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Xinhua-Baltic International Shipping Centre Development Index Report 2025

China Economic Information Service

Xinhua-Baltic International Shipping Centre Development Index Report

2025

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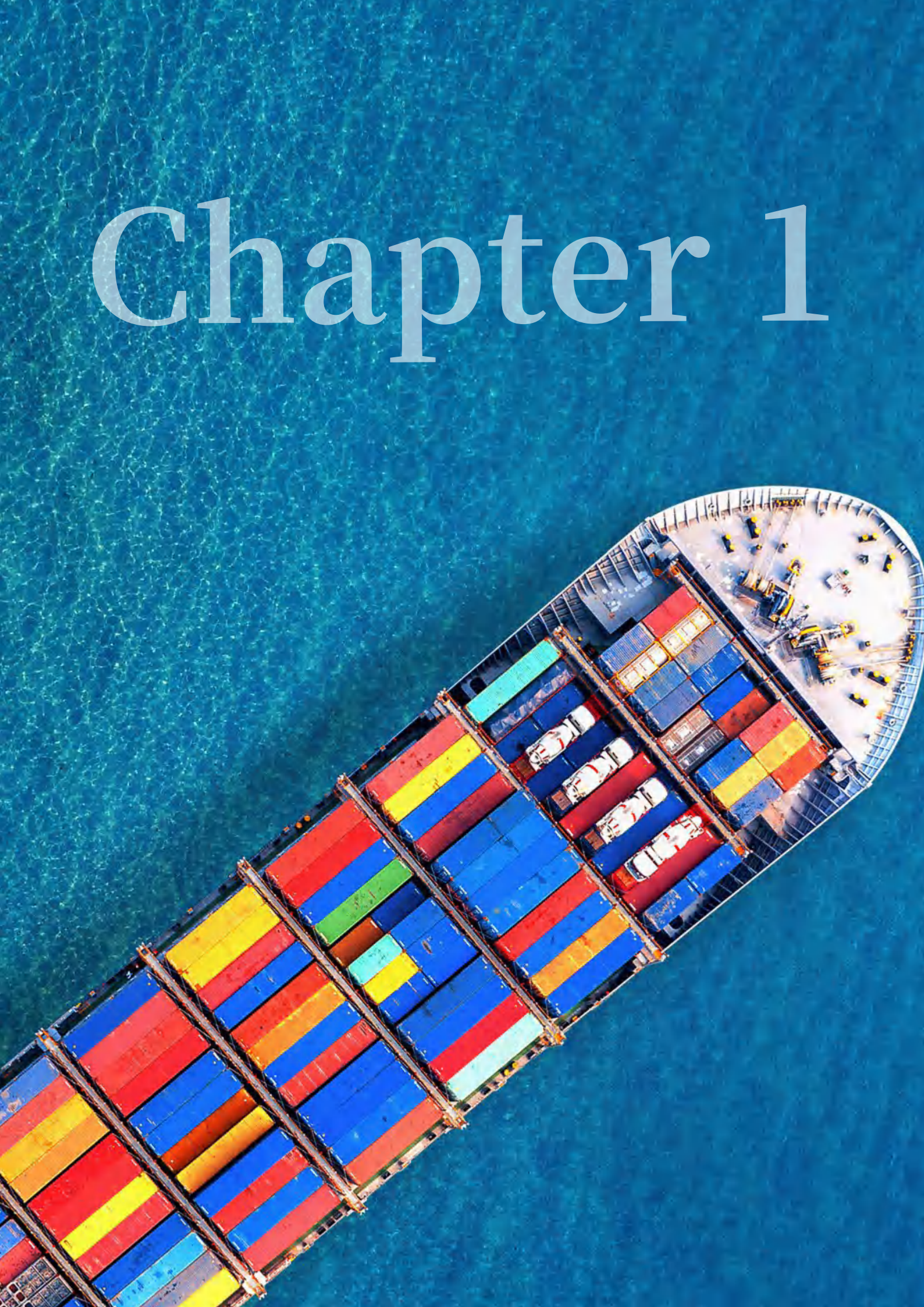

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Introduction

The Xinhua-Baltic International Shipping Centre Development Index (ISCDI) provides a comprehensive ranking of the world's top 43 port cities and maritime centres, employing a diverse array of metrics. These metrics encompass every facet of a shipping-centred environment, from business elements involving maritime service providers such as lawyers, financiers, and shipbrokers, to port factors including cargo throughput, draught, and container berth length. Additionally, the index evaluates the overall business climate, factoring in customs tariffs and logistics performance.

Since its inception, the ISCDI has become one of the most renowned independent reports for the performance of the world's largest cities that offer port and shipping business services. Alongside our dedicated reports of the top 20 maritime centres in the world each year, the ISCDI details some of the key events, issues and trends impacting the international maritime sector in the previous year.

This year marks the twelfth anniversary of the ISCDI, a testament to the ongoing and productive collaboration between China Economic Information Service, a subsidiary of Xinhua, and Baltic Exchange, one of the maritime industry's most historicand renowned freight data service providers.

Singapore has once again topped the ISCDI rankings in 2024, maintaining the top position since the report was launched in 2014. The city continues to command a strategic position as a global maritime hub in a critical region for international shipping and its maritime industry remains vibrant and critical to its entire economy. Singapore is home to an abundance of maritime companies, many of whom are essential to running the day-to-day operations of commercial vessels, as well as innovating new and exciting technologies that will help shape the industry of tomorrow.

London, Shanghai, Hong Kong, Dubai and Rotterdam all maintained their places in the top six maritime centres globally, owing to their continued role in providing key maritime services, industry-leading port infrastructure and adhering to global environmental regulations.

This year's rankings also showed significant improvements for ports across China. Guangzhou, Qingdao and Tainjin have all improved in the ISCDI rankings compared to last year, while Ningbo-Zhoushan continued their steady climb to sit seventh, marking the third year in a row that this major container hub has risen in the ranks. The prominence of China's ports throughout the ISCDI rankings showcase how the country's continued investment, innovation and development as a maritime powerhouse is now cementing its ports and maritime centres as the world's best.

This year's ISCDI also welcomes two new ports to our global rankings. Los Angeles in the United States and Vancouver in Canada have both entered the top 20 port cities in the world, owing to their continued development and the robust nature of North America's economy in 2024.

The international shipping industry is in the midst of an incredibly volatile and unpredictable period. Geopolitical instability, financial pressures and a strain supply chain have all presented hurdles to normal business proceedings. However, shipping has maintained its resilience and adaptability to continue operating efficiently as it has kept its reputation as a reliable and cost-effective means of moving cargo.

Amongst the challenges currently facing

the industry is maritime's ongoing focus on decarbonisation. The International Maritime Organization (IMO) has set a target for achieving net zero by 2050 and many across the shipping landscape are making steps to make their operations more sustainable. From using cleaner energy sources to adopting energy saving technologies to using the power of the wind, shipping is full of fascinating stories of innovation as many look to ensure they comply with international standards.

Maritime finance also remains a key topic of discussion. As more shipping news makes mainstream headlines, many financiers are looking at the maritime industry as a worthwhile investment opportunity. Insurance and operational costs, which also faced a number of headwinds in 2024, remain important factors in the day-to-day activities of shipping companies, while the need to offer green finance continues to play a crucial role in modern maritime funding.

The adoption of Artificial Intelligence, Machine Learning and other future technologies has been a frequent topic of discussion within the maritime industry. Shipping is getting smarter, quicker and more technologically proficient as new disruptors enter the market, many of which are using advanced systems in innovative and exciting ways to improve the entire industry. At a port level, terminals around the world are increasingly using technology to futureproof their operations and make themselves more efficient as cargo volumes continue to rise year on year.

Finally, safety and security within the maritime industry remains an important issue. Piracy, seafarer welfare, and vessel security risks have all been topics of discussion in recent months, while the incident involving the Francis Key Scott Bridge in Baltimore made international headlines and put the safety of commercial vessels directly in the spotlight.

This year's ISCDI covers all of these subjects and more as we look to enhance your understanding of ocean-going shipping and its dynamic maritime centres around the world.

We extend our gratitude to everyone who made this report possible, and wish to thank all of our contributors for providing detailed and insightful stories about the incredible world of international shipping.

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Message from Xinhua News Agency

The global shipping industry, as a vital artery of international trade, continues to play a pivotal role in fostering economic integration and supply chain resilience. Against the backdrop of geopolitical tensions, energy transitions, and technological advancements, the Xinhua-Baltic International Shipping Centre Development Index (ISCDI) Report provides a comprehensive evaluation of the world's leading maritime hubs, offering insights into their evolving competitiveness and the broader industry trends.

Since its inception in 2014, the Xinhua-Baltic ISCDI has established itself as a benchmark for assessing the performance of international shipping centres. The 2025 edition evaluates 43 global port cities across three primary dimensions—port infrastructure, shipping services, and business environment—supported by 16 sub-indicators. By leveraging authoritative data and expert analysis, the report not only ranks these centres but also highlights the dynamic forces shaping the future of maritime trade.

The shipping industry is undergoing a transformative shift.

Sector-wise, the dry bulk market achieved a historic milestone with trade volumes exceeding 5.6 billion tonnes, driven by robust demand for iron ore and coal. Container shipping normalised post-pandemic, though geopolitical disruptions — such as the Red Sea crisis, caused significant rate volatility. The tanker and LNG sectors faced headwinds from oversupply and shifting trade patterns. Meanwhile, decarbonisation accelerated, with the EU ETS implementation, IMO's CII framework, and wind-assisted propulsion technologies signalling a greener future.

Digital transformation reshaped operations: AI optimised routes and maintenance, blockchain streamlined documentation, and LEO satellites enhanced global connectivity. However, cybersecurity risks escalated, demanding stronger safeguards.

As the Xinhua-Baltic ISCDI marks its twelfth anniversary, we hope it serves as a compass for policymakers, businesses, and researchers navigating the complexities of the shipping industry. By fostering collaboration and innovation, we can collectively steer towards a more efficient, sustainable, and resilient maritime future.

Editorial Board,

Xinhua-Baltic International Shipping Centre Development Index

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Message from Baltic Exchange

The global shipping industry continues to show remarkable resilience as it navigates an increasingly volatile and uncertain landscape. Geopolitical tensions, economic instability, the growing complexities of technological adaptation and climate-related disruptions have all played their part to create a challenging environment for everyone in the global supply chain, but the maritime sector continues to provide stability and continuity as it facilitates the key movement of vital goods around the world.

At the heart of this stability are our ports and maritime centres. These vital parts of the world are ensuring that, no matter the challenge, they remain at the forefront of the global maritime industry and adapt with the times to handle the increasing amount of goods and services the world requires. Shipping centres like Singapore, London and Shanghai continue to provide the necessary infrastructure and professional services that keeps shipping moving forward. From key freight data and financial institutions to insurance companies and legal entities, these shipping centres form the backbone of our industry.

Looking forward, the shipping industry will continue to face challenges. This is particularly the case when it comes to decarbonisation as the sector charts its course towards a carbon free industry by 2050. Baltic Exchange is doing its part to help the shipping industry by providing critical freight, emissions and bunker data to keep our industry informed and help them navigate their way to a greener future. Most importantly, we are doing this in collaboration with so many like-minded shipping companies around the world, all of whom know the importance of what an environmentally friendly shipping industry can do for our planet.

The Xinhua-Baltic International Shipping Centre Development Index Report continues to champion the progress and innovation our industry is making. On behalf of Baltic Exchange, I wish to congratulate all of this year's leading shipping centres for the dedication to keeping shipping sailing in the right direction.

Mark Jackson

Chief Executive, Baltic Exchange

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How the rankings are decided

The rankings are based on the following categories:

Port inputs (20% of weighting)

- Container throughput (TEU)
- Dry bulk cargo throughput (tons)
- Liquid bulk cargo throughput (tons)
- Cranes (no. of)
- Container berths (length of)
- Port draught (m)

Sources: Drewry, Shanghai International Shipping Institute

Business services inputs (50% of weighting)

- Shipbrokers, managers, liner & bulker companies (no. of)
- Classification society offices (no. of)
- Maritime legal (no. of lawyers & arbitrators)
- Ship finance (no. of banks)
- Hull underwriting premiums ($)

Sources: Baltic Exchange, International Association of Classification Societies, International Union of Marine Insurers, Dealogic, Legal 500, London Maritime Arbitrators Association, Singapore Chamber of Maritime Arbitration, Alphaliner

General environment inputs (30% of weighting)

- Government transparency
- Extent of e-government and administration
- Customs tariffs
- Logistics performance index

Sources: United Nations For full methodology details, please see Appendix 1.

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Global rankings – 2014 to 2025

#	2014	2015	2016	2017	2018	2019
1	Singapore	Singapore	Singapore	Singapore	Singapore	Singapore
2	London	London	London	London	Hong Kong	Hong Kong
3	Hong Kong	Hong Kong	Hong Kong	Hong Kong	London	London
4	Rotterdam	Rotterdam	Hamburg	Hamburg	Shanghai	Shanghai
5	Dubai	Hamburg	Rotterdam	Shanghai	Dubai	Dubai
6	Hamburg	Shanghai	Shanghai	Dubai	Rotterdam	Rotterdam
7	Shanghai	Dubai	New York/New Jersey	New York/New Jersey	Hamburg	Hamburg
8	Tokyo	New York/New Jersey	Dubai	Rotterdam	New York/New Jersey	New York/New Jersey
9	New York/New Jersey	Busan	Tokyo	Tokyo	Tokyo	Houston
10	Busan	Athens/ Piraeus	Athens/ Piraeus	Athens/ Piraeus	Busan	Athens/ Piraeus

#	2020	2021	2022	2023	2024	2025
1	Singapore	Singapore	Singapore	Singapore	Singapore	Singapore
2	London	London	London	London	London	London
3	Shanghai	Shanghai	Shanghai	Shanghai	Shanghai	Shanghai
4	Hong Kong	Hong Kong	Hong Kong	Hong Kong	Hong Kong	Hong Kong
5	Dubai	Dubai	Dubai	Dubai	Dubai	Dubai
6	Rotterdam	Rotterdam	Rotterdam	Rotterdam	Rotterdam	Rotterdam
7	Hamburg	Hamburg	Hamburg	Hamburg	Athens/ Piraeus	Ningbo Zhoushan
8	Athens/ Piraeus	Athens/ Piraeus	New York/New Jersey	Athens/ Piraeus	Ningbo Zhoushan	Athens/ Piraeus
9	New York/New Jersey	New York/New Jersey	Athens/ Piraeus	Ningbo Zhoushan	Hamburg	Hamburg
10	Tokyo	Ningbo Zhoushan	Ningbo Zhoushan	New York/New Jersey	New York/New Jersey	New York/New Jersey

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Overall rankings

	Country	City	Compared to 2024
1	Singapore	Singapore	same
2	UK	London	same
3	China	Shanghai	same
4	China Hong Kong	Hong Kong	same
5	UAE	Dubai	same
6	Netherlands	Rotterdam	same
7	China	Ningbo-zhoushan	up one
8	Greece	Athens/Piraeus	down one
9	Germany	Hamburg	same
10	USA	New York/New Jersey	same
11	USA	Houston	same
12	China	Guangzhou	up one
13	China	Qingdao	up two
14	Japan	Tokyo	down two
15	Korea	Busan	down one
16	Belgium	Antwerp	same
17	China	Shenzhen	same
18	China	Tianjin	up one
19	USA	Los Angeles	new entry
20	Canada	Vancouver	new entry

Chapter 2

INTERNATIONAL SHIPPING MARKET REVIEWS

1.Overview of the 2024 shipping market

2.Dry bulk shipping review of 2024

3.Container shipping review of 2024

4.Tanker shipping review of 2024

01

Overview of the 2024 shipping market

Cargo, Carbon, and Conflict: Maritime's focus continues to shift in 2024

Global shipping has long had a tradition of being able to weather a storm in a way that other industries simply cannot. With volatility continuing to impact international supply chains and commodity movements in 2024, the maritime sector was once again able to show how dynamic and flexible it can be to continue delivering, even in the most challenging of environments.

In this realm, Chinese imports and exports grew 5% in 2024 compared to a year earlier to reach 43.85 trillian Chinese yuan (US$5.98 trillion), according to data released by the General Administration of Customs (GAC), with exports growing 7.1% and imports by 2.3%. With more than 150 trading partners, China continues to dominate and expand its presence in global shipping to ensure it has a long-term future as the cornerstone of global trade.

This demand meant that, generally, trade volumes and freight rates showed strong performances across all sectors.

Superb sectors

In the dry bulk market, global seaborne trade exceeded 5.6 billion tonnes of cargo for the first time ever in 2024, with each quarter setting its own record.

In the tanker market, there was optimism at the start of the year about strong oil demand growth from China and countries East of Suez. However, as the year progressed, revisions showed that China had reduced its oil demand, forcing the tanker market to dampen its growth expectations. Despite this volatility, not to mention the increasing impact of sanctions of certain oil trades, the tanker market showed remarkable resilience, with increased tonne-miles and vessel demand throughout the year.

In the container sector, it was another successful year for almost all major container lines. Many reported year-on-year growth and their third-highest ever historical performance since 2021 and 2022. According to Container Trade Statistics (CTS), the market grew 6.2% year on year, with the ongoing issues in the Red Sea causing TEU-mile demand to surge by 20%. This was combined with a rise in fleet capacity of 10.2% in 2024. The supply-demand dynamics seen in 2024 in container shipping helped to fuel a sharp increase in freight rates to help drive the sector to yet another hugely profitable year as demand for containerised and e-commerce goods ramped up yet again.

It was a mixed story in 2024 for the gas carrier market. While the global LNG trade grew by 2.4% in 2024 to reach more than 410 million tonnes, with notable demand coming from China, Singapore and Rotterdam, the market faced a major oversupply of vessels. As a result, freight rates fell dramatically last year, with some experiencing negative earnings. This was combined with a decline of LNG imports from China at the start of the year due to increased domestic production. The LPG market, meanwhile, experienced strong growth in 2024 as new liquefaction projects came online and demand rose. The VLGC segment, in particular, witnessed significant growth due to its ability to transport LPG over longer distances.

Regional challenges

While demand for commodities remained high, shipping capacity remained tight in 2024. A low orderbook combined with a prolonged shipbuilding process, due to disruptions in

global supply chains and rising raw material costs, meant that there were capacity shortages on certain routes, leading to high freight rates on certain vessel types. In particular, long-haul routes from Asia to Europe led to a bullish outlook on certain trades from some major shippers.

These tighter conditions, which were exacerbated by geopolitical uncertainties, energy price volatility and congested supply chains, led to longer shipping times and higher costs for freight forwarders.

Challenges in the Red Sea continued to impact commercial shipping in 2024. With Houthi rebels continuing to target commercial vessels, many shippers continued to reroute around the Cape of Good Hope. As a result, transit times and fuel costs continue to rise, alongside insurance premiums and War Risk cover from P&I clubs. The Suez Canal remains one of the world's most important waterways and, as the risk of attacks in the region continues, shipping continues to find ways of keeping critical cargoes moving, even in difficult circumstances.

There was positivity to be seen in Panama this year as the Panama Canal returned to somewhat normal operations following a distinctly poor 2023. Significant droughts had reduced the waterway's draft, limiting the number of vessels that could transit the canal. However, renewed rainfall and new domestic infrastructure projects rejuvenated the Panama Canal's fortunes in 2024 to boost transit options for shippers looking to access US East Coast and US West Coast ports.

Going green

Decarbonisation and sustainability efforts in commercial shipping dominated headlines in 2024 as industry leaders ramped up investments in alternative fuels, retrofitted ageing fleets with cleaner technologies, and navigated evolving international regulations aimed at cutting greenhouse gas (GHG) emissions by 40% before 2030.

The year began with the launch of the EU Emissions Trading System (EU ETS) regulation, which is designed to cut carbon emissions at EU-based ports with the implementation of a 'cap-and-trade' system. This particular regulation is set to continue to hit the headlines as it targets a 100% fee for reported annual GHG emissions by 2026. In other regulatory news, the International Maritime Organization (IMO) identified the challenges related to the Carbon Intensity Index in 2024, many of which are set to be addressed before the end of 2025.

There was strong investment levels in alternative fuel-powered vessels last year, with 52% of the total tonnage on the orderbook being green-fuel

capable, according to shipbroker Clarksons. In particular, LNG remains the current green fuel of choice, with more than 1,200 LNG-powered vessels either in operation or on order, as of the end of 2024.

In a landmark moment for the industry, in November 2024, container line Maersk launched its first-ever methanol-powered box ship that will operate on a transpacific route. The retrofitting project is a clear example of how major shipping lines have made real steps in 2024 to create a more environmentally friendly fleet and adopt cleaner fuel options. Real-world cases like these are particularly notable as more widespread adoption will ultimately lead to cheaper operations for shipping lines, regardless of trade, cargo or vessel type.

Safety in the spotlight

Shipping also made mainstream news in 2024 for issues related to safety. In March 2024, the M/V Dali container vessel collided with the Francis Scott Key Bridge in Baltimore, causing the loss of six lives, the complete loss of the bridge, and shutting down the Port of Baltimore's main shipping channel. The incident made international headlines and highlighted critical issues related to vessel maintenance, operational safety and in infrastructure vulnerability in high-traffic waterways.

Global shipping losses, however, continued to fall to their lowest level in decades in 2024, with just 27 vessels lost – a far cry from the 200 seen annually in the 1990s. Despite improvements to maritime safety in recent years, Allianz Commercial, the insurance division of Allianz Group, noted that shipping is entering a new phase of risk, shaped by escalating geopolitical tensions, shifting trade policies, and rising incidents involving fire and misdeclared cargo.

Lithium-ion batteries were one such example of a growing risk in 2024. The cargo, which is vital to the development of electric vehicles, is particularly susceptible to thermal runaway, which can lead to fires or explosions. With ro-ro vessels increasingly called upon to transport new electric vehicles, which have grown in popularity in recent years, many are calling for increased safety measures for vessels carrying lithium-ion batteries to reduce the risk of onboard fires.

It is not just vessels at risk but the ports themselves. In September 2024, operations at the Port of Los Angeles were shut down as an overturned tractor trailer carrying a load of lithium batteries ignited a fire on Terminal Island. While the incident was fortunately minor, it continued to show the importance of safety and risk management across the supply chain when it comes to transporting hazardous materials.

Ports push on

Port development continued at pace in 2024 as many major maritime hubs look to make their terminals more efficient, sustainable and effective, particularly as vessels continue to grow in size and stature. This led to an increase in investment in automation, digitalization, and green energy infrastructure at ports around the world,

Meanwhile, some of the leading maritime hubs, such as Singapore and Rotterdam, continued to expand their smart port initiatives. This included investing in Artificial Intelligence and Internet of Things-based systems to emissions monitoring platforms, while other ports, such as Los Angeles and Savannah, focused on upgrading intermodal connections to ease congestion. Singapore's Tuas Port advanced its development to become the world's largest fully automated terminal, while Busan Port in South Korea implemented AI-based logistics systems to further enhance efficiency and safety.

Deepwater facilities also gained traction in 2024, driven by the growing need to accommodate ultra-large container vessels (ULCVs) and diversify global trade routes. This was particularly the case for ports in emerging markets, such as Africa, Southeast Asia and Latin America, that are increasingly looking to establish their place in the maritime ecosystem. Meanwhile, projects such as the Bagamoyo Port in Tanzania and the Vizhinjam International Seaport in India continued to progress in 2024 as new trade corridors opened up to enhance global trade.

Progress Amid Challenges

Global shipping continues to weather many storms. By doing so, it maintains its place as one of the world's most reliable industries. While challenges remain over ongoing geopolitical, environmental, and financial risks, the industry continues to show positive momentum. Sustainability projects continue to make the industry cleaner and a push to digitalisation is making the maritime sector more effective. 2024 will be known as another year of positive development for shipping but many will not hedge their bets as they strive to balance growth, environmental responsibility and resiliency in an increasingly volatile global landscape.

02

Dry bulk shipping review of 2024

Dry bulk market hits new heights amid global volatility

It was an unexpectedly positive year for the global dry bulk market, with records being broken across the board every quarter. According to data from AXSMarine, global dry bulk seaborne trade exceeded 5.6 billion tonnes in 2024, a new industry record, with every quarter setting its own record and surpassing 2023 levels by 4.2% on average.

As the world's leading iron ore consumer, activity in China was largely responsible for these heightened trade levels. More than 1.24 billion tonnes of iron ore were imported by China in 2024, up 5% from 1.18 billion tonnes a year earlier according to data from China's General Administration of Customs (GAC). This spike in activity mostly came as a result of China's decision in September 2024 to introduce a robust stimulus package to turnaround its flailing real estate sector, leading to renewed demand for iron ore and coal to boost domestic steel production.

As a result, Australia, the world's largest exporter of iron ore, boosted its output by 1.1% in 2024, transporting more than 928 million tonnes of iron ore globally. Meanwhile, other countries also marked a strong 12-month period, with Brazil moving 384 million tonnes, Canada moving 60 million tonnes and other major exporters – such as South Africa, India and Ukraine – also showing levels similar to those seen in 2023.

Flattening freight rates

These strong levels were indicative of a dry bulk trade that had witnessed a return to normal in 2024 after a difficult 2023. This was reflected in much better freight rates for dry bulk cargo, with the Baltic Dry Index (BDI) showing a much stronger year before rates rapidly fell in late 2024.

According to the BDI, rates spiked in March 2024 after Lunar New Year, with strong activity seen throughout the year, including similar spikes in May, July and September. However, in October 2024, rates dropped rapidly as Chinese demand for imports reduced in the final quarter of the year due to a loss of steam in the Pacific market. This resulted in rates for Capesizes halving in the space of a few weeks, which further exacerbated freight rate declines.

Dry bulk rates were also impacted by the slow recovery of the Panama Canal. Drought conditions brought on by La Niña had significantly reduced the number of dry bulk carriers transiting the canal. According to shipbroker Howe Robinson, just 1,392 vessels passed through the Panama Canal in Fiscal Year 2024, down more than 700 from a year earlier. It was a similar story in the Red Sea where the ongoing security crisis meant many bulk carriers avoided the Bab el-Mandeb Strait entirely. As a result, the number of vessels passing through this key waterway fell from 5,994 vessels in 2023 to just 2,754 in 2024. While rerouting initially boosted tonne-mile demand for dry bulk vessels, importers in Asia began to source dry cargo from closer regions, which ultimately reduced cargo demand and caused freight rates to fall.

Carriers keeping busy

The global dry bulk fleet was kept busy in 2024. More than 154,000 individual laden legs were carried out by dry bulk carriers last year, an increase of 2% that was largely due to the continued expansion of the fleet. According to Signal Ocean, the global dry bulk fleet has expanded rapidly from 4,545 vessels in 2020 to 5,330 by the end of 2024, an annual growth rate of 3%. The global fleet is also expected to expand

further to reach more than 5,800 vessels in 2026.

Fleet utilisation in 2024 increased across almost all segments. Panamax vessels of between 68,000 dwt and 85,000 dwt were the best performing category in 2024, carrying more than 1 billion tonnes of cargo, including iron ore, coal, and soybeans. Meanwhile, Post-Panamax vessels between 85,000 dwt and 100,000 dwt saw renewed utilisation as they helped to support record shipments of coal and bauxite, while VLOCs of more than 220,000 dwt were heavily involved in the booming iron ore market.

With strict environmental regulations coming into effect in 2024, there was also a pronounced demand for younger, more energy-efficient vessels, with charterers and operators showing a preference for 'eco' ships that could deliver regulatory advantages, particularly for those operating in Europe. Data from Drewry shows that the utilisation rates of Capesize and Supramax vessels under five years of age rose significantly in 2024 as a result.

Coal

Demand for coal, the second most common dry bulk commodity after iron ore, surpassed more than 1 billion tonnes once again in 2024. Indonesia and Australia shipped significantly more steam coal, with much of it heading to China to meet renewed demand. China alone imported more than 540 million tonnes of coal in 2024, which is roughly 41% of global coal imports. India remained the world's second-largest importer, taking in more than 250 million tonnes, while Vietnam recorded a sharp increase in coal demand as it quickly expands its regional power infrastructure.

Coking coal had an above average performance in 2024, increasing 5.5%. Australia remained the world's leading exporter, shipping about 160 million tonnes last year, while the United States and Canada both vastly improved their export levels. These changing volume levels helped to offset decreasing exports from Russia, which continues to be impacted by sanctions from Europe.

Despite decarbonisation commitments, the global coal trade remained remarkably resilient in 2024. The International Energy Agency (IEA) projects that global coal trade will continue to grow until 2027 before stabilising as renewable energy adoption accelerates and China boosts its domestic coal production.

Grains

Record production levels meant global soybean trade hit new heights in 2024. Roughly 152 million tonnes of soybeans were shipped last year, with more than 100 million tonnes of that total coming from Brazil, a year-on-year increase of 3%, according to AXSMarine. Argentinian supplies also bounced back from a particularly weak 2023, although US exports fell to below 40 million tonnes as China relied more heavily on South America for its soybean trade.

Other grain cargoes, such as wheat and corn, saw a boost in volumes of 2.2% year-on-year. In the United States, more than 71 million tonnes of wheat and corn was exported to make it the world's leading exporter in this arena in 2024. Meanwhile, Argentina boosted its grain supplies more than 41.5% compared to 2023 with more than 43 million tonnes exported, and Ukraine boasted an impressive 43.9% increase to move more than 37 million tonnes in 2024. However, reduced outputs from Brazil and Australia meant that any major gains in the grain sector were cut short.

Minor bulks

While not grabbing all the headlines as iron ore or coal, minor bulk commodities still represent roughly one-third of total dry bulk cargo volumes. In this market, global minor bulk shipments grew 4% in 2024 due to a recovery of the construction market in emerging economies.

Bauxite continued to be a sought after commodity in 2024, with more than 198 million tonnes of cargo moved last year, an increase of 12.4%, predominantly from Guinea, Australia and Brazil. Alumina trade also grew last year as a result of better refining capacity in Indonesia.

Nickel ore volumes also saw steady growth in 2024 as the commodity remains vital in the development of electric vehicles and stainless steel. Global nickel ore production reached 126 million tonnes in 2024 due to rising demand, most notably from China. However, while the Philippines remains the world's leading exporter at more than 43 million tonnes, oversupply from emerging markets such as Indonesia led to a significant price drop in 2024, with prices falling to their lowest point in four years.

In other areas, steel product trade rebounded in 2024 as a result of increased infrastructure spending in Africa, the Middle East and Southeast Asia; while forestry products such as woodchips and pulp showed strong demand in East Asia due to their biomass energy sectors. Cement trades also grew in 2024 due to increased construction projects in Africa and Southeast Asia.

Meanwhile, global fertilizer exports fell year-on-year due to a significant drop in Chinese exports to stabilise and reinforce its domestic supplies. However, despite this drop, the global value of the market is now worth US$84 billion, a 51% increase when compared to 2020.

Looking Forward

While it was yet another record-setting year for the global dry bulk market, geopolitical tensions in key waterways and a volatile marketplace means the sector continues to weather many storms.

One of the biggest questions facing the market is how it is going to absorb the nearly 36 million dwt of new vessels that will come online in 2025. According to Maritime Strategies International, more than 240 million tonnes of additional cargo will be needed to absorb those new vessels, which will be a tall order for a dry bulk sector that is seeing slowing growth and changing trading patterns.

03

Container shipping review of 2024

Container market shows signs of life

Like all other areas of shipping, the container market was not immune to the continued volatility that has hit the global supply chain. Persistent disruptions plagued 2024, with port congestion, labour constraints, geopolitical tensions, and vessel rerouting placing sustained pressure on container availability and scheduling. Freight rates, while down from the peaks seen during Covid-19, have remained above historical averages in many trade lanes. For those operating in the container sector, these challenges continue to reshape global trade dynamics, forcing many to adapt to a new, less predictable operating environment.

Despite these headwinds, the container sector continued to show renewed growth in 2024. According to Container Trade Statistics, global volumes of containerised goods rose more than 6% compared to 2023.

Part of the reason for 2024's strong growth was the flat performance in 2023. The sector continued to recover from the pandemic and major stockpiling efforts of 2022, with container players beginning to enjoy things returning to what would traditionally be considered normal.

Dominant Asia and America

Container traffic out of Asia dominated 2024, with more than 61% of global exports coming from the Far East. Volumes from the region grew 8% in 2024, with strong export markets in North America, Europe, the Middle East and the Indian Subcontinent. Europe, meanwhile, accounted for 15% of container exports, with North America (8%) India & the Middle East (7%), and South & Central America (5%) making up the bulk of the rest.

Asia also dominated global container imports in 2024, accounting for 39% of container imports. Meanwhile, Europe and North America both accounted for 19% each, while India & the Middle East (10%), South & Central America (6%) and Australasia (4%) made up the rest.

North America saw a major growth in container imports in 2024, with a 12% year-on-year increase compared to 2023, making it the fastest-growing market of last year. This is a far cry from the 5% decrease in container traffic seen in 2023 and a sign of renewed recovery in the American market. Notably, the Port of Los Angeles handled more than 90% of container cargo arriving from Asia as the US West Coast continues to drive port activity.

One of the biggest growth stories of 2024 was that seen in the Indian Sub-Continent & the Middle East, which saw container trade grow 34% in 2023 and more than 58% compared to 2022. The majority of this growth is attributed to India, where imports have more than doubled over the last couple of years.

Europe's container trade remained relatively flat in 2024, with Germany notably recording the largest container export fall of the year at 4% year-on-year. This marked a continuation of 2023 as Germany continued to reduce trade volumes with China.

Port by port

Chinese ports continued to dominate global container trade in 2024. Shanghai was the world's largest container port once again, moving more than 51.5 million teu, an increase of 4.8% year-on-year. Other Chinese ports including Ningbo-Zhoushan, Shenzhen, Qingdao, and Guangzhou all saw major growth, some double-digit, last year.

Other ports in Asia saw similar growth in their container throughput. Singapore moved more than 41.1 million teu (up 5.4%), while South Korea's Busan moved 24.4 million teu (up 5.4%), Malaysia's Port Klang moved 14.6 million teu (up 4.2%), and Thailand's Laem Chabang moved 9.5 million teu (up 9.2%).

It was not all good news for Asian ports however. Despite moving 13.7 million teu in 2024, Hong Kong saw its container trade fall 4.9% year-on-year as renewed competition from mainland China ports led to its seventh year in falling throughput.

In other parts of the world, one of the biggest success stories was the Port of Long Beach, which saw a 20.3% growth in container volumes in 2024 to move almost 9.7 million teu. Meanwhile, Rotterdam and Antwerp-Bruges remained the largest container ports in Europe, moving 13.8 million teu and 13.5 million teu, respectively. Other ports also saw major growth in 2024, including Jebel Ali (up 7.3%) and Tanger Med (up 18.8%).

Buoyed freight rates

Container freight rates showed a robust recovery from a particularly downbeat 2023. Port to port containerised spot freight rates on major routes reached a high of just over US$10,000/feu in mid-2024, with two noticeable drops. The first was in February and March due to the traditional Lunar New Year drop and the second was in late 2024 as many shippers scrambled to move goods early due to global disruption to meet holiday demand, leading to an earlier-than-anticipated peak season.

Despite this volatility, container spot freights were much higher than in 2023, which rarely got over US$3,000/feu throughout the year. This recovery provided much needed comfort to container lines, which faced pressure from a poor 2023 and provided some much-needed comfort heading into 2025 as vessel and transit expenses continue to rise.

Container charter rates also showed signs of life in 2024 as continued disruption in the Red Sea led to a huge demand for capacity to fill the void left by vessel rerouting, alongside increasing tonne-mile demand.

Veson Nautical reported that timecharter rates for post-panamax vessels rose by 111% year-on-year, reaching a high of £73,330/day. This spike was caused by increased demand for container services, rising earnings and a robust asset value across the container sector. This strong outlook resulted in large volumes of new vessels hitting the water in 2024 and a vast drop in the number of container ships being sent for scrap as liners looked to capitalise.

Similarly, Clarksons confirmed that 2024 was the strongest year for the container market since the start of the pandemic, with container charter rates climbing 48% year-on-year on average across various vessel sizes.

It was a similar pattern on the Freightos Baltic Index (FBX), which is one of the shipping industry's leading container shipping benchmarks. The year started slow, with FBX rates falling to $2,307/feu in January before spiking to $5,552/feu in August before falling to $3,315/feu in November. However, in comparison to FBX rates seen in 2023, which peaked at $2,238/feu and dipped to a near record low of $1,048/feu, container players will have been much happier with the stronger rates seen in 2024 to bring greater levels of profitability and recover from a challenging 2023.

While rates were much stronger in 2024, the

downward pressure towards the end of the year led to a contraction of freight rates. However, despite an increase in overall tonnage by the end of 2024 for the container sector, there is still expected to be tight supply of vessels in 2025, leading to continued positivity in the market.

Back in business

After enduring rerouting throughout 2023, many container shipping lines rebounded in 2024 with double digit profit growth that was far beyond initial expectations. Some of the biggest names in container shipping, including Hapag Lloyd, Maersk, HMM, Yang Ming and ZIM all saw profits rebound at least 12% in 2024, with some seeing nearly 40% growth in the third quarter of 2024.

With disruption and volatility continuing to plague global shipping, container profitability is expected to remain high throughout 2025.

Overcapacity risks

The flood of new capacity that is expected to hit the container market is not just due to carriers looking to secure their market share. Environmental regulations are heavily shaping vessel orders, with many container lines making significant orders for greener vessels in 2024.

These include 12 dual-fuel methanol vessels of up to 14,000 teu by Cosco, 11 dual-fuel LNG vessels of up to 24,000 teu for Evergreen, and 13 eco-vessels ranging up to 15,000 teu for Yang Ming. Meanwhile, some of the major names continue to dominate the global orderbook, with MSC having 107 container vessels on order and CMA-CGM having 103 vessels.

The major risk of this renewed flurry of orders that dominated 2024 is that, should normal activity return to the Red Sea, the carriers will likely quickly resume their former routes. This will likely bring freight rates crashing due to the massive overcapacity in the container market. For the time being, carriers are hedging their bets that the coming months and years are likely to stay as they are, with high tonne-mile demand and continued push for containerised goods globally.

Conclusion

The past year has been one of recovery for the container market as it continued to adapt to volatility in the global supply chain, and crucially find ways to remain profitable in turbulent times. Soaring profits meant many lines splashed out on new vessel orders as they take a long-term look at tonne-mile demand in 2024 and beyond.

For the ports, almost all saw 2024 as a much stronger year compared to 2023. Ports in China and throughout Southeast Asia saw much stronger container throughput across 2024 as demand for goods in North America and Europe continued to rise.

While this much stronger market is a net positive for the container industry, risks remain persistent, particularly when it comes to the risk of overcapacity within the global fleet. For now though, container lines have renewed optimism that, since the pandemic, things might have finally turned a corner in 2024.

04

Tanker shipping review of 2024

Oil & gas shipping face the reality of volatility

Predicitability is one of the most sought after aspects of commercial shipping. While maritime players often have to contend with a range of risks that could impact daily operations, many hedge their bets on stable trade flows, consistent regulatory environments, and long-term charter agreements providing enough certainty to maintain profitability and operational efficiency.

For those in the tanker and gas sectors, any optimism that 2024 was to be another year of recovery, strong rates and boosted profits was undone by geopolitical headwinds, changing regional demand and vessel oversupply that muted any opportunity for growth across almost all sectors.

Tankers face misplaced optimism

Market participants in the tanker sector started 2024 with a lot of optimism. There were encouraging signs for a positive year ahead, primarily due to projected strong oil demand growth driven by China and other Asian countries. Meanwhile, fears of supply challenges due to OPEC production cuts were seemingly counterbalanced by non-OPEC suppliers expanding their output, while the temporary removal of Venezuelan sanctions helped provide further optimism for a strong year in the tanker market.

With all these factors in mind, there was a widespread belief that increased tonne-miles and vessel demand for routes running West to East, combined with a declining number of tankers in the water, would lead to 12 months of very strong freight rates in the tanker market. The reality was very different.

Revised downward growth forecasts for China, due to a slumped construction sector, a shift to cleaner energy sources and a rise in electric vehicle usage, throughout 2024 meant a major reduction in global oil demand, which fell by an average of 400,000 bpd throughout the year. According to the International Energy Agency, China's oil demand was forecasted to be 710,000 bpd in January 2024, which was then revised at 150,000 bpd in December 2024. This drop was further exacerbated by China's cut to export tax rebates on oil products in December, leading to reduced imports by the end of the year.

All this resulted in a dampening in overall market activity in the VLCC sector and an increased use of smaller tankers. Spot rates for VLCCs declined throughout the second half of 2024, with spot rates hitting a new low in a lacklustre fourth quarter. There were some small signs of recovery, however, with China beginning to source more crude oil from the Middle East and West Africa in November 2024 but despite this, the overall sentiment was downbeat following a particularly difficult 2024.

This was evidenced by the year-on-year timecharter equivalent (TCE) rates seen in 2024. According to data from shipbroker Gibsons, in the VLCC sector on the Middle East to Ningbo route, the TCE was $41,000/day in December 2023 but fell to just $13,750/day in December 2024.

It was similar story in other sectors. Suezmax rates fell from $44,500/day in December 2023 to $29,500 a year later, while Medium-Range rates fell from $25,250/day to just $10,500/day in the same period.

Another reason for this decline was due to an increase in the number of Suezmaxes and VLCCs switching to clean products from dirty due to

stronger Clean Petroleum Product tanker rates in the second half of the year. This was supported by new refining projects coming online in 2024, including the much-anticipated Transmountain Expansion in Canada, the Dangote Refinery in Nigeria, and the Olmeca refinery in Mexico. These projects are all net-positives for crude oil and refined product trade, particularly for long-haul routes to Asia.

Meanwhile, rising water levels in the Panama Canal and a lifting of transit restrictions in 2024 did remove one of the key barriers to elevated freight rates last year, particularly for the US market. This was critical as the US Gulf region was one of the few bright spots for the tanker market in an otherwise poor year.

When it comes to major waterways, the continued de facto closure of the Red Sea to tanker vessels was felt strongly, with LR2 rates soaring at the start of the year as many vessels rerouted around the Cape of Good Hope, leading to increased tonne-miles. However, these rates fell throughout as tanker players adapted to the new norm and shifting trade patterns meant importers sought supplies from closer to home.

Meanwhile, the crude and product tanker orderbook surged in 2024, continuing the trend seen in 2023. According to AXSMarine data, by the end of 2024, more than 105 million dwt was in the orderbook, propelling the orderbook-to-fleet ratio to a strong 15% as the tanker sector saw renewed willingness to invest in new vessels after a period of caution that goes back to 2016. There has been a strong focus on Aframax and LR2 vessels that promise operational flexibility and compliance with tighter carbon emissions rules. How these new vessels will impact freight rates once they hit the water is currently uncertain as freight rates remain volatile, with some owners willing to keep older tonnage running while the going is good.

LNG & LPG continue upward trend

In comparison to their tanker counterparts, the gas carrier market saw a much stronger 2024. Following the challenges of 2022 and the gradual rebalancing of 2023, gas markets saw growing demand of 3% year on year in 2024 despite the fuelling price volatility that has plagued gas markets since 2020.

In the LNG market, global exports increased 1.6% in 2024 to reach 411.5 million tonnes. However, despite this increase in exports, an oversupply of new LNG carriers meant that spot charter rates were mostly flat throughout the year. More than 60 new vessels hit the water in 2024, while more than 80 more are expected by 2026. That means shipping capacity in the LNG sector is growing faster than expected production increases over the coming two years, leading to a vast number of vessels either laid up or sent for scrap.

In 2024, however, this meant that the traditional spike in gas demand usually seen in winter months was not realised, with LNG carrier overhang causing some charter rates to fall from $200,000/day in November 2023 to just $50,000/day in November 2024. This was further exacerbated by a boost in trade between the United States and the European Union due to the shorter routes across the Atlantic.

In the LPG carrier sector, it was a mixed performance in 2024. A surge in exports at the start of the year, buoyed by increased demand in India and China, saw a strong market performance for rates. This was predominantly led by exports from the United States, which boosted LPG exports to record 20.2 million metric

tonnes in the first quarter of 2024, with supplies heading to Asia and Europe to meet regional demand.

However, an oversupply of vessels and subsequent increased fleet availability eventually suppressed rates in the second half of the year. Similar to the LNG market, eased restrictions in the Panama Canal and ongoing Red Sea tensions led to an increase in vessel availability that offset the increased demand for LPG throughout the year.

An oversupplied market and muted growth did not stop shipowners from placing orders for new LPG carriers in 2024 however. According to data from Drewry, more than 120 orders for LPG carriers were placed last year, the majority of which were for very large ammonia carriers (VLACs) and very large ethane carriers (VLECs) as demand for emerging green fuels boosted investments.

Conclusion

The events of 2024 served as a stark reminder that volatility can easily impact oil and gas shipping. Despite early hopes for a rebound in the tanker market and continued momentum in the gas carrier segment, external shocks ultimately undermined much of the year's potential. As the industry looks ahead to 2025 and beyond, it will need to balance optimism with caution, investing wisely in fleet renewal, and navigating emissions compliance, while remaining open to market fluctuations that come with a rapidly evolving global energy and trade landscape.

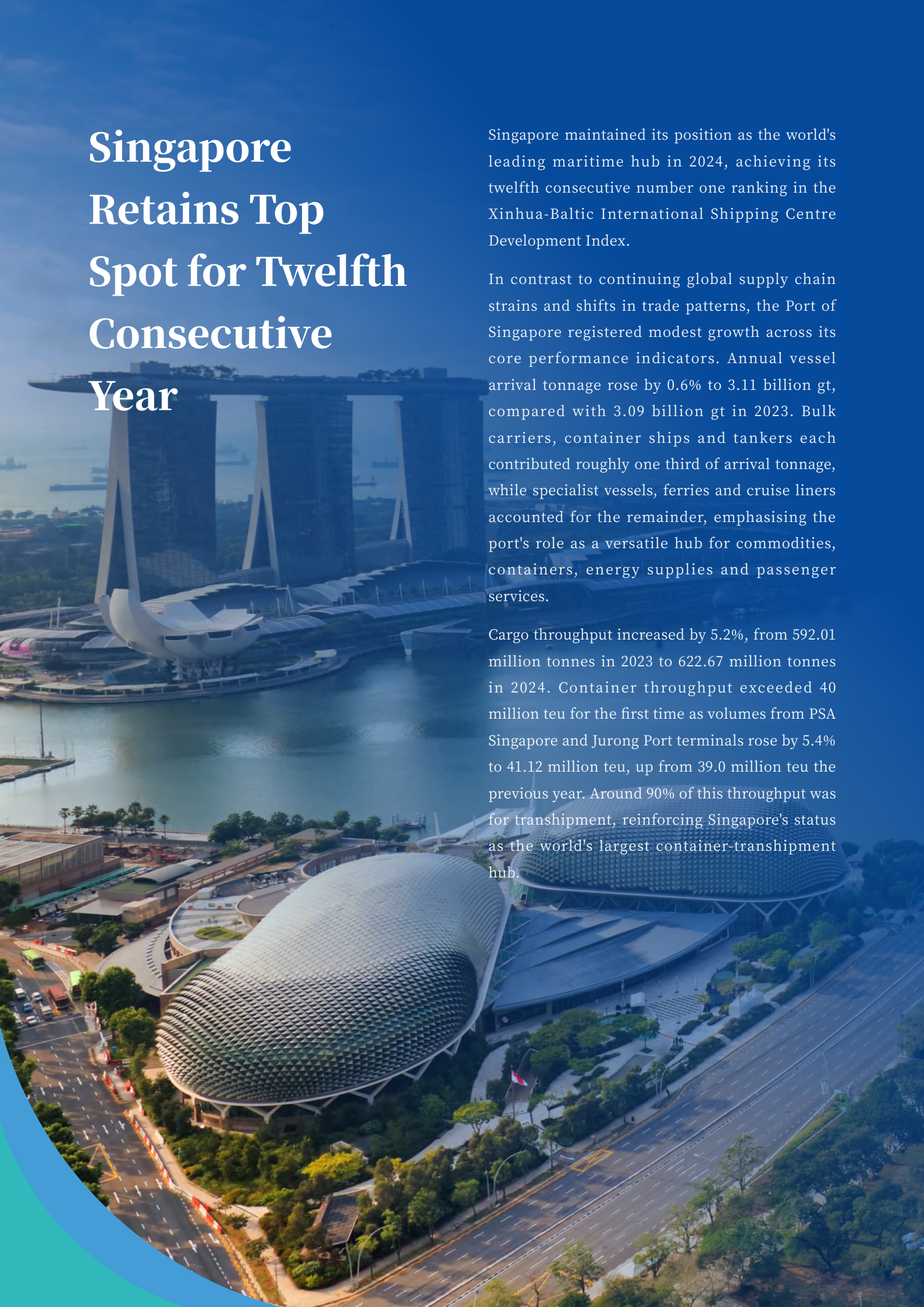
Chapter 3

MARITIME SHIPPING CENTRE RANKING ANALYSIS

1.1st to 10th Shipping Centres

2.11th to 20th Shipping Centres

Singapore Retains Top Spot for Twelfth Consecutive Year



Singapore maintained its position as the world's leading maritime hub in 2024, achieving its twelfth consecutive number one ranking in the Xinhua-Baltic International Shipping Centre Development Index.

In contrast to continuing global supply chain strains and shifts in trade patterns, the Port of Singapore registered modest growth across its core performance indicators. Annual vessel arrival tonnage rose by 0.6% to 3.11 billion gt, compared with 3.09 billion gt in 2023. Bulk carriers, container ships and tankers each contributed roughly one third of arrival tonnage, while specialist vessels, ferries and cruise liners accounted for the remainder, emphasising the port's role as a versatile hub for commodities, containers, energy supplies and passenger services.

Cargo throughput increased by 5.2%, from 592.01 million tonnes in 2023 to 622.67 million tonnes in 2024. Container throughput exceeded 40 million teu for the first time as volumes from PSA Singapore and Jurong Port terminals rose by 5.4% to 41.12 million teu, up from 39.0 million teu the previous year. Around 90% of this throughput was for transhipment, reinforcing Singapore's status as the world's largest container-transhipment hub.

Operational efficiency remained a priority as the port managed congestion caused by mid-2024 Red Sea disruptions. The Maritime and Port Authority of Singapore (MPA), PSA Singapore and industry unions introduced measures including commissioning new berths at Tuas Port, reactivating yard space at Keppel Terminal, increasing manpower, optimising feeder-line schedules and permitting night-tow operations for container barges at Pasir Panjang Terminal. These steps ensured that most container vessels completed both cargo handling and bunkering within a day of arrival, ensuring that port congestion was kept to a minimum.

Infrastructure expansion continued at the new Tuas Port. By the end of 2024, 11 berths were operational, with a further seven due by 2027. In November 2024, Evergreen Marine Corporation and PSA Singapore formed a joint venture to secure long-term terminal capacity for Evergreen's growing fleet of container vessels. This arrangement helped to ensure that Singapore remained a leading provider of stable, high-capacity facilities for major global carriers in a key maritime region.

Bunkering operations in Singapore saw growth in 2024, with total bunker sales rising by 6% to 54.92 million tonnes, up from 51.82 million tonnes in 2023. Extended Asia–Europe routes around the Cape of Good Hope contributed to higher fuel demand in Singapore as carriers sought alternatives to the disrupted Red Sea corridor. Sales of alternative fuels more than doubled to 1.34 million tonnes, with biofuel blends increasing from 520,000 tonnes to 880,000 million tonnes and LNG from 110,000 tonnes to 460,000 tonnes. Methanol bunkering reached 1,626 tonnes, while 9.74 tonnes of ammonia were trial-bunkered. In December 2024, MPA issued an Expression of Interest to explore sea-based LNG reloading and e-/bio-methane supply to complement onshore bunkering.

As an international maritime centre, Singapore continued to attract business investment. Total spending by key maritime companies under MPA oversight rose from SGD$4.8 billion in 2023 to SGD$5.2 billion in 2024. Nearly 200 international shipping groups remained headquartered in the city-state, and over 30 maritime firms in shipping, legal services, insurance, shipbroking and marine technology established or expanded operations during the year. Classification society RINA opened its Innovation Hub in Singapore in 2024, reflecting the port's growing role as a start-up incubator.

Singapore made steps to ensure it remains a leading maritime hub by introducing new regulatory reforms to lower operating costs. MPA announced plans to reduce the annual verification frequency of mass-flow metres from twice to once a year, in line with updated SS648:2024 standards, saving the industry an estimated SGD$300 000 annually. Risk-based audits continued, supporting the sector's transition to cleaner fuel options while maintaining safety and environmental standards.

The Singapore Registry of Ships (SRS) exceeded 100 million gt, as total tonnage under the Singapore flag rose by 8.5% from 99.6 million gt in 2023 to 108 million gt in 2024. Twenty-nine Singapore-flagged vessels received Green Ship Certificates under MPA's Green Ship Programme last year, while in April 2024, Eastern Pacific Shipping signed an MoU to register ammonia dual fuel newbuilds under SRS, indicating a move towards cleaner fleet expansion.

MPA advanced digitalisation and cyber-security measures to support port operations and maritime stakeholders last year. In April 2024, it announced the upcoming commissioning of the Maritime Testbed of Shipboard Operational Technology (MariOT) at the SUTD iTrust Centre. MariOT is an industrial-grade simulation platform featuring propulsion, machinery, power and bridge systems intended for cyber-security training and solutions testing in a controlled environment. An inaugural MariOT exercise in March 2025 involved MPA's Cybersecurity Network and international partners, allowing participants to simulate cyber-attack scenarios and refine response protocols. These efforts aim to bolster the resilience of both port and vessel operational technology against an evolving threat landscape.

Further digital initiatives include the rollout of electronic Bunker Delivery Notes in 2024 to streamline fuel reporting and the continued enhancement of DigitalPORT@SG ™ , a one-stop portal for maritime regulatory and port service transactions. Through these platforms, shipping lines and agents can complete bookings, submit declarations and track applications online, reducing administrative overheads and turnaround times. The expansion of PIER71 ™ , a port innovation ecosystem, saw start-up membership rise from 17 in 2018 to over 140 by the end of 2024, with these companies securing more than SGD$80 million in investment, including SGD$17 million during 2024 alone.

To support long-term competitiveness, MPA collaborated with industry and education partners to strengthen Singapore's maritime talent pipeline. In 2024 it worked with unions and training institutions to introduce accelerated mid-career pathways for seafarers, reducing training time and enhancing progression to leadership roles. These programmes cover areas such as alternative-fuel handling, digital port operations and maritime law, ensuring that both sea-going and shore-based professionals acquire the skills needed for a decarbonising and digitalising sector.

While Singapore's port operations made progress on alternative fuels and efficiency, the broader shipping industry continued to address greenhouse gas emissions. The doubling of alternative fuel sales and the pilot ammonia bunkering in Singapore highlighted practical steps towards decarbonisation. Singapore's approach combined infrastructure expansion, digitalisation, regulatory incentives and skills development to support both port users and flag-state vessels in meeting forthcoming IMO standards and national sustainability targets.

As Singapore enters 2025, its combination of steady volume growth, infrastructure expansion at Tuas, digital and cyber-resilience initiatives, talent development and sustainability measures underpinned its twelfth successive year at the top of the maritime index. The Port of Singapore's continued focus on efficiency, innovation and environmental stewardship positions it firmly in the front to navigate the evolving demands of global trade and regulatory change.

London sets the course for maritime's future

London has once again earned the silver medal in the Xinhua-Baltic International Shipping Centre Development Index, reflecting its status as the world's leading shipping centre for maritime professional and financial services. Despite facing strong competition, London's foundational strength and unique historical advantages means it is home to some of the biggest and most renowned names in professional shipping services.

This includes being the home for the International Maritime Organization, which is responsible for regulating shipping to ensure safety, environmental protection, and legal standards across international waters. Governments, officials and shipping players from around the world fly into London on a regular basis to ensure they are able to contribute to the ongoing work of the IMO, particularly for issues related to decarbonisation.

Beyond the IMO, the City of London hosts major maritime insurers such as the P&I clubs and Lloyd's of London that help to underwrite more than 60% of global hull, cargo and liability risks and ensure that shipowners, charterers and terminal operators can arrange cover for complex trades and novel fuel blends quickly.

Leading classification societies, including Lloyd's Register and DNV, also call London home, ensuring that the city plays a role in certifying vessel compliance with evolving safety and environmental standards. Their presence underpins confidence in the city's ability to handle advanced and eco-friendly vessels including dual-fuel and zero-emission ships.

London also remains the world's pre-eminent centre for maritime law and finance. Major City law firms have dedicated shipping divisions that advise on charter parties and sale and purchase agreements. They are also being increasingly called upon to handle sanctions compliance and green-fuel contracts as they become more commonplace in commercial shipping.

Meanwhile, the capital's financial markets facilitate debt and equity financing for a multitude of shipping ventures. While the majority of shipping finance is carried out by foreign banks, many have realised the importance of having a presence in London due to its synergies with law, insurers, brokers and operators. London continues to ensure its maritime finance operations remain world class by increasing shipping capital markets activity, and promoting the city has an attractive location for global financial activity.

One major deal of note took place in April 2024 when MSC utilised London's shipping services for a syndicated financing package for two new LNG-powered world-class cruise ships. This deal was significant, not just to showcase London's importance in helping to finance major new ship deals but to ensure London supports shipping's ongoing decarbonisation efforts and finance more environmentally friendly vessels.

Leading shipbrokers also maintain a presence in London, including Clarksons, Braemar, Simpson Spence Young and Howe Robinson. They facilitate vessel chartering, sale and purchase negotiations and provide freight-rate assessments that feed into Gateway's service offerings.

Baltic Exchange continues to maintain a key presence in the UK capital. Bringing together the world's ship brokers, owners and charterers, Baltic Exchange acts as a bridge between shipping and finance, offering real-time market insights and benchmark indices for dry bulk, tanker and gas shipping that are increasingly being used to price freight, settle derivatives and assess market

trends. For example, the Baltic Dry Index (BDI) remains a critical barometer of global trade activity and economic health, helping shipping players and the wider industry understand the real-time cost of moving dry bulk goods at sea.

Lloyd's Register, the renowned maritime classification society and risk management organisation, also plays a pivotal role in bolstering London's maritime status. Established in 1760, Lloyd's has a rich history of providing critical services to the shipping industry, including the certification of ships' seaworthiness and the development of safety standards. Its longstanding expertise and extensive network lend credibility and comprehensive risk management solutions to maritime stakeholders. This coverage is vital for maintaining the trust of global shipping lines, which prefer to operate in secure and well-insured environments and as a result, Lloyd's Register has become a renowned and well respected name in the industry.

Beyond these world famous institutions, the UK government remains a major champion for its maritime sector. Launched in 2019, the UK's Maritime 2050 framework has bolstered London's standing as a leader when it comes to maritime professional services, promoting and investing in innovative technologies, and pioneering methods to boost the sustainability credibility of the entire shipping landscape. This includes more than £206 million in its UK SHORE programme to tackle shipping emissions and more than £128 million awarded to technology companies through its Clean Maritime Demonstration Competition.

In October 2024, the UK Chamber of Shipping outlined a roadmap for the UK shipping industry to reach net zero by 2050, with a proposed £700 million investment to help make the United Kingdom a global hub for clean shipping. This includes through continuous research and development opportunities, boosting the shore power potential of UK ports, protecting essential ferry services from emission trading fees, and ensuring that the UK maritime sector has the necessary skills and workforce for the future. The report also calls for the UK to become a leading hub in future fuels. Currently, the UK provides about two million tonnes of fuel annually to commercial vessels, compared to Rotterdam's 10 million tonnes. As demand for alternative fuels grows, the UK is looking to plant its flag as a leader in the clean fuel industry.

Some evidence for this can already be seen. London's maritime training institutions, such as Warsash Maritime School and the Maritime and Coastguard Agency's Merchant Navy Training Board, offer courses in alternative-fuel handling, digital port operations and maritime law. In 2024, London hosted a series of joint workshops with local law firms and classification societies, upskilling 150 participants in green-fuel bunkering procedures and cyber-resilience for port systems. These collaborations underline how London's professional-services ecosystem supports the terminal's operational readiness for future fuel types.

Meanwhile, the City's Marine ESG Forum, which brings together insurers, banks and classification societies, set up working groups to standardise carbon-intensity disclosures for terminal operations.

London's ports, meanwhile, have seen major investment in 2024 to future-proof their operations. London's capital markets played a crucial role in underwriting DP World's £1 billion expansion of London Gateway, which

included sustainability linked loans. These green-loan arrangements require DP World to meet defined targets for reducing carbon emissions and increasing shore-power usage at London Gateway.

This financing package also signals investor confidence in the port's future throughput growth and its strategic importance to the UK economy. The allocation of proceeds specifically to the construction of two additional deep-water berths and a second rail terminal highlights how London's financial ecosystem can deliver bespoke funding solutions for specialist assets. This GBP1 billion investment not only accelerates London's ability to handle the world's largest container ships but also establishes a model for green infrastructure financing in the entire maritime sector.

The United Kingdom also remains a global leader in modern technologies, with automation trials at London Gateway drawing on advanced robotics and AI innovations. In 2024, DP World piloted automated stacking cranes in one yard block, achieving a 15% increase in stacking density and a 10% reduction in fuel use per move. London's academic institutions including University College London and Imperial College are collaborating on these trials, ensuring London remains at the cutting edge of port-automation research.

With six deep-water berths planned by 2030, a doubling of rail-lift capacity and a £1 billion expansion under way, London Gateway is set to increase annual capacity to over 8 million teu and potentially overtake Felixstowe as the UK's busiest container port.

While developments in London's port infrastructure will support the UK economy, it is its embedded and historical ties to the shipping industry that will ensure London has a place in global maritime institutions. From finance and law to broking and technological developments, London's position as the world-class centre of the maritime industry is well established and continues to flourish.

Shanghai Holds Top Container Spot

Once again coming third in the rankings, Shanghai retained its status as the world's busiest container port in 2024, marking its fifteenth successive year at the summit of global throughput rankings. Over the course of the year, it handled 51.51 million teu, surpassing its own late-December milestone of 50 million teu and representing a 4.8 % increase on the 49.16 million teu recorded in 2023.

In addition to its world-class port infrastructure, Shanghai's prominent position means hundreds of maritime companies have a presence in the city. Major insurers, such as China Pacific Insurance and Ping An Insurance, have specific marine divisions while almost all leading P&I clubs have a presence in Shanghai due to the city's proximity to major shipping lines. The Shanghai Free Trade Zone has also boosted the competitiveness of the city, enabling and encouraging international trade, leading shipping services and financial backing to attract maritime institutions to the city.

Similarly, Shanghai is also home some of the world's biggest shipyards and ship designers as more shipowners turn to China to build new vessels. China State Shipbuilding Corporation (CSSC) and its subsidiaries operate major shipyards in the region, while the city also offers ship repair, conversion, and maintenance services as more owners call or transit through East Asia.

Finally, Shanghai remains a powerhouse when it comes to finance and law in the maritime industry. State-owned banks and financial institutions, such as Bank of China and ICBC Leasing, offer critical leasing and structured finance options for shipowners, while many use Shanghai's bond and equity markets to raise much-needed capital. Shanghai also has specialised maritime courts and legal systems that are trained international maritime conventions and Chinese admiralty law. The Shanghai International Shipping Institute and China Maritime Arbitration Commission (CMAC) have seen increased use in recent years to resolve maritime disputes involving charter parties, bills of lading, collisions, salvage, marine insurance, and shipbuilding contracts.

As Shanghai continues to position itself as one of the world's biggest maritime centres, it is its world-class port infrastructure that keeps bringing an increasing number of shipowners calling at the port year on year.

Throughput trends at PSA China Terminals

in Yangshan and the automated facilities at Waigaoqiao helped to maintain year-on-year growth in Shanghai despite headwinds in world trade. Approximately 90% of the port's containers were transhipment cargo, highlighting Shanghai's role as a pivotal interchange linking East–West and North–South trade corridors. Its feeder alliances with inland terminals along the Yangtze River further extended reach into central China, enabling efficient inland distribution of imports and consolidation of exports for deep-sea shipment.

When congestion at the southern entrance to the Red Sea prompted carriers to reroute via the Cape of Good Hope, Shanghai's port community quickly adjusted quay schedules, increased night-shift manning and deployed extra yard cranes to clear sudden backlogs. Local reports indicate these measures kept average vessel turnaround within 24 hours, ensuring importers and exporters faced limited additional delay.

Infrastructure development continued apace, with enhancements at Yangshan Deep-Water Port and Waigaoqiao Phase 4 improving berth depth, yard capacity and rail connections. Although no new berths opened in 2024, Shanghai International Port Group (SIPG) completed dredging works and yard expansions to accommodate the increasing number of Ultra-Large Container Vessels (ULCVs) entering the global fleet, each of which is capable of holding up to 24,000 containers. In addition, SIPG inaugurated an upgraded rail terminal linking Waigaoqiao with Ningbo-Zhoushan, providing a secondary lifeline for container traffic in the event of waterway delays.

SIPG reported total revenue of RMB38.12 billion for 2024, a year-on-year increase of 1.51% compared with RMB37.54 billion in 2023. Net profit attributable to shareholders reached RMB14.95 billion, up 13.36% year-on-year, marking the fourth consecutive year that net profit exceeded RMB10 billion. However, net cash flow from operating activities declined by 31.26% to RMB9.221 billion. Quarterly net profits in 2024 were RMB3.70 billion in Q1, RMB4.72 billion in Q2, RMB3.40 billion in Q3 and RMB3.14 billion in Q4.

SIPG's home-port container throughput of 51.51 million TEU in 2024 meant Shanghai completed 103% of its annual target and making it the first port globally to exceed 50 million teu in a single year. Total cargo throughput at the home port was 580 million tonnes, up 3% year-on-year and

achieving 101.8% of its budgeted target. Bulk cargo throughput stood at 87.31 million tonnes, reaching 102.1% of target.

Nationally, Chinese ports handled 17.6 billion tonnes of cargo in 2024 (up 3.7% year-on-year), with foreign-trade cargo accounting for 5.4 billion tonnes (up 6.9%). Total container throughput across China reached 330 million teu, a 7.0% increase.

In 2024, the container shipping market saw stabilised freight volumes and increased demand on certain international routes. However, fleet expansion outpaced demand, with new vessel deliveries remaining high. Route disruptions, such as the Red Sea crisis and Panama Canal drought, maintained elevated freight rates on European and American routes, enhancing carrier profitability. Looking ahead, the market is expected to remain concentrated, with further adjustments to route networks. Trends such as vessel upsizing, new container alliances, digital transformation, green shipping and end-to-end logistics integration will continue to reshape the container industry, presenting both opportunities and challenges for China's ports, including Shanghai.

China's port industry development remained stable in 2024, supported by the country's economic resilience, growing domestic demand and regional integration. The Belt and Road Initiative and the Regional Comprehensive Economic Partnership (RCEP) are expected to further enhance trade cooperation and drive port growth, although external trade uncertainties persist. Key industry trends include increased reliance on major transhipment hubs, rapid development of inland multimodal transport networks, technological integration through 5G, AI and IoT, and a shift towards green and sustainable port operations.

Shanghai Port's 'Port +' digital platform continued to streamline processes for customs clearance, cargo release, fee payment and vessel scheduling. By mid-2024, more than 95% of declarations were submitted online, reducing transaction times by an estimated 30% compared with manual channels. This digitalisation method proved crucial during peak periods, preventing bottlenecks at Shanghai's inland terminals.

With alternative fuels picking up in popularity, SIPG has entered discussions to establish dedicated bunkering facilities for liquefied natural gas, methanol and ammonia. While detailed plans are pending, the intent is to offer shore-to-ship delivery of low-carbon fuels, positioning Shanghai as a key green-bunkering hub in East Asia.

It also announced plans to build its very first maritime decarbonisation centre to coordinate efforts on green fuel promotion, such as integrating research, policy making, standards development and green fuel trading. The centre will help China to lead the maritime industry's energy transition efforts, particularly with stakeholders across Asia.

In 2024 the Port of Shanghai successfully managed rising container volumes, maintained operational efficiency amid rerouting pressures, and deepened hinterland integration through feeder and rail alliances. SIPG's financial performance, marked by revenue growth, strong net profit and consistent dividends, complements its throughput leadership. As the port prepares for 2025, its focus on infrastructure enhancement, digitalisation, green bunkering and multimodal connectivity will be essential to sustaining its position in an evolving maritime landscape.

Hong Kong looks to turn the page

Hong Kong maintained its fourth-place position in the Xinhua-Baltic International Shipping Centre Development Index, reaffirming its long-standing position as one of the leading maritime hubs in Asia and reflecting its continued resilience amid ongoing supply chain and trade challenges.

In 2024, the Port of Hong Kong handled 13.69 million teu, a 4.9% decline from 14.38 million teu in 2023 and the lowest annual total since 1996. Total throughput comprised 10.35 million teu at Kwai Tsing Container Terminals and 3.34 million teu at other berths. Kwai Tsing's volume fell by 6.2% year-on-year, while other facilities recorded a smaller decline of 0.9%, driven largely by feeder and regional services. Transhipment cargo continued to make up around 85% of total throughput, although the absolute transhipment volume also decreased as lines increasingly routed boxes through Shenzhen and Guangzhou.

While Hong Kong has faced growing competition from other Chinese ports, there is also a growing need of the opportunity for local regulatory bodies to play a more strategic role—particularly in driving long-term investment in digitalisation, green shipping, and advanced port connectivity—to strengthen the city's position as a future-ready maritime hub.

Fortunately, Hong Kong made several noticeable moves in 2024 to help reestablish their credentials as a leading maritime centre and ensure they have a strong influence over the region's shipping space.

In October 2024, Hong Kong Chief Executive John Lee unveiled the newly rebranded Hong Kong Maritime and Port Development Board (HKMPDB), giving the new board greater independence and chaired, for the first time, by a maritime professional and supported by other experts from the shipping sector. HKMPDB will also be bolstered with additional research resources, greater funding levels, strengthening its mainland presence and promoting more sustainable development. Beyond the new board, Hong Kong is also putting more emphasis on developing high value-added and professional services by providing tax exemptions for ship leasing businesses and offering half-rate tax concessions for marine insurance, ship management, ship agency and shipbroking companies.

It also made headlines in the same month as it launched the Hong Kong Chamber of Shipping to boost its credentials as an international maritime centre. Established by Leung Chun-ying and industry leaders, the Chamber brings together major shipowners, operators and classification societies such as China Merchants Energy Shipping, COSCO Shipping (Hong Kong) and the China Classification Society's Hong Kong branch. It is hoped that Hong Kong's maritime, trade, financial, professional, and educational sectors can work together in tandem with those of mainland China to create a unified national maritime ecosystem, while moving towards high value-added activities within the industry.

Part of that strategy includes a major focus on alternative fuel development. This includes the development of a green shipping centre in Hong Kong to promote the greening of registered ships, a green bunkering centre and providing effective support measures for green bunkering. Studies conducted by Hong Kong agencies and private-sector partners are assessing the feasibility of LNG, biofuel and shore-power installations for ocean-going vessels, with the first shore-power facility slated to come online in 2026 to support the city's greenhouse-gas reduction commitments.

Despite falling throughput volumes, Hong Kong continues to develop its port infrastructure to ensure it can handle the increasing size of vessels in the global fleet.

In 2024, it optimised harbour-wide berth utilisation by rescheduling deep-sea calls and consolidating services into fewer, high-throughput terminals. Gate operations were extended, gate-in procedures were streamlined, and night-shift staffing was bolstered to reduce truck queuing and container dwell times. Early indications suggest that average gate turnaround improved by nearly 15% following these changes. Harbour pilots and towage operators also co-ordinated more closely to maintain vessel turnaround times, and contingency plans helped to avoid significant delays despite seasonal labour

shortages.

To enhance capacity and efficiency, Hong Kong continues to advance ongoing infrastructure projects. Expansion of the South-West Tsing Yi reclamation area, which will create additional container-stacking yards and support future terminal growth, remains on schedule for completion by 2026. Meanwhile, upgrades to the automated gate systems at Kwai Tsing are expected to boost processing throughput by up to 20%.

Digital transformation continued with the overhaul of the Port Community System (PCS). Since its mid-2024 relaunch, over 90% of customs, port health, quarantine and cargo-release declarations have been submitted electronically, significantly reducing paperwork and processing delays. The introduction of an API-based Cargo Real-Time Tracking service has given shippers end-to-end visibility of their consignments, helping to align Hong Kong's digital offering with those of competing hubs in the Greater Bay Area.

The reduction in container throughput has had direct implications for related sectors. The port underpins approximately HK$500 billion of trade value each year, and the 4.9% drop in container volume is likely to translate into a roughly 5% reduction in logistics and handling revenues. Bunkering sales also declined by an estimated 3% as fewer transhipment calls bypassed local facilities.

Maritime-related activities still account for around 5% of Hong Kong's GDP, supported by a strong group of financial and legal service providers specialising in trade finance, insurance and dispute resolution. The Hong Kong Shipping Register remained among the world's top 10 registries, with tonnage under the Hong Kong flag increasing by 2% to 20.8 million gt, as several owners reflagged vessels to benefit from the registry's reputation for high compliance standards.

The Port of Hong Kong continues to leverage its existing strength and harness new opportunities for growth. One potential avenue lies in handling high-value, time-sensitive goods such as pharmaceuticals and perishable products, where the port's proximity to Asia's financial and professional services centres can be an advantage. Trials of 5G-enabled robotics and AI-driven yard management systems are under way at Kwai Tsing, testing new methods to improve operational efficiency and reduce unit handling costs.

Despite another challenging year, there is an air of optimism in Hong Kong as it looks to turn the page and continue to compete as one of the leading international maritime centres in East Asia. Continued investment in infrastructure and digital expansion, supported by a more proactive and future-focused regulatory framework, can help reinforce Hong Kong's position as a leading maritime hub. As Hong Kong prepares for 2025, success will depend on its ability to harness its strategic location, regulatory framework and innovation to serve specialised cargo flows and maintain its role within a competitive Asia-Pacific maritime network.

Dubai looks forward as Middle East's maritime crown jewel

Maintaining its position as fifth in this year's rankings, Dubai continues to cement its position as the leading maritime centre of the Middle East.

Dubai is home to a full ecosystem of maritime service providers, from marine insurance and ship registries to ship building and repair services to handle the increasing number of vessel calls into the United Arab Emirates each year. Crucially, the Dubai International Financial Centre (DIFC) supports maritime finance, leasing, and legal arbitration, while the Emirates Maritime Arbitration Centre (EMAC) also offers world-class marine claims, charters, collisions, and cargo disputes resolution services.

While Dubai already has an established maritime ecosystem in place, it has ambitious plans for the future. Launched in 2023, the Dubai Marine Transport Master Plan aims to enhance the city's marine transport system by 2030. This includes by increasing the number of marine transport users and expanding the length of the marine transport network, as well as developing the Dubai Maritime City, a multipurpose maritime zone dedicated to international shipping, hosting classification societies, ship management firms and legal service providers.

This strategy is important as Dubai, and the Middle East region, is increasingly being called upon to handle more goods year on year as it sits in the major crossroad of leading trade routes connecting Asia, Africa and Europe. It is a major stopover point for east-west shipping traffic, and is increasingly being called upon to manage the rising number of e-commerce goods coming to market. As a result, its ports have seen major growth in recent years.

Jebel Ali Port in Dubai retained its status as the Middle East's foremost transhipment hub in 2024, underpinned by record cargo volumes and continued investment in infrastructure and services. Operated by DP World, the port handled 15.5 million teu in 2024, representing its highest annual container throughput since 2015. This performance accounted for nearly 18% of DP World's global container throughput of 88.3 million teu, reinforcing Jebel Ali's pivotal role within the operator's network.

Growth was driven by robust demand from Asia and the Indian subcontinent, the introduction of new shipping services that enhanced global connectivity, and efficient terminal operations that minimised delays despite challenges such as Red Sea re-routing.

Breakbulk cargo also saw substantial growth, rising by 23% year-on-year to reach 5.4 million tonnes in 2024. The rebound was fuelled by the UAE's expanding investments in infrastructure, renewable energy and industrial development. Jebel Ali handled major shipments of wind turbines, solar panels, heavy machinery and construction materials in 2024, with imports comprising 80% of the total. Major outbound commodities included sugar, iron and steel.

Jebel Ali's success is closely linked to the adjacent Jebel Ali Free Zone (JAFZA), which houses more than 9,000 companies engaged in manufacturing, logistics and trade. JAFZA offers customs-free import and re-export, 100% foreign ownership and streamlined licensing. The synergy between port and free-zone operations enables seamless cargo movement from vessel to warehouse, reducing supply-chain costs and handling times. In 2024, phase one of the new JAFZA Logistics Park was completed, adding extensive warehousing and distribution capacity to support growing cargo volumes.

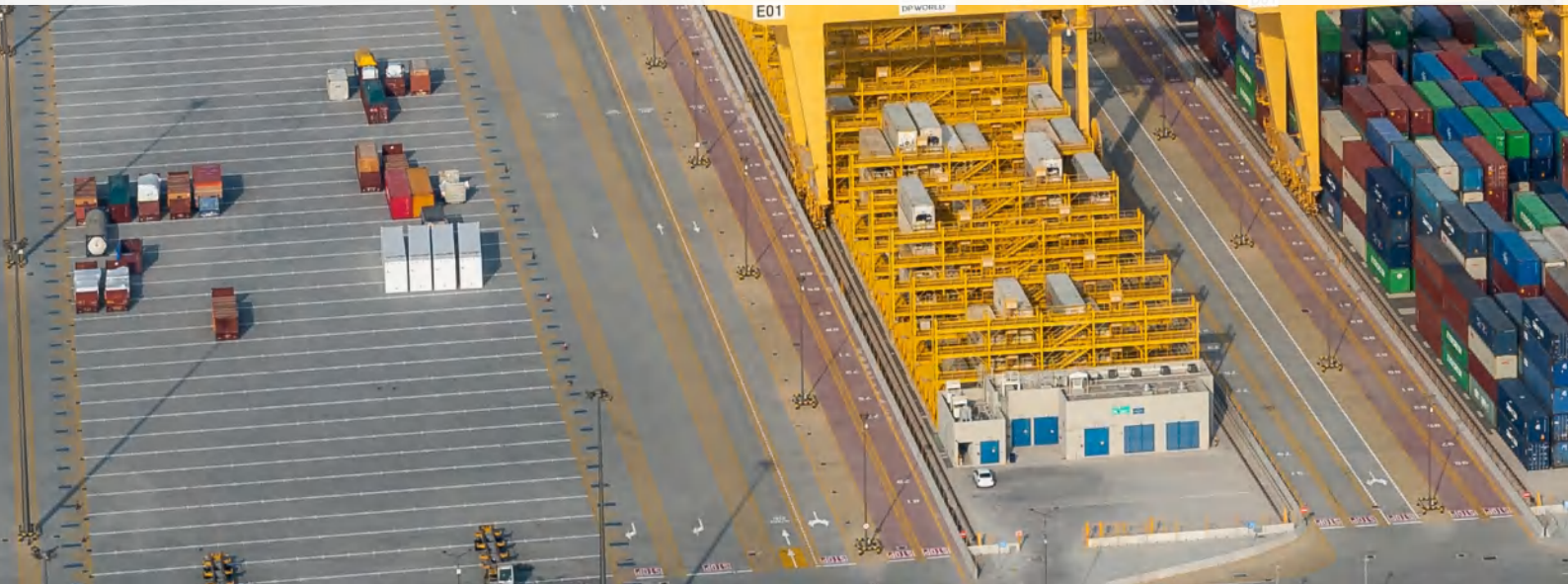
To accommodate larger volumes and the world's biggest vessels, DP World advanced several infrastructure projects at Jebel Ali. In 2024, additional yard space was commissioned and berth-deepening works continued, allowing the port to handle Ultra Large Container Vessels (ULCVs) of up to 24,000 teu. A third rail terminal was brought online in late 2024, boosting rail-lift capacity and connecting Jebel Ali directly to key inland depots in the UAE and Saudi Arabia. These upgrades underpin the port's ambition to maintain high productivity as container and breakbulk volumes grow.

DP World also invested in digital platforms and automation to keep cargo flowing smoothly. The port's Terminal Operating System was upgraded in 2024 to integrate vessel scheduling, yard management and truck appointments in real time. Chatbots and mobile apps now allow truck drivers to book slots and track container movements, cutting gate-in waiting times by up to 20%. Automated stacking cranes and remote-controlled rubber-tyred gantries were trialled in one container block, demonstrating a potential 15% increase in stack density and a 10% reduction in energy use per move.

Jebel Ali Port intensified its sustainability drive in 2024. Shore-power connections at Berth 2 were expanded, enabling vessels to shut down auxiliary engines while alongside and reducing local emissions. The port also launched a pilot biofuel bunkering service, supplying low-carbon fuel blends to calling vessels. Solar panels covering 50,000 m^2 of rooftop space now generate renewable energy for lighting and equipment, and electric straddle carriers were introduced in the container yard, cutting diesel use by an estimated 2,000 tonnes of CO_2 annually.

The port's record performance contributed significantly to Dubai's GDP, supporting an estimated AED120 billion of trade value in 2024. The expansion in container and breakbulk throughput sustained growth in allied industries such as trucking, warehousing, ship repair and bunkering. Bunkering sales at Jebel Ali increased by 4% in 2024, reflecting higher call volumes and the introduction of biofuel blends. The port's trade-facilitation measures, including single-window customs clearance and digital invoicing, have reduced dwell times for imports and exports by an average of 10 hours.

The UAE government continued to support port growth through strategic policy measures. Customs tariffs were streamlined under the GCC unified tariff code, and new free-trade agreements with India and the Eurasian Economic Union came into effect in 2024, boosting regional trade.



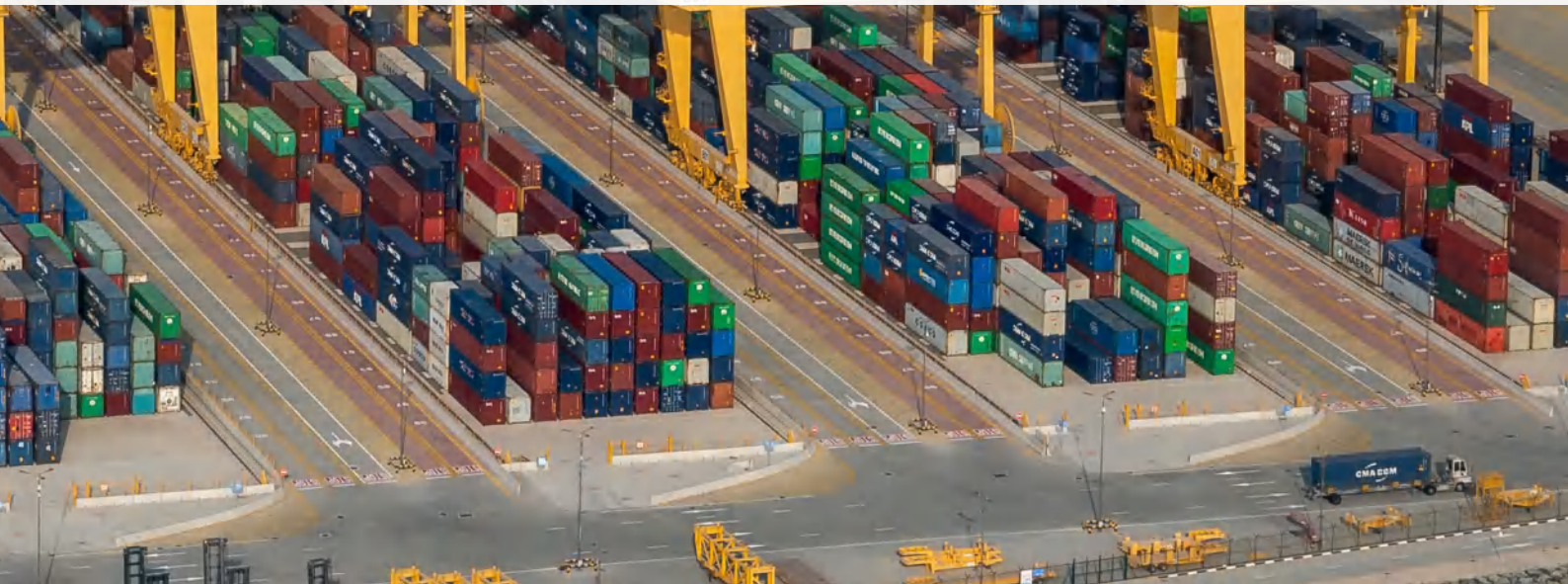
Jebel Ali's integration with the Al Maktoum International Airport cargo hub, via a dedicated rail link slated for 2025, will create a multimodal logistics corridor linking sea, air and land transport.

DP World partnered with the Higher Colleges of Technology and the Emirates Maritime Arbitration Centre to train 300 students in port operations, maritime law and sustainability. In October 2024, the company launched the "NextGen Ports" scholarship programme, offering internships and research opportunities in automation and green shipping. These initiatives aim to develop local talent and support the UAE's National Maritime Agenda.

Looking ahead to 2025 and beyond, Jebel Ali Port faces both opportunities and risks. Continued growth in e-commerce and industrial projects across the Middle East and Africa is expected to sustain cargo demand. However, geopolitical tensions in key shipping lanes and potential disruptions from Red Sea security risks could affect vessel schedules. DP World is exploring Blockchain-based supply-chain finance to provide cargo owners with secure, transparent financing options and mitigate payment-term risks.

In 2024, Jebel Ali Port achieved its highest container throughput since 2015 and delivered strong breakbulk growth, supported by infrastructure expansion, digitalisation and sustainability initiatives. The strategic alignment with JAFZA and Dubai's policy framework has reinforced the port's position as a regional trade gateway. As DP World advances its capacity upgrades and green-fuel trials, Jebel Ali is well placed to meet rising demand, foster economic diversification and maintain its role as the Middle East's leading maritime hub.

For Dubai as a whole, the local government's support to make the city a maritime centre of excellence continues at pace. As demand for leading maritime services and logistics needs increases in the Middle East, Dubai's position will become increasingly important.



Rotterdam stays the course

Coming in at sixth position once again, Rotterdam held its position as Europe's largest maritime gateway in 2024, weathering a tough trading environment while delivering solid progress on decarbonisation and modernisation.

Total throughput dipped slightly to 435.8 million tonnes, down from 438.8 million in 2023. Container volumes held steady at 13.8 million teu, with containerised cargo making up 133.4 million tonnes of the overall total. The port's financial performance was equally strong, with revenues climbing 4.8% to € 882.0 million and net profit reaching € 273.7 million, an increase of € 40.2 million on the year before. The results showed both commercial resilience and prudent financial management, which was no small feat given global circumstances.

Cargo flows reflect energy shift

Rotterdam's cargo profile continued to shift in response to broader changes in energy demand in Europe and regional climate regulation. Growth in dry bulk, particularly iron ore, agribulk and mineral oil products, helped balance sharp declines in coal and crude oil. Iron ore shipments rose as steel production picked up, while agribulk benefited from steady imports following poor harvests in parts of Europe. Breakbulk volumes slipped slightly, with global uncertainty dampening capital goods trade. Meanwhile, roll-on/roll-off cargo remained stable, supported by sustained demand for vehicle shipments between the Netherlands, the UK and Scandinavia.

Transhipment traffic, both short-sea and deep-sea, maintained momentum through improved rail and barge connectivity, with operators reporting improved hinterland clearance rates thanks to digital scheduling and reduced congestion at terminals. The port's central position in north-western Europe, combined with its ability to handle multi-modal cargo efficiently, continued to underpin its competitiveness.

Climate strategy moves forward

When it comes to environmental progress, the standout development in 2024 was the Porthos carbon capture and storage (CCS) project, which is considered one of Europe's most ambitious CCS initiatives.

Following a final investment decision in late 2023, this past year saw the construction of a compressor station and pipeline development at Maasvlakte. Once operational, Porthos will store over one million tonnes of CO_2 emissions annually from port-based industries. The project is backed by a consortium of government and industrial partners and is expected to lay the groundwork for a broader CO_2 transport and storage ecosystem in Europe, including the proposed Aramis expansion that could link to cross-border facilities.

Overall emissions from port activity, combining Scope 1, 2 and 3 sources, stood at 2.16 million tonnes of CO_2 in 2024. This continued the downward trajectory from 2023, when emissions first fell below 1990 levels. Rotterdam remains aligned with national and EU targets to cut emissions by 55% by 2030. Its strategy is built on a combination of carbon capture, electrification, digital optimisation and clean fuel access.

In parallel, the port pursued further development of its circular economy zones, aiming to attract bio-based industries and recycling specialists to the western docklands. These clusters are intended to operate alongside conventional cargo terminals, demonstrating how legacy port infrastructure can be adapted for sustainable industrial use in today's modern maritime economy.

Infrastructure and digital growth

Hydrogen infrastructure also advanced, with Rotterdam initiating planning for a new pipeline linking industrial users across the Rotterdam cluster. The network is intended to serve projects such as Shell's Holland Hydrogen I electrolyser and forthcoming ammonia terminals. With completion scheduled for 2025–26, the infrastructure is expected to unlock the wider hydrogen economy and cement Rotterdam's role as a key import and conversion hub for clean fuels in Europe.

WarmtelinQ, the regional district heating network, moved closer to full deployment and will distribute residual heat from port industries to nearby towns and cities by 2026 or 2027. The

project will reduce household emissions across the region and further improve Rotterdam's overall energy efficiency. Meanwhile, the Netherlands' new energy board boosted the port's access to vital renewable electricity supplies, which have become increasingly important as new facilities such as shore power stations, data centres and electrolyser plants come online at Rotterdam.

Investments in shore power also continued, allowing more cruise and container vessels to plug into the local grid while berthed. The upgraded infrastructure supports compliance with upcoming EU FuelEU Maritime regulations and improves air quality in high-traffic berthing zones.

Beyond infrastructure, the port stepped up its digital transformation. Rotterdam expanded its Secure Chain system in 2024, introducing virtual perimeter control and digital PIN-code validation to improve container security and prevent fraud. The programme now covers all major terminals and logistics parks. It is complemented by the Port Reference Architecture, a shared digital logistics framework used by shippers, barge operators and inland depots for coordinated scheduling and asset visibility.

Capital investment reached € 320.6 million in 2024, an 11% annual increase compared with 2023. Projects included quay-wall reconstruction at Prinses Amaliahaven, the expansion of the Container Exchange Route and the start of construction on Portlantis, a new visitor and knowledge centre focused on the energy transition.

Community focus and year ahead

Social and governance measures remained embedded in Rotterdam's overall strategy. Rotterdam's stakeholder satisfaction scores ranged between 7.4 and 7.7 out of 10 in 2024, reflecting consistently high ratings across infrastructure, customer support and communications. Over 200 status-holders and asylum seekers were brought into the port labour force through targeted support schemes. The Human Capital Coalition continued to promote diversity and workforce development across the logistics sector.

The port also maintained its focus on safety, implementing updated training modules for terminal staff and refining incident response protocols. Across the port area, the number of serious incidents remained low, with continued improvements in reporting and contractor oversight contributing to a positive safety culture.

Looking to the year ahead, the Port of Rotterdam is focused on delivering its next wave of green infrastructure while maintaining its lead as a European logistics hub. The CCS rollout, hydrogen corridor, and further grid modernisation are all scheduled for 2025. These efforts are designed not only to safeguard throughput but to transform the port's long-term sustainability and competitiveness.

Reflecting on the year, CEO Boudewijn Siemons said: "Together we are building tomorrow's sustainable port." It is a sentiment echoed across Rotterdam's operations. This is a port focused on leadership through transition, balancing trade growth with climate responsibility.

Ningbo-Zhoushan continues its container climb

Highlighting its increased importance to commercial shipping, the Port of Ningbo-Zhoushan rose one place in this year's rankings, overtaking Athens to reach seventh in the Xinhua-Baltic International Shipping Centre Development Index. This is the fourth year in a row that Ningbo-Zhoushan has risen in the ranks as the Chinese port continues to dominate the container market and ensure that China remains the world's leading exporter for containerised goods.

Globally, Ningbo-Zhoushan Port jumped to fourth place among global container ports in 2024, overtaking Busan in South Korea for the first time with a record 39.3 million teu moved. The rise marked its highest position yet and reflected an 11% increase in container traffic compared to the previous year.

The result came amid a broader rebound in shipping volumes across China's eastern seaboard. While total cargo throughput also reached new heights at 1.37 billion tonnes, up 4%, it was container handling that stole the spotlight. The port's operators credited expanded rail links and long-haul service restarts for the sharp increase in 2024.

In financial terms, listed entity Ningbo Port Co., Ltd reported RMB 28.7 billion in annual revenue, a rise of just over 10% year on year. Net profit edged up by nearly 5%, reaching RMB4.898 billion. These results were supported by stable growth in both container and bulk trade, as well as modest increases in value-added logistics services.

Ningbo-Zhoushan's continued growth has come amid challenges to the port's inland connections, which has been strained over growing volumes. However, its continued resilence to handle greater cargo volumes shows Ningbo-Zhoushan's forward-thinking and positive approach to supply chain challenges.

Container growth drives inland reach

Container performance defined Ningbo-Zhoushan's year. The 39.3 million teu figure represented the strongest annual growth since before the pandemic. That jump helped close the gap between mainland China's top four ports, now all positioned in the global top tier.

In September 2024, the port announced plans to build a new terminal in the Liuheng port area that will be able to handle ultra-large container vessels of up to 24,000 teu. Once fully operational in 2030, these two new berths will be able to handle an additional 2 million teu per year

Behind the headline figures was a shift in flow patterns. The port reported rising volumes on both transpacific and intra-Asia routes, as well as greater use of its inland multimodal network. More than 1.8 million teu moved via sea–rail corridors, with trains now serving over 60 inland cities. Operators pointed to stronger coordination between shipping lines and rail hubs as a driver of that increase.

The expansion comes as Zhejiang province continues its manufacturing boom, with industrial output from Ningbo, Hangzhou and surrounding cities driving demand for raw materials and export capacity.

Meishan Port continued to expand its footprint. A tenth berth came online in 2024, making it the only location in the world with two terminals each handling over 10 million teu annually. On the bulk side, the newly-extended Shulanghu terminal successfully completed parallel unloading of two 400,000-tonne ore carriers, an industry first that demonstrated progress in large-vessel handling and efficiency gains in bulk operations. This development is crucial for Ningbo-Zhoushan's long-term bulk handling capacity as it looks to boost its unloading capabilities by 30% to reach 50 million tonnes annually.

But perhaps more telling is how the port now connects with the rest of the world. Ningbo-Zhoushan now operates more than 300 container routes, with 250 of them linking directly to overseas ports. The network spans over 200 countries and regions and continues to deepen its role in Belt and Road and RCEP-related logistics chains.

Smarter terminals, greener energy

Alongside volume growth, 2024 saw the reveal of the 2035 Overall Plan for Ningbo Zhoushan Port.

The plan is a long-term strategy to develop the port into an even greater global maritime hub, with the capacity to handle up to 60 million teu and 1.8 billion tonnes of cargo each year. With up to 30 new projects kicking off over the next two years, including expansions at key facilities like the Fodu container terminal, the Daxie container terminal, the Meishan roll-on/roll-off terminal, and the Jintang new materials project terminal, Ningbo-Zhoushan continues to make good progress to future-proof its operations.

This includes steady investment in terminal automation and energy infrastructure. Ningbo-Zhoushan expanded the rollout of AI-driven yard planning tools and digital scheduling platforms. Truck appointment systems were scaled up to manage gate flow, while real-time dashboards helped coordinate between customs, terminal operators and freight forwarders.

At Meishan Island, testing of autonomous terminal vehicles continued across selected zones. AI-assisted gantry cranes also saw wider use, with early signs of improved lift rates and reduced idle times. These upgrades form part of a longer-term transition towards semi-automated operations across the port's largest terminals.

Meanwhile, clean energy infrastructure at the megaport gained momentum in 2024, led by the launch of a wind, solar and battery facility at Meishan. The site generated more than 60 million kilowatt hours over the year, helping reduce reliance on grid electricity for shore power and administrative functions.

Further steps were taken on the decarbonisation front. The port signed new green shipping corridor agreements with Hamburg, Wilhelmshaven and Valencia, joining other Chinese hubs in exploring zero-emission routes.

While implementation remains at an early stage, port authorities confirmed that work had begun on aligning vessel schedules, fuel availability and landside support.

Electric vehicles and handling equipment also became more visible across several terminals. A transition plan for full electrification is now underway, with initial results showing energy and emissions savings in targeted areas.

Environmental initiatives extended to biodiversity measures. Trials of floating ecological platforms and expansion of greenbelt zones were introduced near key berths in line with national port sustainability benchmarks.

Ningbo-Zhoushan's rise in 2024 marked a clear shift in the global port landscape. While the port continues to lead on raw throughput, its gains in container traffic and smart infrastructure suggest a more diversified growth model is taking shape.

That said, the momentum will be tested. Competition with peers in mainland China and East Asia remains strong and sustaining double-digit container growth may prove difficult if global demand softens. Nevertheless, the port's positioning, supported by intermodal links and a growing digital toolkit, gives it a strong base heading into 2025.

Whether it can continue climbing the global rankings will depend not just on volumes, but on how well it manages complexity as expectations grow.

Athens–Piraeus quietly pushes forward

Despite falling one place in the rankings, Athens–Piraeus confirmed its standing in 2024 as one of the Eastern Mediterranean's most stable and strategically aligned ports, and reaffirmed Greece's position as one of the leading maritime nations in the world.

Greece continues to play one of the most significant roles in the global maritime sector, with more than 1,000 shipping offices having a home in either Athens or the wider region of Attica. As of 2022, more than 5,500 vessels, or approximately 20% of the global fleet are owned by Greeks, according to the Union of Greek Shipowners (UGS). The power of the Hellenic maritime community has only improved over the past decade as this number has grown more than 53%.

The dominance of Greek shipping is underpinned by tankers and bulkers. According to UGS data, Greek shipping constitute 30% of the world's tanker fleet, 25% of the bulk carrier fleet, 23% of LNG carriers, 15% of chemical and product carriers and 13% of LPG carriers. However, only 8% of the world's containerships are Greek-owned.

As it continues to help shape the future of the maritime industry, Athens is gaining a large amount of traction for its involvement in developing leading maritime technologies. The Greek capital is home to a number of innovative and dedicated technological start-ups that work closely with the large shipowning community in Athens to develop unique and modern solutions that are boosting the capabilities and efficiencies of fleet managers. These tech companies are now spreading their wings, setting up shop in Asia and bringing those solutions to shipowners all over the world.

Like the rest of global shipping, the Port of Piraeus was no stranger to the issues affecting supply chains and cargo throughput. However, against a backdrop of economic strain, regional volatility, and shifting shipping patterns, the port continued to deliver across cargo, cruise and vehicle segments while scaling up long-term investments in capacity, energy transition, and digital infrastructure.

Total revenue for the calendar year rose to € 230.9 million, marking a 5% increase from € 219.8 million in 2023. Meanwhile, net profit after tax reached € 87.5 million, up more than 30 percent on the € 66.8 million reported a year earlier.

Cargo, cruise and coastal volumes

Container throughput was solid, though down year on year. In 2024, the port handled 4.79 million teu, compared to 5.10 million teu in 2023. This drop reflected broader global pressures from rerouting and overcapacity, particularly affecting transshipment hubs. However, Pier I, which is directly managed by the Piraeus Port Authority, recorded a 9% increase to 563,725 teu. This demonstrated resilience in domestic logistics flows and the growing competitiveness of Pier I's integrated offering.

The vehicle terminal saw a remarkable rebound. Piraeus handled 247,600 vehicles in 2024, up sharply from 153,381 in 2023. That 61.6% increase pointed to a resurgence in regional car flows and improvements in export logistics.

Cruise volumes also reached record levels. The port welcomed 1,698,877 cruise passengers, up 14.4% from 2023's figure of 1.48 million. Homeport traffic increased by 26.5%, with operators citing Piraeus's efficiency and air connectivity. Cruise-related revenues totalled € 30.4 million. EBITDA stood at € 16.8 million, reflecting a solid return from cruise's rebound and improved seasonal scheduling.

Coastal shipping continued its stable growth trajectory. Ferry traffic reached 17.05 million passengers, up from 16.16 million in 2023. The port recorded a six percent uplift in service frequency and island routes.

The year saw a continued focus on safer access controls, crane operations, and perimeter lighting, which resulted in recorded incidents declining for the second consecutive year. Internal safety audits stepped up in high-traffic areas, with Port management noting improved contractor compliance and stronger integration of HSE protocols across all terminals.

Strategic investments and project delivery

Capital expenditure more than doubled year on year. Piraeus invested € 64.3 million in 2024, a substantial increase on the € 22.8 million from 2023. Key investments included a new cruise terminal building and related infrastructure, with a total budget commitment of € 136.3 million. Additional funds were directed toward Pier I upgrades, including resurfacing and crane electrification, totalling € 8 million. Ro-Ro terminal enhancements were also delivered, at a cost of € 20 million.

The port authority also advanced the design and funding process for a smart energy network covering key piers and administrative buildings. These projects reflect the port's ambition to meet new environmental standards while creating economic opportunity.

Digital systems also saw marked improvements. The core ERP platform was upgraded and integrated with a new vessel traffic dashboard. Smart container tracking trials were extended to external terminals. The port also deepened its involvement in EU-backed digital corridor and smart port programmes to harmonise customs, logistics and vessel data into a single operational interface.

The cruise expansion project moved into the construction phase, with key works scheduled for completion in 2026, while the port started work on ferry electrification upgrades These forward-looking initiatives align with the port's long-term plan to remain competitive across both cargo and passenger segments.

Environmental priorities and public value

Environmental performance remained steady at Piraeus. The port spent € 1.7 million on sustainability initiatives for the second year in a row, which included noise mapping, waste recovery upgrades, and vessel cold ironing. Certification under the EcoPorts environmental review system was renewed, and full compliance with IMO and EU environmental obligations was maintained. Emissions monitoring and incident reporting were updated to new software platforms to enable real-time oversight of pollutants and response measures.

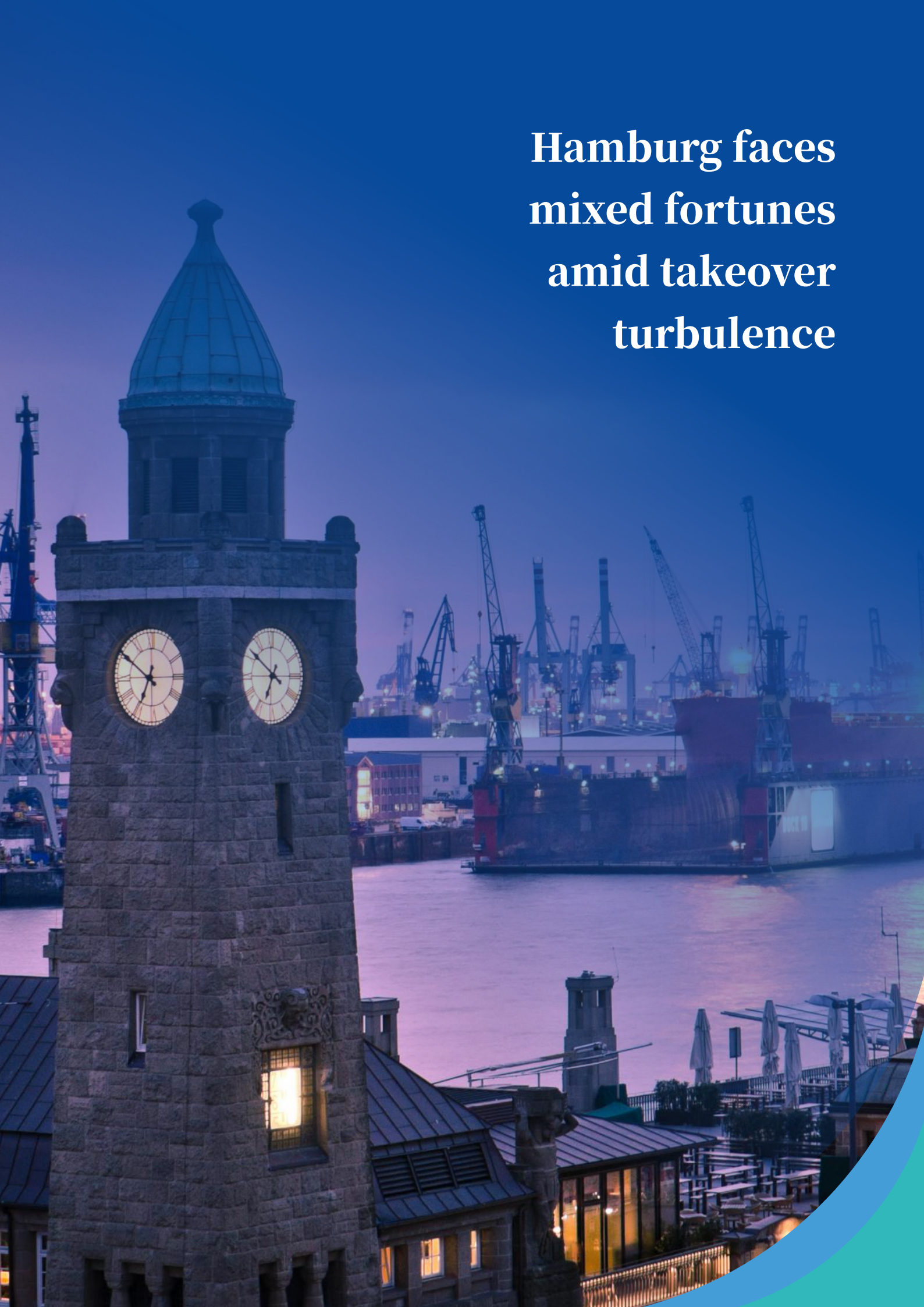
The port continued to invest in environmental training, with 500 staff and contractors participating in green operations seminars during the year. Renewable energy procurement trials were launched for selected buildings and pier lighting. The port authority reaffirmed its commitment to full electrification of coastal shipping berths by 2030.

Forward momentum in 2025

Looking ahead, Athens–Piraeus is set to continue its strategic transformation. Key focuses in 2025 will include progressing the cruise terminal project, scaling shore-side electrification, and deepening integration with hinterland logistics infrastructure. Smart systems and emissions data tools will also be extended across ferry and cruise operations.

The port's leadership called 2024 a landmark year across all strategic axes. That sentiment appears justified. Piraeus is quietly managing growth through focus, investment and a long-term outlook. In a region marked by uncertainty, the Greek gateway continues to lead through calm delivery and sustained results.

Hamburg faces mixed fortunes amid takeover turbulence



Retaining its ninth-place ranking, Hamburg remains one of Europe's most predominant maritime centres. With key logistical routes to the North Sea, the Port of Hamburg handles a significant amount of cargo traffic each year that look to access Central and Eastern Europe.

Germany's maritime prowess continues to be renowned internationally as a leading import and export market of maritime products, technologies and services. In 2023, Germany's maritime industry was worth roughly USD93 billion in annual revenue, supporting more than 450,000 jobs in around 2,800 maritime-linked companies. Germany is also home to around 130 shipyards which provide services relevant to commercial, inland, recreational craft building, naval shipbuilding, and general repairs and conversions. In 2024, the shipbuilding industry employed roughly 15,000 people and generates annual revenues worth USD6.17 billion. Germany's ports, led by Hamburg, directly support about 36,000 jobs, as well as 124,000 port-related logistics jobs.

With a history dating back more than 800 years, the Port of Hamburg now boasts state-of-the-art facilities, including four modern container terminals, over 50 multi-purpose berths, and extensive warehousing and logistics centres. These facilities enable it to manage a diverse range of cargo types, from bulk goods and containers to specialised project cargoes. The port is also integrated with a robust network of rail, road, and inland waterways, facilitating seamless intermodal transport across Germany and wider Europe.

The port has not been without controversy, however. In September 2023, the Port of Hamburg announced that Mediterranean Shipping Company (MSC) was looking to purchase a 49.9% share in the port, resulting in it becoming a joint venture managed between MSC and the City of Hamburg. Following the deal, MSC will gradually increase its handling volume to 1,000,000 teu by 2031 and move its German headquarters to Hamburg. The move, which is estimated at nearly USD1.4 billion, has received criticism from both unions and political opposition, although political leaders have reinforced the move as a positive for Europe's maritime sector.

Strikes and protests against the deal occurred in Hamburg in 2024 as many demanded stronger wage protections and union involvement in the MSC deal amid fears of job losses. It was also another pushback against private ownership of a major German public asset. Despite the opposition, the deal was approved in November 2024. Following the conclusion of the deal, MSC and Hamburg have pledged more than USD475 million to support additional upgrades and investments to ensure that the Port of Hamburg has long-term viability.

While the deal dominated Germany's headlines in 2024, the Port of Hamburg itself saw mixed throughput results.

Total cargo throughput declined year on year to 111.8 million tonnes, down from 114.2 million tonnes in 2023 and continuing a downward trend that Hamburg has experienced since 2021. One of the leading reasons behind the fall was Germany's decarbonisation push and energy transition, which reduced the demand for coal and oil as it switched to natural gas instead. As a result, dry bulk cargo volumes fell 8.6% year on year and mineral oil imports declined 21.7% as Germany turned to cleaner energy options. There were some bright spots, including a 5.6% increase in

oilseed imports and 9.4% in animal feed exports. Despite these gains, the cargo throughput volume trend continues to decline in Hamburg.

On the other hand, container throughput in Hamburg increased by 0.9% to 7.8 million teu. Trade with China grew by 0.7% to 2.2 million teu, maintaining its position as Hamburg's largest trading partner, while second-place United States saw larger improvement, rising 5.0% to a record 685,000 teu. Other major trading partners include Singapore, Poland, Sweden, Finland, the United Kingdom, India, Malaysia, and Canada. Container trade remains vital to the Port of Hamburg, accounting for nearly 70% of total throughput.

The Port of Hamburg continues to undergo a number of major infrastructure projects to future-proof its operations. One key area of development for the region is in the development of alternative fuels for residential and commercial use.

In July 2024, energy company Mabanaft agreed to construct an ammonia import terminal at the Blumensand tank terminal in the Port of Hamburg to help expand the country's hydrogen development. The facility, which is scheduled to open in 2027, is a major project designed to secure Germany's energy independence and provide a green energy option for commercial vessels calling at Hamburg. In addition, momentum gathered in 2024 as the new Hamburg Green Hydrogen Hub saw new pipeline networks and electrolysers installed, further boosting Germany's clean energy credentials.

Work also continued in 2024 at Hamburg's cruise and container terminals. A new onshore power plant was activated at Cruise Centre Steinwerder and Altona in 2024, doubling the energy capacity of 2023 and supporting the more than 140 cruise ships that call at Hamburg each year. Meanwhile, container terminals at Burchardkai, Tollerort, and Eurogate have also installed cold ironing systems to provide clean energy to vessels while at berth, improving Hamburg's sustainability credentials.

The Port of Hamburg also continues to innovate at pace. In October 2024, Hamburg signed a deal with the Saudi Ports Authority to advance innovations in port operations, port development, and workforce capacity building. Work also continued to establish Hamburg's official 5G network, scheduled to come online in 2025, while the port introduced a new digital truck checkpointing system to support over 200,000 trucks accessing the port each year. Other developments include a new berth-scheduling platform to coordinate more than 5,000 port calls per year, a new drone system to support crane inspections, and the rollout of autonomous electric trucks.

Overall, it was a positive year for Hamburg in 2024. Total throughput, when accounting for all cargo and containers, held steady year on year, and the port continues to lead the way in digitalisation and clean energy development in Europe. However, continued controversy surrounding the takeover of the Port of Hamburg loomed large in 2024, so only time will tell how this will impact the maritime centre going forward.

New York/New Jersey battles through a choppy 2024

Cementing its place in top 10 in the Xinhua-Baltic International Shipping Centre Development Index, the New York/New Jersey maritime cluster remains one of the world's leading hubs for shipping finance, maritime law and a host of owners, operators, brokers and charterers.

Long heralded as the 'Gateway to North America' and the birthplace of container shipping, New York's maritime industry is responsible for supporting more than 500,000 jobs and tens of billions of dollars in local and regional economic activity, including customs duties, shipping, warehousing, trucking, and rail logistics.

At its core, New York is the epicentre for private equity, bonds and alternative financing all of which provides much needed capital to the maritime industry. Similar to its European rivals, such as London and Athens, New York is home to key financial institutions, law firms, insurance houses, brokerage firms, and arbitration services that are crucial to the successful running of the maritime industry.

As a result, the New York Stock Exchange remains a vital part of the maritime sector, with dozens of major shipping names, including Ardmore Shipping, Carnival, Dynagas, Eagle Bulk, Frontline, Navios Maritime, Norweigian Cruise Line Holdings, Royal Caribbean, Scorpio Tankers, and Tsakos Energy Navigation, present on the exchange. More shipping companies are listed on the New York Stock Exchange than any other exchange in the world.

With approximately one-third of the United States' population living on or near the East Coast, the Port of New York and New Jersey has remained one of the top three busiest port clusters in the entire country. This is due to the overwhelming volume of imports arriving to support America's thriving economy in 2024, particularly in this affluent and densely populated area.

According to the Port Authority of New York and New Jersey, 2024 marked the third-busiest year for the port, behind the pandemic-driven totals of 2021 and 2022. In 2024, the port handled 8.7 million teu, an 11% jump on last year's figures and a reflection of the shipping industry's confidence to use New York/New Jersey as a reliable and efficient cargo port.

Notably, the Port of New York and New Jersey proved to be a vital hub in March 2024 when the Francis Scott Key Bridge collapse closed Port of Baltimore, causing dozens of vessels, many of which were car carriers, to reroute to other ports along the East Coast. As a result, New York experienced approximately 10% higher volumes during this period of disruption, as four in 10 vessels were sent to New York/New Jersey. However, despite concerns that these unexpected diversions and constrained capacity could cause bottlenecks in the supply chain, adding to constraints on labour, equipment handling and trucking availability, New York demonstrated tremendous adaptability to minimise disruption and keep vessels and cargo moving across the East Coast.

Another major period of disruption came in early October 2024 as more than 47,000 dockworkers represented by the International Longshoremen's Association (ILA) walked off the job at 36 major East and Gulf Coast ports, including New York/New Jersey, to protest working conditions, automation concerns, and wage issues. The strike triggered widespread disruption to cargo operations. Ships were stalled in the harbour, and cargo movement was severely delayed, straining supply chains in the region. Fortunately, a deal

was struck, which included wage increases and a curb to automation efforts, and dockworkers returned a few days later. Despite immediate concerns, New York/New Jersey was able to avoid a prolonged shutdown in 2024, providing stability through to 2030 as the port adapts to post-pandemic cargo surges and shifts toward larger container vessels.

The Port of New York and New Jersey continued to look ahead in 2024, announcing several major new funding and development projects to shore up the port for future operations. All of this falls under the port's Port Master Plan 2050, which provides a full roadmap to chart the course for future growth and development in New York. The 30-year plan includes developments to container facilities, automobile terminals, dry and liquid bulk cargo operations, cruise terminals, and ferry landings.

In March 2024, APM Terminals (Maersk) extended its Port Elizabeth lease through 2062, committing over USD500 million toward berth maintenance, zero-emission handling equipment, and expanded capacity. Work also continued last year on the USD220 million Port Street Corridor Improvement Project to enable safer, more efficient trucking operations.

Last year also saw a major ownership trade-off as the Port Authority of New York and New Jersey took full control of the Howland Hook Marine Terminal while the city of New York took over the Port Authority's half-ownership position in the Brooklyn Port Authority Marine Terminal at Red Hook. This deal is part of a USD350 million funding to fully optimise the region for international cargo handling and low-carbon, last-mile freight movement. Specific developments will include modern electric cranes and new cold storage facilities. It is believed that the new development, which is also supported by CMA CGM, will boost the facility's capacity by 50% over the next seven years and enable it to handle up to 750,000 containers per year.

New York also made major steps in 2024 to advance its offshore wind sector. In February 2024, New York approved Equinor's plans for a state-of-the-art operations and maintenance (O&M) facility at SBMT for Empire Wind 1, which, when fully operational, would supply 3.3 GW, or enough to power more than 2 million New York homes. Ground was broken on the 73-acre site in June 2024, making it the United States' largest dedicated offshore wind port. At the same time, Skanska secured an USD861 million contract to convert Empire Wind & South Brooklyn Marine Terminal (SBMT) into a renewable manufacturing hub, including dredging, heavy-lift crane pads, new wharf, utilities, and warehousing.

Despite the numerous challenges that 2024 posed to the region, New York and New Jersey demonstrated resilience and adaptability to continue providing the US East Coast with the efficient port operations it requires. The continued investment in port infrastructure, alongside the city's prominent position as a leading shipping finance centre, means that New York will continue to have a major part to play in international shipping.

Houston: A powerhouse for the US Gulf

Port Houston in Texas maintained its status as one of the United States' leading ports in 2024, showing impressive resilience and performance despite headwinds ranging from global market shifts to significant labour disputes. Supporting nearly 1.5 million jobs in Texas alone and 3.4 million jobs nationwide, Port Houston is involved in more than USD900 billion in economic activity across the US.

Container volume remained strong throughout the year, with the port handling more than 3.8 million teu. This represented a slight year-on-year increase and underscored Houston's crucial role in US Gulf trade. Imports of furniture, electronics, and retail goods continued to flow steadily, while exports of resins and chemicals benefited from strong global demand and Houston's proximity to petrochemical production hubs.

A standout moment for the port came in Q2 2024, when it reported record throughput numbers in May, handling over 350,000 teu, a testament to the port's efficient operations and America's sustained trade growth in 2024. Port Houston also advanced its sustainability initiatives, expanding electric yard equipment trials and finalising a plan to reduce greenhouse gas emissions by 40% by 2030.

However, the year was not without disruption. In October 2024, a strike by the International Longshoremen's Association (ILA) brought 36 ports across the East and Gulf Coasts, including Houston, to a standstill. The first strike of its kind since 1977, it saw more than 45,000 dockworkers walk out in a push for a 77% wage increase over six years and protections against job loss from automation. The U.S. Maritime Alliance (USMX), representing employers, had offered a 50% raise and partial limits on automation, terms the union rejected.

At Port Houston, the impact was immediate. Public terminals halted operations, disrupting imports of machinery, produce, and seasonal goods, as well as key exports like grain and energy-related materials. Analysts estimated potential losses of up to USD5 billion per day across affected ports, warning that each day of strike action could require three to five days of recovery time.

Despite these setbacks, the port rebounded swiftly. Once the strike concluded following federal mediation and an updated tentative agreement, operations ramped up with extended gate hours, rapid vessel turnover, and coordinated trucking efforts to clear backlogs. Industry observers praised Houston's preparedness and ability to collaborate with labour unions, federal officials, and logistics partners under pressure.

Beyond the strike, Port Houston also pressed forward with long-term infrastructure investments last year. The Project 11 widening and deepening of the Houston Ship Channel made substantial progress, aimed at improving safety and efficiency for larger vessels. The port continued expanding its Barbours Cut and Bayport terminals, with new STS cranes and yard improvements to support future volume growth, with more than USD630 million being invested by the end of the year.

Overall, 2024 showed that Port Houston could perform well and stay resilient. Despite labour challenges that disrupted supply chains and day-to-day operations, the port's quick recovery and continued investment positioned it for a strong 2025.

Guangzhou: Celebrating milestones

The Port of Guangzhou, located in Guangdong Province, remains one of China's busiest and most dynamic ports.

In 2024, Guangzhou Port Group recorded a container throughput of 25.6 million teu, a 5.5% year-on-year increase. The Nansha Port Area, a key segment of the group, surpassed 20 million teu, accounting for 75% of the total volume and growing 5.9% from the previous year. As the fastest-growing port in South China and the only deep-water port on the western Pearl River Delta, Nansha plays a vital strategic role in the region.

In December 2024, a major ceremony at the Nansha International Conference Center celebrated the port's 20th anniversary and marked the signing of a new cooperation agreement. Nearly 500 attendees including government officials, port authorities, shipping companies, and logistics clients gathered to support Guangzhou's ambitions to lead integrated development in the Greater Bay Area and promote stronger collaboration between China's government, industry, and the maritime sector.

Guangzhou Port Group is driving Nansha's growth by aligning port development with major regional initiatives, including the Free Trade Zone and the Guangdong-Hong Kong-Macau Cooperation Zone. Leveraging its central location in the Greater Bay Area, Nansha is developing an integrated port and shipping system to support global trade. These efforts involve closer cooperation with shipping companies and a focus on emerging trade models such as offshore, digital, and cross-border e-commerce. Innovation zones like the Comprehensive Bonded Zone are also being advanced to transform the region into an international logistics and trade hub.

New government policies and strategies like the "Nansha Plan" aim to enhance Guangzhou's role as a global shipping centre by improving resource allocation, supporting innovation in the port and shipping industries, and developing the Port Economic Zone. These efforts also aim to reinforce key industrial chains and keep Guangzhou competitive in international trade.

Guangzhou Port is working to ensure smooth sea routes and efficient operations through initiatives like 24-hour "zero-wait" pilotage and prioritised berthing for container vessels. Large-scale infrastructure projects are underway to expand its world-class facilities and strengthen global and inland trade connectivity. Improving the business environment and policy support for shipping companies remains a key priority, with initiatives like the Port Economic Zone and the Greater Bay Area Shipping Joint Trading Center boosting the port's overall competitiveness.

In 2024, Guangzhou Port Group also signed several strategic cooperation framework agreements with COSCO Shipping Group and other central and state-owned enterprises, as well as major industry partners. Eight port and shipping companies launched the "Digital Intelligence Integration, Green Sharing" initiative, aiming to build a smart and sustainable port and shipping network across the Greater Bay Area.

One notable achievement in 2024 was the launch of a direct shipping route from Guangzhou to Chancay Port in Peru. This route reduces logistics costs by about 20% and cuts transit time to around 30 days, strengthening trade ties between southern China and Latin America. The route also connects with other key Latin American ports, including Mexico's Port of Manzanillo and Chile's Port of San Antonio. It is expected to benefit exports such as appliances, electronics, furniture, toys, fruit, seafood, and wine.

Guangzhou's 2024 development blueprint also included establishing port economic zones focused on the Nansha and Huangpu districts. This three-year plan is set to boost the port's total throughput to 700 million tonnes in cargo and 27 million teu by 2026, alongside increases in sea-rail intermodal traffic and vehicle shipments. These zones will integrate shipping logistics, harbour industry, advanced services, and smart technologies, while supporting industries like connected vehicles, advanced materials, aerospace, marine technology, and the digital economy. Industrial clusters in automotive logistics, cold chain logistics, and marine engineering equipment will also expand. Development of Shazi Island into a bonded zone and support for marine engineering enterprises on Longxue Island are key parts of this vision.

Despite these advances, 2024 also brought tragedy with the collapse of part of the Lixinsha Bridge due to a barge collision, resulting in five deaths and several injuries. While local transport was briefly affected, port operations continued with minimal disruption. The incident highlighted the importance of emergency response systems and infrastructure oversight. As a result, safety and infrastructure resilience remain key priorities in the port's ongoing development, with renewed focus on risk management, maritime safety measures, and coordination between port and city authorities.

Guangzhou Port's 2024 performance shows strong progress, driven by infrastructure upgrades, global partnerships, digital innovation, and better port-city integration. These efforts are helping the port grow as a resilient and competitive hub in regional and global trade, supporting China's broader economic goals.

Qingdao: Growth in green energy

Qingdao Port cemented its role as one of China's most forward-looking maritime hubs in 2024, combining strong volume growth with expanding green infrastructure and sector-leading automation. The port handled 32.17 million teu over the calendar year, a 7.2% rise on 2023's throughput. Total cargo climbed to 694 million tonnes, up 4.5% year-on-year.

Financial results reflected the port's success and stable operational leadership. Operating revenue reached RMB18.94 billion (USD2.64 billion), an increase of 4.2%year-on-year. Net profit grew to RMB5.23 billion, while operating profit stood at RMB7.07 billion, showing consistent performance across terminal, logistics, and maritime services. The strong top-line and bottom-line results were driven by containerised trade expansion, improved vessel scheduling, and efficiency gains across Qingdao's flagship terminals.

This past year was also one of expansion for Qingdao. In September 2024, it announced it had acquired four liquid bulk terminal companies under Shandong Port Group for RMB94.4 billion as part of the port's shifted focus towards the oil business. The deal is expected to boost Qingdao Port's asset size, revenue, and profitability significantly, marking a key step in the port's ongoing modernization and digital transformation efforts.

Meanwhile, in October 2024, Qingdao launched the new Dongjiakou-North America breakbulk route to handle increasing transportation demand for bulk commodities such as metal ores, grain, coal, and containers. It also supports cargoes like steel and timber, while expanding into cold chain logistics and other specialized functions, further enhancing the port's commercial and comprehensive service capabilities.

Hydrogen-powered efficiency and smart terminals

Qingdao's green port ambitions advanced significantly during the year. The port became the first in the world to integrate hydrogen-powered equipment with a 5G network across yard and container operations. The rollout includes hydrogen fuel-cell terminal tractors, yard cranes, and automated guided vehicles. A commercial hydrogen refuelling station was launched in the West Coast New Area in October 2024, supporting both industrial and maritime hydrogen.

Twelve hydrogen-powered yard cranes are now operating at Qingdao as part of a pilot scheme running through 2025, with projected savings of over 22,000 tonnes of CO_2. Green bunkering infrastructure also progressed, while coordinated development of a hydrogen logistics cluster continued in partnership with municipal and industrial stakeholders.

Automation advances contributed further to Qingdao's operational gains. Its flagship fully automated container terminal set new productivity records in 2024, with single-crane efficiency reaching 60.9 teu per hour. The facility operated across three expanded phases, allowing for higher berth utilisation and seamless landside coordination. At the adjacent pulp terminal, a new bulk-handling automation system came online, expanding the port's use of digital workflows.

Qingdao also extended its logistics management platform using 5G and AI tools. The integrated system improves real-time container routing, crane control, and truck scheduling at the port, with early results showing that scheduling accuracy increasing by up to 79%. These advances are expected to support continued growth in transshipment and gateway trade in 2025.

Consolidated growth in a competitive region

With 32.17 million teu moved in 2024, Qingdao remains a top global performer and a core hub within the northern China port system. Strategic automation and energy investments have positioned it to handle rising volumes while preparing for environmental compliance and future shipping demands.

As regional competition intensifies, Qingdao's balance of physical expansion, digital capability, and clean energy deployment makes it a compelling model for next-generation port performance. The year's results confirm its role not just as a volume leader, but as a sustainability and innovation benchmark for the region.

Tokyo: Resilience amid global competition

The Port of Tokyo remains one of Japan's largest and most vital ports, playing a central role in both domestic and international maritime trade. Since its establishment in 1941, the port has evolved into a multifaceted logistics centre, managing a wide array of cargo types including containers, bulk goods, and specialised shipments. Its prime location in Tokyo Bay, supported by modern facilities and advanced cargo handling technologies, ensures smooth and efficient cargo operations for a key market in Asia.

In 2024, the Port of Tokyo demonstrated resilience amidst ongoing global economic uncertainties. Container throughput rebounded slightly to 4.65 million teu, reflecting a modest recovery following the previous year's dip, with key commodities including automobiles, machinery, electronics, and consumer goods. This increase was supported by improved trade flows and targeted efforts to enhance the port's operational efficiency. However, the port continued to face challenges from shifting shipping alliance patterns and fluctuating demand in global supply chains.

One of the standout achievements for the Port of Tokyo in 2024 was the continued growth of its cruise sector. The port welcomed a record number of cruise ship calls, surpassing 52 visits during the year, driven by a robust resurgence in tourism. The reopening of the Harumi Cruise Terminal, scheduled for June 2025, was announced during the year, aiming to expand capacity for medium-sized vessels and further cement Tokyo's status as a premier cruise destination in the region.

Sustainability remained a core focus for the port throughout 2024. A key milestone was the introduction of a hydrogen-powered rubber-tyred gantry crane at the Oi Container Terminal, marking a significant step in the port's decarbonisation journey. This initiative forms part of Tokyo's broader Carbon Neutral Port Implementation Plan, which also saw all container terminals transitioning to renewable energy sources and increased adoption of shore power facilities to reduce vessel emissions while docked.

In infrastructure developments, the Tokyo Metropolitan Government and the Ministry of Land, Infrastructure, Transport and Tourism jointly inaugurated a new north-south harbor road in June 2024. This project enhances internal port connectivity, improving traffic flow and logistics efficiency across the port area. The improved road network supports smoother cargo movement and positions the port for future growth in trade volumes.

The Tokyo Memorandum of Understanding (MoU) on Port State Control hightlighted the port's ongoing commitment to maritime safety and environmental compliance in its 2024 annual report. Tokyo's rigorous inspection regime and safety standards reinforce its reputation as a responsible and well-regulated port, contributing to the overall safety of shipping in the region.

Looking ahead, the Port of Tokyo continues to push forward with initiatives that balance growth and environmental stewardship. Waiving port fees for ships powered by LNG and hydrogen remains an active policy to encourage cleaner fuels. The port also remains engaged in international collaborations to develop green shipping corridors and digital solutions, ensuring it stays at the forefront of sustainable maritime innovation.

These developments illustrate the Port of Tokyo's dedication to maintaining its strategic importance while embracing the challenges and opportunities of a rapidly evolving maritime landscape.

Busan: Engineering for the future

South Korea's Busan Port is strengthening its place as one of the world's top maritime gateways, connecting East Asia with the wider global trading network. As a vital hub handling container, bulk, liquid, automotive, and general cargo, the port plays a key role in powering South Korea's economy.

In 2024, Busan Port hit a new record by processing 22.98 million teu, a 1% rise from the previous year, making it the busiest year in the port's history. This achievement shows the port's ability to adapt and thrive despite ongoing global economic uncertainties and changing trade patterns.

Transhipment continued to be a major part of Busan's operations in 2024, making up over 56% of total container volumes. The port plays a key role in moving cargo between major East Asian trade routes, specifically to China, Japan and Vietnam, as well as further afield to the United States. Despite facing challenges like changing demand and regional competition, Busan's strong location and modern infrastructure keep it a popular choice for shipping lines needing a dependable, high-capacity hub.

In late 2024, South Korea announced a nearly $10 billion plan to transform Busan into a "megaport" by 2045. The project includes building a new port at Jinhae, which will eventually merge with Busan to create the world's largest container hub, capable of berthing 30,000 teu vessels. The first phase will feature nine berths operated by a single terminal operator, aiming to streamline operations and boost capacity. Alongside this, a major logistics complex and renewable energy targets reflect the port's push toward greater efficiency and sustainability amid growing global competition.

2024 also saw Busan Port take significant strides towards environmental sustainability and green innovation. In October, the port successfully completed South Korea's first ship-to-ship methanol bunkering operation, transferring over 3,000 tonnes of this cleaner-burning marine fuel. Earlier in the year, Busan also performed its first simultaneous LNG bunkering, further demonstrating leadership in the adoption of low-emission energy sources.

Environmental initiatives extended beyond fuel innovations. The port introduced a pilot project installing piezoelectric modules in terminal gates to harvest energy from truck vibrations. This cutting-edge technology is expected to generate around 45 MWh of electricity annually, sufficient to power over 100,000 homes, while cutting carbon emissions by an estimated 936 tonnes.

Sustainability played a key role in Busan Port's ongoing infrastructure projects in 2024. By reusing over 159,000 cubic meters of recycled concrete and 15,500 cubic meters of asphalt, the port cut nearly ₩4 billion in material costs. These efforts also helped reduce carbon emissions from construction, supporting South Korea's wider sustainability goals.

Additionally, the introduction of the hybrid-electric tugboat Meta 7 marked a leap forward in cleaner port operations. Able to run on battery power for up to an hour during vessel manoeuvring, the Meta 7 reduces diesel consumption and air pollution within the harbour area, improving both environmental and community health outcomes.

Busan Port's continued focus on expanding capacity, adopting new technologies, and prioritising sustainability shows its commitment to staying competitive in a changing global trade environment. Despite ongoing uncertainty in global markets, the port's mix of growth and green innovation keeps it well prepared for what lies ahead.

In 2024, Busan quietly strengthened its role as a global maritime leader. From record container volumes to cleaner fuel bunkering, smart energy projects, and eco-friendly construction, the port made steady progress toward a more sustainable and efficient future.

Antwerp-Bruges: Sustainability takes centre stage

Port of Antwerp-Bruges in northern Europe delivered a robust performance in 2024, with rising container volumes, expanding green infrastructure, and increased market share across the Hamburg–Le Havre range. Total cargo throughput reached 277.7 million tonnes, up 2.3% on 2023. Container throughput rose 8.1%to 13.5 million TEU, supported by overall gains in reefer and transshipment traffic.

Container tonnage increased 8.9%, with reefer volume up 9.2%, now making up 8.6% of total boxes. By the end of Q3, the port had lifted its market share in the Hamburg–Le Havre range by 0.7% points, reaching 30.6%.

Mixed trends were evident in other cargo segments. Dry bulk grew slightly by 0.4%, driven by a 22.9% surge in fertiliser shipments, though coal dropped sharply by 35.4% as Europe turns to cleaner forms of energy. Chemical cargo increased 14.8%, backed by a 60.1% boost in biofuels. Ro-ro volume declined 3.4%, reflecting broader headwinds in automotive and heavy machinery volumes.

Vessel traffic was steady. In 2024, the port welcomed 20,195 ocean-going vessels, handling 632.4 million gross tonnes, while Zeebrugge hosted 187 cruise ship calls and 557,000 cruise passengers, consistent with its dual logistics-tourism role.

Green hydrogen and zeroemission tug launches

Antwerp-Bruges became a pioneer in green energy with the deployment of Belgium's first 100% hydrogen-powered boiler, piloting climate-neutral workshop heating across a 1,430 cubic metre facility. The port also joined the Hy.Region. Rhein.Ruhr network in 2024 to bolster regional hydrogen rollout and remains a partner in the 100 MW green hydrogen plant project developed alongside Plug, expected to be fully operational by the end of 2025

The hydrogen initiative is part of the port's push for broader fleet electrification operations. In 2024, Volta 1, Europe's first fully electric tug, joined the port's operations. Hydrogen, methanol, and LNG-powered tugs have also entered service at Antwerp-Bruges, signalling a clear shift toward lower-emission pilotage vessels. Shore power infrastructure for cruise ships at both Antwerp and Zeebrugge received a € 1.55 million upgrade, furthering the port's zero-emission berth ambitions.

In June 2024, the Port of Antwerp-Bruges joined the Sweden-Belgium green shipping corridor, joining the Port of Gothenburg and North Sea Port as key transportation hubs across the corridor. The corridor connects 11 European countries through sea, land and rail routes from Norway to Spain and, by 2030, will operate ammonia-fuelled roro vessels to boost efforts on ammonia bunkering and electrification. The agreement is part of the ports' continued push for green operations both at sea and on land, and commits Antwerp-Bruges to offering more clean marine fuel options to vessels calling into Europe.

Innovation at the quay and beyond

Antwerp-Bruges continues to embrace the circular economy through its NextGen Demo hub. The latest addition, TripleW, now upcycles industrial food waste into 10 tonnes per day of lactic acid to be used as part of the port's energy mix, underscoring the port's commitment to sustainable chemistry pathways.

With increased volumes, green technology, and evolving industrial capacity, Antwerp-Bruges enters 2025 strengthened in both logistics power and low-carbon competitiveness. Its blend of operational resilience and sustainability progress positions the port as a model and a maturing leader in North Sea supply chains.

Shenzhen: Turning to technology

The Port of Shenzhen remained a key player in global trade in 2024. Located in the fast-growing Greater Bay Area and home to major terminals like Yantian, Shekou, Chiwan, Dachan Bay, and Mawan, it held its place as one of the world's most advanced and well-connected ports. Despite global challenges, the port set a new record for container handling and led the way in smart technology and green initiatives.

In 2024, Shenzhen Port handled an all-time high of 33.38 million teu, reflecting an 11.7% year-on-year increase. This milestone cemented its position as the world's fourth-busiest container port and underscored its vital role in maintaining resilient international supply chains. By the end of October 2024, throughput had reached 27.66 million teu, up 14.9% from the same period in 2023, driven by recovering global trade demand and continued strength in Chinese exports.

Shenzhen focused heavily on technology to drive its growth in 2024. The Mawan terminal underwent a major transformation into a fully fledged smart port, showcasing autonomous container trucks, 5G-enabled operations, and remote-controlled quay cranes. Operated by China Merchants Port, Mawan has become a blueprint for future port development in the region, offering digitalised logistics and real-time data integration that significantly improve efficiency and safety.

Shenzhen's Yantian port also made significant strides in the LNG bunkering sector. In 2024, it reached a record-high LNG bunkering volume of 300,000 cubic meters, nearly six times that of 2023, positioning Yantian as the second-largest LNG bunkering port in China. The port is targeting a 50% increase to reach 450,000 cubic meters by 2025. As the first port in China capable of simultaneously refueling two international ships with LNG, Yantian is advancing its role as an international offshore LNG bonded bunkering centre.

Environmental leadership also took centre stage. Shenzhen Port joined forces with global partners, including the Port of Long Beach, in a landmark agreement aimed at reducing emissions from ocean-going trade and build a green maritime economy around the Pacific Rim. This initiative aligns with China's national objectives for maritime decarbonisation and positions Shenzhen at the forefront of international green port collaboration.

Challenges did arise early in the year. In January 2024, Yantian Terminal, one of the port's busiest terminals, experienced major congestion as exporters rushed shipments ahead of the Lunar New Year and looming US tariff deadlines. Port authorities responded by increasing container handling quotas by 15% per day, demonstrating the port's flexibility in managing pressure under time-sensitive trade surges.

Overall, Shenzhen's 2024 performance highlighted a port that is not only growing in volume but also evolving in capability. With smart infrastructure, a clear sustainability agenda, and a proven ability to adapt to rising demand, the Port of Shenzhen is well-positioned to continue driving economic growth in the Greater Bay Area and facilitating global trade for years to come.

Tianjin: Record-breaking throughput

Tianjin Port, located on the Bohai Sea in northern China, is an important part of China's shipping network and a major entry point for trade in the north. As one of the busiest ports in the world, it showed strong growth and progress in 2024, focusing on both expanding its operations and becoming more sustainable despite global challenges.

In 2024, Tianjin Port achieved a record-breaking container throughput of approximately 23.28 million teu, marking a 5% year-on-year increase despite ongoing uncertainties in global supply chains. This strong result highlights the port's important role in supporting China's burgeoning trade and keeping its economy moving, even with difficult international trade conditions.

A key highlight of the year was Tianjin Port's strong focus on green energy and protecting the environment. The port's renewable energy projects expanded significantly in 2024, with wind and solar power installations generating more than 200 million kilowatt-hours, enough electricity to meet nearly 40% of the port's annual consumption. This milestone reflects a substantial reduction in carbon emissions, estimated at around 150,000 tonnes annually, showcasing Tianjin's commitment to achieving carbon neutrality by 2035. The port also ramped up shore power connections for vessels, exceeding 380 connections by year-end, which contributed to a dramatic increase in clean energy use and reduced reliance on fossil fuels during ship berthing.

Technological innovation remained central to Tianjin Port's operational strategy in 2024. The port is renowned for being one of China's leading 'smart ports', leveraging advanced digital technologies, including IoT, big data analytics, and AI-powered systems, to optimise cargo handling, berth allocation, and logistics coordination. These innovations led to a significant reduction in container handling times, boosting ship turnaround efficiency.

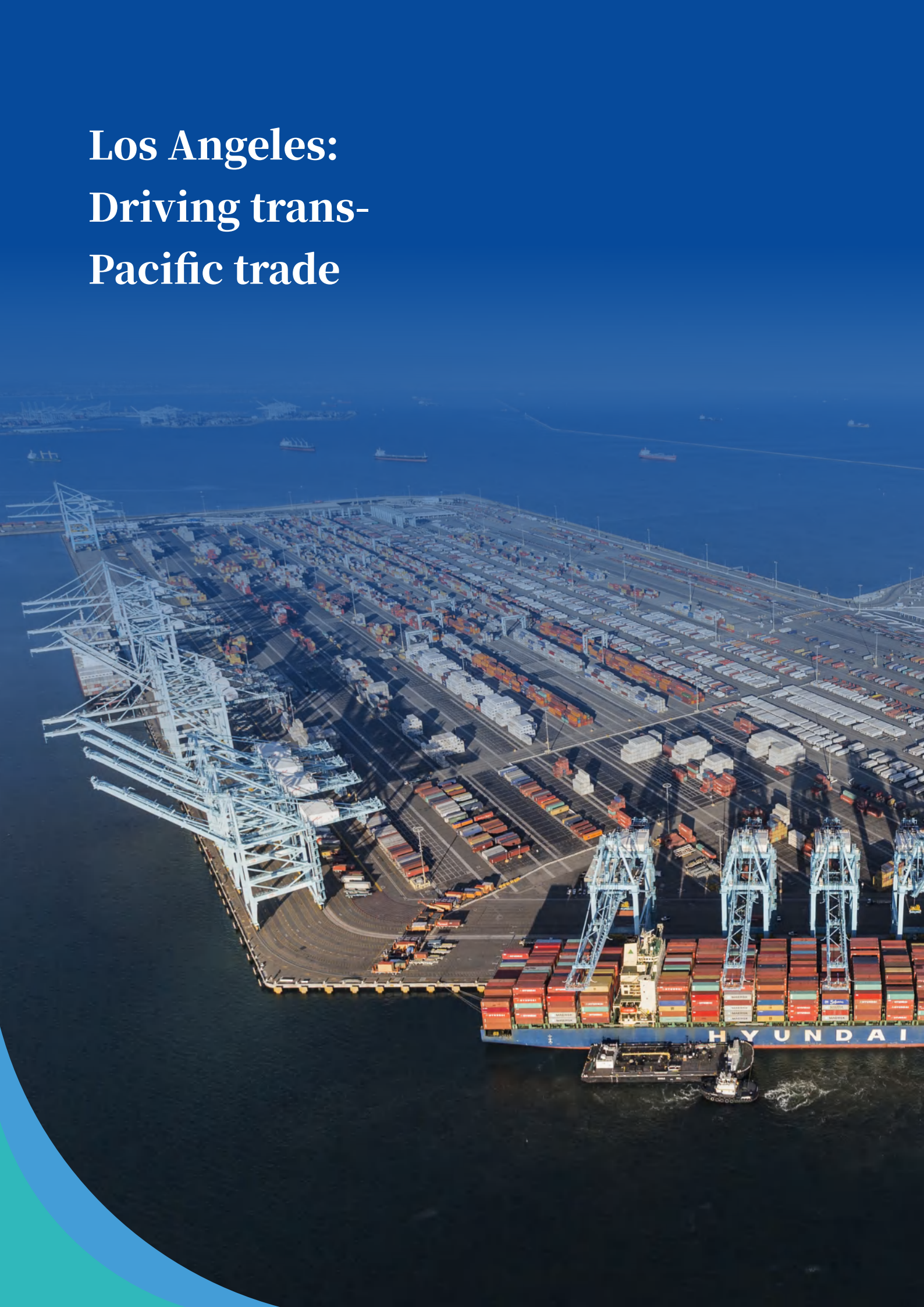
Tianjin Port also strengthened its role in China's Belt and Road Initiative (BRI) by adding new shipping routes to Europe, Central Asia, and Southeast Asia. With more than 150 international routes now in place, the port is a key hub that connects sea, rail, and road transport, making trade faster and easier across the region and beyond. It is advanced its trade with Latin and South America in 2024, as Tianjin became the primary gateway for the region's fresh and frozen imports, while also establishing north China's first-ever express route with Chile.

Infrastructure development also featured prominently in 2024. The port invested RMB5.80 billion in the second phase of its terminal expansion project, which includes the construction of three new 70,000-tonne coal loading berths and a 200,000-tonne iron ore unloading berth. These additions are set to double the port's bulk cargo handling capacity, reinforcing its role in supporting China's industrial supply chain.

To address evolving maritime security concerns and regulatory complexities, Tianjin Port has also upgraded its digital customs clearance systems. The enhanced platforms have improved transparency and efficiency in cargo inspections and compliance processes, helping to reduce delays caused by global regulatory changes and facilitating smoother international trade transactions.

2024 was a milestone year for Tianjin Port, marked by record throughput, a deepened commitment to sustainability, technological advancement, and expanded global connectivity. Tianjin Port continues to set the standard as a modern, efficient, and environmentally responsible maritime hub, well-positioned to remain a global leader in the years ahead.

Los Angeles: Driving trans-Pacific trade



Entering the top 20 in this year's Xinhua-Baltic International Shipping Centre Development Index, the Port of Los Angeles, the busiest container port in North America, saw a strong rebound in 2024, driven by record-breaking throughput, major sustainability initiatives, and continued investment in digital and physical infrastructure. Located on the US West Coast, the port remains a vital hub for trans-Pacific trade, connecting global supply chains to the American market.

In 2024, the port handled approximately 10.3 million teu, marking a nearly 20% increase from 2023 volumes and recording the second-highest container throughput in its 117-year history. This strong performance shows both a rise in US import demand, especially from Asia, and the impact of better operations and ship scheduling. Crucially, it shows that the Port of Los Angeles has learnt significant lessons from the regular bouts of vessel congestion it experienced during the pandemic.

Alongside container traffic, cruise activity surged. The port welcomed 183 cruise ship calls, with over 1.1 million passengers passing through the World Cruise Center, a strong sign of post-pandemic recovery in the tourism and leisure sectors.

Significant infrastructure upgrades continued throughout the year. A key development was the USD73 million expansion of the Pier 400 rail yard, which will boost on-dock rail capacity and reduce truck traffic in surrounding communities. Meanwhile, Los Angeles improved its Port Optimizer digital system with nearly USD8 million in state funding. This upgrade helps make terminal operations, truck appointments, and emissions tracking more visible and efficient.

The Port of Los Angeles remained at the forefront of green innovation in 2024. It secured a USD412 million grant from the Environmental Protection Agency, the largest of its kind in port history, to support the transition to zero-emission cargo-handling equipment and electric drayage trucks. Demonstrations of battery-electric yard tractors and LNG-powered equipment took place across terminals, aligning with California's climate targets.

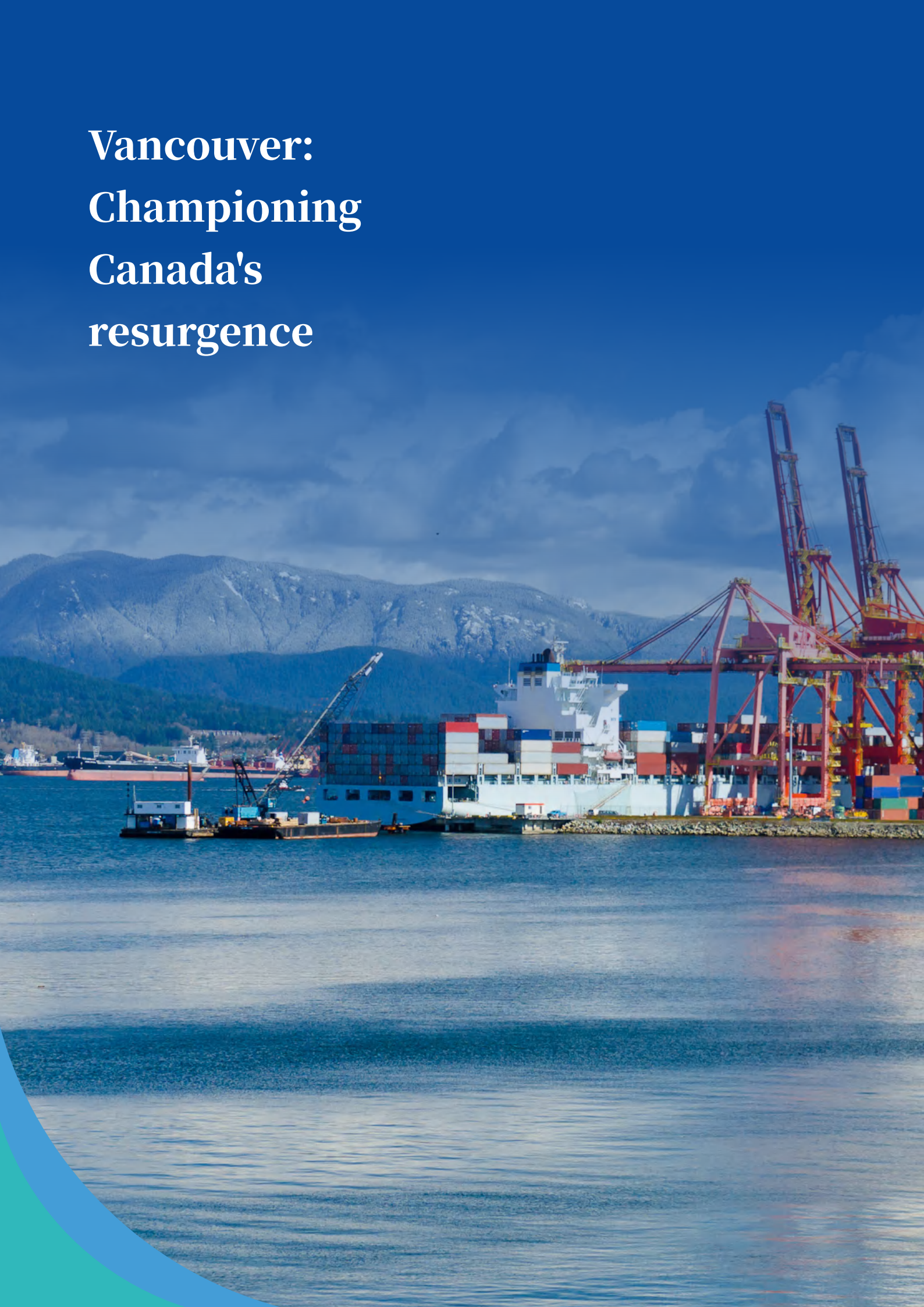
The port's international partnerships also played a critical role. Its Green Shipping Corridor initiative with the Port of Shanghai progressed significantly, focusing on the development of low- and zero-carbon fuel solutions, vessel emissions reductions, and coordinated decarbonisation across the Pacific trade lane.

Environmental progress remained a cornerstone of port activity. Since 2005, the Port of Los Angeles has reduced diesel particulate matter by 91%, nitrogen oxides by 63%, and sulfur oxides by 98%, positioning itself as a global leader in sustainable port operations. Shore power capabilities continued to expand, enabling more vessels to plug into clean electricity while docked rather than burning fossil fuels.

With stable vessel call numbers averaging around 70 ship visits per day, and modernised appointment and logistics systems, the port maintained consistent flow and avoided the backlogs seen in earlier years.

In 2024, the Port of Los Angeles showed strong growth while focusing on sustainability and efficiency. Looking ahead, it's ready to lead the way in cleaner, smarter shipping across the Americas, the Pacific and beyond.

Vancouver: Championing Canada's resurgence



The Port of Vancouver, Canada's largest and most varied port, had a standout year in 2024. It saw record trade volumes, made big strides in infrastructure, and continued to lead on environmental efforts. Sitting on the country's west coast, the port plays a key role in moving Canadian goods to global markets and keeping supply chains running smoothly across the country.

In 2024, the port handled an unprecedented 158 million tonnes of cargo, reflecting a 5% increase compared to 2023. This growth was driven by strong demand across multiple sectors, notably automotive, bulk commodities, and containerised cargo. There was also a record number of oil exports, made possible by the newly expanded Trans Mountain Pipeline. In total, more than 17.1 million metric tonnes (MMT) of liquid bulk cargo was exported from Vancouver, up 203% year on year, with petroleum exports quadrupling to 15 MMT and canola oil exports doubling to 0.9 MMT.

The notable rise in exports saw Baltic Exchange start two public trials on new routes from Vancouver to Ningbo and Pacific Area Lightering as Canada begins to exert its presence on global oil markets.

The container terminals processed 3.47 million teu, an 11% rise from the previous year and a 2% growth over pre-pandemic levels in 2019. Import volumes surged by 14%, while exports grew by 5%, with containerised goods reaching over 128 countries worldwide. This strong performance shows Vancouver's growing importance in global trade and its key role in North American supply chains.

The port's cruise sector had a standout year, welcoming a record 1.32 million passengers across 327 ship calls between March and late October. To make the passenger experience smoother and more secure, the port introduced new facial biometric technology at the terminal, cutting boarding times for Canadian and US residents by 94% and setting a new benchmark for fast, contactless processing.

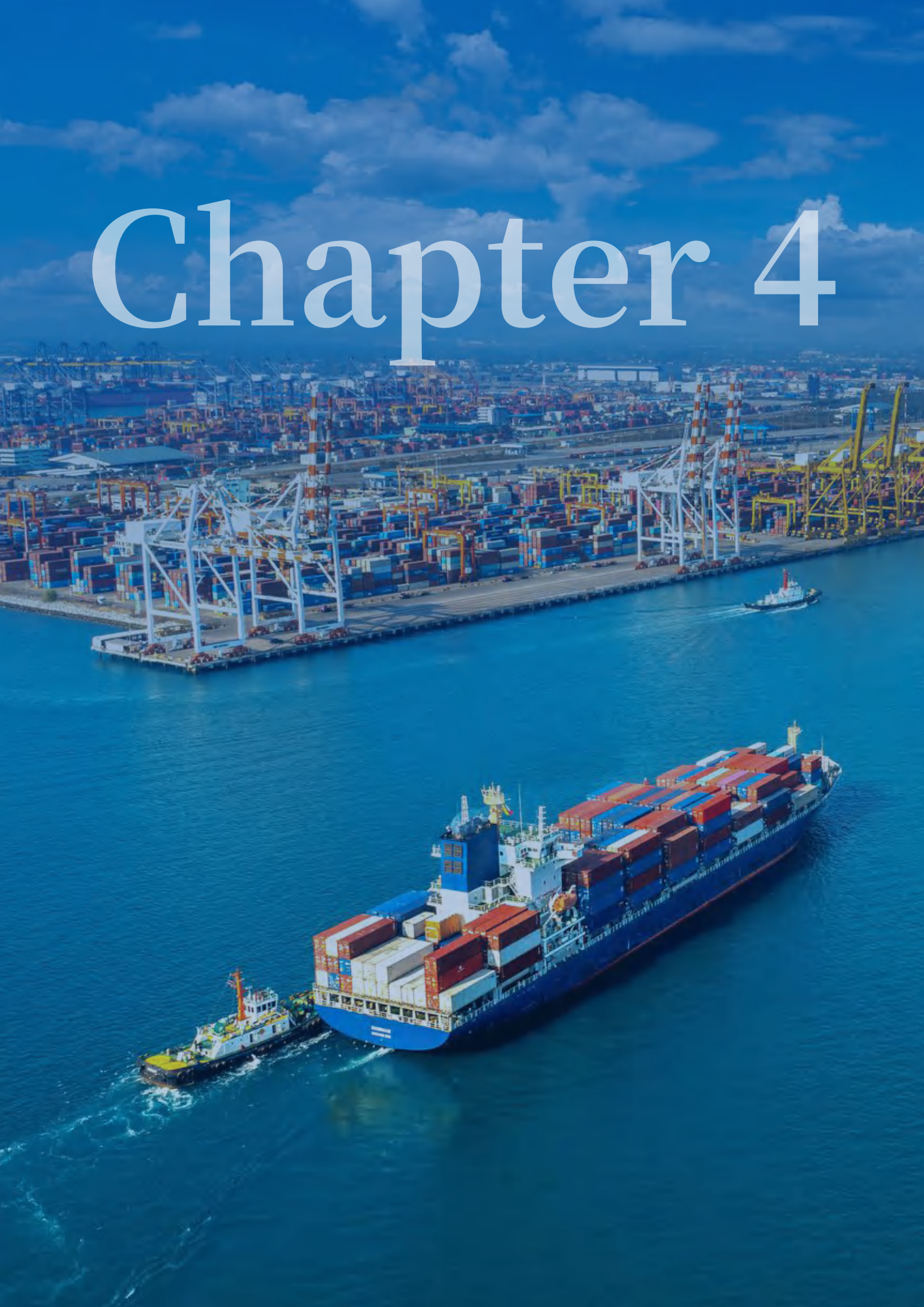
Significant infrastructure investments advanced throughout 2024 to support the port's growing capacity and operational efficiency. The Active Vessel Traffic Management system was expanded, enhancing navigational safety and streamlining traffic flow for over 5,000 commercial ship movements annually in the busy Burrard Inlet. These upgrades contribute to the smooth and secure movement of vessels while minimising environmental impact in the surrounding marine areas.

Caring for the environment remains a key focus for the Port of Vancouver. In 2024, the port saw exciting progress with the launch of its first electric tugboats, operated by SAAM Towage, a big step toward lowering emissions during terminal operations. Seaspan Energy also earned accreditation to provide LNG bunkering services, offering ships cleaner fuel options. This year also marked 10 years of the port's ECHO program, which has helped cut underwater noise by up to 50% in important habitats for the endangered southern resident killer whales, a clear sign of the port's ongoing commitment to protecting marine life.

Despite challenges like labour disruptions and extreme weather events, including local wildfires, the Port of Vancouver showed strong resilience and flexibility in 2024. By staying focused on sustainable growth, embracing new technologies, and working closely with partners, the port continued to play a significant role in global trade and ensure that Canada has a major part in the North American supply trade.

Looking ahead, Vancouver is set to boost both capacity and environmental performance through ongoing infrastructure upgrades and green initiatives. With smart investments in digital tools, low-carbon technology, and community partnerships, the port is well-positioned to stay a key economic driver, and a leader in sustainable port operations.

Chapter 4



ANCHORING MARITIME DECARBONISATION

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01

EU ETS and shipping's new emissions era

In January 2024, the European Union brought the shipping industry under its Emissions Trading System (EU ETS) for the first time. This extension is part of the EU's wider push to decarbonise and ensure maritime transport contributes to the target of cutting greenhouse gas emissions by 55% by 2030, compared with 1990 levels. With this move, shipping joins Europe's energy, industry and aviation sectors in a single carbon pricing regime.

How the Extension Works

The EU ETS now applies to cargo and passenger ships over 5,000 gt. It covers all emissions from intra-EU voyages and 50% of emissions from international journeys involving EU ports. The obligations are being phased in: 40%of verified emissions must be offset in 2024, 70% in 2025, and the full amount by 2026. From then, methane and nitrous oxide will also be included.

The measure was introduced through an amendment to Directive 2003/87/EC under the 'Fit for 55' package. Shipping companies are required to report emissions using the THETIS-MRV platform. By the end of 2023, the European Commission reported that around 12,000 ships had submitted data, and more than 5,000 companies had registered monitoring plans. The European Maritime Safety Agency has provided guidance, especially helpful for operators encountering these requirements for the first time.

What the Numbers Say

Maritime emissions under the EU ETS totalled 72 million tonnes of carbon dioxide in 2024, according to the European Environment Agency. Meanwhile, emissions across all ETS sectors declined by 5%, part of an ongoing downward trend.

The market issued 1.39 billion allowances. Prices varied: the average was € 83.60 in 2023, peaking above € 96 and falling to around € 63 by April 2025. Notably, however, the overall revenue from auctions reached € 44 billion in 2023, much of which went towards clean energy investment via the European Commission's Innovation Fund.

Some operators responded by adding ETS surcharges to freight rates. Others focused on operational changes. The Commission's first implementation report noted that more efficient vessels were being routed into EU service, while older ships were reassigned to regions outside the ETS. In practice, many operators find these trade-offs increasingly factor into deployment decisions.

Operational Effects and Route Changes

Early concerns centred on possible avoidance tactics, such as diverting to ports just outside the EU or using smaller vessels. The European Commission's March 2025 review, however, found no significant evidence of widespread evasion.

To close potential loopholes, the EU excluded certain ports like Tangier Med in Morocco and East Port Said in Egypt from resetting ETS voyage boundaries. Exemptions remain for remote and island services, intended to maintain essential connectivity.

The Red Sea crisis also affected shipping routes, with many operators rerouted around the Cape of Good Hope. While these changes initially raised questions about ETS evasion, the Commission (and others) concluded they were primarily driven by security concerns and broader commercial pressures.

According to industry observers, some carriers remain wary of the long-term cost implications

of EU ETS, with one ship operator calling the regulation "an administrative burden with few incentives for innovation." While this view is not universal, it reflects a segment of the market navigating change with caution.

Using Data to Make Decisions

As operators seek to understand the financial impact of emissions regulations, Baltic Exchange has stepped in with a set of digital tools. The centrepiece is the EU ETS calculator, which estimates allowance needs based on ship type, route and fuel use. Owners and operators have already begun using it for commercial planning and budgeting.

The tool draws on familiar Baltic routes and allows users to input tonnage, fuel type and itinerary to gauge cost exposure. Owners can assess how fuel choices impact compliance costs, while charterers can use the tool to cross-check whether surcharges reflect real ETS liabilities. Baltic Exchange says the tool helps "kick the tyres" on emerging regulations and adds practical clarity to an otherwise complex system.

This ETS calculator complements the Baltic's wider emissions platform, which also includes benchmarking features aligned with CII and EEXI frameworks. Users can compare individual vessel performance against anonymised fleet averages, supporting operational adjustments and long-term investment planning.

According to Baltic Exchange, the tools are proving useful beyond voyage optimisation. Market participants report applying them during charter party negotiations and to support ESG reporting. They offer clarity on emissions risk, something investors and cargo owners are scrutinising more closely.

While data remains limited, early indications suggest that such tools are helping companies respond with greater confidence and precision. Crucially, the tool does not require loading or discharge port data, just the standard Baltic route, making it quick to use and broadly accessible. More detailed modelling, including biofuel comparisons, is expected to follow in the near future, but as of 2024, the ETS calculator is already an important step in demystifying emissions compliance.

Looking Ahead

Shipping's inclusion in the EU ETS is not simply a compliance exercise, it is reshaping how companies plan and operate. The scheme's phased approach, backed by verified reporting, gives time to adapt. But its message is clear: emissions now carry a price.

Perhaps unsurprisingly, other regions are taking note. While the ETS is a European policy, its structure and outcomes are influencing regulatory discussions elsewhere. The International Maritime Organization continues to explore market-based mechanisms of its own.

Ports and transport hubs are also adjusting. As carbon costs begin to affect routing preferences, some locations may find themselves under pressure to offer more efficient infrastructure, or risk being bypassed altogether.

Tools like those from Baltic Exchange are evolving from calculators into planning companions. They help operators prepare for rising expectations, anticipate financial impacts, and build emissions strategies into routine decision making.

The first year of maritime's inclusion in EU ETS did not cause dramatic disruption to the sector in Europe. Instead, it marked a slow shift. As the policy bedded in, it brought emissions closer to the heart of commercial strategy, and helped lay groundwork for what comes next.

Carbon Intensity Indicator makes its presence felt

The release of the first round of Carbon Intensity Indicator (CII) ratings marked a significant step in the International Maritime Organization's efforts to quantify and reduce emissions from international shipping. Introduced as part of MARPOL Annex VI, the CII measures the operational efficiency of vessels, expressed as grams of CO_2 emitted per cargo-carrying capacity and nautical mile.

While its technical structure was known in advance, 2024 offered the first opportunity for the maritime industry to observe how the regulation would translate into real-world fleet performance.

Understanding the CII System

CII applies to ships of 5,000 gt and above, which must report their emissions annually. Based on this data, vessels receive a rating from A (best) to E (worst). The calculation considers CO_2 emissions in relation to transport work, offering a practical gauge of carbon efficiency. The rating thresholds tighten progressively each year, with the C-D boundary reducing by about 2% annually. Ships rated D for three consecutive years or E in a single year must submit a corrective action plan within their SEEMP (Ship Energy Efficiency Management Plan).

According to the IMO, this regulatory tool is designed to prompt continuous operational improvements for commercial vessels. While it does not prescribe a single solution, it encourages shipowners to consider multiple decarbonisation levers, from speed reduction and route optimisation to hull cleaning and technical upgrades.

First-Year Results and Market Reaction

In March 2025, the first set of CII ratings was published, based on emissions data collected during the 2023 calendar year. According to the IMO, 28,620 ships covering more than 1.3 billion gt were assessed. Of these, 78% received a rating of C or better, suggesting a relatively strong initial alignment with the regulatory framework. That still leaves over 6,000 vessels rated D or E, however, each of which is now subject to additional scrutiny and planning obligations.

While the rating distribution offers early reassurance that the regulation is being taken seriously, it also highlights the scale of adjustment still required. Ships with lower ratings must either demonstrate improvement or face potential commercial disadvantages. Charterers, financiers, and insurers are beginning to take note of these indicators as part of broader environmental considerations. As a result, CII is becoming a conversation point beyond the technical considerations of vessel operations and towards the financial impacts of ensuring compliance.

Implementation and Practical Considerations

From a procedural standpoint, data from 2023 had to be submitted to national administrations by 31 March 2024 and to the IMO Data Collection System by 30 June 2024. Any ship receiving an E rating was required to submit a corrective action plan by 30 April 2024. These deadlines gave structure to the first reporting cycle but also highlighted some teething issues. Several operators noted challenges in aligning internal reporting processes with external verification systems.

In practice, many found that modest operational changes could significantly influence ratings. Reducing speed, scheduling port calls more efficiently, and maintaining clean hulls all had noticeable effects. The flexibility to choose from

a menu of options has been broadly welcomed, although some operators argue the metric still favours certain ship types and trades over others. For those seeking to stay ahead of regulatory pressure, real-time dashboards are emerging as a useful ally. Wärtsilä is among the providers offering digital tools that allow shipowners to monitor CII performance across the year, detect risk trends early and adjust accordingly.

Classification societies have also stepped in to support practical application. Korean Register (KR), for example, has launched a CII simulation tool to help shipowners test out compliance strategies before implementation. KR is also offering guidance to address the operational quirks—such as idle time and voyage patterns—that may distort performance ratings. In one illustrative case, KR used its modelling tool to demonstrate how a 0.5 knot reduction in speed could shift a vessel's expected CII rating from D to a compliant C. While results vary by vessel and trade, these examples offer tangible proof that the right operational tweaks can make a measurable difference.

The shipping industry took heed of the challenges at the first-ever CII conference in January 2024, hosted by the Royal Institution of Naval Architects. The two-day conference included a wide range of industry players, from industry body representatives, such as DNV, IMO and the International Chamber of Shipping, and major vessel owners, such as Foreship, Carnival Corporation and MSC, to parts and service providers, such as Norsepower, Hempel, and Finocean. The wide range of industry names and sectors that joined the event was a clear indication of how many across the maritime space are impacted by CII. However, importantly, it was a even clearer showcase of shipping's collaborative spirit to help navigate unchartered waters.

Looking Ahead: Regulation or Catalyst?

The CII regulation is due for review by 1 January 2026, and it remains to be seen whether its current structure will remain intact.

In 2024, INTERCARGO submitted a formal call for review, expressing concern that the system disadvantages bulk carriers whose trading patterns are more susceptible to idle time and weather-related delays. They argued that the methodology could unintentionally penalise ships based on operational realities rather than genuine inefficiency.

While INTERCARGO and others have suggested adjustments, some industry voices view the framework as a useful starting point that encourages behavioural change without mandating a fixed technological pathway. Despite raised concerns with the regulation, there remains broad interest throughout the industry in refining rather than replacing the regulation.

What is clear is that CII has introduced a new layer of accountability. For some, the first round of ratings confirmed that existing practices were already on the right track. For others, it was a wake-up call. Either way, 2024 will be remembered as the year operational carbon efficiency moved from the margins to the mainstream of commercial decision making.

Perhaps unsurprisingly, market sentiment is mixed. But there is broad agreement on one point: understanding and responding to CII is no longer optional for today's ship owners, operators and managers. It is now a defining part of the shipping sector's regulatory and reputational landscape.

03

Wind propulsion hits new heights as popularity soars

By Gavin Allwright, Secretary General of the International Windship Association (IWSA)

Wind-assisted propulsion systems (WAPS), as a means of decarbonising vessel operations, made significant progress in 2024, with the number of installations more than doubling from just over 25 to 56 vessels within a single year.

This marked the strongest growth period to date for the technology, although the market has yet to reach a full inflection point. Bulk carriers, tankers, RoRo vessels and general cargo ships led uptake in 2024, accounting for approximately 3.5 million dwt, including VLCC and VLOC tonnage, while the year also ended with a number of other vessel types, including cruise vessels, that are wind-power ready under construction. This growth in installations was also backed by a healthy pipeline of orders that was nudging triple figures by December 2024.

Asia Emerges as a Key Growth Region

While innovation and investment in wind propulsion continued globally, 2024 saw a significant upswing of interest and activity in Asia.

In Japan, six shipowners and charterers, including Iino, NYK, Marubeni, and Mitsubishi, joined existing IWSA members such as MOL and K Line in adopting or exploring wind technologies as a decarbonisation method. Meanwhile, Singapore-based shipowners, such as Bergebulk and ONE, also expanded their involvement with new installations.

China has also been active from a shipbuilding and ship installation perspective. Many of the vessels that made headlines in 2024 for adopting WAPS were built or retrofitted in Chinese yards. China is also heavily investing in its own WAPS technologies, with three ships having been installed with seven Chinese designed rotor sail systems, including a 45,000 dwt bulker, 5,000 dwt tanker and 17,000 gt heavy-lift deck carrier. Interest has also been growing in South Korea, with all three major shipbuilding groups continuing research and development, while a similar trend is evident in Japanese yards as well, where activity is also increasing.

Technology Choices Evolve as Confidence Builds

One of the most frequent questions from industry observers is which wind propulsion technologies are showing the most progress. In a market still in its early growth phase, there is no simple answer.

The three main wind-propulsion technology groups for larger vessels are rigid or hard wings, suctions sails/wings and rotor sails, also known as Flettner rotors. Installation numbers alone do not provide a full picture of market uptake as the size of systems, power of systems, size of vessel and other such considerations all influence adoption.

Nonetheless, all three of these technologies are actively competing for prominence. Recent announcements of multiple ship and fleet-level orders have influenced perceptions of which solutions are leading the market at any given time.

From a performance perspective, outcomes remain highly variable. Results depend on the type of ship, the size and design of the vessel, siting of the system, their size/power and number of systems, amongst other factors. As a result, shipowners are growing in confidence that the systems are delivering the promised performance or in some cases exceeding these.

The International Windship Association (IWSA) has always stated that WAPS that are retrofitted onto non-wind optimised newbuilds will typically deliver between 5-20% of the propulsive power for the ship. This figure excludes potential gains from weather routing and operational optimisation, both of which can significantly enhance performance.

Policy Pressure and Regulatory Rewards Drive Uptake

Industry perception of wind propulsion has shifted notably in the past year. It is now widely regarded not only as a commercially viable decarbonisation pathway, but also as a proven technology, supported by a growing track record and increasing number of installations.

This change has been driven by a number of factors in 2024. Volatility and uncertainty in the fuel markets and trade pattern disruption has created a very challenging environment for many maritime stakeholders, making wind propulsion increasingly attractive. The confidence level has been further bolstered by the growth in demonstrator ships, improving wind propulsion for the bulker, tanker, general cargo and RoRo segments.

Policy developments have also been looming over the industry in 2024. EU ETS came into force for shipping at 40% levels at the beginning of the year, to be increased up to 70% from 2025 as Fuel EU Maritime comes into force. Together, these regulations have sharpened attention among shipowners, particularly given the incentives available for wind-assisted ships.

Under FuelEU Maritime, WAPS are eligible for a 1-5% 'wind reward'. Meanwhile, systems that deliver 15% or more of the ship's energy will receive a 5% bonus in the calculations, effectively making the ship compliant until 2035, particularly when banking and pooling are used up to 2030. Notably, this reward is delivered whether the system is deployed or not, and will save owners hundreds of thousands of dollars in fines, even before factoring in fuel and EU ETS savings.

These policy initiatives are increasingly being reflected in commercial decision making. The relatively ambitious decarbonisation strategy revised by the IMO in 2023 has influenced strategic planning, particularly given the uncertainty around what the IMO technical and economic measures would look like after the high-level deliberations in spring 2025.

This has helped position wind propulsion as an off-the-shelf option that is increasingly verified, safe, and robust. Crucially it remains a solution that does not require a new fuel supply chain and will remain free at the point of use throughout the lifetime of the vessel.

Scaling Up

Looking forward, a growing focus within the wind propulsion segment is the question of scalability. Increasingly, the industry is asking whether these systems can be deployed at speed. The simple answer yes, and development in China during 2024 illustrates why.

China's entry into this market has helped lower costs and build knowledge and capacity in the yards, making it more feasible for wind systems to be offered as standard options to their customers.

In parallel, European-based technology developers have opened or expanded production lines in China, while also increasing more local manufacturing facilities. For now, production capacity is expected to remain in the dozens of units but expected to ramp up into the hundreds

beyond 2025.

The International Windship Association continues to serve as a convening and facilitating body for the wind sector. Work is underway on regulatory and policy initiatives, especially as guidelines for wind propulsion's integration into the IMO regulatory measures are under development.

The association also brings together industry stakeholders to collaborate on initiatives that benefit the wider segment. These include efforts to develop standards, liaise with other industry bodies and address persistent myths and misconceptions around wind propulsion.

The 2026 Turning Point

IWSA have identified 2026 as the year that will be the key inflection point in the market deployment 's-curve'. This is based on three key points. Firstly, 2026 will have up to 200 wind-installed ships in operation, meaning there will be a critical mass of reference vessels operating in most key shipping segments and important sub-segments. For example, for bulker owners and operators, there will not just be 20 bulkers installed with wind, but up to 10 bulkers will have WAPS installed in the size range and operational profile relevant to their own fleets. This will be critical for moving adoption beyond the early movers.

Secondly, 2026 is also an important watershed in regulation, with EU ETS at 100%, the first FuelEU Maritime compliance payments being charged and new IMO measures that will be adopted in late 2025 having to be incorporated into commercial planning for the 2027/28 period.

Finally, the learning curve and economies of scale will have reduced costs significantly compared with early installations in 2023/24. With growing competition, system prices are also likely to fall. There is also likely to be increased interest among shipowners of the possibility to lease WAPS, with providers potentially offering such models.

This financial trend will continue to lower barriers to entry for many shipowners as will the growing availability of verified publicly available, standardised and anonymised performance data in the market, a development that will go hand-in-hand with the expanding number of installed vessels.

Another key enabler will be greater understanding and improved tools for the finance and insurance sectors, allowing them to price risk more accurately alongside better training and familiarisation for seafarers working with WAPS onboard.

If this sector is to outperform projections of up to 10,700 installations by 2030 and 40,000+ installations by 2050, then greater engagement from cargo owners and charterers — by actively creating demand for the lowest-emission technology options on the vessels they use — would be a significant driver.

Equally important would be the promotion and full funding of a wind-powered fleet serving LDC and SIDS regions, helping them transition fully away from fossil fuels, as well as delivering resilience and support for the IMO's pledge to deliver a Just and Equitable Transition.

The future of shipping is certainly a windy one, but that is a good thing. In a time where everything is changing in our industry, there is one thing we can be sure of, the wind will always be an open, clean and free source of energy, uniquely available to harness forever.

04

From adoption to accountability: LNG reaffirms its carbon credentials

In 2024, liquefied natural gas (LNG) continued to develop its position in international shipping. No longer viewed solely as a transitional fuel, it is now embedded in fleet planning and operational strategies, offering a route to regulatory compliance and supporting broader decarbonisation objectives.

Adding to the confidence of LNG as a suitable alternative for commercial shipping, the industry has also seen continued fleet growth in dual and multi-fuel vessels, a more established bunkering network for LNG, and renewed efforts to address environmental concerns associated with methane emissions. In this vein, forward-thinking engine manufacturers, such as Wärtsilä, and collaborative maritime programmes like the Methane Abatement in Maritime Innovation Initiative (MAMII), led by Safetytech Accelerator, played a central role.

Strengthening the Commercial Case

According to SEA-LNG's A View from the Bridge 2025 report, 169 dual-fuel LNG vessels were added to the global fleet in 2024, bringing the total to 638 vessels. LNG bunkering infrastructure expanded to 198 ports, with 78 additional facilities in development. The number of bunkering vessels also increased by 22%. These developments reflect growing industry confidence in LNG's immediate value and longer-term adaptability.

LNG provides clear air quality benefits, including significant reductions in sulphur oxides, particulate matter, and nitrogen oxides. Depending on engine type, it also offers greenhouse gas emissions reductions of up to 23% on a well-to-wake basis. Crucially, it allows for vessels to more seamlessly transition to renewable methane variants without requiring changes to onboard systems.

The appeal of LNG also lies in its cost-effectiveness within the current regulatory landscape. It offers operators a way to meet both global and regional emissions targets while maintaining operational reliability. This combination of environmental and economic practicality continued to attract orders across several vessel segments, with the container, tanker and cruise sectors showing notable momentum.

Wärtsilä's Role in System Advancement

As one of the world's leading engine manufacturers, Wärtsilä has maintained a strong presence across both propulsion supply and systems optimisation in recent years. The introduction of Royal Caribbean's Icon of the Seas in January 2024, powered by six Wärtsilä multi-fuel engines, demonstrated LNG's role in mainstream cruise operations and showcasing flexibility in new vessel designs.

Elsewhere, Wärtsilä also worked with Chevron Shipping to convert dual-fuel engines on six LNG carriers to spark-ignition mode, targeting a reduction in methane slip. Additional agreements with GasLog and Capital Gas focused on operational efficiency and emissions management. These efforts formed part of Wärtsilä's broader approach to performance optimisation, particularly as market attention continues to focus on operational emissions.

The company's 31DF engine, incorporating NextDF features, was identified in Lloyd's Register's Fuel for Thought: LNG report as showing reduced methane slip at lower engine loads. As slow steaming becomes more common, these improvements are increasingly relevant.

Wärtsilä's approach extends beyond newbuild projects. The company has also been active in

retrofit markets, enabling existing vessels to benefit from updated efficiency measures. As more shipowners explore life extension strategies for their fleets, this focus on modular upgrades is expected to remain important amid growing decarbonisation targets.

Coordinating Action through MAMII

Methane emissions remained a focal point of environmental scrutiny in 2024. MAMII, coordinated by Safetytech Accelerator, brought together stakeholders across the LNG value chain to improve data collection, develop mitigation strategies, and create more consistent reporting frameworks.

In practice, MAMII piloted onboard sensors and engaged with verification protocols and methane measurement certification companies such as MiQ and OGMP. The initiative is one of the leading industry efforts to support an industry shift towards greater transparency in methane performance and the standardisation of emission measurement practices.

Progress was evident. Methane slip from four-stroke dual-fuel engines has been reduced by more than 85% since early implementations. Two-stroke high-pressure engines, which now represent the majority of LNG-powered vessels on order, are now considered to have negligible methane slip as a result of such programmes.

These efforts reflect a pragmatic understanding that long-term viability depends not only on performance, but on verifiability. By providing a structure for consistent reporting, MAMII enables regulators and stakeholders to engage with LNG performance based on critical data and evidence, further supporting critical investment strategies.

Expanding the Role of Renewable Methane

The availability of bio-LNG has continued to increase in recent months. SEA-LNG noted that over 70 ports now have access to liquefied biomethane. In April 2024, CMA CGM completed a bio-LNG bunkering operation in Rotterdam, supplied by Titan Clean Fuels using a mass balance approach.

When derived from waste-based sources, bio-LNG can deliver emissions reductions of up to 80% compared to marine diesel. These figures provide shipowners with a pathway to lower emissions using existing LNG-capable systems.

Wärtsilä's dual-fuel engines are compatible with both bio- and e-methane, offering flexibility in meeting regulatory and climate-related targets without major fleet modifications.

At the same time, developments in e-methane production offer future potential for fully synthetic fuels. While production capacity remains limited, trials and demonstration projects are progressing in several regions. The integration of renewable methane is expected to strengthen as policy frameworks evolve and incentives align.

Moving Forward

LNG is now firmly embedded in global fleet development. In 2024, it accounted for around 6% of fleet tonnage and made up nearly a quarter of the global newbuild orderbook by installed power. While discussion around alternative fuels continues, LNG's role is now defined by infrastructure, adoption and incremental emissions improvement.

Reports from SEA-LNG and Lloyd's Register reflect a broad yet positive industry view: LNG provides a workable solution for today's operational and compliance needs, while supporting the transition to future fuels. It is a practical choice, increasingly supported by both data and deployment.

The sector's direction will depend on continued emissions transparency and access to low and zero-carbon methane options. With Wärtsilä's technological developments and MAMII's coordination on methane governance, LNG's role appears likely to remain relevant well into the next phase of maritime energy transition.

Looking ahead, more structured integration of renewable molecules, improved emissions tracking and a maturing retrofit market will likely define the next chapter. LNG's progress in 2024 suggests that pragmatic, adaptable solutions still carry weight in a sector facing complex challenges.

05

Keeping track of green technology

During 2024 the shipping industry increased its pursuit towards decarbonisation through increased adoption of alternative fuels and energy-saving technologies. Data from Clarkson's Green Technology Tracker indicated that half of all newbuild tonnage ordered in 2024 was capable of using some form of alternative fuel. While this signalled substantial investment in green propulsion and emissions-reducing equipment in recent years, infrastructure development and overall fleet emissions trends showed ongoing challenges in reducing greenhouse gas (GHG) output in the maritime sector.

Alternative Uptake in Newbuilds

Statistics for 2024 show a total of 820 vessels were ordered with alternative fuel capability, including 727 orders (totalling 52.1 million gt) once LNG carriers were excluded. This level of investment reflected that 50% of all newbuild tonnage featured provisions to switch from conventional marine fuel. Within alternative fuels, dual-fuel LNG technology accounted for the majority share. Excluding LNG carriers, LNG dual-fuel designs made up 70% of green-enabled tonnage ordered in 2024, compared with 43% in 2023. Vessels capable of using methanol represented 14% of alternative fuel orders, down from 30% the previous year. Other fuel carriers in the order book comprised ammonia (25 orders), LPG (72 orders) and hydrogen (12 orders).

Data also noted an increase in "ready" orders. Ships categorised as "ready" have hull design, engine-room layout or structural modifications that allow future retrofitting to alternative fuel use. In 2024, approximately 21% of all ordered tonnage, equivalent to 452 vessels, fell into this category. Among these, methanol readiness accounted for 320 orders and ammonia readiness for 130 orders. This trend suggests that yards and owners aimed to limit near-term capital spending on green fuel systems while retaining the option to install them as fuel availability and economics change.

Not all vessel segments adopted alternative fuel uptake at the same rate. Cargo segments that can use the transported commodity as fuel showed higher uptake. For example, 100% of all LNG carrier tonnage ordered was equipped for dual-fuel LNG operation. LPG carriers (including VLGC, VLAC and VLEC) recorded a 90% rate of LPG/ethane/ammonia dual-fuel capability.

In the container market the 12,000-plus TEU class saw 71% of ordered newbuild capacity able to burn LNG, with 17% offering methanol capability. Car carriers followed a similar pattern, with 78% of orders LNG-capable and 21% methanol-ready. These segments had the highest levels of uptake among non-commodity-fuelled fleets in 2024.

In contrast, smaller vessel classes showed lower uptake. Ultramax bulk carriers and Handyside vessels each recorded 4% of orders equipped for alternative fuels, while medium-range tankers had just 1% of new orders featuring green-fuel capacity. These figures indicate that some smaller shipowners remained cautious about new-technology propulsion, possibly due to cost, fuel availability or uncertainty around return on investment.

With nearly half of the confirmed order book tonnage being alternative fuel capable in 2024, it is forecast that more than 20% of global fleet capacity will be technically able to burn an alternative fuel by 2030. In 2017, only 2% of the global fleet was alternative fuel capable, rising to 8% in 2024. However, delivery cycles and lead times, currently averaging around 3.7 years at

major shipyards, mean that the fleet's average age remains relatively high. The gross-tonnage weighted age of the global fleet was 13.1 years, compared with 9.7 years in 2013. As a result, the rate of new alternative fuel deliveries will need to continue increasing to offset the emissions footprint of older vessels.

Infrastructure and Fuel Availability

While the newbuild order book reflects engines and fuel systems ready for use, actual uptake of green fuels depends on bunkering infrastructure.

In 2024, 276 ports worldwide had operational or planned LNG bunkering facilities, and 275 ports had existing or planned shore-power connections. In contrast, only 35 ports featured available or committed methanol bunkering. This gap indicates that LNG remains the more accessible alternative fuel at scale, while methanol and ammonia infrastructure still lag. Ammonia bunkering continues to be challenged by technical and regulatory hurdles, so its roll-out remained slower despite 25 newbuild orders for ammonia-capable vessels in 2024.

The difference between ports with LNG readiness and those equipped for methanol or hydrogen highlights another challenge. Until fuel supply chains expand, many ordered "ready" vessels may not be able to operate on green fuels even after delivery. Shipowners have long monitored port developments and fuel-price spreads carefully before planning large-scale retrofits of "ready" vessels, with some owners choosing to retrofit existing tonnage with dual-fuel capacity under green-corridor pilot schemes in Northern Europe and Asia, where infrastructure support was relatively stronger.

Given the lead times for newbuilds that can accommodate alternative fuels, retrofitting energy-saving technologies (ESTs) remained a key measure for decarbonising the existing fleet. By the end of 2024, more than 10,360 ships, accounting for over 37% of global fleet tonnage, had been fitted with at least one significant EST. These included propeller ducts, rudder bulbs, Flettner rotors, wind-assistance kites and air-lubrication systems. More than 580 vessels were equipped with air-lubrication systems and over 145 units involved wind assistance, either via rotor sails or kite technology. Such retrofits have helped to reduce fuel consumption by decreasing hull resistance or harnessing wind power on longer voyages.

Meanwhile, 37 vessels were actively testing carbon capture systems, while 12 newbuild orders incorporated carbon capture equipment in 2024. These pilot schemes aim to capture carbon emissions from main engines before release into the atmosphere. As regulatory scrutiny around carbon intensity continues, shipping companies observed pilot results to assess scale-up potential.

Another metric was the increase in "Eco" engine installations. In 2024, about 34% of the global fleet was powered by an engine design optimised for fuel efficiency and lower emissions, up from 29% the previous year. These engines feature improvements such as higher compression ratios, optimised fuel injection systems and reduced internal friction. Combined with hull and propulsion retrofits, "Eco" engines contributed to a lower overall emissions baseline, even where alternative fuels were not yet available.

Despite trends in green technology adoption, global GHG emissions from shipping rose by about 4% year-on-year in 2024, reaching over one billion tonnes of CO_2 equivalent on a well-to-wake (WTW) basis. Several factors contributed to this increase. Vessels spent more time at sea due to longer voyage distances, especially as ships rerouted around the Red Sea to avoid

regional security risks. Average vessel speeds also increased in the container sector, driven by e-commerce demand that encouraged faster transit rather than slow steaming, while growing trade volumes offset emissions reductions from new alternative fuel vessels, "Eco" engine installations and EST retrofits.

In addition, a significant portion of capacity continued to rely on conventional heavy fuel oil or marine gas oil. Ships rated D or E under the Carbon Intensity Indicator (CII) in 2023 made up about one third of fleet gross tonnage, indicating that many vessels were not operating at optimal efficiency. Until those older vessels are phased out or retrofitted, absolute GHG emissions are likely to remain elevated, particularly as trade grows in emerging markets and fleet utilisation increases.

Ongoing Challenges

Looking ahead to 2030, the forecast suggests that even if over 20% of fleet capacity is alternative fuel capable by that time, broader decarbonisation targets will require simultaneous expansions in port infrastructure, fuel supply chains and operational efficiency measures. Ports need to accelerate construction of methanol and ammonia bunkering facilities alongside LNG, since the percentage of new multifunctional vessels increases each year. Without aligned investment in fuel availability, many ordered "ready" vessels may not operate on their intended fuels for several years after delivery.

Retrofitting remains a cost-effective measure to reduce emissions in the near term, yet owners face challenges in financing such projects amid thin charter rates and uncertain regulatory regimes. Air-lubrication and wind-assistance systems can each deliver single-digit percentage reductions in fuel consumption, but installation costs and downtime must be balanced against expected savings. Carbon capture kits on a limited number of vessels require further demonstration of operational feasibility and compliance with safety and port regulations.

Shipping's path to lower carbon intensity also depends on fuel-price dynamics. LNG remains relatively cheaper and more widely available than methanol or ammonia, but governments and ports may incentivise lower-emission fuels through subsidies, tax breaks or mandate schemes. Owners need to balance short-term economics against longer-term regulatory risks, particularly as the International Maritime Organization and various regional bodies tighten emissions standards.

Regardless of the obstacles, 2024 was another positive year in the development of green technology, with record investment in alternative fuel capabilities, an increase in EST retrofits and growth in "Eco" engine installations.

Despite these developments, global GHG emissions rose by 4% as longer voyage distances, higher operational speeds and continued reliance on older vessels offset some of the benefits. With half of newbuild orders featuring alternative fuel capacity and over one third of existing tonnage fitted with ESTs, the shipping industry moved toward cleaner operations.

Achieving emissions reductions by 2030 will require coordinated expansion of port infrastructure, reliable fuel supplies, financial incentives and continued innovation in energy efficiency. Only through alignment of ship design, retrofit strategies and regulatory frameworks can the sector reduce its contribution to climate change.

06

Container shipping's mountain to climb

The container shipping industry finds itself navigating one of the biggest transitions in its modern history by trying to significantly reduce its carbon emissions. As the engine room of global trade, shipping has come under increasing pressure to decarbonise and leading container lines responded in the past year with innovative technologies and new initiatives to minimise their environmental footprint.

Among those making notable progress is Ocean Network Express (ONE), with the Singapore-headquartered liner taking a multi-pronged approach to cutting carbon emissions. In April 2024, ONE launched ONE LEAF+, a green shipping programme that lets customers choose lower-carbon shipping options using alternative marine fuels. Each shipment comes with a verified certificate showing how much CO ☒ has been avoided that proved to be a valuable tool for companies tracking their own climate impact.

Aside from reducing current emissions, ONE has also been future proofing its fleet with the company placing orders for 22 methanol dual-fuel container ships in 2024, with deliveries expected from 2027. These vessels are designed to operate on cleaner-burning methanol, giving the liner more flexibility as the fuel transition landscape evolves.

ONE's efforts are part of a broader trend across the industry as many of the world's top shipping companies race to meet decarbonisation targets.

Maersk, long seen as a leader in maritime sustainability, has taken a holistic approach to decarbonisation that goes beyond alternative fuels. In 2024, the company continued to invest in green corridors, partnering with ports and logistics providers to create end-to-end low-emission trade routes. It also expanded its fleet efficiency programme, using advanced digital tools and AI to optimise vessel speeds, routing and fuel use in real time.

On land, Maersk has also been transitioning warehouses and terminals to renewable energy, with several major facilities now powered entirely by solar and wind.

Over at CMA CGM, the focus is on fleet expansion and diversification. The French carrier is adding more dual-fuel vessels that can run on liquefied natural gas (LNG) and, in the future, low-emission synthetic fuels like biomethane. By 2029, the company expects to operate more than 150 ships capable of using lower-carbon energy sources.

Hapag-Lloyd, based in Hamburg, is also investing in dual-fuel ships and biofuels. In 2024, the company's Ship Green programme allowed customers the option to reduce the emissions of their cargo using second-generation biofuels made from waste rather than crops. The German carrier has reported over 80% emissions reductions when using these fuels versus standard marine oil and continues to explore new routes for further decarbonisation.

Meanwhile, MSC, the world's largest container line by capacity, has focused on strategic partnerships to build its low-carbon roadmap. In 2024, MSC deepened its collaboration with Italian energy company Eni to explore bio-LNG and other renewable marine fuels to replace and supplement its traditional bunker fuel. The two companies are also working on joint energy transition projects that include renewable power for ports and terminals.

Overcoming challenges

While these examples show that progress is being

made, they also remind us of the complexity of decarbonising the world's shipping fleet.

One of the biggest challenges remain fuel availability and cost. While green methanol, ammonia and biofuels show great promise, they remain limited in supply and more expensive than conventional fuels. For smaller carriers or those operating on thinner margins, adopting these fuels at scale may not yet be financially feasible.

Another bottleneck is infrastructure as many ports are still not equipped to handle alternative fuels safely and efficiently. That means dual-fuel ships cannot always find the right fuel at every port which creates uncertainty for voyage planning and fuelling schedules. Hence, there remains a pressing need for greater investment in port-side infrastructure including storage tanks, safety systems, and trained personnel to make alternative fuels a truly global solution.

On top of that, regulatory uncertainty is causing hesitation. While the International Maritime Organization (IMO) has set a goal of reaching net-zero greenhouse gas emissions from shipping by around 2050, the finer details such as carbon pricing, fuel standards, and enforcement are still evolving. The European Union has already included shipping in its carbon pricing system but other major economies have not yet introduced similar regulations or aligned their approaches. For globally operating carriers, this patchwork of policies adds administrative complexity and cost.

Building adaptability

While the momentum behind alternative marine fuels has accelerated, no single solution has yet emerged as the definitive choice for decarbonising global container shipping. Two of the most talked-about contenders, methanol and ammonia, each present a unique set of advantages and challenges.

Methanol has gained traction due to its relative ease of handling, compatibility with existing engine technologies and lower investment requirements for onboard fuel systems and bunkering infrastructure. However, its lower energy density means ships must carry significantly more fuel to travel the same distance, which impacts vessel design and cargo space.

And while ammonia is far more energy-dense and emits no carbon dioxide at the point of combustion, its extreme toxicity and corrosiveness still pose serious safety concerns.

Not surprisingly, container shipping companies are investing in dual-fuel vessels that can be retrofitted for either fuel or opting for modular engine platforms that can accommodate future adaptations. Meanwhile, other technologies like wind-assisted propulsion and electric vessels are gaining ground, particularly in short sea and regional shipping markets.

In short, the past year was one of experimentation and strategic positioning within the global container sector and what is clear is that the race is no longer about finding the right green fuel, but building the flexibility and agility to adapt in the years to come.

07

How the new IMO Net-Zero Framework can shape the future of maritime decarbonisation

In July 2023, the International Maritime Organization (IMO) adopted a revised greenhouse gas (GHG) strategy that set the sector on a trajectory to reach net-zero emissions by 2050. Nearly two years later, that strategy has come to life in the form of the IMO Net-Zero Framework, binding policy measures that were agreed upon in April 2025 with final adoption expected in October 2025.

A new Getting to Zero Coalition report drew on total cost of ownership (TCO) modelling, and more than 30 interviews with stakeholders across the value chain, to examine the implications of these measures on the maritime sector's capital and operational strategies, costs, and risks. These include a focus on how they can drive early commercial maturity of scalable, zero-emission fuels and vessels, thereby minimising long-term disruption and investment risk.

The analysis shows that:

·Scalable zero-emission fuels that can be produced using electricity as a primary input, such as e-ammonia, e-methanol, and e-methane, have the highest potential to deliver on the sector's decarbonisation targets. Still, their value chains must be developed within the next decade to reach commercial viability.

·The shipping sector's binding emissions targets and the current level of penalties for not hitting them are enough to incentivise long-term investment, but they require further strengthening via targeted rewards for scalable zero-emission fuels, stricter emissions accounting, and higher penalties for non-compliance.

·Long-term cost modelling finds that, without rewards or increased penalty levels, dual-fuel ships running on liquefied natural gas (LNG) and ammonia will be the most cost-competitive options before the mid-2030s, with blue ammonia taking the lead from around 2037 and e-ammonia from 2043 onwards.

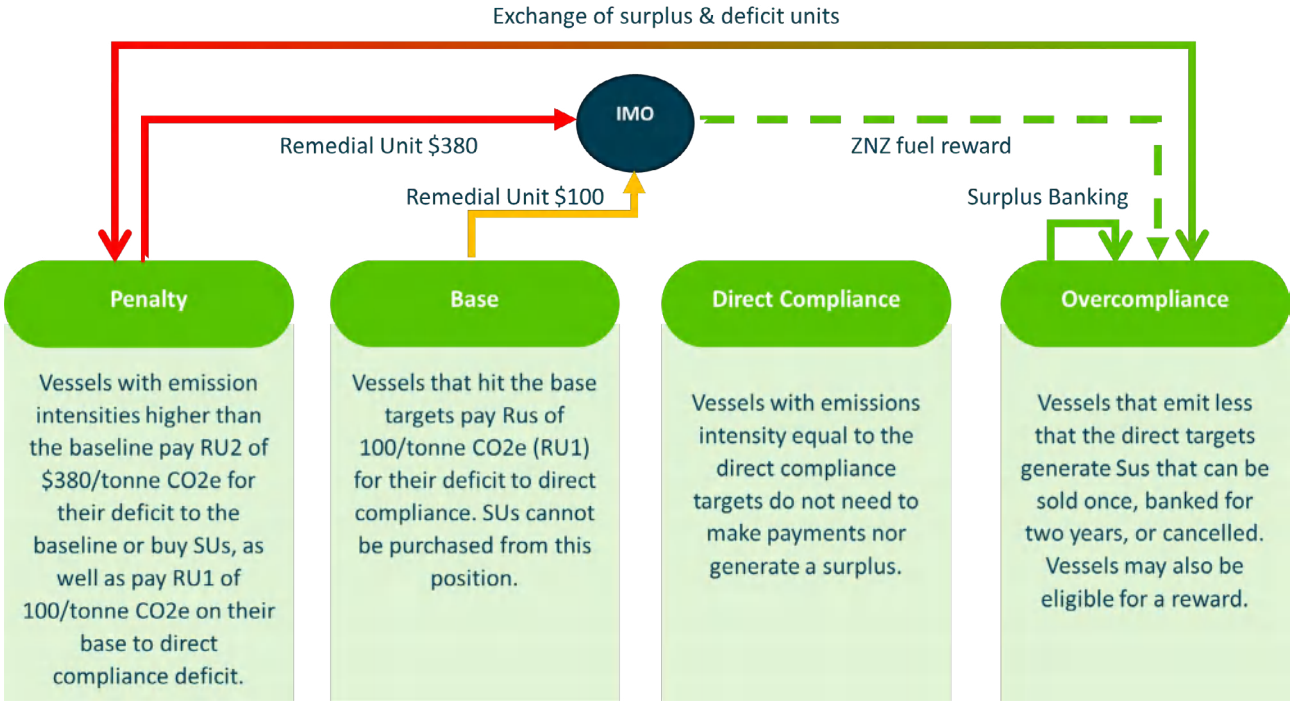
What was agreed upon at MEPC 83?

The new policy framework establishes a tiered global fuel standard, which sets annual fuel GHG intensity reduction targets for 2028-2035 and 2040. It establishes two reduction trajectories: a "base" trajectory, which splits undercompliance into two tiers, and a stricter "direct compliance" trajectory, which vessels must meet to avoid penalties. Each year, vessels may be deemed under-compliant, compliant, or over-compliant relative to the targets.

The framework also incorporates a credit trading scheme that allows under-compliant vessels to comply by paying remedial units (RUs) to the IMO or, if they emit more than the base target, the additional possibility of buying surplus units (SUs) from vessels that emit less than the direct compliance target. Meanwhile, the use of zero- or near-zero emission fuels will be rewarded, although the specifics remain unknown.

The framework creates four possible compliance positions for vessels across the two tiers:

Figure 1



Possible maritime fuel pathways

The steepening GHG reduction curve and remedial unit pricing set a clear decarbonisation pathway for the sector. The transition period will likely be characterised by different technological pathways as the targets become increasingly stringent and the compliance options narrow. The expected targets for 2040 will likely limit the viable fuel options to e-fuels and advanced biofuels. Where biofuels may face scalability concerns because of scarce feedstocks and competition from other sectors, e-fuels have high scalability potential. Though 2040 may seem far off, vessel lifespans, infrastructure needs, and the time it will take to scale e-fuel production mean that investments and a growing share of e-fuels in the global fuel mix must begin this decade.

The Getting to Zero Coalition modelling identifies LNG and ammonia dual-fuel ships as the likely most cost-competitive solutions before the mid-2030s, with ammonia becoming the most competitive option from 2037. However, this is mainly driven by blue ammonia (ammonia produced from natural gas using carbon capture and storage technology) as e-fuels remain insufficiently incentivised before 2040. Appropriately designed rewards will be required for e-fuels to be competitive.

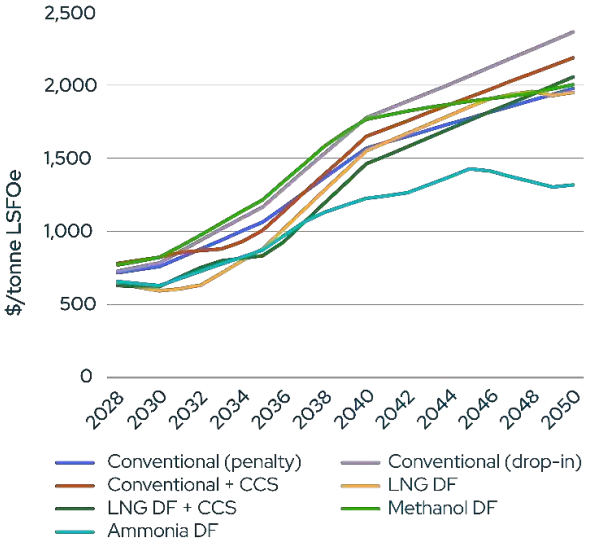


Figure 2

TCO for the lowest cost compliance options based on static RU/SU development without rewards

Interviews indicated that many shipowners may focus on short-term cost optimisation by reducing their non-compliance penalty amount. Shipowners with a long-term strategy for e-fuels, meanwhile, will likely leverage the system to maximise their investments. However, this hinges on sufficient incentives for first movers to ensure they reach the offtake of e-fuels already this decade.

What else is required to support the transition?

Despite the increase in dual-fuel vessels capable of running on e-fuels, commitment to the offtake of such fuels remains low due to several barriers:

1.**Uncertainty** as regulatory and market landscapes remain fluid

2.**Fuel availability constraints**

3.**High commercial risk** associated with long-term offtake agreements

4.A general **wait-and-see mindset** across the sector

Stronger signals are needed to break this cycle and avoid delaying the uptake of e-fuels.

Firstly, targeted rewards for e-fuels within the IMO Framework are required to ensure they reach the same commercial maturity in time as other compliant fuels. The modelling shows that with a targeted reward of $14 per gigajoule (GJ), e-ammonia could reach cost equivalence with LNG, while a $12–13/GJ reward could close the gap with blue ammonia. Without these incentives, the commercial viability of scalable zero-emission fuels may remain out of reach in the coming decades.

Secondly, the flexibility compliance mechanism, particularly the trading of overperformance through the sale of Sus, is also crucial to the business case of e-fuels. High SU prices make over-compliance more attractive, while lower SU

prices may result in a reliance on a 'pay to pollute' strategy that delays the transition. To support e-fuels and prevent SU prices from falling too low, the IMO can target rewards to scalable zero-emission fuels and introduce a flexible floor price for SUs.

Thirdly, the levels of the various penalties should increase to match the marginal abatement cost of high-potential fuels. Increasing RU levels in the long run is required to progressively remove the option of 'pay to pollute' and ensure a sufficiently high SU price.

National policies supporting e-fuels production and storage, financing, and risk sharing can also further drive the uptake of e-fuels, especially in the near term.

Recommendations

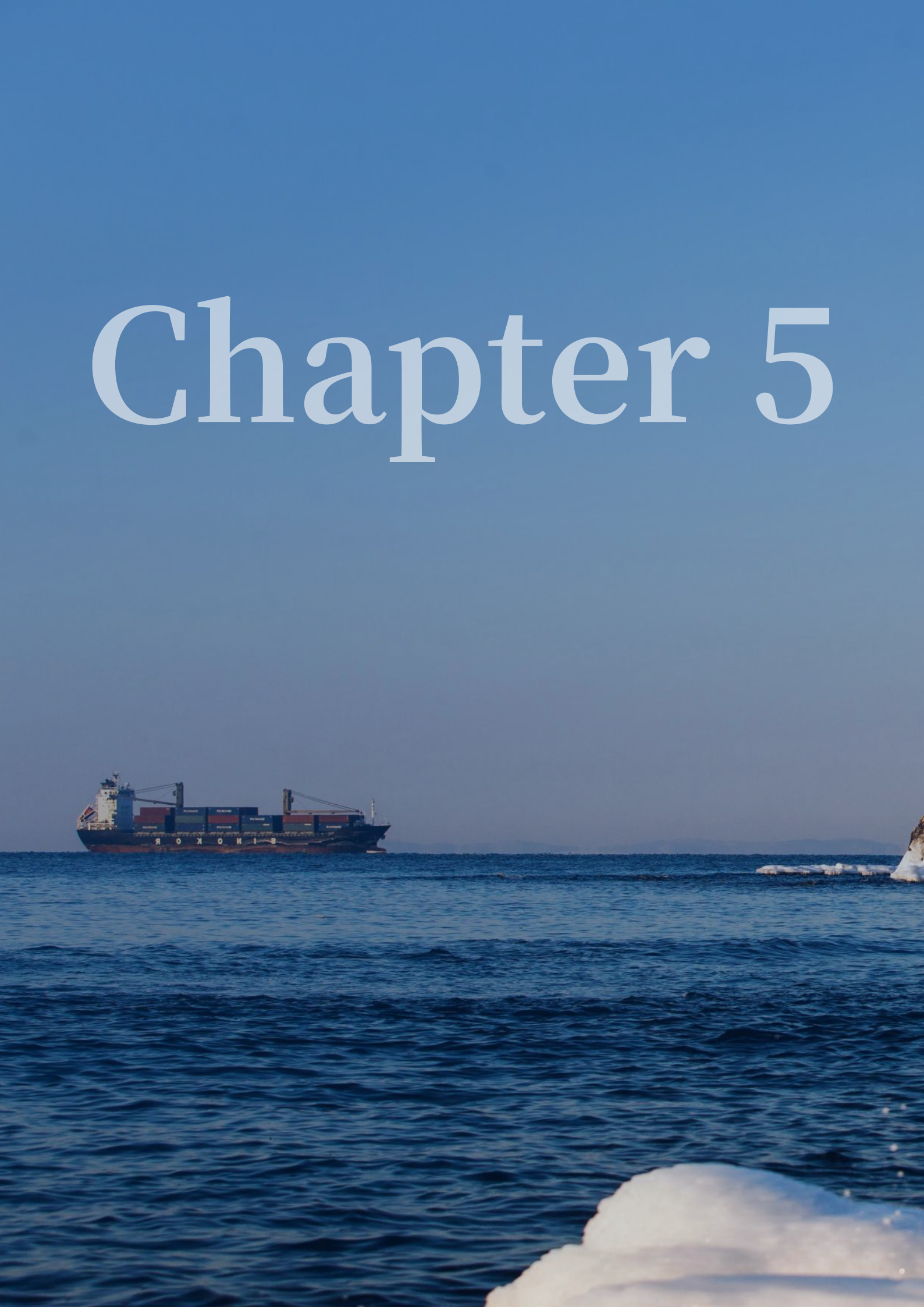
It is important to note that the sector's energy transition will only be successful if it is just and equitable, with no country or region left behind. This requires inclusive support for less developed countries, notably funding for technology transfer, capacity building, fuel and infrastructure, and climate impact mitigation.

With projected revenue from IMO measures expected to reach $11 billion annually during the first three years, balanced support must be provided to the global fuel supply chain and equitable development, particularly for countries with strong renewable potential.

The maritime industry should integrate long-term fuel planning into current compliance strategies, invest early in dual-fuel and e-fuel-compatible ships, advocate for policy clarity and a fair rewards system, and pursue risk-sharing strategies.

The choices made now will not only shape competitiveness but also the speed and success of the shift to zero-emission shipping.

Chapter 5



MARITIME FINANCE, INSURANCE AND RISK OUTLOOK

01

FFA market continues to ride the waves

In a story similar to that seen a year earlier, 2024 again saw volatility and instability in global shipping markets that saw freight rates fluctuate widely throughout the year. For many, this meant that Forward Freight Agreements (FFAs) were once again a popular choice for those seeking to hedge against the risk of dramatically changing freight rates, alongside providing financial security and a degree of predictability in a continually unpredictable environment.

As a result, figures published by Baltic Exchange show that 2024 was yet another strong year for the freight derivatives market in commercial shipping.

FFAs are typically brokered through shipbrokers with specialist futures desks. Companies, including Clarksons, SSY, Freight Investor Services, Braemar and Arrow, have teams in financial centre such as London, Singapore, Dubai and New York that focus on this market, as well as offering access to carbon, iron ore, oil brokerage and other specialist areas.

Driving freight derivatives trading is the volatility in the physical freight market. Freight rates can fluctuate in the region of thousands of dollars per day as the market assesses vessel availability versus cargo demand. Sentiment can also play a significant role. Shipping companies, banks, investment houses and other institutions seek to manage freight exposure by reducing this risk through hedging or taking positions with an expectation of profiting from the volatility.

Positive sentiment across sectors

In the dry bulk sector, a total of 3,047,511 FFA volumes were traded in 2024, which was almost exactly the same as those traded in 2023. This sustained high level underlines the importance of FFAs to the dry bulk sector, which remains the most liquid sector in the maritime space due to the size and importance of dry bulk commodities globally, particularly in China.

In the tanker sector, it was an even stronger year for FFA volumes following a notably positive 2023. A total of 885,243 FFA volumes were traded across the dirty and clean sectors, up from the 828,000 seen in 2023. This rise was primarily due to continued disruption in the Red Sea that caused many tanker vessels to reroute around the Cape of Good Hope, leading to longer shipping times and increased freight rates.

In the container market, freight rates reflected the market's volatility, particularly due to the Red Sea crisis and ongoing strike actions at US East Coast and US West Coast ports. According to the Freightos Baltic Container Index (FBX), rates rose quickly in January to 3,448 before dropping to 2,305 in April. It then spiked to 5,620 in August before falling again to 3,087 in October owing to an earlier than predicted peak season and volumes easing earlier than usual. Despite this volatility, rates were more than double those seen pre-pandemic as the sector continued to battle ongoing geopolitical, inflationary and capacity challenges.

Landmark deals

This volatility meant those in the container market sought FFAs as a means on managing the risk. In May 2024, Braemar Securities, the FFA desk of Braemar Shipping Services, closed the first-ever container derivatives trade on the Singapore Exchange (SGX). According to Mark Jackson, CEO of Baltic Exchange, this landmark deal "is a significant step forward in providing the same level of certainty to the container freight market, particularly as it faces increased volatility amid ongoing geopolitical risks and port

congestion in key hubs".

This year also saw another notable first in the FFA market. In March 2024, shipbroker Clarksons brokered the world's first LNG FFA trade on the Chicago Mercantile Exchange (CNE), specifically for the Baltic Exchange's BLNG2g 173 LNG route, in what it described as "a flexible and efficient tool to hedge against future freight rate fluctuations, allowing for better risk management and enhanced decision-making in the dynamic LNG shipping market".

Forward look

With demand for FFAs growing across multiple sectors, it is unsurprising that the FFA market is now worth up to US$100 billion, according to FFA partners speaking at a dry bulk conference in Geneva. Increased volume numbers from specialists, hedge funds, and commodities giants has boosted the market's liquidity and made FFAs a more viable option to navigate the complexity of modern shipping.

Meanwhile, the arrival of a younger generation that investment banking or financial sector backgrounds may well have a positive development on the FFA market. Many arrive in shipping with more familiarity of the derivatives market, how to combine physical and paper positions, and how to manage financial risks using derivatives.

For many outside of traditional maritime circles, shipping is also beginning to present itself as a new derivatives asset class to invest in as investors look at ways to diversify their opportunities and seek unexplored and unique asset classes. This could bring a lot more liquidity to the market as shipping companies increasingly use FFAs and options as hedging strategies to protect themselves from potential losses from falling rates, while also reflecting how mature and sophisticated the shipping market has become.

Advances in technology and data-driven analytics will likely result in an FFA market that is driven by data science, machine learning and artificial intelligence, enabling market participants to process vast volumes of data more quickly and easily.

This evolution could result in a more efficient, broader and liquid FFA market, according to a market report by Braemar. However, the report also cautions that, as data-driven models become more entrenched, there is a growing risk that FFA pricing could become detached from the realities of the shipping industry, with market movements increasingly shaped by financial dynamics rather than physical supply and demand.

For now, however, FFAs continue to be a sought-after commodity, particularly as volatility shows no sign of slowing down and many seek the confidence and predictability of pricing to help guide their investment decisions.

02

Insuring uncertainty: How 2024 reshaped marine insurance risk

The past year proved to be an eventful period for the maritime industry that shaped how marine insurers assessed, priced, and structured risk. As trade routes shifted and inflationary pressures drove up claims cost, premiums rose across key coverage lines while exclusions widened as underwriters adopted more conservative approaches.

We examine five key developments that defined marine insurance in 2024 and continue to influence the sector's trajectory moving forward.

Geopolitical risk disrupted traditional routes

Geopolitical tensions dominated the marine insurance landscape in 2024, with the Houthi attacks on commercial vessels in the Red Sea disrupting one of the world's most important maritime routes.

Rerouting vessels around the Cape of Good Hope led to longer voyages, higher fuel consumption and rising logistical complexity. This not only drove up war-risk premiums in high-threat zones but also contributed to broader increases in hull & machinery, cargo, and business interruption premiums along rerouted paths.

Meanwhile, the Russia-Ukraine conflict continued to cast a long shadow over global maritime insurance. Coverage conditions were tightened not only in directly impacted areas but also in nearby shipping corridors where the risk of escalation was high.

These developments prompted insurers to recalibrate geopolitical risk assessments across multiple regions by factoring in potential flashpoints beyond immediate zones of conflict.

Baltimore bridge incident

The collapse of the Francis Scott Key Bridge in Baltimore in March of last year significantly influenced the marine insurance market's risk outlook. For one, the event led to insured losses of up to approximately US$4 billion, making it one of the most expensive marine insurance incidents of the past decade.

Claims spanned Protection & Indemnity (P&I), third-party liability, hull and machinery (H&M), and business interruption lines. While the incident alone may not have been sufficient to cause a direct hardening of the market, it amplified concerns about infrastructure risk and contributed to upward pressure on liability-related premiums.

In its aftermath, insurers and reinsurers reassessed port vulnerability globally, with underwriting practices evolving to include greater scrutiny of vessel manoeuvrability in high-density traffic zones, as well as bridge and berth clearance standards.

Climate risk remains in focus

Climate-related risk continued to shape marine insurance throughout 2024, with extreme weather events contributing to a rise in claims linked to cargo damage, vessel groundings, and infrastructure disruption.

Maritime energy transition gathered pace with operators under increasing pressure to decarbonise. For instance, the FuelEU Maritime directive that took effect in January 2024 imposed mandatory greenhouse gas intensity reductions on fuels used by ships calling at EU ports.

Vessel operators that have invested in green shipping technologies and lower-emission fleets continue to be viewed favourably by underwriters. As environmental compliance become both a regulatory and risk-based issue,

insurers are playing a greater role in incentivising sustainable maritime practices.

4. Cyber exposure on the rise

Throughout 2024, cyber security increasingly became a core marine insurance concern, with several attempted ransomware attacks on port authorities and digital logistics systems underscoring the fragility of maritime infrastructure in the face of digital threats.

Insurers responded by tightening cyber exclusions within traditional marine policies and rolling out stand-alone cyber marine coverage for operators. While adoption of cyber insurance remained uneven across the industry, it became clear that digital risk assessments would become a standard part of marine underwriting moving forward.

For underwriters and ship operators alike, 2024 was a reminder that cyber vulnerabilities could have physical, financial, and reputational consequences.

5. Supply chain and inflation amplified marine risk

Supply chain disruption remained high on the agenda for global shipping in 2024, as seen in vessels rerouting around conflict zones, more frequent port congestion and wider economic challenges such as inflation.

The closure of the Port of Baltimore following the bridge collapse added to inland congestion across North America, while Red Sea tensions forced carriers onto longer and more costly routes via the Cape of Good Hope. These shifts strained container availability, delayed schedules, and increased unpredictability across global freight networks.

Meanwhile, inflationary pressures drove up the cost of vessel repairs, spare parts, labour, and salvage operations, leading to an uptick in cargo claims and a sharp increase in the cost of settling H&M claims.

The combined effect of disrupted logistics and rising costs prompted insurers to reassess how supply chain fragility and inflationary pressures should be factored into risk exposure, policy limits, and operational expectations.

A riskier and more discerning market

By the close of 2024, marine insurers increasingly demanded visibility, compliance, and digital resilience from shipping operators in exchange for competitive terms. For the industry, this marked a continued shift toward proactive and real-time risk management rather than reactive claims handling.

The year also demonstrated that traditional marine risks, such as collision, weather and liability, as well as the emerging threats of cyber, geopolitics and regulatory risk, were well and truly interconnected.

Marine insurance has long served as the shock absorber of global trade. In 2024, that role became much more critical and complex than ever before.

03

P&I Clubs regain strength amid ongoing risk pressures in 2024

Global Protection & Indemnity (P&I) clubs posted a strong financial performance in 2024 on the back of improved underwriting discipline, record-high free reserves, and greater stability in marine insurance markets.

The sector's rebound came despite persistent geopolitical tensions, emerging regulatory complexities, and heightened scrutiny of compliance risk within the shipping industry. It also followed a challenging 2022/23 policy year that saw almost double the number of pool claims compared to a year earlier.

The 12 International Group (IG) Clubs, which collectively insure over 90% of the world fleet by tonnage, ended the 2023/24 policy year with an all-time high total free reserve of US$5.7 billion - a notable increase from US$4.9 billion the year before. This improved capital position strengthens the role of P&I Clubs as financial backstops in an increasingly uncertain maritime environment.

The majority of P&I clubs posted significant reserve growth, bolstered by strong investment returns and fewer large pool claims. Several clubs also reported underwriting surpluses or near break-even performance, supported by controlled premium increases and modest growth in mutual tonnage.

Arthur J Gallagher (AJG), one of the world's largest insurance brokerages and risk management firms, estimates that premium income from 2024 to be around US$5.2 billion, up 10% from US$4.7 billion in the previous year, although an element of this increase will be reflected in increased reinsurance costs. Incurred claims also appear to be up almost 10% from US$2.85 billion to approximately US$3.1 billion.

Given improved performance, capital return measures have re-emerged. Clubs such as Steamship Mutual, Gard, and Skuld distributed a combined total of US$35 million back to members through premium credits and refunds, a signal of renewed financial confidence.

Tonnage growth was observed across the sector, including at merged entity NorthStandard, which announced premium revenue of US$825 million and a mutual poolable book of 256 million gt. Skuld increased its mutual book by 11% to 116 million gt, while Steamship Mutual and London P&I Club also reported tonnage gains, highlighting market confidence in diversified coverage offerings.

Despite the financial improvement, systemic risks remain. War-related exclusions, particularly in the Red Sea and Persian Gulf, continue to disrupt fixed premium markets, and reinsurers are increasingly cautious about high-risk geopolitical exposure. Concurrently, enforcement of sanctions, the EU Emissions Trading Scheme (ETS), and the growing 'dark fleet' pose regulatory and compliance hurdles for underwriters.

As Asia cements its role as a critical driver of maritime growth and regulation, Singapore-based insurers and stakeholders are particularly well-placed to navigate this complex environment. Clubs with strong regional ties in the Asia-Pacific region are expected to play a central role in risk mitigation as decarbonisation, digitalisation, and geopolitical fragmentation reshape global shipping.

Overall, the 2024 performance signals a welcome stabilisation in the marine mutuals market. With greater financial resilience, P&I clubs are poised to continue serving as key enablers of international trade as the maritime industry navigates an uncertain global outlook.

04

P&I Clubs seek to rebalance after record year

Despite delivering their strongest financial performance in recent memory, marine Protection and Indemnity (P&I) clubs approached this year's renewal season with caution. The return of large claims, rising geopolitical instability and a renewed sense of underwriting discipline saw P&I clubs take a more pragmatic approach despite a highly profitable financial year in 2023.

Back then, the combined ratio for the group stood at a healthy 96%, improving from 99% the previous year, while investment income also rebounded significantly reaching 6.6% on average. All of this led to a 15% increase in free reserves across the market, which put clubs in a strong capital position heading into the new policy year.

However, that optimism was tempered by a sharp reversal in claims experience during the 2024 policy year. Pool claims surged back to levels more in line with long-term historical trend after a notably quiet period in 2022 and 2023, thus prompting a reassessment of risk. Insurers now believe the market is returning to a more typical pattern of 20 or more pool claims per year, and the volatility of these large losses once again became a central issue during renewal discussions.

Premium increase

The Dali incident in Baltimore certainly comes to mind, with total insured losses from the event expected to be between US$1.5 and 2 billion. This would make it one of the largest claims in the history of P&I clubs, comparable to the Costa Concordia loss of 2012.

The overall rate increase for P&I clubs' reinsurance program was slightly above 10%, and adjustments were passed directly to shipowners as they are not absorbed or mitigated by the clubs themselves.

In parallel, the clubs pursued general increases in premium across their memberships. These ranged from zero, as offered by the Shipowners Club, to 7.5% as applied by Britannia. Clubs that had experienced more severe pool claims during the 2024 policy year generally applied higher increases to restore balance in the face of elevated claims activity and rising cost inflation.

Geopolitical risk weighs heavy

Looking forward to the 2026 policy year, a similar pattern is expected. Claims volatility is likely to continue, and most clubs are anticipated to target premium increases in the range of 5% to 7.5%.

Beyond these core financial dynamics, geopolitical factors are playing an increasingly influential role in shaping the P&I landscape. One growing concern is the expansion of the shadow fleet, and it is estimated that up to 10% of global ocean-going tonnage may now fall outside the P&I Clubs' cover.

This poses a systemic risk because if a major casualty were to involve an underinsured vessel in this group, the cost potentially could fall on local governments and the wider maritime community.

Additional geopolitical risks include instability in the Red Sea region, uncertainty around the Panama Canal, and evolving trade dynamics between the US and China. If threats such as tariffs or service fees on Chinese-built vessels materialise, or if geopolitical friction disrupts key maritime chokepoints, the resulting re-routing of vessels through more hazardous waters could increase the frequency of high-severity claims.

With broader geopolitical risks casting uncertainty over the sector, clubs and their members are likely to face a cautious and complex operating environment in the year ahead.

05

Shipowners navigate rising costs and shrinking returns

The global shipping investment landscape in 2024 reveals a striking contrast: vessel prices, both newbuildings and secondhand, have risen sharply, while their financial performance has declined. This mismatch between rising costs and falling returns has created a challenging environment for shipowners and investors.

One of the defining trends this year has been the sharp rise in newbuilding prices, pushed up by strong demand, changing environmental rules, and an ageing global fleet.

According to Baltic Exchange Investor Indices (BII) data, average newbuilding prices rose year-on-year across all major vessel types. For example, the cost of a new Capesize vessel increased from US$64.2 million in January 2024 to US$73.5 million in January 2025. Similar increases were recorded for Panamax (US$35.2 million to US$37.5 million), VLCCs (US$114 million to US$120.7 million), and Aframax tankers (US$62 million to US$69.3 million).

These price increases are partly due to a full shipyard schedule and wider market pressures, like the fallout from 2023's Red Sea disruptions, which have affected shipyard capacity and delivery times. Demand is also rising for greener, more efficient vessels, as shipowners prepare for new regulations.

The secondhand market has also seen prices rise, with five-year-old ships now costing more than last year. Buyers are turning to this option as newbuildings face delays and global trade remains uncertain.

According to BII data, a five-year-old Capesize saw its value rise from US$48.5 million to US$59.2 million in 2024, while the price of a five-year-old VLCC moved from US$100.8 million to US$109.6 million. Notably, Suezmax and Aframax tankers also experienced consistent growth, reaching US$80.9 million and US$71 million, respectively, by January 2025.

These increases, however, come at a time when vessel profitability has declined. The Baltic Exchange's Health of Earnings Index (HEI), which measures the margin between daily revenue and operating costs, revealed shrinking returns across most segments. For example, the HEI for a Capesize vessel dropped from US$3,993 per day to US$634 per day over the course of 2024. Panamax earnings declined from US$2,417 to US$713 per day, while Supramax and Handysize vessels saw similar downward trends. In the tanker sector, some segments, such as VLCCs, showed a modest improvement (from US$1,666 to US$2,161 per day), yet the overall picture remained below 2023 levels.

Amid these challenges, tools that support data-driven investment decisions have never been more crucial. The Baltic Exchange Investor Indices (BII) offer a comprehensive suite of indicators designed to support dry bulk and tanker shipping investment decisions. These indices provide insights into vessel investment health, residual value, earnings potential, purchase and recycling values, and operational costs. Covering major vessel types, including Capesize, Panamax, Supramax, Handysize, VLCC, Aframax, Suezmax, and MR tankers, the BII indices help investors track market trends, asset values, and risk exposure. By analysing historical and current data, including timecharter earnings and recycling values, the indices reveal market cycles, investment risks, and potential returns. This tool enables investors to make well-informed entry and exit decisions amid the cyclical nature of freight rates and global shipping dynamics.

2024 has been a challenging year, but tools like the BII remain key to navigating market fluctuations. As vessel prices rise and earnings come under pressure, investors need to balance short-term gains with long-term value and timing.

06

Shipping finance sets stronger course to net-zero

As the maritime sector navigates its course towards a net-zero future, the scale of investment required to achieve decarbonisation goals is coming into focus. Shipping is responsible for nearly 3% of global greenhouse gas emissions, and the industry has committed to achieving net-zero emissions by 2050. Yet progress remains uneven, and financing continues to be one of the biggest barriers to change.

Unlike other sectors making fast progress in the green transition, maritime decarbonisation is still just beginning. Technologies like green ammonia, methanol, carbon capture systems, and wind-assisted propulsion are making steady progress, but scaling them up needs huge amounts of investment. The Environmental Defense Fund (EDF) estimates that trillions of dollars will be needed across shipbuilding, fuel infrastructure, and upgrades. But right now, that level of funding is not coming in fast enough to meet shipping's 2050 target.

One major reason is the lack of clear, long-term incentives for investors. Shipping is a global, fragmented industry where many owners work with tight margins. Low-carbon fuels currently cost much more than traditional heavy fuel oil, and the infrastructure to support them is still limited. This creates uncertainty for investors and lenders, especially without strong carbon pricing or regulations that reward those who act early.

The Poseidon Principles, a global framework launched in 2019, is helping to reshape shipping finance. Representing over 80% of global ship lending, around US$240 billion, the initiative, which includes global banks, major shipping lines and institutions, and other leading sustainability non-profit organisations, encourages financial institutions looking to invest in maritime, either through credit, mortgages or leases, to align their portfolios with the sector's decarbonisation goals. Its 2024 Annual Disclosure Report shows growing transparency and accountability among major banks and lenders, highlighting the evolving collaboration between finance providers and shipowners.

Importantly, the report highlights tangible investments in decarbonisation efforts in recent months. For example, several signatories have financed vessels equipped with advanced emission-reducing technologies and have supported projects involving green fuel-ready ships. The report also points to increased financing for vessels that meet stricter emission intensity standards, reflecting a shift toward more climate-aligned fleets. This is encouraging evidence of concrete action within the industry's financing landscape.

According to the report, 35 signatories'portfolios were aligned with the IMO's trajectory in 2024. This includes leading ship finance banks such as Société Générale and ING, showing that momentum is building. However, the report also highlights inconsistencies, with other institutions falling short of their targets. The gap between the front-runners and those falling behind is still large, showing that although progress is happening, it is not happening everywhere.

To close this gap, both public and private sectors need to take action. Governments can help by introducing targeted incentives and regulations that support early adopters. Meanwhile, financial institutions should integrate climate goals into their core investment strategies to comply with rules, and as part of a broader vision for sustainable and resilient transport.

Ultimately, the shipping industry cannot reach net zero without finance that is as ambitious and forward-looking as the technological solutions it aims to fund. Collaboration, transparency, and shared responsibility are essential. The Poseidon Principles are a promising step forward, but to truly change the sector, more institutions need to commit, more capital must be unlocked, and investment barriers must be removed.

The journey is long, but with collective action, shipping can not only meet its climate targets, but become a model of green innovation for other sectors.

Chapter 6

SHAPING THE FUTURE: INDUSTRY DEVELOPMENT

1.E-Commerce continues to thrive as shipping adapts to the online world

2.Global fleet continues to expand as 2024 orders line up

3.Compliance priorities shape flag state performance

4.Shipbroking continues forward momentum as demand soars

5.London remains at the forefront as global maritime arbitration expands

01

E-Commerce continues to thrive as shipping adapts to the online world

In 2024, the global e-commerce market continued to flourish despite ongoing challenges in the shipping industry. Continued consumer reliance on online shopping drove seaborne trade volumes higher even as carriers contended with vessel shortages, congestion and cost fluctuations. Shipping companies and logistics providers adapted by investing in infrastructure, embracing digital solutions and forging closer ties with e-tailers. Those developments pointed to an increasingly interwoven relationship between online retail growth and maritime trade, where agility and reliability were essential to ensure the supply chain could manage the surge in e-commerce cargo.

One factor underpinning e-commerce's strength was rising consumer demand across regions such as the Middle East and Southeast Asia. According to industry data, global seaborne trade expanded by 5% in the first half of 2024, largely driven by e-commerce and manufacturing growth. Governments in countries like Saudi Arabia accelerated investment in port infrastructure, while China constructed new berths to accommodate larger vessels, reducing delays. Those improvements helped absorb surging cargo volumes even as traditional trade routes faced pressure from shifting consumer patterns.

Shipping companies began offering more varied services and focused on routes with growing demand to cater to market needs. They created special "e-commerce lanes" that emphasised faster, more reliable delivery rather than merely lower costs. Rather than depending only on once-a-week sailings, they added more frequent smaller ships to mid-sized ports, which cut down transit times to major regional distribution centres. By working with last-mile delivery partners, logistics providers gave online retailers a complete service that tracked parcels from the factory all the way to the customer's home. That integration was particularly important for smaller online merchants, which often lacked the volume to negotiate advantageous rates directly with carriers.

Continued digitalisation

Another significant development was the continued digitalisation of shipping processes. E-commerce businesses require real-time visibility as consumers have grown to expect next-day or two-day delivery windows regardless of product origin. In response, many liners and freight forwarders invested in cloud-based platforms that enable automated booking, dynamic pricing and shipment tracking. That change reduced manual paperwork and minimised errors, allowing logistics teams to respond rapidly to disruptions such as port strikes or sudden shifts in demand. As a result, e-tailers could promise delivery estimates with greater confidence, strengthening brand reputations and encouraging repeat purchases.

Sustainability considerations also shaped the relationship between e-commerce and maritime logistics. Consumers increasingly favoured retailers that committed to lower carbon footprints, and major carriers began offering 'green shipping' options for online merchants. By routing vessels along green corridors and adopting alternative fuels such as biofuels or liquefied natural gas, shipping lines provided e-commerce platforms with more environmentally responsible transport services. That alignment of corporate social responsibility goals helped smaller e-tailers compete against global rivals by meeting consumer demand for eco-friendly delivery without significant cost

increases.

Despite those positive trends, challenges remained as the maritime sector adapted to an increasing online market. Port congestion and equipment imbalances continued to cause delays, especially during peak shopping seasons. Fluctuating fuel prices and geopolitical tensions drove sudden spikes in freight rates, forcing e-tailers to adjust pricing or absorb additional costs. To mitigate those risks, many logistics providers established regional distribution hubs closer to key consumer markets. Such flexibility was crucial to avoid lack of stock and maintain customer satisfaction.

Competition for e-commerce

Whilst shipping is set to benefit from increased e-commerce cargo, it has to be aware of its more rapid competition. Global air cargo demand rose by 11.3 % in 2024, surpassing the previous 2021 record, as e-commerce platforms and shippers sought faster delivery options. Retailers and online marketplaces increased their reliance on air services to meet consumer expectations for next-day or two-day deliveries, particularly during peak shopping periods. This shift presented a clear challenge to maritime trade as some e-commerce volume that would once have moved by sea now bypassed container shipping in favour of air freight's speed and certainty.

Airport crowding and bottlenecks, however, added to costs and scheduling uncertainties in 2024, prompting carriers to invest in additional aircraft capacity and upgraded terminals. Amazon, for example, accelerated plans to expand its dedicated air cargo fleet, while Alibaba's logistics arm reduced transit times by deploying its own freighters for cross-border routes. Carriers converted older passenger aircraft into freighters and maximised cargo space on passenger flights to absorb the surge. Nevertheless, persistent congestion at major hubs drove up spot rates, making air freight more expensive yet still attractive for goods where speed directly influenced e-tailer margins.

As air cargo service levels improved, some online merchants shifted part of their supply chains away from slower ocean-based alternatives. This trend forced shipping lines to reconsider their value proposition and explore ways to offer quicker, more reliable services that could rival air-cargo reliability without incurring prohibitive costs. In turn, ports and terminal operators were under pressure to streamline handling processes, reduce dwell times and invest in digital tracking tools that could help container shipping regain its appeal among e-commerce shippers.

In a shipping landscape marked by uncertainty, e-commerce's ability to thrive underscored the necessity for maritime trade to keep evolving. Operators that embraced digitalisation, sustainability and strategic partnerships were best placed to meet consumer needs in 2024.

02

Global fleet continues to expand as 2024 orders line up

Shipping's asset markets saw continued fleet renewal in 2024 as owners across bulk carriers, tankers, container ships and gas carriers sought to replace ageing tonnage and address regulatory requirements. According to the 2024 end-of-year report by maritime data and freight management firm Veson Nautical, newbuilding orders increased in most segments while second-hand market activity and demolition varied by vessel type.

Dry bulk carriers

In the bulk carrier sector, ordering returned to levels last seen before 2022. Owners placed 501 newbuilding orders, up around 6% on 2023, supported by steady spot rates and the need to meet forthcoming ballast-water management and carbon-intensity regulations. Panamax vessels accounted for 40% of the total, while Ultramax, Supramax and Handysize designs made up roughly another third. Capesize orders more than doubled year on year as operators opted for larger, more fuel-efficient ships to handle iron-ore trades from Australia and Brazil. Chinese shipyards built three quarters of these new vessels, using their capacity to fit scrubbers, dual-fuel engines and other emissions-reduction equipment. Greece, traditionally the largest buyer of bulk tonnage, reduced its orders by more than a third, reflecting caution around capital expenditure and yard delivery schedules.

Second-hand bulk-carrier transactions increased by 8% to 1,121 sales in 2024, led by Ultramax and

Handysize vessels, which together accounted for about two thirds of deals. Owners were attracted by relatively lower prices and acceptable charter earnings in regional trades. Panamax sales rose by about 15% as grain and coal traders replaced older hulls. Capesize trades fell slightly because high asset values made mid-life vessels less appealing.

Scrapping remained limited, with only 59 bulkers sent for demolition, down 35% year on year. Most vessels sent for demolition were over 30 years old since charter earnings continued to support mid-life ships.

Tankers

New tanker orders reached 435 vessels in 2024, a 31% rise on the previous year. Stricter ballast water and NO_x emissions standards drove demand for Handy and MR-type tankers, which made up nearly half of all orders. These ships are used in refined-products trades and chemical shipping, where operators value flexibility and lower port fees. Aframax and LR2 units followed, with VLCC and Suezmax classes seeing smaller increases as crude flows remained steady. China increased its tanker orders from almost zero to 75 ships, reflecting an aim to expand its oil-trading and storage capacity. South Korea and Vietnam also contributed, with South Korean yards winning contracts for vessels built to eco-design specifications. Japan's share of such orders declined as its shipyards focused on LNG carriers and other specialised vessels.

Second-hand tanker sales fell by 18% to 671 vessels, as buyers in China, Greece and the United Arab Emirates waited for clearer signals on charter rates and possible policy changes after the US election. Many traders chose to delay purchases rather than pay high second-hand prices, causing a slight slowdown in deals for VLCCs and Suezmax ships. Only 11 tankers were scrapped, mostly older Aframaxes that no longer met Tier II emissions requirements, indicating that many operators prefer to defer demolition until rates or regulations make renewal more compelling.

Container vessels

Container shipping also saw higher activity in 2024. Newbuilding orders rose by 76% to 321 vessels. Growth in Asia–Europe and intra-Asia trades, combined with rerouting around the Cape of Good Hope due to Red Sea disruptions, increased TEU-mile demand by about 16%. Ultra-large container ships made up over 60% of new orders on the basis that larger units reduce unit costs over long distances. Post-Panamax and feeder vessels filled the remaining orders as regional services sought additional capacity. Taiwan, Singapore and Switzerland led in placing orders, with major container lines such as Evergreen, Hapag-Lloyd and MSC securing multiple options to guarantee tonnage.

Second-hand containership trades fell by 7% to 336 vessels as higher prices discouraged some buyers. However, feeder and Panamax ships remained in demand to cover delivery delays. Only 51 container ships were broken up in 2024, most of which were feeders built in the mid-1990s that did not meet modern fuel-efficiency standards.

Gas carriers

The gas carrier sector, divided into LPG and LNG markets, displayed different patterns. LPG ordering rose by 20% to 122 vessels, driven by demand for very large gas carriers and midsize fully refrigerated ships from petrochemical exporters in the Middle East, Asia and the US

Gulf. Singapore and Greece together accounted for nearly half of these orders, with other buyers including family-owned shipping groups. Second-hand LPG sales increased by 16% to 148 vessels, highlighted by a block sale of 12 VLGCs for over US$1 billion. Scrapping fell to seven vessels, the lowest in five years, as limited asset availability led owners to retain relatively modern tonnage.

Meanwhile, LNG ordering grew by 25% to 109 vessels, led by Q-Max and large LNG carriers for projects in Qatar, Australia and the United States. Asian utilities and charterers placed repeat orders under long-term contracts, which helped secure capacity until 2028. Second-hand LNG sales rose by 39% to 68 vessels as charterers took on slightly older ships under extended time charters to manage slot shortages. Seven LNG carriers, mostly non-eco designs, were dismantled, marking the highest level of demolition in this segment since 2019, as operators withdrew older ships to meet environmental standards.

Regulatory Pressure

Regulatory changes covering ballast water, sulphur limits, NO_x emissions and carbon intensity have been the main driver of renewal across the global fleet. Owners have generally preferred to invest in more efficient, newer ships rather than scrap mid-life vessels, particularly while charter rates remain at levels that help offset the cost of newbuild deliveries. China's growing role as an ordering and purchasing nation has altered regional demand, while Greece and other traditional markets have scaled back activity. The gap between second-hand trades and demolition has widened, with sales rising or holding steady even as scrapping stays at multi-year lows.

Shipyards are reported to be busy until 2027, as owners balance regulatory deadlines against financing challenges and the prospect of changing freight-rate cycles. Financial institutions have become more selective about supporting orders beyond 2025, concerned about potential overcapacity if demand weakens. Whether charter markets can maintain current returns will influence whether second-hand trading picks up again or demolition rates increase, which will shape the make-up of the global fleet. Owners must weigh the benefits of ordering now to meet environmental targets against the advantages of waiting for more favourable financing terms.

Regional developments have also affected ordering and sales patterns. Changes in trade growth across Asia, Europe and the Americas have prompted some operators to adjust vessel deployment and seek tonnage closer to main trade routes. Investors and lenders are closely examining how these shifts influence order books and vessel valuations, while operators consider fuel-cost differences and port charges when selecting new or second-hand ships.

In 2024, the global fleet underwent a phase of renewal reflecting both regulatory pressures and economic considerations. Choices about new orders, second-hand purchases and demolition policies carry implications for profitability and operational efficiency. As the International Maritime Organization's carbon intensity indicator and fuel-switch measures come into effect, decisions made now by shipowners, yards and financiers will shape the industry's progress towards lower emissions and sustainable operations. These outcomes will determine how the maritime sector adapts when environmental rules tighten, and market conditions evolve.

03 Compliance priorities shape flag state performance

There was no change in the order of the world's 10 largest flag states in 2024, according to data from Lloyd's List. Liberia retained the top position by gross tonnage, followed by Panama, the Marshall Islands, and Hong Kong. While rankings remained stable, a more cautious regulatory environment shaped decision-making among leading registries, with growth slowing and compliance emerging as a clear priority.

Regulatory action among leading registries

Over the past year, Liberia removed around 50 tankers previously linked to the Russian operator Sovcomflot, a move taken to reinforce its alignment with international sanctions regimes. Panama also implemented a new legal mechanism in early 2024 to deregister vessels associated with sanctioned activity. These actions affected net fleet figures but were largely viewed as efforts to preserve regulatory credibility.

Many of the vessels removed from leading registries during the year were reflagged with registries outside the top 10. While these flags did not appear in the main performance tables published by the International Chamber of Shipping or in Paris MoU White List rankings, their growing role as recipients of delisted tonnage attracted renewed attention from compliance and insurance stakeholders.

The ICS Flag State Performance Table 2024–2025 showed continued consistency at the top. Liberia, the Marshall Islands, and Singapore achieved full performance marks across all 19 indicators covering safety, environmental regulation, labour rights and international cooperation. These results reflect longstanding investments in compliance infrastructure and registry governance.

Port State Control outcomes for the 2021–2023 period, published by the Paris MoU in July 2024, placed the Marshall Islands, Singapore, Hong Kong, Malta and Liberia on the White List, indicating low detention ratios and strong inspection outcomes. Panama, by contrast, was listed at position 55 on the Grey List. While not considered substandard, its continued absence from the White List marked a departure from past performance and highlighted ongoing regulatory challenges.

No flag state in the top 10 appeared on the Paris MoU Black List. Among the White List performers, most maintained or improved their standing compared with previous cycles. This was seen as an encouraging signal of continuity, particularly as enforcement mechanisms across port state control regions became more coordinated.

Stable rankings, shifting perceptions

Fleet contraction was not limited to Panama. According to Lloyd's List data, the China and Greece registries recorded net reductions in tonnage, down 3.6% and 4.2%, respectively. Panama also saw a modest decrease of 0.7%. These declines contributed to the overall slowdown in flag growth at the top end of the rankings.

Overall, 2024 was characterised by a shift in emphasis among major registries. With geopolitical complexity increasing and enforcement actions extending into new domains, reputational factors played a more prominent role in registry decision making. While headline rankings were unchanged, the operational profile of several top flags adjusted in response to external pressure and internal policy reforms.

As scrutiny intensifies and performance benchmarks evolve, the ability of flag states to

demonstrate measurable compliance will remain central to their standing in the international system. Actions taken in 2024 suggest that the leading registries are aware of this shift and positioning themselves accordingly.

Position	Flag	Total Gross tonnage	Position in 2023	Gross tonnage % change*
1	Liberia	259.4m GT	1	1.30%
2	Panama	256.7m GT	2	-0.70%
3	Marshall Islands	196.1m GT	3	2.00%
4	Hong Kong	132.3m GT	4	0.50%
5	Singapore	106.6m GT	5	1.60%
6	China	100.9m GT	6	-3.60%
7	Malta	97.4m GT	7	2.10%
8	Bahamas	64.3m GT	8	1.30%
9	Greece	36.6m GT	9	-4.20%
10	Cyprus	24.4m GT	10	2.50%

Source: Lloyd's List Intelligence, November 2024. Note: Vessels above 500 gt, excluding fishing vessels

*on November 2023

04

Shipbroking continues forward momentum as demand soars

With global shipping continuing to be heavily influenced by external factors, shipbrokers have found demand for their services at near-record highs. A rise in maritime accidents, evolving trade routes, growing demand for shipping services, and a surge in key commodities have pushed the shipbroking market to US$1.39 billion in 2024 — up 4.9% from US$1.33 billion in 2023.

This forward momentum shows no sign of slowing either. The market is expected to reach a value of US$1.69 billion by 2028 as geopolitical events, environmental concerns, increasing ship numbers and rising demand for more complex cargo logistics continue to influence the global supply chain.

As demand for their services rose, some of the world's leading shipbrokers took the opportunity to further expand and consolidate their services in 2024, in line with their own growth projections and customer expectations.

Clarksons, the world's largest shipbroker, reported another strong year, recording revenue of more than £660 million in 2024, up from £640 million in 2023. Crucially, the London-listed shipbroker remains one of the few shipbroking businesses involved across every shipping market, with a strong presence in the dry bulk, container and energy markets.

SSY, another London-based shipbroker, had a year of expansion in 2024. It opened a new office in Osaka, Japan, and expanded its offices in Athens, Dubai, Oslo, Seoul, Varna and Tokyo. By expanding its global presence, SSY was also able to enter the LPG, ammonia and agri-derivatives markets in 2024.

Meanwhile, Braemar capitalised on a strong 2023, which included the purchase of US-based Southport tanker brokers and the tanker desk of Spanish shipbroker Medco. These investments meant that turnover remained strong in 2024, with £154 million recorded, albeit profit was slightly down due to additional overheads.

Other shipbrokers reported similarly strong results in 2024. Ifchor Galbraiths saw impressive growth last year due to the launch of IG Capital, the group's dedicated finance arm, and enhancing its sustainability offerings to the market. MB Shipbrokers, Howe Robinson, and EA Gibson Shipbrokers also saw strong results in 2024, while Affinity Shipping boosted its presence in Dubai with the launch of a new office, as well as entering the small tanker and LPG markets.

This greater demand for shipbroking services is directly linked to the increasing complexity of cargo logistics. Cargo logistics involves the efficient planning, execution, and control of goods movement and storage from their origin to destination. The increasing globalisation of supply chains, particularly out of Asia, has heightened the need for more effective and reliable transportation and storage solutions.

Shipbrokers are seizing this opportunity to bolster their market presence and make the process more effective. Many are investing in advanced digital solutions, such as vessel auction platforms, to make the market more transparent and make transactions more seamless. These platforms are critical to help augment the entire shipbroking experience for those looking to charter vessels to those looking to deploy their units.

Crucially, shipbrokers are keen for their industry to remain human-led. The global shipbroking industry has historically been built on building trust, navigating complex negotiations and fostering strong relationships between partners, and this process remains vital as the industry moves to a more digital-first approach.

Shipbrokers, and their customers, are likely to benefit from a more digitalised workflow, particularly when it comes to understanding more about charterparty agreements, trades and contracts. For now, many are seizing the chance to capitalise on the renewed demand for shipbroking services and make their own name in the market.

05

London remains at the forefront as global maritime arbitration expands

London remains the dominant force in maritime arbitration, continuing to lead the field with a strong volume of cases and a reputation for expertise that attracts complex disputes from across the world.

In 2024, the London Maritime Arbitrators Association (LMAA) reported a total of 3,006 appointments and around 1,733 case references, confirming its status as the world's leading maritime arbitration centre. The number of awards issued also highlighted London's continued efficiency and authority, with 478 awards rendered, including 75 following oral hearings. These further highlight London's position as the preferred place for handling increasingly complex maritime disputes, where parties look for clear, authoritative decisions delivered efficiently.

However, other regions are also experiencing notable growth in maritime arbitration, reflecting the rising demand for dispute resolution outside London as global trade patterns evolve.

The Singapore Chamber of Maritime Arbitration (SCMA) saw a remarkable 112% increase in case references compared to its previous five-year average, handling 95 cases involving claims valued at nearly US$98 million. This surge demonstrates the expanding importance of Asia-Pacific arbitration hubs, which are quickly developing their services and infrastructure to meet growing demand. SCMA's launch of new mediation panels and accreditation programmes further supports the region's rising role in maritime dispute resolution.

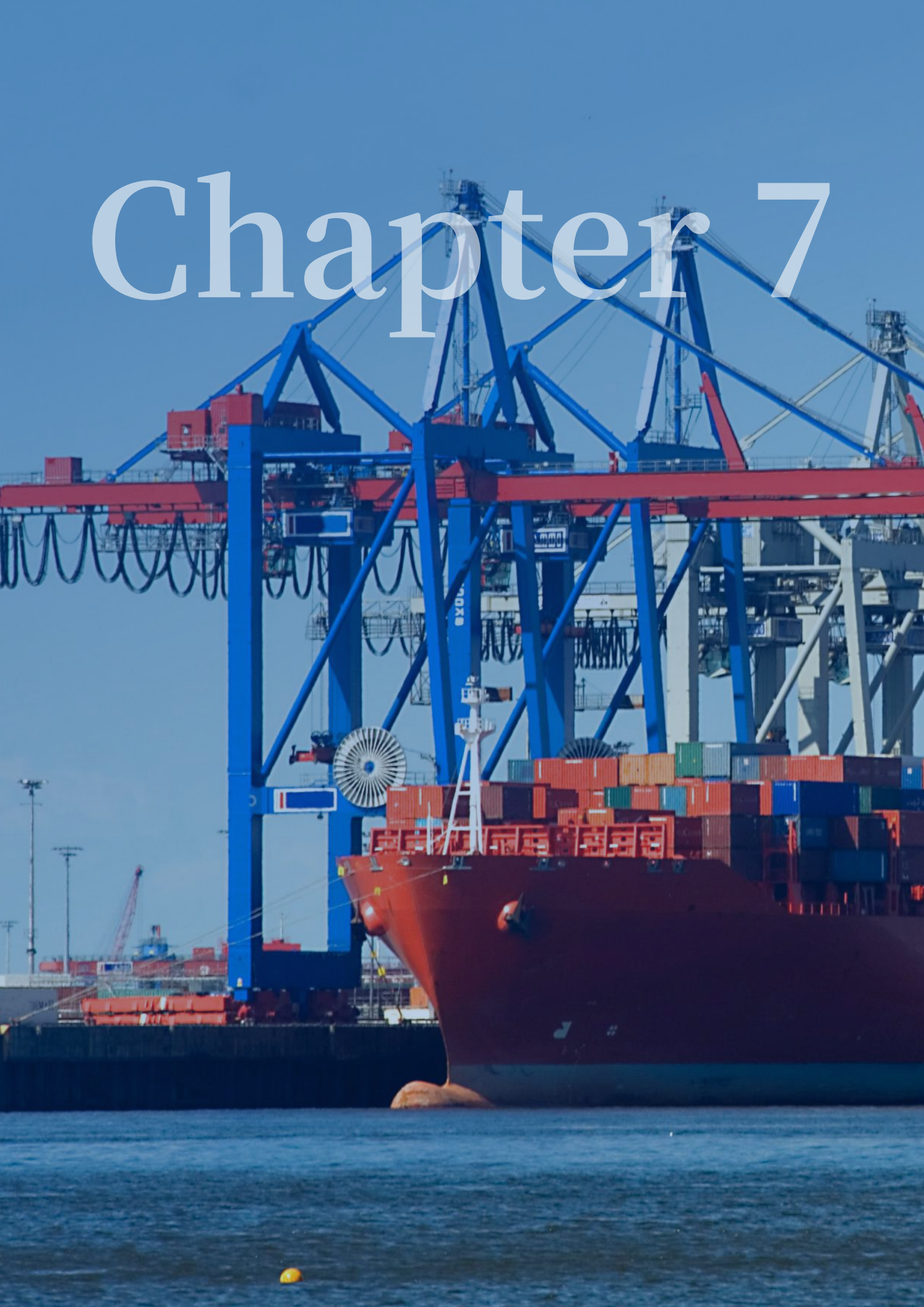
Similarly, the Hong Kong International Arbitration Centre (HKIAC) set a record with 352 arbitration filings in 2024, a 25% increase from the prior year. The total value of disputes administered under HKIAC or UNCITRAL rules reached approximately US$13.6 billion, illustrating the increasing financial stakes involved. With parties from 53 jurisdictions and a high proportion of international cases, HKIAC continues to attract complex, cross-border disputes. Efforts to enhance diversity, including appointing nearly 35% female arbitrators and welcoming many new arbitrators, highlight its commitment to modernising arbitration practices. Notably, HKIAC saw a rise in court-ordered interim measures in Mainland China, reflecting the growing complexity and urgency of cases requiring asset preservation.

In Europe, the Stockholm Chamber of Commerce (SCC) reported 204 new cases in 2024, with the total disputed value surging to € 13.5 billion, more than four times the amount from 2023. The average dispute value has risen substantially, reflecting more high-stakes, sophisticated disputes spanning sectors such as retail, financial services, real estate, technology, and energy. SCC maintains its reputation for efficiency, with most of the awards delivered within 12 months, even as cases grow in complexity and significance.

Meanwhile, the latest 2024 caseload statistics from the International Centre for Settlement of Investment Disputes (ICSID) highlight a strong year, with 58 new cases registered, the second highest annual total ever, and 341 cases administered overall, also ranking second highest. The caseload reflects growing geographic and sector diversity, with Eastern Europe and Central Asia accounting for the largest share of new cases, followed by the Americas, Africa, and the Middle East. Key industries involved include oil, gas, mining, transportation, and construction, demonstrating the broad economic scope of investment arbitration.

These trends mirror a wider pattern in maritime and investment arbitration: as disputes grow more complex and financially significant, arbitration remains the preferred, efficient method for resolution. While London continues to lead based on its strong history as a dispute resolution centre, rising hubs in Asia, Europe, and institutions like ICSID are expanding rapidly, offering parties worldwide alternative expert and adaptable dispute resolution for today's interconnected global economy.

Chapter 7



DIGITAL CURRENTS: AI AND DATA IN SHIPPING

1.The rapid rise of AI in maritime

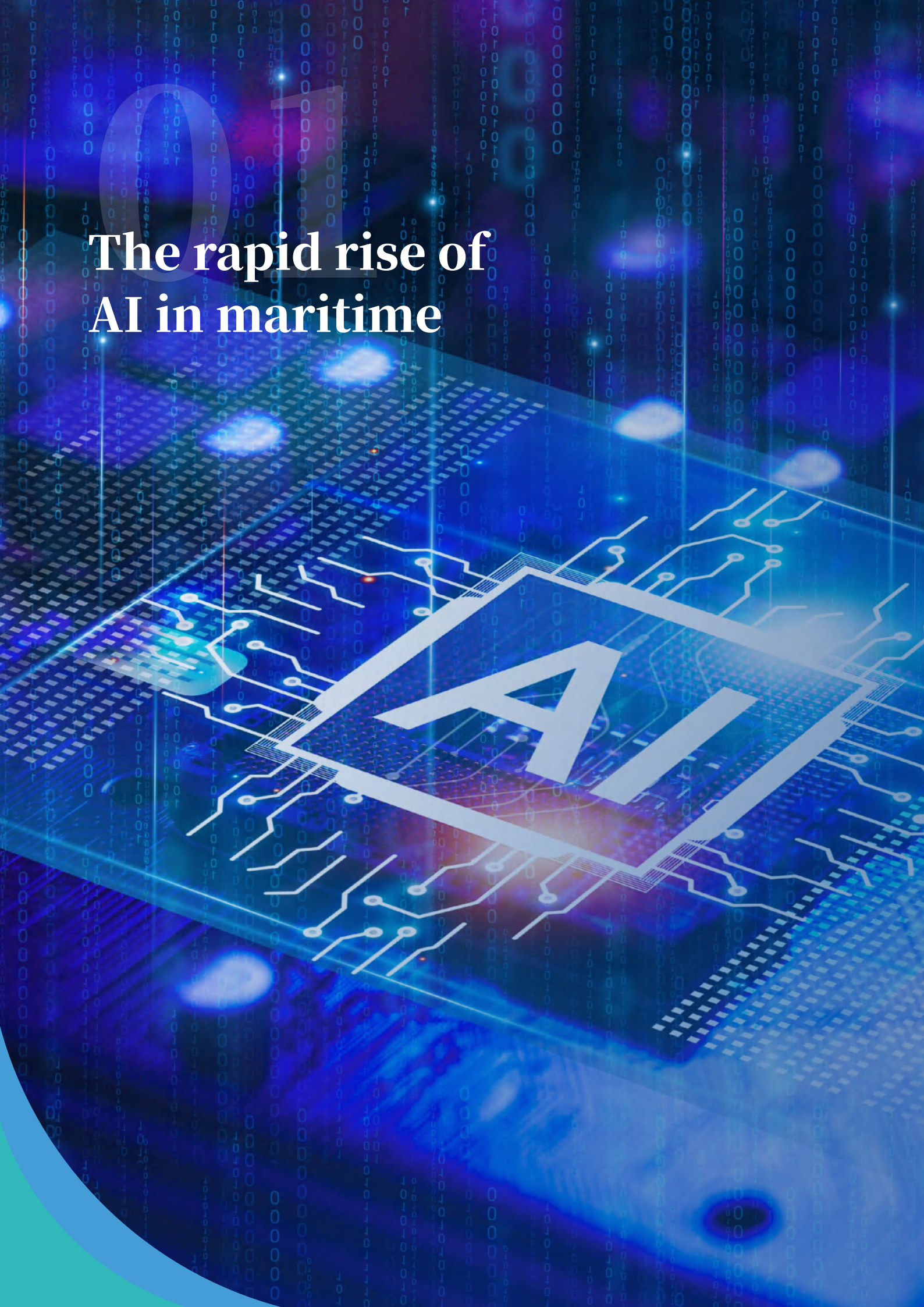
2.Shaping the future of port cost management: The role of AI

3.Shipping looks to navigate the digital tide

4.Maritime looks to 'connect the dots' of data and technology

01

The rapid rise of AI in maritime



The maritime sector saw an unprecedented surge in the adoption of artificial intelligence (AI) technologies in 2024. According to a joint report by Lloyd's Register and Thetius, the global maritime AI market nearly tripled in size over the past 12 months to reach a valuation of US$4.1 billion, with a projected five-year compound annual growth rate (CAGR) of 23%.

This explosive expansion is a result of the industry's drive towards greater operational efficiency, enhanced safety, and sustainability. For example, a 2024 study by maritime safety tech platform Orca AI noted that AI-driven navigation could cut global shipping emissions by as much as 47 million tonnes of CO_2 annually, which is the equivalent of 336 billion km of driving by cars.

Conversely, the rise of AI and digital platforms opens more opportunities for cyber risks in the maritime space. During the 2024 Shipping Minds conference, experts noted that a fleet of just 30 ships now faces around 80 cyber-security incidents per year at an average cost of up to US$3.2 million per breach.

Balancing the positives and negatives of AI in maritime is a challenge almost all shipping players are facing. However, despite the uncertainty around certain aspects, uptake of AI-based platforms increased in 2024.

Thetius IQ, the research firm's database tracking over 4,000 maritime organisations, logged 604 AI-related market updates between July 2023 and June 2024. Of those, 420 organisations developed, sold, bought or invested in AI solutions, compared with just 276 over the previous year. Among the 125 technology suppliers recorded, small and medium-sized enterprises (SMEs) accounted for 63% of activity, while corporates made up 18% and startups 17%, representing a five-point rise in startup participation since 2022-23. This SME dominance reflects their agility and niche specialisations, enabling them to partner effectively with research institutions and larger firms to meet shipping lines' urgent demand for energy-efficient, safety-focused and emission-reducing solutions.

Key Applications of AI

Voyage optimisation emerged as a leading AI application in 2024, with Ardmore Shipping deploying DeepSea Technologies' Pythia tool fleet-wide after a year-long trial. By leveraging AI-generated vessel behaviour models trained on Ardmore's historical data, Pythia delivers real-time route adjustments that account for weather, sea state and fuel costs, resulting in a more efficient voyage, including significant man-hour savings and reduced fuel burn.

Data-driven condition-based maintenance (CBM) also gained traction in 2024. According to a joint study from leading maritime classification society Lloyds Register, Japanese shipping line NYK Line and Japan's Monohakobi Technology Institute, vessels employing AI-enabled CBM for lubrication, repairs and docking achieved cost savings of up to US$5 millionover 10 years, with even greater operational-expenditure reductions for older ships. Meanwhile, German shipping line F Laeisz rolled out Kaiko Systems' AI inspection app across 18 of its vessels, enabling near real-time risk detection, preventing costly maintenance surprises and boosting collaboration between ship and shore teams.

In autonomous navigation, Orca AI launched its automated watchkeeper platform in 2024, which enables users to use multiple visual feeds to augment human watchkeeping. In addition to raising $23 million in critical funding in May

2024, Orca reported a 33% reduction in close encounters and a 40% drop in crossing events over a cumulative 15 million nautical miles. These AI-based navigational decisions resulted in an average of US$200,000 saving in fuel per vessel per year. In one example, Marubeni's shipowning arm, MMSL, saved US$86,000 in fuel on a single vessel within one year by equipping watchkeepers with an AI-powered proximity alert tool.

Safety and compliance saw innovation through platforms like Sealenic's AI decision-support system, which consolidates company manuals, public regulations and BIMCO clauses into a conversational interface. By returning answers with source references and confidence scores, this approach cut document search times from hours to minutes, improving crew decision-making under pressure. Furthermore, the SafetyTech Accelerator launched targeted programmes to support startups developing AI-driven safety solutions, offering mentorship, funding and pilot opportunities with major shipowners.

Meanwhile, port management has been transformed by analytics software such as SparkCognition's suite, which merges terminal data to run hypothetical scenarios on vessel rerouting or unscheduled calls. Notably, the Port of Rotterdam's deployment of PortXchange Synchronizer, which uses AI to more accurately predict Estimated Time of Arrival (ETA), reduced vessel waiting times by 20%, lowering both idle time and associated emissions.

Challenges to Overcome

Despite the rapid uptake of AI, several challenges remain. High-quality, timely and granular data are foundational for successful AI deployments, yet sensor noise and data gaps continue to mislead models, particularly in voyage optimisation. Industry experts recommend dedicating as much as 80% of AI development efforts to data quality control and the implementation of robust data-quality management systems.

In parallel, a growing data consent crisis is emerging as platform owners increasingly restrict third-party scraping. One study found that 5% of general-purpose datasets and 25% of critical-domain datasets are now disallowed for reuse, threatening established training pipelines.

Trust and transparency remain central to user acceptance of AI in shipping. Transparency around AI decision logic directly impacts operators' willingness to delegate critical tasks. Some providers have begun branding their tools as 'intelligent assistants' to reinforce the notion of human-machine collaboration. Ethical considerations also come to the fore as AI systems may inadvertently process personal or proprietary data beyond original consents, raising privacy concerns. Proactive ethical risk assessments are needed to address gaps that current regulations have yet to cover.

Regulatory uncertainty adds another layer of complexity. The European Union's provisional AI Act proposes categorising systems by risk level, imposing stringent requirements on high-risk AI deployed in critical infrastructure. Smaller technology providers may find compliance particularly restrictive, potentially slowing innovation and adoption.

To build confidence in AI solutions, classification societies like Lloyd's Register have adapted their assurance frameworks to accommodate greater vigilance in adopting AI-based platform. Their

four-phase process evaluates provider readiness, conducts product reviews, runs rigorous testing and validates performance in service. Complementary initiatives, such as the Centre for Assuring Autonomy and the Maritime Autonomy Assurance Testbed, are also establishing formal testbeds and certification pathways for uncrewed and remotely operated vessels that increasingly use AI to operate on a day-to-day basis.

The rapid rise of AI in maritime marks a paradigmatic shift akin to software reshaping the world. While the market's value tripled in just one year, translating buzz into sustainable value demands robust data strategies, transparent adoption management and rigorous assurance. As the sector navigates data consent crises, escalating cyber-risks and evolving regulations, collaboration between SMEs, corporates, classification societies and regulators will be essential. The future of smarter, safer and more sustainable shipping depends on harnessing AI, not as a standalone tool but as a genuine partner in global trade.

02

Shaping the future of port cost management: The role of AI

The maritime industry is at a critical juncture, undergoing rapid digitalisation that promises to transform operations. Historically, port call and port cost management processes have been complex, administrative tasks prone to inefficiencies. However, with the rise of artificial intelligence (AI) and data-driven technologies, there is enormous potential for change. AI is poised to address long-standing challenges in port call management, creating a more efficient, transparent, and cost-effective approach to operations.

For years, manual processes, fragmented data, and reliance on third-party providers have hindered efficiency. But with AI-driven solutions, the maritime industry now has the opportunity to overcome these obstacles. As new technologies emerge, AI is not just a tool for automation but a transformative force that, combined with human expertise, can unlock powerful capabilities for maritime stakeholders.

Embracing Digital Transformation: Getting Future-Ready

Port call management has long been a time-consuming, labour-intensive process, where estimating port costs in advance and validating those costs after a vessel's departure requires significant manual effort. Shipping companies must also navigate fluctuating port charges, operational delays, and departmental silos, all of which can lead to inefficiencies.

Digitalization, when combined with AI, offers a powerful solution for ship owners and operators, as well as those operating port side. AI-powered tools not only automate tedious tasks but enhance efficiency by enabling faster, more accurate decisions. These tools are increasingly used to generate real-time, precise port cost estimates based on the latest official port tariffs, accounting for dynamic variables such as vessel specifications, operational details, and port conditions. Furthermore, machine learning algorithms are continuously improving predictions, adapting to changing circumstances to provide the most current and relevant information.

Perhaps most importantly, AI allows companies to maximize the productivity of their teams. By automating administrative tasks within shipping companies, AI can help triple the task-handling capabilities of an individual. This shift means that employees no longer need to spend their time on manual processes and can focus on higher-value tasks, making operations not only faster but also more strategic and impactful. In this way, AI is not just a tool for efficiency—it is a catalyst for improving overall performance and ensuring the shipping industry seamlessly adapts to modern processes.

This digital transformation reduces human error, shortens operational delays, and enhances communication, transparency, and decision making. By integrating AI into their workflows, maritime companies are managing increasingly complex tasks while staying agile and prepared for the future.

Enhancing Transparency: Breaking Down Silos

One of the greatest challenges in port cost management is calculating the total expenses at each port of call. To ensure accurate calculations, it is essential to factor in variables like port tariffs, vessel specifics, terminal and berth information, operational times (including weekends), cargo tonnage, and more. Furthermore, coordinating with agents on issues like crew changes, spare parts, and husbandry services often leads to siloed work, miscommunication, and additional costs.

AI-powered solutions tackle this problem by centralising data and offering a unified, real-time view of operations. These digital tools consolidate

information—from port charges to vendor performance—into one accessible interface, enhancing communication and accelerating decision making.

The benefits of improved transparency are immense. By creating a single, shared view of all port-related activities, AI helps break down the traditional silos between departments like operations, procurement, and finance. This fosters better collaboration, reduces errors, and improves decision making. Moreover, real-time access to data enables stakeholders to address potential issues—such as unexpected delays or cost discrepancies—before they escalate into significant problems.

Empowering Users: Control in-house

Outsourcing tasks, such as vendor management, cost approvals, and payment processing, has been common practice in the maritime industry for some time. While this approach can streamline operations, it often leads to higher costs, slower response times, and a lack of control over crucial decision-making and financial processes. Shipping companies often struggle with limited visibility into external vendors' operations, creating risks and inefficiencies.

AI-powered digital solutions, such as HarborLab, are changing this dynamic by enabling shipping companies to maintain full control over key aspects of their operations. These platforms provide end-to-end visibility—tracking who is responsible for each step, identifying bottlenecks, flagging delays, ensuring accurate cost payments, and offering market benchmarking for port charges.

By reducing dependence on third-party vendors, AI tools empower organisations to act more autonomously and with greater flexibility. This autonomy is especially valuable when it is combined with human expertise and experience, ensuring that companies can adapt swiftly to changing conditions and make informed, cost-effective decisions.

The Growing Role of AI in Maritime: A Strategic Opportunity

The growing integration of AI into maritime port management represents a significant shift—not just in technology, but in how the industry approaches operational challenges. AI is tackling long-standing issues such as cost estimation, data fragmentation, and third-party dependency, offering new opportunities for transparency and control. The adoption of solutions like HarborLab demonstrates how AI can streamline operations, drive efficiency, and empower companies to make smarter decisions with real-time data.

However, it is essential to recognize that AI alone is not the solution. AI represents a fundamental transformation in the way maritime operations are managed, but its true potential is unlocked when combined with the human element. In the modern shipping world, AI should serve as an augmentation tool, giving maritime professionals extra capabilities, enabling them to perform their tasks more efficiently, and helping them make smarter decisions with greater ease.

In this way, AI is not just about automation; it's about enhancing human expertise and ensuring that people have the right tools to handle complex challenges more effectively. When used correctly, AI can multiply the capabilities of the human workforce, creating a synergy between technology and human insight that drives innovation and improves outcomes.

As AI continues to evolve, its applications in port call management will become more sophisticated, offering deeper insights, predictive capabilities, and even greater automation. For maritime companies, the opportunity is clear: embracing AI not only improves operational efficiency but also strengthens the role of human expertise in shaping smarter, more responsive maritime operations.

03

Shipping looks to navigate the digital tide

In 2024, the shipping industry accelerated its adoption of advanced digital tools, driven by the need for greater connectivity, efficiency and safety. Emerging technologies ranged from low Earth orbit satellite connectivity to autonomous vessels, each helping operators to meet regulatory demands, optimise operations and guard against increasingly prevalent cyber risks. As ports and ships embraced more digital applications, they also faced heightened vulnerability to cyber-attacks.

LEO Satellites

Low Earth orbit (LEO) constellations moved from trial phases into commercial service during 2024, offering shipping lines faster bandwidth, lower latency and continuous global coverage. According to the 2024 Thetius report, the maritime AI technology market nearly trebled in value to US$4.13 billion in the 12 months to mid-2024, in part due to demand for real-time satellite data feeds. Shipowners report that LEO installations now reduce crew communication costs by up to 50% while enabling high-definition video links for remote diagnostics and performance monitoring.

6G Trials and the Smart Port

Building on the ongoing 5G roll-out, research institutions and port authorities initiated 6G trials in dedicated maritime corridors last year. Sixth-generation networks promise data rates up to 100x faster than its predecessor and near-zero latency, enabling real-time monitoring of IoT-enabled cranes, autonomous trucks and digital-twin simulations of terminal operations. These trials focus on predictive maintenance of berth equipment and AI-driven collision avoidance in harbour approaches. Moreover, they are laying the groundwork for fully automated terminals by 2026.

Voyage Optimisation

Artificial Intelligence (AI) platforms further transformed voyage planning in 2024 by integrating weather routing, fuel-consumption models and port congestion forecasts. One leading example was Ardmore Shipping's full-scale deployment of DeepSea Technologies' Pythia voyage optimisation tool, which used AI-driven insights to deliver a 3-5% reduction in bunker spend and over 170,000 tonnes of CO_2 emissions saved following a year of joint trials and data-cleaning to ensure model accuracy. Meanwhile companies like Eastern Pacific Shipping rolled out the Cassandra Performance Monitoring platform across its fleet, which uses AI-generated digital twins of vessel machinery to track engine health and operational parameters, improving decision-making and reducing fuel consumption.

Under International Maritime Organization guidelines, Maritime Autonomous Surface Ships (MASS) also moved closer to operational reality in 2024. Classification societies certified new autonomous navigation and dynamic-positioning modules, and pilot projects, which ranged from remote-controlled survey vessels to prototype uncrewed cargo ships, demonstrated safe remote operation in coastal waters. Industry experts emphasised that high-quality vessel sensor data and rigorous safety frameworks are essential to move MASS from trials to mainstream deployment.

Strengthened Cyber-Security

As digitalisation processes become more commonplace in daily shipping operations, the risk of cyber threats has risen in parallel, with increased connectivity introducing new entry points for malicious actors. The Thetius report recorded a sharp uptick in industry cyber incidents in 2024, prompting the IMO and

classification societies to mandate cyber barriers in navigation and control systems on all vessels and in port installations. Operators responded by investing in zero-trust architectures and AI-driven threat-detection platforms to safeguard critical systems.

To combat this, the International Association of Classification Societies' updated its unified requirements E26 and E27, which came into force on 1 July 2024. These standards impose minimum cyber-resilience criteria on new-build vessels and their connected systems. UR E27 in particular supports manufacturers and OEMs in evaluating and improving their cyber defences. To demonstrate compliance, operators must submit an asset inventory, detailed topology diagrams of their system architecture, descriptions of security capabilities, test procedures and configuration guidelines.

Although these requirements provide a clear view of a vessel's digital assets and networks, their risk-assessment process gives limited attention to comprehensive cyber-security policies and procedures. It urges organisations to concentrate their efforts and investments on three critical areas: people and culture, network-connected systems and services, and a robust incident-response plan.

Tools, such as Inmarsat's Fleet Secure suite, have been highlighted for helping shipowners and managers comply with UR E26 and E27 while embedding cyber security into their wider connectivity strategy. As a result, classification societies are collaborating with industry leaders to streamline cyber-risk controls, align them with corporate governance and ultimately build more resilient maritime operations.

Other and Conclusion

Several other tools also gained traction in 2024. Blockchain-based platforms, such as TradeLens and CargoX, enhanced the security and transparency of trade documentation, reducing paperwork turnaround by up to 30%. Digital twins were extended from terminal simulations to vessel-asset management, allowing operators to monitor hull integrity, engine health and ballast operations in virtual form. Augmented reality headsets and drones were increasingly deployed for remote inspections and crew training, cutting in-port survey times by nearly 20%. Meanwhile, robotic systems performed automated tank cleaning and hull inspections, reducing human exposure to hazardous environments.

The digital surge of 2024 has laid the groundwork for a more connected, efficient and resilient maritime sector. LEO satellite networks brought near-global coverage, 6G trials pointed to fully automated smart ports, AI-based voyage planners reduced costs and emissions, and autonomous vessels advanced under robust safety and assurance programs. Stronger cyber-security measures became a mandatory counterweight to this data-rich environment. As these technologies mature, the coming years will test the industry's ability to integrate them seamlessly and realise operational, commercial and environmental gains.

04

Maritime looks to 'connect the dots' of data and technology

In 2024, the maritime sector found itself at a critical inflection point as it looks to navigate a complex web of issues. As the industry adapts to ever-increasing regulatory complexity, geopolitical tension, supply chain uncertainty, and rising cost pressures, shipping leaders are also having to tackle another long-standing challenge that has long hindered the industry's ability to utilise data and technology at scale: fragmented digital solutions.

As it stands, the sector still relies on a patchwork of digital tools that do not communicate with each other effectively. This lack of interoperability results in duplicated efforts, inconsistent data, and delayed decision making. For instance, port call operations involve multiple stakeholders—port authorities, agents, and shipowners—each using different systems that can often lead to miscommunication and operational inefficiencies.

One of the key challenges impacting the maritime sector is transforming unstructured, transactional data—such as invoices and port logs—into structured insights that drive smarter commercial and compliance decisions. Without standardised input, the effectiveness of tools like artificial intelligence and automation, which are becoming more commonplace in commercial shipping, is compromised. Greater quality and uniformity of data are critical for these technologies to thrive in the modern era.

At present, across ports, agents, owners and charterers, operations remain highly decentralised. Siloed processes and non-standardised data formats persist, undermining efficiency and eroding trust between counterparties. Yet momentum is building to change this narrative. Data consolidation and system integration are emerging as pivotal enablers of a more connected, efficient and transparent maritime ecosystem.

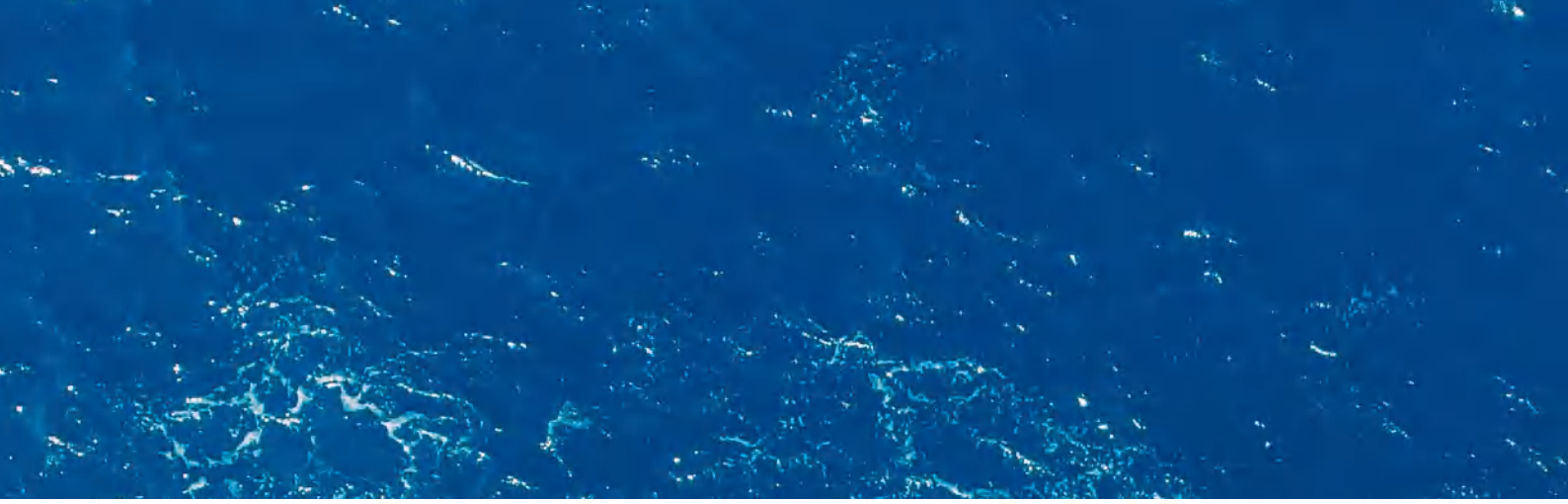
The Urgent Need for Integration

The maritime industry's over-reliance on diverse digital solutions has given rise to poor system integrability and operability. Financial leaders, executives and players in the shipping marker have voiced concerns about the excessive customisation of digital tools due to increased complexity and integration costs.

According to the Navigating Financial Seas report, published by maritime digital solution specialist Marcura and shipping research firm Thetius in 2024, financial players favour agile, adaptable technologies but seek to avoid unnecessary intricacies when embedding new systems into legacy infrastructures.

Much of this complexity stems from the current state of fragmented port data. Different stakeholders employ varied tools, reporting methods and processes—even for identical events. As a result, time and money are lost reconciling records, verifying disbursement accounts, and cross-checking contracts—often across spreadsheets, emails and static PDFs.

The Digital Container Shipping Association (DCSA) echoed these concerns in its 2024 report, The State of the Industry 2024: Insights on Digital Evolution in Container Shipping. While 90% of cargo owners are ready to adopt digital solutions, 66% say they still require external support, particularly for integration and modernising outdated infrastructure. The report highlights a strong link between digital standardisation and operational efficiency, though stakeholders continue to be hindered by system complexity.



Unsurprisingly, this legacy fragmentation of digital solutions slows technology adoption, preventing the industry from keeping pace in an increasingly dynamic world.

Collaborating for Connected Solutions

Rather than operating in isolation, industry stakeholders are increasingly recognising that collaboration is the only viable path forward. Cross-sector cooperation efforts, particularly between regulators, ports, shipping companies and digital solution providers, are quickly emerging as the most effective way to address digital fragmentation at scale in the maritime space. From global institutions to private-sector innovators, efforts are accelerating to lay the groundwork for interoperability and standardised systems.

The International Maritime Organization (IMO) is developing a global strategy for maritime digitalisation, aiming to integrate vessels and ports, improve logistics, and optimise routes. This bold strategy emphasises the need to standardise data exchange to facilitate seamless operations.

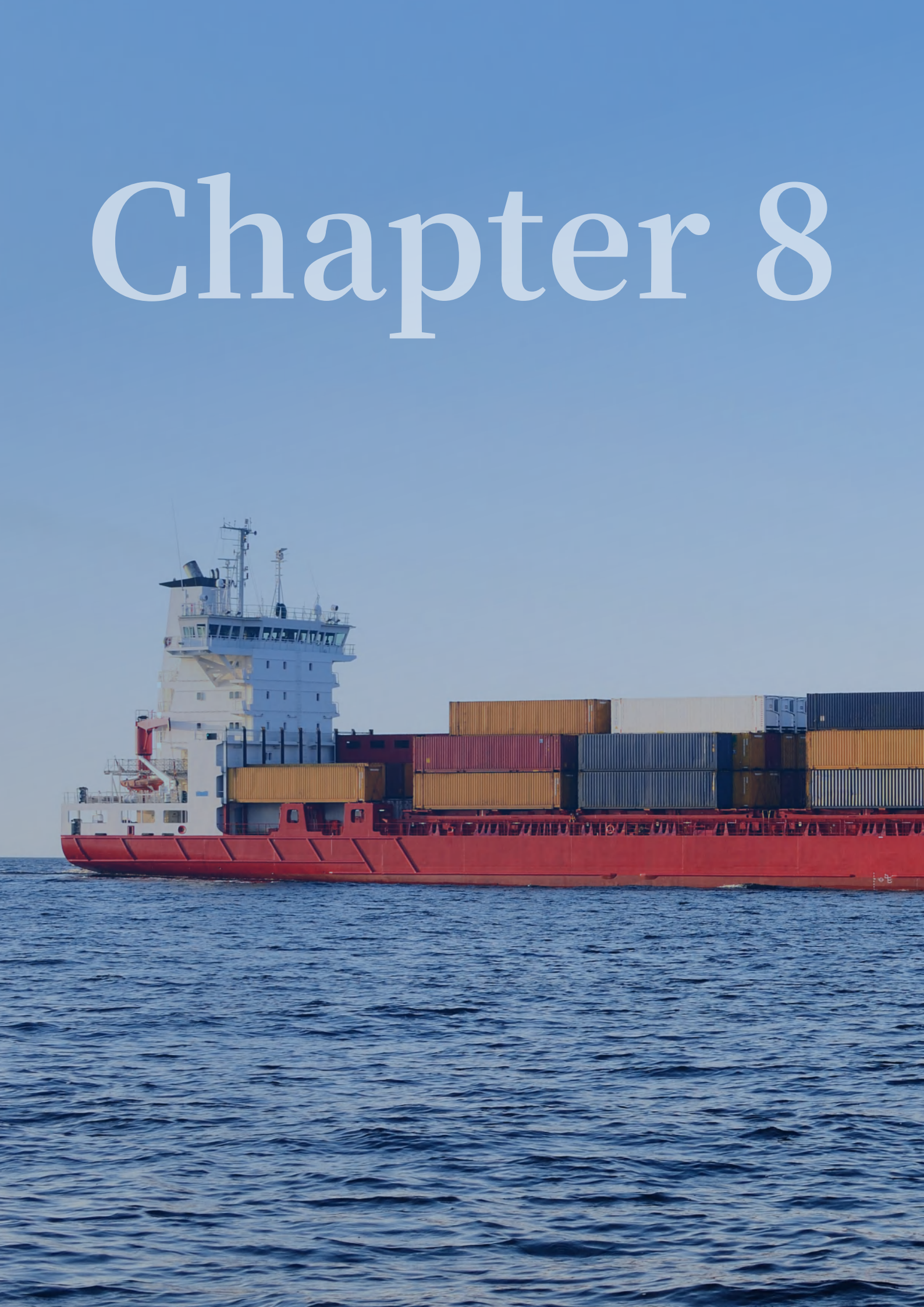
In United States, the Federal Maritime Commission (FMC) is seeking to create better data communication and management processes across the shipping industry, promoting transparency and efficiency through the Maritime Transportation Data Initiative (MTDI).

Leading maritime digital transformation company Veson Nautical is also heavily promoting data standardisation within the maritime sector, aiming to unify workflows and serve as a single source of standardised data to enhance process efficiency. This includes partnering with other key players involved in the evolving maritime technology space. One example is its partnership with Marcura, which is also playing a key role in addressing technology fragmentation.

Through the integration with Veson Nautical in 2022, the addition of online procurement service ShipServ to its portfolio in 2023, and the integration of vessel management suite VesselMan in 2024, Marcura has taken strategic steps to build a cohesive suite of solutions that allows data to exchange and integrate with each other to boost operational effectiveness. With data fragmentation remaining a key obstacle in modern maritime operations, Marcura's approach is helping to 'connect the dots' to help operational and financial players make more informed and data-driven decisions.

Critically, with the maritime industry continuing to face all manner of environmental, regulatory and commercial hurdles, minimising easily avoidable risks in the technology space is one area that quick solutions can be found, if only the right collaboration is there to begin with.

Chapter 8



PORTS AT THE FOREFRONT

1.Shipping and ports as enablers of the wider energy transition

2.Uncharted waters: Shipping braces for long-term impacts of climate change

3.Panama Canal's road to recovery

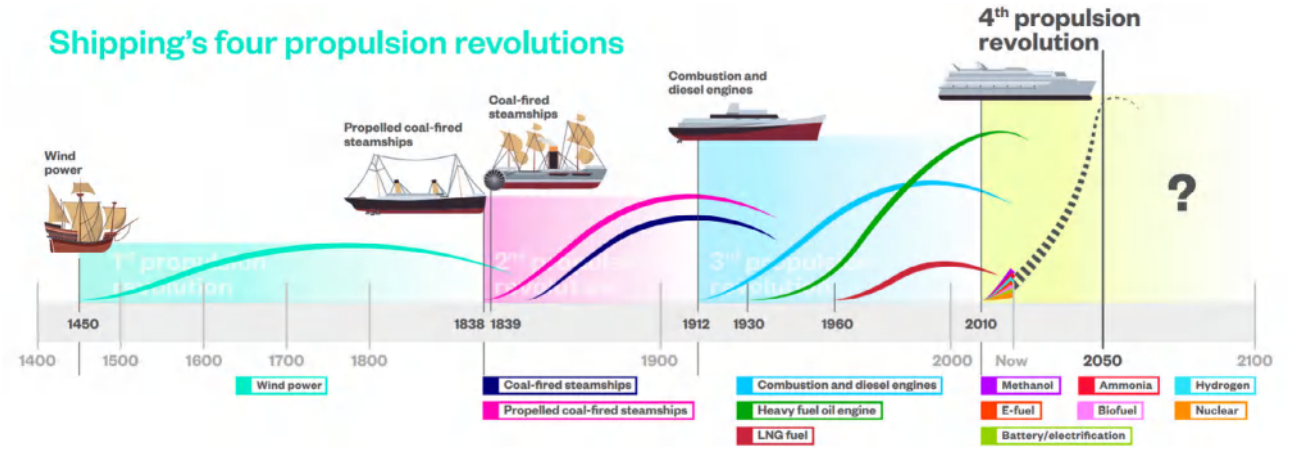
4.China's ports smarten up

01

Shipping and ports as enablers of the wider energy transition

Whilst there is a significant shift by the shipping industry towards decarbonisation following the historic outcome of the IMO discussions at MEPC, shipping will have to compete with other industries to gain access to those new low and zero carbon fuels. This is where the concept of CEM-HUBS comes in, argues IAPH's Strategy and Communications Director Victor Shieh.

With the maritime sector's attention mainly focused on how the current range of options of low and zero carbon fuels can be adopted by shipping and what the fourth propulsion revolution will look like, ports are faced with a quandary. How can they minimise the risk in long-term investments in port infrastructure to accommodate the supply of those fuels to ships, when it is evident that the future will clearly be one which is multi-fuelled? This so-called fourth propulsion revolution will essentially be the first man-made one as these energy carriers will need to be produced to reduce emissions rather than extracted from below the land surface. This comes at a cost.



Source: International Chamber of Shipping

It is highly likely that for at least the next ten years, currently-adopted fuels will continue to dominate, with LNG in its various forms consistently being perceived as the most viable choice for the immediate future – albeit with the caveat of some legal challenges against the green credentials of the fuel. Biofuels will also remain in high demand despite supply challenges to meet that demand, and the emergence of wind propulsion in vessel designs, innovations in battery longevity, the possibilities of onboard carbon capture and even the options being looked at in terms of nuclear propulsion are widening this mixed-fuel landscape.

This exacerbates the investment decision problem for ports in decarbonisation. As an example, many have invested substantial sums already in providing onshore power to meet local regulatory needs and demands from shipowners calling at their ports, mainly with subsidised funding. With the CAPEX secured and infrastructure in place for onshore power, some ports are now staring down the barrel of demand by owners and shippers which is conditional upon renewable energy sourcing. They are also having to manage escalating OPEX costs while ship owners and operators constantly evaluate price differentials on electricity supply. This means offshore power supply requires smart management in terms of energy distribution of the local grids, with some ports having to install micro grids of their own or entering into joint ventures in

or within the vicinity of the port area to balance the books.

When it comes to hydrogen-based fuels as part of the overall energy transition, perceived demand for some of these commodities such as green ammonia remains reasonably consistent, although the reality is that expected mainstream adoption is now further than closer away. Ports also have the challenge of adapting their operations, safety protocols and spatial planning as well as meeting new regulatory obligations for these new fuels, both as a commodity cargo and as bunker fuels.

Closing the investment gap in hydrogen-based fuels

Although some governments and industry have set goals and started the low-carbon pathway, only approximately 4% of the world's current low-carbon hydrogen production projects have a final investment decision, according to the IEA. Almost none of these are close to or with access to a port.

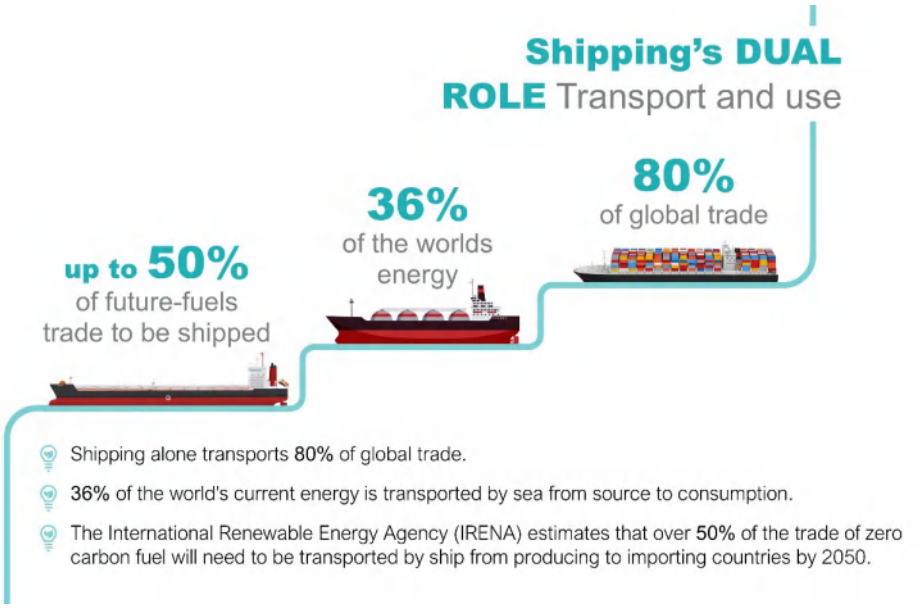
While the main economic inhibitor - namely the production cost differential between hydrocarbon-based and synthetic low and zero-carbon fuels – remains, public-private initiatives across industry clusters as well as maritime offtake supply chains are beginning to emerge, concretely in Asia.

For example, the total capacity of green methanol project production in China increased by 10.4 Mt since January 2024. As of December 2024, China accounts for 16.6 Mt of potential methanol projects, which is approximately 50% of the global project pipeline, with this number set to grow substantially by 2030. Produced by various means (principally through biomass plus green hydrogen), offtake supply chains are emerging with centers of production planned in locations such as Inner Mongolia, Heilongjian, Jilin, and Liaoning . These will be supplemented by electrolysers in Zhuzhou, Hunan Xi'an, Shaanxi Beijing feeding into gasifiers in Guangzhou, Guangdong Taiyuan, Shanxi Beijing. With pipelines planned, green methanol will be stored in the ports of Shanghai, Dalian and Tangshan*. While much of this renewable fuel will be used for local energy needs as well as industrial applications, a percentage has been earmarked for marine fuels following offtake agreements with Gemini-alliance partners Maersk Line and Hapag Lloyd for their respective newbuild dual-fuel container vessel fleets.

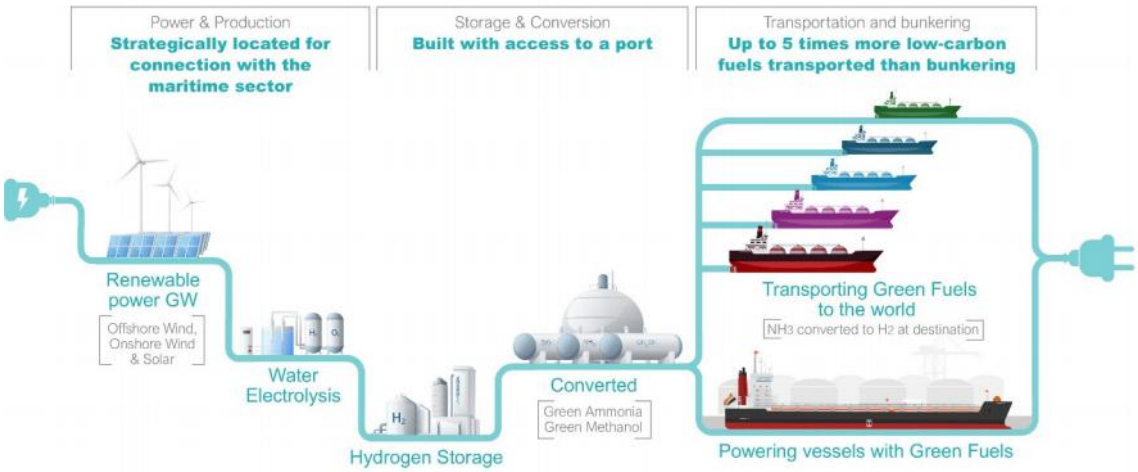
*Source : CEWA, CEM-HUBS workshop, London, March 2025

The CEM-HUBS concept – producing, storing, exporting and importing low and zero carbon fuels as commodities in or within the vicinity of ports

The key enabling role shipping has to play in the energy transition is moving these synthetically produced low and zero carbon fuels as commodities in liquid bulk from production locations with access to low-cost renewable energy such as in the southern hemisphere to import demand regions that are unable to become self-reliant, such as north Asia and north-west continental Europe.



IRENA estimates that by 2050, global shipping will take up to 50% of the transportation of these new synthetically produced hydrogen-based fuels to meet demand, with the remaining 50% by pipeline. Yet shipping will only represent around 5-10% of total demand. For these numbers to work, and for ports to meet renewable energy demands of their ship-owning customer base, port authorities will need to connect with neighbouring energy producers and industrial sectors as well as offtake companies prepared to commit to long-term purchases of these energy carriers to de-risk those investments. National governments, global and regional development banks and sovereign funds will be needed to derisk and kick-start private investments in establishing the infrastructure.



As an initiative of the Clean Energy Ministerial (CEM), the CEM-HUBS initiative brings energy and transport together to co-create low-carbon energy-maritime value chains. As an alliance of nine governments, shipping (ICS), ports (IAPH) as well as industry partners and partnering organisations such as IRENA, WEF, OCIMF, ABS, Lloyds Register and the Global Centre for Maritime Decarbonisation, it is a cross-sectoral initiative that breaks silos and brings together the energy and maritime sectors to de-risk opportunities to produce, transport and use low-carbon fuels at scale for shipping to transport and use. It aims to create a CEM-HUB Blueprint for governments and industry which is fuel agnostic, and is already preparing ports with self assessment tools on readiness to handle the new fuels as cargoes.

02

Uncharted waters: Shipping braces for long-term impacts of climate change

With up to 90% of cargo traditionally moved by sea, the effects of climate change are likely to reshape the world's oceans and shipping routes. More frequent harsh weather events and rising sea levels are set to increase the risks associated with vessel maintenance, cargo protection, fuel costs and route planning over the coming decades.

Despite the efforts made by the International Maritime Organization (IMO) to limit greenhouse gas emissions by 2050, the reality is that the shipping industry needs to adapt to the various scenarios that could unfold as the effects of climate change begin to realise themselves.

40cm

What if average global sea levels rose by at least 40cm by 2050? This fictional scenario was posited by a joint effort between classification society Lloyd's Register and The Economist in 2024 as it looked to understand the real-world impacts of climate change on commercial shipping in its Global Maritime Trends 2050 Report.

In this scenario, it suggested that China could lose 15% to its most economically important fish species by 2030, Arctic sea routes could be busier than the Suez Canal by 2040, and ship and port designers will be unable to adapt to unpredictable change in climate.

Meanwhile, increased Arctic traffic expands the use of existing ports in Canada, Iceland and Norway, as well as the development of many new ports in the region. Conversely, ports that were once vital economic and social hubs, such as Shanghai, Jakarta and Houston, are submerged due to rising sea levels. Economic exclusive zone boundaries also become more contentious as access to cargo and key shipping routes becomes more fragmented.

Ship design also becomes more problematic. Anticipating future climate conditions leads to conflict between industry leaders and policy makers over design standards for new vessels. As a result, ship ownership becomes more expensive as the traditional 20-year lifespan of a vessel cannot keep up with changing climate conditions, with ships easily becoming unsuitable for use within 10 years of use.

While this scenario is certainly stark, it is a reminder of how important close collaboration between industry and policy stakeholders has become in order to start envisioning the possible futures of the maritime industry by 2050.

Adaption and mitigation

According to a University of Oxford Environmental Change Institute study published in January 2024, 86% of ports globally are exposed to more than three climate-change related geophysical hazards, including tropical cyclones and river flooding. Large ports in high- and middle-income areas, such as Asia, Gulf of Mexico and Europe, are particularly vulnerable, with the total cost of climate risks at global ports set to be roughly USD7.6 billion per year.

In a bid to minimise potential downtime associated with these risks, ports that are caught in the crosshairs of climate change and rising sea levels are responding through both adaptation and mitigation.

Investments in more robust infrastructure and greater flood protections, including raising quays and berths, as well as constructing storm surge barriers, are key examples of adaptation strategies being taken by ports globally. Another example is the growing implementation of early warning systems and remote access to track extreme weather events more effectively and

minimise disruptions where possible.

Mitigation strategies, meanwhile, are increasingly focused on reducing carbon emissions during regular port operations. This includes increasing the electrification of port equipment and making cold ironing more available to vessels at berth. Other mitigation strategies being adopted by ports also include quicker adoption of alternative fuels, both in port operations and making greener fuels more easily available to a growing number of dual-fuelled vessels, as well as creating green shipping corridors between major hubs.

Crucially, almost all ports are now heavily monitoring their carbon footprint and energy efficiency. According to a survey by the European Sea Ports Organisation (ESPO) in October 2024, 98% of ports have an official environmental policy and that the vast majority were working to make infrastructure more resilient and 86% were integrating climate adaptation into new projects.

While challenges remain to make these adaptation and mitigation projects a reality, such as access to greener fuels and insufficient grid infrastructure, ports are thinking long term as they look to remain resilient amid the threat of rising sea levels.

An Arctic Future

While a lot has been written over the impact of climate change on the planet as a whole, its effects on commercial shipping are complex.

One significant consequence is the Arctic region becoming more navigable as sea ice diminishes, thus opening more trade route options for commercial vessels. Routes such as the Northern Sea Route (NSR) and the Northwest Passage are likely to gain in prominence over the next few decades as increasing numbers of vessels access these new options as a means of offering more competitive shipping options.

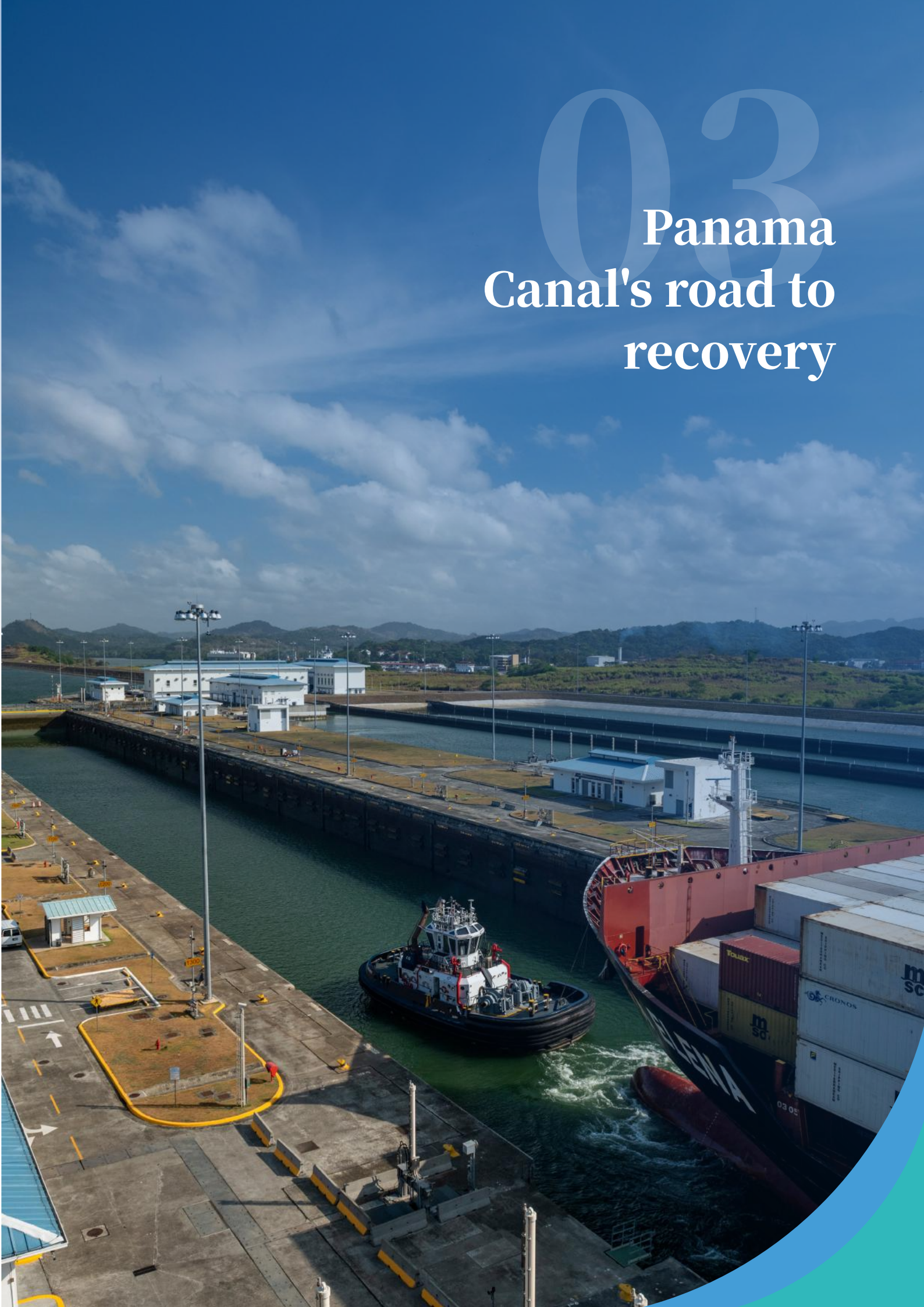
Arctic shipping offers reduced canal fees, lower fuel costs and shorter shipping times. In the case of the Northern Sea Route, it offers a more direct route between leading ports in China and mainland Europe, reducing the route time from 40 days via the Suez Canal to just 25 days. This strategic advantage could reduce freight rates due to the lower fuel consumption and labour costs, and offer a quicker form of transportation for key cargo.

Although the opening of Arctic routes is often discussed as a potential opportunity for commercial shipping, the implications of diminishing sea ice raise complex environmental, regulatory and operational challenges, which is prompting ongoing debate within the maritime industry.

Extreme sea level events that are currently viewed as a once in a century event are expected to become commonplace by 2100, according to the Intergovernmental Panel on Climate Change (IPCC). Global shipping and major maritime hubs are taking the steps they need to take to futureproof their operations and ensure that, amid the challenges of the future, the global supply chain remains robust.

03

Panama Canal's road to recovery



Global shipping saw a return to more normal operations in 2024 as the Panama Canal recovered from one of its driest years on record. After a severe drought in the 2023–24 fiscal year reduced vessel transits and affected global trade, the waterway returned to its usual capacity. To combat the potential for similar challenges, particularly as climate change-related changes looks to impact global shipping, the Panama Canal Authority (ACP) has also introduced measures to reduce the risk of future disruptions.

Recovery following the 2024 drought

In fiscal year 2023–24, unusually low rainfall forced the Panama Canal to impose draft restrictions, reducing the number of ships it could handle and lengthening both waiting and transit times. That drought, the third most severe in 110 years, saw water levels fall so low that some vessels had to carry lighter loads in order to pass safely.

By mid-2024, rainfall had returned to near-average levels and the Canal's performance indicators improved. In fiscal year 2024 the Canal recorded 9,944 transits and moved 423 million Universal Canal Ship Tonnage units, which was much closer to the volumes expected in a typical year. Panamax and Neopanamax vessels accounted for 7,084 and 2,852 of those transits respectively, allowing operations to return to standard efficiency.

During the same period, waiting times declined by 1%, saving around 15 hours per vessel compared with FY-2023, and transit durations fell by a similar margin. Time spent within Canal waters dropped by 4% to approximately 16 hours per transit, while water consumption per Neopanamax transit decreased by 5%. These improvements were supported by restored water levels in Gatún Lake, the Canal's main reservoir and water source.

With the return to more normal operations, the economic ripple effects were felt immediately. Shippers saw lower demurrage costs and penalties, thanks to faster scheduling and more predictable passage times, while insurers adjusted coverage terms to reflect the reduced drought risk. Several major liner companies noted that tariff structures in the Canal were refined to encourage off-peak bookings, smoothing demand and further conserving water.

Concurrently, the ACP expanded its hydrological monitoring network around Gatún Lake by installing additional stream gauges and rain-measurement stations to provide more granular data for operations planning. Collaborative efforts with Panamanian environmental agencies led to reforestation initiatives in the watershed, recognising that land-cover restoration helps regulate rainfall runoff into reservoir catchments. These combined measures have strengthened both the Canal's immediate response and its capacity for proactive resource management going forward.

Local economic and social impacts

The drought's effect on Panama's domestic economy was also significant. Around one-fifth of national GDP depends directly or indirectly on Canal traffic, and Lake Gatún also supplies drinking water to roughly half the population. Although public water supplies remained uninterrupted throughout the crisis, the ACP's decision to prioritise household needs over ship transits highlighted the difficult trade-offs involved. Cross-chamber lockages, which reuse chamber water between passages, proved particularly effective in conserving critical

volumes when fresh inflows were scarce.

The temporary reduction in daily transits also affected local businesses reliant on consistent ship calls, from port services and stevedores to hospitality and logistics providers. As bookings resumed, several operators reported a swift rebound in activity, although some smaller enterprises faced cash-flow challenges during the drought peak. The government and ACP responded by maintaining a flexible booking system and temporarily adjusting fee structures to help smaller vessels maintain access while preserving water levels.

The Rio Indio reservoir project

To provide a longer-term solution and combat future climate change impacts, the ACP has revived plans for the Rio Indio dam and reservoir. First proposed two decades ago, this US$1.6 billion project will capture water from the Rio Indio and El Zaino/La Arenosa valleys to support lock operation and supply sufficient drinking water to nearby communities. The structure will be 840 metres long and 80.5 metres high, creating a storage capacity of 1.25 billion m^3. That volume is intended to allow up to 15 extra transits per day during extended dry seasons and to build resilience against the potential of more frequent El Niño events. The ACP has also allocated US$400 million for compensation and relocation of approximately 2260 residents directly affected by severe water shortages and an estimated

2000 more in partially inundated areas. Public consultations and compensation plans are now under way, while environmental groups continue to seek additional safeguards.

Construction of the new reservoir is expected to take several years, with completion targeted for 2030–31. In the meantime, the ACP has introduced several operational adjustments to boost the confidence of shipping companies that had become wary of using the canal during the drought.

The Canal's reservation model now encourages shippers to plan transits earlier and consolidate cargo onto fewer sailings, which reduces daily peaks and limits unnecessary lock use. Discounts for grouped shipments and slot swaps have led operators to maximise vessel loads, lowering the number of required transits and conserving water in Gatún Lake. Trials of water recovery at the Miraflores and Pedro Miguel locks have demonstrated up to 20% reuse of chamber water per cycle, with further expansion under consideration. These steps have already contributed to the shorter waiting and transit times observed in FY-2024.

The ACP estimates that rezoning nearly 5000 hectares will be needed for dam works, agricultural land, housing and access roads. While canal traffic supports 2.5% of global maritime trade, the impact on local residents is significant. In response, the ACP has carried out a detailed census to identify affected households, planned individual relocation agreements covering education, healthcare and livelihoods, and partnered with civil society organisations to monitor environmental effects and propose mitigation measures such as reforestation and wildlife corridors. The long-term success of the reservoir project will depend on maintaining community support and meeting engineering targets.

Lessons for other waterways

The Canal's recent experience underlines several lessons for similar infrastructure projects in the maritime space. Combining large-scale engineering projects with operational refinements can provide a more resilient response to variable climate patterns. Early engagement with stakeholders, including local communities and environmental groups, tends to reduce the risk of delays or legal challenges.

Meanwhile, real-time data on reservoir levels, vessel schedules and water use support informed decision-making and can prevent critical shortages before they occur. As El Niño cycles become more frequent, potentially every three years, the Canal's new measures will face another test, possibly as early as 2027. Their effectiveness will determine whether the waterway can continue to serve global trade reliably.

The Panama Canal's recovery in 2024 demonstrates both its dependence on adequate water supplies and the value of adaptive management. Restored transit volumes and shorter wait times indicate that the Canal's temporary measures have been effective, while the Rio Indio reservoir and related initiatives aim to provide longer-term stability. Over the coming decade, the Panama Canal's ability to manage water resources, maintain community relationships and adapt operations will continue to shape its critical role in international shipping.

04

China's ports smarten up

Home to some of the world's biggest terminals and maritime facilities, China has accelerated the development of 'smart ports' in recent years to ensure it has a leading edge in the global supply chain and maintain its place at the heart of maritime logistics.

Smart ports are digitally connected, highly automated facilities that are designed to streamline every aspect of port logistics, from cargo handling and storage to customs clearance and real-time data tracking. As global trade intensifies and supply chains grow more complex, smart and efficient port infrastructure has become a strategic priority for China.

Several of China's major ports and terminals have embraced these modern technologies to give them a competitive edge, particularly as China's economy continues to grow. This has been critical as adding more people and equipment amid this growth does not necessarily improve overall handling volume. Instead it can lead to increased traffic, which can actually reduce the efficiency of ports.

As of May 2024, China has 18 automated container terminals, with a further 27 under construction. By successfully implementing key technologies in its automated terminal design, construction and operation, China's ports were able to handle more than 16 billion tonnes of cargo and process more than 300 million containers from January to November 2024.

Several of China's major ports and terminals have demonstrated or are in the midst of introducing modern technologies, such as Machine Learning, Artificial Intelligence, automation, Blockchain, Internet of Things, and 5G and 6G, to enhance decision making and making vessel turnaround and cargo throughput

The Port of Shanghai has set out an ambitious four-phase transformation plan to launch a fully automated, intelligent port at their newest Yangshan Harbour zone, which would run 24 hours a day, seven days a week. The facility would use advanced port intelligence system that could control all aspects of container handling, from ship traffic coordination and automated cranes, to autonomous container vehicles. Human interaction would be limited to the control tower, monitoring video feeds of container traffic and ensuring the port intelligence software was operating correctly.

On a wider scale, Shanghai is also expected to add more automated cranes and guided vehicles as it looks to increase its annual handling capacity from 4 million to 6.3 million containers.

Meanwhile, already established smart ports are starting to flex their muscles. Qingdao Port, which was Asia's first fully automated terminal when it launched in 2017, broke its own world record in 2024 for the most number of containers moved per hour, with more than 61 moved every 60 minutes. This is due to Qingdao's bespoke A-TOS and A-ECS equipment intelligent control system, which optimises stacking positions to reduce turnover rate and operating speed. The port is in the midst of developing new ship automation technologies that use AI and cloud-based systems to further reduce the handling time for a single container.

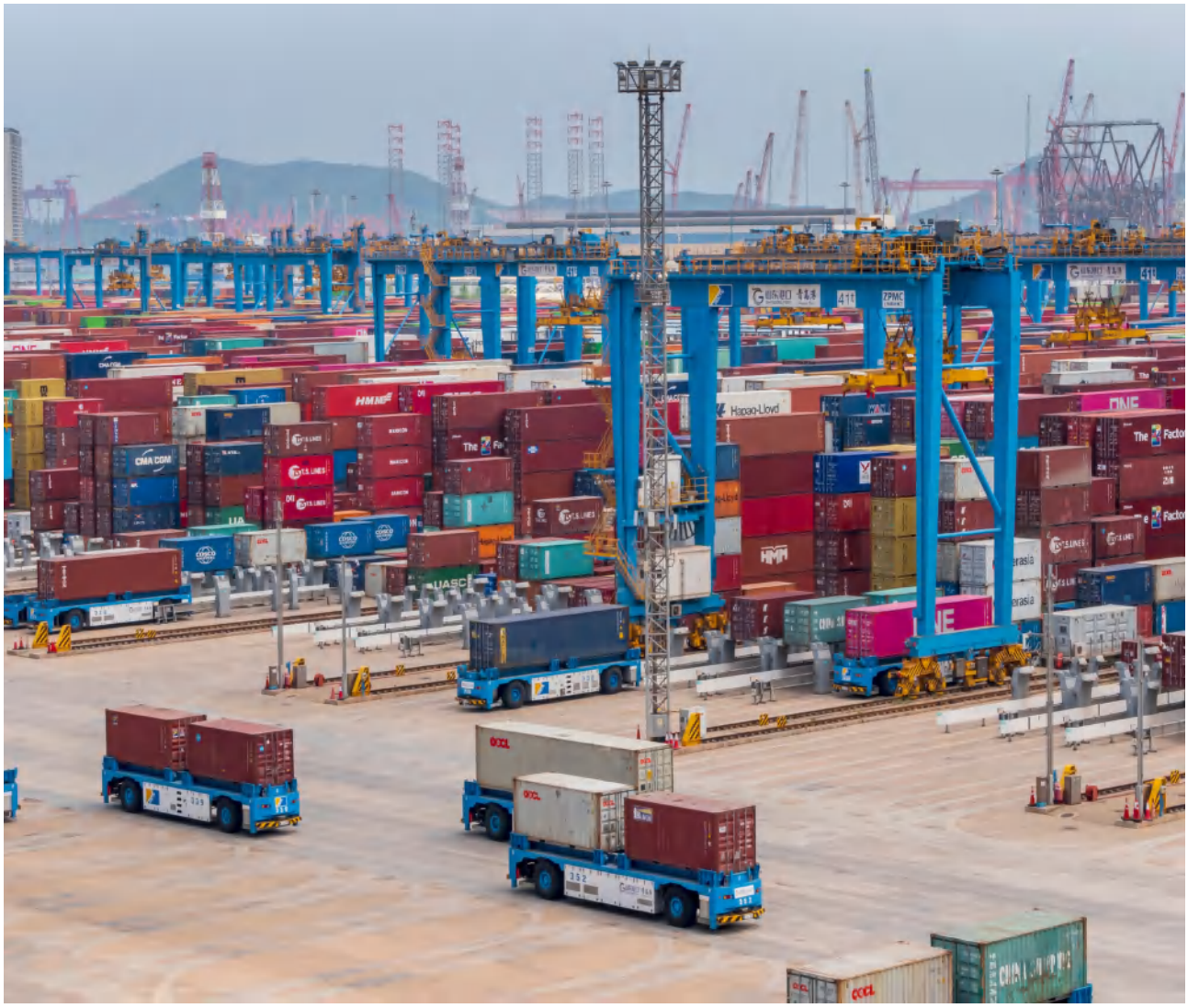
Tianjin Port continues to show its development as one of the world's most renowned smart ports. In 2024, Tianjin became the world's first port to construct an intelligent zero-carbon terminal, with a total investment of RMB5.2 billion. The new smart terminal is designed to increase the operating efficiency of a single gantry crane by

more than 40% and reduces labour costs by 60%. It is part of a long-term development project at the port, which has used smart technologies to increase its container throughput from 13 million teu in 2015 to 22 million teu in 2024.

The move also comes as Tianjin Port looks to become an upgraded green, smart, and hub port to help enhance the overall competitiveness of the Beijing-Tianjin-Hebei city cluster.

Other ports in China have also been showcasing how smart technologies can benefit their long-term operational effectiveness to boost competitiveness. The second phase of Ningbo-Zhoushan's Meishan port area has increased the container handling capacity of the port's Meidong Container Terminal to 10 million teu, while the construction of a smart port has also steered Rizhao Port in Shandong Province to become the world's youngest port to have an annual cargo throughput of more than 500 million tonnes.

No matter the size or scope, or even the cargo type, China continues to lead the way in the development of smart ports and remains committed to setting the standard when it comes to modern maritime logistics. As more nations explore similar upgrades, China's smart port model could become a blueprint for the future of shipping, one that is faster, greener, and smarter.



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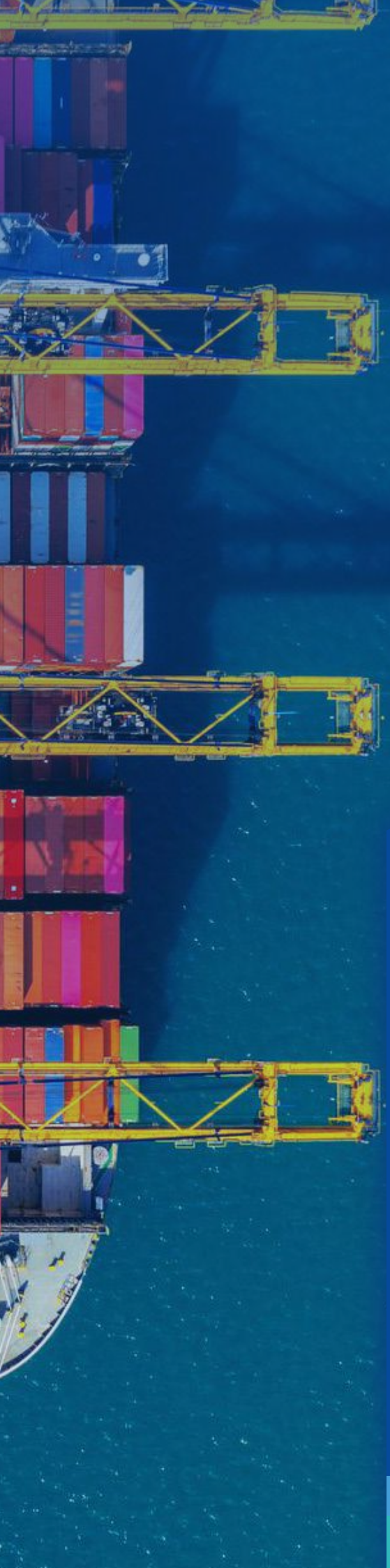


PEOPLE AND PROTECTION: CREW WELFARE AND MARITIME SAFETY

1.The Baltimore Bridge incident: Lessons for maritime safety and risk management

2.Navigating the Future of Crew Welfare

3.The growing need to upskill seafarers

4.Piracy remains a prominent threat to crew safety in 2024

5.Vessel losses hit new low and security risks reach new highs

01

The Baltimore Bridge incident: Lessons for maritime safety and risk management

It has long been said that shipping rarely makes headlines for the right reasons and no event made more striking and major mainstream headlines in 2024 than the incident of a commercial vessel colliding with the Francis Scott Key Bridge in Baltimore.

During the early morning of 26 March 2024, the Singapore-flagged 9,971 teu neopanamax container ship Dali, setting sail from the Port of Baltimore, collided with one of the bridge's support pillars. The incident caused the entire bridge to collapse into the Patapsco River, causing vehicles and a sizeable construction crew to plummet into the river, leading to unfortunate loss of six lives.

While President Joe Biden hailed the heroics of the crew for their immediate mayday call to local authorities, which did lead to the evacuation of some individuals on the bridge, the 21 crew members from India and Sri Lanka were immediately found in the centre of the storm as investigations began.

At the time of writing, the incident appears to have been caused by an onboard electrical power failure minutes before the Dali struck the bridge. There remains questions about a lack of fuel pressure to the generators that caused electrical breakers to turn off, while transcripts released by the National Transportation Safety Board (NTSB), who are leading the investigation, showed several alarms and loss of system data were detected hours before the vessel departed the Port of Baltimore.

The collision led to a major rescue and environmental clean-up effort involving US Army, Navy and Coast Guard members, alongside Maryland authorities and specialist private firms. Nevertheless, the sight of the collapsed bridge hanging off the edge of Dali's bow caused the incident to become one of the most infamous maritime disasters in recent history, with insurance payouts potentially reaching the billions of dollars to cover the cost of the vessel and cargo damage, rebuilding the bridge and compensation to the families of victims.

Lack of transparency

Critically, the incident highlighted the ongoing concerns about the transparency of safety incidents in the shipping industry. While incidents such as the Dali make international headlines, many smaller incidents remain unreported, which makes it challenging to identify potential and trending safety risks in commercial shipping.

According to data from leading insurer Allianz Commercial, there have been 203 incidents of container ships striking infrastructure since 2014. Most of these incidents are minor, involving collisions with harbour walls, piers, quays and locks, with very few incidents of hitting a major piece of infrastructure like a bridge. However small the incident, these collisions can have long-term consequences for commercial shipping, including loss of life, environmental damage and economic costs. Understanding and investigating these incidents, no matter the size and scale of the collision, is crucial for enhancing safety protocols and preventing future collisions.

Assessments and protocols

While vessels are becoming more technologically advanced, the Dali serves as a reminder that commercial vessels remain at risk to catastrophic breakdowns when basic systems lack certain levels of redundancy.

Onboard power systems are critical to ensure effective steering control, propulsion threat,

navigation and communications. A sudden loss of electrical power, which is believed to have impacted Dali, strips the vessel and its crew of control and leaves the vessel exposed to environmental drift and mechanical vulnerability. Back-up generators and automated fail safes are vital in modern shipping in order to prevent these types of incidents or at least enable the crew to buy time to minimise potential risk or damage.

The collision also reinforced the need for stringent safety protocols for vessels of this size when transiting restricted or challenging waterways. These include proper training for crew members, regular maintenance of onboard systems, and effective communication between pilots and crew.

It also showcased the need for thorough risk assessments when transiting waters that are also home to major infrastructure. Mitigating procedures such as greater tug assistance and route planning protocols must take these circumstances into account, no matter how rare they may be. Any momentary lapse in vessel reliability can have real-world and life-changing consequences.

In the wake of the Baltimore Bridge incident, risk assessment strategies for commercial vessels need to include enhanced crew training, real-time monitoring, and closer coordination with port authorities, while also ensuring that the mechanics of the vessel remain in good condition with any redundant systems removed or replaced prior to departure. This is vital as trade lanes become increasingly congested and more technologically complex.

While there are also arguments to be made about how major pieces of infrastructure are constructed, from tunnels and bridges to ports and terminals, maritime engineers must also look to collaborate with their civil counterparts to improve vessel resilience and prevent potential disasters from happening again in the future.

Learning from the past

As part of its investigation, the NTSB noted that there are 68 bridges similar to the Francis Scott Key Bridge throughout the United States that present a major risk of another incident happening if the correct preventative measures are not taken.

It is vital that shipping players around the world, even those that do not ply the US East Coast, learn from the devastation of the Dali incident. From ensuring that vessels are well maintained to undertaking critical risk assessments prior to any departure from port to making sure that crew members are fully trained and know how to respond to a power failure, shipping operations need to prioritise resilience and preparedness at every level.

By doing so, shipping can make sure it plays no part in infrastructure collisions and keeps human lives protected at all costs.

02

Navigating the Future of Crew Welfare

Crew welfare remains one of the most pressing issues in the global shipping industry. Although their welfare conditions have vastly improved in recent years, seafarers continue to face serious risks to their health, livelihoods, and overall well-being, despite the vital role they play in keeping world trade moving. With 90% of global trade transported by sea, it is more important than ever to protect the rights and dignity of the people at the heart of this essential industry.

One of the most serious developments in recent months has been the sharp rise in seafarer abandonment.

According to the International Transport Workers' Federation (ITF), 2024 saw a staggering 87% increase in abandonment cases compared to the previous year, affecting 3,133 seafarers across 312 vessels. This represents a 136% surge in the number of abandoned ships, with many crews left stranded without wages, food, fuel, or access to contact their families for long periods of time. About 90% of these vessels were flagged under Flags of Convenience, exposing systemic flaws in a regulatory framework that enables irresponsible shipowners to evade accountability. Countries such as Panama, Palau, Tanzania, Comoros, Cameroon, and Bahrain were among the worst offenders, while the United Arab Emirates, particularly those within Dubai's free trade zones, emerged as the leading port state for abandonment, registering 42 incidents in 2024.

This large escalation is underscored by data from the joint IMO/ILO abandonment database, which recorded 310 cases in 2024, an all-time high and a 118% increase from 2023. The growing scale of abandonment highlights the need for stronger international enforcement and better mechanisms to hold shipowners accountable.

Despite growing recognition from institutions like the International Maritime Organization (IMO) and the International Labour Organization (ILO), enforcement of financial security laws remains patchy and often ineffective. The IMO Legal Committee is the main forum for tackling abandonment, but progress is currently being held back by weak action from flag and port states, shipowners avoiding responsibility, and vessels without proper insurance. As a result, many abandoned crews continue to face long delays and unnecessary hardship.

Alongside abandonment, piracy is emerging as serious concerns for seafarers, especially in high-risk regions like the Gulf of Guinea and the Red Sea. Although the total number of reported piracy incidents has remained relatively stable, the number of crew taken hostage has risen sharply, with 126 hostages reported in 2024, up from 73 in 2023 and 41 in 2022. Twelve crew were also kidnapped in 2024, while others were threatened or injured. These numbers have raised concern among industry groups, who are calling for more investment in security training, onboard protection, and emergency response to keep seafarers safe in high-risk areas.

The industry is also having to contend with a growing labour shortage. Long contracts and limited shore leave are putting off younger people from joining the profession, especially since the pandemic. At the same time, those still working at sea are dealing with fatigue from long hours and not enough crew to relieve them, raising concerns about both safety and ship operations. Smaller companies are especially affected, as they often cannot afford to offer competitive pay or cover rising labour costs.

A report by the World Maritime University, commissioned by the ITF, shows widespread failure to follow rules on work and rest hours.

Based on over 6,000 responses, it found that more than 88% of seafarers work beyond the allowed hours at least once a month, and 16.5% do so more than 10 times a month. Alarmingly, there are recorded incidents of seafarers faking records to avoid trouble during inspections or with employers. The report highlights how pressure, power imbalances, and fear of punishment have created a culture where unsafe practices are seen as normal. Only about half of seafarers report these issues to their companies, and fewer than a quarter of companies respond by adding more crew.

The mental toll of seafaring is also increasingly being recognised by the wider industry. Prolonged isolation, uncertainty, and fears of abandonment are severely impacting mental health across the sector. Access to better onboard Wi-Fi and communication systems is helping to alleviate loneliness by enabling more frequent contact with loved ones, but industry stakeholders are calling for mandatory implementation of mental health support services and well-being policies onboard all vessels.

The challenges are complex, but fortunately the shipping industry is actively working to address them. Several initiatives are underway to improve crew welfare and safety, including strengthened international agreements like the Maritime Labour Convention (MLC), which sets minimum standards for working conditions. Port states are increasing inspections to enforce compliance, and industry groups are promoting the use of financial security mechanisms to prevent abandonment.

Technological advancements are also playing a role. Enhanced communication tools and onboard mental health support programs are being introduced to reduce isolation and provide psychological assistance. Training on piracy awareness and emergency response is being expanded, particularly in high-risk areas, to safeguard crews from growing security threats.

Furthermore, collaboration between governments, shipowners, unions, and NGOs is helping to develop more effective policies that protect seafarers' rights and ensure fair treatment. While progress may be gradual, these collective efforts demonstrate the industry's commitment to creating a safer, more supportive environment for seafarers worldwide.

With continued global cooperation and a focus on practical solutions, real and lasting improvements in crew welfare are achievable, ensuring that those who keep global trade moving are valued and protected.

03

The growing need to upskill seafarers

As momentum gathered throughout 2024 around the decarbonisation of shipping, increasing attention was paid to the readiness of the global maritime workforce. The adoption of new fuels such as ammonia, methanol and hydrogen may have progressed at different rates, but a consistent concern across the sector was whether current training standards are keeping pace.

The Maritime Just Transition Task Force (MJTTF), supported by the International Maritime Organization and Lloyd's Register Foundation, brought this issue into sharper focus during the year. Its work offered a clearer picture of the scale of training required, and laid early foundations for addressing it.

Mapping the workforce implications

Over the course of 2024, the MJTTF completed the first phase of its training project, titled Baseline Training Framework for Seafarers in Decarbonization. The work was informed by a series of 12 hybrid workshops, involving 116 participants from across the maritime ecosystem. Their input helped identify the core gaps between conventional training and the competencies required for working with new fuels.

Earlier research commissioned by the Task Force and supported by DNV projected that 450,000 seafarers would require some form of additional training by 2030. That figure rises to 800,000 by the mid-2030s under scenarios where uptake of alternative fuels accelerates. The 2024 workshops validated these estimates and provided a more detailed picture of how competency requirements vary by fuel.

Understanding the scale of change

The workshops revealed that ammonia, methanol and hydrogen each introduce distinct operational and safety challenges.

Ammonia's toxicity, for example, requires knowledge of hazardous zones, toxic exposure limits and enhanced emergency response protocols, while methanol presents fire risks that demand new detection systems and updated fire safety procedures. Hydrogen, which remains less widely understood in the maritime context, requires new technical knowledge of storage systems and ventilation, as well as greater awareness of flame detection and leak management.

Participants were asked to assess the scale of change needed to current training regimes. For all three fuels, many scenarios were rated as requiring a high degree of change, with significant implications for the duration, complexity and human-centred aspects of training delivery.

Laying groundwork for future regulation

In response, the project focused on drafting fuel-specific competencies and training materials, while also contributing to the broader review of the STCW Convention and Code. The development of instructor handbooks and alignment with interim IMO safety guidelines were among the key outcomes of 2024.

The findings of the MJTTF's work during the year also highlighted the importance of standardising approaches across regions and institutions. Given the pace of fuel innovation, the coming years are likely to see a growing divergence in fuel handling experience among crews. Looking forward, a harmonised training framework will be essential to ensuring that safety standards are met consistently.

As 2025 progresses, further work is expected to refine these frameworks and support the delivery of 'train-the-trainer' programmes. The groundwork laid in 2024 now provides a platform for the maritime community to move from broad ambition to more practical implementation.

04

Piracy remains a prominent threat to crew safety in 2024

Global piracy incidents declined marginally in 2024, with 116 events reported compared to 120 the previous year. However, a closer examination of the data from the International Maritime Bureau (IMB) reveals a worrying increase in violence directed at seafarers. While the number of reported cases has remained stable in recent years, the risks faced by crews are becoming more severe and geographically dispersed.

A total of 151 seafarers were affected by piracy or armed robbery in 2024, compared with 102 in 2023 and just 55 in 2022. Among these, 126 were taken hostage and 12 were kidnapped. Several were threatened or injured. These figures mark the highest level of crew impact since systematic reporting began and highlight the continued threat piracy poses to global shipping operations.

Gard, one of the world's leading marine P&I clubs, has underlined these concerns, noting that the use of violence and threats has increased markedly. It warns that failure to follow best management practices may leave crews vulnerable, particularly in high-risk anchorages and transiting corridors. Regular threat assessments, testing of emergency communications, and enhanced crew training and vigilance are all vital protocols to follow amid growing risks.

Resurgence off Somalia and Entrenched Risks in Asia

The sharpest escalation in violence occurred in the first half of the year as Somali pirate groups resurfaced in the Western Indian Ocean. Nine incidents were reported between December 2023 and May 2024, including four hijackings. Several of these occurred hundreds of nautical miles from the Somali coast, signalling that the operational range and capability of pirate groups remains significant. Although no further attacks were recorded in the second half of the year, the IMB continues to advise ship operators to remain highly alert in the region.

Southeast Asia remained the most active region globally, with 43 incidents reported in the Singapore Strait alone. The vast majority involved successful boardings, often under cover of darkness. While these are frequently characterised as opportunistic thefts, the use of weapons has increased. In 2024, eight incidents involved firearms and 19 involved knives. Thirteen crew were taken hostage, five were threatened and one was injured.

Indonesia also recorded a rise in piracy cases, reaching 22 in 2024. Two of these were hijackings off Central Kalimantan, in which barges were seized, cargo stolen, and crews detained. These incidents point to a more organised and aggressive threat profile than in previous years.

Crew Safety Still at Risk in the Gulf of Guinea

In West Africa, incidents continued to fall, with 18 reported in 2024 compared with 22 in 2023 and 81 in 2020. However, the region remains the most dangerous globally for crew kidnappings. All 12 global kidnapping incidents in 2024 occurred in the Gulf of Guinea. Notably, four attacks were reported off Equatorial Guinea, including one involving a Cypriot-flagged offshore supply vessel that was boarded 95 nautical miles west of Bata. Although the crew avoided harm by taking refuge in a citadel, the attack caused significant damage to the vessel.

Weapons remain prevalent in many of these incidents. Across all regions, guns or knives were reported in 65 attacks, and more than 80% of all reported incidents resulted in perpetrators successfully boarding vessels. Bulk carriers and product tankers were among the most frequently targeted in 2024.

The IMB and industry partners continue to promote coordinated reporting and adherence to route-specific best practices. Registration with regional frameworks such as UKMTO and MSCHOA is encouraged for vessels operating in high-risk waters. Although global numbers may appear stable, the increase in violence against seafarers underscores the enduring threat of maritime piracy and the need for sustained vigilance.

05

Vessel losses hit new low and security risks reach new highs

The global shipping industry continues to make significant improvements in recent years when it comes to vessel safety, with total annual losses at record lows and safety improvements helping to keep more crew members safe while at sea and keep critical cargo moving globally. However, increasing geopolitical risk and conflicts are an ever-present potential cause for maritime loss, with these challenges leading to greater numbers of abandoned and kidnapped seafarers globally.

According to the most recent Safety and Shipping Review from Allianz Commercial, just 27 vessels were lost in 2024, down from 35 in 2023 and a record low. Southeast Asia, including Indochina, Indonesia and the Philippines, remains the main loss hotspot globally last year, with the British Isles, the Mediterranean and Black Sea also showing a small number of losses in 2024. This is largely due to these areas remaining as major shipping lanes, meaning they are more susceptible to large-scale losses.

In total, 681 vessels were lost between 2015 and 2024, showing how much shipping loses has dropped in the last few years alone.

Despite the reduced number of losses, 2024 saw an increase in the number of shipping casualties or incidents. Last year there were 3,310 recorded incidents, up 10% from 2,963 in 2023. Of these incidents, machinery damage and failure accounted for well over half of the total, with vessel collision and fires and explosions also showing a high number of incidents in 2024. There were a recorded 250 fire incidents last year, a 20% year-on-year increase and the highest total in a decade.

Despite the downward trend when it comes to vessel losses, owners and operators are becoming acutely aware of some of the growing risks in commercial shipping. This is particularly evident in the dry bulk sector. INTERCARGO's latest Bulk Carrier Casualty Report, covering the decade from 2015 to 2024, highlights that 20 bulk carriers over 10,000 dwt were lost during this period, excluding three high-profile Red Sea casualties in 2024 caused by missile and drone attacks. These incidents, which resulted in the tragic deaths of four seafarers, underscore the rising security threats faced by bulk carriers operating in geopolitically sensitive regions.

Complexity surrounding geopolitical conflicts, sanctions and tariffs, combined with the risks posed by the shadow fleet, continue to challenge major shipping players, particularly at a time when decarbonisation and regulatory hurdles are becoming more prominent in daily operations. According to the Allianz Commercial report, the relevance of political risk and conflict as a potential cause of maritime loss is increasing with heightened geopolitical tensions. The INTERCARGO report also warns of increasing recruitment challenges for seafarers on bulk carriers transiting regions such as the Red Sea and Gulf of Aden, where over 100 attacks on merchant vessels were recorded in 2024 alone.

Meanwhile, fires, collisions and groundings continue to occur due to a lack of mitigation and understanding of loss prevention and risk. INTERCARGO's analysis shows that groundings remain the leading cause of ship losses in the dry bulk segment, accounting for 45% of all bulk carrier casualties in the past ten years. Moreover, cargo liquefaction continues to be the deadliest hazard, responsible for over 60% of crew fatalities over the same period.

Shipping continues to progress in the right direction in terms of safety but wholesale changes to safety and security, from the boardroom to the grass roots, are still necessary in order for maritime to become a fully safe industry to be a part of.

Appendix

Methodology for International Shipping Centre Development Index

1. The General Rationale

The research process for the Xinhua-Baltic International Shipping Centre Development Index consists of 7 steps:

Step 1

Theoretical research on index: Collate and study relevant literature to achieve a comprehensive understanding of the theoretical foundation of international shipping centres and the current state of development. Conduct in-depth interviews with government organisations, university academia and professional experts to collate their expertise and suggestions on the rationale for selecting indicators and the methodology for index computation.

Step 2

Index system design: The Xinhua-Baltic International Shipping Centre Development Index system is jointly developed by the China Economic Information Service and the Baltic Exchange, which is authenticated by an expert committee.

Step 3

Data collection and processing: Initial data for indicators is collected through two channels: China Economic Information Service and the Baltic Exchange. This data has then gone through a normalisation process to form the relevant indicator data.

Step 4

Index model construction and computation: Based on earlier theoretical research and in accordance with correlations between indicators, an index model is constructed. Subsequently an index is computed using the model.

Step 5

Index report writing: A report about the creation of the index is produced under the guidance of the index expert committee.

Step 6

Organise an expert team to ascertain the scientific foundation of the research and confirm the final result.

Step 7

Announcement of index results.

2. Index System

Indicator system and associated weightage for Xinhua-Baltic International Shipping Centre Index

Primary Tier		Secondary Tier
Name	Weight	Name
Port Factors (A1)	0.20	Container throughput (B_1)
		Dry bulk cargo throughput (B_2)
		Liquid bulk cargo throughput (B_3)
		Number of cranes (B_4)
		Total length of container berths (B_5)
		Port draught (B_6)
Shipping Services (A2)	0.50	Ship brokerage services (B_7)
		Ship engineering services (B_8)
		Shipping business services (B_9)
		Maritime legal services (B_{10})
		Shipping finance services (B_{11})
General Environment (A3)	0.30	Government transparency (B_{12})
		Extent of e-government and administration (B_{13})
		Customs tariff (B_{14})
		Ease of doing business index (B_{15})
		Logistics performance index (B_{16})

A_1 Port Factors

This refers to the infrastructures of the port city and the throughput of various types of cargo.

A_2 Shipping Services

This refers to the level of shipping services provided by the port city.

A_3 General Environment

This refers to the business and economic environment together with government policy measures to support the development of the port city.

B_1 Container throughput

Container throughput is an important indicator of the size of the port. It refers to the number of containers passing through the boundary of the port via its waterway for loading or unloading within the reported period. The computation unit is "10,000 TEU".

Source of data: China Economic Information Service Database

B_2 Dry bulk cargo throughput

This refers to the quantity of dry bulk cargo passing through the boundary of the port via its waterway for loading or unloading within the reported period. The unit is "ton".

Source of data: China Economic Information Service Database

B_3 Liquid bulk cargo throughput

This refers to the quantity of liquid bulk cargo passing through the boundary of the port via its waterway for loading or unloading within the reported period. The unit is "ton".

Source of data: China Economic Information Service Database

B_4 Number of cranes

Cranes are machinery for loading and unloading containers in the wharf area. The operating capacity of cranes can determine the cargo handling capacity of a wharf.

Source of data: Drewry

B_5 Total length of container berths

Berths refer to locations within the port where ships can dock. A single location equipped with berthing facilities to accommodate a single ship is called a berth. The length of a berth is determined by the length of ships it plans to accommodate and the safety distance required for two adjacent ships. These include quayside berths, pontoon berths and anchorage berths.

Berthing facilities are an important indicator reflecting the ability of a port to accommodate berthing ships. It is one of the basis for measuring the size and capacity of the port. Total length of container berth refers to the actual length of berth available – including various types of fixed or floating wharf – for berthing of ships for loading and unloading of containers within the reported period. The unit of computation is "metre".

Source of data: Drewry

B_6 Port draught

The draught of a ship refers to the maximum depth of the ship that is under the water line. Different ships have different draught. Moreover, the draught of a ship may even differ depending on its load and the salinity of water in the region. Port draught is an important indicator that reflects the deadweight of a ship that can be accommodated by the port. Port draughts in this report refer to water depth statistics of the deepest container berth in the port.

Source of data: Drewry

B_7 Ship brokerage services

An important component of shipping services, shipbrokers provide professional agency, brokerage and consultancy services covering a gamut of industries including transportation, insurance, financial and commerce, which facilitate shipping development.

In this report, shipping brokerage services is assessed based on the number of shipbrokers in each port city.

Main source of data: The Baltic Exchange

B_8 Ship engineering services

Ship engineering service enterprises are companies with marine engineering professionals having the ability to provide ship engineering technology and related services. The sector also provides training on basic theory and technical skills in seamanship and transportation that comply with relevant occupational certification by the authorities; as well as training of professionals on advanced applied technologies to enable them to navigate vessels.

In this report, ship engineering service are assessed based on the number of shipping companies available in the port city. Services offered by ship engineering companies include ship engineering, repairs, quantity surveying and ship classification.

Main source of data: International Association of Classification Societies (IACS)

B_9 Shipping business services

A shipping company may manage its own vessels or vessels commissioned by other owners. In this report, shipping business services consist mainly of the following three indicators: the number of ship management companies operating in the port city, the number of branches of top 100 container shipping companies and top 100 bulk carrier companies.

Main source of data: Lloyd' s List

B_{10} Maritime legal services

In this report, the overall level of maritime legal services is assessed from the two perspectives of maritime arbitration services and total number of partners practicing in legal offices. Maritime arbitration refers to the agreed system whereby any dispute shall be arbitrated in an agreed arbitration institution in accordance with the arbitration agreement (terms) established before or after the dispute event.

In this report, maritime arbitration service are assessed based on the number of arbitrators located in international arbitration centres in London, Singapore and New York. The number of partners in law firms is assessed based on data from the Legal 500 Law Firm Index, Chambers and law firm websites.

Main source of data: London Maritime Arbitrators Association, Singapore Chamber of Maritime Arbitration, Society of Maritime Arbitrators, Legal 500, Chambers

B_{11} Shipping finance services

The scope of shipping finance services cover four areas: namely ship financing, capital settlement, maritime insurance and maritime financial derivatives.

Ship financing includes syndicate loans, debt capital markets and equity capital markets. Maritime insurance refers to insurance taken out on cargo or ship against the potential risks of loss or unforeseen expenses during the sea journey. The types of maritime insurance include cargo insurance, ship insurance, freight and P&I insurance. Statistical collation by IUMI includes maritime insurance premiums for ship insurance, cargo insurance, maritime liability insurance and offshore energy insurance.

In this report, shipping insurance service is assessed based on maritime insurance expenses of the port city. Shipping insurance services are assessed based on maritime insurance premiums associated with each port city. To derive this figure, the total ship and cargo insurance premiums for each country is calculated and then allocated to each port city based on their respective port' s cargo throughput.

Source of data: Marine Money, International Union of Marine Insurance (IUMI)

B_{12} Government transparency

Government transparency related to publicised rules, plans, processes and operations so that the general public understand the why, how, what and how much of policies. Transparency can ensure that the conduct of public officials, civil servants, administrators, are transparent. Reports can also be made against them so that they would be held accountable for their conduct. This is the most reliable way to prevent corruption.

Source of data: Transparency International

B_{13} Extent of e-government and administration

e-Government and administration refers to the government' s willingness and ability to implement information technology in the provision of public services. Ability, as used here, refers to the extent of support provided by the government towards national finance, infrastructure, human resources, management, administration and system function.

Source of data: United Nations
e-Government Development Database

B_{14} Custom tariff

Custom tariffs refer to the rate applicable to computation of tax on targeted taxable goods stipulated in custom regulations.

Source of data: "Wall Street Journal" and The Heritage Foundation,
Index of Economic Freedom Report

B_{15} Ease of Doing Business Index

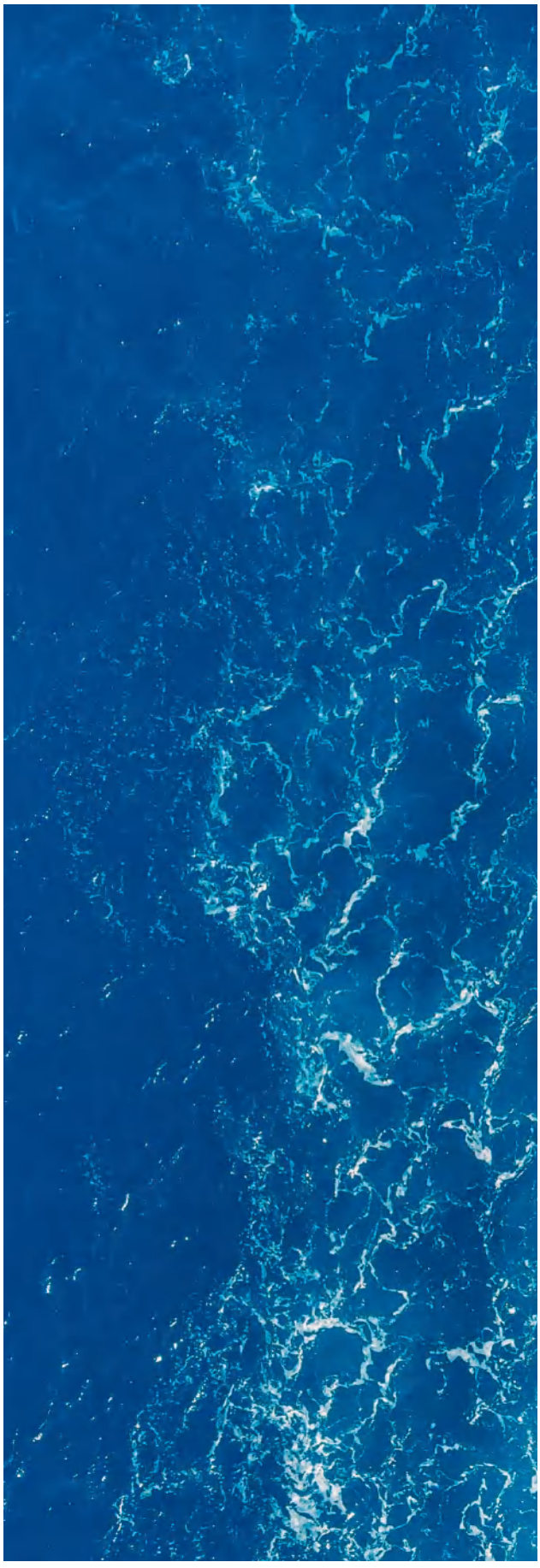
Economies are ranked on their ease of doing business, from 1 to 189; 1 being the best. A higher rank means the regulatory environment is more conducive for doing business. The index is derived from simple averages of national ranking by percentage scores on 10 themes under the Doing Business ranking by the World Bank.

Source of data: World Bank Database

B_{16} Logistics performance index

Logistics performance index is a score that reflects the following logistics attributes of a country: The efficiency of customs clearance process; quality of trade and transport related infrastructures; the ease of arranging competitively priced shipments; quality of logistics services; ability to track and trace cargo; and the frequency with which a shipment reaches the recipient within the expected delivery schedule. The index ranges from 1 to 5; a higher score means better logistics performance. The data is derived from the Logistics Performance Index Survey, which is conducted by the World Bank in cooperation with academic institutions, international organisations, private enterprises and international logistic professionals.

Source of data: World Bank Database



3.Data Processing

Data for secondary indicators required for the Xinhua-Baltic International Shipping Centre Development Index is mainly sourced from authoritative organisations such as the United Nation, Drewry, and World Bank.

Due to the differing nature of various indicators (size, ranking, ratio, etc.), if the raw values of these indicators are used directly in analysis, then indicators with large quantitative values may weaken the effects of indicators with smaller quantitative values; thus resulting in unequal contribution of each indicator to the computation. To avoid such phenomenon, each indicator is normalised – through relative processing to make its statistical variables dimensionless – before using it in index computation.

The raw data is divided into two categories: The first comprises indicators with score values ranging from 1 to 100. This category of indicators is used directly for computation. The second category comprises indicators with absolute score values. These indicators are normalised by applying the standard deviation approach on data distribution.

(1) Determining sample mean and standard deviation

Supposing that the data distributions of secondary indicators are all normal distributions, bootstrap resampling is applied to these samples. After 500 resampling, the mean value and standard deviation are computed from the normal distribution of each indicator.

$$mean_{l,m}=\frac{1}{a}\sum_{i=1}^{a}\bar{x}_{l,mi},sd_{l,m}=\frac{1}{a-1}\sum_{i=1}^{a}(\bar{x}_{l,mi}-mean_{l,m})^2$$

Where, $m=1,2,\cdots,6$, $m=1,2,\cdots,6$, $x_{l,mi}$ is sample mean of each sampling of the m-th indicator, $a=500$ =500 indicates a total of 500 resampling, $mean_{l,m}$ is the mean value obtained after bootstrapping the m-th secondary indicator, and $sd_{l,m}$ is the standard deviation obtained after bootstrapping the m=th secondary indicator.

(2) Computing the score for secondary indicators of sample cities

Based on the mean value and variance of each indicator, the indicator' s quantile is computed for each city.

The quantile score of the m-th indicator for the p-th city is computed with the following formula:

$$y_{l,mp}=\phi(\frac{x_{l,mp}-mean_{l,m}}{sd_{l,m}})$$

Where, $y_{l,mp}$ is the quantile score of the m-th secondary indicator for the p-th city, $x_{l,mp}$ is the indicator value of the m-th secondary indicator for the p-th city, and $\phi(\ )$ is the distribution function of standard normal distribution.

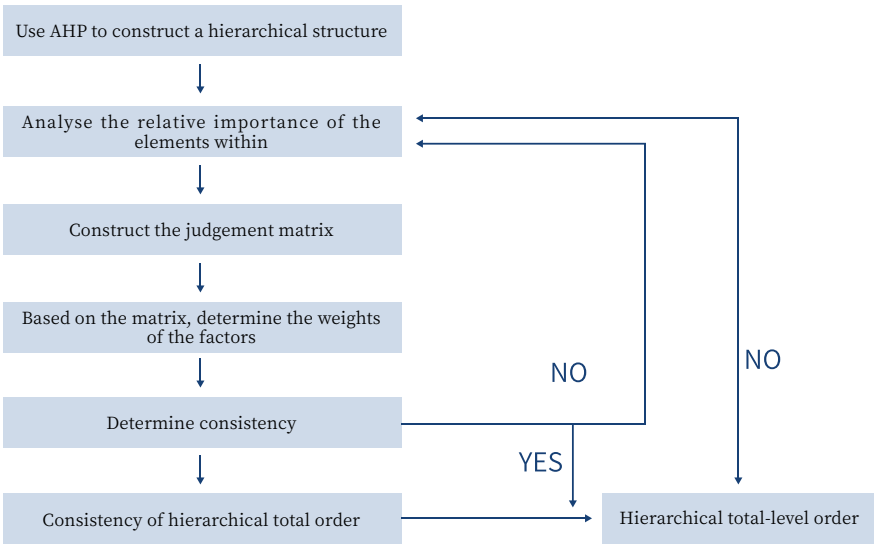
4. Model Computation

(1) Design of weighting system

The design of the weighting system for the Xinhua-Baltic International Shipping Centre Development Index employs an analytic hierarchy process (AHP algorithm).

The basic principle of AHP is to break down the problem into a hierarchical structure consisting of goals, sub-goals (guidelines), constraining criteria and departments to analyse the various factors. From the hierarchical structure, apply pair-wise comparison to determine the judgement matrix. Derive the components of the eigenvector corresponding to the largest eigenvalue of the matrix. These components represent the corresponding coefficients that will be used to compute the weight of each factor (degree of priority).

AHP algorithm can be broken down into the following 6 basic steps:



Basic processes of AHP algorithm

(1) Defining the problem: Clarify the problem in terms of scope, contributing factors and the relationship between different factors in order to have sufficient understanding of the problem.

(2) Construct a hierarchical structure: In this step, the factors are assigned to different hierarchical levels. It comprises the goal at the top level (goal level), several intermediate levels (guidelines levels) and the bottom level (solutions level). If an element is linked by all elements from the next level immediately below it, this element is said to have complete hierarchical relationship with the next level. If an element is linked by only some elements from the next level immediately below it, this element is said to have incomplete hierarchical

relationship with the next level. A sub-level can be inserted between two hierarchical levels. This sub-level is subordinate to one element on the main level. The elements of the sub-level may be linked with the next level, but the sub-level may not constitute an independent level.

(3) Construct judgement matrix: This is the critical step in AHP. The judgement matrix defines the relative importance of relevant elements within a hierarchical level that is linked to an element in a higher level. For n indicators, $\{A_1, A_2, \cdots, A_n\}$, a_{ij} is the judgement value that signifies the importance of A_i relative to A_j . a_{ij} is generally assigned a 5-grade rating scale of 1, 3, 5, 7, 9. A rating value of 1 means A_i and A_j are of equal importance; 3 means A_i is slightly more important than A_j ; 5 means A_i is relatively more important than A_j ; 7 means A_i is significantly more important than A_j ; and 9 means A_i is extremely more important than A_j . The mid values of 2, 4, 6, 8 may also be used for intermediate judgement, especially when five grades become insufficient to represent the level of importance.

(4) Single-level order: The purpose of single-level order is to sort elements in the current level in order of their importance with respect to a linked element in a higher level. It is the basis for ordering all the elements in the current level in terms of importance with respect to an immediate higher level.

If we take the weight vector,
$W = [w_1, w_2, \cdots, w_n]^T$, then we have : AW=λW
If λ is the largest eigenvalue of A, then W is the eigenvector of A with respect to λ. Hence, single-level order process can be achieved by solving the judgement matrix for the values of λmax and its corresponding eigenvectors to obtain the relative weighting of this group of indicators.

In order to test the consistency of judgement matrix, we need to calculate its consistency index:

$$CI = \frac{\lambda_{\max} - n}{n-1}$$

When CI =0, judgement matrix is complete consistency; conversely, a larger CI value indicates lesser consistency in judgement matrix.

(5) Hierarchical total-level order Using the results of single-level order of all the levels with respect to the same level, we can compute the weight values representing the importance of all elements in this level with respect to the immediate higher level. This is known as total-level order. Total-level order must be carried out layer by layer from top to bottom. For the highest level, its single-level order is the same as total-level order.

If total-level order for all elements $A_1, A_2, \cdots, A_m$ of a higher level is completed, and the corresponding weight values $a_1, a_2, \cdots, a_m$, a_j are obtained, then the results of single-level order for $B_1, B_2, \cdots, B_n$ corresponding to elements in the current level are . Now, if B_i is not linked to A_j , then b_i^j =0, and total-level order is achieved.

(6) Analyse consistency Similar to single-level order, we need to assess the consistency of the results of total-level order. Therefore, we perform consistency check as follows:

$$CI = \sum_{j=1}^{m} a_i CI_j$$

$$RI = \sum_{j=1}^{m} a_j RI_j$$

$$CR = \frac{CI}{RI}$$

CI is the consistency index for total-level order; CI_j is the consistency index of judgement matrix a_j corresponding to level B; RI is the random consistency index of judgement matrix RI_j corresponding to level B; and CR is the ratio of total-level order consistency index to random consistency index. Similarly, when CR<0.10, the consistency of computation results of total-level order is deemed to be satisfactory; otherwise, the judgement matrices for the current level need to be adjusted until satisfactory consistency is obtained for total-level order.

(2) Model for Index Computation

Specific computation formulae for the Xinhua-Baltic International Shipping Centre Development Index are as follows:

Use weighted sum method to compute the primary index:

$$y_{lp} = \sum_{m=1}^{l_m} y_{l,mp} * w_m = \sum_{m=1}^{l_m} \phi\left(\frac{x_{l,mp} - mean_{l,m}}{sd_{l,m}}\right) * w_m$$

Where, w_m are the weights of m secondary indicators; and y_{lp} is the score of the l -th primary indicator of the p -th city.

The computation formula for comprehensive score of the sample cities is:

$$y_p = \sum_{l=1}^{3} y_{lp} * w_l = \sum_{l=1}^{3} \left(\sum_{m=1}^{l_m} y_{l,mp} * w_m\right) * w_l = \sum_{l=1}^{3} \left(\sum_{m=1}^{l_m} \phi\left(\frac{x_{l,mp} - mean_{l,m}}{sd_{l,m}}\right) * w_m\right) * w_l$$

Where, w_l is the weight of l -th primary indicator; and y_p is the score of the p -th city.

5.Survey Questionnaire

Dear experts,

Greetings! China Economic Information Service and the Baltic Exchange have embarked on a joint research to develop the Xinhua-Baltic International Shipping Centre Development Index. The aim is to produce an objective, impartial and scientific review and assessment of the competitiveness of cities with international shipping centres. The main purpose of this questionnaire is to obtain some fundamental information regarding weight assessment for analytic hierarchy process (AHP). Your response is of utmost importance to this research. Therefore, we sincerely seek your support to fill out the questionnaire carefully. Thank you for your support!

(1) Explanation for scoring

his questionnaire uses scoring rules based on the 1-9 scoring scale method of AHP:

- 1 means elements i, j are equally important;
- 3 means element j is slightly more important than element j ;
- 5 means element i is relatively more important than element j ;
- 7 means element i is significantly more important than element j ;
- 9 means element i is extremely more important than element j ;

The values 2, 4, 6, 8 may also be used as mid value judgement for 1-3, 3-5, 5-7, 7-9 respectively.

An example is shown below (vertical column represents element i , while horizontal row represents element j):

Technological innovation capability (A)	B_1	B_2	B_3
Innovative output capability (B1)	—	③	5
R&D capability （B2)	—	—	2
Innovation management capability (B3)	—	—	—

In the above table, the value 3 (2nd row and 3rd column) means that for Technology Innovation Capability (A) on the target level, Innovative Output Capability (B_1) is slightly more important than R&D Capability B_2).

(2) Scoring by experts

1. Scoring for primary indicators

Please fill in the value of importance between the primary indicators (A_1-A_3) with respect to the ultimate indicator (D). The shaded areas need not be filled (same for all tables below).

Xinhua-Baltic International Shipping Centre Development Index（D）	A_1	A_2	A_3
Port Factors（A1）	—		
Shipping Services（A2）	—	—	
General Environment（A3）	—	—	—

2. Scoring for secondary indicators

(a) Please fill in the value of importance between the secondary indicators (B_1-B_6) with respect to the primary indicator (A_1).

Port Factors（A1）	B_1	B_2	B_3	B_4	B_5	B_6
Container throughput（B1）	—					
Dry bulk cargo throughput（B2）	—	—				
Liquid bulk cargo throughput（B3）	—	—	—			
Number of cranes（B4）	—	—	—	—		
Total length of container berths（B5）	—	—	—	—	—	
Port draught（B6）	—	—	—	—	—	—

(b) Please fill in the value of importance between the secondary indicators (B_7-B_{11}) with respect to the primary indicator (A_2). Shaded areas need not be filled.

Shipping Services（A2）	B_7	B_8	B_9	B_{10}	B_{11}
Shipping brokerage service（B7）	—				
Ship engineering service（B8）	—	—			
Shipping business service（B9）	—	—	—		
Maritime legal service（B10）	—	—	—	—	
Shipping finance service（B11）	—	—	—	—	—

(c) Please fill in the value of importance between the secondary indicators (B_{12}-B_{16}) with respect to the primary indicator (A_3). Shaded areas need not be filled.

General Environment（A3）	B_{12}	B_{13}	B_{14}	B_{15}	B_{16}
Government transparency（B12）	—				
Extent of e-government and administration（B13）	—	—			
Customs tariff（B14）	—	—	—		
Ease of doing business index（B15）	—	—	—	—	
Logistics performance index（B16）	—	—	—	—	—

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