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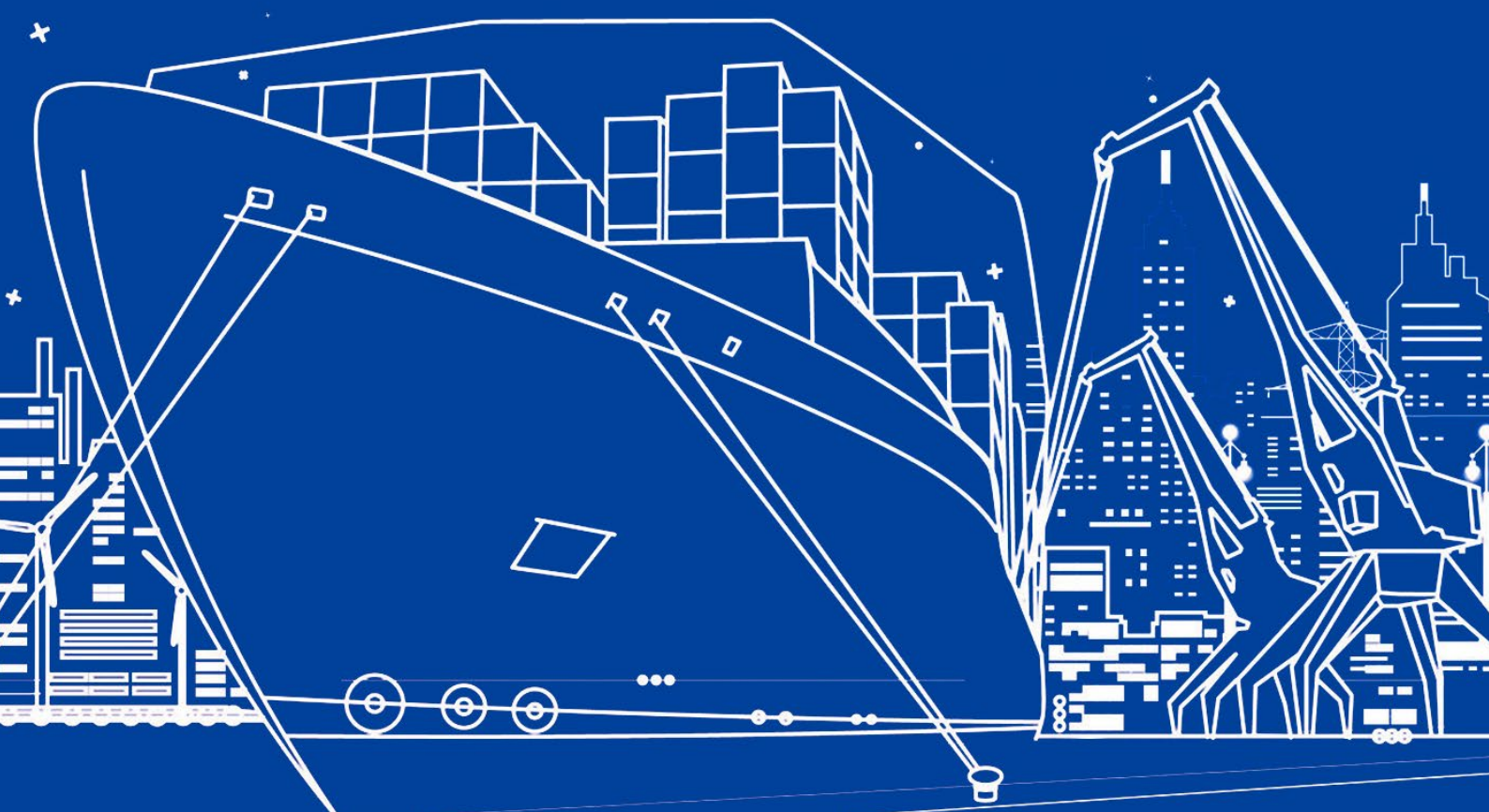
Baltic Exchange

2021 XINHUA-BALTIC INTERNATIONAL SHIPPING CENTRE DEVELOPMENT INDEX REPORT

2021

Xinhua-Baltic International Shipping Centre Development Index report



Editorial Committee

Acknowledgement (In alphabetical order)

This index research has received great support and enthusiastic help from several professionals in shipping industry around the world. Their insights allow us to gain in-depth and multi-faceted knowledge of the natural orders of shipping centres, as well as understanding of many aspects of global shipping development. Their input has played a crucial role in forming the viewpoints of this report.

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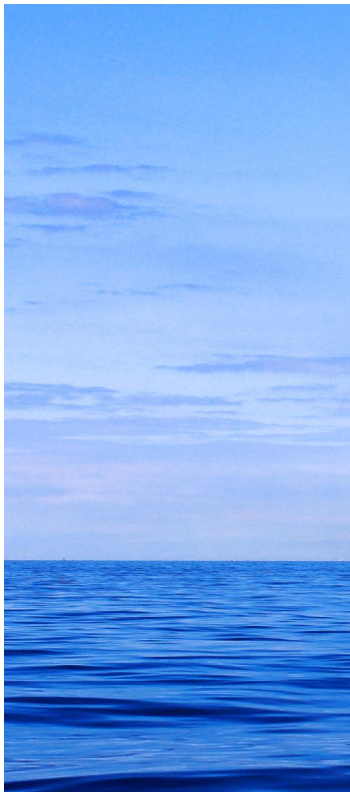

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Xinhua-Baltic International Shipping Centre Development Index 2021

Introduction

Welcome to the 8th edition of the Xinhua-Baltic International Shipping Index report.

Produced by the China Economic Information Service in collaboration with the Baltic Exchange, the report is designed to benchmark the performance of the top port cities and maritime centres around the world.

Based on a combination of metrics, including port factors such as cargo throughput, draught and container berth length; business factors including the number of professional maritime service providers such as lawyers, financiers and shipbrokers; as well as assessments of the general business environment including customs tariffs and logistics performance, the rankings look at 43 locations in Asia, Europe, Africa, Oceania and the Americas.

We thank our partners at the Shanghai International Shipping Institute, Drewry, IACS, Alphaliner, Lloyd's List, LMAA, SMAA, Society of Maritime Arbitrators, IUMI, the World Bank, Marine Money and the International Association of Ports & Harbors for contributing data and commentary to the report.

This year's rankings were made against the backdrop of the global pandemic and the huge disruptions to life and business around the world. It has been a year that has seen a significant drop in global seaborne volumes, with approximately 1 billion tonnes of trade having been lost in 2020 as a result of the Covid-19 pandemic according to Clarksons Research. Tensions between the USA and its trading partners, the UK's exit from the European Union, ongoing friction in the Middle East, a collapse in oil price and volatile freight rates for shipping also contributed to a difficult environment for the industry. The temporary blockage of the Suez Canal by the Ever Given in April 2021 showed just how dependent global supply chains are on shipping. It has been a year when every business has had to reassess its priorities and look carefully at the way it operates.

But despite these challenges, it has been a year in which shipping has continued to service global trade, delivering food, fuel and critical goods safely and efficiently. We owe a debt of gratitude to the world's seafarers, many of whom have been stuck aboard ships for over a year unable to return home due to Covid-19 restrictions. The huge infrastructure of people and equipment which supports the global seaborne movement of billions of tonnes of trade, held strong.

This year's report finds that once again, Singapore holds the title of the world's most important maritime location. Home to a huge port and bunkering hub as well as internationally focused shipbrokers, financiers, lawyers and insurers, the Lion City has continued to prosper, despite the many challenges it has faced. It continues to innovate, developing new technology and practices in its port and supporting the next wave of transformative ideas. We congratulate Singapore,

London and Shanghai and commend all the cities covered in our report.

How the rankings are decided

The rankings are based on the following categories:

Port factors inputs

- Container throughput
- Dry bulk cargo throughput
- Liquid bulk cargo throughput
- Number of cranes
- Total length of container berths
- Port draught

Sources: Drewry, Shanghai International Shipping Institute

Shipping service inputs

- Shipping brokerage services
- Shipping engineering services
- Shipping business services
- Maritime legal services
- Shipping finance services

Sources: Baltic Exchange, Lloyd's List, 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

- Government transparency
- Extent of e-government and administration
- Custom tariff
- Ease of doing business index
- Logistics performance index

Sources: United Nations, World Bank

Message from Xinhua

An international shipping centre is an important port city with a range of key characteristics. These include excellent port facilities, advanced logistics systems and a key geopolitical location; it also has highly efficient shipping services as its core driver, as well as global shipping resources.

In 2014, China Economic Information Services, in collaboration with the Baltic Exchange, introduced the first "Xinhua-Baltic International Shipping Centre Development Index" to the industry. Since its inception eight years ago, it has been gaining international influence.

Impacted by the COVID-19 global pandemic, the international shipping industry has been undergoing significant changes since 2020. Facing such a big challenge, all international shipping industry practitioners had done an incredible job to maintain the global logistic stable and reliable. It ensured the supply of pandemic prevention materials.

In addition to data, the editorial team has also conducted an in-depth quantitative analysis of the development of international shipping centres globally to bring new perspectives to traditional concepts. We hope the evaluation results offer additional insight that is objective and impartial.

There will inevitably be inadequacies in this research report, but we constantly strive to update and improve it. As such, we value and appreciate our readers' comments and feedback. Our Comprehensive Environmental Index aims to reflect, as accurately as possible, the differences in the comprehensive environment amongst domestic shipping cities within a large country.

We welcome and encourage other ports to join us in a collaborative effort to explore how we can further develop international shipping centres. A collective industry effort is required to help promote a rational allocation of global shipping resources, enhance the movement of global commodities and support the scientific development of international shipping centres.

Editorial Board,
Xinhua-Baltic International Shipping
Centre Development Index

Message from Baltic Exchange

This year's report provides a fascinating snapshot as to how global maritime centres have reacted to the disruptions caused by COVID-19 and how the pandemic has accelerated innovation.

The global shipping industry is changing fast. Environmental regulations, changing players in the ship finance landscape, digitisation, supply chain pressures, increased scrutiny of environmental, social and governance (ESG) practices, trade wars and sanctions are transforming the ways in which the maritime eco-system works.

Location is an important ingredient, even if many of us are still working remotely. A successful shipping centre provides everything that the international shipowner needs. It needs to be an efficient port with good onward connections and offer a competitive port services environment. It needs to be a one-stop shop for the shipowning and chartering community providing access to world class finance, legal, shipbroking, IT and classification services. It should be a place which is able to attract the best international talent. It should have a robust and transparent legal system, backed up by efficient courts and arbitration services.

A successful shipping centre has good quality office space and should offer a good quality of life. It should offer an attractive fiscal regime for international owners who, in theory, can base their operations anywhere. It needs new ideas from an ecosystem of startups and sources of funding and support for these innovations.

All of the cities featured in the Xinhua-Baltic International Shipping Centre Development Index have their areas of excellence. Some are great port cities whose innovations mean that they are able to facilitate and open up trade to the wider region. Others' excellence lies in their provision of business services. Here experience counts for much. A location which can offer a choice of the best lawyers, brokers, bankers and underwriters is always going to be a crucial part of the global trading system.

The report is based on analysis drawn from numerous independent datasets and offers an impartial view of the merits of the world's leading maritime centres.

Mark Jackson, Chief Executive
The Baltic Exchange

2021

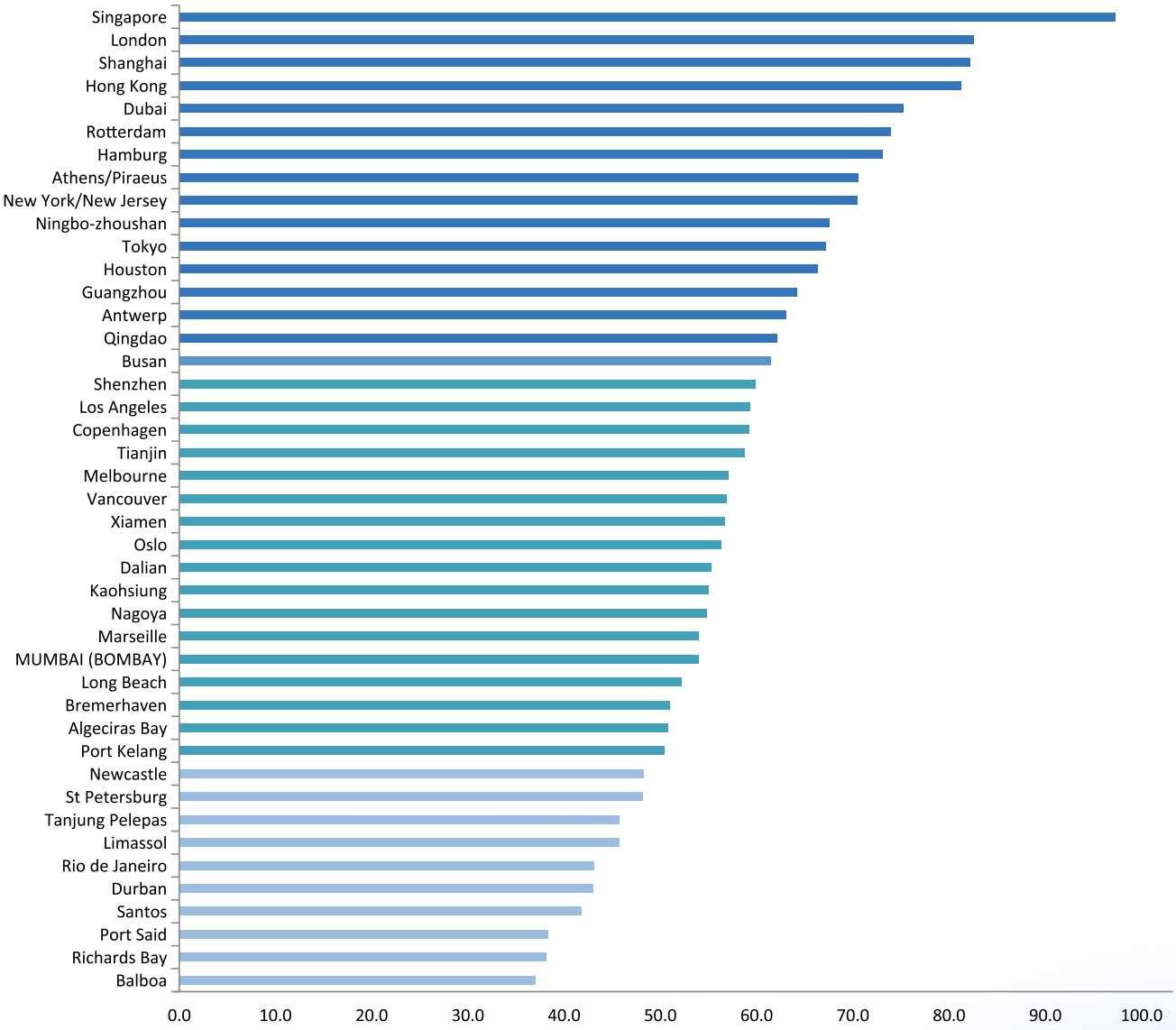
Xinhua-Baltic International Shipping Centre Development Index report

Global rankings

Map of world highlighting: Top 20 maritime cities 2021

Singapore	1
London	2
Shanghai	3
Hong Kong	4
Dubai	5
Rotterdam	6
Hamburg	7
Athens/Piraeus	8
New York/New Jersey	9
Ningbo Zhoushan	10
Tokyo	11
Houston	12
Guangzhou	13
Antwerp	14
Qingdao	15
Busan	16
Shenzhen	17
Los Angeles	18
Copenhagen	19
Tianjin	20

Overall rankings



Previous years' top 10 rankings

Ranking	2020	2019	2018	2017
1	Singapore	Singapore	Singapore	Singapore
2	London	Hong Kong	Hong Kong	London
3	Shanghai	London	London	Hong Kong
4	Hong Kong	Shanghai	Shanghai	Hamburg
5	Dubai	Dubai	Dubai	Shanghai
6	Rotterdam	Rotterdam	Rotterdam	Dubai
7	Hamburg	Hamburg	Hamburg	New York
8	Athens/Piraeus	New York/New Je	New York	Rotterdam
9	New York/New Je	Houston	Tokyo	Tokyo
10	Tokyo	Athens/Piraeus	Busan	Athens

Port ranking analysis

Singapore unchallenged in #1 slot

With its world-leading port, excellent shipping services and supportive shipping business environment, Singapore has consistently topped the ranking for the past five years. Under the support and leadership of the Maritime and Port Authority of Singapore (MPA), the island-state has continued to develop its maritime industry with backing for technological advances in future shipping fuels, innovation, safety improvements, nurturing young talent, and maritime workforce transformation.

The Singapore government has played a vital role in facilitating the development of the city state as an international shipping centre. The Singapore government provides forward-looking planning and guidance in many aspects, including the integration of the shipping industry chain, harbour industry development and intelligent and green port technology, which is instrumental in promoting Singapore’s development as an international shipping centre. Meanwhile, Singapore's favourable business environment, supportive tariff policy, flexible and user-friendly registration and management system regarding ships and crew, as well as a variety of shipping-related incentive policies, all foster positive conditions to attract a large amount of shipping resources.

The Malacca Strait, along which Singapore is situated, connects the Pacific Ocean and Indian Ocean. Known as the "lifeline" of maritime shipping, it is a shipping passage connecting countries in East Asia, Oceania, South Asia, West Asia, Africa and Europe. Being situated near the Malacca Strait is Singapore's most significant geographical advantage. Since 2000, emerging economies in the Asia-Pacific region, most notably China, have developed rapidly, with the sophisticated manufacturing industries in China, Japan, South Korea and ASEAN supporting the boom in global trade. This has in turn spurred strong shipping demand in the Asia-Pacific region, which makes Singapore's geographical advantage even more prominent.

Relying on its distinct geographical advantage and building on the development of the traditional freight sector, Singapore has attracted a variety of maritime enterprises, and gradually built a comprehensive shipping industry ecosystem. It has not only successfully congregated the greatest number of the world’s international shipping groups, but has also attracted international commodity traders, which enriches its shipping and trade business network.

The concentration of players with respect to shipping insurance, maritime law and arbitration, shipping financing and shipping brokerage has strengthened Singapore’s shipping services sector, while the scientific research strength of universities, research centres, technology companies, start-ups and other institutions based in the country has injected innovation capabilities for future shipping development.

Singapore’s maritime sector employs 170,000

people, contributes 7% of the country' s GDP and is home to over 5,000 companies.

Singapore has also played an active role in proposing pathways for the decarbonisation of the industry and has worked to protect seafarers caught up in the crew change crisis resulting from the Covid-19 pandemic.

Its drive and activity on these many fronts have kept it at the top of the ranking.

Despite the pandemic, Singapore port handled its second highest ever container throughput at 36.9 million TEUs. According to MarineTraffic, 33,133 vessels exceeding 5000 gross tonnes (GT) arrived at the port in 2020. Singapore also retained its position as the top bunker port, registering 49.83m tonnes in 2020, its second highest bunker sales ever and up 5% on the previous year.

According to MPA Chief Executive Quah Ley Hoon, 17 international shipping groups either set up or expanded their operations in Singapore in 2020.

Singapore is also pushing its credentials as an arbitration centre and saw an increase of 5% in the number of cases handled.

But Singapore is not resting on its laurels and continues to plan for continued growth.

Looking forward, the MPA says that as its next generation port in Tuas gradually begins operations, much of which will be digitalised and automated, more skilled jobs will be created in the port ecosystem with more systems engineering professionals needed to design and maintain complex automated systems.

The MPA is targeting more investments and hoping to bring in US$ 15 billion in business spending commitments from shipping companies between 2020 to 2024.

The MPA also notes that as part of its strategy to identify and adopt new technologies, it will support more maritime R&D projects, and aims to triple the number of maritime technology start-ups supported under its programmes by 2025.

Shanghai: 20 years of development

By Zhao Nan, Shanghai International Shipping Institute

Today Shanghai is an international shipping centre with a high concentration of shipping-related resources and services, a supportive market environment and efficient modern logistics services. After more than 20 years of development, Shanghai has grown from a regional hub port city to an international shipping centre It plays an increasingly important role in ensuring the smooth flow of international trade and promoting the development of the international shipping industry. Outlined here are the key stages in Shanghai' s development.

1. "Double wheel" drive for hub construction and service industry development

An international shipping service centre is more than just a port: it is also a hub that serves various elements of maritime transportation providing a full chain of services. Shipping service centres need to have both “hard power” and “soft power”. “Hard power” refers to the hub capability of port logistics and is the foundation of any shipping centre. “Soft power” refers to shipping service capabilities. It is key to maintaining the competitiveness of a maritime location. The construction and development of Shanghai International Shipping Service Centre fully integrated and coordinated the two capabilities, and achieved the resultant effect through the “double wheel” drive.

Shanghai Port has been the world’ s largest container port for 11 consecutive years, with world leading port operation efficiency, service level, and technological innovation. In the first half of 2021, due to the “butterfly effect” caused by ship jams in the Suez Canal, leading to the concentrated arrival of ships, Shanghai Port optimised production scheduling and allocated resources based on intelligent technology and platforms. The average daily container throughput reached 140,000 TEU, demonstrating the flexible service level and intelligent and efficient service capabilities of the port. At the same time, the increase in the scale of logistics has brought about the accumulation of logistics, human flow, capital flow, and information flow for Shanghai, which has created demand for shipping services. Shanghai actively promotes the development of modern service industries such as ship brokerage, maritime law, ship finance, marine insurance, shipping information consulting, maritime culture, education and training. After more than ten years of development, Shanghai has significantly grown its market share for ship broking, insurance and legal services.

2. Building an open and efficient business environment for pilot free trade zone

In September 2013, the Chinese government allowed Shanghai to build a pilot Free Trade Zone (FTZ). The FTZ has helped power the Shanghai International Shipping Service Centre. Under the FTZ framework, Shanghai has established the management mode of national treatment and negative list before investment access, and has implemented a series of reform measures to liberalise the service industry, promote innovation in the financial sector, establish an international system, improve port efficiency and optimise the business environment. For the shipping industry, the FTZ has allowed for the further expansion and opening of shipping-related industries in the negative list, an international ship registration system, and the innovative development of international transit and consolidation services .

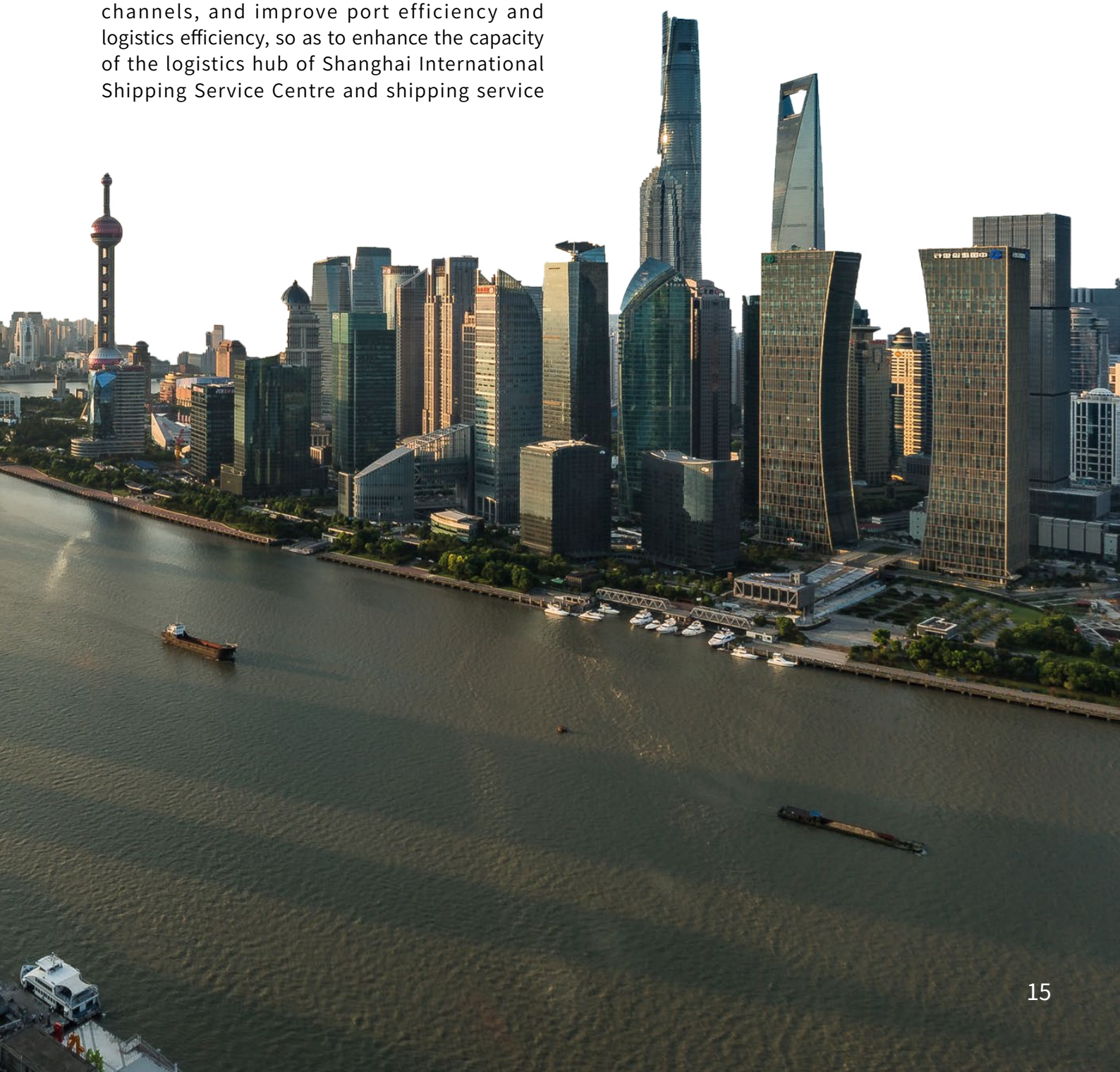
3. Technology to enable the transformation and upgrading of the shipping industry

The shipping industry has entered a new stage of development. Information technology, Internet technology, 3D printing and artificial intelligence are having a profound impact. New modes of transport, new types of business, new technologies and new rules are emerging. These changes will also have an impact on Shanghai. In May 2015, the Shanghai Municipal People's Government officially issued the "Opinions on Accelerating the Construction of a Science and Technology Innovation centre with Global Influence", clarifying that Shanghai would build a global science and technology innovation centre to support and promote the construction of "four centres" including the international shipping service centre. The development of shipping science and technology innovation has become the key driving force for the new round of development of the Shanghai International Shipping Service Centre. The Shanghai Municipal People's Government has set up special fund projects to carry out innovative research, support the environment and cultivate and incubate scientific and technological innovation, and become a source of innovation in international shipping.

4. Regional coordination to optimise resource allocation and improve service levels

The Shanghai International Shipping Service Centre has the unique location advantage of connecting rivers and seas and communicating with the world. It connects the Yangtze River Delta and even China with the international market. By promoting the integrated development of ports and shipping logistics in the Yangtze River Delta, a mechanism has been established to continuously strengthen regional coordination, smooth logistics channels, and improve port efficiency and logistics efficiency, so as to enhance the capacity of the logistics hub of Shanghai International Shipping Service Centre and shipping service industry in the Yangtze River Delta region to service the international market.

In 2021, the construction of the Shanghai International Shipping Service Centre has reached a new stage, moving from “basic completion” to “comprehensive completion.”



NINGBO

Moving on up

Ningbo Zhoushan entered the top ten in 2021 for the first time. Expect to see this China powerhouse climb further up the rankings in coming years. Located in the middle of China' s coastline and south of the Yangtze River Delta, Ningbo is a typical harbour city.

As well as home to the Ningbo-Zhoushan burgeoning port complex, Ningbo is a growing shipping services centre. Its Ningbo Shipping Exchange provides customers with one-stop services integrating shipping transactions, finance, information consulting, policy research and government services. The port, meanwhile, is investing in its future with agreed development projects set to add 5.56m TEU in container handling capacity annually and 20m tonnes of ore handling capacity. It is also committed to further developing its sea-railway combined transport business, expanding the hinterland of **Ningbo Zhoushan**.

Another shipping centre to watch is **Athens-Piraeus**. While it slipped out of the top ten in 2018, it reappeared in tenth position in 2019 and has since climbed to eighth position. The historic importance of Greece to the shipping industry does not need labouring. Greece is the world' s largest ship owning nation, representing over 20% of global tonnage. This ship owning expertise is supported by a thriving maritime cluster that generates investments and employment opportunities in the country. Piraeus is also one of Europe' s rapidly growing ports and is the fourth largest in the region, in terms of total container throughput in 2019 and 2020. There are government plans to strengthen the Greek flag and to further develop the country' s ports, which will enhance Athens/Piraeus' offering in the years to come.

LONDON

London has danced around second and third place in the ranking over the past five years, but has not managed to secure the number one position. While it has continually built on its position as a world leader of maritime professional business services, its geographical location means that it lags Singapore in terms of port volumes and does not have the shipowner presence that other top ten shipping hubs have. In 2020, according to MarineTraffic, 3080 vessels called at its Thames and Tilbury terminals. Yet its combination of legal framework, experience, timezone, language and proximity to a huge financial hub means that it continues to provide maritime services to the world. This ability has been unimpacted by Brexit.

The undecided

Tokyo has skirted the top ten ranking over the past five years, ranking ninth in 2017 and 2018, dropping out of the top ten in 2019, re-appearing in tenth place in 2020, only to drop out again in 2021. Its green ambitions might give it a welcome ranking boost in coming years though with a plan in play to develop all-electric propulsion for bunker supply vessels operating in Tokyo Bay.

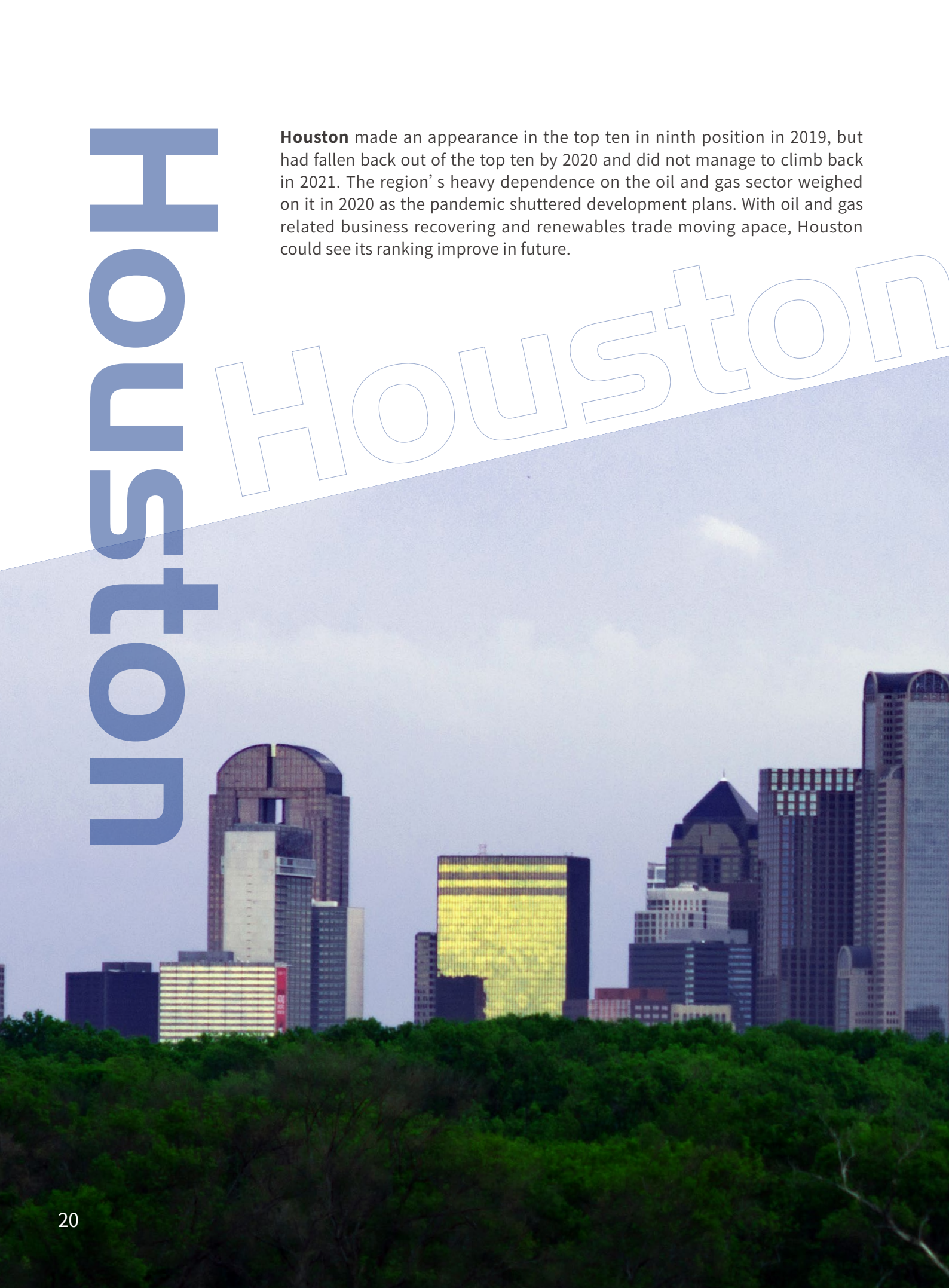
Another shipping centre that has dipped in and out of the top ten tanking is **Busan**, having missed out on the top ten in 2017. It crept in at number 10 in 2018, only to drop out again in 2019. While its port and shipbuilding successes - South Korean shipbuilders retained their global top spot in terms of shipbuilding order volumes for the third consecutive year in 2020 - propel it forward, its shipping services fall short of those above it in the ranking.

Meanwhile, after sliding three places in 2018, **Hamburg** has kept hold of its number 7 position for the past three years. **Rotterdam** jumped two places to number 6 in 2018 and has also been able to keep hold of its ranking since then. Both European cities are investing in sustainability and innovation for their ports and supporting clusters, but it remains to be seen if this will be enough to keep them in the top ten in the coming years.

TOKYO

Houston

Houston made an appearance in the top ten in ninth position in 2019, but had fallen back out of the top ten by 2020 and did not manage to climb back in 2021. The region' s heavy dependence on the oil and gas sector weighed on it in 2020 as the pandemic shuttered development plans. With oil and gas related business recovering and renewables trade moving apace, Houston could see its ranking improve in future.



HONG KONG

HONG KONG

Hong Kong made gains in 2018, leapfrogging London to take second place in the top ten. But it dropped back to fourth place in 2020 and its ranking was unchanged in 2021. Hong Kong has been hit by instability since 2019. Port throughput has been slipping in comparison to the rising star of **Ningbo Zhoushan** and the staples of Singapore and Shanghai and an end to the reciprocal tax arrangements between Hong Kong and the US has impacted Hong Kong`s ranking.

In 2020, 12,633 vessels called at Hong Kong, still making it one of the world' s busiest ports. Its ship register is the fourth biggest in the world and has passed the 130 million dwt mark. In 2020 it amended its laws to offer tax concessions to the ship leasing and marine insurance businesses and is currently looking into the feasibility of tax reforms to attract shipowners, managers, agents and brokers.

Hong Kong has an undeniably robust maritime ecosystem, an excellent geographical position, as well as business-friendly government policies which support its place in the top ten.

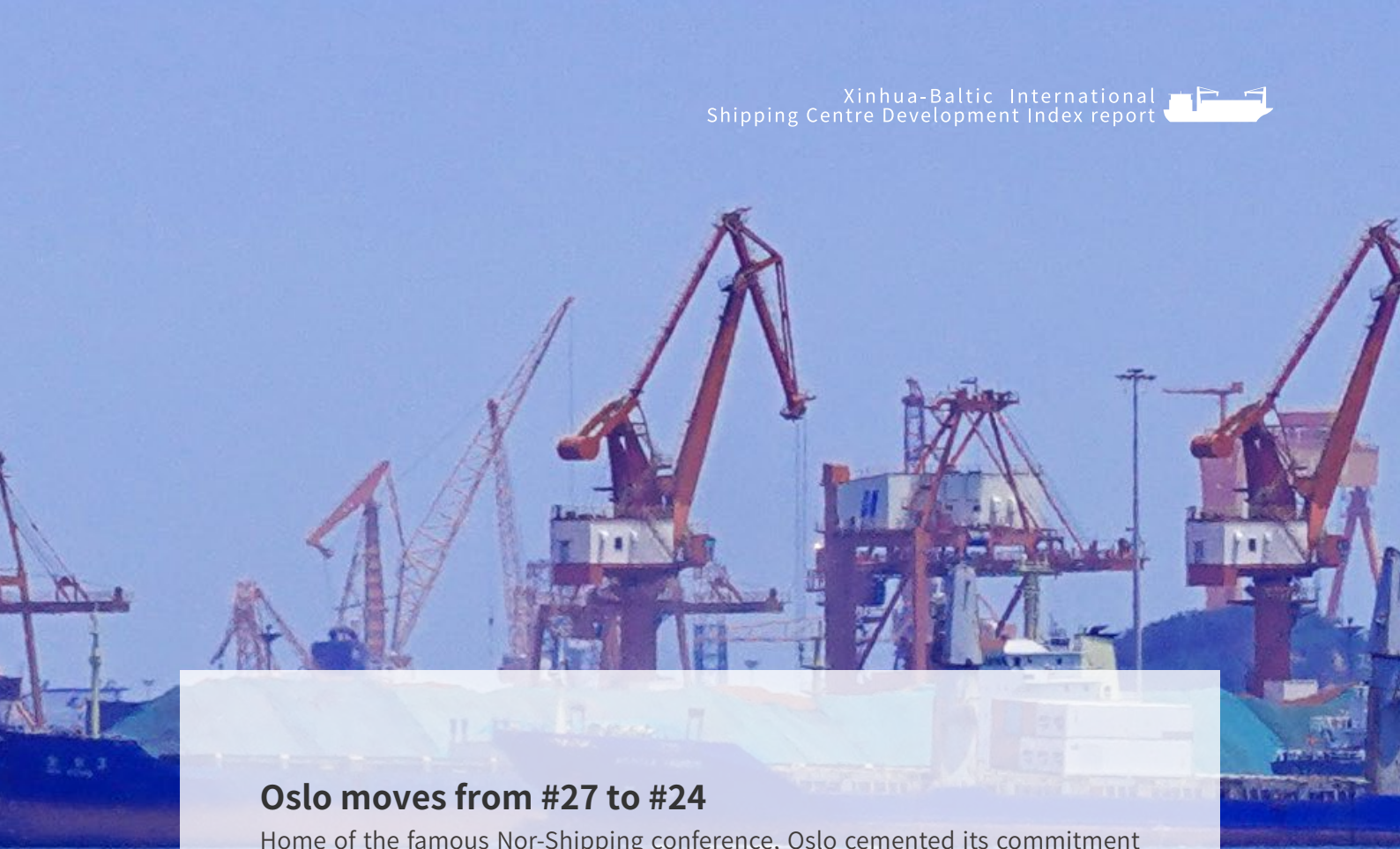
Rising stars in the top 50

Antwerp jumps from #16 to #14

Antwerp is on a growth mission, having agreed to merge operations with Zeebrugge early in 2021. The concept of merging the two ports has been put forward several times in the past, but blocked by political opposition. Annual throughput of the combined operations will be more than 278 million tons, making the new entity one of the largest breakbulk and ro-ro ports in Europe. The port is also investing in sustainability, innovation and safety. In 2020, Antwerp joined forces with the European Maritime Safety Agency in employing drones to support enforcement and control in the port area. It is also part of a city-wide initiative to develop and test a private 5G network to increase the speed, reliability and security of the port authority, the police and the fire service' s digital applications.

Xiamen rises from #25 to #23

Container throughput of East China' s Xiamen port was 11.41 million TEU in 2020, up 2.5% year-on-year. Xiamen is making good on its ambitions to reach an annual container throughput of 14 million TEU by 2025 and to become a special economic zone with a free trade port by 2035. Supporting those aims, the port co-operated with Israel-based ZIM to introduce its first e-commerce express cargo route in September 2020, with five vessels in service. Xiamen is also focused on rail services and currently offers freight train routes to central Europe, central Asia and Russia, reaching more than 30 cities in 12 countries. It hit record highs in rail freight in 2020 with 273 trains carrying 24,112 TEU of cargo. Looking to its digital future, Xiamen has received approval from China' s Ministry of Transport to construct a new automated container berth, with a planned annual handling capacity of 910,000 TEU.



Oslo moves from #27 to #24

Home of the famous Nor-Shipping conference, Oslo cemented its commitment to ship autonomy in 2020 with investment in and support for autonomous shipping projects: Kongsberg Maritime and Massterly' s contract to equip two fully-electric new vessels with autonomous technology plans to sustainably meet the delivery needs of a Norwegian grocery distributor. The Norwegian-controlled foreign-going fleet has in recent years experienced good growth in both the number of ships and tonnage, showing a slight decline in the number of ships during 2020. As of January 2021, the fleet numbers 1,783 ships with total tonnage of 51.1 million deadweight tonnes. Through 2019 and 2020, the fleet has grown by almost nine per cent.

Bremerhaven edges up from #32 to #31

Germany' s Bremerhaven port is looking to a greener future with a purchase of eight shore power supply units for ships to enable them to switch to electric power while at berth. The energy comes from renewable energy sources and the move marks an important milestone in the port' s journey to become a green, climate-neutral port.

Tanjung Pelepas moves from #37 to #36

Malaysia' s Port of Tanjung Pelepas posted record throughput of 9.8 million TEU in 2020, having invested more than US$173 million to improve its container handling capacity, capability and reliability. It aspires to be an advanced preferred port in the region, offering smart solutions that will help optimise operations, promote efficiency and reduce logistics costs in a safe environment.

Top 10 shipping services centres

1	London	91.4
2	Singapore	90.9
3	Shanghai	78.4
4	Hong Kong	72.0
5	Athens/Piraeus	71.3
6	Dubai	69.8
7	Hamburg	63.4
8	Houston	62.1
9	Mumbai	61.9
10	New York/New Jersey	61.8

London tops services, but challengers close ranks

London has once again topped the Xinhua-Baltic International Shipping Centre Development Index in the shipping services section of the ranking, coming out on top for law, arbitration, financing, insurance and brokerage services. But there are other global shipping centres nipping at London's heels. In the overall shipping services ranking it is Singapore that is vying for the top spot.

Scoring just 0.5 below London, Singapore has taken a rounded approach to bolstering its maritime services sector. In 2017, Singapore's Maritime and Port Authority (MPA) established the International Maritime Centre (IMC) 2030 Advisory Committee to undertake a strategic review to take stock of Singapore's achievements to date as an international maritime centre, identify key trends which may impact future IMC competitiveness, and map out a developmental strategy to take Singapore's IMC to 2030 and beyond.

The Committee advised Singapore to further widen and deepen its IMC cluster by harnessing both physical and non-physical trade flows; strengthening inter-linkages within the Singapore IMC cluster and with adjacent industries such as commodity trading, logistics and e-commerce, as well as with other complementary international maritime clusters through stronger business ties, collaborations on research and development, and training and education; and strengthening its focus on innovation and talent. Singapore has been working through the recommendations in multiple streams to improve Singapore's IMC position. In one strand, for example, the city-state is making progress on its R&D Roadmap 2030 for maritime transformation. Agreed in 2019, the Roadmap was charted to address the strategic need for R&D capabilities to be developed to support Singapore's long-term maritime competitiveness.

Why London?

The United Kingdom (UK) sits at the heart of the international shipping industry and its professional expertise in ship chartering, insurance, legal, financial services and consultancy is called upon by shipowners and charterers worldwide. London is home to a number of the maritime sector's international bodies including: International Chamber of Shipping (ICS), International Association of Classification Societies (IACS), The International Group of P&I and The Baltic Exchange. London is also privileged to host the International Maritime Organization (IMO).

Key strengths of UK maritime services sector

Expertise – Shipping is a niche and highly technical sector which requires specialist knowledge to succeed. The pool of expertise available in the UK is second to none. Whether former seafarers or financial, broking or insurance experts, the UK-based workforce has a huge range of shipping industry specific skills available.

Quality – UK-based firms are renowned for the quality of their work. The framework provided by key institutions such as the Baltic Exchange, Lloyd' s of London, the Admiralty and Commercial courts and Financial Conduct Authority delivers a high degree of security and confidence.

Variety – The breadth and depth of UK maritime service providers means that any requirement however large or small can be handled. The interaction between the various professions is a key advantage, enabling quick and expert solutions to shipping related problems.

Experience – UK-based firms have been providing maritime related services for over 300 years and continue to be at the cutting edge of new developments.

Source: Maritime London

Legal services

Breaking the shipping services ranking down into different sectors reveals a clearer picture of which centres are leading the ranks in specific sectors. With law, it is New York/New Jersey that is competing with London' s prowess in terms of the number of maritime partners at law firms.

Looking at arbitration, London is a clear forerunner with Singapore its closest rival but still a way behind. Fears that the UK' s decision to leave the European Union would dent the reputation of the nation' s capital as the leader in maritime arbitration cases were not realised and the UK capital continues to demonstrate its strength in arbitration.

Figures from the London Maritime Arbitrators Association (LMAA) report 3,010 arbitrator appointments in 2020, the highest number since 2015. There was also a year-on-year increase in the number of new cases, with 1,775 new arbitrations registered with the LMAA in 2020. Despite the pandemic the number of awards in 2020 was largely in line with 2019, with 523 arbitral awards produced by LMAA arbitrators in 2020.

"The increase in appointments and sustained volume of new cases provide a clear indication that users of ad hoc arbitration continue to regard London as a world-leading arbitral seat," said the LMAA.

But London' s position as the maritime arbitrator of choice in the past is not a guarantee of future success.

London' s dominance as the most popular venue for international arbitration is under threat from Singapore and Hong Kong, recent research by the School of International Arbitration at Queen Mary University of London has found.

It also found increasing support for using arbitration in conjunction with other forms of alternative dispute resolution (ADR), along with a strong preference for procedural hearings in future to be all or partly remote.

Asked to name their organisation' s most preferred seats of arbitration, 54% said London – down from 64% in 2018 – while Singapore drew level, up from 39% in 2018 and just 19% in 2015. The survey was based on over 1000 responses from lawyers and arbitrators.

Across all sectors, including maritime, the Hong Kong International Arbitration Centre reported a record 311 new filings in 2020, while the Singapore International Arbitration Centre (SIAC) set a new record with 1,080 new case filings. This is the first time that SIAC' s caseload has crossed the 1,000-case threshold.

Gary Born, president of the Court of Arbitration of SIAC, commented:

"These numbers are exceptional and will spur us to work even harder on improving the quality and efficiency of SIAC' s case administration, to fulfil our goal of being the leading choice of users all over the world."

Insurance, finance & shipbroking

Meanwhile, in insurance services, London is a clear winner, with its closest rivals some way behind.

Analysis from the International Union of Marine Insurance (IUMI) recorded marine underwriting premiums for 2019 at $28.7 billion, a fall of 0.9% from 2018. The 2020 figures were not available at the time of writing.

The global income was split between geographic regions as follows: Europe 46.3%, Asia/Pacific 31.8%, Latin America 10.3%, North America 5.3%, Other 6.3%. 2019 saw Europe' s global share reduce slightly from 46.4% (2018) to 46.3% and Asia' s share increase modestly from 30.7% (2018) to 31.8%, demonstrating the ambition of Asian insurers.

The shipping brokerage ranking reveals a closer competition with Singapore and Greece closing the gap with London, while the shipping finance services ranking saw Shanghai, Singapore, New York/New Jersey, Hong Kong and Tokyo all score highly, in competition for London' s top spot.

Does location matter anymore?

For centuries the great port cities analysed in our report were built on the confluence of trade, people and ideas. Centred around ships and the presence of their owners, managers and charterers, maritime clusters steadily grew across Europe, Asia and the Americas. A combination of talent, time-zone, geography, expertise and government policies has helped locations such as Singapore, London and Shanghai thrive. Successful clusters combine the experience and size of established companies with the energy and drive of smaller and start-up firms. Collectively they have consistently delivered innovation, jobs and tax receipts.

But has the successful shift to working from home during the COVID-19 pandemic ruptured the maritime business cluster concept forever? Will like-minded and complementary as well as competing businesses operating in the same field continue to see the advantage of co-locating in the same expensive business districts? Has the theory of clustering, which describes the economic advantages of the concentration of specialised industries in a single location, been overturned by a brave new world of remote meetings and home working? Or will we see a swift return to business as usual and offices in maritime clusters fill up again with shipbrokers, tech-specialists, financiers, insurers and lawyers when the pandemic ebbs?

Of course, the impact of COVID-19 has been felt very differently around the world. In China, thanks to rapid government intervention, a swift uptake of technology and strictly enforced lockdowns, life in the cities has returned much to normal fairly rapidly. Office work and face-to-face activity have continued. But in Europe and the US, a devastating winter wave led to further lockdowns, which only at the time of writing are beginning to ease. Maritime employers have faced very different challenges around the world and adapted accordingly.

The London P&I Club, one of the world' s leading providers of mutual insurance services for shipowners, is one such employer. Headquartered in London, but with important regional hubs in Athens, Cyprus and Hong Kong, it believes that proximity to its members is critically important.

"Whilst we don' t need offices in every country, we do believe that regional hubs are key," says Chief Executive Ian Gooch.

The London Club has grown its Hong Kong office over the past 12 months, which it sees as an important regional base for Asia. He notes that face-to-face culture is extremely important in China and that "Zoom meetings haven' t been as popular there as in Europe."

At the same time however, its London headquarters has managed to successfully function with mainly homeworking for the organisation' s claim handlers, underwriters and administrative staff. He says that the Club is committed to London, but that the future will probably involve some form of hybrid working and possibly a smaller office. However, the Club sees the advantages of having all its disciplines under one roof.

The same is true for shipbroker Simpson Spence Young. The firm is one of the largest shipbrokers with offices in 20 locations around the world including Singapore, London, Dubai and Shanghai.

"Shipbroking has always thrived on personal interactions, the buzz of the trading floor and building a relationship with your clients," explains Chairman Mark Richardson. "Lockdowns and travel restrictions have made this tough, but thanks to technology we have continued to work well across our network of global offices."

Most businesses report that the pandemic has simply hastened existing trends. For many in the maritime business sector, the past 12 months has been about accelerating digitalisation, automation and efficiencies. But for classification societies, whose surveyors' work involves physical presence and travel, COVID-19 restrictions have brought forward changes to testing and certification processes.

"Remote service delivery will become a part of everyday life for us," says Laurent Leblanc, Bureau Veritas Senior Vice-President, Technical & Operations.

He cites the example of a survey in early February 2021 of an engine test conducted jointly between head office in Paris and a facility in China with multiple stakeholders also witnessing the test process. A BV machinery expert located in Paris, a network office in Germany and an equipment maker in Europe were able to witness testing in a facility in China where BV surveyors were also present. Using real-time video communication tools, those unable to travel due to COVID-19 restrictions were able to be virtually present and to witness and contribute to confirming an important test procedure.

"The capability does not replace our surveyors but allows speed of access and connectivity between teams and stakeholders to enable decisions to be made quickly," says Leblanc.

The consensus which seems to be emerging amongst maritime employers is that the future of work will feature a good deal less travel and possibly more homeworking, but certainly a commitment to location remains. Flexible working is popular with many employees, particularly those juggling young families and the pandemic has challenged many leaders' pre-conceptions about working from home.

However, maritime knowledge workers still need to collaborate, share ideas and work closely with clients. Younger and new employees need to be trained and

"While the pandemic has led to acceleration of technology adoption or innovation, efforts in battling the crisis have, however, inevitably put many economic activities to a standstill. In particular, periods of social distancing measures such as class suspension, event cancellation, facilities suspension and business operation restrictions aiming to minimise face-to-face interaction have posed exceptional difficult times on different industries in Hong Kong. Against the odds, the financial services and trading and logistics, which are pillar industries in Hong Kong, have even registered positive growth amid the pandemic."
Invest Hong Kong

"The London and UK market has been remarkably resilient through the pandemic. The pragmatism and ingenuity shown to ensure we can continue to do business and serve the needs of the global shipping community from our homes instead of our offices has been a great success, and can only leave us in good stead for the future."
Maritime London

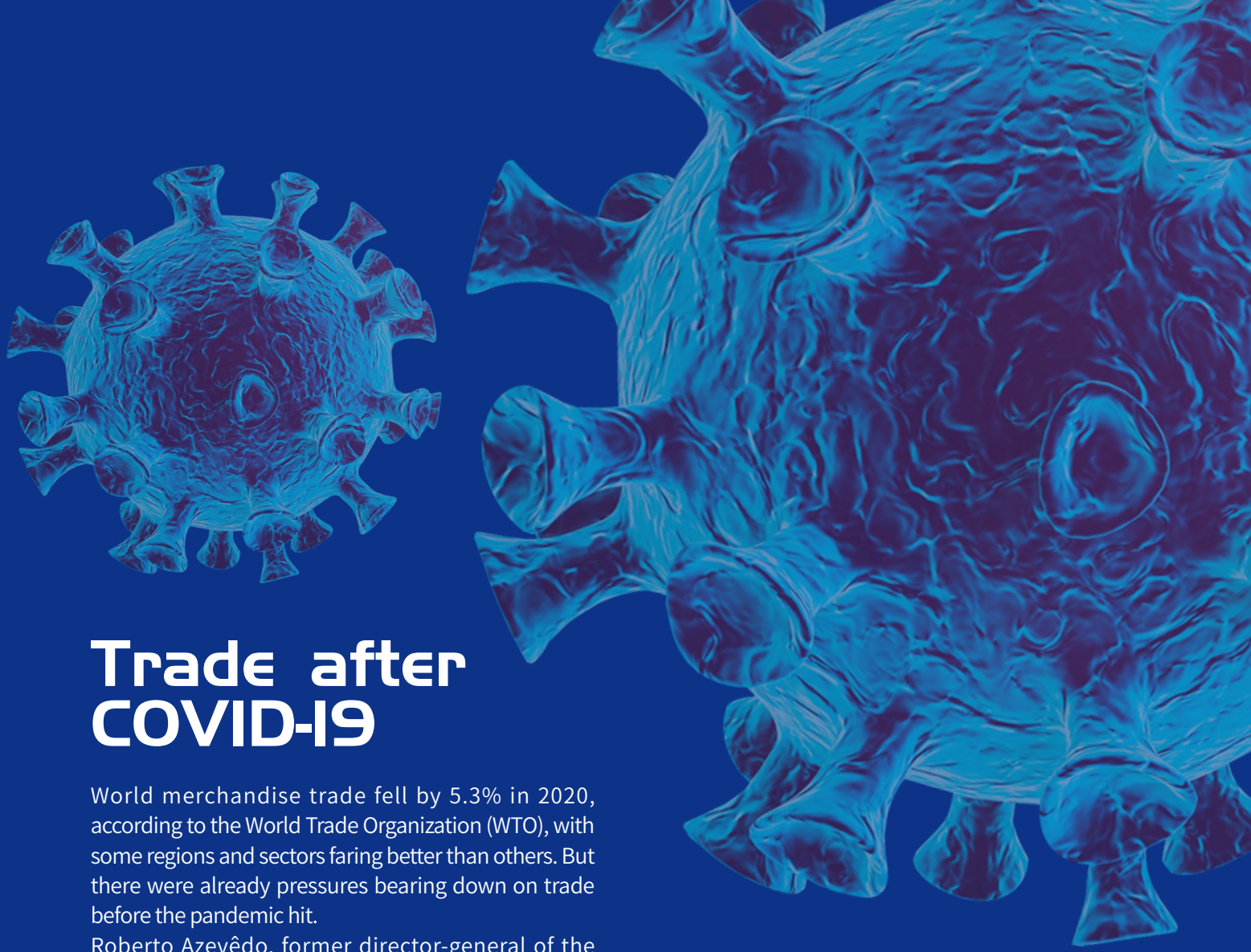
learn about a company's culture: this is difficult to achieve remotely. Maritime clusters succeed because they provide access to know-how. When companies are located in close proximity to each other, it is easier to share knowledge and best practices or recruit the right people.

Jos Standerwick, Chief Executive at promotional body Maritime London says:

"Maritime London does not prescribe to the rather dystopian view that COVID-19 may facilitate the end of the 'physical cluster'. Will we spend more time working from home? Probably. Is this a bad thing? Probably not. Will there still be a need for a physical market to cement old relationships, forge new ones and work together to find solutions to the increasingly complex questions facing international shipping? Yes. Will London and the UK still be the best place in the world to transact such business? Definitely."

Baltic Exchange Chairman Denis Petropoulos has the final word:

"Remote working has been successful because so many of us have taken our longstanding business relationships from our pre-pandemic life home. But these need replenishing and renewing through personal interaction. The great maritime hubs facilitate this."



Trade after COVID-19

World merchandise trade fell by 5.3% in 2020, according to the World Trade Organization (WTO), with some regions and sectors faring better than others. But there were already pressures bearing down on trade before the pandemic hit.

Roberto Azevêdo, former director-general of the WTO, noted that in 2019, before the pandemic, world merchandise trade had declined in volume terms by 0.1%, weighed down by political tensions and protectionist measures. In comparison, merchandise trade volumes grew by 2.9% in 2018.

The post-COVID trade recovery is expected to be strong but uneven and will rely on the individual successes of countries in overcoming the pandemic. Estimates from the WTO put that recovery at an 8% increase in the volume of world merchandise trade in 2021. But looking further out, trade growth is expected to slow to 4% in 2022, with the total volume of global trade remaining below the pre-pandemic trend.

This global trade recovery is also "marred by regional disparities, continued weakness in services trade, and lagging vaccination timetables, particularly in poor countries", according to the WTO. "COVID-19 continues to pose the greatest threat to the outlook for trade, as new waves of infection could easily undermine any hoped-for recovery."

North America is expected to drive demand for traded goods in 2021, at 11.4%, supported by large fiscal injections in the US, which should also stimulate other economies through the trade channel, the WTO forecasts. Europe and South America are, meanwhile, projected to see growth of around 8%. On the export side, Asia will meet much of the demand growth, shifting the trade imbalance even more towards the east. Exports from the region are expected to grow by 8.4% in 2021. European exports will also increase by 8.3%, while shipments from North America will see a smaller rise of 7.7%. These regions will pick up the slack from areas such as South America which is expected to see weaker export growth of 3.2% in 2021 and the Commonwealth of Independent States (CIS), including certain former and associate members, at 4.4%.

Disruptions brought about by COVID-19 also affected some sectors more significantly than others. UNCTAD noted that the value of global trade in the energy sector has declined the most, with a drop of more than 35% in value. Steeper declines also hit the automotive sectors, machinery and metals and ores.

In a 2020 paper (Ports and Shipping in the COVID-19 Pandemic) comparing the resilience of container shipping and ports between the COVID19 pandemic and the 2008–2009 financial crisis, specialist shipping and port academics Theo Notteboom, Thanos Pallis and JeanPaul Rodrigue found that while the two events were completely different, shipping lines were better prepared to cope with the pandemic because of the lessons learned from the financial crisis, and also because of more effective joint capacity management through alliances.

"The core lesson is that capacity management is a robust resilience strategy for the shipping industry to mitigate disruptions," said the authors. However, they note that since maritime transportation serves derived demand, the risk is that the external supply chain shock brought on by COVID-19 could become internalised within the global economy, having long-term impacts on demand. Therefore, what happened after the financial crisis of 2008–2009 – where it took several years for the global economy to recover from the resulting recession - could follow the initial disruptions caused by COVID-19.

On a more positive note, while the 5.3% contraction in trade hurt shipping in 2020, volumes did not dip as much as feared thanks to strong monetary and fiscal policies implemented by many governments. These policies, noted the WTO, helped prevent a larger drop in global demand, which would have reduced trade further. Additionally, national lockdowns and travel restrictions caused consumers to shift spending away from non-traded services and towards goods while the shift to remote working generated trade income and demand.

Indeed, the pandemic accelerated a number of significant trends that will shape future trade demand.

01

The pandemic highlighted the vulnerability of global supply chains. Organisations are now rethinking their supply chains specifically with an eye to dealing with disruption. A McKinsey survey of 60 senior supply chain executives in 2020 found that 93% of them were planning to increase the level of resilience of their supply chains. Nearshoring, dual-sourcing and/or regionalising of supply chains will have an important part to play in those plans.

02

End users are more able to influence global trade than ever before with their ability to order international goods with ease. With sustainability and social responsibility high on the public' s agenda, that influence has a direct and increasing impact on what consumer goods are ordered and from where.

03

Political pressure – already a barrier to some trade – has intensified. Unresolved tensions between the US and China, as an example, continue to influence international trade. Trade tensions between the two major economies started in 2018 and led to several rounds of retaliatory tariffs resulting in a contraction of trade between them by about 15% in 2019, according to UNCTAD figures.

Container imbalance stymies trade

Surging demand for containerised goods, a rapid bounce-back from the world's production powerhouse China, and disruptions to vessel supply as pandemic restrictions took hold at ports all combined to create the perfect storm for a crippling east-west container imbalance in 2020 and into 2021.

While containers from Asia were sent to North America and Europe, due to Covid-19 restrictions comparatively little moved in the opposite direction. Analysts calculated a 40% container imbalance in North America as at March 2021, meaning that for every ten containers that arrived only four containers were sent back, leaving six at the arrival ports.

Phillip Sanfield, director of media relations at the Port of Los Angeles, said that the Port has experienced an unprecedented surge in one-way import trade since mid-year 2020, resulting in record cargo volumes.

"Every node of the supply chain has been challenged, and we're working with all our partners to improve efficiency on many fronts."

The number of ships at anchor in the San Pedro Bay for Los Angeles/Long Beach (LA/LB) ports was about 40 in February 2021. This had fallen to about 20 in May 2021.

"Our goal is to significantly reduce to just a few ships at anchor by June." In May, the port was working an average of about 15 ships at berth on a daily basis. Pre-pandemic, it was about 10 ships. "So, our productivity has gone up dramatically," said Sanfield.

On the US east coast, the Port Authority of New York and New Jersey has faced the same pressures and has worked with its stakeholders across logistics sectors to ensure the fluidity of port operations. It called on ocean carriers to continue to help ports around the US relieve ongoing tightness in the supply chain through mitigation actions, such as deploying extra loaders and evacuating empty containers as quickly as possible.

To put the scale of the problem in perspective, in April 2021 the combined total volume of loaded outbound containers at LA/LB was down 3% to 172,836 TEU, while the volume of inbound loaded boxes rose 3% to 500,097 TEU. In the same month, LA handled 171,874 empty TEU, up 27% over the same month in 2020, while Long Beach saw a 33% growth in empty handling to 125,015 TEU.

A lack of empty containers has stymied trade, with claims of some ships leaving with space still available because there were insufficient empty containers to load goods. China has been working hard to produce additional containers: the China Container Industry Association said China has been producing 300,000 TEU a month since September

to alleviate the shortage - but the perennial imbalance means that this will simply lead to more empty storage at US and European ports.

The lack of containers in the right locations, as well as a lack of containers more generally, has had an impact on freight rates. Transportation costs had risen from about $1,500 per container to $6,000-$9,000 per container by February 2021. Prices for actual containers have also shot up with manufacturers reportedly charging $2,500 for a new container, up $900 from 2020' s prices.

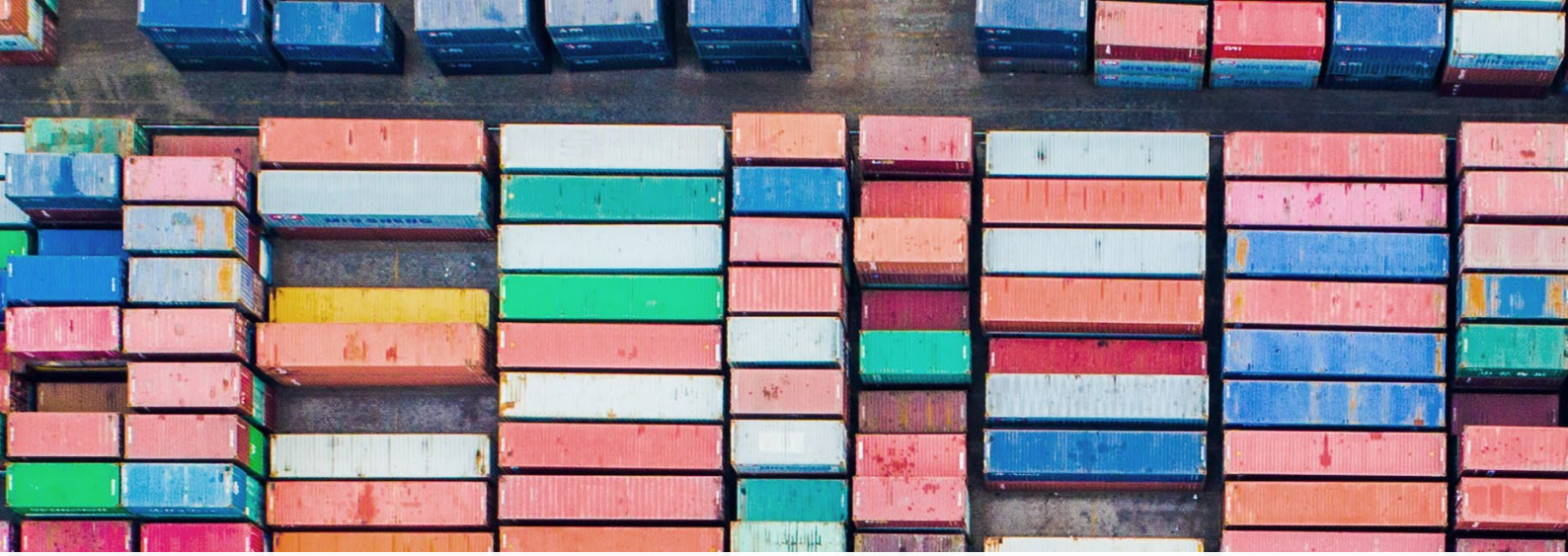
The effect of the Suez Canal blockage further exacerbated imbalances with a substantial amount of vessels forced into the same berthing windows after being held up behind the Ever Given. This temporarily placed a significant strain on infrastructure at European and US ports, led to a round of missed sailings and, crucially, delayed the flow of empty containers back to Asia.

According to Container xChange, Europe' s leading container ports were still receiving far more boxes than were departing in May 2021. The average Container Availability Index (CAx) reading of incoming 20 dry TEU across three of Europe' s biggest ports – Rotterdam, Antwerp and Hamburg – climbed 3% at the end of April compared with the week before. At Rotterdam, box numbers rose +3.75% week-on-week; at Antwerp the week-on-week increase was +3.5%, while at Hamburg it was +2.2%. An index reading of below 0.5 means more containers leave a port compared to the number which enter. Above 0.5 means more containers are entering the port.

Hamburg has recorded a CAx reading of above 0.8 since the beginning of March 2021. Rotterdam' s CAx reading has risen steadily in 2021, climbing from 0.65 in week 1 to 0.74 by the beginning of March and up to 0.83 by the end of April. Antwerp, meanwhile, recorded a CAx of 0.38, 0.78 and 0.9 respectively.

Dr Johannes Schlingmeier, CEO and founder of Container xChange, said: "Europe' s top container terminals have been struggling to keep congestion at bay, with incoming boxes outweighing outgoing boxes for much of 2021. The closure of the Suez Canal appears to have only made the box crunch at Europe' s hubs only slightly worse than it already was.

"What we' re hearing from our container leasing and trading members is that they find it increasingly difficult to book export containers with the carriers across Europe. It seems shipping lines are prioritising empty containers in order to move the boxes back to China as fast as possible."

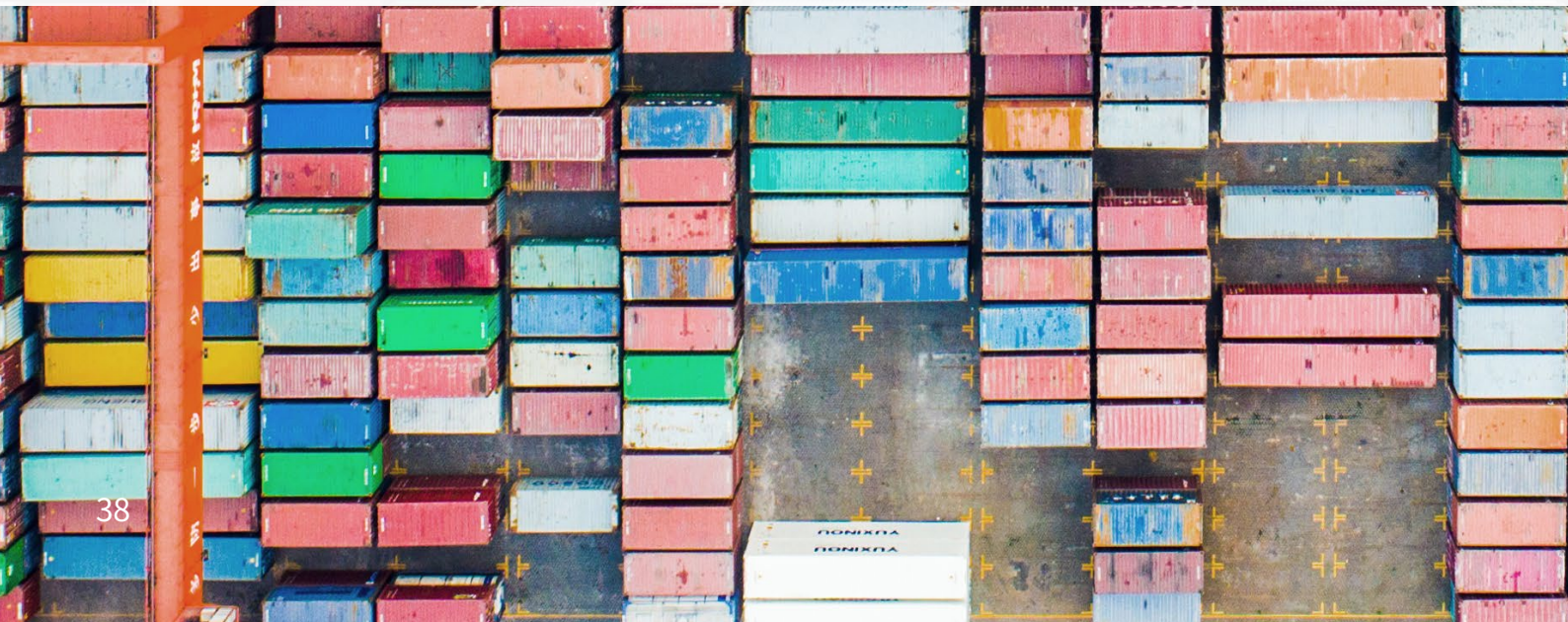


Mixed bag for global container ports

Container ports around the world had a bumpy year in 2020, with the effects of the pandemic varying widely depending on cargo type, national movement restrictions, and the impact of the virus on trading partners.

In Asia, **Shanghai** set historic records in 2020 for the most containers handled in a 24-hour period – 149,600 TEU on July 30 – and a monthly throughput high – 4.2 million TEU in October 2020. Handling 43.5 million containers for the full year 2020, marginally up (0.5%) year-on-year, Shanghai has maintained its place as number one in the global port rankings in terms of throughput. For the future, Shanghai International Port Group has outlined its firm commitment to integration of the Yangtze River Delta, pledging to make continued efforts to strengthen collaboration with ports, railways and highways across the Yangtze River Delta, exploring a more diversified port collection and distribution system and promoting information sharing and business interconnectivity.

China Merchants Port Holdings (CMPort) was able to increase TEU handling at its ports in 2020 to 120.5 million, but its bulk cargo volumes dropped 8.6% to 411 million tonnes. It is channelling its 2021 investments into sustainability initiatives and partnerships to develop its commercial offering. CMPort closed the acquisition of equity interests in eight terminals through Terminal Link in 2020, expanding its operations into Southeast Asia, the Middle East, Europe and the Caribbean. It has also developed its West Shenzhen Port Zone, and Columbo International Container Terminals and Hambantota Port International Group in Sri Lanka with the construction of channels and infrastructure, integrated operations, and the development of Mawan Smart Port.



Fellow China operator, **COSCO SHIPPING Ports** pursued a lean operations strategy in 2020 and increased throughput by 3.5% to 32.7 million TEU. The operator is also continuing to expand its global terminal portfolio, focusing on project development and overseas investment. Digitalisation is a target here, with goals of enhancing asset quality and efficiency, maintaining cost control, and strengthening marketing capabilities.

Singapore' s PSA, meanwhile, handled 86.6 million TEU in 2020 at its ports around the world with its flagship Singapore terminal contributing 36.6 million TEU to that total. In 2021, PSA plans to continue its investments into solutions "to improve supply chain transparency and to create possibilities for smarter resource efficiencies", according to Tan Chong Meng, group CEO. PSA is also investing in alliances, with a joint venture agreed with HMM to offer long-term hubbing certainty to HMM' s fleet in Singapore.

Hong Kong has been working through its Hong Kong Seaport Alliance (HKSA) on a plan to improve its competitiveness. Towards the end of 2020, HKSA agreed to a series of commitments to maintain a fair level of competition in the Port of Hong Kong. These include a commitment to cap charges for services to shipping lines, specifically for gateway cargo transported between the port and the hinterland, which will also apply to inter-terminal trucking services. HKSA will also maintain a minimum service level for gateway cargo and extend the price cap to non-liner customers, such as exporters and truckers. Hong Kong handled 18 million TEU in 2020, down 1.8% from 2019.

In Europe, the UK's **Port of London Authority (PLA)** is focused on zero carbon with the authority making a commitment in 2020 to more than halve its carbon emissions within five years and deliver net zero by 2040 or earlier. Working towards these aims, the PLA launched a Thames Green Scheme accreditation project in 2020, recognising vessel owners' efforts to protect the environment. The initiative aims to help operators on the river in their work to improve their vessels' green performance. Further, the PLA in investing in greening its own vessel fleet through the adoption of biofuel across the fleet, and – over the next four years – replacing two vessels with low emission alternatives. The authority also plans to switch its road vehicles to electric and all pilot taxis will be lower emission vehicles. A successful trial using biofuel on one of the PLA river patrol vessels started in late 2020.

Rotterdam is firmly backing sustainability through several projects and partnerships. Hydrogen is one focus area: The port has partnered with German steel companies to investigate setting up international supply chains for hydrogen. Rotterdam is also investigating the import of hydrogen from other countries and regions and has partnered with Uniper to investigate the possibilities of large-scale production of green hydrogen at its Maasvlakte area. Carbon capture and storage is another green project forging ahead in Rotterdam. The port is one of the organisations behind the Porthos initiative, a project for storing industry-generated CO2 under the North Sea. The project is on schedule to store 2.5 million tonnes of CO2 annually from the industry in empty gas fields beneath the North Sea from 2024. The port is also homing in on shore power to plug vessels into the electric grid while at berth, working with the City of Rotterdam on the joint rollout of shore-based power for sea-going vessels in the port.

In Germany, **Hamburg Port Authority (HPA)** and companies within the port made use of the unusual operating environment of 2020 to expand and modernise infrastructure and handling facilities and to equip them with the latest technology. For example, terminal operators HHLA and EUROGATE both invested in additional container gantry cranes for their Waltershof handling facilities. A significant bright spot for Hamburg in early 2021 was the completion

of dredging works for the fairway adjustment of the River Elbe. The Elbe fairway has been widened to 385 metres along an 8-kilometre stretch between Wedel and Blankenese with the construction of a passing box also completed. Now, seagoing ships with a combined width of 104 metres – instead of the former 90 metres – can safely pass each other. Ultra large container carriers also gain extra draft of up to 90 centimetres with further increases expected in 2021.

Greece's **Port of Piraeus** saw a decline in demand for its container services in 2020 with its three container piers combined handling a total of 5.4 million TEU, down 3.8% from 2019. However, it is strengthening its equipment and hardstanding to meet future demand. It has signed a supply contract for five electric stacking cranes for Pier I of its container terminal, has agreed the supply and installation of one new super post panamax crane for loading and discharging containers, and is investing in the repair of pavements and rails for its existing rail-mounted gantry cranes. The investments will increase the capacity of Pier I by 30% to 1.3 million TEU/year.

Elsewhere in the world, Dubai-based **DP World** maintained volumes in 2020, reporting 71.2 million TEU for its terminals around the globe, up 0.2% on a like-for-like basis. In 2020, DP World de-listed its equity from the stock exchange and returned to private ownership. It plans to continue to be selective on new investments and focus on the integration of recent acquisitions to drive synergies and protect profitability. It celebrated the breaking of ground at the end of 2020 for a $40 million project to construct a world-class petrochemical terminal in its Jebel Ali Port. AquaChemie Middle East will build a state-of-the-art specialised bulk storage terminal with a planned total capacity of around 40,000 cubic metres. Construction is planned to be completed by the second quarter of 2022.

Meanwhile in the US, the Port of **New York/ New Jersey** is continuing with its $20 billion Port Wharf Replacement Program, replacing mission-critical, timber-supported wharf structures vital to marine cargo activities at five port facilities. The programme' s goal is to complete the replacement of the majority of the wharfs by 2050.

Keeping ports operational during the pandemic

By Victor Shieh, Communications Director at International Association of Ports & Harbors

In March 2020, the International Association of Ports and Harbours (IAPH) set up a COVID-19 Task Force to monitor the impacts and facilitate information exchange between ports in dealing with COVID-19. It consisted of experts from port authorities from the world' s five main continents, including Chinese and South Korean ports first impacted by the pandemic. The aim was to share best practices to support ports in dealing with the same challenges in their own environment as the pandemic became global.

The IAPH COVID-19 task force took the initiative to launch an IAPH-World Port Sustainability Program (WPSP) Port Economic Impact Barometer to gather information on the short-term impacts of COVID-19 on ports in terms of number of vessel calls, impact on hinterland transport for cargo, capacity utilisation of storage areas in and around ports and the impact on port personnel availability.

As a result, 17 Barometer reports have been prepared by two prominent port economists from the IAPH COVID-19 taskforce, professors Theo Notteboom and Thanos Pallis of the universities of Ghent (Belgium) and the Aegean (Greece) respectively. These were based on a consistent, representative survey of the world' s ports, which averaged around 73 ports per survey from around the world between April 2020 and April 2021. Respondents from Europe and the Americas made up the majority, with a smaller percentage of Asian and African ports, and occasional contributions from Southern Asian and Middle Eastern ports.

The percentages indicated in the blue bars of the IAPH Barometer Dashboard highlight the level of impact of the COVID-19 contagion on world ports based on responses to identical questions in the survey, subdivided into relevant categories. These were vessel calls, vessel restrictions and delays from new port call procedures, intermodal availability, cargo storage capacity, and port worker availability.

During the first phase in early 2020, a supply shock in China occurred where lockdown measures sharply decreased Chinese production during the Chinese New Year period, curtailing the industrial base between mid-January and early March 2020. Ports in the Far East saw a drastic reduction in export cargo with the rest of the world yet to feel the impact of the pandemic.

The second phase began in mid-March 2020 with a global demand shock. Lockdown and semi-lockdown measures resulted in a decline in global derived demand, suspension of travel, tourism, entertainment, hospitality and retail activity. Consumption patterns shifted to essential goods such as food, medical supplies and personal items.

As indicated in the Dashboard as of early April 2020, vessel calls drastically fell, depending on vessel type. Vessel restrictions and delays at berth increased, especially for cruise and passenger vessels, as extra procedures were introduced at the ship-shore interface.

Closures in cross-border trade as well as hinterland transport delays brought with it stockpiling in warehousing and storage facilities in ports, with notable increases in storage of liquid bulk and chemicals which spilled over from land to floating storage as demand for energy and fuel collapsed. Ports continued to operate, albeit with reduced staff at the quayside and in the office. This was achieved by adapting shift systems, number and composition of gangs and remote working, in some cases with split office locations.

In the third phase, many regions worldwide started to relax the Covid-19 measures, with most economic sectors resuming activity. However, deferred demand levels remained uncertain with new waves of the pandemic re-emerging or intensifying in countries resulting in new forms of restrictions on economic and social life, which by now impacted ports very differently depending on the region of the world.

Since the summer of 2020, container demand from Asia to the rest of the world has surged as a result of restocking and strong sales of durable goods such as office equipment, furniture, and electronic devices. Worldwide container equipment imbalances and capacity shortages have resulted in congestion at many of the larger ports, with a noticeable increase in warehousing and berth storage usage, and the re-emergence of delays in onward hinterland transportation of cargoes. Cruise and passenger activity remains muted, with some activity mainly on a local level and with new health and safety measures.

The world economy has yet to reach a consistent recovery and a return to normal demand patterns. In the meantime, the IAPH surveys and report confirm that overall, ports have maintained operations during the pandemic and kept world trade flowing despite operational, financial and commercial challenges faced during the pandemic.

		Week 15 April 06	Week 16 April 13	Week 17 April 20	Week 18 April 27	Week 19 May 05	Week 20 May 12	Week 21 May 19	Week 23 June 02	Week 25 June 16
Ports with decline in vessel calls (last week compared to normal conditions, %)	Container vessels	41%	41%	53%	39%	45%	43%	53%	45%	48%
	Other cargo vessels	41%	39%	47%	44%	42%	46%	51%	42%	33%
	Passenger vessels	77%	77%	76%	71%	85%	68%	73%	74%	78%
Ports with extra restrictions on vessels (last week, %)	Container vessels	49%	22%	33%	20%	19%	10%	7%		
	Other cargo vessels	47%	23%	34%	25%	20%	6%	12%		
	Passenger vessels	51%	38%	31%	26%	25%	17%	16%		
Port call delays due to extra procedures (last week, %)	Container vessels	42%	35%	33%	27%	27%	18%	17%		
	Other cargo vessels	35%	28%	32%	30%	25%	20%	19%		
	Passenger vessels	53%	40%	49%	44%	34%	30%	32%		
	Inland barges	27%	21%	19%	21%	16%	8%	19%		
Ports facing hinterland transport delays (last week compared to normal conditions, %)	Trucks (cross-border)	43%	41%	35%	37%	38%	26%	28%	23%	28%
	Trucks (in/out port)	37%	33%	35%	35%	16%	15%	23%	8%	11%
	Rail services	28%	21%	35%	13%	22%	17%	19%	14%	13%
	Inland barge services	41%	23%	35%	21%	19%	21%	20%	20%	18%
Ports facing high capacity utilization of warehousing and storage facilities (last week, %)	Foodstuff & medical supplies	35%	34%	33%	25%	25%	20%	14%	16%	8%
	Consumer products	27%	28%	25%	18%	19%	9%	12%	13%	10%
	Liquid bulk	21%	22%	20%	15%	20%	17%	13%	17%	16%
	Dry bulk	16%	17%	13%	12%	17%	13%	10%	9%	18%
Ports facing shortages in port-related workers (last week, %)	Dock workers	16%	16%	16%	22%	19%	17%	16%	13%	13%
	Technical-nautical services	7%	9%	4%	12%	11%	6%	8%	7%	7%
	Harbour master services	4%	8%	7%	10%	4%	8%	10%	5%	4%
	Port authority	28%	22%	22%	26%	16%	22%	12%	12%	21%
	Truck drivers	no data	no data	21%	16%	12%	9%	11%	10%	3%

IAPH WPSP

Ports: Innovation as far as the eye can see

Global ports in the 2021 Xinhua/Baltic ranking are no strangers to technology. While smaller and less developed ports may be still on the starting block when it comes to making digital moves, international operators and ports in the top ten maritime centres have reached a sprint.

A spokesperson for PSA explains that the explosion of data science, the Internet of Things, predictive technologies and artificial intelligence mean that automation and digitalisation will be key elements of the maritime industry for years to come.

"Automation in port operations enables us to stay competitive and improve operational efficiency, and business process automation allows us to have greater insights to analyse big data for optimal decision-making."

PSA is developing innovative cargo solutions through CALISTA (Cargo Logistics, Inventory Streamlining & Trade Aggregation), a global supply chain digital platform that brings together the key physical, regulatory and financial activities of cargo logistics on a digital ecosystem. Its next generation port at Tuas will see automation innovations and smart technologies deployed on an unprecedented scale, to deliver class-leading levels of service and cement Singapore' s position as a premier transhipment hub.

PSA has also partnered with the Container Depot and Logistics Association (Singapore) (CDAS) to launch SmartBooking, an integrated one-stop booking platform for container depots, terminals, hauliers and logistics facilities across Singapore. Further, PSA, with advisory input from CDAS, has introduced 'iBOX' (Intelligent Box Operation eXchange), a"next-generation" depot management solution that digitally connects the port with container depots across Singapore.

Shanghai is also actively looking to harness technology to further improve its offering. In September 2020, Shanghai International Port Group (SIPG) launched a Yangtze River Port and Shipping Blockchain Integrated Service Platform to propel fresh trade and logistics growth along the Yangtze River Economic Belt. The platform will enable real-time tracking across the logistical chain. SIPG has partnered with Ant Group, a major Chinese financial services and technology provider, to further investigate blockchain technologies, jointly researching and advancing applications and innovations of blockchain in the port-shipping ecosystem.

In China, China Merchants Port Holdings (CMPort) has pushed forward with the construction of intelligent ports and the building of a port ecosystem. The first berth of its Mawan Smart Port construction project

was completed in 2020, delivering on a project that "embodied smart technology, as well as social and economic benefits", according to the Group. The smart port incorporates nine major intelligent elements: CMCore, CM ePort, artificial intelligence, 5G, Beidou high precision positioning system, automation, intelligent customs, blockchain, and green and low-carbon development. CMPort has also partnered with technology companies Tencent and Alibaba to explore the establishment of an open platform for intelligent ports.

COSCO SHIPPING Ports, meanwhile, has moved from the experimental to the implementation phase of its 5G Smart Ports project with a successful trail of automated, driverless trucks delivering and collecting containers at its Xiamen Ocean Gate Terminal.

In Europe, Rotterdam pivoted quickly when the Ever Given blockage of the Suez Canal disrupted hundreds of shipping schedules. The port authority, its subsidiary PortBase and five deep sea terminals developed a unique real-time digital overview of arrival times to provide transporters, shippers and other parties with real-time information. It has a goal to be the smartest port in the world and drafted an integrated digital strategy in 2020 covering three key areas: digitalisation at the port authority, digitalisation of port development and management, and commercial digital strategy.

Piraeus in Greece, meanwhile, has invested in end-to-end digitisation and optimisation of its car terminal to expand the strategic importance of its port within the international vehicle trade.

Dubai-based DP World is surging ahead with innovation projects on several fronts. It has entered into an agreement to equip its Jebel Ali Port with a fleet of autonomous internal terminal vehicles, launched a Digital Freight Alliance - a connected ecosystem of platforms to increase the efficiency, visibility and the resilience of global supply chains, is an investor in cutting-edge hyperloop technology to rapidly transport goods and passengers, and has joined TradeLens, a blockchain-based digital container logistics platform jointly developed by A.P. Moller - Maersk and IBM.

DP World has also completed assembly of the world' s first container High Bay Store system at Jebel Ali Port, an automated container handling system that stacks containers up to eleven storeys high and delivers more than three times the capacity of a conventional yard with enhanced performance.

Keep a weather eye on cyber threats

With increased digitalisation comes increased cyber threats. Cybersecurity consultancy Naval Dome reported a 400 percent increase in attempted attacks on maritime companies from February to June in 2020. This was due to an increase in malware, ransomware and phishing emails as the pandemic took hold globally, and simultaneously weakened cyber defences as recessions hit and spending cuts were enforced. There was the additional problem of equipment technicians being unable to travel to service systems, leading to "remote" service calls that required the operator to bypass security protections – and in doing so, creating an opening for a cyberattack.

Ports were already the target of hackers before the pandemic: Barcelona and San Diego were the victims of ransomware attacks in 2019; in May 2020, Shahid Rajaee port terminal in Iran came to an abrupt halt when a hacker took the port' s computers offline; then late in 2020, the Port of Kennewick in the US was forced to rebuild the port' s digital files from offline backups after being struck by ransomware.

PSA said that it recognises and embraces the need for greater and more efficient cyber resilience as part of its digitalisation efforts. It relies on a cyber resilience framework aligned with the National Institute of Standards and Technology (NIST) framework to identify, protect, detect, respond and recover from cyber security incidents. PSA says that the framework helps it to manage and mitigate cyber risks and greatly enhances its overall business continuity.

Jens Meier, International Association of Ports and Harbors (IAPH) Vice President for the European Region and CEO of Hamburg Port Authority (HPA), agrees that to take full advantage of the opportunities offered by digitalisation, ports must manage the cyber-risks involved and ensure digital trust. "Protection" he said, "starts with people".

"Regardless of the methods of attack – e-mail, cloud applications, web, or social media – attackers are increasingly taking advantage of the human factor. That' s why the approach to cybersecurity should be centred around people."

Global terminal investment trends

By Zhang Jianan, Research and Consulting Centre, China COSCO Shipping Group

Impacted by a slow global economic recovery, rising trade protectionism and COVID-19, the global industrial chain is undergoing deep adjustments.

The port industry has experienced its worst decline since 2009. In 2020, global throughput dropped by 2.13% year-on-year, essentially returning to 2018 levels 2018. The utilisation rate of global terminals cannot return to the level of 2019 in the short term. This has also led to a slowdown in the growth of the global terminal investment. Many port expansion projects under construction have been required to delay delivery. Projects that have not signed construction contracts and equipment orders are facing termination, and some terminal operators have even begun to sell port assets. According to maritime consultant Drewry, the expansion rate of global container ports will drop by 40% in the next five years, and global terminal investment will show the following five trends.

First, investment is treated more cautiously, and the growth rate will slow down.

Currently, global terminal operators are cautious about port placement and are selective in making new investments. However, emerging markets are still the focus of investment, and two-thirds of the projects of global terminal operators are in these markets. With the Sino-US trade friction and the accelerated acceptance of manufacturing plants in Southeast Asia, major nodes in Southeast Asia, South Asia, Africa, and the Americas have become key investment areas, especially gateway ports in emerging markets which enjoy a certain monopoly. Additionally, increasing trade protectionism has continuously strengthened regional economic and trade represented by RECP, CPTPP, etc. Regional ports will grow better than trunk ports; those in developing economies and along the “Belt and Road” will continue to receive attention. On the other hand, in the past few years, major terminal operators around the world have occasionally sold terminal assets, converted shares, and increased partners. In the future, global terminal operators may present a round of “mergers and exits”.

Second, investment entities are diversified, and the market share of traditional terminal operators has shrunk.

The world’ s top five global terminal operators account for more than 30% of the global port market, but since 2019, the market share of PSA, Hutchison Whampoa, DP World and other operators has gradually been decreased. Only two operators, namely, China COSCO Shipping and Maersk Terminals

have continued to increase their market share with a background as international liner companies. The share of investment entities with a background in national government operations is also gradually increasing. For example, Shanghai SIPG has accelerated its overseas terminal investments in the past two years, and its Israel Haifa project has become a landmark project along the "Belt and Road".

Thirdly, the investment strategy is based on supply chains, with terminal extension services becoming a core source of competitiveness.

In recent years, terminal investment has not only been confined to the terminal itself, but extends to supply chain strategy. Terminal operators and port authorities are seeking investment opportunities in the broader supply chain and investing in the depth of port services. Improving logistics facilities, enhancing the accessibility of port logistics, and providing personalised, one-stop integrated services have become the focus of investment. These improvements are the main strategy and focus for terminal operators, allowing them to enhance their bargaining power, improve their competitiveness and build new sources of profit.

Fourth, digitalisation and smart ports are core elements of investment.

Whether it is incremental investment or upgrading, digitalisation, automation and intellectualisation have become the focus of terminal investment, with the number of automated terminals growing. On one hand, the port needs to achieve lean management goals of reducing costs, improving efficiency and improving services through digital strategy. On the other hand, the entire industry needs to be connected with the rapidly developing digital economy to realise the deep integration of the port industry with the global logistics supply chain and global industrial chain.

Fifth, geopolitics, environmental protection and other issues increase investment risks.

This year, the Palestine-Israel conflict and the continuing pandemic have once again proved that COVID-19, competition between major powers and climate change are still important variables affecting global politics and the economy, as well as global multinational investment. In 2020, foreign direct investment fell by 42% year-on-year and is expected to recover this year. However, terminal investments that are high in investment costs, long in construction periods, and heavily affected by local conditions are still facing problems such as increased costs and greater risks.

Growing pressure on shipping to decarbonise

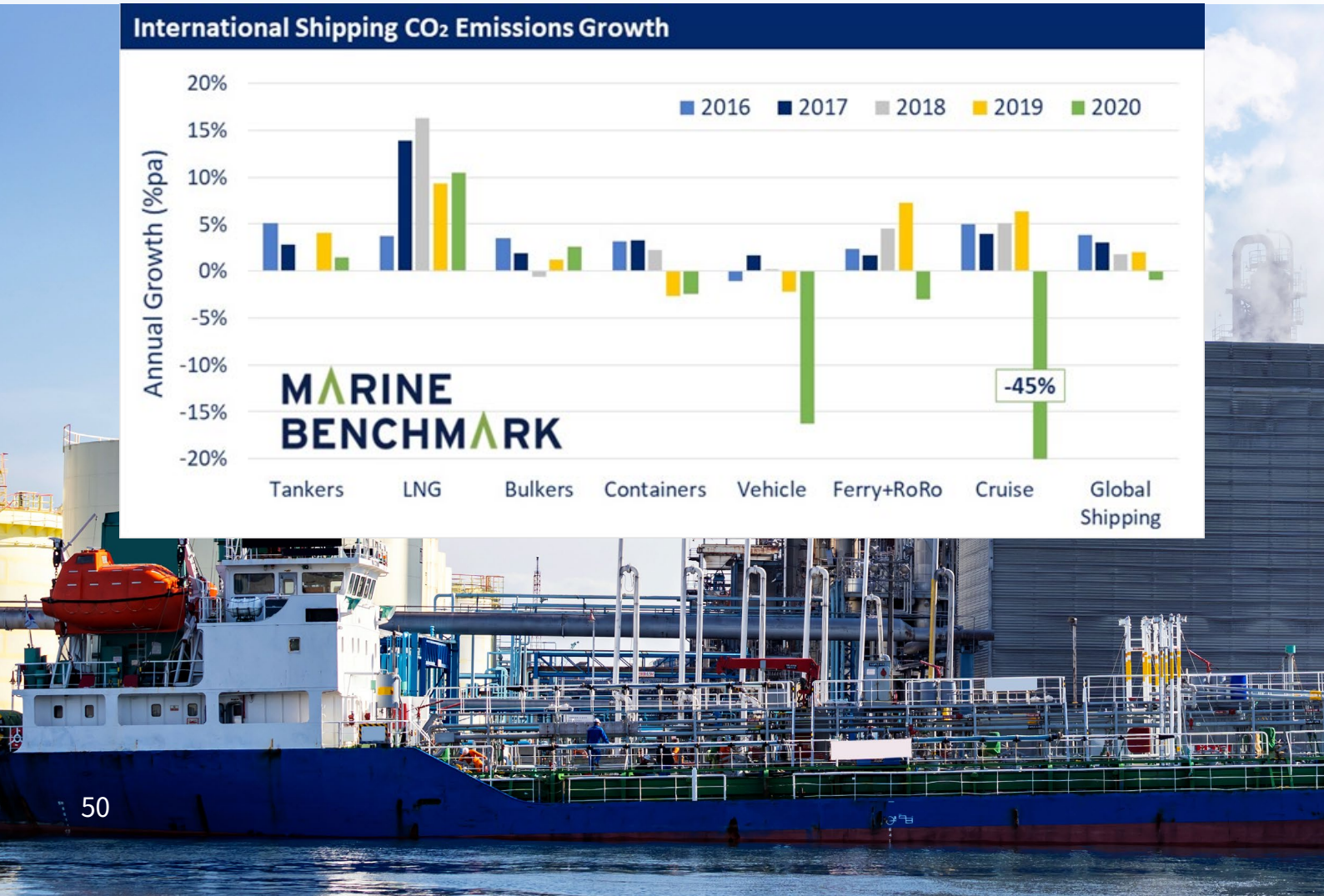
The highly carbon intensive shipping industry is under more pressure than ever before to clean up its act and achieve a significant reduction in its CO2 emissions.

Global shipping accounts for around 3% of global carbon emissions, a share that is likely to increase as other industries tackle climate emissions in the coming decades. The International Maritime Organization (IMO), a specialised agency of the United Nations responsible for regulating shipping, has already set a target to reduce shipping' s total annual greenhouse gas emissions by at least 50% from 2008 levels by 2050. The question is how to reach this target.

Despite significant improvements in the past decade to the design, management and operation of ships having led to a reduction of the carbon footprint of the average ship, overall fleet growth has negated these gains. Between 2011 and 2019, Swedish maritime data provider Marine Benchmark says that international Automatic Identification Signal (AIS)-tracked maritime CO2 emissions rose at an average annual rate of 2.1% to reach approximately 800mt CO2 annually as the fleet grew to meet global trade demands.

The good news is that in 2020 global shipping CO2 emissions were estimated to have decreased by 1% on the previous year. But the bad news is that was probably a temporary blip caused by the curtailment of some types of shipping during the COVID-19 pandemic.

In 2020 many cruise ships and offshore support vessels went into lay-up, whilst steep declines in activity were seen by ro-ro' s, vehicle carriers and passenger ferries. Emissions from the cruise sector were down 45%. However, emissions from tankers, bulk carriers and container ships which collectively account for around 82% of international shipping C02 releases, grew by 1.2%.



With shipping activity already showing signs of an increase in 2021, the trend of continued rises in absolute emissions from the sector will continue until new fuel types are adopted, commercially viable technologies rolled out and new vessels ordered.

The shipping industry itself has proposed that its carbon emissions are taxed to fund the huge technical leap that is needed.

The International Chamber of Shipping, with the backing from the shipowner' s organisation Bimco, Cruise Lines International Association and the World Shipping Council, which collectively represent around 90% of the global merchant fleet, announced that it wants to see a price of $2 per tonne put on the carbon which the shipping industry emits. But this is dwarfed by a proposal put forward by Trafigura, one of the world' s largest ship charterers, which says that a levy of between $250 and $300 per tonne of CO2 from shipping fuels is needed to make progress towards a carbon free shipping industry.

So called "Market Based Measures" (MBMs) are intended to facilitate the adoption of zero-carbon technologies and ships. By putting a price on CO2 emissions the maritime sector is given an economic incentive to reduce its emissions by narrowing the price gap between fossil fuels and zero-carbon fuels.

But the decision on how to regulate the changes needed to reduce shipping' s environmental impact rests with the IMO as well as regional and national governments.

The shipping industry, which prefers a level playing field and international regulation, is facing a significant challenge in the form of regional legislation from the European Commission. The Commission is proposing extending the European Union's Emissions Trading System to encompass international shipping, including foreign ships calling at EU ports. Critics say that this unilateral approach will undermine global negotiations at the IMO and are in effect a tax on foreign trade. Non-EU ships trading with Europe would have to purchase allowances for carbon dioxide emissions throughout the ships' voyage.

But it is not just governments which are putting pressure on shipping to reduce its emissions, but its customers and financiers who are looking for verifiable reductions today. To achieve this, a standard, transparent and consistent approach to emissions tracking is needed. In 2020, a group of some of the world' s largest energy, agriculture, mining, and commodity trading companies agreed to assess and disclose the environmental impact of their shipping activities through the Sea Cargo Charter.

A similar approach is taken by some of the leading financiers to the shipping sector through the Poseidon Principles. Representing around one third of global lending or over $150bn in loans to shipowners, the first 15 signatories to the Principles are now disclosing the climate alignment score of their ship finance portfolios. However, the 2020 Poseidon Principles Annual Disclosure Report showed that only three of the banks' ship finance portfolios were aligned with the IMO' s decarbonisation targets. There is clearly some way to go.

The problem confronting shipowners is the potential of stranded assets. Will an eco-spec vessel ordered today be able to trade in ten or even five years' time? A combination of major uncertainties over the outlook for world trade, the environmental regulatory environment and as to which vessel designs and propulsion technologies will emerge, means that many have put the brakes on ordering newbuilds. The orderbook is currently at a historical low as a percentage of the trading fleet. In 2020, according to Clarksons Research, the average age of a vessel greater than 2000 GT was 14.3 years and for vessels below 2000 GT it has now reached 27.5 years meaning that the world' s ageing ships will struggle to deliver efficiency gains.

In the absence of immediate large-scale carbon free propulsion options for shipping, some shipowners and charterers are turning to carbon offsetting schemes to reduce their impact on the planet. This involves the purchase of carbon credits in the voluntary market which are then used to support natural offsets such as tree planting or provide the financial support needed for the development of new fuels and technologies.

Several leading shipbrokers have set up carbon trading services for their clients and are reporting an increasing take-up of the service.

LPG ship operator Navigator Gas is an example of one such company. In February 2021, the company reported that it had offset the 1068 tonnes of carbon generated by a voyage of one of its handysize vessels across the Atlantic Ocean by supporting a renewable energy project in the Philippines. A number of other firms including Pantheon Tankers, Reliance Industries and Pacific Basin have also reported using similar schemes in recent months.

The direction of travel for the shipping industry is clear. The question is how exactly it will arrive at its destination.

Fundamentals of marine insurance remain strong within a changing environment

By Lars Lange, Secretary General, International Union of Marine Insurance (IUMI)

Shipping moves around 80% of global trade and so the prognosis for the health of marine insurance remains strong. The global fleet will continue to grow in line with trade predictions and ships and their cargoes will always need to be insured. But the risk profile is changing and underwriters are adapting accordingly.

Stable premium base

The global premium base – the total amount of marine insurance premiums paid to hull, cargo and offshore energy underwriters in a given year – is a key indicator which IUMI publishes each year. In 2019 (the most recent year), global premiums were recorded at US$28.7 billion which was roughly comparable with the 2018 number.

Global fleet growth is currently around 3% annually but global hull premiums have stagnated over the past two or three years at around US$6.9 billion. This has created a wide and growing gap between the amount of premium collected and the number of vessels afloat. As a result, the premium per ship is reducing (as a global average) and this impacts negatively on underwriting profitability and the ability to cover large losses which, fortunately, are at an all-time low.

The marine cargo sector has fared slightly better and global premiums were relatively stable at around US$15.6 billion.

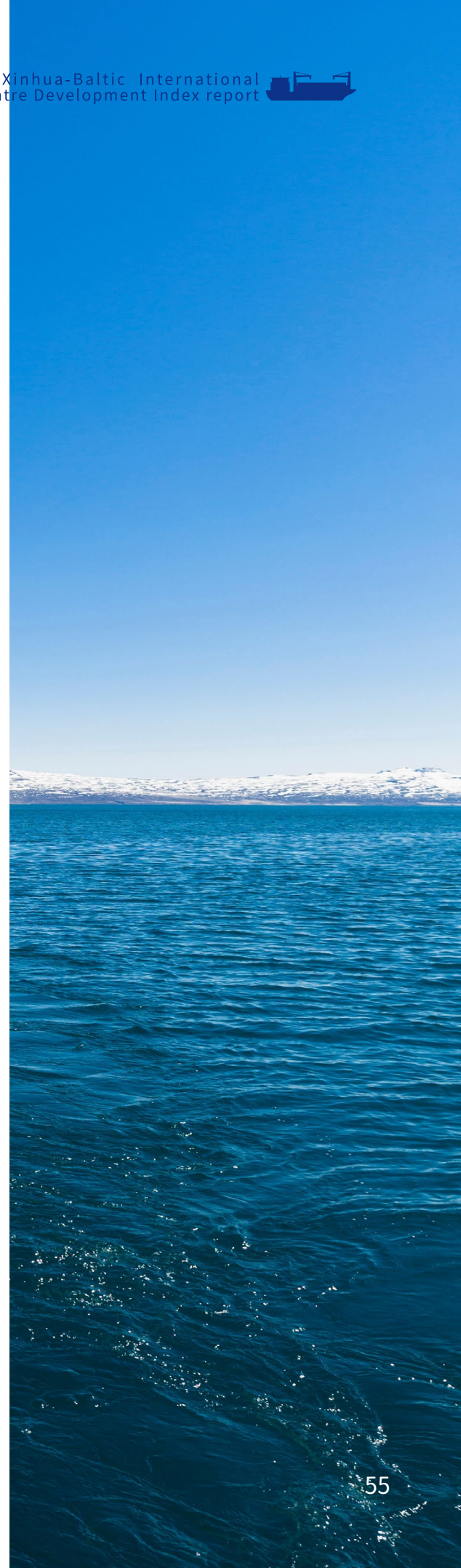
Sadly, the offshore energy market continues to be depressed largely due to the collapse of the oil price. Many billions of dollars have been wiped from the global premium base in recent years but, thankfully, 2019 saw only a 1.4% reduction. Fortunately, losses in this arena have been modest but it will only take a single and aggressive hurricane season to eclipse the entire earnings.

Reversal of fortunes

More positively, the fortunes of marine insurance are beginning to turn, albeit from a low base. There are encouraging signs that all insurance lines are set for a more positive future as a market recovery is now firmly underway. But there are a number of global issues that underwriters will continue to face.

Global challenges

The obvious challenger is COVID-19. With at least one billion tonnes of trade wiped from the books during the first half of last year, the direct impact on marine cargo insurance needs no explanation. Early on, supply chains were severely disrupted and the average weekly mileage for the global fleet took a sharp downwards dip - particularly for container and passenger vessels. But unlike the financial crisis in 2008, recovery from the current pandemic has been consumer led and, thankfully, vessel mileage has returned to more normal levels, with the exception of passenger shipping. In general, marine insurance covers physical damage to vessels and their cargoes and so COVID-19 isn' t impacting too heavily on the overall claims profile.
Environmental, Social and Governance (ESG) issues are likely to make themselves known in three ways. Climate change and the related rise in sea levels will impact the frequency and severity of claims. The evolution of the transport assets insured and changes to the cargoes protected will also be significant and underwriters are already seeing the impact as the industry adopts low sulphur fuels. And third is the sustainability of the assureds themselves and the industries in which they operate. It is becoming increasingly clear that some industries will have the opportunity to grow and develop while others will shrink as the world moves to a more sustainable footing.
Underwriters will need to embrace the oncoming wave of digitalisation which has the potential to transform how the insurance sector operates as a whole. Advances in data management and analysis will enable more informed decision making and risk profiling. And technology will drive efficiencies throughout the market. COVID-19 is already forcing the pace of change which much more on-line placing of business being seen. With digitalisation set to grow across the entire maritime industry, the corollary of cyber-threat, cyber-security and cyber-insurance must not be forgotten.
Another growing concern is the increasing accumulation of risk. Economies of scale have encouraged shipping companies to build ever larger vessels to move cargoes more efficiently and cheaply. The newbuild cost of a 24,000 TEU Ultra Large Container Vessel is around US$150 million. Add in 24,000 loaded boxes with a rough value of $50,000 each and the total value of hull and cargo could easily approach US$1 billion. Modern container ports operate multiple terminals and each is capable of berthing multiple vessels – all carrying many thousands of boxes. Add this to the containers waiting in the stack or stored in adjacent warehouse facilities and the insured values skyrocket. A single incident in this context has the potential to become an unprecedented insurance loss.



Adapt to survive

The past few years have been tough for marine underwriters but the core of the business has remained intact and the need for asset owners to place insurance will not go away. But the maritime industry itself will change as new technologies, new assets, new cargo types and new trading patterns are introduced. And the way insurance is broked and underwritten will also adapt to take advantage of digitalisation and the efficiencies it brings. Marine insurance has underpinned global trade for many centuries and its ability to adapt is the strength that will allow the sector to continue to deliver the products required in a changing maritime world.

The International Union of Marine Insurance (IUMI) represents 45 national and marine market insurance and reinsurance associations. Operating at the forefront of marine risk, it gives a unified voice to the global marine insurance market through effective representation and lobbying activities. As a forum for the exchange of ideas and best practice, IUMI works to raise standards across the industry and provides opportunities for education and the collection and publication of industry statistics. IUMI is headquartered in Hamburg and traces its roots back to 1874.

About IUMI

IUMI collects premium income data from all relevant marine insurance markets which are released as global market averages. The most recent data given in this article are from the 2019 underwriting year. 2019 numbers will be adjusted and 2020 numbers published in September 2021 at IUMI's annual conference which, this year, will be held online.

More information can be found at www.iumi.com

The new green financing revolution

By Campbell Houston, Research Analyst, Marine Money

In recent years, there has been a convergence of three factors which has led to the adoption of sustainability-linked financing by the shipping industry and the application of Environmental, Social, and Corporate Governance (ESG). The first major milestone came in April 2018 when the IMO adopted an initial strategy on the reduction of greenhouse gasses (GHG). The strategy called for international shipping to reduce its GHG emissions by at least 50% by 2050 when compared with 2008 levels.

The second milestone occurred at the June 2019 Marine Money Week in New York: the launch of the Poseidon Principles. The Principles were initially signed by eleven banks, representing over $100 million of shipping loans. Since the launch, this has grown to 26 signatories and the majority of the industry' s bank lending volume.

Third was the widespread embrace of ESG measurements by institutional investors. The result of this was that by 2019, according to one CFO of a publicly listed shipping company, every owner needed to have an ESG story if they wanted to continue to be able to access debt capital markets or syndicated loans.

In 2020, Marine Money tracked 10 sustainability-linked loans worth over $7,000 billion and accounting for over half of total loan volume. These loan facilities generally feature margins linked to key performance indicators (KPIs) which are aligned with the IMO targets or Poseidon Principles. While KPIs can vary, most centre on the reduction of CO2 emissions per mile per ton of cargo. Loans have been structured with margin decreases if KPIs are met, while others include margin step ups if KPIs are not met.

The adoption of green bonds has not been quite as rapid, though the market for them continues to grow. In 2020, just two out of the 36 bond offerings tracked by Marine Money were green. In the first quarter of 2021 alone however, three green bond offerings raised $654 million or 18% of the quarter' s total volume. Sustainability linked bonds include similar features as their loan brethren, particularly adjustable interest rates, however green bonds have the added possibility to link the redemption price to ESG KPIs.

Proceeds for green deals may also be linked to a wide array of environmental projects, including alternatively fuelled newbuildings, ballast water treatment, exhaust gas scrubbers, vessel efficiency improvements, and research and development programs. Understanding the impacts and validity of such projects, as well as the position of companies as a whole, has made ESG auditing and ratings a key component for many transactions. Companies such as DNV, Sustainalytics, Cicero and Kroll have quickly come into the industry or begun offering this service.

Green financing will soon not be an option for shipowners to choose, but rather a requirement for raising capital in any meaningful form. None of these changes are occurring in a vacuum, rather they are driven by individuals and institutions committed to seeing the shipping industry address climate change. Marine Money is proud to support the banks, owners, and institutions who embrace them.

Tech: Innovation wave breaks on shipping

The maritime startup ecosystem is awash with innovation, covering the full breadth of the industry. In its 2021 research on startups, London' s Startup Wharf, an independent global hub of startup-driven maritime innovation, calculated that there are already over 300 startups in the international maritime ecosystem. In 2019 the overall maritime tech sector was estimated to be worth US$106 billion, expected to rise to US$278bn by 2030 according to a report commissioned by Inmarsat (Trade 2.0: How Startups are driving the next generation of maritime trade).

While there may be many more touting themselves as maritime startups, Leonardo Zangrando, founder of Startup Wharf, said that many are out of scope or no more than an idea. Still, the 300-plus in existence give a flavour of the vast innovation potential of the maritime industry.

Singapore has proved itself a hotbed for maritime startups with East Pacific Techstars, PIER71, and a commitment from Motion Ventures and SEEDS Capital, the investment arm of Enterprise Singapore, to invest in maritime technology startups.

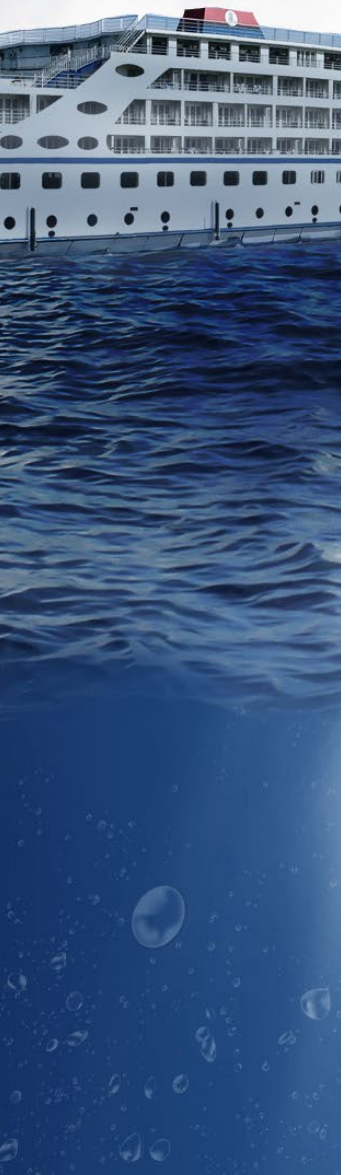
Singapore' s ambitions in the tech arena are great. Senior Minister of State for Transport, Chee Hong Tat, has said that the sovereign island city-state aims to more than triple the number of maritime tech start-ups supported under the PIER71 funding programme, from 30 to 100 by 2025.

"Our goal is to be the top maritime startup hub in the world, the Silicon Valley for maritime technology," he said.

PIER71, or Port Innovation Ecosystem Reimagined @ BLOCK71, was officially launched in June 2018, as a collaboration between the Maritime & Port Authority of Singapore and NUS Enterprise. PIER71 has a 200 m2 area co-working space at Launchpad @ BLOCK71 to accommodate up to 10 start-ups at any one time. The 2020 cohort for its Smart Port Challenge - a six-month programme - included startups that focus on underwater autonomous vessels, an efficiency enhancement and cleantech company helping operators of combustion engines to reduce primary fuel consumption, and a vision AI solution provider focused on safety, productivity and quality control.

East Pacific Techstars, a partnership between ship management company Eastern Pacific Shipping (EPS) and entrepreneur network Techstars, is a maritime tech startup accelerator based in EPS' headquarters in Singapore. Its class of 2020 included a robotics start-up building a cheap and effective autonomous hull cleaning solution for ocean-going vessels, a machine vision analytics tool to improve crew and vessel safety on board ocean-going vessels, a revolutionary way to conduct industrial inspections, and a blend of virtual, augmented and mixed reality to make training in heavy industries more effective, and cost and time efficient.

In Hong Kong, it is the Captain's Table, a Young Professionals in Shipping Network (HK) initiative, that steers maritime startups as a mini-accelerator and pitch competition for startups with solutions targeted at the maritime and logistics industries. Launched in 2019, the finalists for the 2020 round included a cybersecurity monitoring and analytics business focused on systems onboard vessels, a mooring management system that seeks to reduce the risk of mooring incidents through the use of data driven solutions, a solution that streamlines the crew change process and a tool to reduce the number of incidents on board by eliminating human error through the use of integrating remote surveillance and predictive analytics.



Athens, the world' s leading shipowning centre, is also emerging as an important tech-hub for maritime and beyond. Numerous tech startups are pushing forward digital transformation at traditional shipowning companies. Venture capital investment has grown by more than 20X in the last 10 years, whilst the Greek government is striving to attract talent to the country by reducing taxes by 50% for those decide to make the country a home base.

Signal Ventures, the investment and incubation unit of The Signal Group, founded by a prominent Greek ship owner is a good example of the cross-fertilisation underway. The company is building its own AI platform and an eco-system of innovative maritime startups. It has so far invested in companies involved with oil and dry bulk analytics, ship management and marine weather. Nikolas Pyrgiotis, Vice President of Technology Ventures, says that Athens is proving to be an exciting place for tech startups thanks to its "unique mix of deep shipping expertise, technically skilled workforce, capital and innovation."

However, tech incubators and accelerators, wherever they are based in the world, suffer from the same problem: staunch conservatism, making it difficult to penetrate with new ideas, technologies or working methods, says PortXL director Carolien Vat-Sandee. PortXL was founded in 2015 in Rotterdam, The Netherlands with the vision of cultivating a spirit of innovation within the global maritime industry. The mission is to innovate ports for sustainable growth. Each year, PortXL runs a three-month acceleration program for innovative start-ups and scale-ups.

"Accelerator programmes such as ours are here precisely to bridge the gap and make inroads into the industry, but it is still a David vs Goliath situation," said Ms Vat-Sandee.

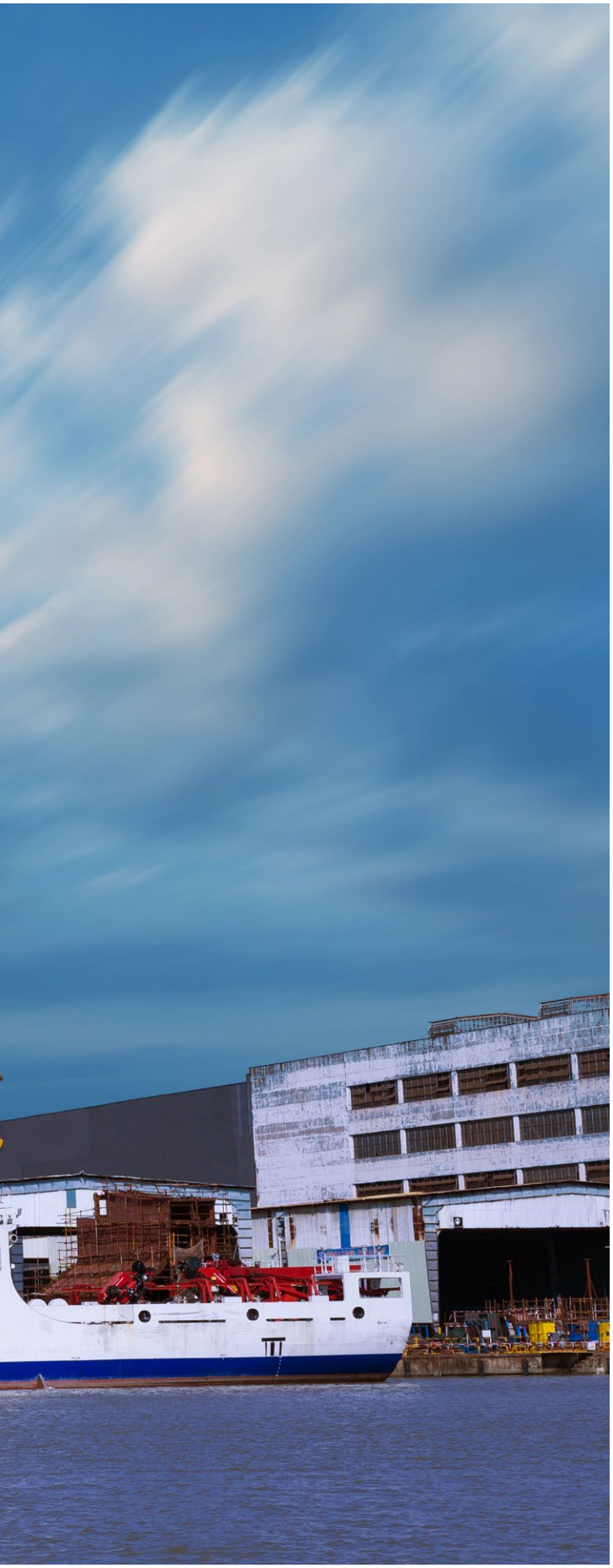
Startup Wharf's Zangrando agreed: "In the UK a problem for startups could be access to maritime clients interested and willing to trial new technologies." Startups need more access to final users like ship management companies, operating shipowners and ports, he added, but the industry is still too resistant to change and unwilling to invest in technological innovation, even if it has the promise of reduced costs, increased efficiency, and/or increased safety.

Vat-Sandee highlights two shipping tech solutions from its 2019 programme that particularly excited her. The first is sHYp BV, which introduced a revolutionary technology with the first electrolyser to use sea water to produce hydrogen.

"No desalination, no purification, no toxic waste—improvements over existing electrolysis technology to produce the pure water required by existing electrolysers and no toxic waste. Green hydrogen is a viable alternative to fossil fuels for shipping and heavy transport, which would go a long way towards reducing shipping' s emissions," Vat-Sandee said.

Second is Canadian scale-up Ionada which applies innovative technological solutions to clean exhaust gases to remove harmful emissions such as sulphur oxides, nitric oxides, particulate matter, and greenhouse gases including carbon dioxide. The startup' s membrane decarbonisation system combines proven chemical absorption processes with porous ceramic tube membranes to remove up to 99% of CO_2 from flue gas without creating a throwaway sludge product.

"Dry desulphurisation systems are carbon neutral with lower total carbon emissions than sea water exhaust gas cleaning systems and low sulphur distillate fuels. Such technologies are key while the energy transition is in progress," said Vat-Sandee.



Startup Wharf's Zangrando recently started collaborating with Lloyd's Register Safetytech Accelerator to improve safety and risk management through the use of digital technologies. According to Gartner, safety tech for safety-critical industries like maritime is expected to be worth around $250bn in 2023, compared to $25bn for traditional safety.

"Ships, as well as ports, are inherently dangerous operations and environments," said Zangrando. "Until recently, safety and risk have been managed with a preventive approach driven by compliance to rules and regulations. In spite of all our efforts to improve safety this way, improvements have stalled since 2012. Safety tech uses digital technologies such as IoT, sensors, connectivity and AI to manage safety proactively."

PortXL's Vat-Sandee expects tech related to fuel alternatives to become even more prominent in 2021 and beyond. "The energy transition is upon us, and many avenues are being explored,"she said. "Whoever wins the 'fuel race' by finding a sustainable solution that works well for shipping will be on the level of Tesla or Amazon as far as commercial success is concerned."

Another topic that she expects more tech to focus on is seafarers' mental health. While there are already initiatives and solutions–such as startup BigYellowFish's platform–that address mental health concerns and support seafarers through their voyages, tech is now looking at the next level.

"Mental health awareness is important, especially in a high-risk industry, where accidents can have wide consequences," she said. "80% of maritime accidents are due to human error; taking care of the human factor and their well-being pays dividends."

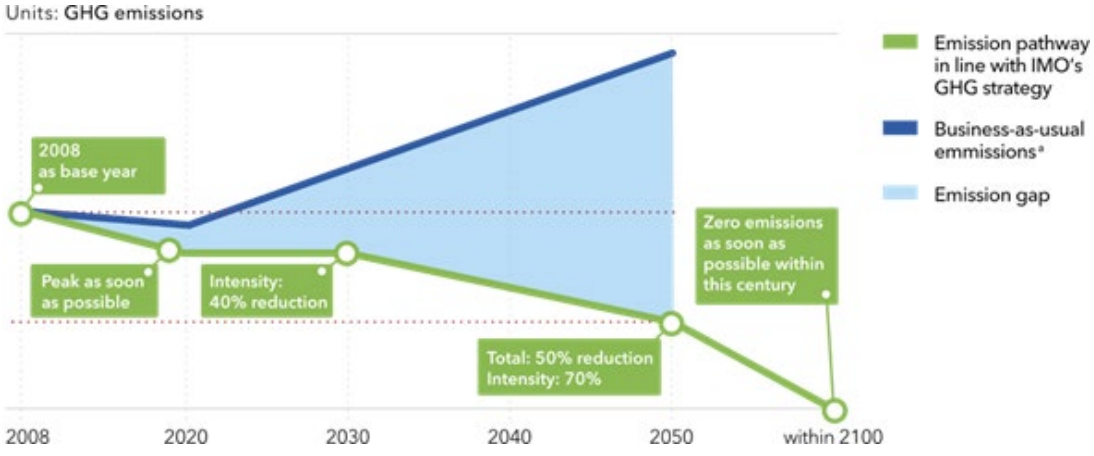
The international shipping markets-outlook mid-2021

Nigel Gardiner, Group Managing Director, Drewry Shipping Consultants Ltd May, 2021

COVID-19 is a major challenge to international shipping markets and it is helping to lay the groundwork for fundamental industry changes that will take place in a post COVID world. These changes are far reaching, with key themes being the decarbonisation of shipping, security of supply chains and increased digitisation/technology in an industry which has often been behind the technological curve.

Decarbonisation of shipping is now a central theme that will dominate for years to come. The International Maritime Organisation (IMO) has set clear targets for the international shipping industry to reduce greenhouse gas (GHG) emissions. Taking 2008 as its base, the IMO aims to reduce total GHG emissions from international shipping by at least 50% by 2050. Concurrently, it also wants to reduce the average carbon intensity (CO2 per tonne mile) by at least 40% by 2030 and by 70% before 2050. Tough targets by any standard for an industry that is not exactly well known for its environmental credentials.

IMO Emission Targets



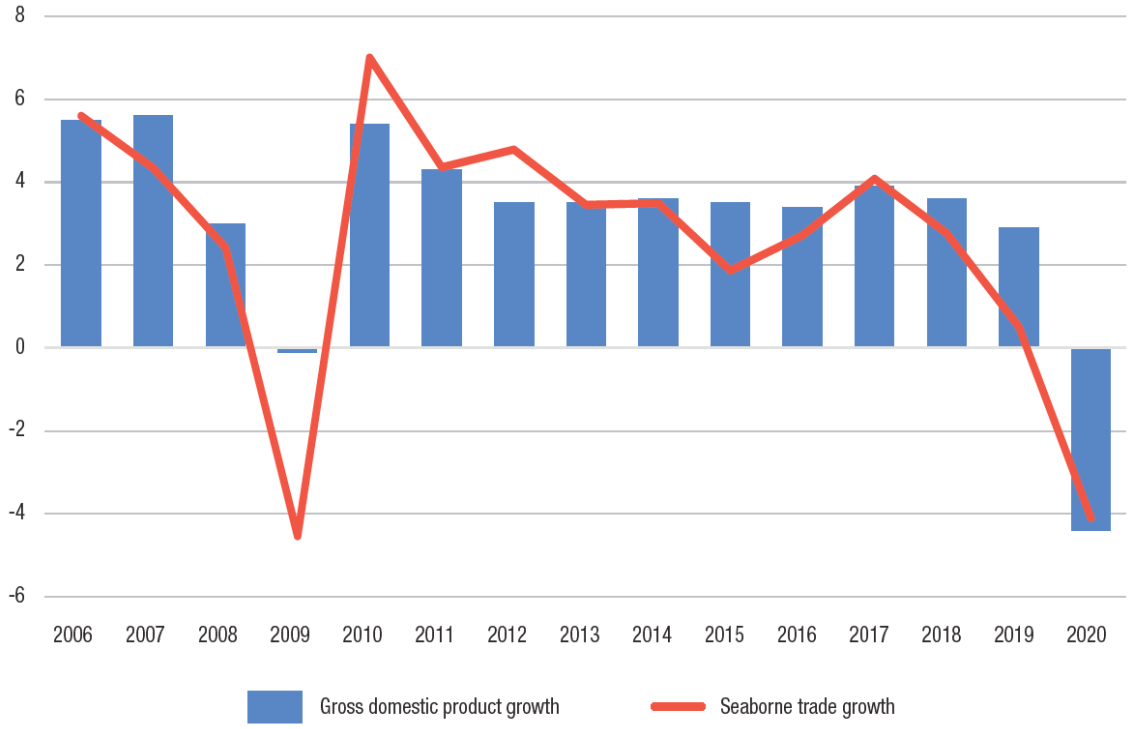
Without doubt decarbonisation targets pose a serious challenge to all stakeholders in the maritime supply chain and they will not be achieved without the application of new and alternative technologies. Besides new fuels for ship propulsion, changes in hull and propellor design, hull coatings and in improved voyage planning to achieve savings on fuel will be required. Quite possibly, we will also see acceptance of lower operating speeds.

As for supply chains, the pandemic has called into question the concept of globalisation. In the last year we have witnessed severe disruption to long supply chains and questions have been raised on the wisdom of sourcing from distant locations. Nearshoring and reshoring of manufacturing and the drive to shorten supply chains are now more relevant than ever, and in turn these developments will alter geographical patterns of trade and in some cases reduce average haul lengths.

The disruption to supply chains has also highlighted the need to increase digitalisation and in a manner that ensures that electronic documentation is seamless between all elements of the supply chain. Increased digitalisation is not, however, without risks and well publicised recent cases have shown how important the whole issue of cyber- security has become.

As for the immediate outlook for shipping markets UNCTAD has recently forecast that total global seaborne trade will rebound by 4.8% in 2021, after falling by over 4.0% in 2020, but much will depend on the pace of the pandemic and the strength of the world economy.

International Maritime Trade and Global GDP 2006–2020



Source: UNCTAD

In terms of the three main sectors – containers, oil tankers and dry bulk – this is how we see markets developing.

Containers

The container shipping market has never been so buoyant. Two sure indicators of the heat in the sector are the pace of new contracting and the rapid escalation in freight rates. The orderbook is now pushing 15% of the current fleet, while the massive hike in rates since the 2H20 was the consequence of temporary factors;

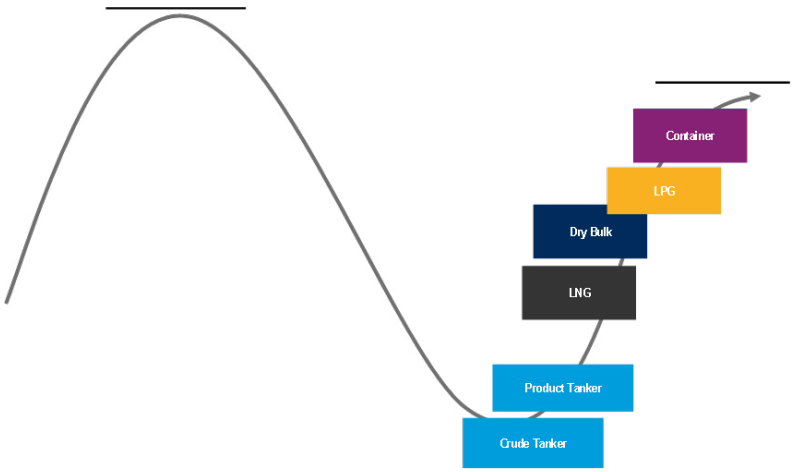
- A demand surge caused by a pandemic-driven shift in consumption habits towards goods;
- Supply chain disruption that reduced port productivity and restricted capacity from the market

The volume surge overwhelmed many ports and terminals and the industry is now caught in a vicious circle; more cargo rollovers lead to a build-up of empty containers in ports across import-dominant markets as well as knock-on shortages of containers in Asia, while shut-out boxes result in overfull yards and less efficient movement of boxes to/from the quay cranes, further reducing port productivity.

These things will pass but that said, in our view the next two years (2021-22) are likely to be very profitable for liner carriers. We expect world port handling to recover by +8.0% in 2021 as the global economy continues to rebound amid vaccine rollouts and large fiscal stimulus packages in place around the world. That said, port congestion and container equipment shortages are expected to remain an unwanted feature throughout the remainder of 2021. This will further restrict the amount of effective capacity available to the market and lead to substantially higher average spot and contract freight rates.

Drewry is now predicting that average global rates (spot + contract) will increase by approximately 22.0% in 2021. For 2022, while we foresee some erosion in freight rates, as carriers will lose the inflationary impact of port congestion and equipment shortages. The other point to note is that changes in the total box ship fleet now have much less sway on the market. Instead, its position has been usurped by port bottlenecks and congestion that, along with a strong recovery in demand are now the two main driving forces.

Sectors of Shipping – Now at Different Points in the Cycle



Source: Drewry

Oil Tankers

The IEA has recently revised its forecast for oil demand growth in 2021 upwards by 230,000 bpd to 5.7 million bpd. However, it still expects global oil demand to remain below 2019 levels at least until 2023, with the obvious knock-on implications for seaborne trade and demand for tanker shipping.

Much will depend on the pace of the pandemic but given the generally more positive outlook for oil demand the tanker market can be expected to stage a gradual recovery from recent lows with improvements in refinery runs and seaborne trade volumes occurring in 2H21 and with further gains to be seen in 2022. On the supply side, due to market weakness and the uncertainty over vessel propulsion choice, the tanker orderbook (crude and products) is comparatively small (just 8.0% of the fleet). This means that new deliveries to the fleet will be capped in the next couple of years, although it has to be recognised that the ongoing weakness in current scrapping activity is a threat to the rebalancing of the market.

Short-term we expect overcapacity to exert pressure on freight rates, but an improvement in the 2H21 is envisaged in tandem with the recovery in oil trade. Nonetheless, for tanker owners average freight rates in 2021-22 are currently forecast to be lower than those prevailing in 2019-20.

Seaborne Trade

Source: Drewry

Sector		Units	2019	2020	2021	2022	% Change 20/21	% Change 22/19
Oil	Crude	*Million Tonnes*	2,291	2,114	2,171	2,249	2.7	-1.8
	Clean Products (1)	*Million Tonnes*	705	546	639	661	17.0	-6.2
	Total Oil	*Million Tonnes*	**2,996**	**2,660**	**2,810**	**2,910**	5.6	-2.9
Dry Bulk	Major Bulks	*Million Tonnes*	3,193	3,104	3,248	3,375	4.6	5.7
	Minor Bulks	*Million Tonnes*	1,064	1,041	1,112	1,164	6.8	9.4
	Total Bulks	*Million Tonnes*	**4,257**	**4,145**	**4,360**	**4,539**	5.2	6.6
Containers	Port Throughput	000 TEU	**801.7**	**792.6**	**861.2**	**901.4**	8.7	12.4

(1) Main clean products only, excludes fuel oil.

Dry Bulk

Without doubt the dry bulk market is recovering sharply. Once again market weakness and uncertainty over compliant fuels has kept the lid on new ordering. In mid-2021, the dry bulk orderbook is equivalent to just 5.6% of the existing fleet and this will lead to a low level of new deliveries in the remainder of 2021 and 2022. In conjunction with the removal of older less fuel-efficient ships, fleet growth will therefore be constrained in the next couple of years.

From a demand perspective, iron ore trade on the long-haul Brazil-China route is growing, in part because of the on-going political dispute between Australia and China. But bauxite trade between Guinea-China is also expanding and these two trades alone are lifting demand for Capesize/VLOCs. Elsewhere, growing coal imports by India and other South East Asian countries are leading to increased demand for Panamax and Supramax vessels.

In short, the groundwork is being laid for a sustained market recovery and freight rates are expected to be on an upward curve in the remainder of 2021 and well into 2022.

Pivoting to meet online education demands

With firm roots in face-to-face teaching and in-person classes and seminars, the education sector was driven to pivot with speed when the Covid-19 pandemic took hold in 2020. Maritime teaching centres felt the full force of this shift, making a rapid jump to in-development digital teaching options, or having to building the same from scratch in record time.

But after a period of rebalancing and reflection, maritime teaching institutions are re-evaluating the value of online learning without physical classes to complement it. Professor Costas Grammenos, CBE, chairman of the Costas Grammenos Centre for Shipping, Trade and Finance at Cass Business School, City, University of London, notes that remote learning has provided the opportunity for broader involvement of industry professionals. But he adds that the provision of face-to-face teaching is essential as it provides additional opportunities for social and professional interaction that cannot be replaced by the virtual environment. He expects that a hybrid approach of face-to-face and online teaching is likely to stay to a certain degree as it allows students who are not able to be physically present to attend teaching programmes.

This hybrid model is a direction echoed by Dr Max Johns, professor at Hamburg School of Business Administration (HSBA) for Maritime Affairs and Business Development, and his colleague Prof Dr Sönke Hartmann, professor of Operations Research and Logistics at the Department of Maritime & Logistics at HSBA. They praise the value of online learning and the benefits that it has brought but see it as an additional way of learning and not the only way.

In Singapore, teaching switched to online at the start of the pandemic. However, tutorials and practical sessions have since reverted to face-to–face sessions with proper safe management measures in place. Captain Mohd Salleh Bin Ahmad Sarwan, director of the Singapore Maritime Academy (SMA) at Singapore Polytechnic, adds that moving forward beyond the pandemic, SMA will be developing and converting e-learning materials in preparation for asynchronous lectures which will be rolled out in the 2022 academic year.

The ready access to learning that the pandemic catalysed has also permitted students to study at any institution in the world, something that TL Yip, programme leader, BBA International Shipping and Transport Logistics, Department of Logistics and Maritime Studies at The Hong Kong Polytechnic University (PolyU), explains has led to universities competing without borders. This has prompted PolyU to explore collaboration opportunities with overseas partners.

Changes to curriculums for maritime-related learning also became necessary in 2020. HSBA' s Johns sums up his institution' s in two "new" areas: sustainability – both social and environmental - and data. Environmental, Social, and Corporate Governance (ESG) related topics have already entered the syllabi of many maritime education centres, but there is scope for enriching maritime related programmes with relevant modules on the digitalisation side, says Grammenos.

Maurice Jansen, a senior researcher specialising in

Port and Transport Economics, and business developer at Erasmus Centre for Urban, Port and Transport Economics at Erasmus University Rotterdam, also highlights the topic of new fuels as a new entrant on syllabi.

"As we are moving towards a decarbonised shipping industry this will be a topic to follow closely in maritime education," he says.

Cyber security is another area that today's and tomorrow's students are expected to learn, adds Captain Mohd Salleh.

Technology is also rising in importance in maritime related teaching, with emerging technologies enhancing competitive advantages for shipping companies, says TL Yip.

Looking ahead, there are challenges on the horizon for maritime learning beyond those created by the pandemic. For example, there is a need for teaching centres to remain flexible by offering blended learning, says Grammenos, all the while promoting interaction and successful career placements – both of which could be difficult in the current environment.

Another challenge will be adapting learning material to cater to an ever-changing business environment, including the increasing importance of technology knowledge, data analytics and programming skills, in addition to ESG considerations.

At a more foundational level, learning institutes need to address a shortage of incoming students into maritime education.

"Despite so many promotion campaigns this requires an ongoing and strong effort," says Erasmus' Jansen.

Any programmes to promote maritime learning also need to address diversity shortfalls and inclusion.

HSBA's Johns says that maritime education "has to leave its silo" to succeed.

"We need to open up, learn from others and invite teachers from the outside. Whoever believes shipping can remain in its comfortable silo where it has been sitting for centuries is doomed to fail."

Trainers also need to up their game, producing learning that is more "entertaining", says Hong Kong PolyU's TL Yip.

"Educators will become more or less YouTubers. Lectures will be based on social media, YouTube, Netflix, etc. We personally need to know how to perform in front of a camera and make good uses of various platform. We cannot compete only based on 'knowledge', which relies on academic research."

Motivation of students is another challenge facing maritime educators.

"Less face-to-face contact hours will mean students will need take on more responsibility for their own learning," says Singapore Polytechnic's Captain Mohd Salleh: "Motivating the students will be key as many may not know how to approach learning new topics on their own."

Grammenos, meanwhile, points to the role that academic institutions play in educating and training seafarers for a switch to shore-based careers, something which is seen as lacking today.

Finally, there needs to be greater focus on multidisciplinary teaching in the future, identifying crossovers between education programmes. Greater co-operation between different sectors to support cross industry co-operation will go a long way towards delivering competitive advantage for the maritime sector today, and in the future.

Maritime education adapting to change

By Dr Cleopatra Doumbia-Henry, President, World Maritime University

The world is in flux. Change – whether with small incremental steps or characterised by radical disruption – has been a characteristic of the 21st century so far. As with all industry and educational contexts, learning in the maritime industry is being challenged to query its traditional approaches and to evolve and adapt to new challenges and opportunities. Perhaps the most significant driver for this is technology and there is a clear trend towards technology-mediated learning to respond to an industry context which is itself dealing with rapid technological change.

The most impactful trends in learning in the maritime industry are therefore those that derive from and are responding to technology. These include an increasing shift to interrogating learning experiences in an online context. The COVID-19 pandemic with the associated restrictions on face-to-face meetings (a requirement for most traditional approaches to education and training), has acted as a significant catalyst in accelerating this trend. This is evidenced, as an example, in the increasing presence of cloud-based simulation to address more practical skills for ship operation and the resort to learning experiences based on virtual, augmented and extended reality.

Another trend is the increasing development of micro-learning courses where specific and targeted knowledge is made available to learners in short online videos that speak exclusively to targeted issues e.g., "enclosed space entry" or "risk assessment" in ship operation. This emerging learning approach, emerging perhaps from a "YouTube generation", appears to be set to have an increasing impact on learning experiences in the maritime sector. So too is the use of learning management and competency management systems.

As these trends continue to drive and shape learning and how it may be optimised, it is necessary to point out that traditional learning approaches have been informed by centuries of research and theory development which have made them very reliable. Newer trends do not necessarily benefit from such research and insights. It is important to keep this in mind when introducing new approaches to learning. Uninformed and random applications of learning tools and approaches must be avoided and efforts made to ensure that there are legitimate bases for their application in the industry and that the methods lead to the achievement of the intended learning outcomes.

Similarly, it must not be concluded that there is no merit to traditional ways of learning. If a critical-thinking approach is not taken to examine the merits and demerits of new trends, the professional future of many individuals and the wellbeing of the industry they purport to support, will be jeopardised.

In all of this, the vision of WMU, as the IMO' s apex education institution and a post-graduate institution, is to offer an educational context which supports the development of knowledgeable, empathetic and innovative thinkers who are appropriately responsive and resilient in adapting to necessary change. At WMU, the leaders of tomorrow (be they involved in national administrations, legislation, shipbuilding, human resource management, education and training, management of ships etc. and irrespective of age, nationality, gender), can build an appreciation of current issues, develop the ability to respectfully but critically interrogate different perspectives, elicit and analyse diverse opinions, and create a network for ongoing international dialogue.

The World Maritime University (WMU) was founded in 1983 by the International Maritime Organization (IMO), a specialized agency of the United Nations, as its premier centre of excellence for maritime postgraduate education, research, and capacity building. The University offers unique postgraduate educational programmes, undertakes wide-ranging research in maritime and ocean-related studies, and continues maritime capacity building in line with the UN Sustainable Development Goals.

www.wmu.se

Appendix I

Methodology for International Shipping Centre Development Index

I. The General Rationale

The research process for 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 will be jointly developed by China Economic Information Service and the Baltic Exchange, which will be authenticated by an expert committee.

Step 3

Data collection and processing: Initial data for indicators will be collected through two channels: China Economic Information Service and the Baltic Exchange. This data will then go 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 will be constructed. Subsequently an index will be computed using the model.

Step 5

Index report writing: A report about the creation of the index will be 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

Table 4 Indicator system and associated weightage for Xinhua-Baltic International Shipping Centre

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	Shipping Brokerage Service (B_7)
		Ship engineering service (B_8)
		Shipping business service (B_9)
		Maritime legal service (B_{10})
		Shipping finance service (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 infrastructures of the port city and the actual throughputs of various types of cargo.

A_2 Shipping Services
This refers to the level of shipping services provided by the port city. This can be gauged by how the shipping centre capitalise on its services to portray its ability in the allocation of shipping resources globally.

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
Source of data: China Economic Information Service Database

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. Container throughput data used in this report is container count. The computation unit is "10,000 TEU".

B_2 Dry bulk cargo throughput
Source of data: China Economic Information Service Database

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".

B_3 Liquid bulk cargo throughput
Source of data: China Economic Information Service Database

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".

B_4 Number of cranes
Source of data: Drewry

Cranes are machinery for loading and unloading containers in the wharf area. Operating capacity of cranes can determine the cargo handling capacity of a wharf.

B_5 Total length of container berths
Source of data: Drewry

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 berth, pontoon berth and anchorage berth.

Berthing facilities is 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".

B_6 Port draught
Source of data: Drewry

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 refers to water depth statistics of the deepest container berth in the port.

B_7 Shipbroking Services
Main source of data: The Baltic Exchange

Characterised by its intermediary services, brokerage is the key services provided by shipping agencies. An important component of shipping services, shipbrokers provide professional agency, brokerage and consultancy services on a gamut of industries including transportation, insurance, financial and commerce, which facilitate shipping development.

In this report, shipping brokerage services will be assessed based on the distribution of the Baltic Exchange – Global Shipping Brokers Membership together with other factors.

B_8 Ship engineering service
Main source of data: International Association of Classification Societies (IACS)

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 professional on advanced applied technologies to enable them to navigate vessels. In this report, ship engineering service is assessed based on the number of shipping companies available in the port city together with other factors. Professional fields of ship engineering company include ship engineering, repairs, quantity surveying and ship classification.

B_9 Shipping Business service

Main source of data: Lloyd's List

A shipping company may manage its own vessels or vessels commissioned by other owners. In this report, shipping business service consists mainly of the following three indicators: the number of ship management companies operating in the port city as published by the website of Lloyd's List, the number of branches of top 100 container shipping companies and top 100 bulk carrier companies, and in conjunction with other factors.

B_{10} Maritime legal service

Main source of data: London Maritime Arbitrators Association, Singapore Chamber of Maritime Arbitration, Society of Maritime Arbitrators, Legal 500, Chambers

In this report, the overall service level of maritime legal service will be assessed from the two perspectives of maritime arbitration service 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 is assessed based on the number of arbitrators located in international arbitration centres in London, Singapore and New York, and in conjunction with other factors. The number of partners in law firms is assessed based on the Legal 500 Law Firm Index or enquiry on the number of partners using the Chamber or websites of respective law firms, and in conjunction with other factors.

B_{11} Shipping finance service

Source of data: Marine Money, International Union of Marine Insurance (IUMI)

The scope of shipping finance service covers four areas: namely ship financing, capital settlement, maritime insurance and maritime financial derivatives.

Wherein, ship financing includes syndicate loans, debt capital market and equity capital market. Maritime insurance refers to a kind of insurance taken 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. To compute maritime insurance expenses of a city, first compute the sum of ship and cargo insurance premiums of each country, then distribute the total premium to each port city based on the port's cargo throughput.

B_{12} Government transparency

Source of data: Transparency International

Government transparency is a concept about 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, company board members and businessmen are open and understandable. 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 and help increase our confidence towards this group of people who are closely linked to our future.

B_{13} Extent of e-government and administration

Source of data: United Nations e-Government Development Database

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. The willingness to provide information and knowledge to empower its citizens is a measure of the government's commitment.

B_{14} Custom tariff

Source of data: "Wall Street Journal" and The Heritage Foundation, Index of Economic Freedom Report

Custom tariffs refer to the rate applicable to computation of tax on targeted taxable goods stipulated in custom regulations.

B_{15} Ease of Doing Business Index

Source of data: World Bank Database

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 doing business ranking by the World Bank.

B_{16} Logistics performance index

Source of data: World Bank Database

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 shipment reaches the recipient within expected delivery schedule. The index ranges from 1 to 5; a higher score means better logistics performance. The data are 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.

3.Data Processing

Data for secondary indicators required for the Xinhua-Baltic International Shipping Centre Development Index are mainly sourced from authoritative organisations such as the Baltic Exchange, 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 should be normalised – through relative processing to make its statistical variables dimensionless – before using it in index computation.

Divide the raw data into two categories: The first comprises indicators with score values ranging from 1 to 100. This category of indicators can be used directly for computation. The second category comprises indicators with absolute score values. These indicators will be 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, $m = 1,2,\cdots,6$, $m = 1,2,\cdots,6$, $\bar{x}_{l,mi}$ 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, compute the indicator' s quantile score for each city.

The quantile score of the m-th indicator for the p-th city is computed with the following formula:

$$y_{l,mp} = \phi\left(\frac{x_{l,mp} - mean_{l,m}}{sd_{l,m}}\right)$$

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 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:

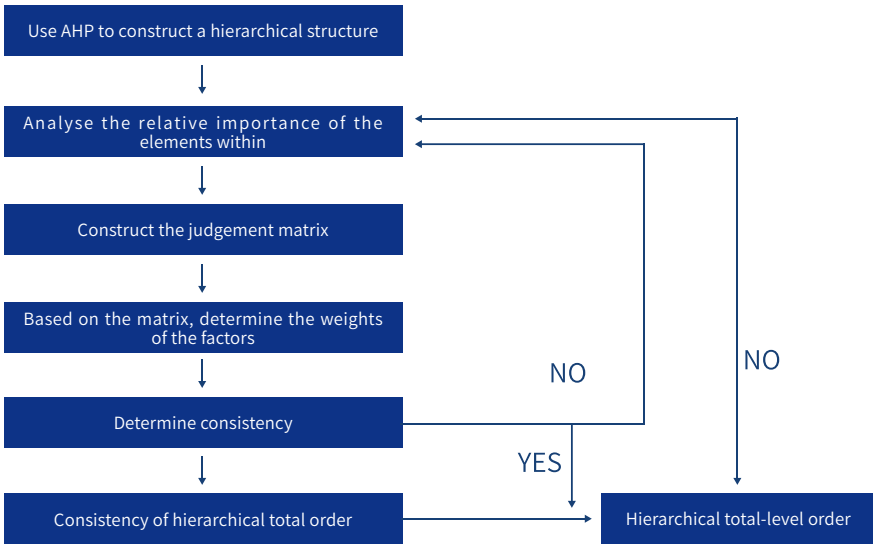


Figure 5 Basic processes of AHP algorithm

(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, $W = \left[w_1, w_2, \cdots, w_n\right]^T$, 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:

$$y_{lp} = \sum_{m=1}^{l_m} y_{l,mp} * w_m = \sum_{m=1}^{l_m} \phi(\frac{x_{l,mp} - mean_{l,m}}{sd_{l,m}}) * w_m$$

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:

$$y_p = \sum_{l=1}^{3} y_{lp} * w_l = \sum_{l=1}^{3} (\sum_{m=1}^{l_m} y_{l,mp} * w_m) * w_l = \sum_{l=1}^{3} (\sum_{m=1}^{l_m} \phi(\frac{x_{l,mp} - mean_{l,m}}{sd_{l,m}}) * w_m) * w_l$$

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!

(a) 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 (B_2)	—	—	2
Innovation management capability (B_3)	—	—	—

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 (B1) is slightly more important than R&D Capability B2).

(2) Scoring by experts

1. Scoring for primary indicators

Please fill in the value of importance between the primary indicators (A1-A3) 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（A_1）	—		
Shipping Services（A_2）	—	—	
General Environment（A_3）	—	—	—

2. Scoring for secondary indicators

(a) Please fill in the value of importance between the secondary indicators (B1-B6) with respect to the primary indicator (A1).

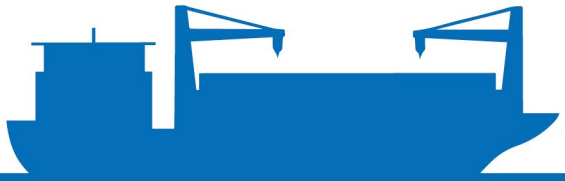
Port Factors (A_1)	B_1	B_2	B_3	B_4	B_5	B_6
Container throughput (B_1)	—					
Dry bulk cargo throughput (B_2)	—	—				
Liquid bulk cargo throughput (B_3)	—	—	—			
Number of cranes (B_4)	—	—	—	—		
Total length of container berths (B_5)	—	—	—	—	—	
Port draught (B_6)	—	—	—	—	—	—

(b) Please fill in the value of importance between the secondary indicators (B7-B11) with respect to the primary indicator (A2). Shaded areas need not be filled.

Shipping Services (A_2)	B_7	B_8	B_9	B_{10}	B_{11}
Shipping brokerage service (B_7)	—				
Ship engineering service (B_8)	—	—			
Shipping business service (B_9)	—	—	—		
Maritime legal service (B_{10})	—	—	—	—	
Shipping finance service (B_{11})	—	—	—	—	—

(c) Please fill in the value of importance between the secondary indicators (B12-B16) with respect to the primary indicator (A3). Shaded areas need not be filled.

General Environment (A_3)	B_{12}	B_{13}	B_{14}	B_{15}	B_{16}
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})	—	—	—	—	—



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INTERNATIONAL SHIPPING CENTRE DEVELOPMENT INDEX REPORT

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