THE LEADING MARITIME CAPITALS OF THE WORLD 2019

A Menon Economics and DNV GL Publication

MENON ECONOMICS

DNV·GL

A Menon Economics and DNV GL Publication

Authors:
Menon team: Erik W. Jakobsen, Sunneva Juliebø, Lars Martin Haugland, Håvard Baustad
DNV GL team: M. Shahrin Osman, Deepti Sewraz, Alina Villemin

Design:
Ludvig Holmen
Daniel Barradas

Photos: iStock

CONTENTS

EXECUTIVE SUMMARY

More than half of the world's population live in cities and it is predicted that two-thirds of the world population will be living in urban areas by 2050, according to United Nations estimates. The importance of city regions will therefore continue to grow. Cities are the centers of knowledge, talent, innovation and specialization of production and services. In today's world, particularly for the maritime industry, cities are to an increasing extent competing to attract the best companies, startups and most talented people. The winners in this race for attractiveness are – and will continue to be – the leading maritime centers of the world.

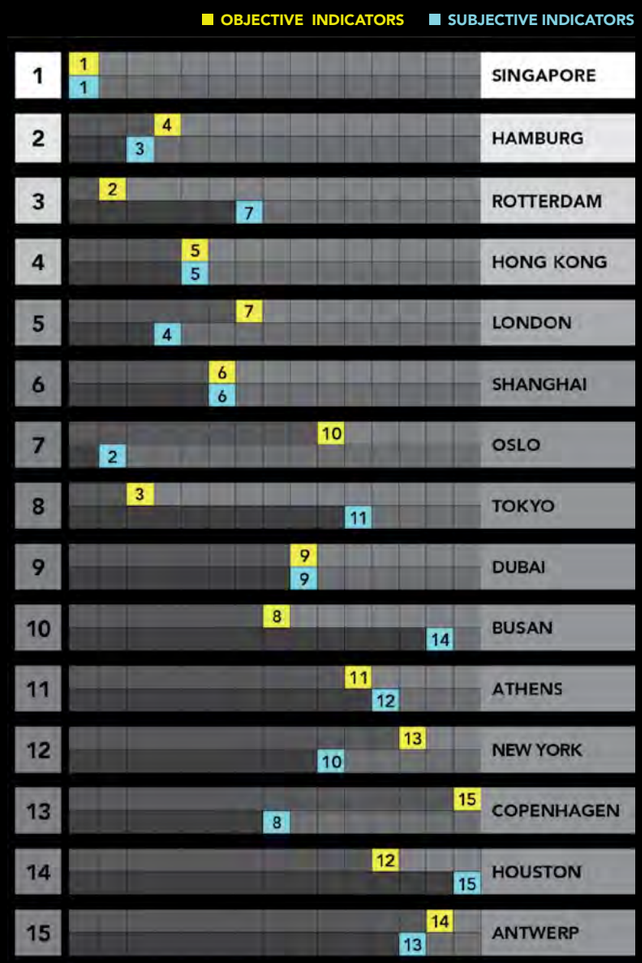
Two years after its last publication, the 2019 edition of Leading Maritime Capitals report is back, with a fresh insight about which maritime capitals provide the best support, in terms of soft and hard infrastructure and world-class talent, to allow maritime businesses and people to connect and thrive. Similar to its previous editions, the LMC 2019 report covers 5 pillars – Shipping Centers, Maritime Finance and Law, Maritime Technology, Ports and Logistics, Attractiveness and Competitiveness – on which the maritime cities are benchmarked. Under each pillar a comprehensive set of objective and subjective indicators have been considered. For the 2019 report, some new and more comprehensive objective and subjective indicators as well as data sources have been used to ensure that the analysis is based on reliable and complete data for the various cities, which ultimately allow for a more refined benchmarking of the relative performance of each city compared to the previous report. For the subjective indicators on each pillar, these come in the form of the perception and assessment by nominated business executives – mostly shipowners and managers – from around the globe. Of these 200 experts called upon for this study, around 40% are based in Europe, 30% in Asia, and the remaining 30% are from America, Middle East and Africa.

Singapore maintains its position as the leading maritime capital of the world. Despite the "new normal" economic conditions in traditional shipping and the still weak offshore service market, Singapore has been able to retain its position as a world leading maritime hub due to its strength in all pillars. Singapore is still outperforming other cities in the Shipping Centers, Ports and Logistics, Attractiveness and Competitiveness pillars, and for the remaining two pillars it is within the top 10 cities.

Whilst Singapore, Hamburg, London and Tokyo have maintained their previous ranking, other cities have seen an improvement in their overall score. Dubai has climbed up by one rank and is now in the 9th global position for leading maritime cities, followed by Busan which also saw a positive move in its in score. It is, however, Rotterdam and Hong Kong that show the greatest development in their rank. Rotterdam has moved up three places and is now ranked 3rd and Hong Kong, with a similar upward move, is now in the 4th position. Rotterdam has improved its score across all pillars, with the biggest positive change in the Shipping Centers pillar, with an increase in the size of its controlled as well as managed fleet. The fleet controlled by owners based in Rotterdam has increased by 50%, whilst the fleet size

RANK	SHIPPING	FINANCE AND LAW	MARITIME TECHNOLOGY	PORTS AND LOGISTICS	ATTRACTIVENESS AND COMPETITIVENESS	OVERALL RANK
1	SINGAPORE	LONDON	OSLO	SINGAPORE	SINGAPORE	**SINGAPORE**
2	ATHENS	NEW YORK	LONDON	ROTTERDAM	COPENHAGEN	**HAMBURG**
3	HAMBURG	OSLO	HAMBURG	HONG KONG	LONDON	**ROTTERDAM**
4	HONG KONG	HONG KONG	BUSAN	SHANGHAI	ROTTERDAM	**HONG KONG**
5	SHANGHAI	SINGAPORE	TOKYO	HAMBURG	HAMBURG	**LONDON**

RANKING

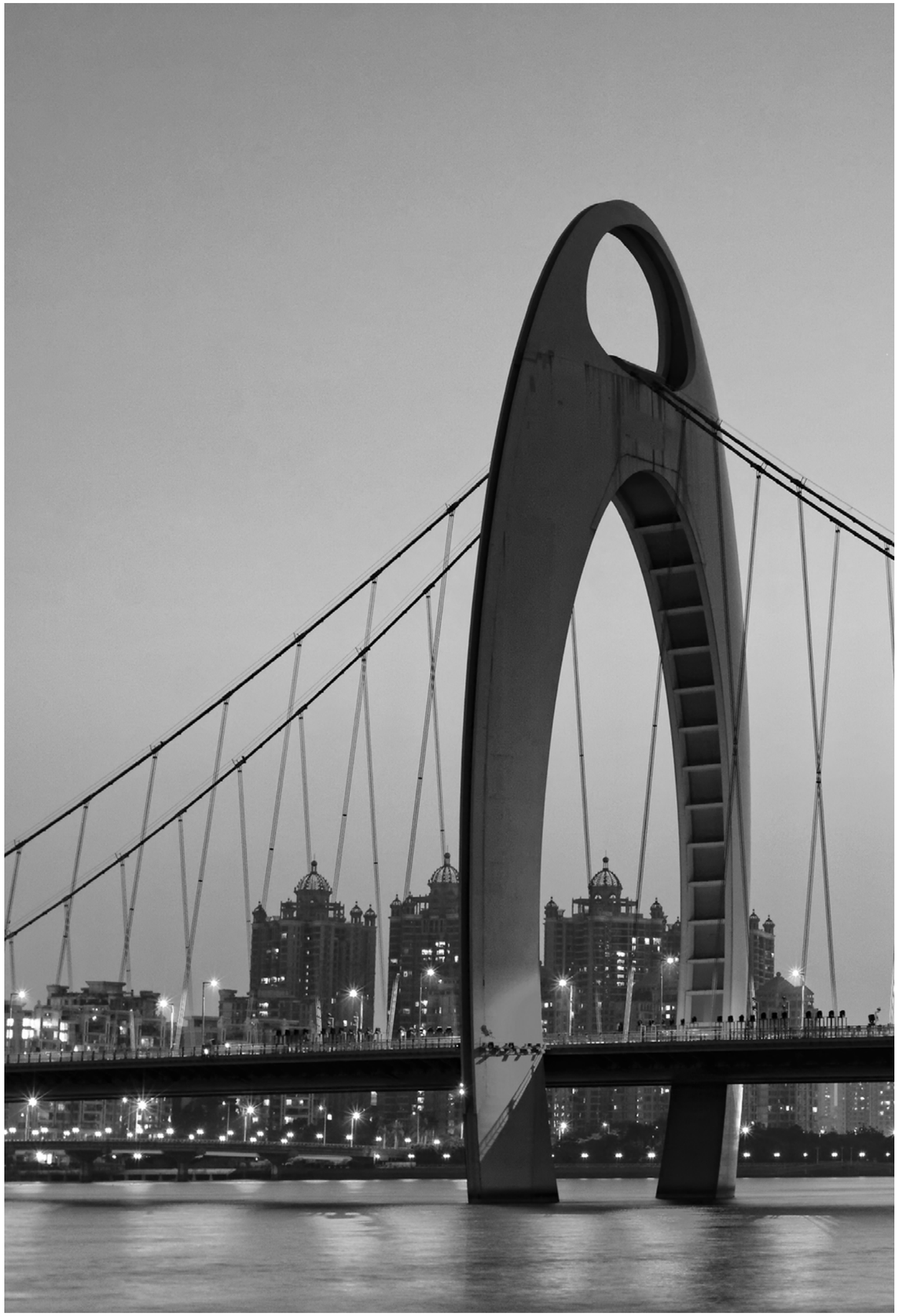


that is managed from there has grown by close to 60%. Rotterdam has moved up in the Maritime Finance and Law pillar, largely due to a 50% increase in loan value from 2017. Unlike Rotterdam, Hong Kong's improvement has not been across all the pillars. Its score has climbed up in three of five pillars; Shipping Centers, Maritime Finance and Law, and Ports and Logistics pillars. Hong Kong is popular for its strong infrastructure in promoting and supporting the ease of conducting shipping business there, with efficient customs procedures. Hong Kong is ranked 2nd by the industry experts as the most attractive location for shipping operations. In terms of the number of listed maritime companies on their local stock exchanges, Hong Kong has also boosted its numbers since 2017, indicating that it is an attractive market for registering new stocks. When considering the trading volume of bonds, IPO and follow-on offerings from each city's stock exchange during the period 2017 to 2019, Hong Kong is in the 2nd position right after New York.

An interesting observation is that most cities are ranked consistent across the objective and subjective indicators. Two cities stand out: Oslo and Tokyo. Oslo is ranked 2nd on the subjective indicators, but only 10th on the objective (down 7 places). For Tokyo, the story is the other way around: 3rd on the objective, but only 11th in the subjective. The main reason for Oslo's weak ranking on the objective indicators, is the lack of a substantial port, giving Oslo a 50th place on the Port and Logistics pillar. The same holds for Copenhagen, a city that is ranked 8th on the subjective indicators and only 16th on the objective. For Tokyo, the explanation is not as straightforward, because Tokyo is ranked lower by the maritime experts on all five pillars than on the objective indicators.

The maritime industry is on the verge of a digital transformation including the adoption of disruptive and innovative technologies. The maritime industry experts voted Singapore, Oslo, Copenhagen and London to be the cities best prepared for the digital transformation of the industry. Oslo has also forged its position as the world's leading center for sustainable technologies and solutions for the oceans.

Looking five years into the future, our experts still predict that Singapore will keep its position as the global leader, while Shanghai is expected to increase its importance and become the second most important maritime city. The race to be the leading city in Europe is still open with Oslo, London, Hamburg, Athens and Rotterdam as the leading contenders in this regional race. In the Middle East, India and Africa region, Dubai is the leading maritime center and at a global level, now ranked 9th. The experts predict that Dubai will continue to grow in importance and could be in the top five of the world's most important maritime centers by 2024, albeit with strong competition by the European cities as well as Hong Kong.



THE MARITIME INDUSTRY

AIMING FOR AN EFFICIENT GLOBAL REACH

For decades, the world economy has become increasingly integrated with a shift of global economic power to emerging economies. According to Peter Dicken, a British professor of Economic Geography, a "global shift" (Peter Dicken, 2015) has transformed the world economy. The main characteristics of this shift are market integration, strong growth in international trade, foreign direct investments, the emergence of transnational companies and a dramatic increase in interdependence between nations. Although the globalization process does not seem as straight-lined as it did some years ago, the world will continue to be highly interdependent and bound together by shipping and maritime activities.

Shipping has and will continue to play a vital role for international trade and the division of labor. The growing demand for raw materials and goods in China and other emerging markets lead to a commodity boom and shipping market bonanza in the early 2000s. From 1995 until today, world GDP doubled and world trade quadrupled. However, in the last few years we have seen both weak GDP growth and a weakened relationship between GDP growth and demand for shipping services. The ClarkSea Index (measuring earnings for the main vessel types) ended above USD 10,000 at the end of year 2018 (year average of USD 12 144), while the Baltic Dry Index reached a level of 690 points in March 2019 after a relative volatile recovery from the record low level reported in February 2016 (a score of 291). The offshore market is also characterized by a large part of the OSV fleet in lay-up, and yards around the world are struggling to fill up existing capacity. With one of the largest bankruptcies in shipping recorded in 2016, with South-Korean container giant Hanjin Shipping filing for bankruptcy, other players in the shipping industry have been looking into consolidation and cost efficiencies. In the past recent years, new alliances have occurred, with, for example, German Hapag-Lloyd's merger with the Middle Eastern container shipping line United Arab Shipping Company (UASC), CMA CGM's acquisition of Singapore's national carrier NOL/APL, and the amalgamation of the container segment of Kawasaki Kisen Kaisha, Ltd. (K Line), Mitsui O.S.K. Lines, Ltd. (MOL), and Nippon Yusen Kabushiki Kaisha (NYK), to form the new joint venture Ocean Network Express (ONE).

The world in 2019 might continue a path of becoming increasingly integrated, but recent political events suggest that the world might be heading in the exact opposite direction. For example, the US threatening international cooperation and trade, the messy and damaging disentanglement of Britain from the European Union, and other political feuds between several countries and China, all serve as important remainders how fragile the international system is. What is clear, however, is that geopolitical tensions and trade policies will continue to influence the industry going forward just as it has done for the last centuries.

Transnational companies operate across the entire world, taking advantage of economic differences by locating their business activities in the most attractive locations. This global trend has been a key factor why world GDP has doubled since 1995 and world trade has quadrupled. At the same time, it also represents a tremendous challenge to countries: it can no longer be taken for granted that companies will stay in their home countries. To an increasing extent, states and cities must compete to attract and retain international firms. In other words, they have to be attractive hosts.

Shipping has always been an international industry. In fact, shipping is the premise for international trade. A central driver for the global shift described above has been the operational and technological development of the shipping industry, which has lowered transportation costs dramatically. With the emergence of standardized bulk carriers, oil and other raw materials could be traded globally. Today most shipping markets, including cruise, offshore and car carriers, are globalized. Maritime services, however, have until the last decade been relatively national or regional, often located around the shipowning companies. Ship finance was among the first to globalize, while legal services, due to national jurisdictions, have been the most national of the maritime services. English law firms have been the exception, with branches in shipping hubs all over the world, since English law is commonly chosen as the jurisdiction in contracts of trade and chartering.

Today, most maritime services are globalized. For example, the five leading classification societies class 82% of the world's ships, and the two largest book runners for ship finance cover one sixth of the global market. Even port operations are becoming globalized. One of these companies is the Port of Singapore Authority (PSA) that was corporatized in 1997. PSA is now one of the world's largest port operators with operations in many key markets.

Partly as a contributing factor to, and partly as an effect of global markets, maritime companies have also become globalized. For example, the Swiss-based Mediterranean Shipping Company (MSC) has a worldwide presence with close to 500 offices in 150 countries and close to 25,000 employees. The structure of the companies varies greatly, but the dominant trend is to build corporations around specialized business units with a global reach. The John Fredriksen Group is a good example of this. The group

consists of companies specialized in segments like rigs (Seadrill), crude carriers (Frontline) and dry bulk (Golden Ocean). The location of companies has also become globalized. Value chains split up, with headquarters located in financial centers, operating units close to markets, and R&D units in knowledge hubs. The group is also an example of how some companies are broadening their focus to more than one specific segment. Both the Fredriksen Group and A.P. Moller-Maersk Group are examples of groups that focus on broadly diversified segments within the industry – although Maersk has decreased their strategic scope recently.

DIGITAL TRANSFORMATION, CYBER SECURITY AND INNOVATION

Digitalization is happening across all industries and change the way we work and live. For the maritime industry, whilst disruptive innovation is the current buzzword, its digital transformation is under way, challenging existing business models but also offering new opportunities.

Digital capabilities are important in the entire maritime industry, which is already seeing a trend whereby crew size is steadily decreasing, whilst software, automation, centralisation and interconnectivity are on the rise. Many maritime companies are already quite technology-driven, with most of their bookings and orders coming through the internet, their internal processes based on digital solutions – and with some shifting to using blockchains to increase their operational efficiency and transparency – as well as their infrastructural and/or assets' operations based on cyber-physical systems (systems coupling digital software with hardware). To adapt to this new reality, some shipping companies and maritime technology providers have a designated Chief Digital Officer (CDO) on their management team. However, for most other players in the maritime industry, there are still uncertainties about the extent and momentum to which digitalization will affect them, based on concerns related to the need to standardize digital practices, and the change of organizational culture and mindset.

Under the umbrella of digitalization, we have assigned another hot topic in the maritime industry: cyber security. Vessels are becoming smarter constantly as they increase their connectivity, control and most importantly their operation is based on Operational Technology (OT). This provides tremendous benefits in terms of safety, availability, and energy efficiency, but at the same time opens doors to cybercrime which is recognized as the biggest emerging challenge of the industry in 2017 alone, the total cost of cyber threats to shipping is estimated at more than 1 billion USD. Cyber security is thus increasingly becoming an integrated part of the safety topic of maritime companies, with the strategic decision of many big maritime players to establish an Information Security Management System and seek compliance to the robust ISO 27001 standards to build confidence among their stakeholders.

In terms of disruptive innovation, the maritime industry has already been introduced to it, whether in the form of additive manufacturing or as the concept of autonomous ships being operated remotely, to name a few. The port of Rotterdam will have its own 'Additive Manufacturing FieldLab' with 3D metal printers. This lab will provide port-related companies with a collective location to accelerate developments in this area and to work together on applications for the maritime industry. Yara Birkeland, the world's first fully-electric, zero-emission and autonomous container ship developed by Kongsberg in collaboration with Yara, is due to be launched in 2020 and will operate within Norway. Another upcoming area is the development of algorithms for predictive maintenance and asset integrity, wider application of Drones for maritime sector and the use of AI-powered algorithms for optimized stowage plans for container ships.

With the force at which digitalization is propagating and newly emerging disruptive technologies springing across the globe, there is an increasing and critical need for a radical improvement of the digital infrastructure for the maritime industry, and an environment that supports the collaboration between maritime companies, technology companies and progressive regulators and assurance providers. A location that can offer this will have a strong competitive edge.

ALTERNATIVE FUELS AND TECHNOLOGY

Global environmental concerns about the invasion of aquatic organisms, GHG (greenhouse gases) and SOx emissions from the shipping industry, have led the IMO in recent years to implement initiatives aimed at limiting the impact of these. As a consequence, ballast water management has been implemented and the carriage ban of fuel with more than 0.50% sulphur content will be enforced as of 1st January 2020. Other potential game changers in the maritime industry include the Tier III NOx requirement, the stronger push for new vessels having improve EEDI (Energy Efficiency Design Index), as well as measures for monitoring and reporting of CO2 emissions from both the EU and IMO.

To navigate in such regulated waters, potential solutions have become available in various parts of the world, whether from scrubber manufacturers or providers of alternative fuels such as LNG. There is thus a need for countries and cities to provide an infrastructure that supports such upcoming aspects of the maritime industry.

Considering this global view of where maritime industry is heading (in terms of its global reach, its uptake of digitalized and innovative solutions, its requirement for new fuels), there is a strong competition on which capitals around the world will provide the best support, in terms of soft and hard infrastructure and world-class talent, to allow maritime businesses and people to connect and thrive.

THE LEADING MARITIME CAPITALS OF THE WORLD

CITIES – ENGINES OF INNOVATION AND GROWTH

Urbanization is one of the strongest global megatrends in this century, with a clear shift in importance from nations to cities (Moretti, 2012; Quartz, 2015). Today, more than half of the world's population live in cities. These cities generate 80% of global GDP (World Bank, 2017). In 2016, there were more than 500 cities globally with more than 1 million inhabitants (United Nations, 2017). China alone is home to more than 100 cities with more than 1 million inhabitants, a number that is likely to double in the next decade. Companies are increasingly focusing on city regions when developing their strategies for relocation or expansion of their operations. Population projections show that virtually all growth over the next 30 years will come in urban areas. Every year the world's cities are growing by 60 million people, roughly equal to the current population of the United Kingdom.

The influx and agglomeration of people, companies and investments is fueled by the vibrant knowledge-creation and innovation of the cities. High concentration of competent people in cities generates more opportunities for interaction and communication, promotes creative thinking, creates knowledge spillovers and develops new ideas and technologies. Cities also facilitate trade and commerce by providing super market places. Hence, all knowledge-based industries tend to centralize in a few leading city regions; San Francisco for ICT, Boston for biotechnology, Houston for oil & gas, London for finance – and Singapore for maritime. It is not, however, a "winner-takes-it-all" game. There is room for cities with leadership in niches of industries, like Geneva in medtech, and London in fintech. There is also room for cities with regional leadership, like Shenzhen in ICT and Singapore's Biopolis for biomedical science.

MARITIME COMPANIES – RESTRUCTURING WITHIN A GLOBAL PLAYGROUND

Aware of such international competition, cities are developing strategies to enhance their attractiveness to highly productive and innovative companies, and to talented individuals. The more mobile the companies, the stronger the competition among cities to attract them. As the maritime industry is global in nature, many maritime companies are mobile entities seeking to take advantage of localization advantages in different countries. This, combined with the maritime industry being a high value-added industry, means that the fight to attract maritime companies is tough, especially for shipping being the most highly mobile sector within the maritime industry. This also implies that it is easy to lose maritime business activities. The gains from winning the location race are hence higher for the less mobile part of the industry.

Specialized knowledge-based services are probably the least mobile companies in the maritime industry. The reason being that knowledge-based companies often have links to universities and are deeply embedded in the local milieu; for example, in their reliance on specialized local competence. Another important point, following from the fact that firms increasingly split up their value chains, is that cities compete to attract activities – not companies. The winners in the future will be those cities that are able to attract:

- Science and higher education
- Owners and headquarters
- R&D – product and technology development
- Financial, legal and other sophisticated business services

While many cities are important centers in today's maritime industry, some researchers suggest that we might see a future concentration of shipping activity (Center for Liveable Cities, 2014). Martin Stopford was one of those who proposed that we will see a development of two or three global centers characterized as "shipping super cities" - one city in each of the eight-hour time zones (Asia, Europe and the Americas). This will mean that some of today's shipping centers will lose importance to a few global centers that will act as shipping service hubs. Stopford also went further, dividing the cities into cargo port cities and shipping services ports. Port cities, such as Rotterdam and Shanghai, are mainly driven by their role of transporting cargo to the regional markets. In shipping services ports, on the other hand, the port is secondary while offering other services to the international shipping industry will be key.

DRIVERS OF COMPETITIVENESS

There are lots of inter-connected factors that drive the attractiveness of a city and the competitiveness of the industries located there:

- Strategic location
- Favorable and stable political framework
- Transparent and efficient legal framework
- Proximity to large, demanding customers
- Local rivalry – creates incentives to continuous improvements and innovation
- Abundance of suppliers and service providers
- Specialized universities and research institutions
- Large pool of talents
- Rich and open flow of knowledge and ideas
- Relationships based on trust
- Meritocratic education and career system
- Soft location factors – an attractive place to live for families and individuals

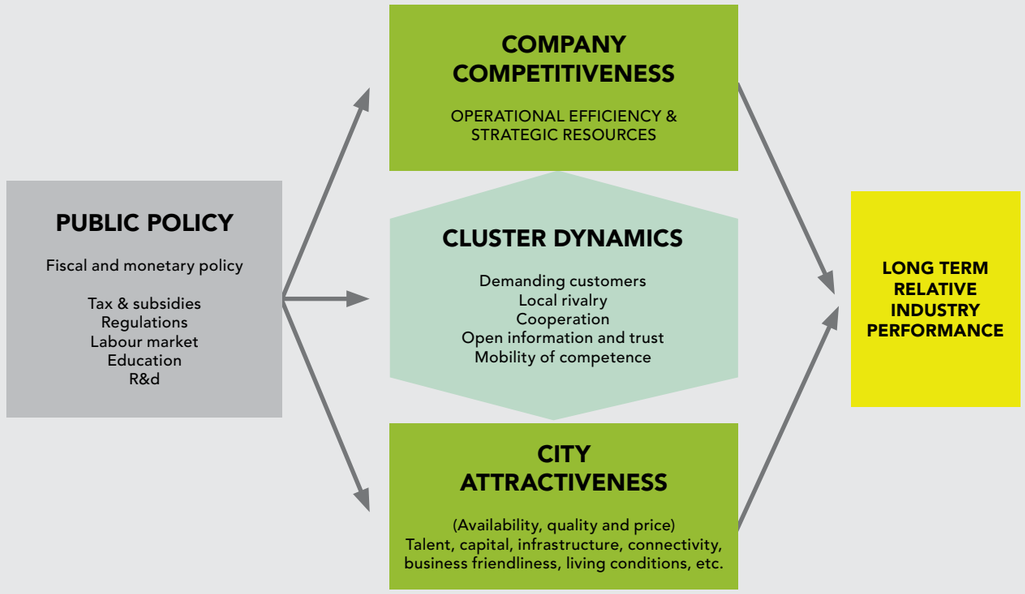
Together, these factors produce spirals of self-reinforcing growth – or decline, if the factors are absent. The mechanisms that drive industry competitiveness are summarized in the model below.

For the maritime industry in a city to prosper, two conditions must be satisfied: the companies must be competitive, and the city must be attractive as a host for these companies. These two conditions are mutually dependent: the companies gain their competitiveness from resources available in the city; for example, access to capital, talent and specialized supplies – and the price they must pay for these resources. Accordingly, the attractiveness of the city increases when competitive companies are present in the city. Hence, the clue is to attract the winners (Jakobsen, et al 2003). Over time, the attractiveness of the cities is gradually shaped by the dynamics of the industry. In an industry with strong cluster dynamics, knowledge is continuously improved and dispersed, upgrading both companies and resources. Finally, governments play a central role in defining the attractiveness of the city. Through various public policy factors like taxes and subsidies, they determine the price of capital, labor and other input factors. The quality of the resources is to a large extent determined by investments in infrastructure, education and R&D.

The four main elements in the model, public policy factors, the competitiveness of the companies, the attractiveness of the cities, and finally, the dynamics of the industry clusters, are measured and benchmarked for the maritime industry in 30 cities.

THEORETICAL MODEL OF INDUSTRIAL COMPETITIVENESS

Source: Jakobsen et al, 2003 (Attracting the winners)



BENCHMARKING BASED ON OBJECTIVE & SUBJECTIVE INDICATORS

The Leading Maritime Capitals report for 2019 is the fourth edition of this report. Again, the ranking was based on a combination of objective data from leading sources and subjective measures to assess and benchmark the 15 leading maritime cities. This approach offers the advantage of considering both hard facts (objective indicators) as well as expert opinions (subjective indicators) in areas that are difficult to measure with available objective data at city level (such as regulations, cluster dynamics, technological expertise and other capabilities).

One major difference (and improvement) in this year's report compared to its previous editions is that the identification of the top maritime cities in the world is now carried out by using a bottom-up approach, whereby all maritime cities in the world are initially considered before being narrowed down to the top 50 through several rigorous elimination and ranking rounds across the different pillars. In the previous reports, a top-down approach was used which was based on the subjective nomination of top 30 maritime cities in the world. The revised bottom-up approach instead allows for the objective selection of the top 50 maritime cities before the leading 15 cities are extracted for further ranking through the subjective assessment by nominated business executives from all around the globe. The main benefit is that this new approach is more transparent and comprehensive. Note that with this year's bottom-up approach, direct comparison of values between 2019 and 2017 is not possible as some cities are out of sample in the 2017 ranking. The approach is illustrated as follows:

ALL MARITIME CITIES IN THE WORLD

50 NOMINATED CITIES
- benchmarked on objective indicators only

15 LEADING MARITIME CITIES
- benchmarked on both objective indicators and expert assessments

50 NOMINATED MARITIME CITIES ORDERED BY RANKING ON THE OBJECTIVE INDICATORS

1	SINGAPORE
2	ROTTERDAM
3	HAMBURG
4	TOKYO
5	LONDON
6	SHANGHAI
7	HONG KONG
8	BUSAN
9	DUBAI
10	OSLO
11	NEW YORK
12	COPENHAGEN
13	HOUSTON
14	ANTWERP
15	ATHENS
16	MUMBAI
17	GUANGZHOU
18	SEOUL
19	HELSINKI
20	KUALA LUMPUR
21	ISTANBUL
22	BERGEN
23	MIAMI
24	DALIAN
25	NEW ORLEANS
26	IMABARI
27	JAKARTA
28	LOS ANGELES
29	SEATTLE
30	VANCOUVER
31	PARIS
32	QINGDAO
33	GLASGOW
34	GENOA
35	BEIJING
36	KOBE
37	MARSEILLE
38	WASHINGTON D.C.
39	ABERDEEN
40	TIANJIN
41	NINGBO
42	PANAMA CITY
43	SYDNEY
44	LIMASOL
45	HO CHI MINH
46	STOCKHOLM
47	MANILA
48	SAINT PETERSBURG
49	DURBAN
50	VALLETTA

INDICATORS FOR CITY RANKING

There are numerous ways to assess the strength of the maritime cities. Data sources that are widely used and renowned in the industry have been used. Methodology and data sources for the indicators are described in the appendixes.

In this year's report, for the objective assessment, previously used objective indicators were revised to be based on new databases whilst new objective indicators were also included. The overarching aim has been to ensure that the analysis is based on reliable, complete and improved data quality for the various cities. Hence, adjustments to the data sources and/or indicator set, where deemed necessary, have been made. For the five pillars in this study, a total of 25 objective indicators have been used.

For the subjective assessment, this comes in the form of the perception and assessment by key business executives – mostly shipowners and managers – from all around the globe. Of these 200 experts called upon for this study, around 40% are based in Europe, 30% in Asia, and the remaining 30% are from America, Middle East and Africa.

The study uses a ranking model consisting of objective and subjective rankings that are weighted 50% each. All indicators are normalized to allow comparisons of different data on a common scale. After normalizing the data, an arithmetic average is used to rank the different cities within five main pillars. Each pillar is weighted 20 percent. The five pillars of the study are the same as in the last edition of the report: Shipping, Maritime Finance and Law, Ports and Logistics, Maritime Technology, and Competitiveness and Attractiveness. The full list of indicators is described in these tables.

PILLAR	SHIPPING		
		DESCRIPTION	SOURCE
OBJECTIVE INDICATORS	1. Fleet size - ship management	CGT owned by shipmanagers registered in the city (Size of fleet (CGT) managed from the city)	Clarkson
	2. Fleet size - shipowner	Size of fleet (CGT) controlled by shipowners registered in the city	Clarkson
	3. Fleet value - shipowner	Fleet value for each city, calculated by multiplying the national fleet value with the city's corresponding national CGT ratio	Clarkson & WFM Vol 9 No 12 December 2018 - estimates of national fleet values
	4. Number of shipping companies with HQ in the city	Number of shipping companies with more than 5 vessels (owner and manager)	Clarkson
SUBJECTIVE INDICATORS		SURVEY QUESTION	
	1. Leading shipping center	Which of the following cities do you consider the five leading SHIPPING centers (ownership, operations and management) of the world?	
	2. Attractiveness for headquarter	If your company should consider relocating, which cities would in your opinion be the most attractive location for the headquarter?	
	3. Attractiveness for operation units	If your company should consider relocating, which cities would in your opinion be the most attractive location for operations units?	

PILLAR	MARITIME FINANCE AND LAW		
		DESCRIPTION	SOURCE
OBJECTIVE INDICATORS	1. Legal Expertice by Who's Who	Number of legal experts per city, assesed by Who's Who Legal.	Who's who Legal
	2. Number of maritime lawyers	Number of maritime lawyers in each city.	World Shipping Register
	3. Insurance premium	National collected insurance premium for P&I, hull, cargo, offshore. Allocated to cities after economic activity and number of marine insurance companies.	IUMI, ORBIS
	4. Mandated loans	Value of maritime syndicate mandated loans issued from bookrunner/MLA allocated to cities following the location of each bookrunner/MLA's maritime headquarter.	Dealogic data top 10 Bookrunner/MLA for 2018
	5. Shipping banks portfolio	Top 40 shipping portfolies by banks across the world, where volumes are allocated to cities after the location of the bank's headquarter.	Petrofin Bank Research
	6. Number of listed maritime owner groups	Number of listed maritime owner groups on the city's stock exchange	ORBIS (Bureau van Dijk)
	7. Market cap of listed companies on the city's stock exchange	Market cap of maritime companies (NACE rev. 2: 5010, 5020, 5030, 5040, 3011, 3012, 3315, 5224 and 7734). Allocated to cities based on listing information on stock exchange.	ORBIS/Bureu van Dijk and Bloomberg
	8. IPO/Bonds/Follow ons	Trading volume of bonds, IPO and follow ons for the years of 2017-2019 in the maritime sector. Volumes distributed by the geographic location of the stock exchange.	Clarkson
		SURVEY QUESTION	
	1. Leading financial center	Which of the following cities do you consider the five leading centers of maritime FINANCE (banking, law, insurance, brokers, analysts/consultants) of the world?	

PILLAR	MARITIME TECHNOLOGY		
		DESCRIPTION	SOURCE
OBJECTIVE INDICATORS	1. Shipyards (CGT)	Size of fleet (CGT) delivered by active shipyards as of current fleet and orderbook. Fleet size per yard aggregated and distributed to the city location of the shipyard	Clarkson
	2. Classified fleet	Fleet size (CGT) classified by classification society with headquarter in each city.	Clarkson
	3. Market value of ships built at shipyards	Purchasing price of ships built at shipyards, sold in the in the years of 2017, 2018 or 2019. Purchasing price aggregated to city level using the location of the shipyard.	Clarkson & ORBIS
	4. Number of patents by maritime companies	Number of patents developed by maritime firms (NACE rev. 2 codes: 5010, 5020, 5030, 5040, 3011, 3012, 3315, 5222, 5224 and 7734). Number of patents distributed to cities after the location of each company's headquarter.	ORBIS/Bureu van Dijk
	5. Number of maritime education institutions in each city	Number of maritime education institutions in each city	World Shipping Register
SUBJECTIVE INDICATORS		SURVEY QUESTION	
	1. Leading technology center	Which of the following cities do you consider the five leading centers for maritime TECHNOLOGY (R&D, education, ship building and maritime equipment) of the world?	
	2. Digital services	In which cities do you find companies producing world class digital SERVICES and maritime IT-products?	
	3. Leading R&D & educational center	In which cities do you find the leading maritime R&D & EDUCATIONAL centers of the world?	
	4. Environmentally substainable technologies	Which cities are in the forefront of environmentally sustainable technologies and solutions for the oceans?	

PILLAR	PORTS & LOGISTICS		
		DESCRIPTION	SOURCE
OBJECTIV E INDICATORS	1. TEU in port	Volume of TEU handled by ports around the world for 2018. Data for top 100 ports.	Lloyd's Top 100 Ports 2018
	2. Total cargo	Total cargo volume in tonns handled by the top 100 ports in the world.	The American Association of Port Authorities
	3. Size of port operators	Volum of TEU handled by port operator.	Drewry
	4. Quality of Port Index	Quality of port infrastructure.	Macrobond/World Bank
		SURVEY QUESTION	
	1. Port related logistics services	Which cities have the best offering of PORT RELATED LOGISTICS SERVICES?	

PILLAR	ATTRACTIVENESS & COMPETITIVENESS		
		DESCRIPTION	SOURCE
OBJECTIV E INDICATORS	1. Ease of doing business	World Bank's index of Business Regulations (Doing Business).	World Bank
	2. Transparency/ corruption	Measures the perceived level of public sector corruption.	Transparency International
	3. Entrepreneurship	Measures, with several indicators, the health of the entrepreneurship ecosystems.	Global Entrepreneurship Index
	4. Burden of customs procedure	Measures, with several indicators, the burden of customs precedure on a country level.	Macrobond/World Bank
SUBJECTIVE INDICATORS		SURVEY QUESTION	
	1. Attractiveness for headquarter	If your company should consider relocating, which cities would in your opinion be the most attractive location for the headquarter?	
	2. Attractiveness for operation units	If your company should consider relocating, which cities would in your opinion be the most attractive location for operations units?	
	3. Attractiveness for R&D units	If your company should consider relocating, which cities would in your opinion be the most attractive location for the R&D unit?	
	4. Most complete maritime cluster	Which cities constitute, in your opinion, the most complete maritime cluster (i.e. a city region where you have access to all relevant maritime services; a one-stop-shop-city with equipment, yards, financial, legal and technological services - in addition to an international shipping community)	
	5. Most innovative and entreprenurial	Which cities do you consider the most innovative and entrepreneurial center for maritime activities?	
	6. Strongest capabilities and positioned for digital transformation	Which cities have the strongest capabilities and are best positioned for the digital transformation of the maritime industry?	

SHIPPING CENTERS

SUMMARY

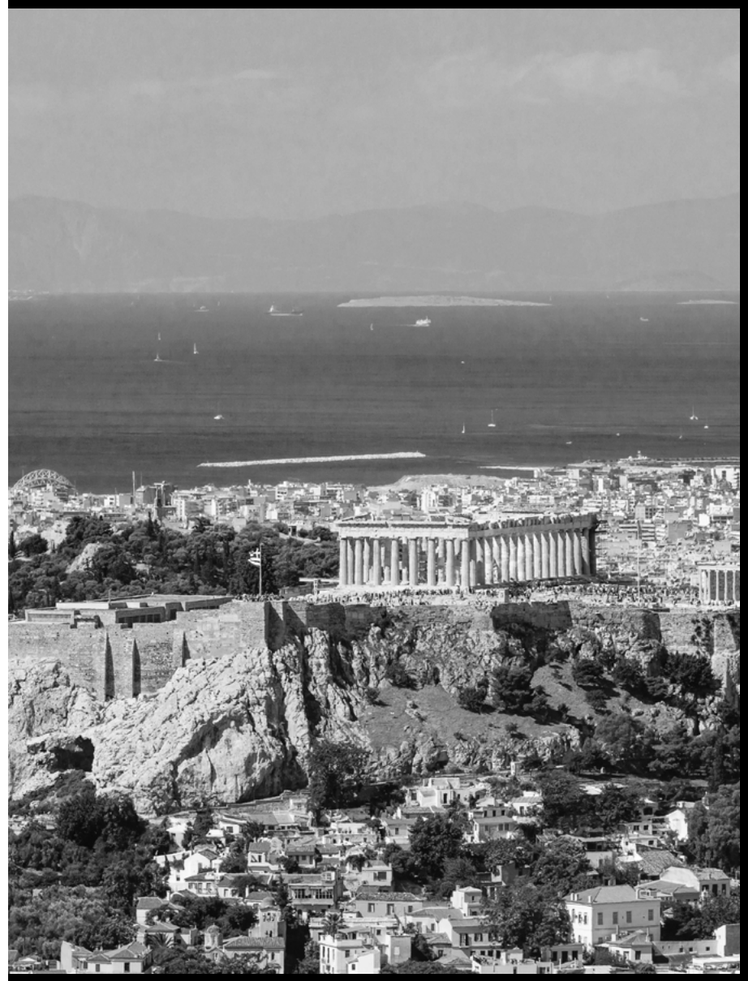
When assessing the importance of the world's shipping centers with an equally weighted combination of four objective indicators and subjective evaluations from 200 leading maritime professionals, Singapore, Athens and Hamburg take the top three spots in the total ranking of the leading shipping centers. With Hong Kong and Shanghai coming next in the ranking, this means that three of the top five shipping centers are now located in Asia. This is a change from the 2017 edition of this report, where European maritime cities were leading the top five.

A general observation for the shipping pillar is that the Asian-based maritime cities have either maintained the same ranking as the 2017 report (Singapore) or improved their ranking such as Hong Kong, Shanghai, Tokyo and Busan. In Europe, it is only Athens and Rotterdam that have moved up in their ranking, with the biggest improvement by Rotterdam which moved four places up. Most of the leading maritime cities in Europe in this ranking have suffered a downgrade, such as Hamburg, London and Oslo.

Globally, there has been a 9% rise in the world's fleet value since 2016. The world's total fleet value is concentrated in the US, Japan, China and Greece whilst Europe currently remains an important center for shipowners, with roughly 40% of the world fleet value being controlled by owners based there. However, whilst Europe has historically been dominant when it comes to ownership, operations have increasingly moved away from Europe, and today many Asian cities are more important for operations than traditional European centers. It should also be noted that European ownership dominance is actually on a gradual decline, as Asian shipowners have taken most of the fleet growth in the last few years. Since 2012 the European share of the world fleet (in terms of GT) has fallen from 47 to 35%. Asian owners on the other hand are increasing their market share and now control 41%, up from 38% in 2012. In particular, Chinese owners have increased their share of the fleet and now own 12% of the world fleet.

Based on the objective indicators, Athens and Singapore are the leading shipping centers, followed by Hamburg and Tokyo. This ranking is, to some extent, aligned with what the experts say, with Singapore and Hong Kong in the lead, followed by Athens and Hamburg. The main difference lies with Tokyo, which is subjectively ranked 11th. This is possibly due to Japanese owners being focused on local cooperation instead of having a global outlook. Shanghai is ranked as the 5th strongest shipping city in the world, with an equal score both on the subjective and objective criteria.

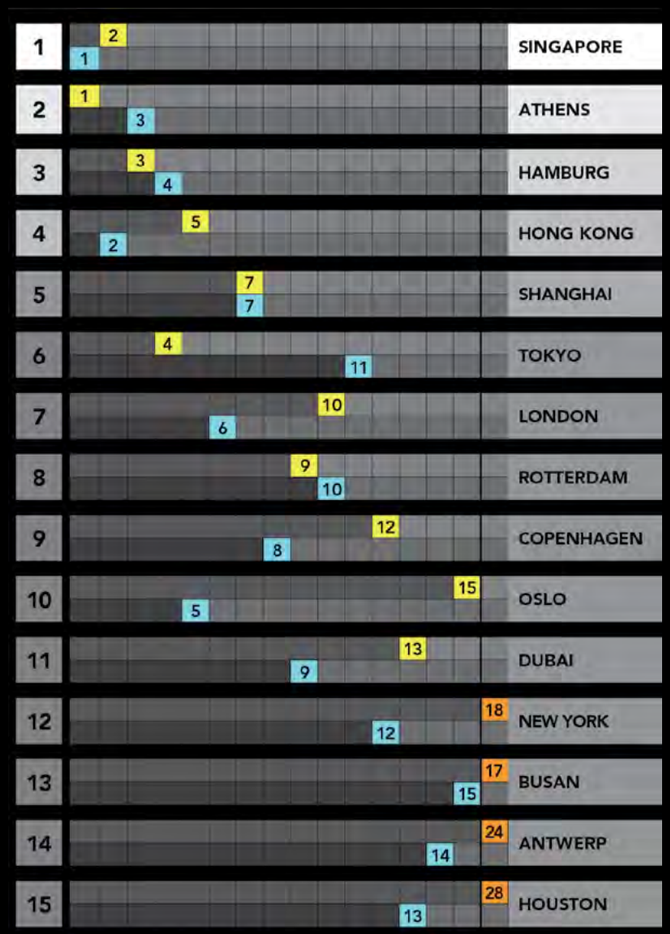
Singapore's strength lies, to a large extent, in its geographic location with close proximity to important markets. The city is a key market place for shipping with an important center for commercial management. Our industry experts rank Singapore highest, while the city scores slightly weaker on the objective criteria.



"The maritime industry will transform; the liner & tanker industry will consolidate leading to merging of suppliers such that only the big and efficient players or the small and highly innovative players will survive"

– INDUSTRY EXPERT FROM SINGAPORE

RANKING OF SHIPPING CENTERS



"The ability to develop technology that will meet the new requirements imposed by environmental challenges and changing regulatory framework"

– INDUSTRY EXPERT FROM OSLO

Still Singapore keeps its position as the leading shipping center in the world. Singapore is home to the third largest fleet in the world (at city level), while the second largest fleet is managed from the city. This demonstrates the strength in operational capabilities in the city. One of the industry experts highlights that the presence of many foreign owners in the city. This illustrates Singapore's global attractiveness. At the same time, it could also be a sign of vulnerability, because foreign companies probably are more footloose than domestic companies.

Athens' strengths lie in an impressively large and strong shipowning community. Athens is home to the world's largest fleet and has a strong ownership position with more than 700 Greek shipowners located both in Athens and around the world. Many Greek shipowners are in cities outside of Greece, something that can explain why Athens only ranks third on the subjective indicators, while it is number one on objective indicators. Furthermore, Athens is being perceived as primarily serving the local Greek shipping companies and not international shipping entities and hence the experts have voted for other shipping centers that are taking a dominant regional or global role in international shipping. Greek shipowners have played a key role in the industry for decades, and they are still expected to be a strong player also in the future. This view can be strengthened by looking at the development in orderbook volume for Greek shipowners located in Athens, in terms of CGT. The contracted orderbook volume has more than doubled each year since 2016. Thus, Greek shipowners in Athens have experienced an outstanding exponential growth in contracted CGT-values the last few years.

When measured at city level, the worlds' fourth largest fleet is controlled by owners in the Hamburg region, making it an important shipping hub in Europe. Industry experts also rank Hamburg as one of the five leading shipping centers of the world. Despite this, the value of the German fleet has fallen over the last years. Owners in Hamburg have focused on container shipping, a segment that has seen low rates and large bankruptcies during the last years. The shipowning community is also not very strong, the reason for this being that most of their fleet has been financed through KG structures, leaving the individual owners with little control over the fleet. The KG structure is a limited partnership with typically the sole general partner being a limited liability company. It can thus combine the advantages of a partnership with those of the limited liability of a corporation. This could be one of the reasons why relatively few companies would consider relocating their shipping headquarter to Hamburg.

Rotterdam has moved up in the ranking this year, due to its improved score on the objective criteria. Rotterdam has benefitted from an increase in the size of the fleet that is controlled as well as managed from the city; the fleet controlled by owners based in Rotterdam has increased by 50% whilst the fleet size that is managed from there has grown by close to 60%.

EXPERT ASSESSMENT

For the shipping pillar, the expert panel identified Singapore, Athens and Hong Kong as the overall three leading cities. This is a change from the 2017 analysis since Hong Kong and Athens were not perceived to be in the top 4 as shipping centers, with their positions formerly taken by Hamburg and London. Oslo, Dubai, New York and Busan have also fallen slightly in their overall ranking as shipping cities by the industry experts. This new perception from the industry experts about the ranking of these maritime cities is due to various factors as explained below.

When considering the breakdown of the industry experts' assessment for the shipping pillar, it is seen from Figure 1B that the preferred maritime cities for all key shipping activities (i.e. ownership, operations and management) are Singapore, London, Hong Kong, Hamburg and Oslo. Of the expert pool used in this study, those business executives with strong insights in shipping indicated they would prioritize Singapore, London, Hong Kong, Hamburg and Oslo should they be given the choice to relocate their companies' headquarter. This ranking is slightly different when it comes to choosing a city for operating their fleets and companies; Dubai and Shanghai are in the top 5 preferred locations, displacing London and Oslo.

Singapore has a strong position, both commercially and operationally, and is also an important meeting place for shipowners even if many of them are not originally from Singapore. An important reason for Singapore's popularity is its stable pro-business environment. In the recent editions of the World Bank's "Ease of doing Business" Index, only New Zealand has been ahead of Singapore.

Hong Kong has achieved an overall 2nd position by our experts, which is a clear improvement from the previous report. Hong Kong is popular for its strong infrastructure in promoting and supporting the ease of conducting shipping business there, with efficient customs procedures. Hong Kong is ranked 2nd by the industry experts as the most attractive location for shipping operations and is in 3rd position when it comes to attracting shipping companies' headquarter for relocation.

Athens is placed 3rd on the subjective ranking. Greek shipowners have been important in the shipping industry for decades and the country used to be home to key industry players such as Aristotle Onassis and Stavros Niarchos. Greece's shipping magnates have emerged largely unscathed from the country's financial crisis and one of the industry's longest downturns. Today, the shipowning environment is still strong, even though many of the Greek shipowners run their business from other cities.

"The upcoming years in the industry will see continual growth of maritime shipping industry and shipowners in Asia, compared with the rest of the world"

– Industry Expert

With Hong Kong and Athens pushing ahead in the experts' assessment, Hamburg and London are now subjectively ranked 4th and 6th. The drop behind London's subjective ranking could also be due to the perceived effects of Brexit.

Over the past few years, industry experts have been acknowledging Dubai as having a strong position in the shipping pillar. When asked about the current leading shipping centers, Dubai is ranked 11th but 6th if shipping business executives were given the choice of relocating their companies' headquarter. Dubai's best score in the shipping pillar is however from industry experts ranking it 3rd relative to other leading maritime cities for the operations of a shipping business. This suggests that Dubai is seen as an attractive location for shipping activities and might be a growing center for shipping in the future.

Fig. 1A - Percentage of industry experts that rank the cities as top-five within shipping activities

Source: Menon (2019)

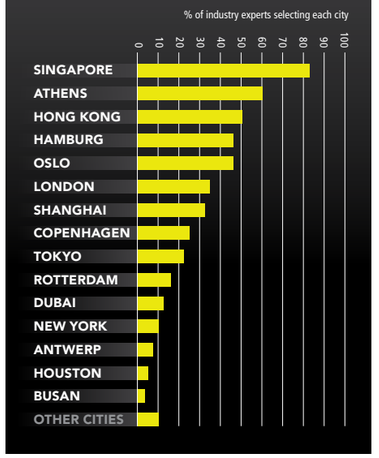
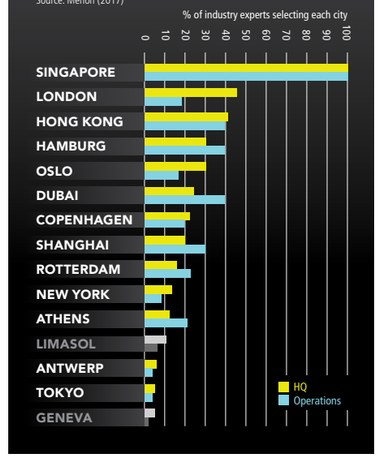


Fig. 1B - Preferred city for relocation of headquarter or operations. Number of shipping companies selecting each city

Source: Menon (2017)



OBJECTIVE INDICATORS' ASSESSMENT

To be recognized as a leading center for shipping, a city must be the registered home to a strong number of shipowners and managers, both in terms of their fleet size as well as fleet value. The number of shipping companies that chose to have their headquarters in a particular city will further impact this city's ranking in our benchmarking assessment of the objective indicators for the shipping pillar. These objective indicators rank Athens first due to its position as a city controlling and managing the largest and most valuable fleet. Singapore comes second, while Hamburg ranks third.

As of March 2019, the world orderbook in terms of GT is dominated by Japanese, Chinese and Greek owners. When considering the number of ships on order, the leading owners' country are Japan, China, Singapore, Norway and Greece. This suggests that, from an objective point of view, Athens is likely to keep its position as a significant ownership city, while the importance of both Tokyo and Shanghai will continue to rise.

SIZE OF SHIPOWNERS' FLEET AND MANAGEMENT OF FLEET

In Figure 2, cities are ranked by the total fleet in compensated gross tonnage (CGT) based on owners located there. Data was compiled for the entire world fleet and vessels were then assigned to individual cities where their owners are located. Athens comes out strongly in the first position, with an owned fleet of 97 million CGT, followed by Tokyo, Singapore and Hamburg each of which have only half this amount. By looking at owners located in a city and not at a country level, hubs like Singapore and Hong Kong will increase their relative importance. National numbers will generally include several shipping communities located within a country.

In addition to ownership, the size of the fleet managed from the different cities were also considered. For an international industry like the maritime business, ownership and management of companies can easily be split up to take advantage of specialized local competence in different cities. For example, in Singapore, whilst its shipowners control a fleet of 45 million CGT, the city is of such importance for the management of other fleets that the figure is almost 60% more when measured in terms of managed fleet. An even stronger effect is seen in Busan; the city manages a fleet that is more than four times as large as the owned fleet. Similar effects are observed in Vancouver, Limassol, Glasgow and Manila.

It can also be noted that whilst New York plays a key role in financing maritime operations, its commercial and operational capacity is weak. The fleet managed from New York is only 40% of its controlled fleet. Such weak fleet managed to fleet controlled ratios are also observed in Seoul, Tokyo, Imabari and Oslo.

VALUE OF CITY-CONTROLLED FLEET

Another means of benchmarking the cities is by considering the value of the fleet controlled from these cities. As opposed to the size of a fleet, the value of the fleet offers a better reflection of its economic importance. This evaluation is based on data from Clarksons World Fleet Register and estimating the value of share of the fleet controlled from the city out of its nation. Globally, there has been a rise in the world's fleet value in the past recent years, with USD 873 bn in 2016 compared to USD 951 bn as of March 2019. The world's total fleet value is concentrated in the US, Japan, China and Greece whilst Europe currently remains an important center for shipowners, with roughly 40% of the world fleet value being controlled by owners based there.

At a city level, as shown in Figure 3, the top 15 cities in this ranking control a fleet valued at more than USD 487 bn which is about half of the world fleet's value. This share illustrates how important these 15 cities are in the global world of shipping. Tokyo and Athens have increased their fleet value from 2017, whilst a drop in fleet value is observed for Singapore and New York, possibly as a result of a decrease in their fleet size either through the sale or the scrapping of ships.

The composition of the merchant fleet differs between cities. Athens might be best known for being home to a large tanker fleet, but the city also has a substantial fleet within the bulk, container and gas carrying segment. Tokyo has a well-diversified fleet consisting of bulkers, tankers, ro-ro vessels and gas carriers. Hamburg is quite specialized within containerships, while Singapore has its strength within tankers, bulkers, offshore and containerships.

NUMBER OF SHIPPING HEADQUARTERS

The location of shipping companies is a strong indicator of a city's attractiveness. Figure 4 shows the number of shipping companies with headquarters in each city. Athens is ahead of all other cities for this indicator with 193 shipping companies registered there, followed closely by Singapore and Jakarta. Next in line, but with a drop of almost half of the amount of shipping companies that are headquartered in Athens are Hamburg and Tokyo. Rotterdam, Istanbul, Dubai have on average 66 shipping companies headquartered there. It should be emphasized, however, that although only companies with at least 5 ships are included, cities with many small companies are favored on this indicator compared to cities with few but large companies. Copenhagen, with the A.P. Møller-Mærsk headquarter, falls weak on this indicator.

Fig. 2 - CGT owned by shipmanagers registered in the city / Size of fleet (CGT) controlled by shipowners registered in a city

Source: Clarksons/ Menon (2019)

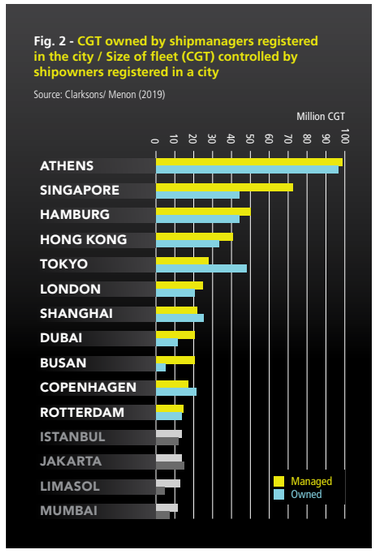


Fig. 3 - The 15 most valuable fleets in the world. Value in Bill USD of the fleet controlled by companies with headquarter in the city

Source: Clarksons/ Menon (2019)

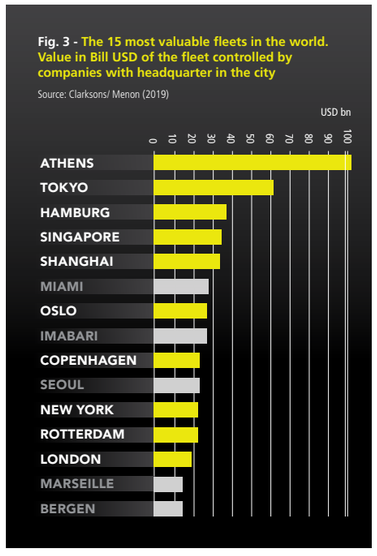
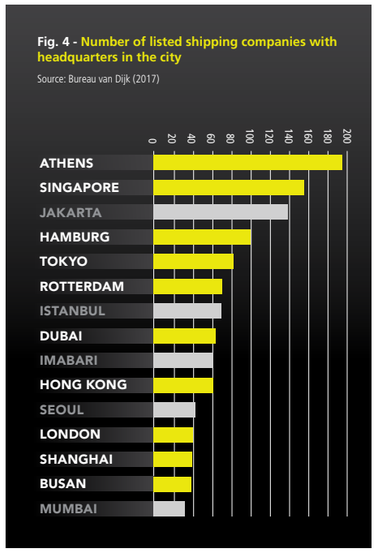


Fig. 4 - Number of listed shipping companies with headquarters in the city

Source: Bureau van Dijk (2017)



MARITIME FINANCE AND LAW

SUMMARY

1	2	3	4	5
LONDON	NEW YORK	OSLO	HONG KONG	SINGAPORE

"Funding accessibility seems to be progressively shifting to the Far East and is expected to remain as such whether China (through Hong Kong or Shanghai) will start putting local content, or in-country value assessments to access the funding."

– INDUSTRY EXPERT FROM HAMBURG

Overall, London is ranked first in the world for maritime finance and law, followed by New York, Oslo, Hong Kong and Singapore. London has a special position in the financial industry globally and is widely recognized for its law-related and marine insurance services. It is home to world-leading institutions, such as Lloyd's for insurance, and English law is the most widely applied in shipping disputes. New York, Hong Kong and Singapore together with London, are considered the four leading global financial cities according to the Global Financial Centres Index.

When it comes to maritime finance, our data rank New York first, followed by Oslo. New York is home to the world's largest maritime stock exchange and plays a key role in financing maritime operations. In the last few years, the importance of private equity in the industry has increased at the expense of traditional shipping banks, and New York based institutions have played a key role in this development. There seems to be a roll back now with banks again playing the major role in financing. In terms of the number of listed maritime companies on their local stock exchanges, Hong Kong, Tokyo and Shanghai have also boosted their numbers since 2017, indicating that they are attractive markets for registering new companies (IPOs).

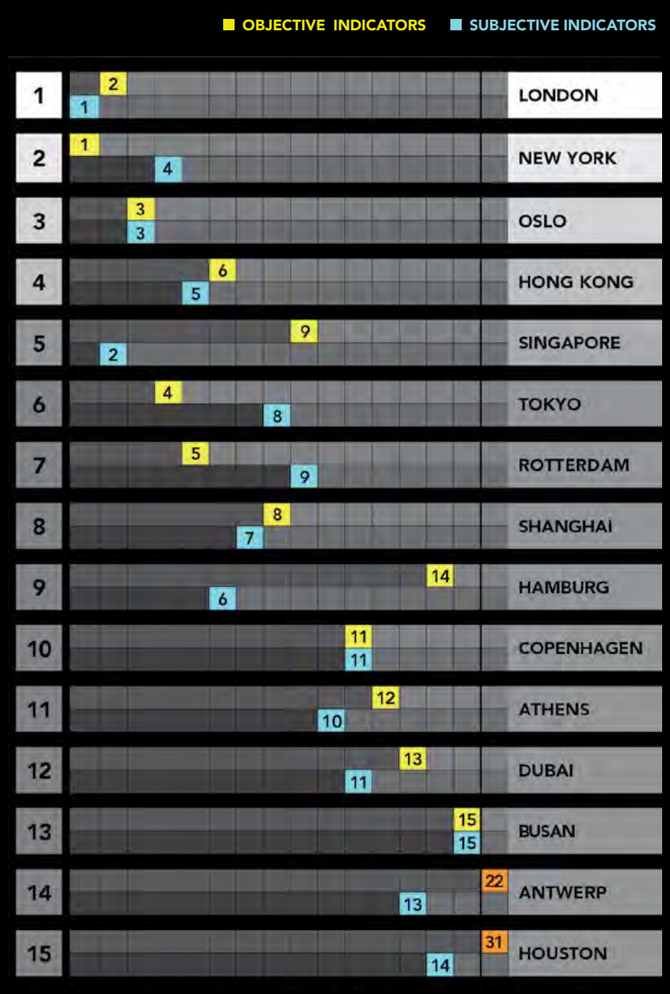
Oslo's strong position in maritime finance is mainly due to Norway's strong historical position in the maritime industry and the development of world leading financial services that have supported this industry. Oslo is home to the world's two leading shipping banks and has a strong position with a maritime focused stock exchange and leading insurance and brokering entities.

In ship financing, whilst Rotterdam is behind Oslo, it is still considered a leading city in this aspect, with a 50% increase in loan value from 2017. Rotterdam-based banks ING and ABN AMRO have boosted their position for both bookrunner loans and in their MLA (Mandated Lead Arranger) portfolios.

Following the recent shipping crisis, Asian (particularly Chinese banks) have emerged in ship finance and as of today, three out of global top ten banks are now Chinese banks (e.g. Bank of China, ICBC, China Exim). When assessing top shipping portfolios by banks headquartered in various cities across the world, Beijing is the top performer, followed by Tokyo, Paris, Oslo and Rotterdam.

According to the industry experts, there seems to be four cities that stand out for maritime finance – London, Oslo, New York but also Singapore. They ranked Singapore as the second most important city even though on the objective criteria Singapore is in the 9th position, behind Rotterdam, Hong Kong and Shanghai.

RANKING MARITIME FINANCE AND LAW



EXPERT ASSESSMENT

Maritime activities tie up large amounts of capital. The industry is characterized by cyclical markets. Hence, access to capital will determine the long-term success of many companies. Companies finance themselves by offering bonds, loans and stocks to owners and other financial entities. London, Singapore, Oslo and New York remain the clear leaders within this field, according to the industry experts, due to their strong positions in banking, law, insurance and brokering services. The main difference in the experts' opinion compared to the previous assessment is that Tokyo and Dubai are now judged to be better in the maritime finance and law pillar, whilst Athens, Houston and Busan have dropped in this subjective assessment.

OBJECTIVE INDICATORS' ASSESSMENT

Eight objective indicators were chosen to benchmark the leading maritime financial and legal centers. These indicators measure the volume of legal and financial expertise and associated activities in each selected city – from the number of maritime legal experts rooted in each location to the volume of mandated loans issued from the financial institutes and companies that provide financing (debt, equity, mezzanine) for the industry, primarily for the sale and purchase of vessels. These companies also include international and investment banks, private equity firms as well as smaller boutiques, which act as arrangers or introducers of capital. Data on the number of listed maritime companies, and volume of traded bonds, IPO and follow-ons from stock exchanges headquartered in each city was also used as an objective indicator.

LEADING FINANCIAL CITIES

Maritime cities have been benchmarked based on the market value and the number of listed maritime companies on their local stock exchanges. New York is by far the largest equity market in the world for maritime stocks, both in number of tradable stocks and market capitalization of the companies.

Compared to the 2017 results, Oslo has maintained its second position when it comes to the number of tradable stocks. Hong Kong, Tokyo and Shanghai have boosted their numbers since 2017, indicating that they are attractive markets for registering new stocks. Singapore which was previously ranked third, has now dropped to the 7th position in a tie with Kuala Lumpur, noting that Kuala Lumpur, Busan and Mumbai have maintained the same number of tradable stocks since 2017.

In terms of market capitalization of maritime stocks, Shanghai and Copenhagen have maintained their 2nd and 3rd ranks, respectively, after New York, even though there was an overall reduction in their values from 2017. On both these two exchanges, one or two major companies dominate the value of maritime stocks. In Shanghai, China Shipbuilding Industry combined with Shanghai International Port Group, has a combined market capitalization of USD 43.5 bn, while A.P. Møller-Mærsk A/S traded at a total value of USD 26.5 bn on the stock exchange in Copenhagen. That is approximately the same value as world-leading companies in other industries such as Kraft Foods and Hyundai Motor. It is also observed that Oslo suffered a 30% drop from its 2017 market value mainly because of the decline in the offshore industry, for example among seismic service companies like PGS and subsea construction, like Subsea 7.

When considering the trading volume of bonds, IPO and follow-ons from each city's stock exchange during the period 2017 to 2019, New York is leading, followed by Hong Kong, Oslo and Shanghai. Singapore, in the 5th position, traded almost half of what Oslo achieved during the same period.

BANKS – SHIP FINANCING

Whilst New York stands out as the leading financial capital of the world, in Europe, Oslo and Rotterdam seem to be the two leading cities for ship finance. Oslo-based DNB and Nordea (shipping division) are the two leading ship finance banks measured in terms of book runner and MLA (Mandated Lead Arranger) portfolios. In Rotterdam, the banks ING and ABN AMRO have boosted their position for both bookrunner loans and in MLA. BNP Paribas, based in Paris, is a new entry, whereas New York is losing its position, with Citi falling on both bookrunner and MLA. Danske Bank in Copenhagen has also fallen in bookrunner loans while Stockholm-based SEB has improved its position in MLA.

Many ships are financed by syndicated loans, which reduce the risk for the individual lenders. In this process one bank usually functions as the mandated lead arranger. That means that the bank has the leading role in the financing stage of a project. During the syndication process one of the banks may also fulfil the role of book runner. When the structure and terms of the loan have been agreed, one (or a number) of banks will be appointed "book runner" and sell the loan to other banks in the syndicated loan market. In some markets national export credit banks also play a key role in the financing process. Oslo is the most important center in the world for this kind of financing. Both Nordea and DNB have their shipping headquarters located in Oslo, with regional offices in maritime cities like London, New York, Singapore and Shanghai.

However, in general, with traditional European banks gradually cutting back on ship financing and with owners increasingly looking for alternative ways to finance their fleet renewal and investment programs, Chinese lenders, leasing institutions and export-import agencies are quickly filling a critical void left by the retreat of European commercial banks, especially for newbuilding orders. Prior to the shipping crisis European banks dominated in global ship financing sector. Five out of global top ten were in Germany, two in Scandinavia, one in the UK, one in France and only one was based in Asia. However, with the crisis many traditional lenders experienced heavy hits on their P&L and were forced to write-off, reduce or even exit their shipping portfolios. Due to the shipping crisis, Asian (particularly Chinese banks) have emerged in ship finance and as of today, three out of global top ten banks are now Chinese banks (e.g. Bank of China, ICBC, China Exim). When assessing top shipping portfolios by banks headquartered in various cities across the world, Beijing is the top performer, followed by Tokyo. Considering that the recent slowdown in the Chinese economy and with fewer newbuilding orders, it is expected that the financing from banks based in the Far East may also be affected.

LEGAL CENTERS

To assess the strength of cities when it comes to maritime law, the use of statistics such as the number of leading legal experts in shipping law as well as the number of maritime lawyers from the broader maritime sector give an indication of a city's importance for financial and legal transactions. Strong knowledge centers with many experts also attract more business to a city. Who's Who Legal, which identifies the foremost legal practitioners in business law based upon comprehensive and independent research, shows that London, by far, has the largest number of leading legal experts (81) in maritime law. Behind London are Hamburg, Singapore, New York and Hong Kong with an average of 20 such legal experts. When considering the broader maritime sector, statistics show that London remains the leading city with the highest number of maritime lawyers, followed closely by New York and Athens. Whilst Athens is home to 60 maritime lawyers, Singapore, Hamburg and Hong Kong have an average of 30 such lawyers.

What these statistics show is that, with English law far widely used in shipping disputes, London has sealed its position as the best location to resolve maritime disputes and for international maritime arbitrations. In that aspect, Singapore and Hong Kong could be London's strongest competitors. In Singapore, the efforts of the Singapore Maritime Foundation (SMF) to develop the city's own Ship Sale Form and SMF's involvement in the development of a modern Charter Party Form together with BIMCO and Association of Shipbrokers and Agents (ASBA) incorporating Singapore as the location of arbitration (in addition to New York and London), reflects the growing importance of Singapore as a leading international maritime legal center. The strength of both Singapore and Hong Kong seems to be related to their proximity to commercial operations and access to key industry players, with Hong Kong positioned as a gateway to mainland China. In the Middle East, whilst not a direct challenger to London, Dubai is also building its reputation as a maritime legal center. The Emirates Maritime Arbitration Centre (EMAC) was launched in 2016 and aims to serve as the first specialized marine arbitration center in the Middle East.

MARINE INSURANCE

Marine insurance was the earliest well-developed kind of insurance, with origins in the Greek and Roman maritime loan. Marine insurance in the modern world is a prerequisite for a functioning shipping market. Large shipping companies transport cargo worth hundreds of millions of dollars every day on large ships that themselves might be as valuable as their cargo. To reduce risk involved in such operations, shipping companies insure both the cargo and the hull of the ship.

To assess a city's position in terms of its reputation as a market place for insurance coverage and its marine insurance services, several factors were considered such as concentration of P&I clubs and the collected insurance premium at city level, and the presence of commercial insurances covering cargo, hull and machinery (H&M). This assessment shows that London, home to the first marine insurance company in the early 18th century with Lloyd's of London and complemented by the International Underwriting Association (IUA), continues to be the unrivalled city for marine insurance with more than 50% of International Group (IG) of P&I clubs covered gross tonnage served by UK-based clubs, over 30% of global cargo and H&M premium collected by UK-headquartered insurance companies and the highest number of representation offices of all clusters. However, considering the recent acquisition of rival Jardine Lloyd Thompson (by Marsh's parent company Marsh & McLennan Companies), there might be an impact on future ranking for London as the company is now headquartered in New York. There is already a positive development for New York; the city has shifted three levels up from our previous report and is now in the 4th position behind Tokyo and Singapore.

Out of Asia, Tokyo and Shanghai have maintained their positions in the top 5, with their focus being mainly on domestic clients. Singapore has dramatically improved and is now ranked 3rd in this indicator, possibly as a result of its efforts to increase its marine insurance activities by introducing its own Singapore War Risk Mutual supported by its industry association (Singapore Shipping Association, SSA).

Fig. 5 - The five leading maritime financial and legal centers, according to industry experts

Source: Menon (2019)

Fig. 6 - Market value and number of listed maritime companies on local stock exchange

Source: Clarkson and ORBIS/Bureu van Dijk and Bloomberg

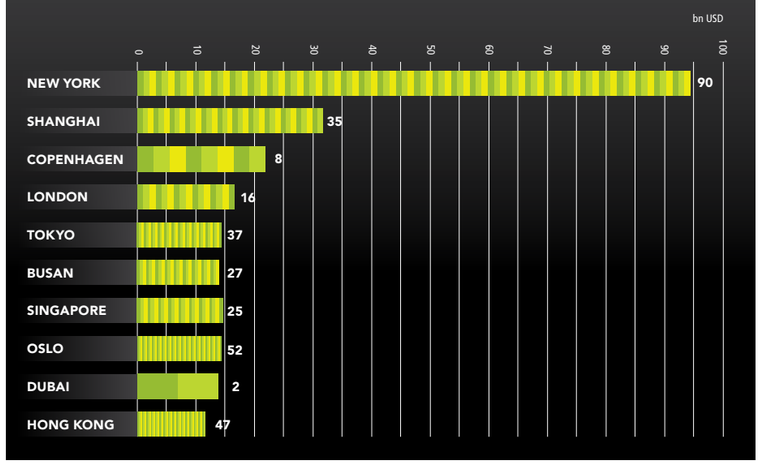


Fig. 7 - IPO/Bonds/Follow-ons during the period 2017 to 2019

Source: Menon (2019)

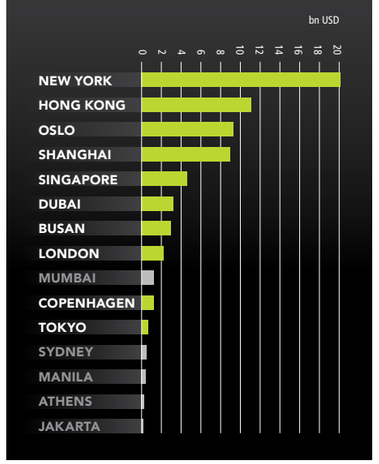


Fig. 8 - Shipping banks portfolio

Source: Petrofin Bank Research

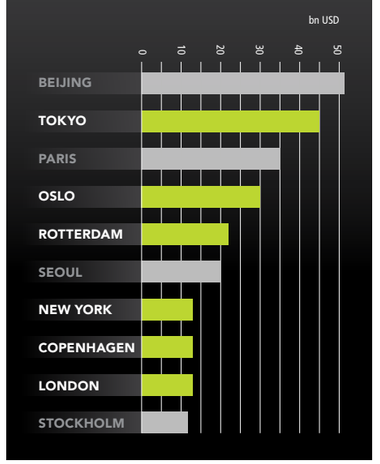
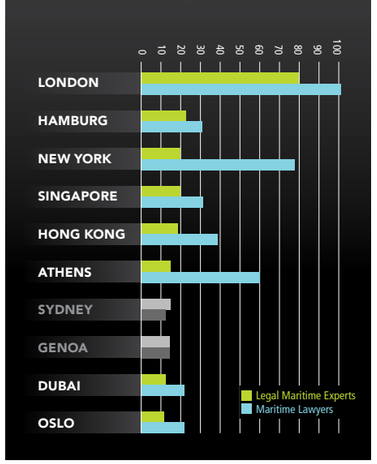


Fig. 9 - Number of leading maritime legal experts (green) and laywers (blue) practicing in the city

Source: Who's Who and World Ship Register



MARITIME TECHNOLOGY

"The maritime industry will see increased focus on digitalization and data analytics, with an intention to strengthen cybersecurity"

– INDUSTRY EXPERT FROM SINGAPORE

SUMMARY

1	2	3	4	5
OSLO	LONDON	HAMBURG	BUSAN	TOKYO

Benchmarking of cities, based on objective indicators, for their standing on maritime technology is challenging. Ideally, measures of R&D, education and innovation should be used. However, it is hard to find global data sources at city-level that compare the magnitude, relevance and quality of maritime research, education and innovation. Such factors are more suited for subjective assessments by maritime experts. Some dimensions of maritime technology that can be objectively measured have nevertheless been identified and include size of fleet (CGT) delivered by shipyards, share of world fleet by classification societies, trend in the purchasing prices of ships built at active shipyards, the number of patents by maritime companies based in a city as well as the number of maritime education institutions found there.

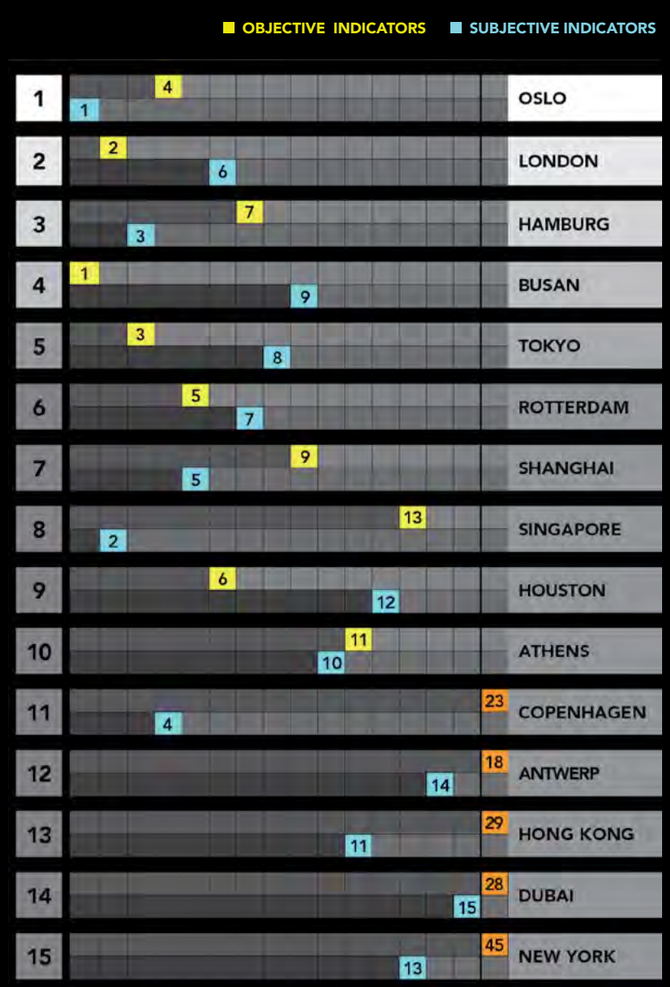
Oslo is ranked as the world leading city when it comes to maritime technology – based on the objective criteria and experts' assessment – followed by London, Hamburg and Busan. With London, Hamburg, Rotterdam and Athens having now moved up in the maritime technology rank, this resulted in a down shuffling of other cities such as Singapore and Shanghai.

One of the most important technology companies in the Norwegian cluster is DNV GL with its head office in Oslo. DNV GL is one of the world's leading maritime R&D companies, investing 5% of its revenues on new technology development, as well as the world's largest ship classification society according to Lloyd's List. The Oslo region also hosts world leading equipment producers, like Kongsberg Maritime and smaller specialized tech-companies such as Xeneta.

London scores greatly from its prestigious maritime education institutions and for being the home of the oldest classification society with a history from 1760, Lloyd's Register. Busan's good ranking in this pillar is primarily due to its big fleet size (CGT) delivered by its shipyards, the market value of the ships built there, as well as leading in the number of patents produced by the maritime firms headquartered there. Busan is the center for the South Korean shipbuilding cluster where the major shipyards focus on offshore units and high value-added "mega-ships" such as container ships, VLCCs and LNG tankers.

Tokyo, with the presence of classification body ClassNK, the size of its classified fleet and its second position in terms of number of patents, places the city within the top 5 in this pillar. ClassNK is the world's second largest classification society and has large parts of its research and development located in the Tokyo area. Tokyo also has some yard activity located within the regional boundaries. On the subjective criteria, industry experts rank Tokyo as the 8th most important city for maritime technology.

RANKING



EXPERT ASSESSMENT

The expert assessment for the maritime technology pillar has been maintained from the previous report; Oslo, Singapore, Hamburg, Copenhagen and Shanghai are the overall five leading cities under this pillar. Only a swap between Oslo and Singapore has occurred, which now places Oslo first in the experts' opinion for offering topnotch R&D institutions and for being home to a highly advanced maritime equipment industry. When seeking experts' opinion on a new indicator related to cities which are at the forefront of environmentally sustainable technologies and solutions for the oceans, Oslo is acknowledged to be the leading city, with a higher score than the combined value of the three next in the rank – Singapore, Copenhagen and Rotterdam. Note that the equipment manufacturing is often located outside of the city region, whereas technology development and engineering are to a large extent within.

Another key finding is that London has moved up in the overall subjective assessment and pushed ahead of Rotterdam, Tokyo and Busan, the latter two being strong on shipbuilding. This is due to London's recognition for being the home of excellent educational and R&D centers, as can be seen when considering the breakdown of the experts' assessment.

KNOWLEDGE CENTERS – R&D AND EDUCATION

Maritime experts in this study identified Singapore, Oslo and Hamburg as being the leading maritime knowledge centers. High labor costs have forced the Norwegian and German maritime industry to seek technological advancement. Close links between educational centers, shipowners and manufacturers are critical for being a strong maritime center for R&D. The closely knit Norwegian maritime industry gives Oslo an advantage; from Oslo one can easily connect to other local maritime clusters in Norway. Hamburg has been the center for R&D in the German maritime industry. Since 1965, the city has been home to the Center for Maritime Technologies, and its predecessor Forschungszentrum des Deutschen Schiffbaus. The center's goal is to promote cooperation between various players in the industry and the academic world, universities and government agencies.

London, Shanghai and Copenhagen follow these top three cities in this ranking. London is particularly strong in maritime finance, for example with a specialized MSc in Shipping, Trade & Finance at Cass Business School. Rotterdam, having several universities and research institutions specialized in maritime, is placed in 7th position by the experts in this category. MARIN, the Maritime Research Institute Netherlands, is one of the leading institutes in the world for hydrodynamic research and maritime technology. Netherlands' Maritime University offers a MSc in Shipping and Transport (both full and part time) and has been set up in close cooperation with the maritime business community.

MARITIME TECHNOLOGY & EQUIPMENT

There is generally a demand for specialized equipment in the maritime industry to cater for improved efficiency under sea conditions as well as to address new operational limitations due to recent environmental regulations. Environmental regulations create new niche markets for maritime equipment, from ballast water treatment systems to marinized long-life batteries and new designs of engines running on unconventional marine fuels or other solutions for compliance against the upcoming IMO regulations such as the sulphur cap.

When assessing cities which are strongest in supporting and nurturing the development of maritime technology and equipment, the expert panel point to Singapore, Oslo, Shanghai, Hamburg and Busan as the places to go for world-class specialized maritime equipment.

Singapore's top rank is due to the city being a market place where buyers and sellers can meet, even without companies necessarily producing ship equipment and technological products in Singapore. Maritime business executives view Singapore as a place where all major marine equipment players are operating and where a high level of sophistication and competence exist locally to support high-value newbuilding of offshore assets, conversion projects, fabrication of process modules or to perform complex repair activities in Singapore efficiently with quick turnaround. Furthermore, the Maritime and Port Authority of Singapore (MPA) has put tremendous focus on R&D and advanced maritime technology as one of their core pillars in promoting Singapore as a global maritime hub. The strategy is backed by a significant funding through the Maritime Innovation and Technology (MINT) Fund since 2003. The fund was extended and topped up in 2013. Singapore also seeks close cooperation between publicly-funded institutions and private companies, as well as close collaborations with other leading maritime research institutions, such as the Research Council of Norway.

Chinese yards import around 50% of equipment installed in vessels, which illustrates that the most advanced parts of the equipment industry are still found outside of China. At the same time the technical capacity in the country is increasing. According to the State Intellectual Property Office, the number of patents relating to shipbuilding grew by more than 70% from 2008 to 2013.

Norway and Germany both have a long tradition of producing maritime equipment within a high cost environment. This has pushed Norwegian and German maritime equipment suppliers to develop and deliver innovative and advanced equipment with a high level of added value.

ENVIRONMENTALLY SUSTAINABLE TECHNOLOGIES & SOLUTIONS FOR THE OCEANS

Considering the major environmental challenges connected to the seaborne trade – and the huge opportunities for maritime companies to be part of the solution to these challenges – a new indicator was introduced this year on this topic; experts were asked which cities are in the forefront of environmentally sustainable technologies and solutions for the oceans. On this indicator, Oslo stands out as the main center for ocean technologies and solutions, with a higher score than the combined value of the three next in the rank – Singapore, Copenhagen and Rotterdam. It is also interesting to observe that, except for Singapore, ocean technologies and solutions are dominated by European cities in the top 5 ranks.

Oslo is forging its position in this aspect through a strong and collaborative partnership with key players to focus on ocean technology and sustainability. It aims to be the world's leading capital and ecosystem for sustainability-oriented ocean tech entrepreneurs. Key partners in this movement for sustainable ocean business include Nor-Shipping; the Katapult Ocean – an impact investment fund and accelerator program targeting sustainable solutions across ocean industries; EntrepreneurShip One – a zero emission pay-it-forward platform for the Nordic startup community; Ocean Industry Forum Oslofjord; Circular Norway; the environmental NGO Bellona, as well as a broad range of key maritime companies and cluster organisations

DIGITAL SERVICES

Last but not least, the industry experts were also asked in which cities they would find companies producing world-class maritime IT services and IT-based products. This is an important aspect to capture the expert panel's assessment on, since it is a strong indicator of how well a city is gearing itself to provide upgraded digital infrastructure as well as an environment that supports disruptive innovation models to its maritime industry. A location that offers such an environment conducive for innovation in the maritime industry will generally have a strong competitive edge.

In this aspect, the maritime experts score Singapore and Oslo score highest, followed by Copenhagen, Hamburg and London. An interesting observation is that Shanghai is regarded as being better than Rotterdam in being a city of world-class maritime IT, with a perception by the industry experts that it is well prepared to ride the digital transformation wave of the maritime industry.

In Singapore, MPA has been extremely proactive in promoting digital innovation and entrepreneurship within the Singapore maritime eco-system by launching the Pier71 to attract, build and accelerate start-ups, establishment of the Singapore Maritime Datahub to serve as collaborative platform for technology companies, startups and maritime stakeholders to co-develop innovative data-driven maritime solutions and renewed its collaboration agreement with the Research Council of Norway (RCN) to focus on Maritime Digitalization and Autonomous Vessels and Systems.

Fig. 10 - Share of industry experts that mention the city as "producing world class digital services and maritime IT-products"

Source: Menon (2019)

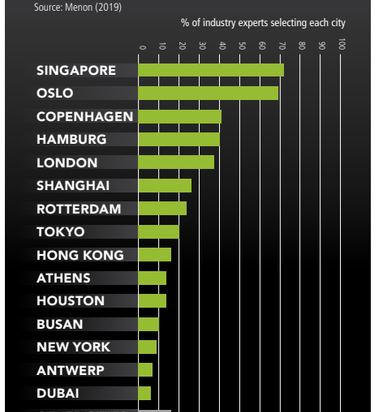


Fig. 11 - Share of industry experts that mention the city as "leading maritime R&D & educational centers of the world"

Source: Menon (2019)

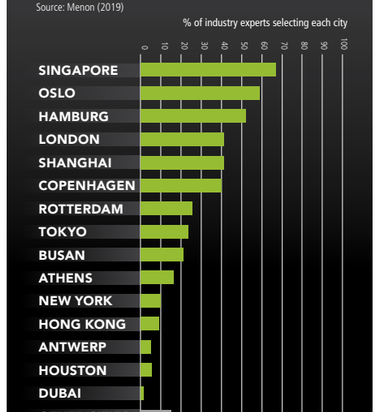


Fig. 12 - Share of industry experts that mention the city as "in the forefront of environmentally sustainable technologies and solutions for the oceans"

Source: Menon (2019)

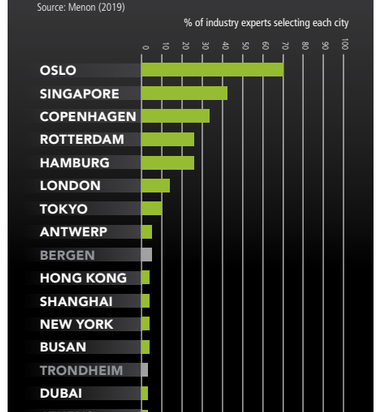


Fig. 13 - Size of fleet (CGT) delivered by active shipyards as of current fleet and orderbook.

Source: Clarksons/Menon (2019)

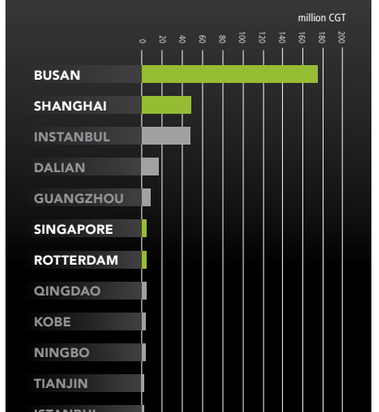


Fig. 14 - Size of fleet by classification societies headquarter (million CGT).

Source: Clarksons/Menon (2019)

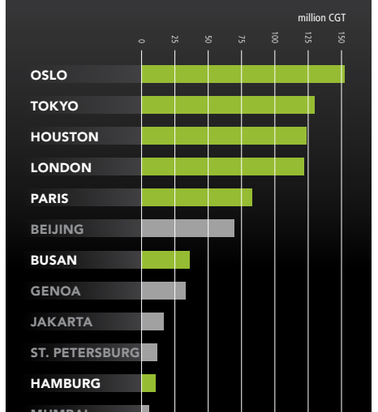
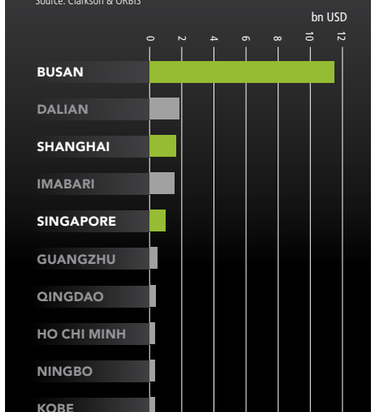


Fig. 15 - Market value of listed shipyards and technical service providers (by year-end 2018). By city headquarter (value in bn USD)

Source: Clarkson & ORBIS



OBJECTIVE INDICATORS' ASSESSMENT

SHIPBUILDING

At shipyards the demands from design and industry standards are put into action. Modern ships are a mosaic of parts from numerous subcontractors that become high-tech industrial assets for their owners. Assembling ships is a technologically and logistically demanding operation. Some shipyards build the entire ship in one location. For more technologically advanced ships, it is common for hull construction to occur in low cost countries before outfitting is done in countries with more highly skilled and costly labor. Shipyards are often surrounded by maritime equipment companies that supply them. These companies are therefore considered vital for the completeness of a maritime cluster.

One indication of the sophistication and leading technical competence in Europe can be seen when comparing the size and value of European yards' orderbook. Measured in size, European yards have less than 1% of the world orderbook (CGT), whereas when measured in value, European yards hold 4% of the world orderbook. This is due to the European yards' focus on high-end markets such as cruise, complex offshore assets and navy. Singapore would also score high on this measure as the city-state focuses on high value rigs and conversion/modifications of offshore structures.

When considering only the currently active shipyards and for the 50 cities for which the overall benchmarking is being done, a ranking based on both delivered CGT and current orderbook from these yards show that Busan is by far the leading city in this field. The region surrounding Busan is the center for the South Korean shipbuilding cluster and offers deep waters free from sand-banks. The major shipyards focus on offshore units and high value-added "mega-ships" such as container ships, VLCCs and LNG tankers. The yards in this region are also highly influenced by a mix of overcapacity in the market and the slow-down in newbuilding orders for the offshore oil and gas industry.

China is the world's second largest ship manufacturer in CGT (through its yards in Shanghai, Dalian and Guangzhou) and but is not yet as technologically advanced as the South Korean shipyards. The main vessel types leaving the Chinese yards have been bulkers, fishing vessels, tugs, general cargo ships and products tankers. Japan, with its large domestic market, comes third with the main contribution from yards in Imabari, primarily serving the fishing, general cargo and bulk carrier segments.

Italy, Germany, the Netherlands, France and Norway are the leading shipbuilders in Europe. Italian shipyards are known for their yachts, fishing vessels and passenger cruise ships, while German yards have primarily focused on containerships, cruise and general cargo ships. The Netherlands also has a history in building chemical inland waterway vessels, fishing vessels and general cargo ships. The Norwegian shipbuilding industry has for many years been specialized on highly advanced offshore vessels, but after the offshore crisis in 2015, has restructured toward fishing vessels, ferries, specialized cruise ships and other high value segments.

CLASSIFICATION SOCIETIES

A classification society is a non-governmental organisation that establishes and maintains the technical standards for ships and offshore structures. All class societies have a strong focus on R&D. Most of the members of IACS (International Association of Classification Societies) are foundations with a focus on supporting the industry and safety at sea. The societies are important technological R&D centers as they certify technological changes in constructions. Classification societies play a vital role in quality assurance in the maritime industry. Most societies have an international presence as this has become a prerequisite for serving the global industry. Many of the class societies have broadened their market focus during the last years.

When ranking the classification societies in terms of the size of their classified fleet, DNV GL, formed through the merger between Norway's DNV and Germany's Germanischer Lloyd and with its headquarters based in Oslo, takes the first place and thus pushes Oslo ahead in the city ranking. Tokyo with ClassNK takes the second position, followed by Houston which does well on this objective indicator much due to the presence of American Bureau of Shipping (ABS). Houston is also one of the leading centers of the world for offshore oil and gas activities, regarded by many as the world's leading center for oilfield equipment. Lloyd's Register, the oldest classification society with a history from 1760, headquartered in London places this city the fourth place, as shown in Figure 14 In the fifth place is Paris with Bureau Veritas. Beijing appears in the sixth position with China Classification Society.

Strategic focus on innovation and development, with support framework for SME's & individuals to foster innovation. The path should be clear and well communicated. Create a structure within the government to help companies that are trying to build or create something innovative in terms of providing opportunities for partnerships and pilots.

– Industry Expert from Dubai

MARKET VALUE OF SHIPS BUILT AT SHIPYARDS

Another parameter to understand the value-add of a yard to a maritime city is to factor in the market value of the ships built at the city's yard(s). Thus, when considering the recent purchasing price of ships built at different shipyards from 2017 to 2019 (as shown in Figure 15), Busan has sold ships from its shipyards at a price of USD 11.8 bn during this period whilst Dalian, Shanghai and Imabari have averaged at a price of USD 1.9 bn or 6 times less the price from Busan yards.

PATENTS BY MARITIME COMPANIES

Another means to measure how well a city's policies support R&D and innovation for its maritime industry is by considering the number of patents produced by maritime firms which are headquartered in that city. The patents analyzed for this indicator have been accumulated over several years and are a good measure of the technological sophistication and innovation within a company and thus an industry. From Figure 16, Busan had the highest number of patents in 2018, followed closely by Tokyo. Daewoo Shipbuilding & Marine Engineering Co. Ltd. holds almost 80% of the patents in Busan, classified under the "building of ships and floating structures" maritime segment (as per the NACE code). The remaining 20% of patents in Busan are split over more than 100 companies, all under the NACE code 3315 which is for "repair and maintenance of ships and boats".

In Tokyo, the "building of ships and floating structures" segment accounts for 93% of its total patents and held entirely by Mitsui E&S Holdings Co. Ltd. Remaining 7% patents are mostly held by Nippon Yusen Kabushiki Kaisha for the NACE segment "sea and coastal freight water transport".

In Europe, maritime cities such as Hamburg, London, Paris, Oslo and Rotterdam have only a small fraction of what Busan and Tokyo demonstrate in this field.

MARITIME EDUCATION INSTITUTIONS

The number of maritime education institutions found in a city is a strong message from the city on the importance it puts on the need for a culture of learning to improve and replenish the workforce for the maritime industry. Maritime companies in such a city benefit from the ease of finding a skilled maritime workforce. Thus, when considering the number of maritime education institutions found in each maritime city, London is the leading city and home to some prestigious maritime academies such as Cass Business School and London Shipping Law Centre. Rotterdam follows closely behind, where its maritime-focused educational institutions have a global reputation for excellence. Athens and Hamburg are in a tie, in the 3rd position, whilst Manila and Singapore hold the 4th position. Manila is a well-known training ground for seafarers, whereas in Singapore, the Bachelor and Master in Maritime Studies degree programs offered by NTU has been a significant source of maritime talent pipeline for more than a decade.

Fig. 16 - Number of patents developed by maritime firms per city

Source: ORBIS/Bureu van Dijk

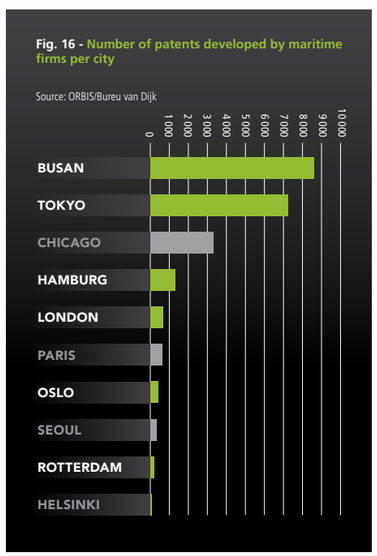
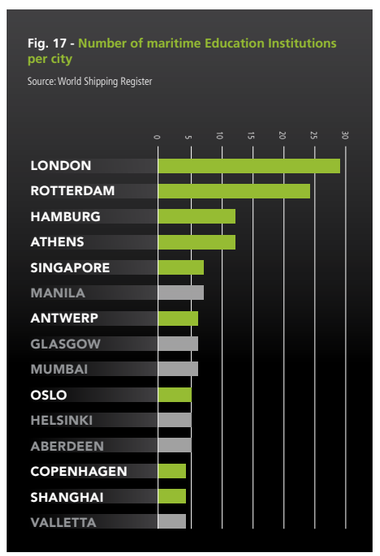


Fig. 17 - Number of maritime Education Institutions per city

Source: World Shipping Register



PORTS AND LOGISTICS SERVICES

"Higher availability of efficient and effective SMART infrastructures is the future of the maritime industry"

INDUSTRY EXPERT FROM DUBAI

SUMMARY

1	2	3	4	5
				
SINGAPORE	ROTTERDAM	HONG KONG	SHANGHAI	HAMBURG

Singapore is a top performer for port services and logistics, securing the first position on both objective criteria and experts' assessment. Singapore is home to the world's third largest port in terms of container and cargo volume handled. PSA International, one of the leading global port groups, is headquartered in Singapore and participates in 17 countries across Asia, Europe and the Americas with flagship operations in PSA Singapore Terminals and PSA Antwerp.

Rotterdam comes in the 2nd position of leading port cities, followed by Hong Kong, Shanghai and Hamburg. Whilst the world's largest ports in terms of container volume handled are found in Asia at Guangzhou and Shanghai, one of Rotterdam's main strengths is in its cargo volume handling capacity for which it is ahead of Guangzhou. Rotterdam is home to the largest port in Europe and is the 3rd largest port operator in the world. Its diverse port with well-established links to the European continent is emphasized by the experts and is also one of the world's most advanced. Rotterdam is ranked 1st on the World Bank's Quality of Port Infrastructure index since its port infrastructure is considered as the most efficient by international standards. The port has for many years focused its attention on increasing automation and Rotterdam Massvlakte II terminal is now fully automated. The port has also recently announced the development of a field lab with its own 3D metal printer. Rotterdam is thereby in the forefront when it comes to leveraging important new technology that will complement its core port activities.

Hong Kong is in the overall 3rd position in leading port cities, behind Rotterdam. Its ranking based on objective criteria is stronger than its assessment by the industry experts who placed it in the 5th position. Hong Kong is an important transshipment port and is home to the largest port operator in the world, with Hutchison Port Holdings. The efficiency and quality of its port is well recognized, placing it behind closely Rotterdam and Singapore on the Quality of Port Infrastructure index.

Shanghai and Hamburg are also in the top 5 leading port cities. Shanghai is robustly ranked in the 4th position by both industry experts and on the objective indicators scale. Even though Shanghai is ahead of Singapore in terms of container and cargo volume handled, and is the 2nd largest port operator behind Hong Kong, its main downfall is in its low ranking as per the World Bank' Quality of Port Infrastructure index which pushes it far behind leading port cities such as Rotterdam, Singapore, Hong Kong and Dubai. Hamburg is a strong shipping center and is the most important access point to the large German market. The efficiency and quality of its port is high, but its main boost in the top 5 ranking is from the subjective view of the industry experts.

Dubai is maintaining its importance in port services and logistics. The city is an important logistics hub both for aviation as well as the maritime industry. The city has strong backing from the government to become the preferred maritime city in the Middle East and is ranked 6th overall.

RANKING

EXPERT ASSESSMENT

For the last 4 years, the experts' assessment on the world's leading centers for ports and logistics services has remain unchanged towards Singapore and Rotterdam. Singapore has the benefit of proximity to the Asian market, and with the ease of doing business in Singapore, excellent connectivity and long history as a trading hub, combined with the city's highly efficient port, make our experts place Singapore first in the ranking.

London is losing its critical mass. Still very strong in some areas, but now noticeably smaller and less effective than European shipping centers for ship management and ship operations than Hamburg, Athens and Limassol. And it is now much less influential in ship management or ship operations than Singapore, Hong Kong or Shanghai.

– Industry Expert from London

Rotterdam is seen as the second most important center for port and logistics services. Rotterdam is the largest port in Europe and has the capability to handle the largest container vessels. From the city, goods are transported either by smaller ships or trucks or by the railway system that is closely linked to the rest of Europe. Rotterdam has several advantages including great connectivity, a business-friendly maritime environment, stable political environment, favorable tax legislation and proximity to major ports.

Hamburg, Shanghai and Hong Kong are next in this subjective rank behind Singapore and Rotterdam, maintaining their position since 2015. Hamburg is by far the most important German port and together with the port in Bremen, the biggest port area in Europe. Eurogate, with its head office in Bremen – one hour away from Hamburg – is Europe's leading container terminal logistics group. Its strong regional maritime cluster positions Hamburg as a leading maritime city of the world.

In recent years, Hong Kong's position as a gateway to the world's manufacturing sector has been challenged by the phenomenal growth of nearby Shenzhen and Guangzhou, as well as Shanghai, leading to a reduction in Hong Kong's market share.

Dubai is also ranked high by the experts. Dubai is a regional maritime center that focuses on increasing its presence in the industry. Currently Dubai's port, its status as an important logistics hub and, to a certain degree, its pro-business environment are its strengths as a city for maritime business activities.

SPECIALIZED LOGISTICAL SERVICES

The increasing size of modern cargo ships and increasing world trade puts pressure on ports to become larger and more automated. All around the world, ports are constantly upgraded and modernized to lower the cost of transportation and be more competitive. The shipping industry's ability to deliver reliable logistics services at a low cost is a prerequisite for the modern world economy. Many companies rely on supply chains that stretch over vast distances, even continents. It is important for cities that companies can use them as hubs for carrying out complex, highly specialized logistical services.

The industry experts point to Singapore and Rotterdam, followed by Hamburg and Shanghai, as the leading cities for offering the best port-related logistics services. It is not surprising that Singapore, one of the world's busiest ports, is on top. Rotterdam and Hamburg are also the largest ports in the European economy, and much of Europe's external trade is organized by companies located in these cities. We see a clear trend with 5-6 leading global port cities followed by the remaining cities with a more domestic or regional importance.

"The upcoming years in the industry will see higher degree of innovation in port facilities, increased information transparency for the final user and reinvention of container functions"

– Industry Expert from Kuala Lumpur

OBJECTIVE INDICATORS' ASSESSMENT

PORT VOLUME

Port cities are at the frontline of globalization, with approximately 90% of external trade volume transported by ship and loaded and unloaded at world ports. In a study by the OECD, it was concluded that well-run ports produce many economic benefits such as lowering the cost of trade, increasing value creation, job creation and attracting related maritime services. To get the best economic benefit from port operations, port cities must facilitate an increase in the maritime services offering and take advantage of possible spill-over effects for industrial development.

The world's largest ports in terms of container volume (TEU) handled are found in Asia at Guangzhou, Shanghai, and Singapore. While the port in Shanghai plays a key role in supporting the manufacturing industry in the larger region, Singapore and Hong Kong are more important as transshipment ports. If all Chinese ports were considered (some of which are not within the 50 top cities ranked across the 5 pillars in this study), the importance of China as a center for world trade would be even clearer. Seven of the world's ten top container ports are found in China.

The largest port in container handling after Asia is found in the United Arab Emirates (UAE). Dubai and the surrounding region are not a manufacturing hub like some of its Asian counterparts. Instead, Dubai plays a role as a transit hub strategically located in the middle of Europe and Asia. The city is still making large infrastructure investments to cement its status as one of the leading transport hubs of the world. Los Angeles, Hamburg and Rotterdam are also major ports from the West with high TEU handling.

When considering volume of cargo handled in million tons, a similar picture is obtained, with Asian ports securing the top positions. For the Western cities, it is Rotterdam, New Orleans and Houston that make it into the top 15 cities ranked in this aspect, with a total cargo tonnage matching Shanghai and Guangzhou combined.

PORT OPERATORS

To strengthen their position in a competitive world, the largest and best port operators branch out to operate new ports and terminals. The ranking in Figure 19 shows the leading cities which are home to the biggest port operators based on the total container volume handled at a global level. No significant changes have happened since the 2017 report, with Hong Kong still in the leading position due to Hutchison Port Holdings and followed by a slightly reshuffled ranking for Shanghai, Rotterdam, Singapore and Dubai. Considering the already close race in the 2017 report, Shanghai and Singapore have now jumped ahead of Dubai. Singapore is home to PSA International, one of the leading global

port groups. PSA participates in over 50 coastal, rail and inland terminals in 17 countries across Asia, Europe and the Americas with flagship operations in PSA Singapore Terminals and PSA Antwerp. Several port operators, headquartered in Shanghai, have a combined container handling volume of 85 million TEU.

Following Dubai, there is a large jump in TEU handled down to the next cities. This highlights how the port business is dominated by a few global operators that control large parts of among the most valuable of all the listed shipping companies.

QUALITY OF PORT INFRASTRUCTURE

A new indicator for the Ports and Logistics Services pillar in this 2019 analysis has been to consider the quality of cities' port index, as provided by the World Bank. The Quality of Port Infrastructure measures business executives' perception of their country's port facilities. Data is sourced from the World Economic Forum's Executive Opinion Survey, where scores range from 1 (port infrastructure considered extremely underdeveloped) to 7 (port infrastructure considered efficient by international standards).

When considering the maritime cities from this study, Rotterdam is ranked highest with a port quality index of 6.8, followed closely by Singapore and Hong Kong. Dubai, Helsinki and Panama City are in the 4th position with an index of 6.2. Since this index is evaluated at a country level, all the maritime cities in the USA from this study averaged at an index value of 5.8.

Fig. 16 - Percentage of industry experts that consider the city home to leading ports and logistics services

Source: Menon (2017)

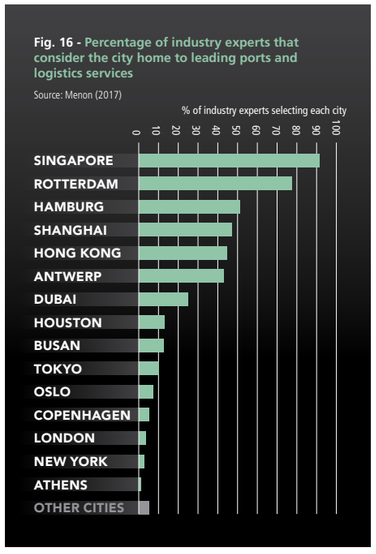


Fig. 17 - Container volume handled in city port (million TEU)

Source: Lloyd's (2017)

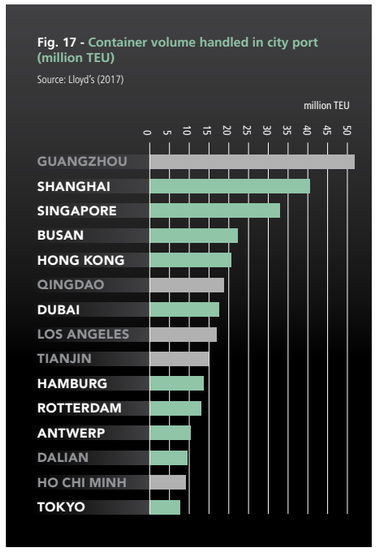


Fig. 18 - Volume of total cargo handled in ports in the city region (million tons)

Source: The American Association of Port Authorities (2016)

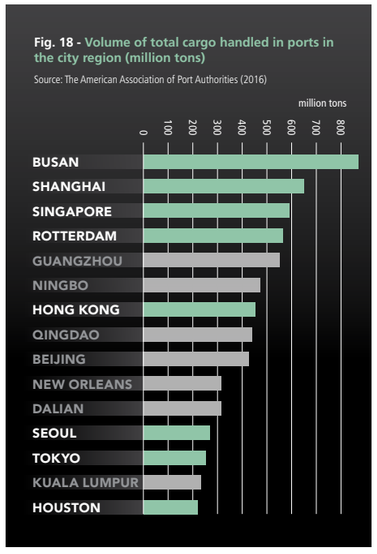


Fig. 19 - The largest port operators in the world by headquarters (million TEU)

Source: Drewry (2018)

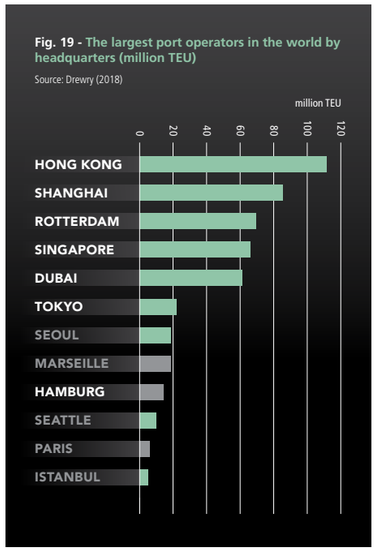


Fig. 20 - Quality ranking of port infrastructure on country level. Ex. Scale range: 1 - port infrastructure considered extremely underdeveloped to 7 - port infrastructure considered efficient by international standards

ROTTERDAM	6.8
SINGAPORE	6,7
HONG KONG	6.5
DUBAI	6.2
PANAMA CITY	6.2
HELSINKI	6.2
ANTWERP	6.1
SEATTLE	5.8
NEW ORLEANS	5.8
HOUSTON	5.8
LOS ANGELES	5.8
NEW YORK	5.8
MIAMI	5.8
WASHINGTON D.C.	5.8

ATTRACTIVENESS AND COMPETITIVENESS

SUMMARY

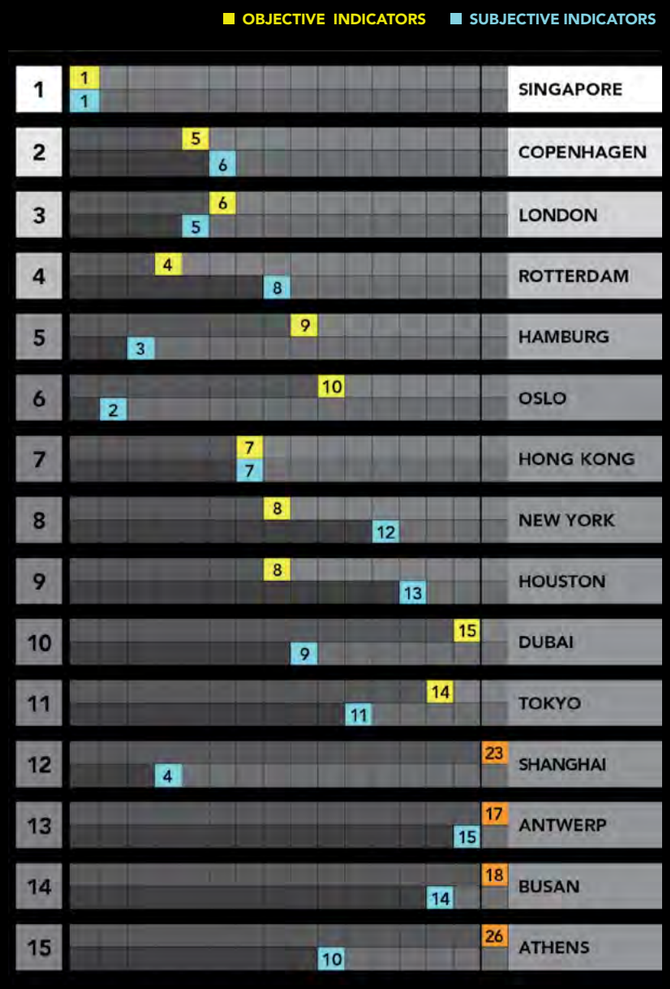
The final pillar in our ranking, the attractiveness and competitiveness of the cities, points to the future. The more attractive a city is, the stronger its growth can be expected in the future. Cities must be regarded attractive by its incumbent companies for the city to retain them, and by external companies to attract them. Cities are complex economies with a range of factors that impact the decision-making process of a business to stay in an existing location or to move to a new one. Hence, industry experts' judgement and objective indicators related to cities' ease of doing business, health of entrepreneurship ecosystem, competitiveness of maritime companies as shaped by cities' cluster dynamics, cities' attractiveness for relocating headquarters, operations and R&D, were used to benchmark the maritime cities in this study.

Overall, Singapore remains the most attractive and competitive maritime city in the world, measured by objective indicators and experts' assessments. Singapore is unsurpassed in most of the benchmarking criteria used in this pillar, except for three of the objective indicators where Copenhagen (on Corruption Perception Index), Rotterdam (on Global Entrepreneurship Index) and Helsinki (on Burden of Customs Procedure Index) each take the first position compared to Singapore.

London and Copenhagen are in a tie behind Singapore for this pillar, both having improved from their 2017 rank. Compared to Copenhagen, London is relatively stronger in its subjective assessment, being in the upper echelons for its attractiveness for the relocation of headquarters, operations and R&D functions of companies, for having a complete maritime cluster and for acting as an innovative and entrepreneurial center for maritime activities. On the other hand, Copenhagen's main strength lies in its top scores for several of the objective indicators, including ease of doing business and for being the most transparent and uncorrupted city in the world. Even on the subjective side, when industry experts are asked to rank their choice of the top three cities acting as the most innovative and entrepreneurial center for maritime activities Copenhagen is in the 4th position whilst London is 8th.

Rotterdam, Hamburg and Oslo are next in the ranking for this pillar. Rotterdam has significantly improved its score for the attractiveness and competitiveness pillar compared to 2017 where it held the 8th rank, improving on both subjective and objective indicators. Rotterdam scores the highest in the Global Entrepreneurship Index which is used to evaluate the health of the city's entrepreneurship ecosystem. When looking at the Middle East, Dubai is a rising star amongst other traditional maritime capitals of the world. Although Dubai is showing an overall reduction in the combined ranking in terms of attractiveness and competitiveness, the city scores well in the Burden of Customs Procedure Index and is also selected by the industry experts in the top four most attractive location to set up their operational offices.

RANKING



EXPERT ASSESSMENT

Any company will seek to be present in a location which will cater for its business needs, provide the necessary environment for it to grow in a cost-efficient manner, and support as far as possible the desired work benefits and lifestyle of its employees and new recruits. The industry experts in this study were thus asked to rank their choice of the top three most attractive maritime cities for each of the following:

- Most attractive cities for maritime companies' relocation (HQ, operations and R&D functions)
- Cities with most complete maritime cluster (access to all relevant maritime services – one-stop-shop city with equipment, yards, financial, legal and technological services – in addition to an international shipping community)
- Cities with the most innovative and entrepreneurial center for maritime activities

The overall expert assessment, based on the above subjective queries, points to a ranking for the most attractive and competitive maritime cities with Singapore in the lead, followed by Oslo, Hamburg, Shanghai and London. The top 10 cities from a subjective point of view also include Hong Kong, Rotterdam and Dubai, and has remained unchanged in the cities' position compared to the previous report. Singapore stands out as the most attractive city for the relocation of headquarters, operations and R&D functions of companies, having the most complete maritime cluster and acting as the most innovative and entrepreneurial center for maritime activities. On all these three factors, Oslo is the second choice after Singapore. Hamburg could have secured the 3rd overall position but the industry experts had a stronger vote for Copenhagen than Hamburg on the aspect of being an innovative and entrepreneurial center for maritime activities.

ATTRACTING COMPANIES FOR RELOCATION

When the industry experts are asked to choose and rank the top three most attractive maritime cities for the headquarter, operations and R&D functions should their company consider relocating, Singapore is consistently the highest preferred location for all three functions. Next in line are Hamburg, Oslo, Hong Kong and London. It should however be noted that experts in this study have highlighted high cost of living as the greatest challenge faced in Singapore and London.

For headquarters' relocation alone, London and Hong Kong are the preferred choices after Singapore according to the maritime business executives. For this subjective indicator, only 3 Asian cities make it in the top 10, including Shanghai whilst 5 cities are in Europe. Dubai and New York are also within the top 10 for headquarters relocation.

For the operational functions of their companies, the top 10 list of preferred cities is somewhat similar to the headquarters' list, except for New York which is replaced by Athens. In this aspect the Asian cities – Singapore, Hong Kong and Shanghai – have a better ranking. Dubai, Hamburg and Rotterdam also are regarded as better locations for the operational part of the companies, compared to their headquarters' position. London, although still in the top 10, has the biggest downward move from the 2nd position for headquarters to 9th position for the operational functions. The maritime business executives in this study also highlighted the uncertainties related to Brexit could impact London's position as a business center in the future.

Finally, for the R&D function, Asian cities prove to be strong according to the industry experts with 4 cities joining the ranks of the top 10, including Busan. With Singapore leading in this subjective indicator, Oslo and Hamburg follow closely behind. Copenhagen and Shanghai are in a tie whilst industry experts place Dubai in between Hong Kong and Busan in this area.

CLUSTER DYNAMICS – OPENNESS AND INFORMATION SHARING

In the long term, the competitiveness of maritime companies in cities is shaped by the cluster dynamics, that is, by relationships between the different players. Openness and information-sharing are particularly important, both for reducing transaction costs and even more important for knowledge-flow and innovation.

The industry experts were asked to rank their choice of the top three cities which have the most complete maritime cluster, including access to all relevant maritime services (one-stop-shop city with equipment, yards, financial, legal and technological services), in addition to an international shipping community. Singapore comes out strongly with 31% of all the votes, followed by Oslo and Hamburg which jointly share 25% of the votes. From a geographical perspective, and for the top 15 cities which have been recognized and chosen for their cluster dynamics, 50% of the votes are for Asian cities (Singapore, Shanghai, Hong Kong, Tokyo and Busan) whilst 46% of the votes are for European cities. Dubai is acknowledged for its maritime cluster and is ranked in the 8th position by the industry experts, with 3% of their votes.

During the expert assessment, it was observed that Europeans in general seem to have higher trust and share more information in their business relationships than maritime companies in other regions do; 95 percent of the experts from Europe (including Scandinavia) partly or fully agree that relationships amongst companies in the maritime cluster in their own city are characterized by openness and information sharing. In the Middle East the share is 84 percent whilst in the Americas, only 73 percent of the experts partly or fully agree that the relationships among the companies in the maritime cluster in their own city are characterized by openness and information sharing.

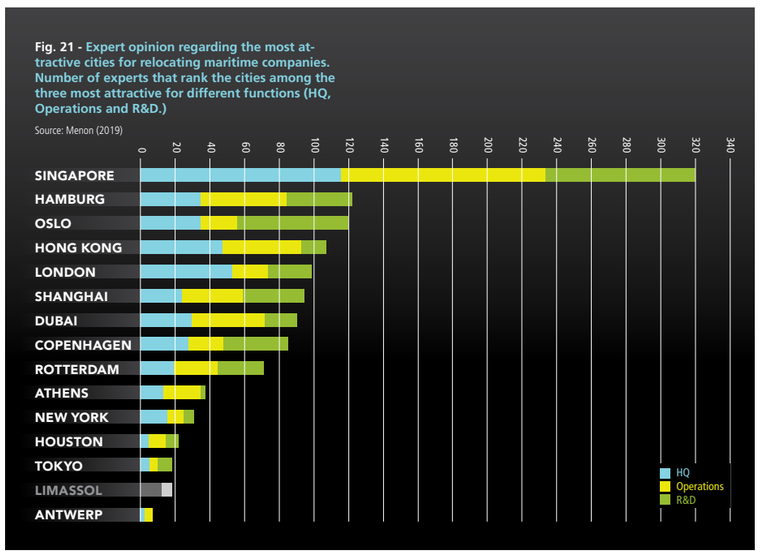


Fig. 21 - Expert opinion regarding the most attractive cities for relocating maritime companies. Number of experts that rank the cities among the three most attractive for different functions (HQ, Operations and R&D.)

Source: Menon (2019)

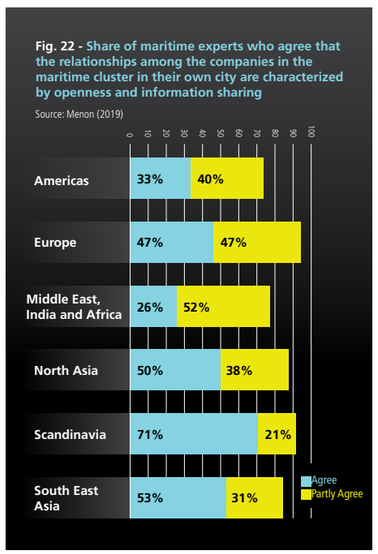


Fig. 22 - Share of maritime experts who agree that the relationships among the companies in the maritime cluster in their own city are characterized by openness and information sharing

Source: Menon (2019)

INNOVATION AND ENTREPRENEURSHIP

Last but not least, when the industry experts are asked to choose and rank the top three cities acting as the most innovative and entrepreneurial center for maritime activities, Singapore is still in the lead, followed by Oslo, Shanghai and Copenhagen. Hamburg and Rotterdam follow closely behind Copenhagen.

CITIES PREPARED FOR THE DIGITAL TRANSFORMATION OF THE MARITIME INDUSTRY

As mentioned in the introductory sections of this report, there is a critical need for a radical improvement of the digital infrastructure that would cater for cyber security, disruptive innovation and the general digital transformation which the maritime industry is facing, based on a collaborative environment between maritime companies, technology companies and regulators.

The expert panel was thus asked which cities have the strongest capabilities and are best positioned for the digital transformation of the maritime industry. Singapore is the most heavily ranked in this aspect. Oslo comes next, for its perceived strength in handling the digital transformation for its maritime industry. These two cities seem to stand out from the rest. It is interesting to observe that whilst Copenhagen is not in the overall top 10 leading maritime cities, there is a strong belief by the industry experts that Copenhagen is in the 3rd position when it comes to having strong capabilities for the digital transformation.

OBJECTIVE INDICATORS' ASSESSMENT

EASE OF DOING BUSINESS

The maritime industry is international in nature, and that makes competitive regulation important for cities to attract and retain business. Both maritime specific regulations and the overall regulatory framework for conducting business is important in this aspect. While it is difficult to measure maritime specific regulations on a global scale, the Ease of Doing Business Index developed by the World Bank gives an insight into the wider set of regulatory environments. A higher ranking indicates better, usually simpler, regulations for businesses and stronger protections of property rights. Empirical research indicates that the impact on economic growth of improving these regulations is strong.

Looking at the maritime cities studied, small city states perform very well on the index, with Singapore and Hong Kong among top three performers. There are relatively small differences among the top 15 cities. Dubai is comparable to Stockholm and Gothenburg on this aspect and is ahead of Hamburg, Rotterdam and Tokyo. Whilst China's maritime cities such as Beijing, Shanghai and Guangzhou are not in the top 15 in this category, they show positive progress compared to the previous ranking and are ahead of Limassol and Athens.

TRANSPARENCY / CORRUPTION

The Corruption Perception Index by Transparency International was used to rank the maritime cities for their transparency and corruption level. The index ranks 180 countries and territories by their perceived levels of public sector corruption according to experts and business organization where a scale of 0 to 100 is used, with 0 is highly corrupt and 100 is very clean. In 2018, more than two-thirds of countries scored below 50, with an average score of 43, which indicates that most countries fail to address corruption in their public system.

For the maritime cities in this study, the Scandinavian cities and Singapore remain strong in this category. Dubai has an index value of 70 which is better than Busan and Athens. China's maritime cities come out poorly in this indicator, with a value of 39 which is below the global average score of 43.

ENTREPRENEURSHIP

Entrepreneurship is one of the key drivers of economic growth and development and is used to assess a city's relative attractiveness and competitiveness. The Global Entrepreneurship Index was selected to evaluate the health of the entrepreneurship ecosystem in each location which was further complemented by the results from the experts' assessment.

Rotterdam scores the highest in this category. Rotterdam is well known worldwide for being a hotspot for innovation in the port. Businesses that set up at RDM's Innovation Dock become part of an enterprising network of start-ups and R&D branches of established multinationals.

Not far behind Rotterdam are London, Singapore and the US-based maritime cities. The United States as a country ranked as the most attractive location for the entrepreneurship, scoring particularly strong in high growth and internationalization. Whilst the other Asian maritime cities such as Busan, Tokyo and Shanghai are not within the top 15, they have a general high score in this category and are ahead of Vancouver, Oslo and Bergen.

BURDEN OF CUSTOMS PROCEDURE

The Burden of Customs Procedure Index produced by World Bank was selected to assess the effectiveness of customs procedures for the maritime cities, where a scale of 1 (extremely inefficient) to 7 (extremely efficient) was used.

Singapore and Hong Kong are strong in this dimension; this ranking goes hand in hand with observations made from the Ease of Doing Business Index. Dubai is also ranked 4th in terms of the effectiveness of its customs procedures, higher than Rotterdam, London and Oslo.

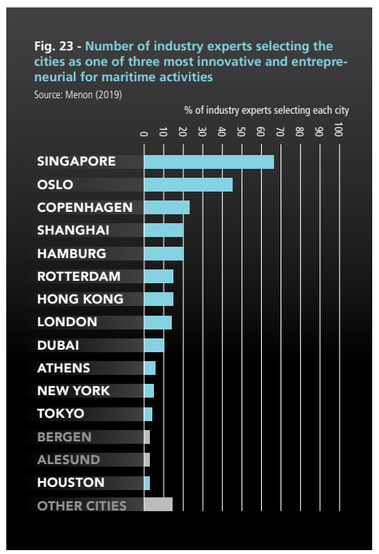


Fig. 23 - Number of industry experts selecting the cities as one of three most innovative and entrepreneurial for maritime activities

Source: Menon (2019)

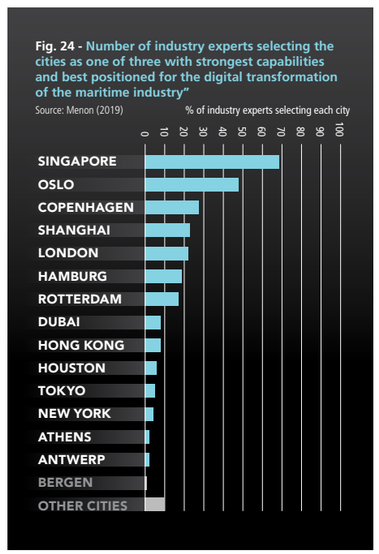


Fig. 24 - Number of industry experts selecting the cities as one of three with strongest capabilities and best positioned for the digital transformation of the maritime industry"

Source: Menon (2019)

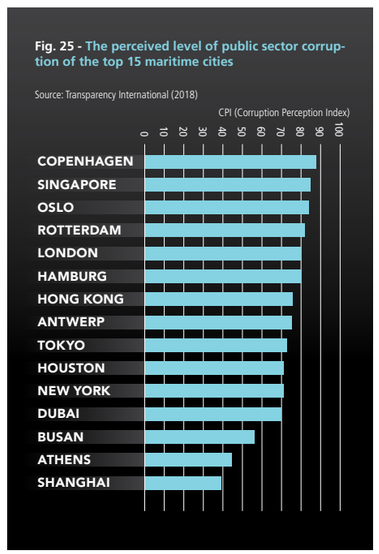


Fig. 25 - The perceived level of public sector corruption of the top 15 maritime cities

Source: Transparency International (2018)

THE LEADING MARITIME CITIES OF THE FUTURE

As part of this study, the experts were asked to make predictions about the leading maritime capitals of the world in five years ahead (2024). Figure 26 shows which cities the expert panel predict will be important in five years from now. The results are consistent with the previous report; this shows that the experts' past predictions have already been partly realized, and this is paving the way for the new predictions.

There seems to be a clear consensus among the experts that Singapore will remain the most important city in 2024, while Shanghai is expected to become the second most important maritime city. Shanghai's increased importance is related to the growing influence of the Chinese economy. China has the world's second largest economy and its export-oriented business environment is dependent on the trade of goods. China is expected to bypass the US as the world's largest economy around 2025. The fact that Singapore and Shanghai are expected to become the most important centers for the industry, tells something about the changing center of gravity in both the world economy and the maritime industry. Manila and Jakarta are two other cities in the region that are growing in importance.

Whilst the third most important leading city can be attributed to Oslo, the experts seem to be divided in their opinion when it comes to selecting a city for the fourth position since the next six cities have been ranked almost equally in this place. London, Hamburg, Hong Kong, Athens, Rotterdam and Dubai are all potential contenders for the fourth position in this predictive ranking in the next five years. Dubai is in the league of these other "traditionally" well-established maritime cities, because the maritime industry experts recognize that the city is developing quickly due to the strong backing from the local government to increase Dubai's presence in the global economy. Dubai is today an important trading center and is becoming the preferred city for maritime activities within its wider region covering Middle East, India sub-continent and Africa.

WHAT CAN THE ORDER BOOKS TELL ABOUT FUTURE GROWTH?

The orderbooks of shipping companies give an objective glance into the near future of maritime capitals. Figure 28 depicts the orderbook of shipowners located in different cities. It is dominated by a mix of well-known Asian and European shipowning hubs. Owners based in Tokyo and Imabari come first, followed by Greek owners in Athens. London- and Hamburg-based shipowners also place these cities in the top 10 for the size of the orderbook for contract dates covering the period of 2018 to February 2019. Earlier in the report we saw that Oslo has weakened its position as a shipping city. Looking at the orderbooks, without Oslo on the top 15 list, there is little reason to believe that Oslo will regain its position.

Fig. 26 - Industry experts answer to: "Looking forward five years from now, which cities will be the five leading maritime centers of the world?"

Source: Menon (2019)

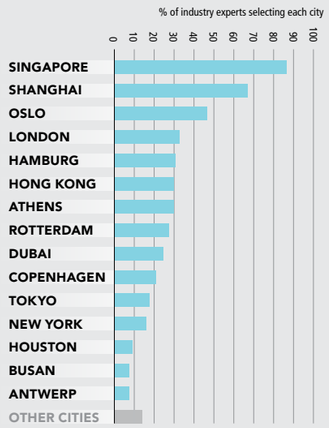


Fig. 27 - Industry experts answer to: "Which cities have the strongest capabilities and are best positioned for the digital transformation of the maritime industry?"

Source: Lloyd's (2015)

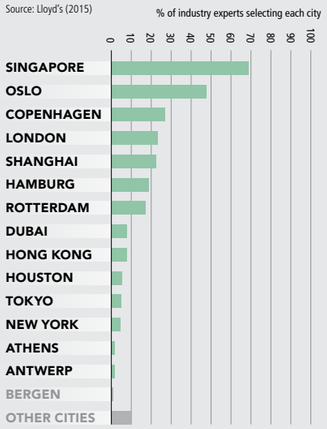
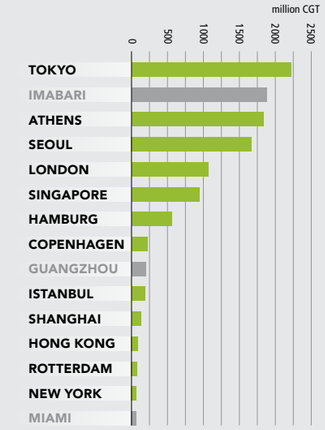


Fig. 28 - Size of orderbook from shipowners based in the city

Source: Lloyd's (2015)



APPENDIX A – OVERALL RANKING FOR ALL/TOP CITIES

Left:
Subjective Indicators of 15 Cities

Right:
Objective Indicators of 50 Cities

City	SHIPPING			PORTS & LOGISTICS					ATTRACTIVENESS & COMPETETIVENESS					
	Leading shipping center	Attractiveness for headquarter and operation units	Leading financial center	Leading technology center	Digital servives	Leading R&D & educational center	Enviromentally substainable technologies	Port related logistics services	Attractiveness for headquarter	Attractiveness for operation units	Attractiveness for R&D units	Most complete maritime cluster	Most innovative and entreprenurial	Strongest capabilities and positioned for digital transformation
Rotterdam	10	9	9	8	7	7	4	2	9	6	6	7	6	7
Singapore	1	1	2	1	1	1	2	1	1	1	1	1	1	1
Tokyo	9	14	8	6	8	8	7	10	13	14	11	9	12	11
Hamburg	4	4	6	4	4	3	4	3	4	3	3	3	4	6
Hong Kong	3	2	5	10	9	12	9	5	3	2	8	6	6	8
Shanghai	7	7	7	3	6	4	9	4	8	5	5	4	3	4
London	6	4	1	9	5	4	6	13	2	9	7	4	8	5
Busan	15	15	16	5	12	9	11	9	15	13	10	12	14	15
Dubai	11	3	11	13	16	16	13	7	6	3	9	8	9	8
Oslo	4	8	3	2	2	2	1	11	4	10	2	2	2	2
Beijing	16	16	13	14	13	15	16	14	16	16	16	15	15	15
Houston	14	12	15	11	10	14	15	8	14	11	12	13	13	10
Athens	2	9	10	12	10	10	13	16	11	7	14	10	10	13
Antwerp	13	13	14	15	15	13	8	6	12	14	15	14	15	13
Copenhagen	8	6	11	7	3	6	3	12	7	8	4	10	4	3
New York	12	11	4	16	13	11	11	15	10	12	13	16	11	12

City	SHIPPING				FINANCE & LAW								MARITIME TECHNOLOGY					PORTS & LOGISTICS				ATTRACTIVENESS & COMPETETIVENESS			
	Fleet size - management	Fleet size - owner	Fleet value - owner (in $bn.)	Number of shipping companies	Legal expertice	Number of Maritime Lawyers	Insurance premium	Mandated loans	Shipping banks portfolio	Number of listed companies	Market value listed maritime companies mUSD per exchange	Trading volume of equity on city's stock exchange	Shipyards (CGT)	Classified fleet	Market value of ships built at shipyards	No of patents	Maritime Education Institutions	TEU in port	Total cargo	Port handling by operator	Quality of port infrastructure, country level	Ease of doing business	Transparency/corruption	Entrepreneurship	Burden of customs precedure
Rotterdam	11	13	12	6	17	5	14	2	5	20	-	-	7	-	18	8	2	11	4	3	1	28	7	1	5
Singapore	2	3	4	2	3	9	3	-	13	7	7	5	6	16	5	14	5	3	3	4	2	1	2	6	1
Tokyo	5	2	2	5	13	29	2	5	2	4	5	11	16	2	14	2	16	15	13	6	25	29	16	19	24
Hamburg	3	4	3	4	2	10	11	-	12	-	-	-	13	11	11	3	3	10	17	9	16	24	9	16	17
Hong Kong	4	5	17	10	5	11	27	-	-	3	10	2	20	-	16	-	16	5	7	1	3	3	14	22	3
Shanghai	7	6	5	13	19	18	5	-	-	5	2	4	2	18	3	24	13	2	2	2	35	34	39	25	32
London	6	10	13	12	1	1	1	6	9	11	4	8	37	4	-	4	1	21	30	-	16	15	9	3	14
Busan	9	28	33	14	40	48	23	-	-	6	6	7	1	7	1	1	31	4	1	-	29	4	30	17	32
Dubai	8	16	26	8	9	17	10	-	-	20	9	6	17	22	-	-	16	7	18	5	4	18	28	41	3
Oslo	21	11	7	19	10	20	8	1	4	2	8	3	27	1	-	6	10	-	-	-	16	6	5	33	18
Beijing	34	22	22	37	40	29	7	-	1	14	-	19	37	6	-	-	31	-	9	-	35	34	39	25	32
Houston	32	26	16	29	25	16	40	-	-	-	-	-	30	3	-	13	24	32	15	-	8	8	21	7	6
Athens	1	1	1	1	6	3	38	-	11	16	19	14	29	14	-	-	3	22	-	-	44	44	35	42	46
Antwerp	28	21	20	25	25	8	12	-	-	20	12	17	36	-	-	18	7	12	16	-	7	33	15	36	18
Copenhagen	10	9	9	17	10	37	42	-	8	12	3	10	37	-	-	20	13	-	-	-	15	2	1	15	18
New York	33	17	11	19	3	2	4	4	7	1	1	1	33	-	-	14	31	17	22	-	8	8	21	7	6
Seoul	15	20	30	15	25	26	28	-	-	9	18	9	23	12	15	24	7	19	21	-	35	46	37	46	32
Mumbai	13	12	23	3	32	31	20	-	-	10	17	15	21	9	-	-	31	18	29	-	48	45	46	50	44
Paris	22	18	18	23	30	37	13	-	-	-	-	-	5	-	6	-	45	1	5	-	35	34	39	25	32
Jakarta	17	7	10	11	25	37	18	-	6	-	21	-	37	21	-	7	45	27	12	7	29	4	30	17	32
Guangzhou	43	42	35	48	12	13	6	3	3	24	13	-	37	5	-	5	31	-	-	11	31	26	19	23	29
Kuala Lumpur	40	32	25	35	8	21	9	-	-	16	16	18	14	8	17	-	24	30	31	-	46	41	33	39	43
Dalian	20	23	19	21	19	31	19	-	-	7	11	16	25	20	-	22	31	-	14	-	23	20	34	40	23
Genoa	29	25	27	29	40	45	33	-	-	-	-	-	4	-	2	-	31	13	11	-	35	34	39	25	32
Imabari	18	15	6	24	32	14	43	-	-	-	-	-	37	17	-	18	16	-	-	-	8	8	21	7	6
Miami	12	14	21	7	25	12	21	-	-	24	-	-	12	15	13	-	31	26	27	12	44	32	37	45	48
New Orleans	35	31	24	21	32	14	43	-	-	-	-	-	19	-	-	-	31	-	10	-	8	8	21	7	6
Istanbul	24	24	14	38	40	33	16	-	-	-	-	-	35	-	-	24	16	-	26	8	31	26	19	23	29
Marseille	23	34	45	15	40	35	31	-	-	18	14	13	37	-	-	-	5	20	28	-	50	50	48	49	50
Helsinki	38	37	31	31	19	26	24	-	-	-	-	-	32	-	-	-	24	23	-	10	8	8	21	7	6
Vancouver	45	40	38	32	32	26	35	-	-	19	15	20	15	-	-	9	10	-	-	-	4	21	2	14	1
Los Angeles	16	8	8	9	40	48	29	-	-	-	-	-	3	-	4	11	45	-	-	-	25	29	16	19	24
Seattle	27	45	47	40	13	23	39	-	-	-	-	-	26	-	-	-	24	24	19	-	23	23	8	32	18
Manila	37	36	29	44	23	23	32	-	-	-	-	-	37	-	-	16	45	8	20	-	8	8	21	7	6
Bergen	26	19	15	18	32	41	22	-	-	-	-	-	28	-	-	12	16	-	-	-	16	6	5	33	18
Glasgow	49	35	40	25	40	33	-	-	-	14	-	-	24	-	8	-	16	14	25	-	49	43	49	43	49
Limasol	19	49	49	46	32	37	15	-	-	-	-	-	34	-	-	21	7	-	-	-	16	15	9	3	14
Kobe	25	33	34	27	40	42	29	-	-	-	-	-	9	-	10	-	31	28	24	-	25	29	16	19	24
Qingdao	14	29	37	27	19	6	45	-	-	-	-	-	-	19	-	-	16	-	-	-	35	42	29	38	31
Ho Chi Minh	30	39	36	44	40	45	-	-	-	-	-	-	8	-	7	-	31	6	8	-	35	34	39	25	32
Aberdeen	47	48	39	39	15	7	37	-	-	-	-	-	-	-	-	-	24	34	-	-	8	8	21	7	6
Washington D.C.	46	47	48	48	23	18	-	-	-	-	-	-	-	-	-	-	13	25	-	-	25	49	32	37	28
Stockholm	41	41	42	40	32	42	-	-	-	-	-	-	-	-	-	23	10	-	-	-	16	15	9	3	14
Ningbo	36	30	32	35	40	48	33	-	-	-	-	-	10	-	9	-	45	-	6	-	35	34	39	25	32
Valletta	39	38	43	32	32	42	17	-	-	-	-	-	18	10	-	10	31	33	32	-	47	25	50	44	47
Sydney	42	46	44	40	7	22	25	-	14	13	20	12	-	-	-	24	24	31	-	-	33	22	13	35	24
Tianjin	48	43	41	46	30	35	-	7	10	20	22	-	-	-	-	17	31	34	-	-	16	19	2	2	6
Saint Petersburg	44	44	46	40	17	4	36	-	-	-	-	-	22	13	-	-	31	16	-	-	4	47	47	48	42
Durban	31	27	28	32	40	45	26	-	-	-	-	-	11	-	12	-	45	9	-	-	35	34	39	25	32
Panama City	50	50	50	48	15	25	41	-	-	-	-	-	31	-	-	-	24	29	23	-	34	48	36	47	44

APPENDIX B: METHODOLOGY AND DATA SOURCES

DEFINITIONS

WHAT IS THE DEFINITION OF MARITIME ACTIVITY?

During almost 20 years of research, Menon has defined maritime activity as: "All companies that own, operate, design, build or deliver equipment or specialized services to all kinds of ships and other floating units." More specifically, for data collection purposes, we defined the maritime industry as economic activity of firms registered in the following NACE rev. 2 codes: 5010, 5020, 5030, 5040, 3011, 3012, 3315, 5222, 5224 and 7734. This industry categorization is broad in the sense that it covers four different sub-sectors, which all include maritime activity. The NACE rev. 2 codes 5010, 5020, 5030 and 5040 account for the shipping industry, while the codes 3011, 3012, 3315 account for the shipyard industry. The NACE rev. 2 codes 5222 and 5224 account for the Ports & Logistics industry and the last code, 7734, account for maritime activity in the Finance & Law industry. For a detailed description of the different NACE rev. 2 codes, please visit https://ec.europa.eu/eurostat/documents/3859598/5902521/KS-RA-07-015-EN.PDF.

Where we use data sources which are specialized at providing maritime data only, such as Clarkson and Lloyd's List, we have not made use of these NACE rev. 2 codes.

WHAT IS A CITY AND ITS GEOGRAPHIC BOUNDARIES?

In this report, we defined a city as encompassing an area that can be reached within a two-hour drive from the city center, approximating to a radius of 200 km from the city's center. This definition is not sensitive to artificial administrative borders, and captures most, if not all, relevant maritime economic activity related to a city.

DESCRIPTION OF DATA SOURCES AND METHODOLOGY

EXPERTS' ASSESSMENT

We have built up a global panel of Maritime Industry Experts who have made thorough assessments of their own cities as well as ranked the nominated cities on a wide range of indicators. From a total of 196 respondents, 144 experts stated a city. These experts are based in 32 different cities, from a total of22 countries.

Almost 50 % of the experts are European, while the European cities constitute only 45% of the 15 cities that are benchmarked in this report. Accordingly, 32 out of 144 experts are Scandinavians, while Copenhagen and Oslo only constitute 2 out of 15 cities. The effect of "home bias" during the expert assessment was minimized by giving an equal weighting to cities when the experts were asked to rank cities from one to three for different aspects and indicators, where one is best and three is worst.

SHIPPING CENTERS

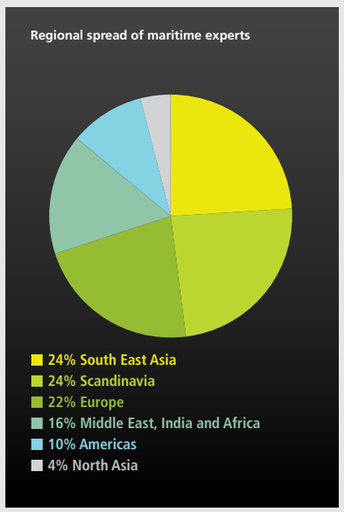
CLARKSONS DATABASE

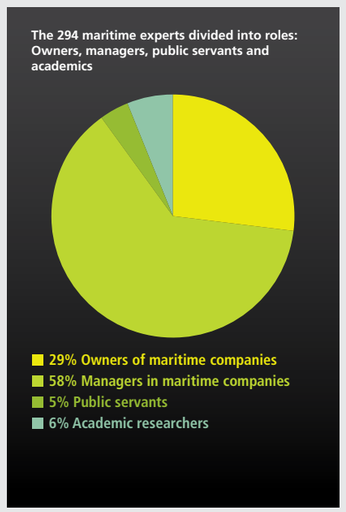
The Clarkson Database was used for collecting various data of shipowner information, such as city of registration, fleet size in terms of CGT, fleet value in terms of USD billions and number of shipping companies with HQ in each shipowners' city of registration (for shipping companies with more than five vessels in their portfolio).
The Clarkson Database was also utilized to collect data of ship management information, such as city of registration and fleet size in terms of CGT. We used both World Fleet Monitor, WFM Vol 9 No 12 December 2018 and Shipping Intelligence Network on the Clarkson Database to collect the data. The data were analyzed by Menon Economics.
To evaluate the fleet value at a city level, we used national fleet values obtained from WFM Vol 9 No 12 December 2018 and multiplying it with each city's share of the national CGT.

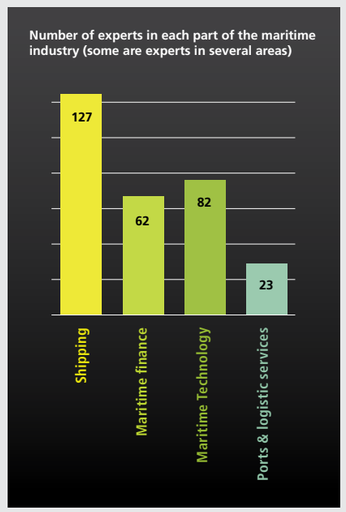
MARITIME FINANCE AND LAW

WHO'S WHO LEGAL AND WORLD SHIPPING REGISTER (WORLD-SHIPS.COM)

In each of the cities, the Menon identified the number of experts in maritime law on Who's Who Legal and the number of maritime lawyers on World Shipping Register. These two sources include a comprehensive list of experts and firms in over 100 national jurisdictions, and the two sources enable us to capture both the expertise and the extensiveness of maritime law activity in each city.







DEALOGIC

Data for mandated and arranged maritime loans was gathered from Dealogic for the year of 2018. Dealogic is a platform used by investment banks worldwide. Banks were sorted according to the location of their maritime headquarters.

CLARKSONS DATABASE

To evaluate the trade level on stock exchange in each selected city, Menon and DNV GL analyzed the data on the number of listed companies retrieved from the Clarksons Research Capital Markets (Shipping Intelligence Network). Furthermore, on each city's stock exchange the team also analyzed the trading volume of bonds, IPO and Follow Ons for the years of 2017-2019. The number of listed companies measures the relative importance of each city as a maritime finance hub, while the trading volume tells us something about the volume of financial activity in each city. These two data sources combined give us a good measure of each city's relative importance as a maritime finance hub. All companies that own, operate, design, build or deliver equipment or specialized services to all kinds of ships and other floating units were considered.

THE INTERNATIONAL UNION OF MARINE INSURANCE & BUREAU VAN DIJK

The International Union of Marine Insurance (IUMI) provided a list of marine insurance premiums paid to insurance companies in each country for Hull Transport/Cargo, Marine Liability Offshore Energy. In addition, premiums for P&I clubs are included. National values are then allocated to cities based on their corresponding maritime financial and insurance activity/importance. Each city's share of the national values is computed by multiplying the national values with a ratio measuring each city's relative financial and insurance importance. The city specific ratio consists of an average two inputs. The first input is a share measuring the amount of non-life insurance premiums in each city relative to aggregate national non-life insurance premiums. The second input is a share measuring the number of non-life insurance companies in each city relative to the total national number of non-life insurance companies. These two shares are combined to one ratio by taking the average, and thus works as a sorting key for national marine insurance premiums. A critical assumption is that all the firms included in computing the ratio are delegated to cities after the location of their headquarter.

BUREAU VAN DIJK, BLOOMBERG & CLARKSON DATABASE

The number of listed companies on each city's stock exchange were obtained from the Clarkson Database, while the market value (measured as market cap in millions USD) was obtained from Bureau Van Dijk's database Orbis and Bloomberg. Values were allocated to cities according to the location of the stock exchange.

PETROFIN RESEARCH

Petrofin Research provided a list of the existing shipping portfolio of the top 40 shipping banks in the world. The corresponding values were allocated to cities according to banks' maritime headquarter.

MARITIME TECHNOLOGY

CLARKSON DATABASE

The size of each classification society's classified fleet (measured as CGT) is allocated to cities by using the location of their respective headquarter. Total CGT carried by each ship, was retrieved from the Clarksons Research World Fleet Register.
The Clarkson Database was also used to measure the size of fleet (CGT) delivered by active shipyards as of current fleet and orderbook. The fleet size per yard was aggregated and then distributed to the different cities based on the location of the shipyard.
In addition to the data over classification societies and shipyard volumes, we also used Clarkson Database to compute the purchasing price of ships sold in the years of 2017-2019. These purchasing prices are allocated to cities based on where the corresponding builder shipyards are located.

BUREAU VAN DIJK – ORBIS DATABASE

The Orbis Database was used to collect information about number of patents developed by maritime companies registered in the NACE rev. 2 codes: 5010, 5020, 5030, 5040, 3011, 3012, 3315, 5222, 5224 and 7734. The number of patents per company were then allocated to cities based on the location of the headquarter of the company.
WORLD SHIPPING REGISTER (world-ships.com)
Data from World Shipping Register was used to collect information about number of maritime schools located in the different cities.

PORTS AND LOGISTICS

THE AMERICAN ASSOCIATION OF PORT AUTHORITIES

The World Port Ranking List, provided by The American Association of Port Authorities, was used to allocate total cargo throughput to cities. The list includes the top hundred ports in the world, and values are allocated to cities based on the location of the port

LLOYD'S LIST TOP 100 PORTS 2018

Lloyd's List rates the top 100 ports in the world based on TEU throughput. Values were allocated to cities based on the location of the port.

DREWRY

Drewry provides a list with the top 21 port operators in the world in 2018, based on TEU throughput. Values were allocated to cities based on the location of company headquarters.

MACROBOND – WORLD BANK

Macrobond were used to collect data from World Bank's 2018 index over quality of port infrastructure. The Quality of Port Infrastructure measures business executives' perception of their country's port facilities. Data are from the World Economic Forum's Executive Opinion Survey, conducted for 30 years in collaboration with 150 partner institutes. Responses are aggregated using sector-weighted averaging. The data for the latest year are combined with the data for the previous year to create a two-year moving average. Scores range from 1 (port infrastructure considered extremely underdeveloped) to 7 (port infrastructure considered efficient by international standards).

ATTRACTIVENESS AND COMPETITIVENESS

THE WORLD BANK

We have used the Ease of Doing Business Index and the Burden of Customs Procedure Index provided by the World Bank. These indexes are on the national level, but since laws, rules and regulations often are identical across cities within a country, we argue that the indexes are representative on the city level.

TRANSPARENCY INTERNATIONAL

The Corruption Perception Index, which measures the perceived level of public sector corruption, is based on data from Transparency International.

CORNELL UNIVERSITY, INSEAD, AND THE WORLD INTELLECTUAL PROPERTY ORGANIZATION

The Global Innovation Index aims to capture the multi-dimensional facets of innovation. This index is used to rate the cities based on opportunities with respect to entrepreneurship.







MENON ECONOMICS

DNV·GL