoided by using zero- or near-zero emissions energy sources.

Figure II.14
Monthly average speed of container vessels
(Knots)



Source: UNCTAD calculations, based on data from Marine Benchmark, 2025.

Note: When steaming above 6 knots.

A conventional Capesize vessel illustrates the potential compliance costs. Running on very low sulfur fuel oil and purchasing "remedial units" under the new measure, it could incur an additional cost of $2,500 per day on top of bunker expenses. As requirements become more stringent, this cost could reach $15,000 per day by 2035. The use of "drop-in" fuels (i.e., alternative fuels that do not require changes to ship engines or fuel systems), technological retrofits and operational adjustments could help reduce emissions from the existing active fleet. Alternative fuels used in newbuilds could support the fleet to achieve compliance by pooling or exchanging potential "surplus units" (Holden, 2025). One study estimates that the additional costs by 2035 would be equivalent to an 82 per cent premium on top of fleet bunker costs (Fray, 2025).

On average, ocean-going ships have a service life of 20 to 30 years. Thus, ships built today will still be in operation by 2050, the year that most net-zero emissions targets are due. To meet these targets, existing ships that are not compliant with the new requirements will likely be recycled, retrofitted, converted or replaced by vessels running on alternative fuels (UNCTAD, 2023).

In a related development, IMO member States agreed to revise carbon intensity indicator limits while tightening requirements for ship energy efficiency and emissions reductions through 2030.

To meet tougher limits, many ships will need to reduce speed (slow steaming). This has implications for service schedule reliability, fleet deployment strategies and operational strategies (e.g., route optimization, reduction of minimized ballast voyages).

Everything else being equal, it will also likely increase demand for ship capacity to carry global trade. An ageing and less efficient fleet may require retrofits (e.g., hull modifications, propeller upgrades or installation of energy-saving devices). The regulation also increases the need for low- and zero-carbon fuels, with alternatively fuelled ships likely to attract higher charter rates and to benefit from incentives such as reduced port fees. Poorly rated ships may face higher costs or be prevented from operating on certain routes. Another key development at the Committee's eighty-third session was to consider excluding fuel consumed during port waiting, anchoring and idle time from carbon intensity indicator calculations.

This issue is part of the phase two review of indicator calculations to be conducted beyond 2026.

Regional regulatory developments continued to unfold in 2024 and early 2025. As of 2024, the European Union's Emissions Trading System (EU-ETS) started to cover greenhouse gas emissions from voyages to and from European Union ports. As of 1 January 2025, vessels above 5,000 gross tons are also required to comply with the FuelEU maritime regulations for voyages within the European Union Economic Area as well as to and from the area (UNCTAD, 2023). To ensure compliance, among other measures, ships can run on low-carbon fuels, pool with compliant ships or pay penalties (see chapter III for a more detailed analysis). Assuming IMO member States adopt the Net-Zero Framework in October (see chapter V), it remains unclear how regional measures at the European Union level will align with IMO requirements for addressing shipping emissions.

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2025 Review of maritime transport

Chapter III

Freight rates and maritime transport costs

Freight rate volatility is becoming the new normal across all shipping segments, driven by continued geopolitical tensions, shifting trade policy, regulatory developments, and persistent supply and demand imbalances. Considering trends discussed in chapters I and II, this chapter analyses freight rate developments in the container, dry bulk and tanker shipping segments from January 2024 to mid-2025.

In 2024, disruptions in the Red Sea significantly affected container shipping. Rerouting via the Cape of Good Hope extended voyage times, reduced effective capacity and increased operating costs, driving spot and charter rates to near COVID-19 peaks by mid-2024 before moderating by the end of the year. Volatility continued into 2025 amid tariff announcements by the United States of America and mounting geopolitical risks, including around the Strait of Hormuz.

Dry bulk markets recorded strong performance in 2024, supported by robust demand for coal, grain and fertilizers. Rates eased in early 2025, however, due to subdued industrial activity and fleet growth. Tanker markets remained highly sensitive to geopolitical developments, with rates surging in June 2025 amid intensifying risks in the Strait of Hormuz.

Meanwhile, environmental compliance costs continue to fundamentally reshape maritime transport economics. Emissions pricing, decarbonization targets and related regulations will directly influence transport costs for all segments.

The tariff measures announced in 2025 may have implications for maritime transport and trade costs. UNCTAD has initiated analytical work to assess potential effects on global trade and seaborne transport.

United Nations

Key policy takeaways

- Increase technical assistance to developing countries, in particular the least developed countries, small island developing States and landlocked developing countries to strengthen their capacities to monitor, assess and manage the impacts of freight rate volatility on trade and supply chains.
- This support should focus on:

  Institutional capacity-building: Equipping national authorities with the tools, data and expertise to systematically monitor freight and transport cost trends.

  Data-driven analysis and impact assessment: Conducting and supporting data-driven research and insights, including impact assessments to evaluate how maritime freight rate fluctuations affect domestic prices, with particular attention to essential imports such as food and fuel.

  Multilateral coordination: Leveraging platforms such as UNCTAD, the WTO, FAO and IMO to enhance international research collaboration and policy coherence between national and global objectives.

  Evidence-based policymaking: Assisting governments in designing timely, evidence-based responses to mitigate impacts.

A. Trends in freight rates

1. The Red Sea crisis drove up spot container freight rates in 2024 with partial relief by year-end

Container freight rates recorded strong increases in 2024, with spot rates peaking around midyear at levels not seen since the COVID-19 disruptions of 2021–2022. The Red Sea disruptions primarily drove this surge, forcing carriers to reroute vessels around the Cape of Good Hope instead of transiting through the Suez Canal (UNCTAD, 2024). This rerouting increased voyage distances and demand for vessels, caused delays to shipping frequency and reliability, and increased overall operating costs. Extended voyage durations contributed to a substantial increase in global ton-miles, estimated at 17 per cent in 2024, along with a significant rise in operating costs, particularly time charter and fuel costs, despite reduced Suez Canal dues.

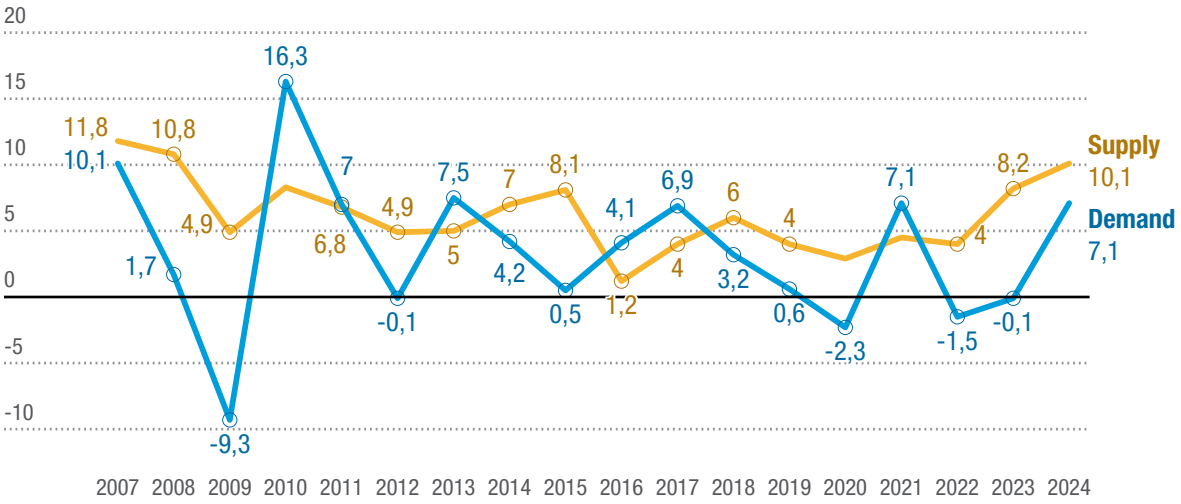
In addition to the impact of disrupted shipping operations in the Red Sea, global cargo volumes grew more than anticipated in 2024, further constricting vessel availability and maintaining high freight rates. This growth in demand was driven by trade between North America and other regions, particularly Asia, as well as by the continued expansion of South-South trade between Asia and developing economies in Africa, Latin America and the Middle East (chapter I).

An analysis of supply and demand dynamics in the container shipping market, measured in TEUs (figure III.1), shows overall growth in demand of 7.1 per cent in 2024. This growth contrasted with the contraction in 2022 (-1.5 per cent) and stagnation in 2023 (-0.1 per cent) (chapter I). On the supply side, global container shipping capacity grew by 10.1 per cent in 2024, equivalent to nearly 3 million TEUs (chapter II), the highest annual growth since 2008. Much of the new tonnage was absorbed by increased demand from longer voyages due to Red Sea rerouting and broader economic activity. Consequently, the additional capacity did not immediately drive rates lower; instead, it continued to support elevated spot freight rates.

By the end of 2024, spot container freight rates eased from midyear peaks but stayed well above levels observed prior to the onset of the Red Sea crisis in December 2023.

Container demand projections for 2025 remain uncertain amid growing geopolitical tensions and trade policy shifts. On the supply side, container fleet capacity is still growing as new ships ordered during the post-COVID-19 period of booming earnings continue to be delivered. These trends are explored in the following subsections and further considered in chapters I and II, which cover demand and supply trends.

Figure III.1
Demand rebounded in the container market in 2024, after a two-year contraction, but remained below supply growth, which saw the highest annual increase since 2008
(Percentage change)



Source: UNCTAD calculations. Demand (TEU) is based on data from chapter I; supply is based on data from Clarksons Research, Container Intelligence Monthly, various issues.

Note: Supply data refer to the total capacity of the container-carrying fleet (TEU), including multipurpose and other vessels with some container-carrying capacity.

The Shanghai Containerized Freight Index reflects elevated rate levels, with a mid-2024 surge in freight rates followed by a year-end decline

The Shanghai Containerized Freight Index (SCFI), a key benchmark for spot rates on containerized shipments from Shanghai to major global destinations, averaged 2,496 points in 2024, an increase of approximately 149 per cent compared to the 2023 average (figure III.2).

The index peaked at 3,600 points in mid-2024, its highest level since the global logistics crunch of 2021–2022 triggered by the COVID-19 pandemic. This increase was reflected across major trade routes.

As the third quarter progressed, freight rates eased due to a decline in seasonal demand and new vessel deliveries. By December 2024, the index had fallen by 34.1 per cent from its July peak. Nevertheless, this figure remained around 93 per cent higher than the 1,230-point level recorded in December 2023. This further underscores the significant impact of the Red Sea crisis on global container shipping dynamics and the sustained upward pressure on transport costs in the 2024 container market.

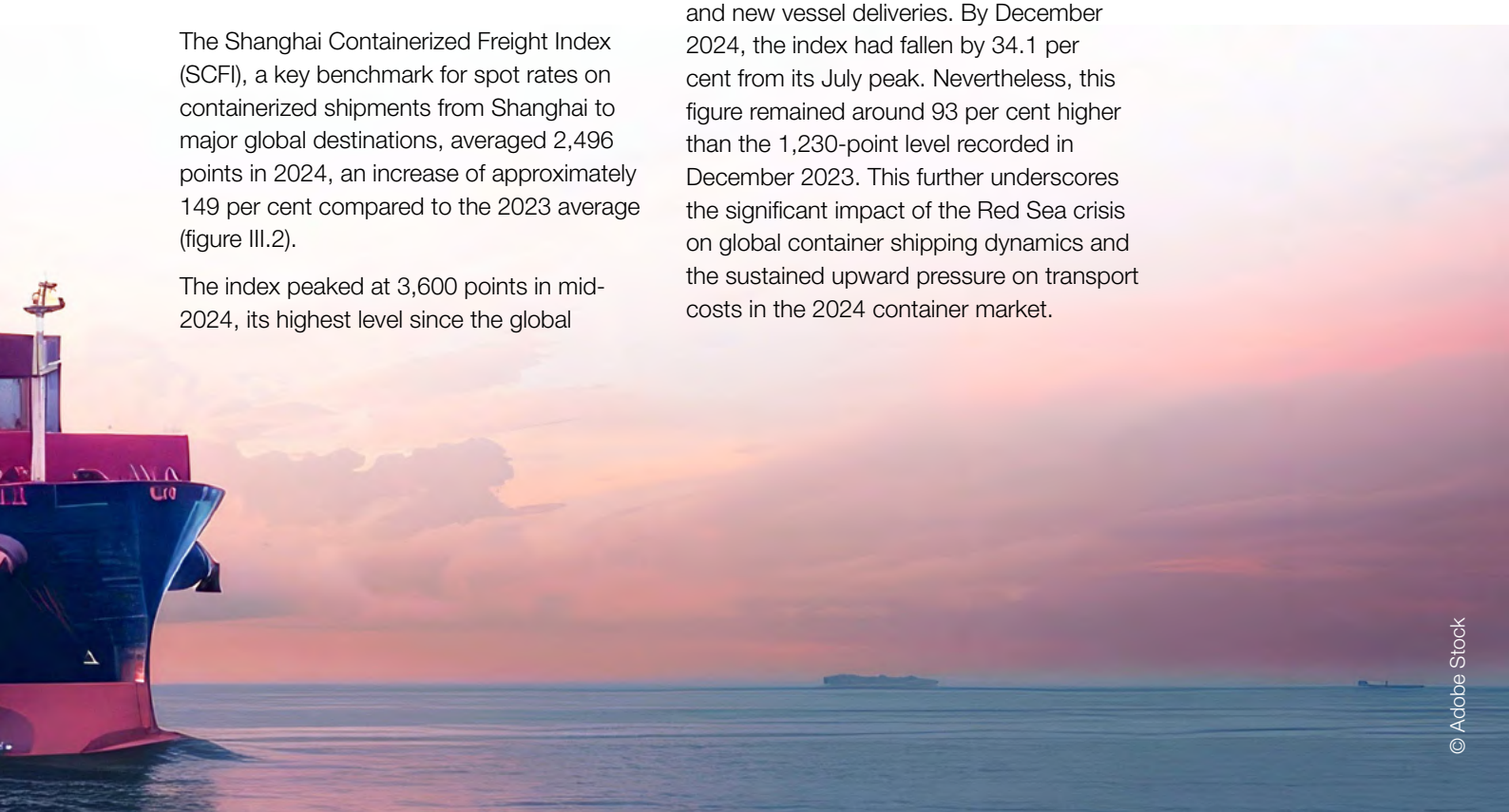
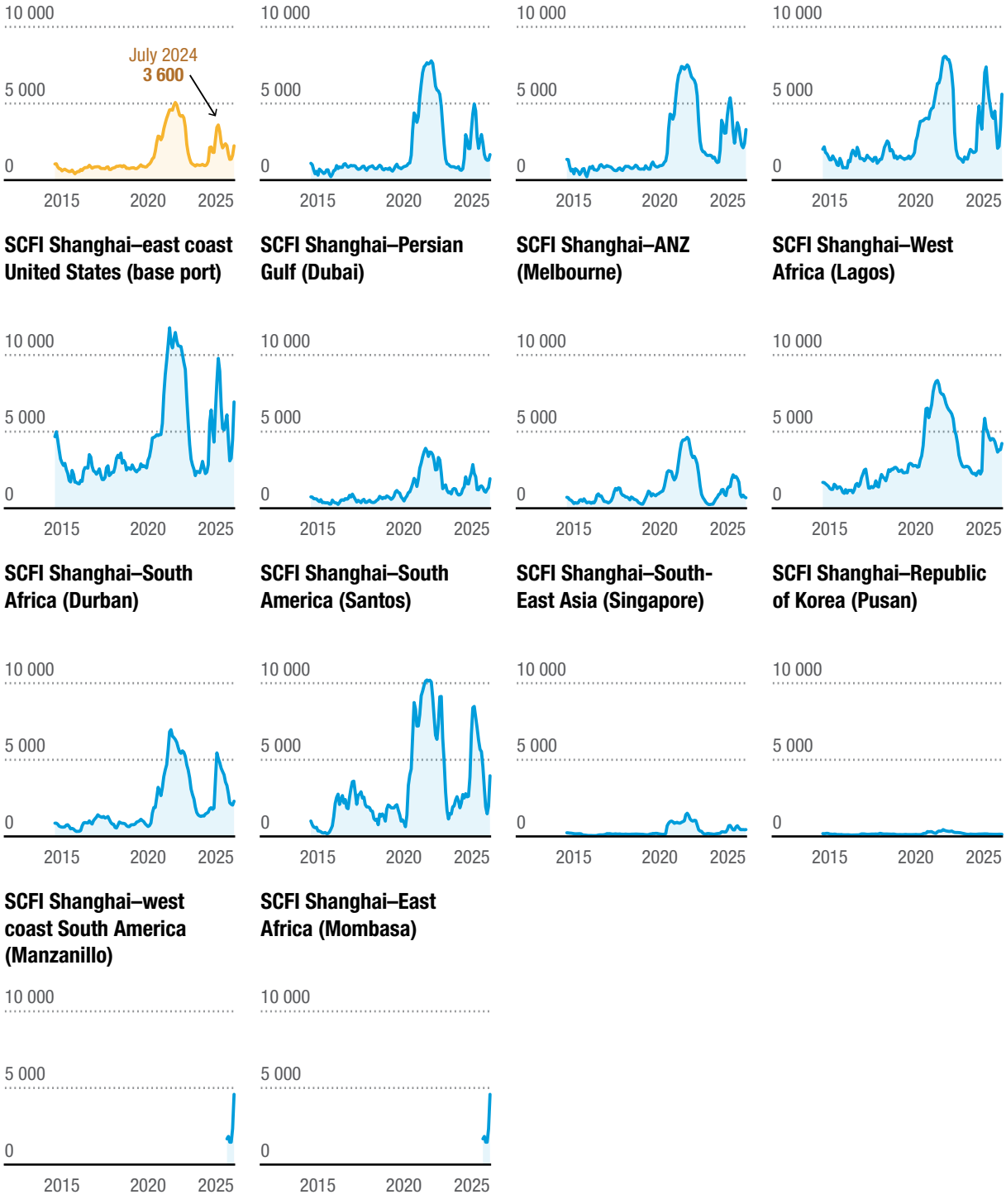


Figure III.2
Shanghai Containerized Freight Index spot rates
(Monthly averages, United States dollars per TEU)



Source: UNCTAD, based on data from Clarksons Shipping Intelligence Network.

Notes: One 40-foot equivalent unit (FEU), equal to two TEUs, applies to the rates from Shanghai to the east and west coasts of the United States. ANZ indicates freight rates from Shanghai to Australia and New Zealand.

Port congestion as a persistent source of freight rate increases and volatility in 2024 and into 2025

In 2024, port congestion also contributed to high freight rates, driven by factors including the disruption to shipping operations in the Red Sea, weather-related challenges in Asia and the Caribbean, and labour issues in the United States and Europe. These elements were in addition to infrastructure bottlenecks and operational inefficiencies, and a general surge in container cargo volumes (Can Fidan, 2025). Such conditions placed significant strain on port operations, leading to increased turnaround times and delays (chapter IV). The resulting congestion reduced the effective supply and timely deployment of vessels, diminishing available shipping capacity and reliability. This, in turn, exerted upward pressure on freight rates.

2. Container freight rates fluctuated into 2025 amid shocks and fleet expansion, with strategic alliances and coordinated capacity management playing a growing role against an increasingly uncertain market outlook

Following a weaker start to the year, characterized mainly by low demand after the Chinese Lunar New Year, freight rate markets experienced heightened volatility as trade tensions amplified.

In April 2025, the United States Administration announced new tariffs, including base-level and more elevated country-specific tariffs on key trading partners (chapters I and II). Such measures would typically exert upward pressure on freight rates, as tariff announcements can trigger the front-loading of imports, temporarily increasing demand for shipping and raising freight rates. Yet the impact on spot rates was limited, as importers in the United States had already accelerated shipments earlier in the year in anticipation of potential tariff impositions on Chinese goods (UNCTAD, 2025a).

However, by mid-May 2025, front-loading had caused a new surge in cargo demand from China to the United States, as the latter announced a 90-day tariff suspension period with its trading partners to allow bilateral negotiations to take place. Increased cargo flows promoted a significant rise in spot freight rates on the trans-Pacific route. Between April and May 2025, average rates from Shanghai to the western coast of the United States rose by 57.3 per cent, while those to the eastern coast increased by 37.3 per cent. Continued carrier capacity management strategies further supported these sharp increases.

In June 2025, tensions between the Islamic Republic of Iran and Israel added a further layer of risk to maritime chokepoints, particularly the Strait of Hormuz. Although the strait caters to a relatively small share of global seaborne container trade, around 3 per cent (Clarksons Research, 2025e), it remains relevant to containerized trade as regional hubs are in its vicinity. These include Jebel Ali Port and Khalifa Port in the United Arab Emirates. Any sustained disruption or closure could affect feeder services and transshipment operations in the Arabian Gulf or northern Indian Ocean, potentially leading to rerouting via South Asian ports (Container News, 2025). Such a shift may result in congestion and increases in freight rates, especially on the intra-gulf and Middle East to Asia and South Asia routes. While the impact on global container trade remains limited, further escalation could have wider implications for network reliability and transport costs. Indeed, average spot rates from Shanghai to Jebel Ali, the Arabian Gulf's largest port, surged by 55 per cent from May to June 2025 (Xeneta, 2025).

Looking ahead, the overall outlook for container freight rates remains clouded by uncertainty. Many risks tilt towards the downside, affecting demand (chapter I). It is unclear if or to what extent changing tariffs will be implemented and how markets will adapt. Uncertainty around China and United States tariff measures as well as capacity realignments, such as the reallocation of surplus trans-Pacific tonnage to other trade lanes (for example, exports to Europe and Latin America, and intra-Asia), are expected to affect market dynamics and exacerbate freight rate volatility. Sudden shifts in trade policy and shipping patterns would likely disrupt the balance between supply and demand (see also UNCTAD, 2025a). At the same time, overcapacity will probably remain a key factor. Global container fleet capacity is projected to expand by 6.7 per cent in 2025 and 4.0 per cent in 2026 (Clarksons Research, 2025e).

In this context, the projected increase in supply will exert downturn pressure on freight rates, particularly if not met with a corresponding rise in demand. Simultaneously, a full return of container shipping to the Red Sea and Suez Canal routes, should conditions allow, would increase capacity that had been absorbed by longer Cape of Good Hope rerouting. This would lead to a decline in global TEU-mile demand and a further drop in freight rates. Existing mitigation measures applied by carriers, such as blank sailing, slow steaming, vessel idling and controlled fleet deployment, may not be sufficient to absorb surplus capacity (Ship&Bunker, 2025). Strategic carrier alliances and continued coordinated capacity management are expected to play increasingly important roles in shaping freight rate dynamics.

Container freight rates volatility is expected to persist

As freight rates continue to adjust to evolving disruptions, risks and regulatory changes, including those related to environmental compliance (discussed below), rate volatility is expected to persist across most containerized trade routes.

3. Containership charter rates: Rebounding across segments in 2024 and into 2025

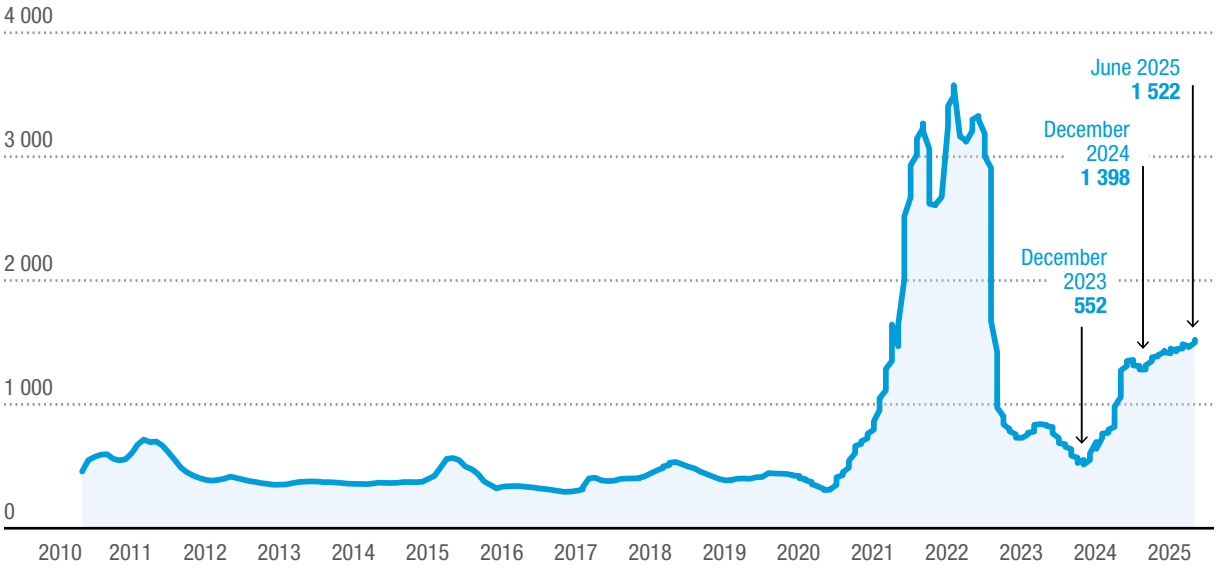
In 2024, global container charter rates were higher than in 2023. This stemmed particularly from increased TEU-mile demand from longer-voyage distances caused by ship rerouting and higher-than-expected growth in trade volumes.

Trends in the New ConTex index, a benchmark for assessing time charter rates for containerships across six key vessel classes, captured this dynamic. The index rose sharply to an average of 1,073 points in 2024, 50.3 per cent over the 2023 average of 714 points (figure III.3). It remains below the peak levels reached during the COVID-19 surge, however. The market's ability to respond more swiftly, supported by the availability of tonnage, has helped prevent spikes observed during the pandemic.

Charter markets remained strong throughout 2024, with rates increasing across vessel segments. Large vessels (3,400 TEU and above) saw daily rates rise by 18 to 25 per cent year-on-year, with charter periods often exceeding 22 months. Smaller ships also experienced robust demand, driven by Red Sea disruptions, as well as increased regional trade and the need for feeder capacity, leading to a 33 per cent increase in average rates for 1,600–1,999 TEU vessels, many fixed for 18–24 months.[1]

[1] See the HAX Hamburg Index (March 2025) of the Hamburg and Bremen Shipbrokers' Association (VHBS) and New ConTex Index. Available, respectively, at www.vhss.de/hax and www.vhss.de/new-contex.

Figure III.3
The New ConTex index performed significantly better in 2024 and 2025 than in 2023



Source: UNCTAD calculations, based on data from the New ConTex Index for container ship chartering produced by the Hamburg and Bremer Shipbrokers Association, available at http://www.vhss.de.

Note: The New ConTex Index is based on assessments of the current day charter rates of six selected container ship types, which are representative of their size categories: Types 1,100 TEU and 1,700 TEU, with a charter period of one year; and Types 2,500, 2,700, 3,500 and 4,250 TEU, with a charter period of two years. The index base is 1,000 points (October 2007).

Container charter market momentum continued into 2025 despite freight rate moderation; the outlook remains uncertain

Charter markets remained firm in the first half of 2025, with the New ConTex index rising from 1,398 points in late December 2024 to 1,522 points by June 2025. An increase of nearly 9 per cent underscored persistent demand for charter tonnage across vessel classes.

Looking ahead, container charter market dynamics remain vulnerable to geopolitical disruptions, shifts in trade policy and an evolving fleet profile. The global active fleet and orderbook are increasingly driven by decarbonization targets and an expected pickup in ship scrapping activity as fleet renewal accelerates (chapter II). Persistent uncertainty linked to new tariffs and geopolitical developments has prompted many cargo owners and charterers to avoid long-term contracts, opting instead for short-term agreements at higher rates to retain flexibility and adapt to shifting conditions (Container xChange, 2025).

4. Dry bulk shipping rates in 2024: Strong but variable demand and moderate fleet growth

The dry bulk shipping freight market experienced a rebound and sustained volatility in 2024, following weaker and fluctuating performance in 2023. The Baltic Dry Index, which tracks bulk commodity shipping costs, averaged 1,755 points in 2024, up 27.3 per cent from 2023.

A strong underlying demand for coal, grain and fertilizers limited new supply, while effective vessel utilization was in play across all segments. The rerouting of vessels from the Red Sea caused dry bulk trade in ton-miles to increase by an estimated 1.2 per cent (Clarksons Research, 2025a). The index began to decline towards the end of 2024, reflecting softening earnings (figure III.4).

Capesize vessels (over 100,000 dwt), which transport cargoes such as coal and iron ore, benefited from strong demand in Asia (particularly China, India and South-East Asia) for both thermal and metallurgical coal. Europe also maintained strategic imports of thermal coal amid high gas prices and energy security concerns. As a result, Capesize one-year time charter rates averaged $22,953 per day in 2024, up from $16,389 in 2023, and peaked at over $35,000 per day during the year (BRS Group, 2025).

Panamax and Kamsarmax vessels (60,000–99,999 dwt), active in the coal, grain and fertilizer trades, also saw strong demand and steady growth in earnings and rates. Grain exports from Brazil, the Russian Federation and the United States remained robust, supporting demand across Africa, Asia and the Middle East. Ukraine continued to export through alternative Black Sea corridors and Danube ports (Polityuk, Saul and Balmforth, 2024), contributing to tonnage demand. Average freight rates for Panamax vessels, as reflected by time charter earnings, reached $16,157 per day in 2024, a 10 per cent increase from the 2023 average (Clarksons Research, 2025b). The Kamsarmax segment averaged $14,099 per day, up 9.7 per cent from 2023, with rates exceeding $20,000 per day during peak periods.

Supramax and Handysize vessels (25,000–59,999 dwt) benefited from firm minor bulk demand, including grains, fertilizers and steel, driven by regional growth in Africa, South-East Asia and short-sea European trades. Supramax rates rose steadily, with the average one-year time charter reaching $13,601 per day in 2024, a 21 per cent increase over 2023 (BRS Group, 2025).

On the supply side, the dry bulk fleet expanded by an estimated 3 per cent in 2024, similar to growth in previous years (chapter II). This moderate pace of fleet growth broadly aligned with market demand. Low scrapping activity also supported available capacity, as firm charter earnings provided shipowners with continued incentives to retain older vessels.

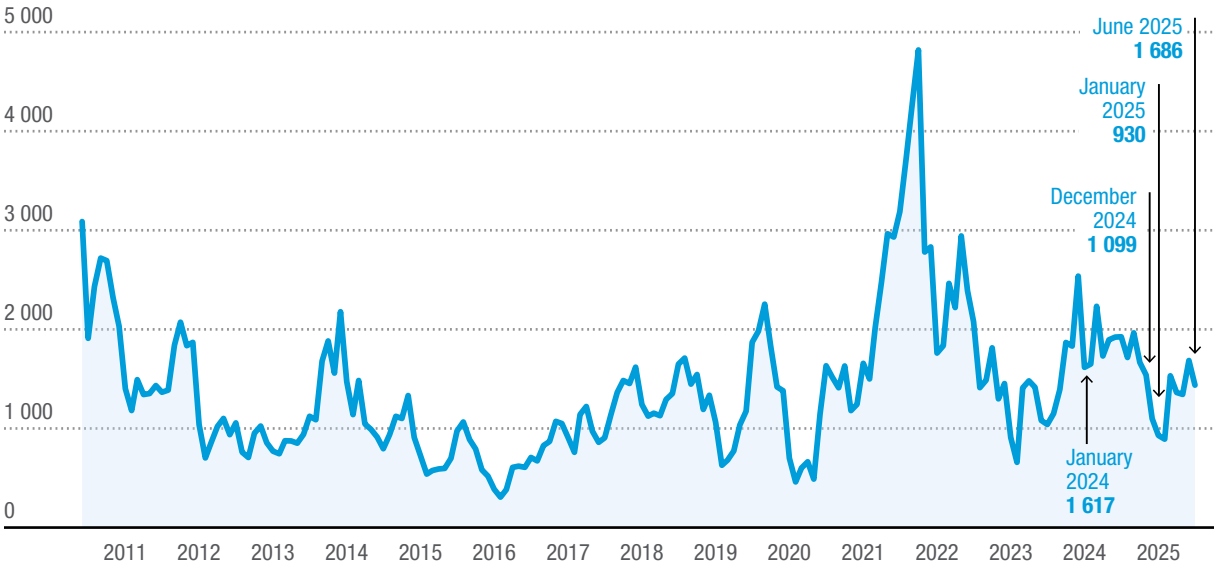
5. Dry bulk markets in the first half of 2025: Weaker demand and lower earnings as fleet growth moderates

The dry bulk shipping market experienced slower and fluctuating demand during the first half of 2025 compared to 2024. Average freight rates, as reflected in daily earnings across the sector, declined to approximately $10,750 per day, around a 30 per cent drop compared to the same period last year. This downturn was primarily driven by weaker demand for key commodities, particularly iron ore and coal, amid reduced industrial output and changing global trade dynamics (Clarksons Research, 2025b; see also chapter I).

A notable but temporary increase in the Baltic Dry Index occurred in June 2025. It saw an average of 1,685.95, supported by rising Capesize rates due to increased bauxite shipments from Guinea to China and a rebound in Chinese coal imports, before easing again in July. The Strait of Hormuz caused concern. Although only around 3 per cent of global dry bulk trade passes through it (Clarksons Research, 2025b), any disruption could put additional pressure on an already fragile and uncertain outlook for the dry bulk trade.

Meanwhile, the dry bulk fleet is projected to expand by approximately 3 per cent in 2025, in line with average annual growth over 2022–2024 (Clarksons Research, 2025b). Without a rebound in demand, projected growth in bulker capacity could keep vessel use low and put downward pressure on freight earnings through 2025.

Figure III.4
The Baltic Dry Index was strong in 2024 but softened in 2025



Source: UNCTAD calculations, based on data from Clarksons Shipping Intelligence Network.

Looking ahead, the dry bulk freight rates are expected to remain under pressure due to a combination of economic uncertainty, the global energy transition, shifting national strategies on energy and food security, geopolitical tensions and trade policy shifts. These factors are reshaping commodity flows, route preferences and vessel deployment capacity, thereby influencing dry bulk freight rates.

6. Tanker freight rates and earnings in 2024: Elevated but volatile

Tanker freight markets remained firm in 2024, although marked by elevated volatility. Freight rates stayed above historical averages but below the exceptional peaks of 2022 and 2023. The Baltic Dirty Tanker Index, which tracks crude oil tanker spot rates, averaged 1,092, reaching a high of 1,399 in January and a low of 877 in September 2024. The Baltic Clean Tanker Index, covering product tankers, such as those transporting refined fuels including diesel, jet fuel and gasoline, averaged 818, peaking at 1,104 in March before declining to 540 in October 2024 (figure III.5).

Freight rates, as reflected in average tanker earnings, declined by 13 per cent to $35,498 per day in 2024 but remained high by historical standards (figure III.6). The first half of the year saw elevated rates and earnings driven by increased ton-mile demand as ships rerouted around the Cape of Good Hope, causing the average haul to increase. The redirection of Russian crude oil and petroleum products to Africa and Asia as well as increased United States and West African crude shipments to Asia and Europe also significantly extended voyage distances and tightened vessel availability (Somasekhar, 2025). Together, these factors and limited fleet capacity growth (0.7 per cent, see chapter II) have pushed tanker freight rates up.

In the second half of 2024, crude tanker earnings declined, particularly for very large crude carriers, due to weakening Chinese crude imports, continued OPEC+ production cuts and the broader global economic slowdown (Clarksons Research, 2025c).

Product tanker rates also fell, impacted by reduced Russian Federation exports, weaker refining margins and increased competition from crude tankers shifting into the clean product segment to capture higher earnings (Lin, 2024; Coyne, 2024).

7. Tanker market freight rates and earnings by mid-2025 and beyond: Decline amid market volatility

As of June 2025, the average Baltic Dirty Tanker Index and Baltic Clean Tanker Index levels stood at approximately 938 and 684 points, respectively (figure III.5). Average tanker earnings had moderated to around $26,333 per day. This reflects a decline from the high levels observed during 2022–2024. Even so, earnings remained historically high and volatile, indicating continued market strength amid ongoing uncertainties.

The tanker market faces a more complex and challenging environment

In the crude tanker segment, average earnings jumped to $52,013 per day in April, supported by increased demand for shipments from alternative suppliers outside markets affected by economic measures. By June, earnings dropped to $33,393 per day, despite an increase in OPEC+ production (figure III.6). Despite this decline, the market remained firm, supported by moderate fleet growth projected at 0.6 per cent in 2025 and steady global seaborne crude trade volumes (Clarksons Research, 2025d).

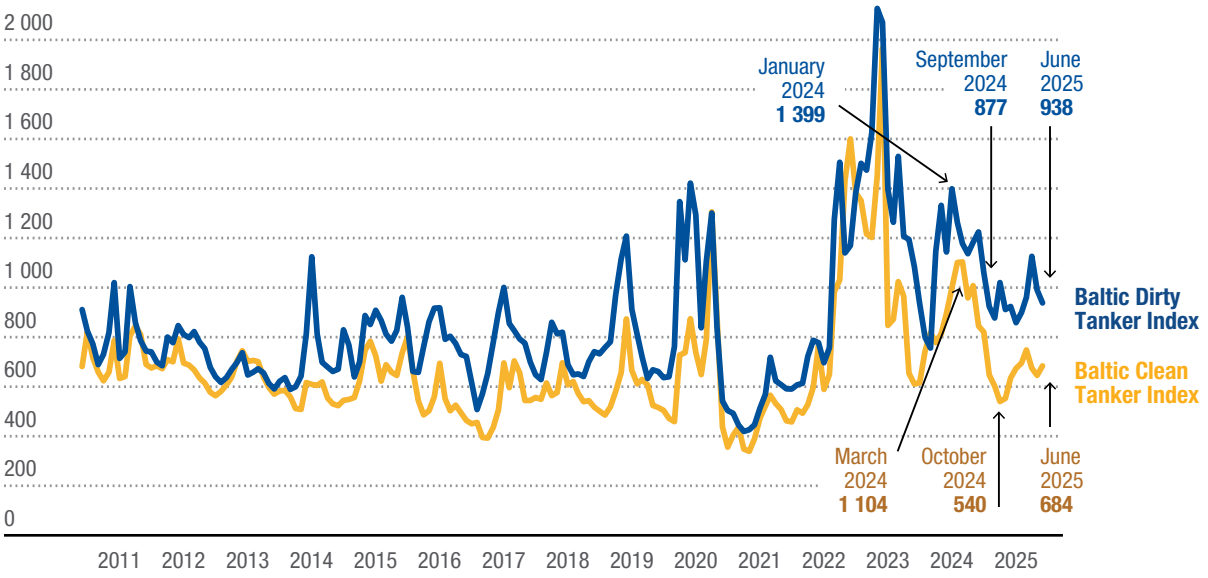
In the product tanker segment, average earnings reached $25,916 per day in March 2025, a decline of nearly 30 per cent compared to $44,555 per day in March 2024. By June 2025, average earnings had eased further to $21,694 per day, although they remained elevated by historical standards. This reflects weakening ton-mile demand due to reduced long-haul product trades alongside an anticipated product tanker fleet expansion of approximately 5 per cent in 2025, which is expected to exert further downward pressure on rates (Clarksons Research, 2025d).

As the Strait of Hormuz is critical for oil transport, accounting for approximately 34 per cent of global seaborne oil trade in 2024 (Clarksons Research, 2025d), tensions in June 2025 were associated with a surge in tanker freight rates amid increased costs and escalating war risk premiums.[2] Prices to charter very large crude carriers sailing from the Middle East to East Asia via the Strait of Hormuz more than doubled to nearly $50,000 per day following the outbreak of conflict. Product tanker earnings surged by 150 to 200 per cent within a week in June 2025 (Wright, 2025). Such developments can create ripple effects in broader tanker markets, intensifying cost pressures that may influence energy prices and shipping costs globally.

Looking ahead, the tanker market faces a more complex and challenging environment. While geopolitical tensions and rerouting spark intermittent surges in demand, global oil demand growth is slowing, fleet utilization is weakening and vessel supply is expanding, especially in the product segment. In parallel, tanker freight rates, much like other fleet segments, will be increasingly shaped by demands for ships running on low- and zero-carbon fuels. This shift is expected to tighten vessel supply and increase operating costs, particularly for older, less efficient ships, thereby exerting upward pressure on freight rates. All these factors will influence how rates evolve.

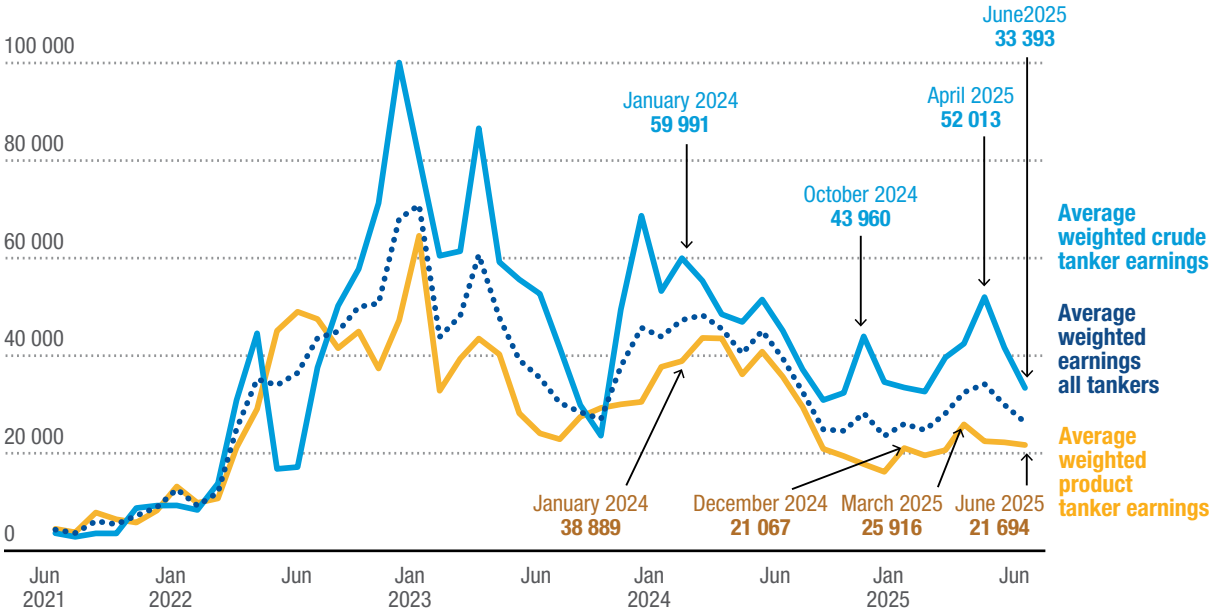
[2] War risk insurance premiums have reportedly surged from 0.07 to 2 per cent of a ship's value (Newsroom Panama, 2025).

Figure III.5
The Baltic Dirty Tanker Index and Baltic Clean Tanker Index show volatility in 2024 and 2025



Source: UNCTAD calculations, based on data from Clarksons Shipping Intelligence Network.

Figure III.6
Average earnings, crude and product tankers, 2024 to mid-2025: Highly volatile but elevated by historical standards
(United States dollars per day)



Source: UNCTAD, based on data from Clarksons Shipping Intelligence Network.

8. Maritime transport costs in a context of environmental regulations

Transport costs, specifically maritime transport costs, refer to total costs borne by the shipper or cargo owner. They include freight rates and additional expenses such as bunker fuel costs, variable surcharges, port and terminal handling fees, and insurance premiums.

Overall maritime transport costs are increasingly shaped by additional charges, especially due to environmental regulations. These encompass the growing costs of regulatory compliance, including those related to decarbonization and emissions controls. Evolving environmental cost components impact both shipping companies and cargo owners, ultimately affecting the final landed prices of goods.[3]

With the inclusion of maritime transport in the EU-ETS from 2024,[4] the entry into force of the FuelEU Maritime Regulation in 2025[5] and the agreement in April 2025 on draft IMO midterm greenhouse gas reduction measures[6] (chapters II and V), emissions-related costs are moving into sharper focus. The costs of compliance with existing legal requirements are now a central element of total maritime transport cost calculations.

Together, relevant regulatory measures are expected to reshape freight rate formation and transport cost structures across all major shipping segments, with more pronounced effects expected in the years ahead (table III.1). While their impact may not yet be apparent, relevant costs are expected to rise progressively in the coming years in line with regulatory obligations and compliance requirements.

Final remarks: Freight rate volatility and trade policy uncertainty heighten risks to global seaborne trade

Freight market developments in 2024–2025 underscored the vulnerability of global trade to persistent disruptions, supply and demand mismatches, and regulatory shifts. Freight rates surged in 2024 across all segments, container, dry bulk and tanker, driven by the Red Sea crisis, longer voyage distances, stronger-than-expected cargo demand and extensive port congestion. Although rates came down by year-end, they remained historically high. Until the middle of 2025, freight rates continued to fluctuate, influenced by increased geopolitical tensions, trade policy uncertainty, and persistent imbalances in global supply and demand.

In addition to the increased volatility in freight rates, evolving trade policies have introduced significant uncertainty into transport and trade costs. In 2025, the United States and several other economies announced additional tariffs and reaction measures.[7] UNCTAD has initiated an assessment of the potential impacts on global trade, including seaborne trade.

The following technical annex presents some preliminary findings from the ongoing analytical work with a focus on seaborne exports.

[3] See also chapter III of UNCTAD, 2023.
[4] Available at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02023L0959-20230516. See also UNCTAD, 2023.
[5] Available at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32023R1805. See also UNCTAD, 2023.
[6] The draft IMO measures include a global fuel standard and an economic measure (a carbon pricing mechanism). They will be considered for formal adoption in October 2025 and would enter into force in 2027, with implementation beginning in 2028.
[7] United States of America, The White House, 2025a–i; United States of America, Department of Commerce, 2025a–e; United States of America, Department of Homeland Security 2025a and 2025b; Canada, Department of Finance, 2025a, 2025b and 2025c.

Table III.1
An illustration of compliance costs by shipping segment under the EU-ETS and FuelEU, 2024–2025

Segment	Legal instrument	Compliance associated with cost	Illustrative impact
Container	**EU-ETS** (effective 1 January 2024) Applies to vessels from 5,000 gross tonnage on voyages within/to/from European Union ports. Covers 100 per cent of emissions on intraunion voyages and 50 per cent on voyages between union and non-union ports. Phase-in: 40 per cent in 2024, 70 per cent in 2025, 100 per cent from 2026 onwards.	**Purchase of European Union Allowances** (EUAs). Each EUA = right to emit 1 ton of carbon dioxide. The EUA price averaged 66–70 euros per ton of carbon dioxide in 2024; it is projected to rise to 75–85 euros per ton of carbon dioxide by 2025–2026.	**ETS surcharges** applied to European Union-related routes, varying by carrier, voyage distance and vessel efficiency (e.g., Maersk Far East to northern Europe: 70 euros/FEU or 31 euros/TEU in Q1 2024 and 61 euros/FEU in Q1 2025)
	FuelEU Maritime (effective 1 January 2025) Applies to vessels from 5,000 gross tonnage calling at European Union ports. Covers 100 per cent of energy used on intraunion voyages and 50 per cent on extraunion voyages.	**Greenhouse gas intensity targets:** 2 per cent reduction in intensity per unit of energy in 2025 over a 2020 baseline (91.16 grams of carbon dioxide equivalent per megajoule) 6 per cent reduction by 2030 Increasing gradually to an 80 per cent reduction by 2050	**Non-compliance penalty:** 2,400 euros/ton very low sulphur fuel oil equivalent in 2025 (rising to 2,640 euros/ton in 2026 and 2,904 euros/ton in 2027) or alternative compliance via use of biofuels or pooling surplus compliance credits from other vessels
	Regulation EU 2023/1804 on the deployment of alternative fuels infrastructure repealing Directive 2014/94/EU, Article 9[a] Requires an onshore **power supply** by 31 December 2029 for the Trans-European Network for Transport (TEN-T) maritime ports and inland waterway ports.	Onshore power retrofit requirement	Estimated retrofit cost of $1 million to $2 million per vessel
Dry bulk	**EU-ETS**	Carbon dioxide surcharge per voyage. Lower-value cargoes make ETS a bigger share of freight.	For example, the EU-ETS added an estimated cost of $0.40 per ton of coal transported by a Capesize vessel (131,000 dwt, built in 2010, non-scrubber) from Baltimore to Rotterdam in 2024, rising to $0.69 per ton in 2025.[b]
	FuelEU Maritime	Greenhouse gas intensity compliance	Penalties apply to high-emission older vessels
Tanker	**EU-ETS**	Carbon dioxide cost per voyage	For example, the EU-ETS costs approximately $0.64 per ton for crude oil from Bonny Offshore (Nigeria) to the Port of Marseille/Fos (France) for an Aframax of 80,000 tons in 2024 and $1.12 per ton in 2025[b]
	FuelEU Maritime	Greenhouse gas intensity compliance	Complexity due to varied fuel mix and voyage patterns

Source: Container segment: DNV (available at https://www.dnv.com/maritime/insights/topics/eu-emissions-trading-system/eu-ets-compliance/ and at https://www.dnv.com/expert-story/maritime-impact/strategies-for-navigating-fueleu-maritime-compliance/); S&P Global (available at https://www.spglobal.com/commodity-insights/en/news-research/latest-news/energy-transition/030425-european-carbon-allowances-trade-at-lowest-2025-value-driven-by-gas-geopolitics); Clarksons Research EU-ETS voyage costs (available at https://www.clarksons.net/); Maersk 24 (available at https://www.maersk.com/news/articles/2023/09/15/eu-emissions-trading-system-ets); Maersk 25 (available at https://www.maersk.com/news/articles/2024/12/02/emissions-surcharge-ems-ess); Bettersea.tech (available at https://www.bettersea.tech/post/case-study-iv-penalty-vs-biofuel-vs-fueleu-pooling-what-s-the-best-compliance-option); Virtue Marine 9 (available at https://www.virtuemarine.nl/post/fueleu-maritime-a-new-era-for-sustainable-shipping); European Commission Regulation 2023/1805 (available at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32023R1805); World Ports Sustainability Program (available at https://sustainableworldports.org/ops/costs/investments/). Dry bulk segment: Clarksons Research EU-ETS voyage costs (available at https://www.clarksons.net/). Tanker segment: Clarksons Research EU-ETS Voyage Costs (available at https://www.clarksons.net/).
Note: [a] More information on Regulation EU 2023/1804 is available at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02023R1804-20250414&qid=1753708349028. [b] EUA carbon dioxide price of $71.3/ton as of December 2024.

Technical annex
Potential implications of additional tariffs on seaborne trade

1. Preliminary overview

This technical annex presents some preliminary findings from ongoing analytical work assessing the potential implications for seaborne trade of additional tariffs announced and implemented in 2025. The preliminary assessment draws on UNCTAD's new World Seaborne Trade Database (UNCTAD, 2025b) and employs a quantitative trade model featuring a modal choice between maritime and non-maritime transport.[8]

By 7 August 2025, the United States and other economies had announced a series of additional tariffs and reaction measures. To address uncertainty about the future trajectory of tariff rates, two simulation scenarios were developed (table A.III.1).

The simulations presented in this technical annex provide some insights into the potential medium-term impacts of the additional tariff measures, defined as effects that could materialize within one to four years of their implementation, assuming the measures remain in place over that period.

Figure A.III.1 displays preliminary simulation results, focusing on the estimated impacts of the additional tariffs on total real seaborne exports (seaborne exports to the world, adjusted for price changes) from selected economies and groups. World seaborne trade is simulated to decline by 6 to 10 per cent, depending on the scenario.[9,10] The estimated reduction under the escalation scenario (S2) is approximately twice as large as that under the first scenario (S1), reflecting the widespread use of reaction tariffs by multiple countries.

The negative impact on seaborne trade would be slightly more marked than the overall impact on total trade (all transport modes combined). This is because the modelled contraction stems largely from reduced exports to the United States market. These exports, including those of major exporters such as China, are predominantly seaborne. The simulation suggests that these economies could attempt to offset such losses by redirecting exports to other markets, involving both maritime and non-maritime transportation.

Notably, developing economies are projected to experience more significant reductions in seaborne exports compared to developed economies (excluding the United States) under both scenarios.

[8] Given that one key data source, version 11 of the Global Trade Analysis Project (GTAP) Data Base (Aguiar et al., 2023), covers data up to 2017, baseline data inputs to the model are benchmarked to that year.

[9] The simulation results represent projected changes in seaborne trade from levels that would be expected in the absence of the additional tariffs. These changes are calculated directly by using the widely recognized "exact-hat algebra" methodology.

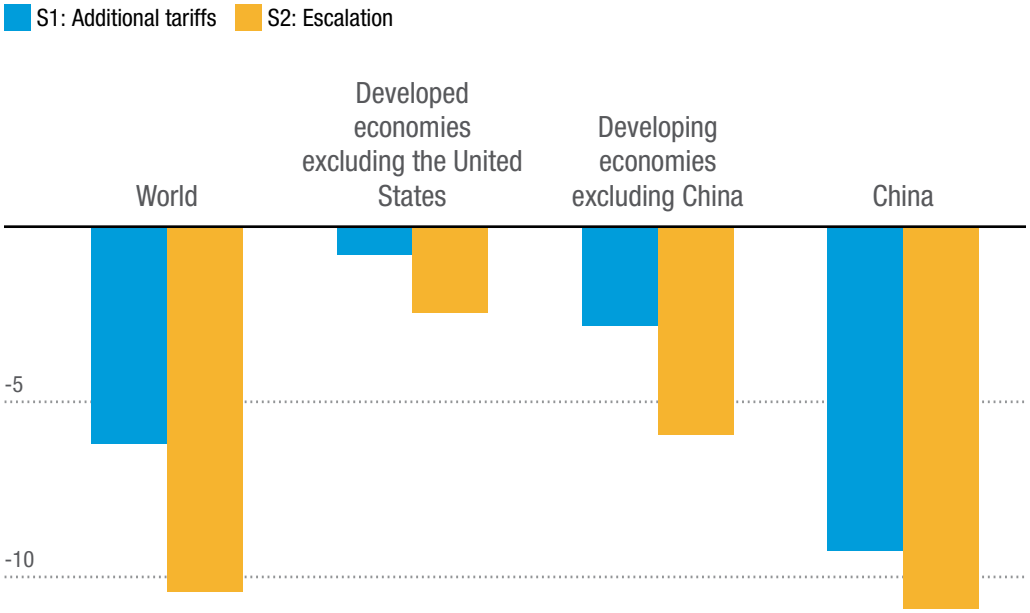
[10] This result is broadly consistent with other simulation studies by IMF (2025) and Conteduca, Mancini and Borin (2025). The IMF study projected a global trade decline ranging from 3.1 to 5.1 per cent depending on the model used. Similarly, Conteduca, Mancini and Borin (2025) estimated a decline between 5.5 and 8.5 per cent depending on the scenario. Furthermore, a WTO (2025) simulation estimated a 3.5 per cent short-term decline in global trade from reciprocal tariffs, a figure derived by reducing trade's responsiveness to trade cost changes by 40 per cent from long-term elasticities. If adjusted to reflect long-term effects, the WTO's findings are also broadly consistent with the analysis in this report. It is important to note a key methodological distinction: The aforementioned studies analysed impacts on total trade (all transport modes combined) whereas the simulation in this report focuses specifically on seaborne trade. This likely accounts for the slightly more significant impacts estimated in this report.

Table A.III.1
Simulation scenarios for additional tariffs

Additional tariff scenario (S1)	Escalation scenario (S2)
• 10 per cent tariff on all goods[a] imported by the United States from all countries • All country-specific reciprocal tariffs[a] by the United States, announced on 2 April 2025, amended on 31 July and implemented on 7 August[b] • Higher tariffs on Canada, China and Mexico by the United States[c] • 50 per cent tariff on steel, aluminium and copper products, and 25 per cent tariff on automobiles and automobile parts imported by the United States from all countries[d] • 25 and 10 per cent reaction tariffs by Canada and China, respectively, on goods from the United States[e]	• All measures in S1 • 34 per cent country-specific reciprocal tariff by the United States on all goods[a] from China (total additional tariff rates are 54 per cent)[b] • 25 per cent additional tariff by the United States on all goods from India (total additional tariff rates are 50 per cent)[f] • 200 per cent tariff on pharmaceuticals and 25 per cent on lumber products[g] imported by the United States from all countries • Reaction tariffs by all countries to the United States, at the same tariff rates imposed by the United States

Source: Compiled by UNCTAD, based on information as of 7 August 2025: United States of America, The White House, 2025a–i; United States of America, Department of Commerce, 2025a–e; United States of America, Department of Homeland Security 2025a and 2025b; Canada, Department of Finance, 2025a, 2025b and 2025c; European Union, 2025; Trade Compliance Resource Hub, 2025; and Baker McKenzie, 2025.
Note: [a] Several goods are exempt, including pharmaceuticals, semiconductors, certain critical minerals, and energy and energy products.
[b] A country-specific reciprocal tariff on China (34 per cent) is included only in the S2 scenario because it was paused until 10 November 2025 (as of 7 August 2025).
[c] For Canada and Mexico, goods compliant under the United States-Mexico-Canada Agreement (USMCA) are exempt from additional tariffs. USMCA-compliance rates were about 50 per cent both in Mexico in 2024 (Graham, 2025) and Canada in March 2025 (Janzen, 2025).
[d] For USMCA-compliant automobiles, additional tariffs are applied to non-United States content. USMCA-compliant automobile parts are initially exempt.
[e] Canada's reaction tariffs are imposed on selected goods. For USMCA-compliant fully assembled vehicles, Canada's reaction tariffs are applied to the non-Canadian and non-Mexican content.
[f] The additional 25 per cent tariff on India was scheduled to be implemented on 27 August 2025 (as of 7 August).
[g] As of 7 August 2025, these commodities are under investigation by the United States under Section 232 of the Trade Expansion Act of 1962 (United States of America, Department of Commerce, 2025c and 2025d). Some other goods are also under investigation, including certain critical minerals and semiconductors (United States of America, Department of Commerce, 2025e). But their tariff increases are not included in the scenario as these types of goods are too granular compared to the industrial classification of the trade model.

Figure A.III.1
Estimated changes in total real seaborne exports due to additional tariffs
(Percentage)



Source: UNCTAD calculations, based on the UNCTAD World Seaborne Trade Database (unpublished granular version), version 11 of the GTAP Data Base (Aguiar et al., 2023) and a new quantitative trade model developed by UNCTAD.

Note: See table A.III.1 for tariff scenario details and technical annex 2 for more on the simulations.

2. Methodology to simulate the impacts of additional tariff measures on seaborne trade

The preliminary simulations presented here were carried out using input data from the UNCTAD World Seaborne Trade Database (UNCTAD, 2025b) and a new UNCTAD quantitative trade model that incorporates transport mode choices.

1. New quantitative trade model incorporating seaborne trade

The new quantitative trade model is based on a widely used trade model, the Eaton-Kortum model (Eaton and Kortum, 2002), and its multisector extension, the Caliendo-Parro model (Caliendo and Parro, 2015). UNCTAD added transport mode choice to the model to separate maritime and non-maritime transport modes in international trade. This enables the simulation of impacts on seaborne trade as well as the simulation of impacts from changes in maritime transport costs. A key difference in the UNCTAD model is that the formula for the bilateral trade share (i.e., the gravity equation) involves transport costs for each transport mode:

$$\lambda_{ij}^{s} = \frac{T_i^s \left[c_i^s \tau_{ij}^s \left(\sum_t T_{ij}^{st} \tau_{ij}^{st\,-\tilde{\theta}^s} \right)^{\frac{1}{\tilde{\theta}^s}} \right]^{-\theta^s}}{\sum_l T_l^s \left[c_l^s \tau_{lj}^s \left(\sum_t T_{lj}^{st} \tau_{lj}^{st\,-\tilde{\theta}^s} \right)^{\frac{1}{\tilde{\theta}^s}} \right]^{-\theta^s}}$$

where λ_{ij}^{s} is the share in sector s of expenditure in destination country j on goods from origin country i (i.e., $\sum_i \lambda_{ij}^{s}$=1, for all j and s),[11,12] T_i^s is the average production technology level in sector s in country i, θ^s is the inverse of the variability of production technology (i.e., lower values imply a stronger force of comparative advantage), c_i^s is the cost of an input bundle (i.e., the combination of labour and intermediate goods) in sector s in country i, τ_{ij}^s is trade costs (combining iceberg trade costs and tariffs but excluding transport costs) in ad valorem terms in sector s from country i to country j, T_{ij}^{st} is the average transport efficiency of transport mode t for transporting goods in sector s from country i to country j, $\tilde{\theta}^s$ is the inverse of the variability of transport efficiency for transporting goods in sector s, and τ_{ij}^{st} is the transport costs of transport mode t for transporting goods in sector s from country i to country j.

If the average transport cost across all transport modes is defined as $\tilde{\tau}_{ij}^{s} = \left(\sum_t T_{ij}^{st} \tau_{ij}^{st\,-\tilde{\theta}^s} \right)^{-\frac{1}{\tilde{\theta}^s}}$ and the total trade cost is given by $\kappa_{ij}^{s} = \tau_{ij}^{s} \tilde{\tau}_{ij}^{s}$ the formula for the bilateral trade share is identical to the Eaton-Kortum and Caliendo-Parro models (except for notational differences).

Furthermore, in the new seaborne trade model, the share of transport mode t in trade in sector s from country i to country j is given by:

$$\lambda_{ij}^{st} = \frac{T_{ij}^{st} \tau_{ij}^{st\,-\tilde{\theta}^s}}{\sum_u T_{lj}^{su} \tau_{lj}^{su\,-\tilde{\theta}^s}}$$

Note that $\sum_t \lambda_{ij}^{st} = 1$ for any combination of i, j, s.

[11] Note that λ_{jj}^{s} represents the country j's domestic expenditure share in sector s.

[12] Sector s corresponds to an industry in input-output tables. In this report, there are 65 sectors because the analysis used version 11 of the GTAP Data Base. Note that sectors include both tradable and non-tradable sectors. For non-tradable sectors, all goods and services are supplied domestically: $\lambda_{jj}^{s} = 1$ and $\lambda_{ij}^{s} = 0$ for $i \neq j$, which implies that trade costs are infinity ($\tau_{ij}^{s} = \infty$ for $i \neq j$).

These new formulations enable two distinct types of analysis: first, quantifying the impacts stemming from changes in maritime transport costs, and second, isolating the specific effects of shocks (such as additional tariffs) on seaborne trade.[13] Critically, this is accomplished without altering the model's outcomes for total trade (all transport modes combined), thereby preserving consistency with the Caliendo-Parro framework.

The simulations used "exact hat algebra", a widely applied methodology for conducting counterfactual analyses in quantitative trade models, as in the Caliendo-Parro model.

2. Baseline data

Simulations based on the "exact hat algebra" of the new seaborne trade model require baseline data for bilateral trade shares (λ_{ij}^{s}), transport mode shares (λ_{ij}^{st}), trade deficits by country, tariff rates by bilateral country pair and sector, shares of intermediate consumption (i.e., shares of intermediate goods produced in sector k used in sector s in country j), share of value added in production by sector and country, value added by country and sectoral share of final demand by country. These data requirements are similar to those of the Caliendo-Parro model but transport mode shares are additionally required. The simulations also require estimates of productivity dispersion parameters θ^{s} and $\tilde{\theta}^{s}$.

Most baseline data, including baseline tariff rates, are drawn from version 11 of the GTAP Data Base (Aguiar et al., 2023). Transport mode shares (λ_{ij}^{st}), however, are obtained from unpublished granular version of the UNCTAD World Seaborne Trade Database (UNCTAD, 2025b). Given that the underlying data in the World Seaborne Trade Database are generally more detailed than those in the GTAP Data Base, the former are aggregated to align with the sectoral and regional classification used in the latter.[14] As the most recent year covered by the GTAP Data Base is 2017, all data inputs to the model are benchmarked to that year.

Productivity dispersion parameter θ^{s} is sourced from the Caliendo-Parro model. As sectoral classification of the Caliendo-Parro model is broader than the GTAP sectors, the same numbers are used across several GTAP sectors considered to belong to the same sectoral classification of the Caliendo-Parro model. Furthermore, the parameter $\tilde{\theta}^{s}$ is assumed to be equal to θ^{s}.

3. Relative changes in trade costs in tariff simulation scenarios

To apply the "exact hat algebra" solution technique for the tariff simulations, the model requires the relative changes in trade costs, denoted as $\widehat{\tau_{ij}^{s}}$.

Trade costs, τ_{ij}^{s}, are modelled as a combination of iceberg trade costs (d_{ij}^{s}) and tariffs (t_{ij}^{s}), such that $\tau_{ij}^{s} = d_{ij}^{s}\left(1 + t_{ij}^{s}\right)$. The term t_{ij}^{s} represents the baseline tariff rate for goods from origin economy i to destination economy j in sector s. Assuming that iceberg trade costs (d_{ij}^{s}) remain constant between the baseline and the simulation scenarios, the relative change in trade costs ($\widehat{\tau_{ij}^{s}}$) is equivalent to the relative change in the tariff rate. This is derived as follows:

[13] Additional tariffs would affect all transport modes uniformly at the sectoral and bilateral levels, implying no direct substitution between transport modes (i.e., modal shares, λ_{ij}^{st}, remain constant for each specific trade flow). However, modal shares can shift at an aggregated country level. These changes are not due to direct substitution but are a result of compositional effects, where the overall mix of traded goods sectors and partner countries is altered by the additional tariffs.

[14] An exception is the treatment of Puerto Rico. In the World Seaborne Trade Database, Puerto Rico is included in the United States (i.e., the same treatment as in UN Comtrade), while the GTAP Data Base separates them. Therefore, for the simulations, Puerto Rico in the GTAP Data Base is added to the United States, and they are treated as one economy. Additionally, each of the following economy/region pairs are integrated into one region to ensure the convergence of model solutions: the rest of North America (such as Greenland) and the rest of the world (such as Antarctica), and the Czech Republic and the rest of the European Free Trade Association (Iceland and Liechtenstein).

$$\widehat{\tau_{ij}^{s}} \equiv \tau_{ij}^{s'}/\tau_{ij}^{s} = \frac{d_{ij}^{s}\left(1+t_{ij}^{s'}\right)}{d_{ij}^{s}\left(1+t_{ij}^{s}\right)} = \left(1+t_{ij}^{s'}\right)/\left(1+t_{ij}^{s}\right)$$

where $t_{ij}^{s'}$ is the new tariff rate under a given simulation scenario.

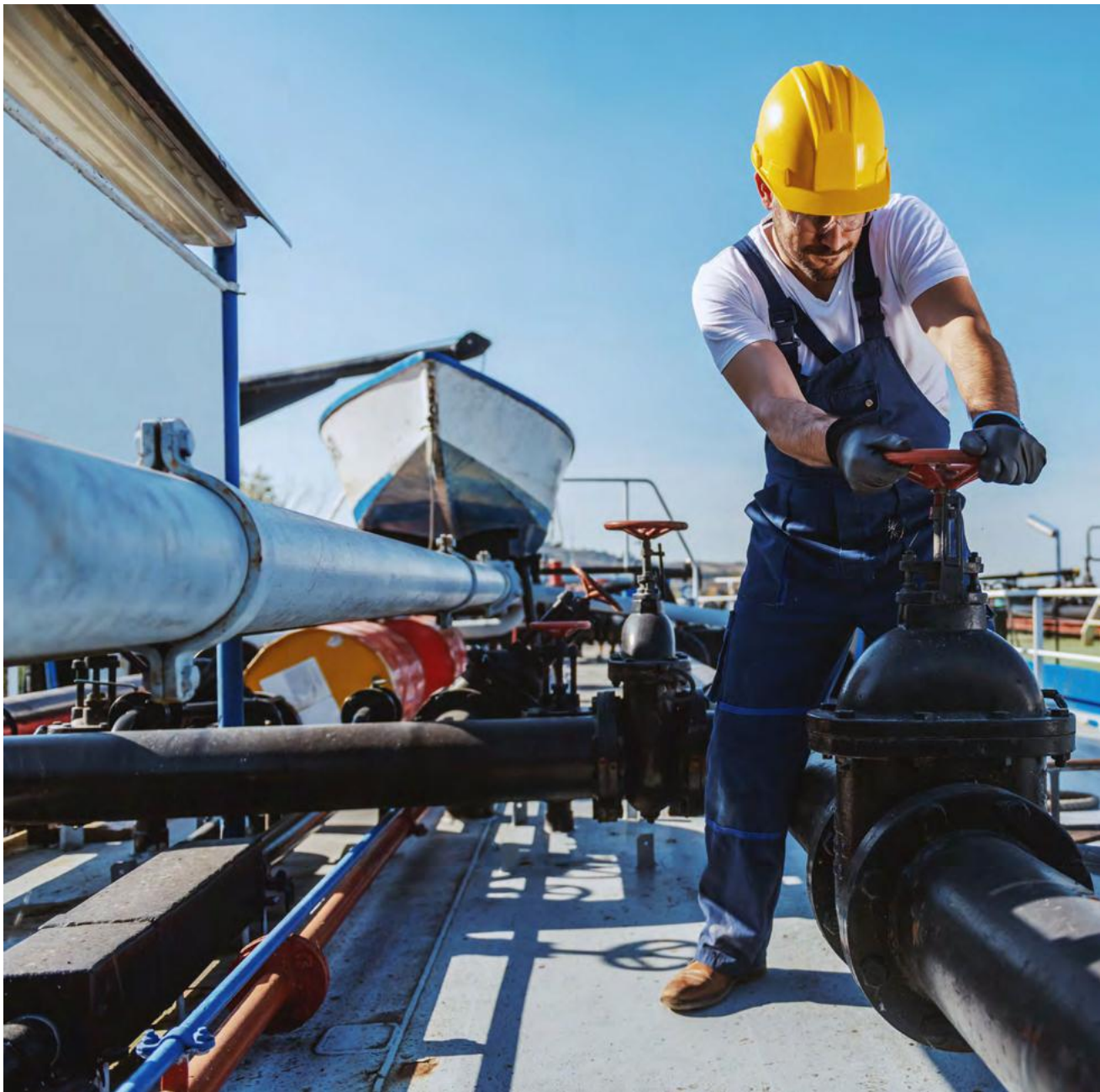
The new tariff rates ($t_{ij}^{s'}$) are calculated by adding the additional tariff rate (Δt_{ij}^{s}) to the baseline tariff (t_{ij}^{s}).[15] Substituting this into the equation above gives the final formula used for the simulation:

$$\widehat{\tau_{ij}^{s}} = \left(1+\Delta t_{ij}^{s}+t_{ij}^{s}\right)/\left(1+t_{ij}^{s}\right)$$

For example, if a destination economy implements a 10 per cent additional tariff on all products from all economies, Δt_{ij}^{s} would be 0.1 for all origin economies (where $i \neq j$) and all sectors s.

The relative changes in trade costs, $\widehat{\tau_{ij}^{s}}$, were calculated using this formula for the two tariff simulation scenarios and served as the primary inputs for the "exact hat algebra" solution method.

[15] Tariff rates under additional tariff scenarios (S1: additional tariff scenario, and S2: escalation scenario) are calculated by adding respective additional tariff rates (as summarized in table A.III.1) to the baseline tariff rates sourced from version 11 of the GTAP Data Base.



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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

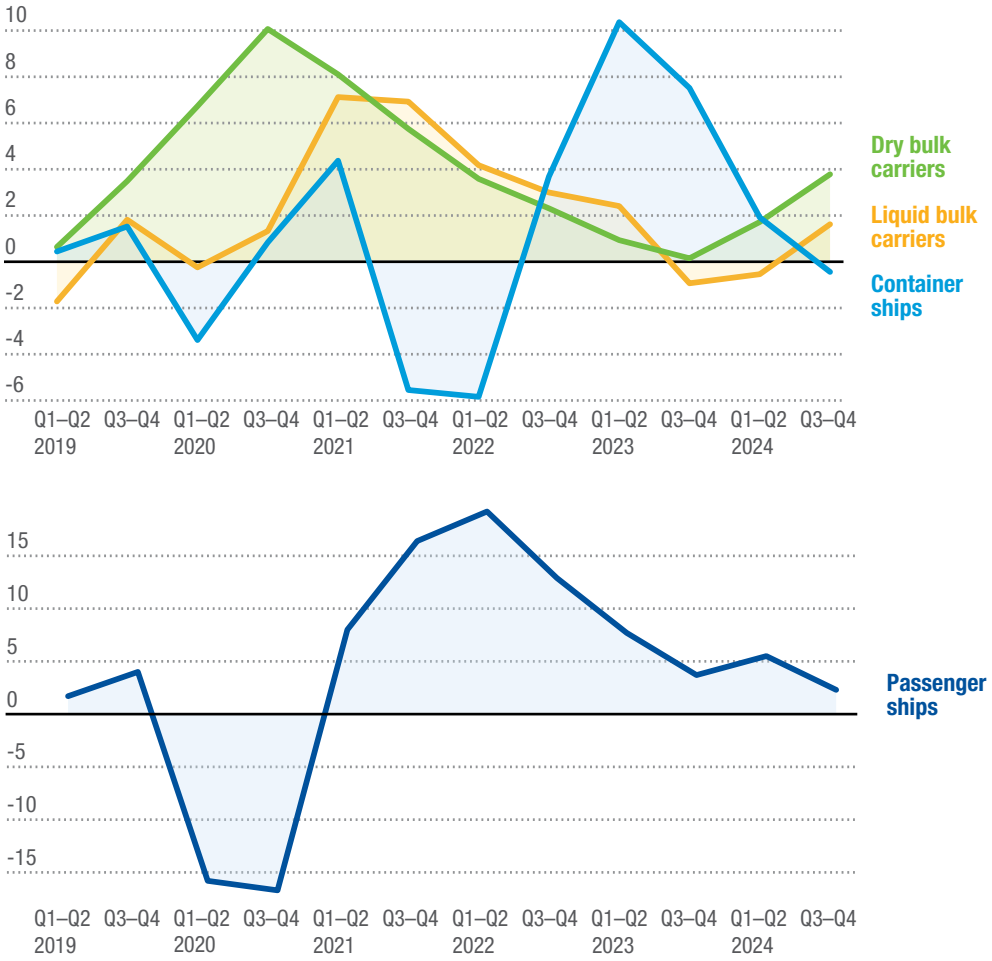
Tanker and container vessels predominantly call at ports in Asia and Europe, with these two regions collectively accounting for approximately 80 per cent of port calls for each of the two vessel categories. Port call trends over the past seven years reveal a geographic shift. Comparing data from the 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.

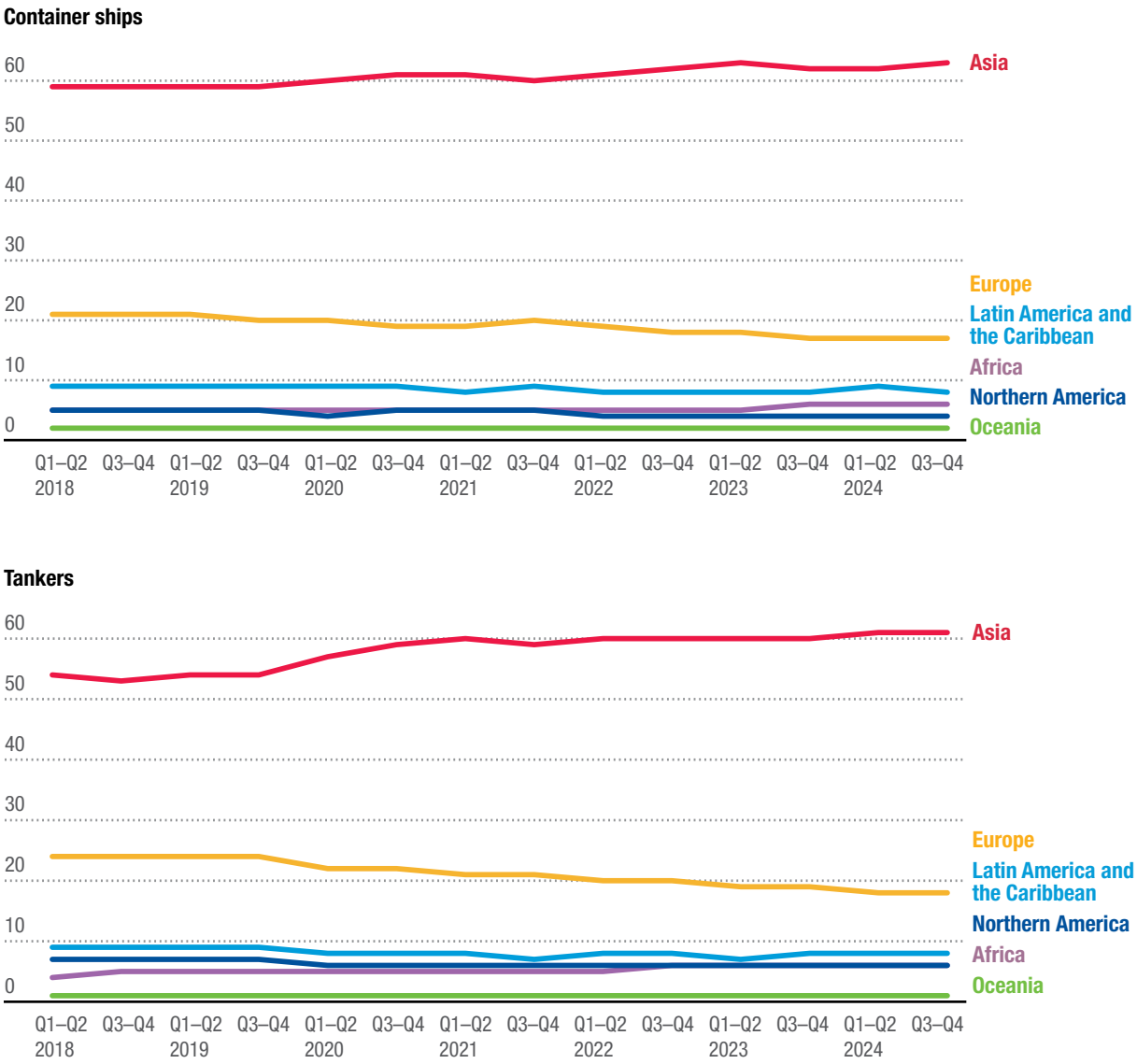
Note: Year-to-year changes are calculated for each semester separately. Vessels are restricted to 1,000 gross tonnage and above, excluding vessels without an IMO number. Port calls data are based on all instances of a vessel entering and leaving a defined port location, excluding cases where a vessel 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.

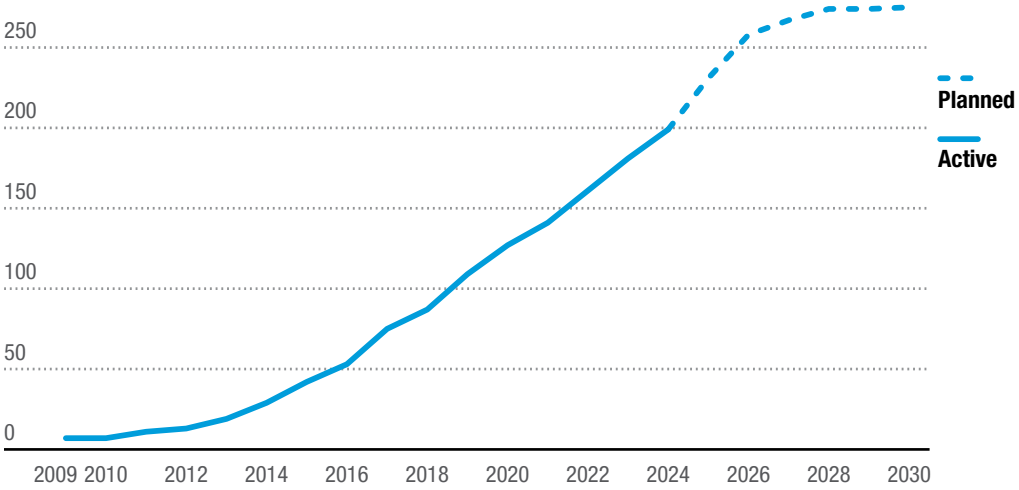
Figure IV.2
Port calls for container ships and tankers
(Percentage of total)



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

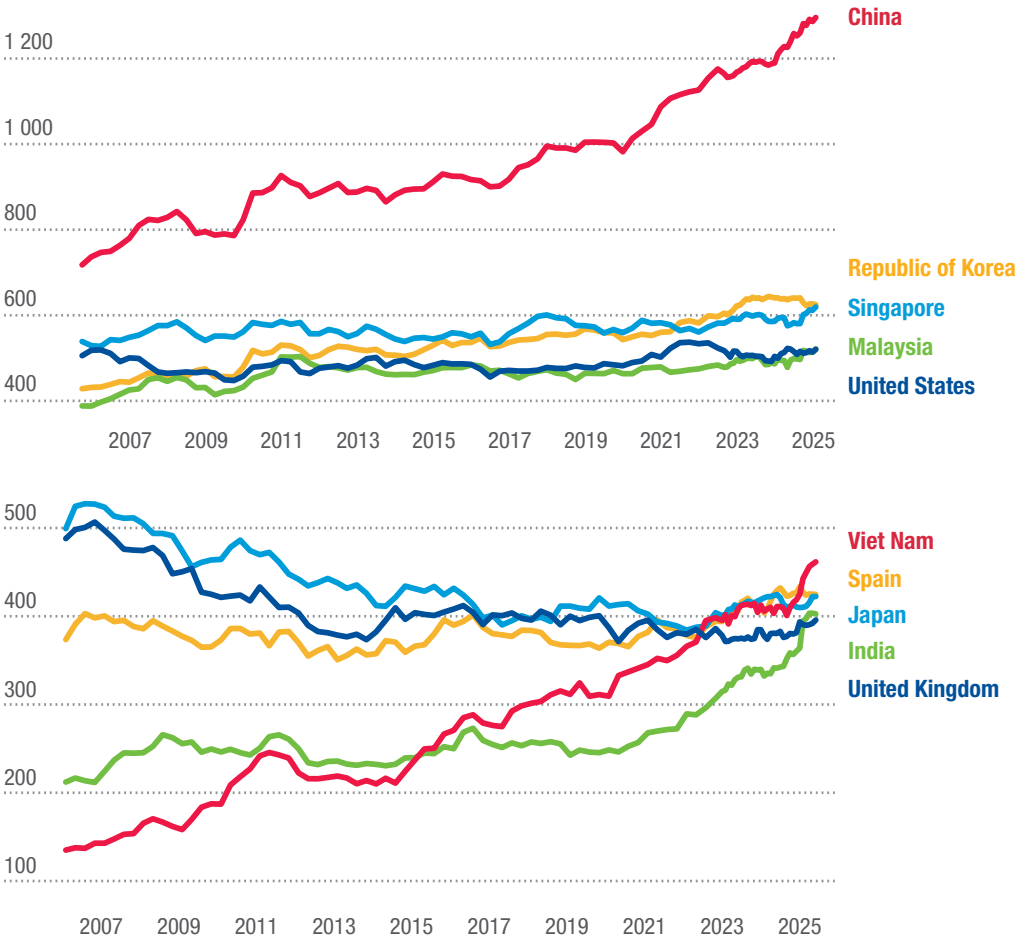
The LSCI, developed by UNCTAD and regularly featured in this publication, is an important indicator to assess how well countries, or individual ports, are integrated into the global network of containerized maritime transport. Enhanced connectivity contributes to supply chain resilience, enabling access 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/.

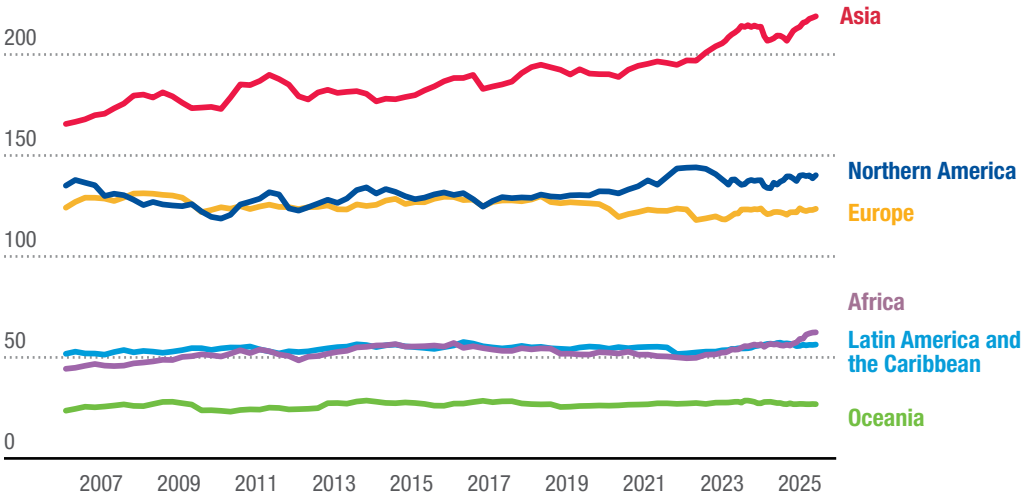
Note: The index is set at 100 for the average value of country connectivity in February 2023.

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).

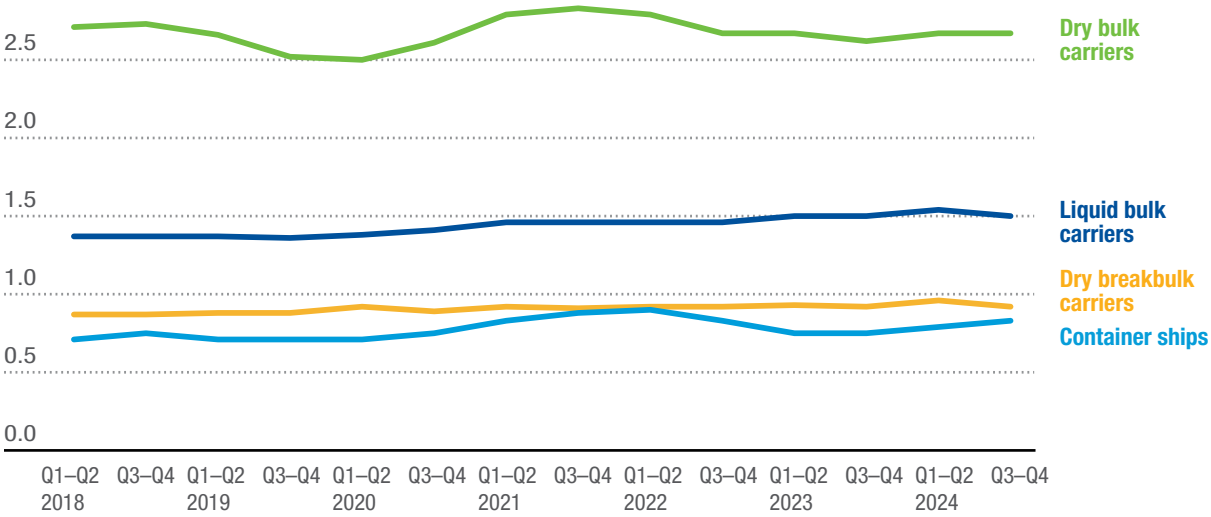
Port congestion is growing globally

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.

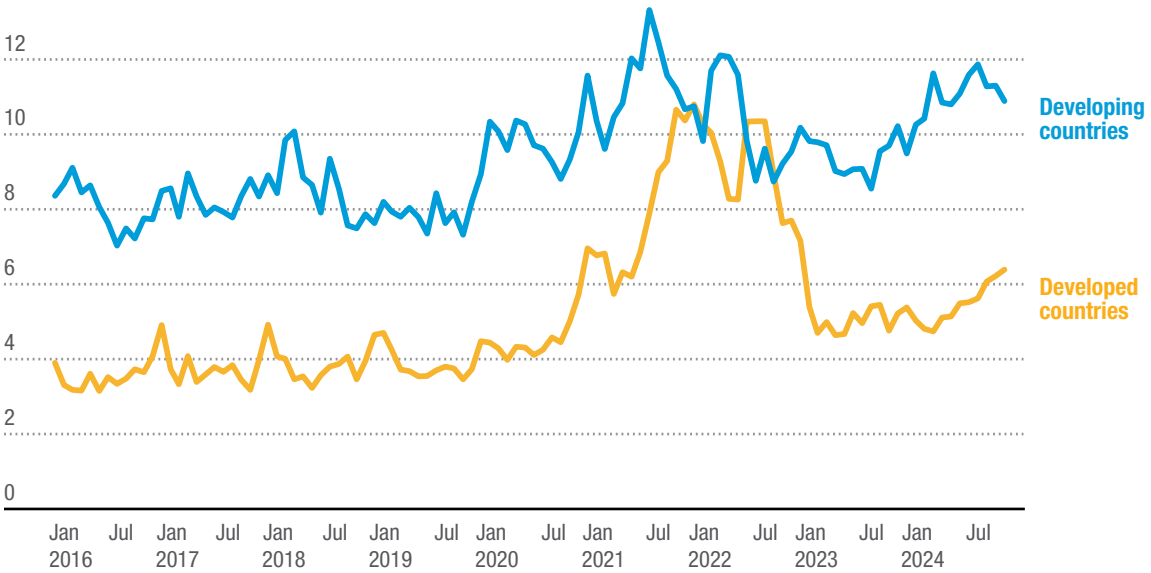
Figure IV.6
World median time in port
(Days)



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)



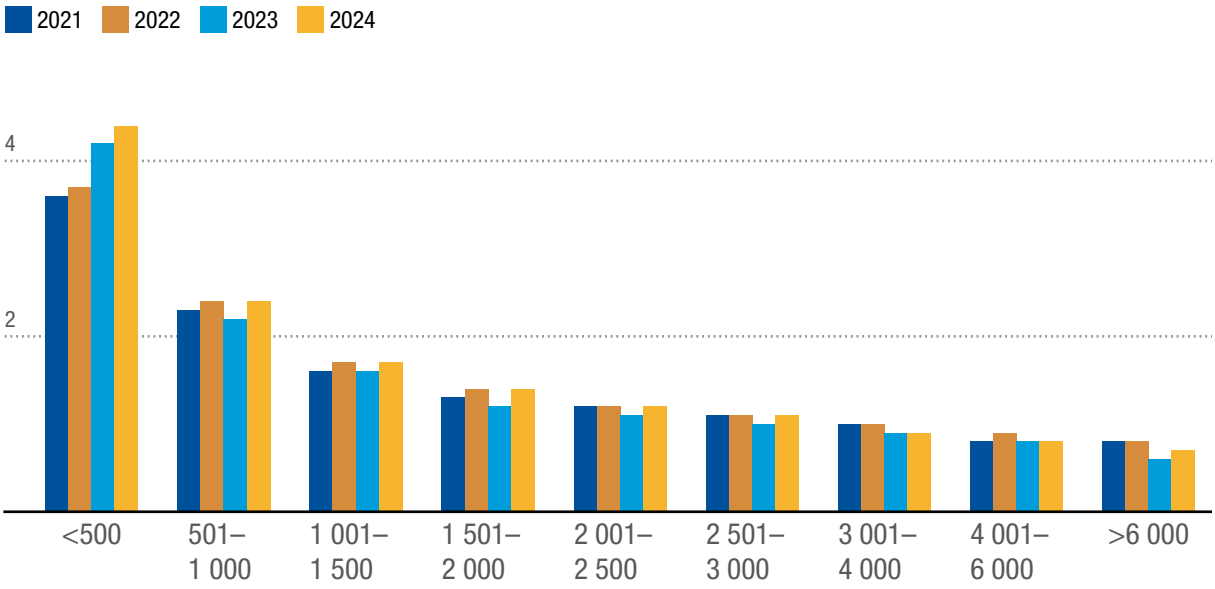
Source: Clarksons Research, March 2025.

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).

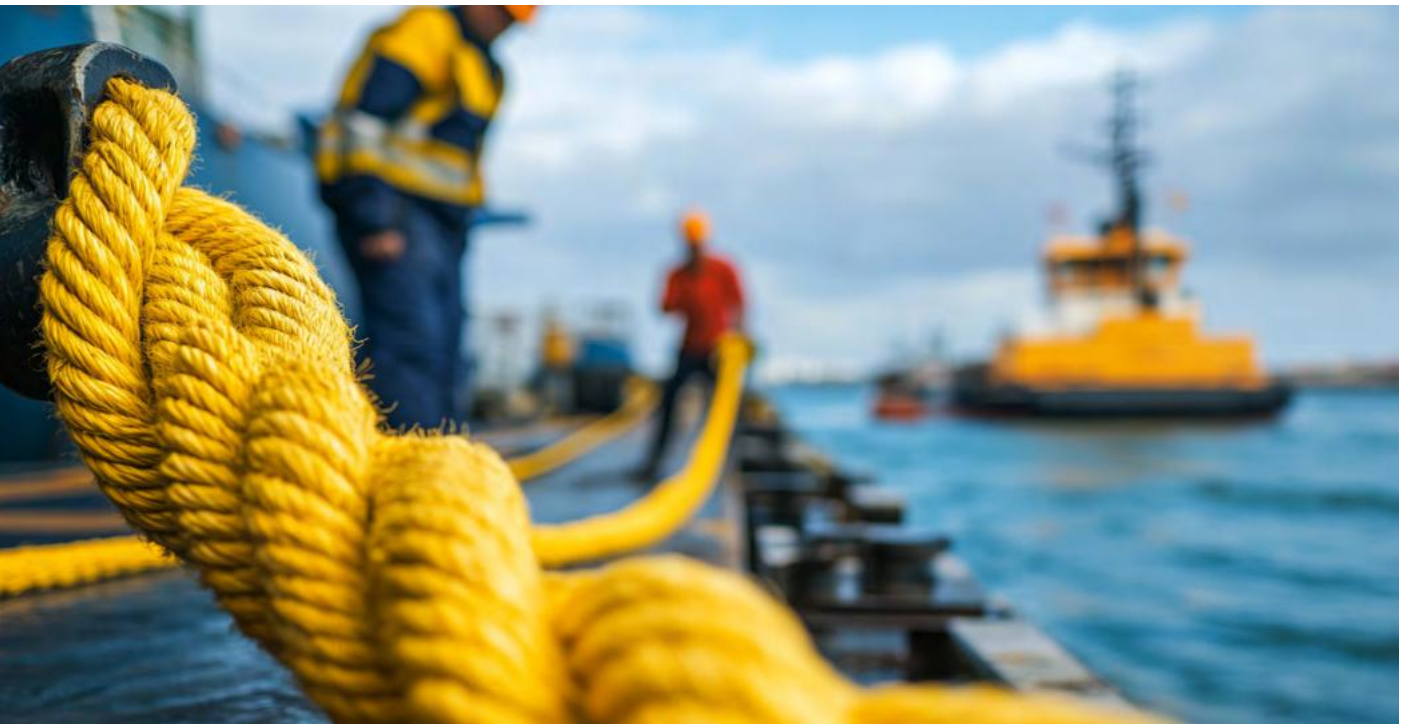
Box IV.1
The Spanish port system joins the Port Performance Scorecard

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).

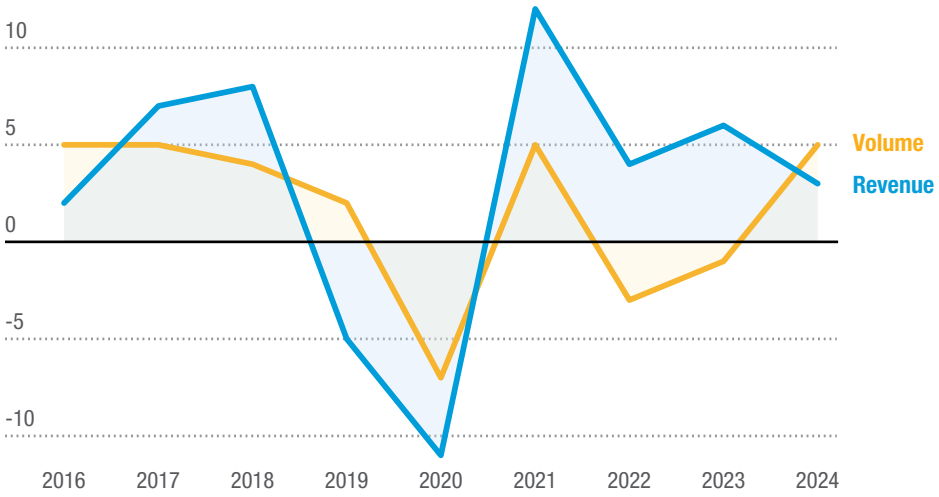
The operating margin – measured as earnings before interest, taxes, depreciation and amortization – has remained consistently strong within the TrainForTrade network, reaching 48 per cent in 2024 (figure IV.10). This reflects high operational efficiency, even amid fluctuating port throughputs. Such resilience 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.

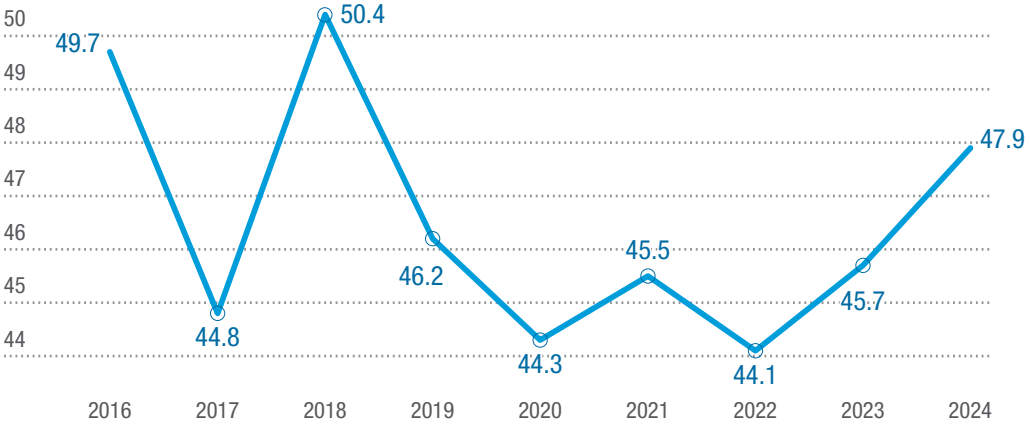
Figure IV.9
Median annual change in port volume and revenue
(Percentage)



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.

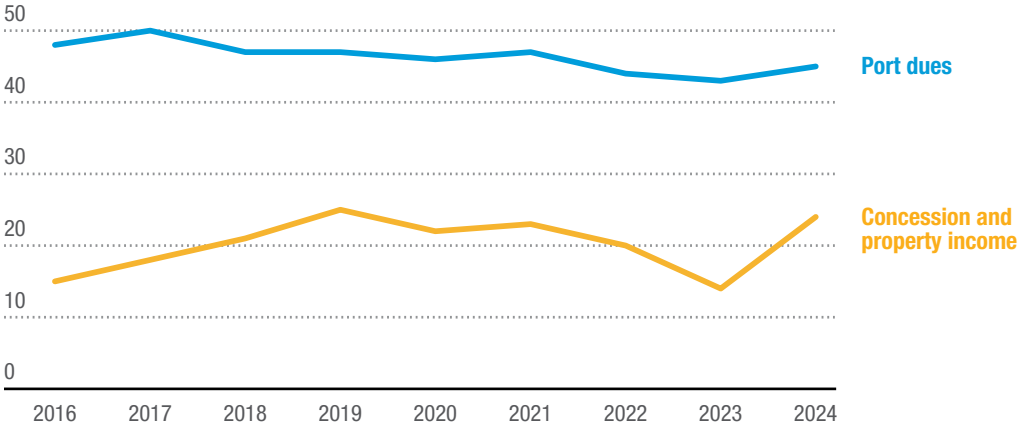
Figure IV.10
Median operating margin as a proportion of revenue
(Percentage)



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)

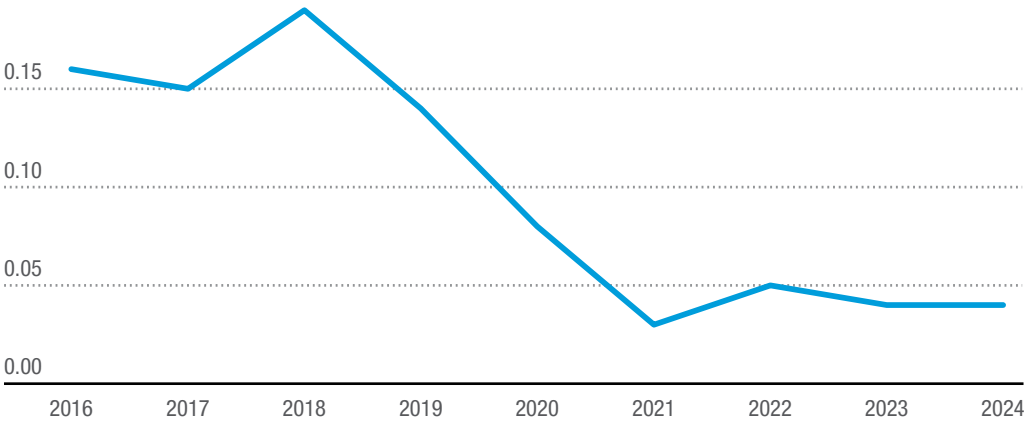


Source: UNCTAD calculations, based on data from 76 ports reporting on the PPS, June 2025 (UNCTAD, 2025a).

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

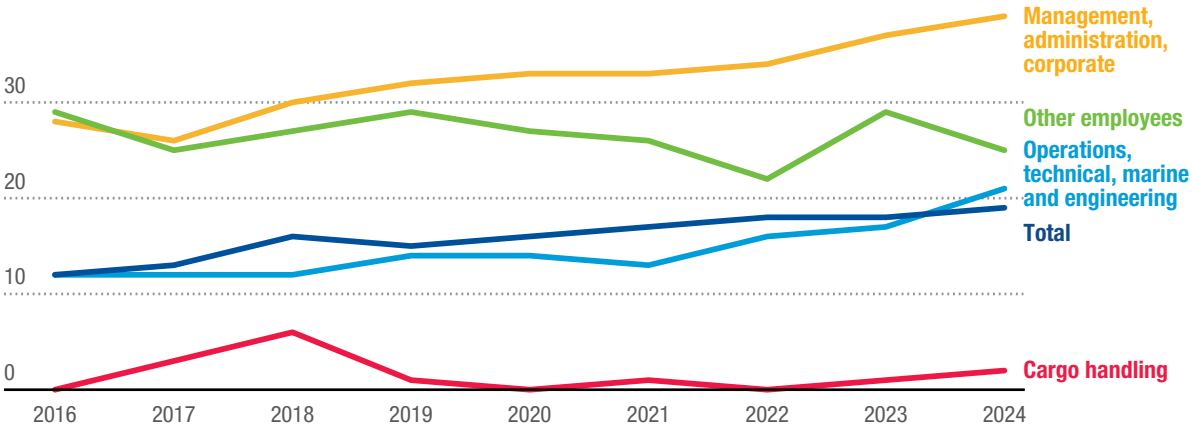
According to PPS data, while women remain underrepresented in most port-related occupations, there are signs of progress (figure IV.13). In 2024, women made up 19 per cent of the overall port workforce among reporting ports. In management and administrative roles, women held 39 per cent of positions, 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).

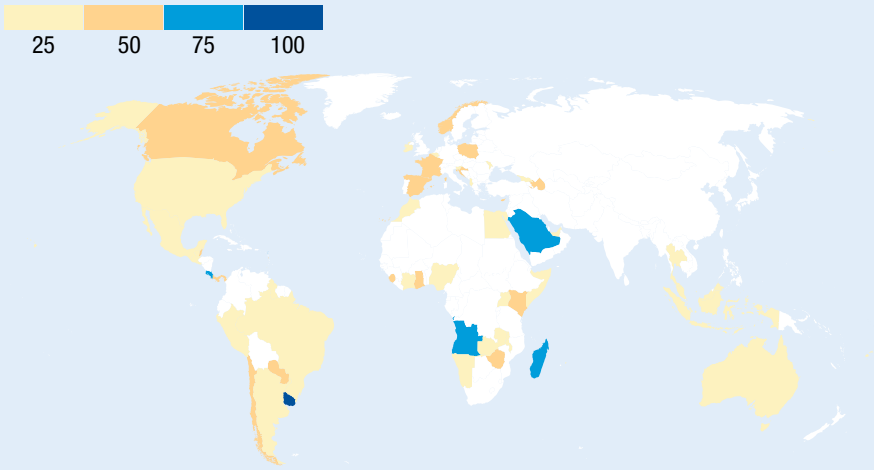
Note: Data are summarized without using missing data imputation.

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".

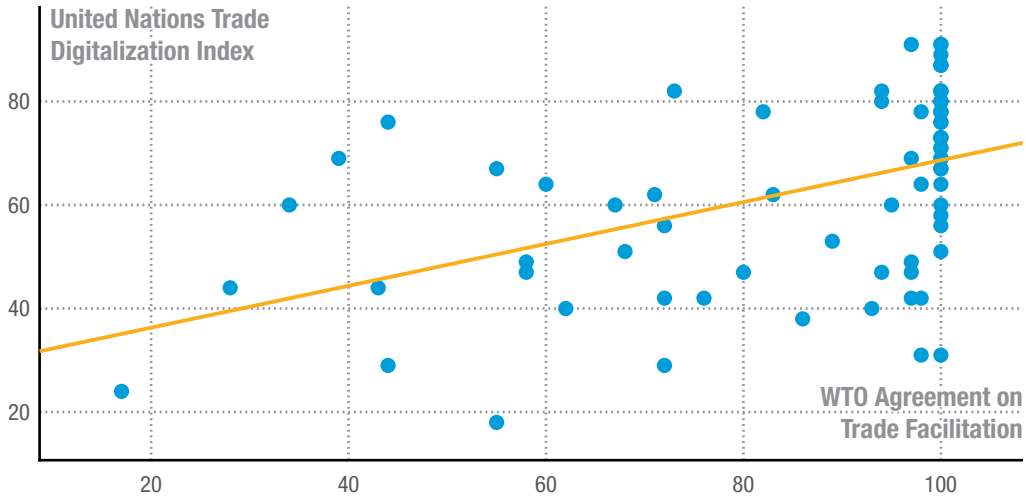
In parallel developments, article 10.4 of the WTO Agreement on Trade Facilitation obligates member States to implement TSWs to enhance import, export and transit procedures. To the extent possible, they should apply digital solutions such as the ones presented in box IV.4. Article 1 of the agreement 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).

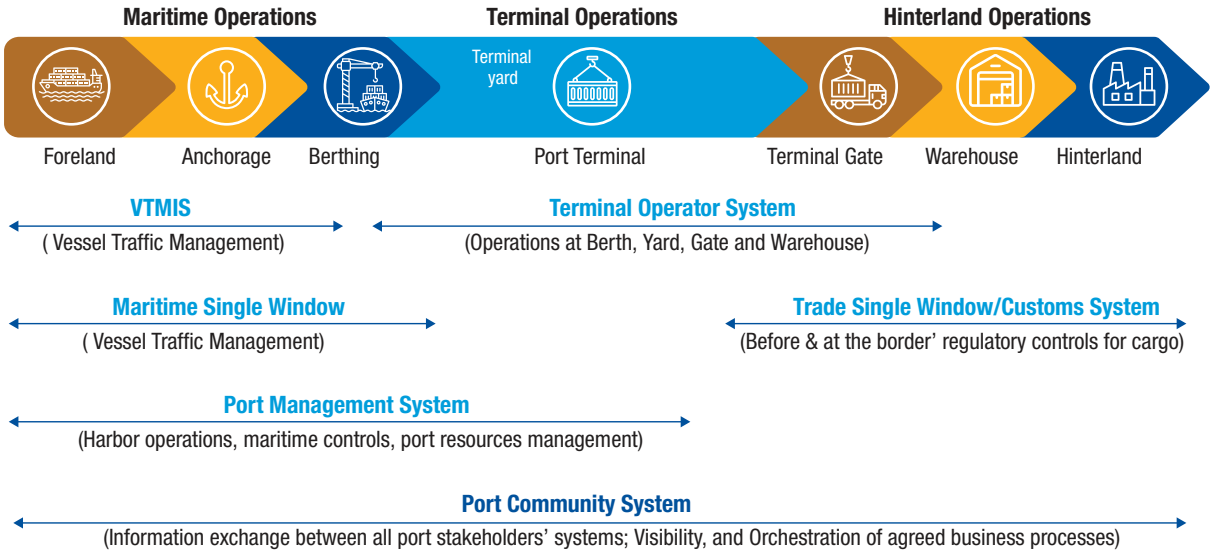
2. Data exchange, maritime single windows and port community systems

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

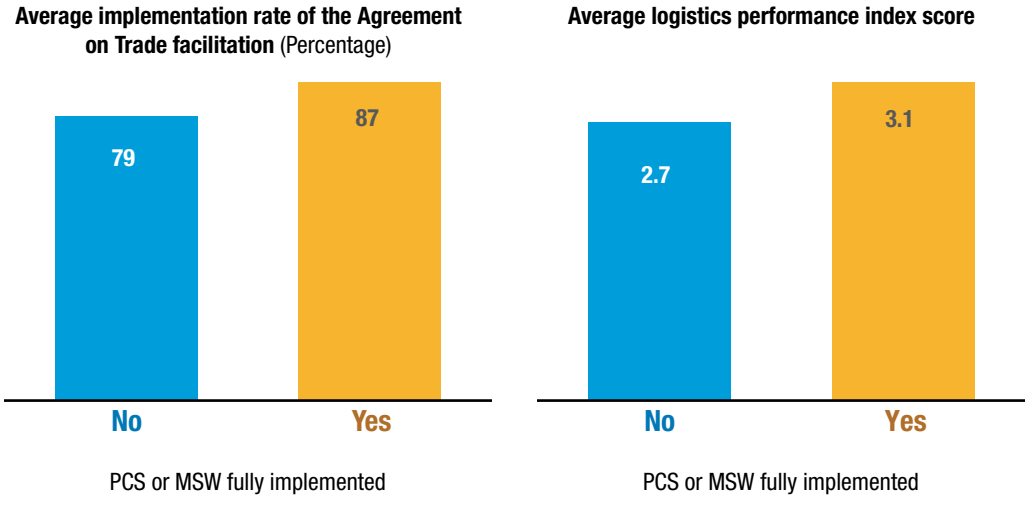
Using a sample of 85 countries with information on PCSs and MSWs, figure IV.16 compares countries that have and have not fully established a PCS and/or MSW. It presents both implementation rates on the WTO Agreement on Trade Facilitation and scores on the Logistics Performance Index (World Bank, 2023).

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.

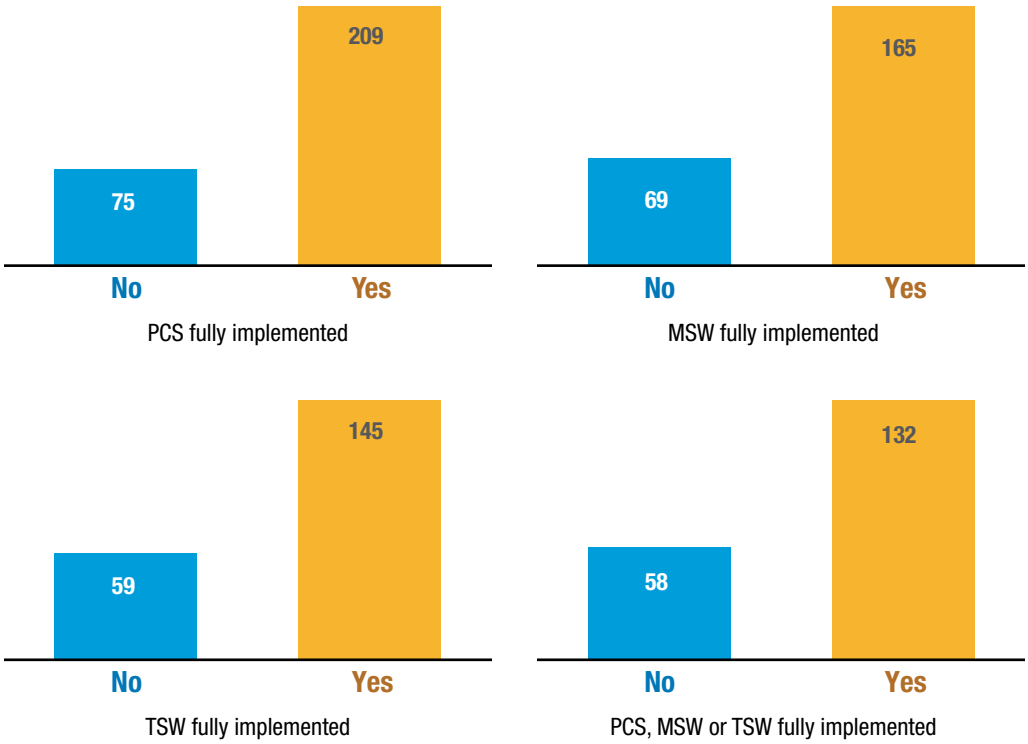
Note: Results are based on a data set including 85 countries. It was built by merging publicly available data on PCS and MSW implementation, compliance with the WTO agreement and logistics performance. It was restricted to developing and least developed countries with at least one international maritime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

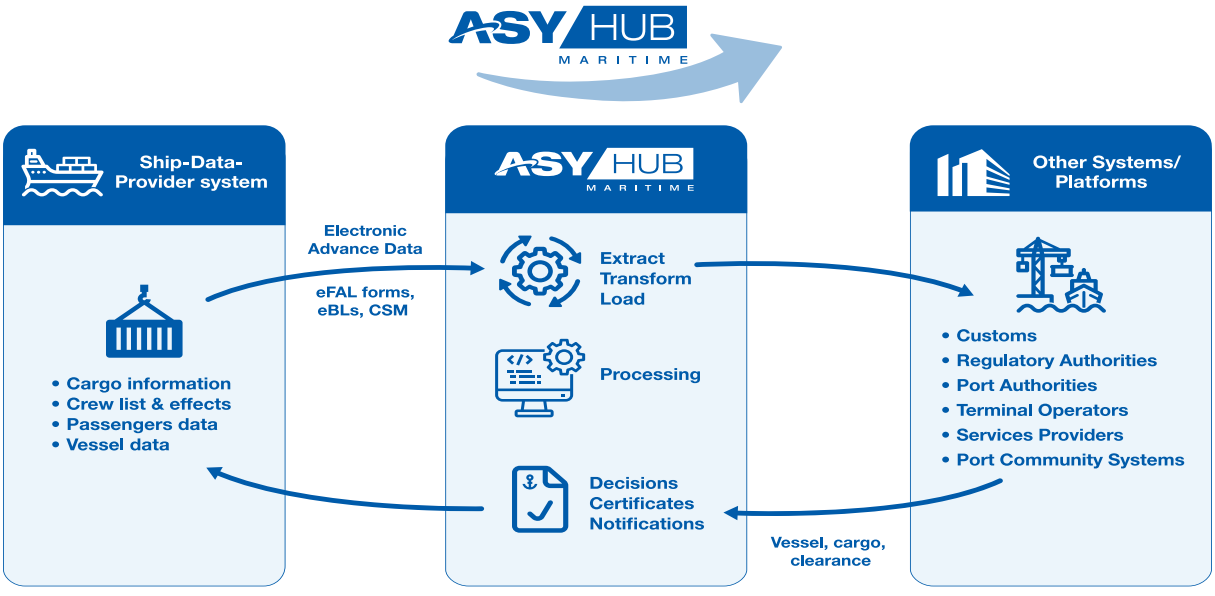
Maritime trade is threatened by cyberattacks

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

© Port Autonome de Sihanoukville, General Department of Customs and Excise, Government of Cambodia.

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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2025 Review of maritime transport

Chapter V

Legal issues and regulatory developments

This chapter provides an overview of important international legal issues and regulatory developments affecting maritime transport and trade. Part A focuses on recent IMO developments to reduce greenhouse gas emissions from ships, notably, the agreement on draft midterm measures in line with the 2023 IMO strategy on greenhouse gas emissions.

Part B explores international regulatory developments to strengthen the rights of seafarers, global key workers who operate in a challenging environment exacerbated by geopolitical tensions and supply chain instability.

Part C highlights other important legal developments and initiatives. These include the entry into force of the 2009 Hong Kong Convention for the Safe and Environmentally Sound Recycling of Ships, the preparation of the draft code on maritime autonomous surface ships (MASS) under IMO auspices, and ongoing IMO work to combat fraudulent ship registration and registries, both matters of growing global concern.

United Nations

Key policy takeaways

- The proposed IMO Net-Zero Framework, agreed by the Marine Environment Protection Committee in April 2025, will be considered for formal adoption as a mandatory chapter to Annex VI of the International Convention for the Prevention of Pollution from Ships (MARPOL Convention) in October 2025. Its entry into force and effective implementation could significantly advance the strategic objective of achieving net-zero greenhouse gas emissions from shipping close to 2050. Development of clear, fit-for-purpose implementation guidance will, however, be critical to assist stakeholders in understanding complex requirements and to facilitate full and effective compliance. The active engagement of all relevant stakeholders in related IMO work is therefore strongly encouraged.

- Revenues generated under the Net-Zero Framework – if adopted – could make an important contribution to supporting a just energy transition and related infrastructure adaptation in developing countries, especially the least developed countries and small island developing States. Much more investment will be required, however, to decarbonize the global shipping fleet and cover the costs of onshore production and distribution of fuels, and the required port infrastructure. Private sector support for green and sustainable investments, green and sustainability-linked loans, and blended finance should therefore be promoted.

- Maritime contracts would need to factor in monitoring, reporting and financial obligations for individual vessels under the Net-Zero Framework. This requires commercial parties to consider potential adjustments to their commercial transactions and contracts. UNCTAD can provide related analysis and guidance, as appropriate. Industry associations can assist in developing standard clauses to support effective implementation and facilitate appropriately balanced allocations of commercial risks and costs.

- Accelerated development, deployment and use of alternative fuels could considerably reduce emissions from ships and contribute to the achievement of IMO targets. But their carriage and use also pose important new risks in terms of pollution and personal injury; these need to be effectively addressed. New IMO Legal Committee work on the suitability of IMO liability and compensation regimes with respect to alternative fuels is an important first step in developing appropriate

liability and compensation frameworks before such risks materialize. UNCTAD research and analytical work can assist in this process. All countries, including vulnerable coastal developing countries and small island developing States, as well as shipping industry and seafarer representatives are encouraged to engage actively in this important work.

- In an era marked by geopolitical tensions and supply chain disruptions, seafarers continue to face challenges, including regarding their rights to repatriation, shore leave, fair treatment and working conditions. Strengthened efforts by Governments, intergovernmental organizations and industry stakeholders to monitor, implement and enforce existing regulatory frameworks, including the most recent amendments to the 2006 Maritime Labour Convention (MLC), will be critical to effectively protect seafarers' rights – and to address the seafarer shortage that continues to affect the maritime industry.

- Accelerated collaborative efforts are needed to reduce cases of seafarer abandonment. Regular updates of contact points in the relevant ILO-IMO database and effective implementation of updated guidelines on managing abandonment cases can contribute to the resolution of cases and facilitate the repatriation of seafarers.

- The entry into force of the Hong Kong Convention for the Safe and Environmentally Sound Recycling of Ships on 25 June 2025 could make a major contribution to safer, more environmentally sustainable ship recycling operations. All United Nations Member States are encouraged to consider acceding to the Convention to ensure its widespread application at the international level.

- Important ongoing IMO work includes the preparation of a non-mandatory draft MASS code, expected to be finalized in 2026, as well as the development of non-mandatory guidelines or best practices on ship registration, initiated by the IMO Legal Committee, in part to assist in addressing fraudulent registration. A regulatory scoping exercise was also launched to develop actions to prevent unlawful operations, including substandard ships. All United Nations Member States and stakeholder representatives are strongly encouraged to actively engage in the related IMO work. UNCTAD stands ready to provide related advice and assistance.

A. Reducing greenhouse gas emissions from ships

Greenhouse gas emissions from international shipping increased by nearly 10 per cent between 2012 and 2018, accounting for almost 3 per cent of global anthropogenic emissions in 2018 (IMO, 2020). Without further action, these emissions are projected to rise by up to 50 per cent until 2050 (equivalent to 130 per cent over 2008 levels) despite further efficiency gains. This trend goes in the wrong direction at a time when "all countries must urgently speed up economy-wide, low-carbon transformations to avoid escalating economic and social costs" (United Nations, 2024, p. 34; see also UNCTAD, 2023).

While article 2.2 of the 2015 Paris Agreement on climate change,[1] which is in force for 195 States Parties, reflects a collective commitment to hold the global average temperature increase "to well below 2°C above pre-industrial levels", recent data suggest that by 2100, global warming of around 2.7°C is "very likely" under an intermediate emissions scenario. It could exceed 3.3°C under a high emissions scenario (IPCC, 2023).[2] Implementing existing policies and pledges would limit the increase to only 2.5–2.9°C by 2100 (UNEP, 2024; Climate Action Tracker, 2024).

With international maritime transport a central transnational economic sector, and emissions from international shipping set to rise in line with steady growth in demand for seaborne trade, regulatory efforts to cut emissions are of particular interest and increasing importance. While the control and management of emissions from domestic shipping falls within the national responsibility of Parties to the United Nations Framework Convention on Climate Change[3] and the Paris Agreement, this is not the case for emissions from international shipping. Recent and ongoing regulatory initiatives to reduce emissions from international shipping therefore play a particularly important role in diminishing overall emissions from maritime transport. This includes global regulatory measures introduced under IMO auspices and regulatory measures introduced by way of legislation at the European Union level[4] (UNCTAD, 2023).

A recent advisory opinion by the International Tribunal for the Law of the Sea highlights the legal obligation of States under article 211 of the 1982 United Nations Convention on the Law of the Sea "to prevent, reduce and control pollution of the marine environment from vessels".[5] This entails an obligation "to prevent, reduce and control pollution of the marine environment in relation to the deleterious effects that result or are likely to result from climate change" (ITLOS, 2024, para. 441(3)(g)).

Emissions from international shipping projected to rise in line with steady growth in demand for seaborne trade

1 The 2015 Paris Agreement, under the United Nations Framework Convention on Climate Change, has been in force since 2016. For the latest information about the status of its ratification, see https://treaties.un.org/pages/viewdetails.aspx?src=treaty&mtdsg_no=xxvii-7-d&chapter=27&clang=_en.

2 See also IPCC, 2018, B.2, which highlights how global warming of 2°C above the pre-industrial level may be reached by 2050.

3 The 1992 United Nations Framework Convention on Climate Change has been in force since 1994. As of 4 July 2025, it had 198 Parties. See https://treaties.un.org/pages/ViewDetailsIII.aspx?src=TREATY&mtdsg_no=XXVII-7&chapter=27&Temp=mtdsg3&clang=_en.

4 These include the extension of the EU ETS to maritime transport (European Union, 2023a) and the new European Regulation on the use of renewable and low-carbon fuels in maritime transport (European Union, 2023b).

5 The Convention has been in force since 1994. As of 4 July 2025, it had 170 Contracting States. See https://treaties.un.org/pages/ViewDetailsIII.aspx?src=TREATY&mtdsg_no=XXI-6&chapter=21&Temp=mtdsg3&clang=_en.

1. Decisions by the Marine Environment Protection Committee

The revised 2023 IMO strategy on greenhouse gas emissions (IMO, 2023) reflects an enhanced common ambition to reach net-zero emissions from international shipping close to 2050; a commitment to increase the uptake of alternative zero and near-zero-emissions fuels by 2030; and indicative checkpoints for 2030 and 2040 (UNCTAD, 2023). It also sets out a number of revised and additional candidate emissions reduction measures with possible timelines:

- Short-term measures include those finalized and agreed between 2018 and 2023 (as detailed in IMO, 2023, appendix 1), such as the enhanced ship energy efficiency management plan (SEEMP), a technical energy efficiency existing ship index (EEXI) and an operational carbon intensity indicator (CII);[6] these should be reviewed by 1 January 2026.
- A basket of midterm reduction measures should be finalized and agreed by 2025 (with entry into force dates to be defined individually or collectively); other candidate midterm measures could be finalized and agreed between 2023 and 2030.
- Possible long-term measures, to be developed as part of the 2028 review of the IMO strategy, could be finalized and agreed beyond 2030.

The mid-term GHG reduction measures will be considered for formal adoption in the extraordinary MEPC session in October 2025

At its eighty-second session, in 2024, the Marine Environment Protection Committee adopted new guidelines to develop the SEEMP (IMO, 2024a); these were further amended at the eighty-third session (IMO, 2025a).

The latter session marked the end of the first phase of the review of short-term measures, resulting in the adoption of amendments relating to the CII reduction factors for the 2027–2030 period (IMO, 2025b; see also chapter II). The Committee further approved draft amendments to regulation 27 of the MARPOL Convention, Annex VI,[7] to make the IMO data collection system on ship fuel consumption accessible to the public and to reinforce data anonymization (IMO, 2025c). The Committee also agreed on a workplan for the second phase of the review of short-term emissions reduction measures from the spring of 2026 to the spring of 2028.[8]

In line with the timeline included in the 2023 strategy, the Committee's eighty-third session approved important draft amendments to Annex VI of MARPOL that introduce midterm measures for emissions reductions. The full draft amendments are available in an IMO Circular (IMO, 2025c). Collectively referred to as the IMO Net-Zero Framework, the measures include a new fuel standard for ships (technical element) and a global pricing mechanism for emissions (economic element) as well as the establishment of a Net-Zero Fund to collect and disburse revenues.

The draft amendments were introduced following intensive and lengthy discussions by the Intersessional Working Group on Reduction of Greenhouse Gas Emissions from Ships. They are based on the revised version of a bridging proposal initially submitted by Singapore (IMO, 2025d). They will be finalized by the Greenhouse Gas Working Group, which was established by the Marine Environment Protection Committee at its eighty-third session, and considered for formal adoption at the second extraordinary session of the Committee on 14–17 October 2025.

[6] A series of 10 technical guidelines was adopted in 2022 to support the implementation of short-term measures (IMO, 2022a, annexes 8–17).

[7] Annex VI addresses air pollution from shipping and is binding for its 108 Contracting States, representing 97 per cent of the merchant shipping fleet by tonnage. See https://wwwcdn.imo.org/localresources/en/About/Conventions/StatusOfConventions/Status%202025.pdf.

[8] Phase two will look at enhancing the SEEMP, further developing CII metrics and creating synergies between the IMO carbon intensity/energy efficiency framework and IMO Net-Zero Framework.

They would then be incorporated as a new Chapter V in Annex VI of MARPOL, under the tacit acceptance procedure, as envisaged in the MARPOL Convention (Article 16 (2)(f)(ii) and (iii))[9] and enter into force 16 months later, in the spring of 2027, with implementation starting in 2028. To facilitate the implementation of the new Net-Zero Framework, detailed implementation guidelines are to be developed by the Greenhouse Gas Working Group for adoption at the eighty-fourth session of the Committee in April 2026.

2. Key features of the Net-Zero Framework

Under the draft regulations (IMO, 2025c), with few exceptions, ships of 5,000 gross tonnage and above will be required to comply with the technical and economic elements of the Net-Zero Framework:

Global fuel standard: Ships must reduce, over time, their annual greenhouse gas fuel intensity (GFI) – that is, how much is emitted for each unit of energy used. This is calculated using a well-to-wake approach.

Global economic measure: Ships emitting above GFI thresholds will have to acquire remedial units to balance deficit emissions, while those using zero- or near-zero-emissions technologies will be eligible for financial rewards.

There will be two levels of compliance with fuel intensity targets: a base target and a direct compliance target at which ships would be eligible to earn "surplus units".

Ships that emit above the set thresholds can balance their emissions deficit by:

- Transferring surplus units from other ships
- Using surplus units they have already banked
- Using remedial units acquired through contributions to the Net-Zero Fund

The IMO Secretary-General will establish the Net-Zero Fund to collect contributions related to emissions. Revenues will then be disbursed to:

- Reward low-emissions ships
- Support innovation, research, infrastructure and just transition initiatives in developing countries
- Fund training, technology transfer and capacity-building to support the IMO greenhouse gas emissions strategy
- Mitigate negative impacts on vulnerable States, such as small island developing States and the least developed countries

According to the proposed amendments, "after the end of calendar year 2028 and after the end of each calendar year thereafter", with few exceptions, all ships of 5,000 gross tonnage and above[10] will be required to calculate their attained annual GFI for the preceding calendar year (reporting period), using ship fuel oil consumption data collected for transmission to the IMO database (draft regulation 27) and taking into account guidelines to be issued by the IMO. The attained annual GFI will be calculated in accordance with a methodology provided in draft regulation 33, taking into account fuel types used, their emissions intensity on a well-to-wake basis,[11] energy consumption by fuel type,

Ship GFI calculation and reporting process

Collect fuel consumption data

Gather data on fuel usage for the year

Calculate attained annual GFI

Compute the attained GFI using collected data and IMO methodologies

Report to the administration

Submit the attained and target GFI, the collected data and the GFI compliance balance to authorities for verification

Balance compliance deficit to reach GFI targets

Purchase remedial or use surplus units

Compliance statement issued

Receive a statement of compliance from authorities

[9] An amendment to the Annexes of the MARPOL Convention is considered to be accepted at the end of a period, which shall not be less than 10 months after the date of adoption, unless within that period "an objection is communicated [...] by not less than one third of the Parties or by the Parties the combined merchant fleets of which constitute not less than 50 per cent of the gross tonnage of the world's merchant fleet, whichever condition is fulfilled" (article 16(2)(f)(iii), MARPOL).

[10] Excluding "ships solely engaged in voyages within waters subject to the sovereignty or jurisdiction of the State the flag of which the ship is entitled to fly, […] ships not propelled by mechanical means, and platforms including FPSOs and FSUs and drilling rigs, regardless of their propulsion; and semi-submersible vessels […]" (draft regulation 30(2)).

[11] Draft regulation 34 envisages a sustainable fuels certification scheme to establish the greenhouse gas emissions intensity of different fuels.

Ships can balance their GFI deficit by purchasing remedial units from the IMO Net-Zero Fund or using surplus units transfered from other ships or banked from previous reporting periods

and the total amount of energy used by the ship in the reporting period, including but not limited to fuel oil, electricity delivered from shore power, and zero-emissions energy sources, such as wind propulsion and solar power. The attained annual GFI will be reported separately for each ship to the responsible administration, which in turn will issue a statement of compliance valid for the calendar year in which it was issued, the following calendar year and the first nine months of the subsequent calendar year (draft regulations 6(10) and 9(13)).

Under draft regulation 35, the target annual GFI of a ship shall consist of two tiers, namely, a base target annual GFI and a direct compliance target annual GFI. Both are determined by a gradually increasing annual GFI reduction factor with reference to the average GFI of international shipping in 2008.[12] The base target annual GFI requires a 4 per cent reduction by 2028, rising to 30 per cent by 2035. The direct compliance target annual GFI requires a 17 per cent reduction by 2028, increasing to 43 per cent by 2035.

The attained annual GFI should aim to be equal to or less than the direct compliance target.

- If the vessel has an attained annual GFI greater than the direct compliance target, then it shall balance its tier 1 compliance deficit through remedial units acquired through emissions pricing contributions to the Net-Zero Fund. For reporting periods from 2028 to 2030, the initial price of a tier 1 remedial unit shall be $100 per ton of carbon dioxide equivalent on a well-to-wake basis (draft regulations 36(5) and 36(8)).
- If the vessel's attained annual GFI is greater than the base target, it shall balance its tier 2 compliance deficit through surplus units transferred from other ships, surplus units banked from previous reporting periods and/or remedial units acquired using emissions pricing contributions to the Net-Zero Fund. For reporting periods from 2028 to 2030, the initial price of a tier 2 remedial unit shall be $380 per ton of carbon dioxide equivalent on a well-to-wake basis (draft regulations 36(6) and 36(9)).
- A vessel in direct compliance will earn surplus units equal to its positive compliance balance, which can be transferred to another ship to balance that ship's tier 2 compliance deficit, banked for use in the following reporting periods or voluntarily cancelled as a mitigation (draft regulation 36(11–15)).
- In addition to any surplus units, if technologies, fuels and energy sources used by the ship fall below the IMO threshold, they would qualify as zero or near-zero-emissions technologies, and the vessel using them may receive rewards from the Net-Zero Fund (draft regulation 39).[13]

Draft regulation 38 envisages establishing an IMO GFI registry to facilitate the implementation of the system by maintaining an account for each vessel falling under the scope of the regulations and keeping track of surplus, remedial and cancelled units, along with other information.

Of particular importance for developing countries, especially the least developed countries and small island developing States, is the envisaged disbursement of revenues from the Net-Zero Fund to promote a just and equitable transition and facilitate "environmental and climate protection, adaptation and resilience building within the boundaries of the energy transition in shipping, paying particular attention to the needs of developing countries", in particular these two country groups (draft regulation 41(2)). To this end, the Net-Zero Fund, in addition to providing rewards for the use of "zero or near-zero GHG emissions

[12] The average GFI of international shipping in 2008 has been determined as 93.3 grams of carbon dioxide equivalent per megajoule of energy (well-to-wake).

[13] According to the proposed amendments, the threshold has been determined as 19 grams of carbon dioxide equivalent per megajoule of energy for an initial period until 31 December 2034.

technologies, fuels and/or energy sources (ZNZs)" (draft regulation 39) and covering operational and administrative costs, is to allocate "sufficient revenue", under draft regulation 41, for:

1. researching, developing and making globally available and deploying zero and near-zero [greenhouse gas] emission technologies, fuels and/or energy sources, supporting the energy transition of shipping, and developing the necessary maritime, coastal and port-related infrastructure and equipment;
2. enabling a just transition for seafarers and other maritime workforce;
3. facilitating information-sharing, technology transfer, capacity-building, training and technical cooperation supporting the implementation of the regulations in this chapter;
4. supporting the development and implementation of National Action Plans (NAPs),[14] including fleet renewal and upgrade; and
5. addressing, as appropriate, disproportionately negative impacts on States, including on food security, resulting from the implementation of the regulations in this chapter.[15]

Other aspects of the Net-Zero Framework that are of particular interest for developing countries include draft regulation 42, on the promotion of technical cooperation and transfer of technology related to continuous improvement in the greenhouse gas fuel intensity of ships, and draft regulation 43, which requires the Marine Environment Protection Committee to "address […] the disproportionately negative impacts of this chapter on food security, paying particular attention to countries exposed to food insecurity", and "keep the potential impacts of this chapter on food security under continuous review".

While still subject to formal adoption, the approval of draft amendments to MARPOL Annex VI represents a milestone for climate action and has been hailed as an "important step towards establishing a legally binding framework to reduce [greenhouse gas] emissions from ships" (IMO, 2025n). The midterm measures were not agreed by consensus, however, but by the majority, with a number of countries voicing opposition.[16]

An initial impact assessment by a multistakeholder non-governmental organization indicates that the measures may not be ambitious enough to achieve the targets of the IMO strategy, support the uptake of zero- and near-zero-emissions fuels, and enable a just and equitable transition. Further, they allow too much leeway for fuels considered transitional (such as LNG). The same assessment suggests that the measures are likely to raise about $10 billion a year to support the uptake of zero- and near-zero-emissions fuels and technologies and contribute to various objectives linked to a just and equitable transition. This sum is significantly less than was projected to be raised by a carbon levy. Moreover, it remains to be decided how and when the revenues will be distributed (T&E, 2025).

Some similar concerns have been echoed by the International Chamber of Shipping, the global shipowner association, which emphasizes the complexity of the amendments and burdens on shipowners already navigating various regulations and reporting demands. It highlights stakeholder calls for urgent action and cross-industry and political collaboration to unlock the Net-Zero Framework's full potential (ICS, 2025).

> Of particular importance for developing countries is the envisaged disbursement of revenues from the Net-Zero Fund to promote a just and equitable transition and facilitate environmental and climate protection, adaptation and resilience building

[14] Refer to resolution MEPC.367(79) on the encouragement of Member States to develop and submit voluntary national action plans to address [greenhouse gas] emissions from ships.

[15] Refer to resolution MEPC.377(80) on the 2023 IMO strategy on the reduction of [greenhouse gas] emissions from ships and MEPC.1/Circ.885/Rev.1 on the revised procedure for assessing impacts on States of candidate measures.

[16] 63 member States were in favour and 16 were opposed, leading to a 79 per cent majority in favour (IMO, 2025e, para. 7.41 and annex 10). The United States of America did not participate in the negotiations.

If and when the proposed amendments to MARPOL Annex VI enter into force, monitoring, reporting and financial obligations for individual vessels will need to be factored into commercial maritime contracts. What this will mean in practice depends, among other factors, on further clarification on implementation, including related IMO guidance, which is yet to be developed.

From the perspective of developing countries, financial support for the development of "the necessary maritime, coastal and port-related infrastructure and equipment" will be particularly critical. The International Association of Ports and Harbors points to an important need for investment in suitable fuel supplies outside Europe. There are no LNG bunkering facilities in sub-Saharan African countries, for instance, which makes it challenging to use LNG-powered equipment and adapt to renewable fuels. At the same time, many developing countries have abundant solar and wind resources and existing renewable energy infrastructure as well as legacy infrastructure that could be repurposed for low-carbon hydrogen production and transport (IAPH, 2024).

Investment in facilities to accommodate new cargo types and bunkering will be key to a just and equitable transition

Investment in new facilities to accommodate new cargo types and bunkering in developing countries will be key to a just and equitable transition. At the same time, mainstreaming climate adaptation in the planning, operation and development of port infrastructure, along with appropriate policy and legal measures, and scaling up adaptation finance for developing countries will be critical to protecting ports against infrastructure damage, operational disruptions and extensive economic losses, and safeguarding the flow of goods across interconnected global supply chains (UNCTAD, 2022b and 2024a; UNECE, 2025).

3. Initiatives supporting green and sustainable investments in shipping

Decarbonizing the global shipping fleet requires significant investment. The annual cost of vessel construction and operation to decarbonize the global fleet is estimated at between $8 billion and $28 billion. Additionally, the onshore production and distribution of fuels, along with necessary port infrastructure (bunkering) might require an additional $30 billion to $90 billion per year (UNCTAD, 2023). Sustainable finance instruments, including green, blue and blended finance, that combine concessional and commercial funding will be central in generating required funds (UNCTAD, 2021a).

Global and regional decarbonization measures have sent strong signals to investors and financial institutions providing credit to shipping operations. Numerous industry initiatives aim to increase sustainability. Examples of recent bond initiatives by some of the largest global liner shipping companies include the Nippon Yusen Kabushiki Kaisha Green/Transition Finance Framework, launched in February 2025;[17] the CMA-CGM $1.5 billion Fund for Energies to accelerate the energy transition in shipping and logistics, announced in 2022;[18] and a 10-year, €500 million green bond issued by Maersk in 2021.[19]

Other relevant initiatives include the Poseidon Principles, a global framework for responsible ship finance, which promotes sustainable shipping by aligning lending practices with climate goals.[20] Adopted in 2019, the principles establish a framework for assessing and disclosing the climate alignment of ship finance portfolios, increasing transparency. The participation of financial institutions has grown to 36 leading banks, jointly accounting for approximately 80 per cent of global shipping

[17] See https://www.nyk.com/english/sustainability/envi/esg-finance/pdf/index_17.pdf.
[18] See https://www.cmacgm-group.com/en/news-media/cma-cgm-a-fund-for-energies.
[19] See https://www.maersk.com/news/articles/2021/11/19/maersk-issues-first-green-bond-to-fund-first-green-methanol-vessels.
[20] See https://www.poseidonprinciples.org/finance/.

finance.[21] Similar voluntary initiatives exist for charterers and shipowners, through the Sea Cargo Charter Framework developed in 2020,[22] as well as for marine insurers, through the 2024 Poseidon Principles Technical Guidance for Marine Insurance.[23]

Incorporating environmental, social and governance (ESG) criteria in the corporate governance of a shipping company might provide access to a larger pool of financiers (Kavussanos, 2024), reputational benefits and preferential margin adjustments in financing. Loans remain the preferred method of financing among shipowners, especially small and midsized operators. Global loan market associations have developed voluntary recommended guidelines, namely the Green Loan Principles and Sustainability Linked Loan Principles (APLMA, LMA and LSTA, 2025a and 2025b). Such voluntary industry guidance, together with innovative funding mechanisms, policy support and global collaboration, can help to bridge the financing gap in reducing greenhouse gas emissions in the shipping sector.

Green loans require using finance for an eligible green project, meaning one with clear environmental benefits.[24] Sustainability-linked loans are not specifically for green projects but instead aim to improve the borrower's ESG performance by setting sustainability performance targets measured against key performance indicators. These loans may play a part, among others, in providing the finance needed for new vessels and alternative fuels (ICS, 2025).

The definition of green or environmentally sustainable projects may vary depending on the sector, location or applicable taxonomy systems. For instance, the European Union's Taxonomy Regulation (European Union, 2020) establishes specific criteria for determining whether an economic activity qualifies as environmentally sustainable. A Commission Delegated Regulation (European Union, 2023c) supplements the Taxonomy Regulation by providing specific technical criteria for numerous industry sectors, including sea and coastal freight water transport, vessels for port operations and auxiliary activities, as well as the retrofitting of sea and coastal freight and passenger water transport.[25] The European taxonomy framework has its own approach to sustainable activities in shipping[26] but takes into consideration the short-term IMO measures to reduce greenhouse gas emissions. The approval of the IMO midterm measures could assist in developing a more harmonized global view of green or environmentally sustainable investment in the shipping sector, creating the necessary legal certainty in the global financing market.

4. Liability and compensation for pollution damage

The use of alternative fuels (including hybrid hydrocarbon fuels and LNG, ammonia, methanol, hydrogen and biofuels) or new battery technologies could contribute considerably to reducing greenhouse gas emissions from ships and achieving IMO targets. As with any new technology, however, the use of alternative fuels poses

[21] See https://www.poseidonprinciples.org/finance/signatories/.
[22] See https://www.seacargocharter.org/.
[23] See https://www.poseidonprinciples.org/insurance/wp-content/uploads/2021/12/Poseidon-Principles-for-Marine-Insurance-Technical-Guidance.pdf.
[24] The Green Loan Principle, in a non-exhaustive list, refers to eligible green projects as those addressing pollution prevention and control (including greenhouse gas emissions); clean transportation (including electric, hybrid and multimodal transportation) as well as the reduction of harmful emissions in transportation; green technologies (such as carbon capture); and climate resilience and adaptation (notably investment in infrastructure, and development of information support systems, such as climate observation and early warning systems) (APLMA, LMA and LSTA, 2025a).
[25] European Union, 2023c, annex I, sections 6.10 and 6.12.
[26] For example, transportation of fossil fuels is considered an unsustainable activity, irrespective of the vessel's performance (ibid., section 6.10).

risks. New fuels can be toxic, flammable, explosive and difficult to disperse. Addressing these risks effectively will require regulatory action to complement the existing regulatory framework governing civil liability for ship-source pollution. This framework currently consists of the following legal instruments:

- The liability framework under the 1992 International Convention on Civil Liability for Oil Pollution Damage and the 1992 International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage,[27] collectively referred to as the CLC-IOPC Fund regime 1992, addresses civil liability for oil pollution damage from vessels "constructed or adapted for the carriage of oil in bulk as cargo".[28] The two Conventions have been widely ratified[29] and provide an autonomous two-tier liability system to compensate victims of oil pollution from tankers. The regime provides for the strict, channelled and limited liability of the shipowner. This is combined with mandatory insurance and a right of direct claims against the insurer, and supplemented by a second tier of compensation provided by the International Oil Pollution Compensation Fund, which pools contributions from oil cargo receivers.[30] In 2003, an optional third tier of compensation was introduced by the Supplementary Fund Protocol,[31] which is in force in some States,[32] mainly in Europe. It raises the maximum compensation available to victims of tanker oil pollution to 750 million Special Drawing Rights (SDRs)[33] per incident.
- For bunker oil pollution from vessels other than tankers, the 2001 International Convention on Civil Liability for Bunker Oil Pollution Damage (Bunkers Convention)[34] establishes the strict liability of the shipowner.[35] In contrast to the CLC-IOPC Fund regime 1992, it does not provide for an autonomous liability system or access to an international fund. Liability and compensation depend on the size of the vessel and may be limited in accordance with "any applicable national or international regime, such as the Convention on Limitation of Liability for Maritime Claims [LLMC] 1976, as amended" (article 6) (see also UNCTAD, 2020, 2022a and 2023).
- The 2010 International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea (HNS Convention)[36] governs liability arising in connection with the carriage of hazardous and noxious substances (either in bulk or packaged form), as specified in the Convention. A continuously updated list of substances can be found through an online tool,[37] including certain types of methanol and ammonia when carried as cargo.

[27] In force since 1996. See https://www.iopcfunds.org/. Note that earlier versions of the two Conventions, from 1969 and 1971, are still in force in a number of jurisdictions. See also UNCTAD, 2012.
[28] Article 1(1) of the 1992 International Convention on Civil Liability for Oil Pollution Damage.
[29] As of 20 June 2025, the International Convention on Civil Liability for Oil Pollution Damage had 146 Contracting States; the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage had 122 Contracting States. See IMO, 2025m.
[30] For further details, see UNCTAD, 2012.
[31] The 2003 protocol to the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1992 (in force since 2005).
[32] As of 20 June 2025, 33 States. See IMO, 2025m.
[33] For the daily exchange rate, see https://www.imf.org/external/np/fin/data/rms_five.aspx.
[34] In force since 2008. As of 20 June 2025, the Convention had been ratified by 107 States. See IMO, 2025m.
[35] Articles 1(1) and 4(1). Vessels that fall within the scope of application of the 1992 Conventions are exempted.
[36] Not yet in force. As of 20 June 2025, the Convention had been ratified by eight States. See IMO, 2025m and https://www.hnsconvention.org/.
[37] Available at https://www.hnsconvention.org/hns-finder/.

Similar to the CLC-IOPC Fund regime 1992, the 2010 HNS Convention provides for an autonomous two-tier liability system and replicates other main elements of the regime.[38] It allocates liability for HNS pollution damage between the shipowner and an international fund, providing for a maximum compensation of 250 million SDR per incident. However, the Convention has not yet entered into force.

New types of fuels are outside the substantive scope of the CLC-IOPC Fund regime 1992 as they do not fall under the definition of "persistent oil", which comprises "any persistent hydrocarbon mineral oil such as crude oil, fuel oil, heavy diesel oil and lubricating oil, whether carried on board a ship as cargo or in the bunkers of such a ship".[39] Some alternative fuels, when carried as cargo, might fall within the definition of a hazardous and noxious substance under article 1(5) of the 2010 HNS Convention. The Convention has not yet entered into force, however. If and when it does, its application would not extend to hazardous and noxious substances used as fuel.

In relation to alternative fuels used to propel vessels, the 2001 Bunkers Convention might be applicable. Article 1(5) defines "bunker oil" as "any hydrocarbon mineral oil used or intended to be used for the operation or propulsion of ships", potentially including some types of hybrid fuels, but excluding fuels not based on hydrocarbons.

Finally, with the exception of the 2010 HNS Convention (which, as noted, is not yet in force), all other liability regimes for pollution incidents exclude claims related to loss of life or personal injury on board or outside the ship. This is a major concern since the carriage or use of new fuels can pose significant risks, both for crews and potential pollution victims, considering their toxicity, volatility and flammability.

This issue was underlined at the 112th session of the IMO Legal Committee by the IMO and the IOPC Funds secretariats, which highlighted the importance of ratification and entry into force of the 2010 HNS Convention in view of the increase in transportation of alternative fuels and, therefore, of potential risks to coastal States (IMO, 2025f). In this regard, the Committee approved a new output on the "Suitability of IMO liability and compensation regimes with respect to alternative fuels", with a target completion year of 2027. It also invited interested member States and international organizations to informally work together in the intersessional period (IMO, 2025g).

As the overview of key developments and issues in this section illustrates, while regulatory and technological progress in reducing greenhouse gas emissions from international shipping is underway, a number of important challenges remain and need to be effectively addressed. United Nations Member States as well as affected industry stakeholders are encouraged to actively engage in related work going forward. UNCTAD can provide related analysis, advice and assistance to help ensure the legitimate concerns of developing countries are appropriately taken into account.

The use and carriage of alternative fuels pose new risks which need to be effectively addressed before they materialize

[38] Such as the strict, channelled and limited liability of the shipowner, combined with mandatory insurance and the possibility to claim compensation directly from the insurer. An international fund on hazardous and noxious substances has been set up under conditions similar to those of the International Oil Pollution Compensation Fund.

[39] Articles 1(1) and 1(5) of the 1992 International Convention on Civil Liability for Oil Pollution Damage.

B. Strengthening the rights of seafarers in times of uncertainty

Consistent application of labour standards requires the active support of flag States, port States and the shipping industry

The world's 1.9 million seafarers – many of whom come from developing countries[40] – play a vital role in maintaining the continuous flow of critical goods along supply chains. They keep the world's shipping and trade moving, including and particularly during supply chain disruptions, as illustrated during the COVID-19 pandemic (UNCTAD, 2021b and 2021c). Protecting the rights of seafarers poses significant challenges due to the transnational nature of the maritime industry. Consistent application of labour standards onboard ships of different flags, especially when multiple jurisdictions are involved, is complex, requiring the active support of flag States, port States and the shipping industry. Long periods of isolation, beyond the reach of local labour inspectors or unions, complicate the situation and present additional risks to the health and well-being of seafarers. Overall, difficult working conditions, including during crises, contribute to perceptions of the maritime sector as an unattractive industry. Seafarer labour shortages have reached a 17-year high (Global Maritime Forum, 2025).

Against this background, coordinated multistakeholder action is crucial, as has been highlighted by UNCTAD as part of its extensive work on seafarer issues, including the humanitarian crew change crisis, during the pandemic (UNCTAD, 2021b and 2021c). International organizations, such as IMO and ILO, provide important fora for cooperation by port States, flag States and other interested stakeholders. In this context, the ILO/IMO Joint Tripartite Working Group was established in 2022 to identify and address seafarers' issues and the human element. UNCTAD participates in this work as an observer.

Effective legal frameworks are instrumental in protecting the rights of seafarers globally. They include the 2006 MLC as amended,[41] often referred to as the fourth pillar of international maritime law, along with the 1974 International Convention for the Safety of Life at Sea,[42] the MARPOL Convention and the 1978 International Convention on Standards of Training, Certification and Watchkeeping for Seafarers.[43] The MLC consolidates and updates 68 international labour standards related to the maritime sector. It provides a comprehensive, structured approach to the rights of seafarers, set out in articles, regulations, and a code with standards and guidelines.

[40] In 2021, leading crewing nations, accounting for almost 50 per cent of global seafarers, included the Philippines (13.3 per cent), the Russian Federation (10.5 per cent), Indonesia (7.6 per cent), China (7.1 per cent), India (6 per cent) and Ukraine (4 per cent). See UNCTADstat, 2021.

[41] In force since 2013. As of 4 July 2025, the Convention had been ratified by 110 States. See https://normlex.ilo.org/dyn/nrmlx_en/f?p=NORMLEXPUB:11300:0::NO::P11300_INSTRUMENT_ID:312331.

[42] International Convention for the Safety of Life at Sea, 1974, in force since 1980. As of 20 June 2025, the Convention had 168 Contracting Parties. See IMO, 2025m.

[43] International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978. As of 20 June 2025, the Convention had 167 Contracting Parties. See IMO, 2025m.

The articles and regulations establish core rights and principles along with the basic obligations of States Parties to the Convention. They can only be revised by the ILO General Conference (article XIV). The code contains details regarding the implementation of the regulations and can be amended through a simplified procedure (article XV). It comprises part A (mandatory standards) and part B (non-mandatory guidelines). It stipulates that:

- Member States should implement the rights and principles in the mandatory standards in law and practice, and have the possibility, when that is not feasible, to implement substantially equivalent measures.
- Member States should give due consideration to the guidelines when implementing their responsibilities (article VI).

In 2025, the fifth meeting of the Special Tripartite Committee, the body comprising representatives of Member States, shipowners and seafarers that oversees the continuous review of the MLC, agreed on several amendments to strengthen seafarers' rights (ILO, 2025a). These were formally adopted at the 113th session of the International Labour Conference on 6 June 2025 (ILO, 2025b) and are expected to enter into force in December 2027.

1. Repatriation of seafarers and cases of abandonment

Seafarers frequently work on ships that undertake consecutive voyages covering long distances far from their country of residence. In cases of illness or injury, or when a seafarer's employment agreement expires abroad or the prescribed period of service on board ends (with a maximum duration of less than 12 months), seafarers must be confident that shipowners will return them to their homes, the place where they joined the ship or the location required by any applicable collective bargaining agreement. The MLC contains firm provisions so that, in general, seafarers may return home at no cost to themselves (regulation 2.5(1)). To strengthen this right, States Parties are required to ensure that ships flying their flag provide financial security for the repatriation of seafarers (regulation 2.5(2)). Amendments to the Convention adopted in 2014, in force since 2016, established requirements to ensure an expeditious and effective financial security system to assist seafarers in the event of their abandonment. Those provisions were put to the test during the COVID-19 crisis, when the suspension of crew changes due to pandemic-related measures left many seafarers stranded at sea far beyond the expiration of their employment agreements (UNCTAD, 2021b and 2021c).

The 2025 amendments to the MLC (ILO, 2025a) strengthen seafarers' rights to repatriation, as they require each Member "to facilitate the repatriation of seafarers in a manner which excludes discrimination on any grounds and irrespective of the flag State of the ship on which they are employed, engaged or work" (standard A2.5.1 (10)). They introduce binding provisions for shipowners on the minimum costs of repatriation that they are expected to cover (standard A2.5.1 (3)). Learning from the lessons of the pandemic, States are advised to designate and recognize seafarers as key workers and facilitate their movement when travelling in connection with, among other issues, repatriation (guideline B2.5.2 (1)).

Despite regulatory efforts, one persistent problem facing seafarers globally is abandonment. This occurs when, in violation of MLC provisions and the terms of employment agreements, "the shipowner: (a) fails to cover the cost of the seafarer's repatriation; or (b) has left the seafarer without the necessary maintenance and support; or (c) has otherwise unilaterally severed their ties with the seafarer including failure to pay contractual wages for at least two months" (standard A2.5.2 (2)).

The 2025 MLC amendments strengthen seafarers' rights to repatriation

A submission by the International Transport Workers' Federation to the 112th session of the IMO Legal Committee in March 2025 highlighted a record high of 312 cases of abandonment involving 3,133 seafarers on 282 different vessels in 2024, as registered in the ILO-IMO Joint Database on Abandonment of Seafarers (IMO, 2025h).[44] By comparison, in 2020, despite significant operational difficulties due to the COVID-19 pandemic and related response measures, only 78 cases were reported.

At its 112th session, the IMO Legal Committee urged port and flag States and all other interested stakeholders to regularly update the ILO-IMO database on abandonment of seafarers to increase its accuracy (IMO, 2025g). It encouraged member States to provide information on national contact points in the State of the seafarer's nationality for cases of abandonment. Member States were also advised to conduct additional information campaigns to raise seafarers' awareness of financial security in the event of abandonment and to implement the "Guidelines on how to deal with seafarer abandonment cases" adopted by the ILO/IMO Joint Tripartite Working Group in 2022 (ILO and IMO, 2022). The guidelines provide a reference tool for flag States, port States and labour-supplying States to design and implement policies, strategies, programmes, legislation, administrative measures and social dialogue mechanisms related to resolving cases of the abandonment of seafarers.

2. Shore leave

In 2023 and 2024, delays and reduced traffic through the Panama Canal, due to climate-induced low water levels, as well as the decrease in marine transit through the Suez Canal, exacerbated by regional conflicts (UNCTAD, 2024a and 2024b), led to the rerouting of ships. This added significant time, cost and environmental impacts to global shipping operations (UNCTAD, 2024c). Reroutes can add weeks to journeys, intensifying fatigue and mental strain among crew members. The prolonged time at sea often exacerbates feelings of isolation and anxiety, impacting both personal well-being and operational safety (IMO, 2019). Shore leave during port calls provides seafarers with opportunities to visit seafarer welfare centres that offer recreational and other facilities and a change of scenery, among other benefits. This can relieve stress and isolation and is important for seafarers' health and well-being.

A recent joint report by the International Transport Workers' Federation Seafarers' Trust and the World Maritime University highlighted an emerging tendency to restrict the traditional right of seafarers to shore leave (Carrera Arce et al., 2025). This shift was attributed initially to the acceleration of the supply chain and implementation of the International Ship and Port Facility Security Code. It reached a peak during the crew change crisis resulting from the COVID-19 pandemic and related response measures. Despite the resolution of pandemic-related crew change challenges, however, previous levels of shore leave have not been restored.

[44] Available at https://wwwex.ilo.org/dyn/r/abandonment/seafarers/search?clear=6. A summary of abandonment cases submitted to the Legal Committee (IMO, 2025i) indicates that most abandoned seafarers in 2024 were Indian nationals (916), followed by Syrians (423) and Ukrainians (292). Most instances of abandonment occurred in the waters of the United Arab Emirates (42 cases), Egypt (26 cases) and Türkiye (25 cases). Panama, the second-largest vessel registry in 2024 by dead weight tonnage (see chapter II) was the flag State accounting for the most abandonments (50 cases in 2024). Cases of abandonment appear to be rising for vessels registered in several smaller registries (Lloyd's Register, 2025).

The MLC provides for seafarers to be granted shore leave to benefit their health and well-being (regulation 2.4(2)) and promotes the establishment of welfare facilities available to all seafarers (regulation 4.4). To strengthen the right to shore leave, the 1965 Convention on Facilitation of International Maritime Traffic (FAL Convention)[45] was amended in 2022 to facilitate the ability of foreign seafarers on international voyages to go ashore (IMO, 2022b). The latest amendments to the MLC add a new standard, directed at port and flag States, that regulates seafarers' right to shore leave (standard 2.4.2 as amended).

More specifically, according to the MLC, public authorities of port States shall ensure that seafarers are allowed ashore, provided that the relevant formalities have been fulfilled and public authorities have no reason to refuse permission to come ashore for reasons of public health, public safety and security, or public order. Port States should ensure that seafarers are allowed to come ashore in a non-discriminatory manner, and irrespective of the flag State of the ship on which they are employed, engaged or work. No seafarer shall be required to hold a visa or special permit for shore leave. If public authorities have reason to refuse permission, this should be communicated to the seafarer and the master, in writing if requested. Each flag State shall require shipowners to allow seafarers to take shore leave to benefit their health and well-being, consistent with the operational requirements of their positions, unless leaving the ship is prohibited or restricted by relevant authorities of the port State or due to safety or operational reasons. Importantly, shore leave provided in accordance with the FAL Convention is considered compliant with the MLC, thus promoting harmonization in the applicable legal framework.[46] Guidelines also provide for facilitating shore leave by establishing procedures for cooperation with shipowners' and seafarers' organizations and other relevant stakeholders. Personnel in ports and terminals should also be provided with appropriate information and training on seafarers' rights, including shore leave (guidelines B4.1.1 (2) and (4)).

Implementation of MLC and FAL provisions important to strengthen seafarers' right to shore-leave

3. Working conditions

Chronic overwork heightens the risk of fatigue-related accidents and long-term health issues, a matter of particular concern in maritime operations.[47] While the MLC includes binding provisions on the maximum hours of work and minimum hours of rest (regulation 2.3 and relevant standards), the importance of effective implementation and enforcement of these provisions cannot be overstated.

A 2022 survey on work/rest practices on ships, involving a diverse sample of seafarers in terms of age, nationality, ranking, vessel and company type (Bhatia et al., 2024), suggests that the standard on the maximum hours of work and minimum hours of rest (standard A2.3(5)) may often not be respected. Of approximately 6,300 respondent seafarers, 88.3 per cent admitted to exceeding work/rest hour limits at least once a month, while 16.5 per cent indicated they exceeded the limits more than 10 times a month. An earlier study highlights a "culture of adjustment" among seafarers, with work hours either being underreported or work/rest hour records manipulated for compliance purposes (World Maritime University, 2020). Records of the daily work hours of seafarers should be maintained on board the vessel per the binding standards of the MLC (standard A2.3(12)). Yet one third of seafarers responding to the survey admitted that they had never adjusted their records if they exceeded work/rest limits (ibid.).

[45] In force since 1967. As of 20 June 2025, the FAL Convention had 131 Contracting States. See IMO, 2025m.
[46] FAL Convention, annex, section 3, part G, standards 3.44-3.49.
[47] See, for example, the grounding of the vessel NCL Salten at Byneset near Trondheim. Press reports attributed this to a variety of causes, including an officer falling asleep on watch at the time of the incident, having completed three port calls within 24 hours (Splash, 2025).

The fifth meeting of the Special Tripartite Committee discussed but did not adopt proposals submitted by the seafarers' group to amend the limits of work/rest hours. It adopted a resolution recommending that the ILO/IMO Joint Tripartite Working Group review relevant provisions of the MLC and the 1978 International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, and consider developing practical guidance on implementation and enhanced monitoring of compliance (ILO, 2025c).

4. Fair treatment of seafarers detained on suspicion of committing crimes

When investigating crimes, States should be mindful that seafarers may unknowingly become implicated in criminal activities and should exercise due caution to avoid the criminalization of seafarers unless this can be supported by relevant evidence. A significant rise in cases of detained seafarers as reported to ILO and IMO (IMO, 2025g, para. 4(c)) suggests that following maritime incidents such as pollution, accidents or the discovery of illicit cargo, seafarers frequently face criminal charges before all relevant facts are thoroughly examined. Geopolitical developments and conflict, including the war in Ukraine, migrant flows in the Mediterranean and attacks on vessels in the Red Sea, have heightened such risks for seafarers.

In accordance with an IMO Assembly resolution (IMO, 2011) and using ILO and IMO guidelines on the fair treatment of seafarers in the event of a maritime accident as a basis, the ILO/IMO Joint Tripartite Working Group adopted the ILO/IMO Guidelines on fair treatment of seafarers detained in connection with alleged crimes at its third session in 2024 (ILO and IMO, 2025). The guidelines address the responsibilities of port, flag and coastal States as well as seafarers' home countries and shipowners. They focus on several issues, including access to consular services and legal assistance and the use of non-custodial measures during investigations. They also aim to raise the awareness of seafarers on the dangers of self-incrimination, arbitrary detention, coercion and intimidation, and their rights to wages and medical care during legal proceedings. Finally, they seek to strengthen cooperation among States and interested stakeholders.

The 2025 MLC amendments refer to the abovementioned ILO/IMO guidelines in the standard on flag State responsibility in cases of marine casualties (standard A5.1.6(1) and (2)) and the guideline concerning seafarers in a foreign port (guideline B4.4.6 (2)).

While the regulatory developments outlined in this section are encouraging, effective implementation and enforcement of the legal framework for the protection of seafarers, involving concerted efforts by flag and port States as well as the shipping industry, remain imperative – both to safeguard the legitimate rights of seafarers and to ensure the flow of goods across supply chains, including at times of disruptions. Drawing on its extensive work on seafarers' issues during the pandemic, UNCTAD will continue to monitor developments and provide related advice and assistance.

C. Other recent developments

While it is not possible to cover the entire range of legal and regulatory developments that may be of interest, this section briefly highlights some recent and ongoing developments regarding issues of particular importance, especially with a view to encouraging the active participation and engagement of United Nations Member States and affected stakeholders.

1. Entry into force of the Hong Kong Convention for the Safe and Environmentally Sound Recycling of Ships 2009

The recycling of ships is likely to grow in importance and will have to increase if the global fleet is to be modernized in line with agreed decarbonization targets. Shipbreaking is a harsh and dangerous process, often undertaken by workers using basic tools and facing daily risks from toxic exposure, explosions and unsafe conditions. Many lack proper training, healthcare or sanitation. These issues render shipbreaking one of the most dangerous jobs in the world (ILO, 2015). It can also cause severe environmental damage, releasing hazardous substances (such as asbestos or polychlorinated biphenyl), oil residues and heavy metals into the soil and sea, polluting coastal communities, and threatening ecosystems, fisheries and public health (Shipbreaking Platform, 2023).

To address some of these problems, the Hong Kong Convention for the Safe and Environmentally Sound Recycling of Ships was negotiated under IMO auspices and adopted in 2009. In an important and long-awaited development, after more than 15 years, the Convention finally entered into force on 26 June 2025, providing the basis for a significant improvement in health, safety and working conditions as well as the environmental sustainability of global ship recycling practices. The Convention currently has 24 Contracting States (IMO, 2025m). They include Bangladesh, India, Pakistan and Türkiye, which together dominate the ship recycling industry, accounting for approximately 90 per cent of global ship recycling volume (UNCTAD, 2024a; Clarksons Research, 2025; see also chapter II). Major flag States, including Japan, Liberia, the Marshall Islands and Panama, are also Contracting States.

The Convention requires implementation measures by both flag States and States with recycling facilities, to enhance safety and make ship recycling more environmentally friendly. Mandatory regulations cover the design, construction, operation and preparation of ships to support safe and environmentally sound recycling; the operation of ship recycling facilities; and appropriate enforcement mechanisms, including survey, authorization, certification, inspection and reporting requirements.

Flag States are required to ensure that all ships of 500 gross tonnage or above flying their flag comply with the Convention's provisions. This includes the development and maintenance of an inventory of hazardous materials that is specific to each ship and updated throughout its operational life. The inventory identifies the location and approximate quantities of hazardous materials on board (articles 5(1) and (3)). Flag States must also ensure that ships undergo surveys to verify the inventory, including an initial survey, periodic renewal surveys and a final survey prior to recycling. After this point, an international ready-for-recycling certificate is issued, confirming that the ship complies with the Convention's requirements for safe and environmentally sound recycling (articles 10 and 11).

The Hong Kong Convention will require implementation from both flag states and states with ship recycling facilities

Non-mandatory MASS Code to be finalized and adopted in May 2026

Ship recycling facilities to which the Convention applies must be authorized by the Contracting State's competent authorities. Authorized facilities are required to develop a ship recycling facility plan detailing procedures for safe and environmentally sound recycling, including worker safety measures, training programmes, emergency preparedness, and systems for monitoring and reporting (articles 18–23). Prior to recycling a ship, the authorized facility must prepare a ship recycling plan specific to the vessel, taking into account its inventory of hazardous materials and other relevant information. Apart from the obligation of States to ensure that recycling facilities within their jurisdiction comply with the Convention's standards, facilities may only accept ships that meet the Convention's requirements. A set of IMO guidelines has been developed to assist States in the implementation and enforcement of the Convention's technical standards.[48]

Prior to the entry into force of the Hong Kong Convention, relevant legislation was already in force at the European level for some time. The European Union Ship Recycling Regulation (European Union, 2013) implemented the Convention at the European Union and European Economic Area level (see UNCTAD, 2024a). The Regulation includes additional requirements, most notably prohibiting European vessels from being recycled in facilities not approved by the European Commission or published in the European list of ship recycling facilities.[49] As the Hong Kong Convention permits more stringent measures (article 1(2)), application of these additional requirements at the European level is not affected by its entry into force. According to some estimations, the application of the European Union Ship Recycling Regulation has ensured that 30,000 vessels already carry an inventory of hazardous materials certificate or statement of compliance. An additional 23,000 vessels need to be certified in the next few years (DNV, 2023).

2. Updated road map for the development of a maritime autonomous surface ships code

Rapid technological advances in the maritime industry are accelerating the development of ships using various degrees of automation, including remotely operated and fully self-navigating vessels. Automation in shipping operations has ramifications for safety at sea, ship navigation and cargo operations, as well as potential environmental, security, social and economic impacts. Acknowledging related risks, IMO has been working since 2017 to identify potential gaps in the existing regulatory framework. This effort is aimed at making sure that rules for MASS keep pace with evolving technology and balance benefits with potential risks and costs. Three regulatory scoping exercises of IMO legal instruments, under the auspices of the Maritime Safety Committee, Facilitation Committee and Legal Committee, took place between 2021 and 2022. They identified potential regulatory gaps and issues that need to be addressed.[50]

Since the completion of these exercises, a joint working group involving the three IMO committees has been working to address common issues identified (such as roles and responsibilities of the master and the crew, certification, cybersecurity, etc.) and consider the definition and terminology of MASS, as well as factors associated with remote operation centres and remote operators. The working group has also developed a table – intended as a living document – to identify preferred options for effectively addressing the common issues identified (IMO, 2024b).

[48] All guidelines can be found at https://www.imo.org/en/MediaCentre/HotTopics/Pages/Recycling-of-ships-and-Hong-Kong-Convention.aspx.
[49] The current eleventh version of the list is available at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2023.190.01.0013.01.ENG.
[50] See https://www.imo.org/en/MediaCentre/HotTopics/Pages/Autonomous-shipping.aspx.

In parallel, the Maritime Safety Committee has been working to develop a non-mandatory code for MASS, aimed at providing a global regulatory framework for the safe, secure and environmentally sound operation of autonomous ships. The latest consolidated version of the Draft International Code of Safety for Maritime Autonomous Surface Ships (MASS Code), submitted by the MASS Correspondence Group to the 110th session of the Committee, contains 15 chapters in three parts covering: (1) overarching matters connected to MASS; (2) technical principles applicable in all cases when applying the code, including approval and certification processes; and (3) goals, functional requirements and expected performance applicable to MASS operations and functions (IMO, 2025j, annex 1).

Following additional work on the draft code, the Committee agreed on a revised road map that envisages further work by the re-established Intersessional Working Group on MASS at its upcoming fourth session from 29 September to 3 October 2025, and finalization and adoption of the code at the Committee's 111th session in May 2026 (IMO, 2025k, annex 8). Following a review and assessment of the non-mandatory code as well as an experience-building phase, a mandatory MASS code is then set to be developed in 2028, with a view to its adoption as a new chapter of the International Convention for the Safety of Life at Sea by 1 July 2030 and its subsequent entry into force on 1 January 2032 (ibid.). The IMO Legal Committee also adjusted the timeline of its own workplan and scheduled the assessment of the non-mandatory MASS code in the spring of 2027 (IMO, 2025g, annex 7).

3. Fraudulent ship registration and registries

Fraudulent ship registration and registries remain matters of growing global concern due to the far-reaching implications for maritime safety and security, pollution, seafarer welfare and ocean governance. Following several decisions at its previous session, and after consideration of the final report of the IMO Study Group on Fraudulent Registration and Fraudulent Registries of Ships, prepared by the World Maritime University, UNCTAD and the IMO International Maritime Law Institute (IMO, 2024c; see also UNCTAD, 2024a), the IMO Legal Committee continued to work on the issue at its 112th session. In particular, it considered a report by the Correspondence Group on Due Diligence and IMO Identification Number Schemes (IMO, 2025l), which had been tasked with further developing elements of «due diligence» to be exercised in the process of registration of ships and with developing a draft proposal for a new output on guidelines or best practices on the registration of ships.

IMO Legal Committee set to begin important work on non-mandatory guidelines or best practices for registration of ship

Following consideration of the report, and amid widespread support for a proposal to develop non-mandatory guidelines or best practices related to the registration of ships, the Legal Committee agreed to include a new relevant output in the 2026–2027 biennial agenda, with a target completion year of 2027, and to establish a working group at its next session to carry out the work. In response to a call by many delegations for a more holistic approach that would also focus on existing mandatory and non-mandatory instruments and involve other IMO organs, the Legal Committee also invited the Maritime Safety Committee, the Facilitation Committee and the Technical Cooperation Committee to consider the problem of fraudulent registration and registries as part of their work.

In a related development, acknowledging challenges posed by unlawful operations and substandard ships in terms of safety, security, protection of the marine environment and fair treatment of seafarers, the Legal Committee approved a proposal for a new output to the current biennial agenda in the form of a regulatory scoping exercise to further develop actions to prevent unlawful operations, including substandard ships. Relevant work will commence intersessionally through a correspondence group under the coordination of Germany. It is charged with developing an appropriate methodology and road map for the conclusion of the regulatory scoping exercise as well as a list of relevant legal matters within the scope of the Organization that should be included in it (IMO, 2025g, paras. 6.19–6.28 and annex 3).

The ongoing regulatory developments and initiatives outlined in this section are important and deserve the active support and engagement of all affected public and private sector stakeholders, to ensure that their legitimate interests are appropriately reflected and the overall result accords with commercial expectations, while leaving no one behind. UNCTAD will continue to support developing countries through its analytical work, as well as related guidance and advice.

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