

THE LEADING MARITIME CAPITALS OF THE WORLD 2017

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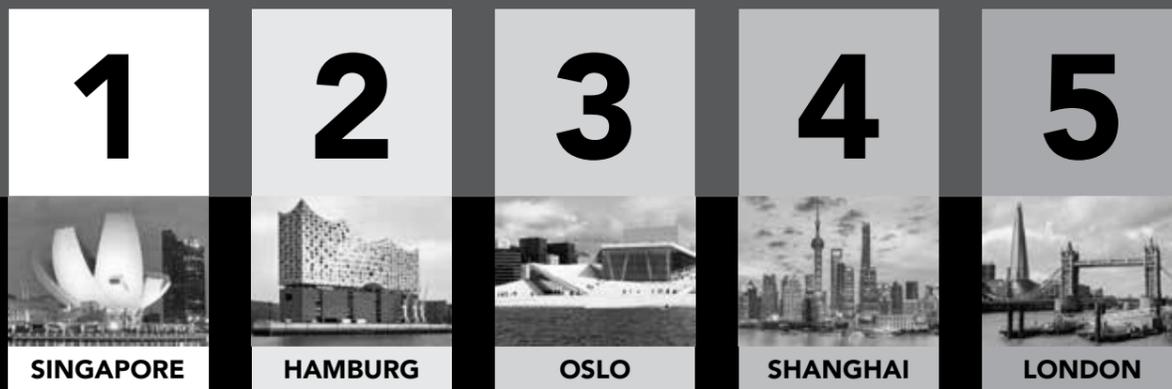


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EXECUTIVE SUMMARY



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

FOR THE FIRST TIME IN HISTORY, more than half of the world's population live in cities. According to United Nations estimates, it is predicted that two-thirds of the world population will be living in urban areas by 2050. The importance of city regions will therefore continue to grow. Cities provide large efficiency benefits, which result in unprecedented gains in productivity and competitiveness. Cities are the centers of knowledge, innovation and specialization of production and services. In today's world, cities are to an increasing extent competing to attract the best companies and most talented people. The winners in this race for attractiveness will become the leading maritime centers of the world.

The third edition of *The Leading Maritime Capitals* report benchmarks the 15 leading maritime city regions around the world in four maritime sectors: shipping, finance and law, technology, ports and logistics, together with an overall assessment of the cities' attractiveness and competitiveness. Compared to the last edition, both the number of objective indicators and number of participating industry experts have increased substantially. This year's report rests on a broad set of almost 50 indicators, combining both objective and subjective measures. More than 250 industry experts from all continents have participated in the study. As such, the report gives valuable insights into the strongholds of the global maritime industry today.

The report once again puts Singapore as the Leading Maritime Capital of the World. Despite weak economic conditions in both traditional shipping and the offshore oil and gas markets, Singapore has been able to retain

its position as a world leading maritime hub. Part of the explanation for this is the width of the maritime industry in the city-state. Singapore is in a top-5 position within all the five pillars of this study and has increased its focus on R&D developments within the industry over the last few years. Singapore has also been able to develop a world-leading service industry that is less influenced by business cycles.

The top three cities have not changed since the second edition of the report two years ago. Hamburg still takes second place followed by Oslo on third. Oslo is strong in maritime finance and law and technology. Hamburg is a more important shipping center than Oslo and is also home to the second largest port area in Europe. Both cities, together with London and Rotterdam, are competing to be the leading city in Europe for maritime activities. London is the world's leading city for maritime finance and law, while Rotterdam's strength lies in port and logistics services. London is again ranked as one of the top-5 leading maritime cities of world, after falling to sixth place on the overall ranking two years ago.

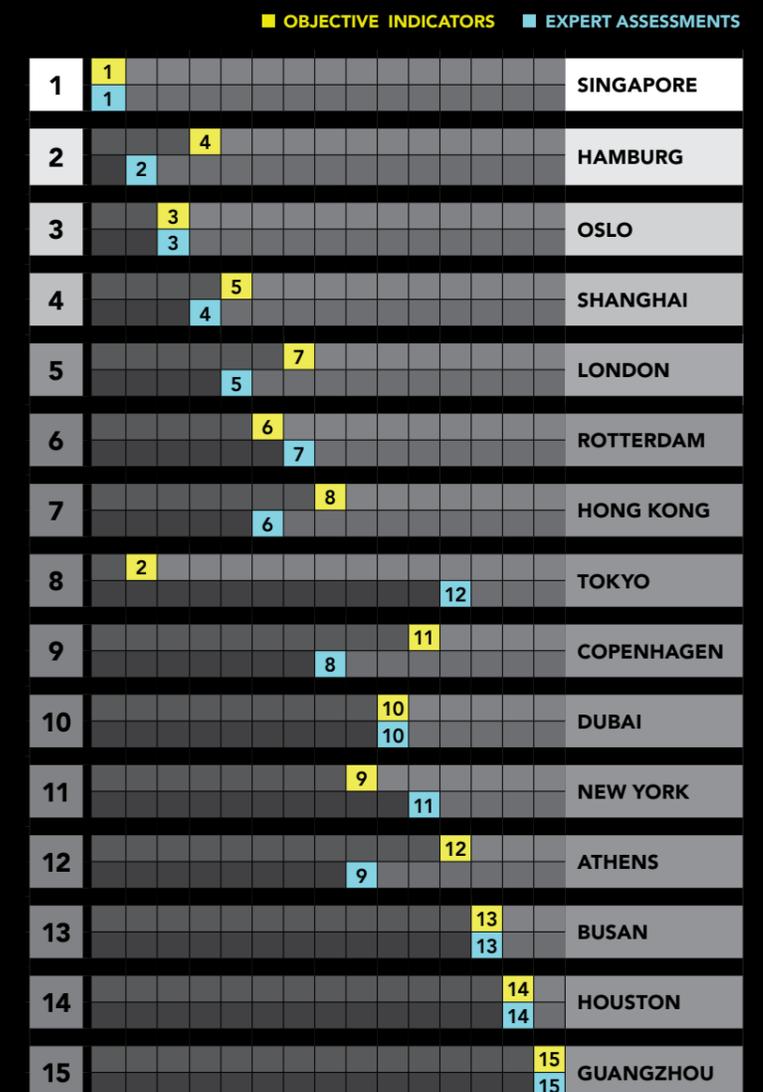
The increasing importance of China in the maritime industry is evident by the fact that Shanghai climbs from fifth to the fourth most important maritime capital. China is the world's largest trading nation, home to the world's largest shipbuilding industry. Seven of the world's ten largest ports are located in the vast country. Hong Kong is challenged as a maritime hub by the strong growth rate of other Chinese cities. The volume handled in the port has for the first time in more than a decade fallen below 20 million TEU. Hong Kong also

drops three places on the ranking, but is still ranked at 7th overall.

Digitalization is expected to disrupt the maritime industry in the coming years. The maritime experts predict that Singapore, Oslo, Copenhagen and London are the cities best prepared for the digital transformation of the industry.

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 Hamburg, Oslo, Rotterdam and London as the leading contenders in this regional race. In the Middle East, India and Africa region, Dubai is the leading centre. The city has strengthened its position from the 2015 report and is now in the list of top-10 maritime capitals of the world. The experts predict that the city will continue to grow in importance and be the world's 6th most important maritime center by 2022. ■

RANKING





THE MARITIME INDUSTRY

– GLOBAL VIEW

FOR DECADES, the world economy has become increasingly integrated. According to Peter Dicken, a British professor of Economic Geography, a “global shift” (Peter Dicken, 2010) 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 below USD 10,000 at the end of year 2016, while the Baltic Dry Index reached a record low in February 2016. 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. 2016 was also home to one of the largest bankruptcies in shipping, with South-Korean container giant Hanjin Shipping filing for bankruptcy.

The world in 2017 might continue on a path of becoming increasingly integrated, but political events in 2016 suggest that the world might be heading in the exact opposite direction. In 2016 we saw both Britain deciding to withdraw from the EU and the US signaling a U-turn in their approach to international cooperation and trade. 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 have to compete to attract and retain internationalized 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 recently 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 due 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. German Hapag-Lloyd’s merger with the largest Middle Eastern container shipping line United Arab Shipping Company (UASC), and CMA CGM’s acquisition of Singapore’s national carrier NOL/APL provide further examples of how global the industry has become.

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. ■

URBANIZATION AND ATTRACTIVENESS

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). In 2008, for the first time in history, more people live in cities than in rural areas. The share is expected to increase by 1.5 times to 6 billion people by 2045 according to the World Bank. Strong agglomeration forces induce firms, talents and investors to locate in the large global knowledge hubs. This trend works in favor of city-states, like Singapore, Hong Kong and Dubai, but cities in large countries, like New York, Rio and Hamburg, may also retain their attractiveness.

Companies have become more willing to move activities to the most attractive locations, with strong competition among cities to draw and retain them. The attracting factors, the glue that makes companies stay, have changed in recent years. Access to talent and proximity to advanced maritime R&D have become increasingly important in the competition. This trend is easily observed in the Expert Assessments in this year's report. The cities that are regarded as the most attractive locations for maritime companies – Singapore, London, Hamburg and Oslo – all score high on R&D, education and digital competence.

*“The world needs better shipping.
We need something like Uber; shipping
is an international community”*

– MARTIN STOPFORD
President, [Clarksons Research Services Ltd](#)

DIGITAL TRANSFORMATION AND INNOVATION

Digital transformation and disruptive innovation have become buzzwords in recent years. Although most companies are more concerned about incremental improvements of their own business, there is no doubt the digital capabilities will be increasingly important in the entire maritime industry. Digitalization will be a key driver for change in the industry, and the maritime world will be transformed based on the exponential growth in digital technology. It will both challenge existing business models and create new opportunities. Autonomy, automation and remote operation represent huge potential for reduced costs and safer operations, and can help make sea transport competitive in new segments. At the same time, digitalization will have a disruptive effect on the industry. How digitalization will affect the industry, and the speed of this force, is still unknown, but several players are trying to adapt to the new market realities. An example of this is that several shipping companies and maritime technology providers are adding Chief Digital Officer (CDO) to their management team. Another example is the port of Rotterdam that will acquire 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. ■



THE LEADING MARITIME CAPITALS OF THE WORLD

CITIES – ENGINES OF INNOVATION AND GROWTH

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 where to relocate or expand 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.

Agglomeration, the influx of people, companies and investments is fuelled 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

City regions are increasingly becoming aware of the international competition and 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

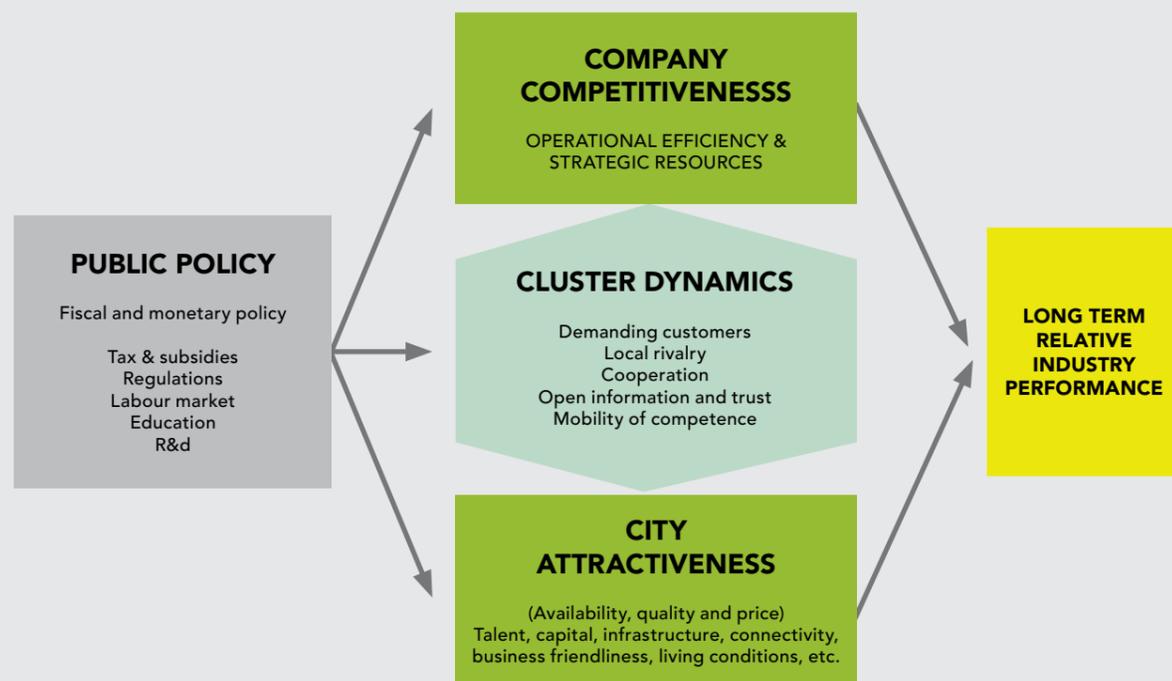
There are lots of inter-connected factors that drive the attractiveness of a city and the competitiveness of the industries located there:

- Strategic location
- Favorable political framework
- Proximity to large, demanding customers
- Local rivalry
- Large pool of talents
- Rich and open flow of knowledge and ideas
- Relationships built on common trust
- A sound and predictable legal framework
- Soft location factors
- Specialized universities and research institutions
- Abundance of suppliers and service providers

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.

THEORETICAL MODEL OF INDUSTRIAL COMPETITIVENESS

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



For the maritime industry in a city to prosper, two conditions must be satisfied: The companies have to be competitive, and the city has to 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 have to 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, labour 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.

BENCHMARKING BASED ON OBJECTIVE AND SUBJECTIVE INDICATORS

The *Leading Maritime Capitals* report for 2017 is the third edition of this report. Again, we base the ranking on a combination of objective data from leading sources and subjective measures to assess and benchmark 15 cities. The advantage of this methodology is that we can include hard facts (objective indicators) while still including expert opinions in areas that are difficult to measure with available objective data at city level (such as regulations, cluster dynamics, technological expertise and so on).

In this year's report, we have both doubled the number of objective criteria from 12 to 24 and increased the number of maritime experts that have taken part in the survey. This year's ranking is then based on a total of 46 different objective and subjective indicators. The process has been structured as follows:



To select the 15 leading cities we first identified the leading 30 cities in the world and benchmarked them based on the objective indicators. The leading 15 were then selected and included in the expert panel assessment. ■

THE 30 NOMINATED MARITIME CITIES

ORDERED BY RANKING

- SINGAPORE
- TOKYO
- OSLO
- HAMBURG
- SHANGHAI
- ROTTERDAM
- LONDON
- HONG KONG
- NEW YORK
- DUBAI
- COPENHAGEN
- ATHENS
- BUSAN
- HOUSTON
- GUANGZHOU
- KUALA LUMPUR
- MUMBAI
- ANTWERP
- SYDNEY
- JAKARTA
- LOS ANGELES
- BERGEN
- ISTANBUL
- VANCOUVER
- KAOHSIUNG
- RIO DE JANEIRO
- LIMASSOL
- MANILA
- PANAMA CITY
- CAPE TOWN

46 INDICATORS

THERE ARE NUMEROUS WAYS to assess the strength of the maritime cities. We have looked for data sources that are widely used and renowned in the industry. Even though we have identified limitations in some of them, we have decided to apply them unchanged. The reason for this approach is that we want to keep the assessments verifiable for others and replicable in the future. Methodology and data sources for the indicators are described in the appendixes.

These indicators are combined with judgments from our expert panel. 260 shipowners, executives, professors and journalists located in more than 50 cities on all continents were included in the study to assess the leading maritime cities of the world.

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, a geometric 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.

Based on feedback from readers, we have updated the first printed version of this report. Small errors and spelling mistakes have been revised in this updated version of the report. ■

PILLAR	SHIPPING CENTERS		
	DESCRIPTION	SOURCE	
OBJECTIVE INDICATORS	1. Fleet size – management	Size of fleet (CGT) managed from the city	Clarksons
	2. Fleet size – owner	Size of fleet (CGT) controlled by shipowners registered in the city	Clarksons
	3. Fleet value - owner	Value of fleet registered in the city	Menon estimations based on Clarksons valuation of national fleet
	4. Number of shipping headquarters	Number of shipping companies with headquarters in the city	ORBIS (Bureau van Dijk)
	5. Market value - shipping companies	Market value of shipping companies with headquarters in city	ORBIS (Bureau van Dijk)
EXPERT ASSESSMENTS	SURVEY QUESTION		
	1. Leading shipping city	Which of the following cities do you consider the five leading shipping centers?	
	2. Relocation HQ	If your company should relocate, which cities would be the most attractive location for the headquarter? (only include answers from shipowners)	
	3. Relocation operations	If your company should relocate, which cities would be the most attractive locations for operational units?	

PILLAR	MARITIME FINANCE AND LAW		
	DESCRIPTION	SOURCE	
OBJECTIVE INDICATORS	1. Number of legal experts	Number of maritime legal experts in the city	Who's Who Legal & Chambers and Partners
	2. Insurance premiums	Collected insurance premiums by organizations in the city	The International Union of Marine Insurance (IUMI)
	3. Maritime syndicate loan arranger/bookrunner	The value of the loans are allocated to banks who function as the lead arranger or the bookrunner. The value is allocated to cities based on banks' functional maritime headquarter	Dealogic
	4. Shipping portfolio	Existing shipping portfolio of top 40 shipping banks	Petrofin Research
	5. Number of maritime companies listed	Number of maritime companies listed on stock exchange in the city	ORBIS (Bureau van Dijk)
	6. Market value of maritime companies listed	Market capitalization of listed maritime companies on the city's stock exchange	ORBIS (Bureau van Dijk)
EXPERT ASSESSMENTS	SURVEY QUESTION		
	1. Leading financial center	Which of the following cities do you consider the five leading centers for maritime finance?	
	2. Brokering Services	In which cities do you find companies offering world-class maritime brokering services?	
	3. Specialized maritime competence	The banks and financial service providers have highly specialized maritime competence	

PILLAR	MARITIME TECHNOLOGY		
	DESCRIPTION	SOURCE	
OBJECTIVE INDICATORS	1. Shipyards	CGT delivered from shipyards in the city-region	Clarksons
	2. Employees in classification society	Number of maritime oriented personnel working in the leading classification societies in the city	Menon
	3. Classified fleet	Size of fleet classified by classification society. Allocated to cities based on HQ of class societies	Clarksons
	4. Market value of shipyards, technological services and equipment producers	Market value of shipyards and technical services of companies with headquarter in the city	Bureau van Dijk
EXPERT ASSESSMENTS	SURVEY QUESTION		
	1. Leading technology center	Which of the following cities do you consider the five leading centers for maritime technology of the world?	
	2. IT services and products	In which cities do you find companies producing world class maritime it-services and it-based products?	
	3. Maritime R&D & educational center	In which cities do you find the leading maritime R&D & educational centers of the world?	
	4. Maritime R&D & educational center	Our maritime research institutions are among the best in the world.	
	5. Maritime R&D & educational center	Our educational institutions are among the best in the world	
6. Maritime equipment	In which cities do you find companies producing world class specialized maritime equipment?		

PILLAR	PORTS AND LOGISTICS		
	DESCRIPTION	SOURCE	
OBJECTIVE INDICATORS	1. Port handling - TEU	Volume (TEU) handled in ports in city region	Lloyd's Top 100 Ports (2015), Copenhagen Malmö Port annual report 2015, Baltic Transport Journal (20.05.2016)
	2. Total cargo handled	Volume of total cargo handled in ports in city region	The American Association of Port Authorities
	3. Size of port operators	Volume (TEU) throughput handled by port operator with HQ in city	Drewry
	4. Port cruise calls	Number of cruise calls to port	DNV GL, Lloyd's List (Seasearcher)
EXPERT ASSESSMENTS	SURVEY QUESTION		
	1. Port and logistics	Which of the following cities do you consider the five leading centers regarding port & logistics services?	
2. Port related services	Which cities have the best offering of port related logistics services?		

PILLAR	ATTRACTIVENESS AND COMPETITIVENESS		
	DESCRIPTION	SOURCE	
OBJECTIVE INDICATORS	1. Ease of doing business	The Ease of Doing Business Index is an aggregate figure that includes different parameters which define the ease of doing business in a country	World Bank
	2. Transparency and corruption	The Corruption Perception Index measures the perceived level of public sector corruption	Transparency International
	3. Entrepreneurship	The Global innovation Index aims to capture the multi-dimensional facets of innovation	Cornell University, INSEAD, and the World Intellectual Property Organization
	4. Housing prices	The average cost of buying a house in city center. Measured in square feet	Global Property Guide and Numbeo
	5. Burden of Customs Procedure	The Burden of Customs Procedure Index measures business executives' perceptions of their country's efficiency of customs procedures	World Bank
EXPERT ASSESSMENTS	SURVEY QUESTION		
	1. Availability of world-class competence (talents)	The availability of world-class competence	
	2. Policy framework	Policy framework – overall assessment of taxes, subsidies and regulations	
	3. Governmental industry support	The government and governmental bodies are supportive to the maritime industry	
	4. Cooperation between the maritime companies in this city region	There is wide-spread cooperation between the maritime companies in this city region	
	5. Trust	When we do business with other companies in the city, we trust their intentions; i.e. we don't expect them to have a hidden agenda	
	6. Cluster openness and information sharing	The relationships among the companies in the maritime cluster are characterized by openness and information sharing	
	7. Relocation of R&D activities, HQ or operational center	If your company should consider relocating, which cities would in your opinion be the most attractive location for the headquarter, R&D and Operations?	
8. Most innovative and entrepreneurial	Which cities do you consider the most innovative and entrepreneurial center for maritime activities?		

EXPERT ASSESSMENT

The two leading cities, according to our expert panel, are Singapore followed by Hamburg. The industry experts rank London third, three places higher than our objective indicators suggest, while the opposite is true for Tokyo. According to the experts, there seems to be a distinction between six top-tier cities and between three and five second-tier cities. In addition to Singapore and Hamburg, Athens, Oslo, Hong Kong and London are seen as important top-tier shipping cities. The ranking differs somewhat when we look at what cities are leading centers today and when we ask shipowners where they would consider to relocate. Dubai is an interesting example. When asked what are the leading shipping centers today, only 5 percent select Dubai. When we ask shipping companies where they would consider to relocate, Dubai comes third overall. This suggests that Dubai is seen as an attractive location for shipping activities, and probably will be a growing center for shipping in the future.

Singapore has a strong position, both commercially and operationally, and is also an important meeting place for shipowners. Still, many shipowners in the country are not originally from Singapore. An important reason for Singapore's popularity is its stable pro-business environment. In the World Bank index for 2017 of "ease of doing business", only New Zealand was ahead of Singapore.

Hamburg is ranked second by our experts and overall. The German fleet grew strongly before the financial crisis, but the current orderbook suggests that its importance will decline somewhat over the next years. One of the reasons behind the increased presence of German owners was the development of "KG funds". These funds are owned by thousands of small private investors, where no single person has control. Subsequently, the shipowning community and the number of key decision makers is smaller in Hamburg than what our objective indicators

suggest. Still, our experts rank Hamburg higher than what the objective indicators suggest.

The experts rank London as the third most important shipping center. That is four places higher than in the 2015 edition of this report. London scores particularly well when it comes to relocation of headquarter functions. Despite Brexit, as least this far, London is seen as the second most attractive city if shipowners should relocate their shipping headquarters. London is followed by Oslo in fourth place. The shipping companies in Oslo have changed direction somewhat focusing more on finance, while in Bergen, the other leading shipping city in Norway, they still focus on industrial shipping operations.

"It is not necessarily the number of ships that says something of a city's status as a maritime capital, it's maybe more important to look at where real decision makers can be found. Hamburg and Oslo are two very different cities when looking at this dimension."

Kristin Holth
Head of the DNB Shipping,
Offshore and Logistics division

While Athens comes out first based on our objective indicators, it is placed sixth 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.

As Andreas Sohmen-Pao, the Chairman of BW Group, says, Singapore is an important center for shipping, and with an increasing number of maritime people being based there or visiting, it is a place where business ideas can be generated and deals can happen.

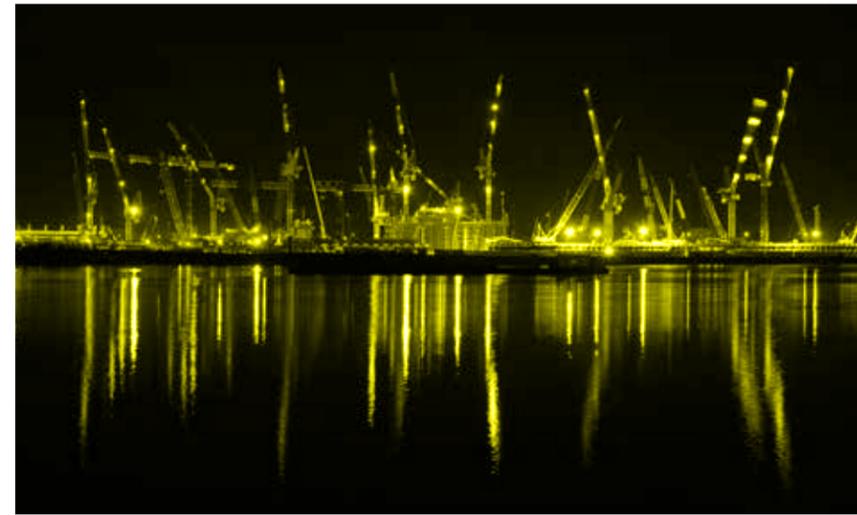
SHIP OWNERSHIP AND MANAGEMENT

To assess the importance of the world's shipping centers, we have combined five objective indicators with the results from a survey among 260 leading maritime professionals. To be recognized as a leading center for shipping, the cities need to have a certain number of major shipowners located in the city as well as companies with operational and commercial operations. Our objective criteria 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.

Currently, the world orderbook is dominated by American, Japanese, Chinese, Greek and Norwegian owners. This suggests that Athens will keep its position as an important ownership city, while the importance of Shanghai will continue to rise. The US fleet is mainly focused on offshore activities and seems to be dispersed in many different cities, making New York less important as a shipping center. Currently they have the largest fleet on order (measured in value). This is due to American owners' strong position within the cruise segment, a segment that has seen massive growth in recent years.

VALUE OF CITY-CONTROLLED FLEET

In figure 4, the cities are ranked by value of the fleet controlled from the cities. The reason why we use value as a measurement, instead of size of the fleet, is that the value of the fleet better reflects its economic importance. The valuation is based on data from Clarksons World Fleet Register and estimates based on the share of the



fleet controlled from the city. The top 15 cities control a fleet with a total value of more than USD 400 bn. That is almost half the world fleet. This share itself illustrates how important these 15 cities are in the global world of shipping.

The world's total merchant fleet is still concentrated in Greece and Japan. However, China is on the move, making Shanghai an ever more important city. In recent years, Germany has increased its market share dramatically, but after the financial crisis in 2008/2009, there has been a shake-out, particularly in the container segment. Still, Europe is the main center for shipowners, with roughly half the fleet being controlled by European owners.

The composition of the fleet differs between the cities. Athens might be best known for being home to a large tanker fleet, but the city also has a substantial fleet within bulk, containers and gas carrying vessels. Tokyo has a very diversified fleet, with a large number of bulkers, tankers, ro-ro vessels and gas carriers. Hamburg is quite specialized within containers, while Singapore has its

strength within offshore and tankers. Singapore's large fleet of offshore support vessels and FPSO/FSO fleet makes this the second most valuable city-fleet in the world after Athens.

SIZE OF SHIPOWNERS' FLEET AND MANAGEMENT OF FLEET

In figure 3, the cities are ranked by the total fleet in compensated gross tonnage (CGT) based on owners located in the various shipping centers. We compiled the data from figures for the entire world fleet and assigned the vessels to individual cities based on the location of the owners. Athens comes out first with an owned fleet of 88 million CGT, followed by Tokyo and Hamburg. By looking at owners located in the city and not the country, hubs like Singapore and Hong Kong will increase their relative importance. This is because national numbers will include several shipping communities located across larger countries.

In addition to ownership, we have included the size of the fleet managed from the different

city-regions. In a global world, and within such an international industry as the maritime, ownership and management of companies can easily be split up to take advantage of specialized local competence in different cities. The numbers are quite similar to the shipowner statistics, but there are some significant differences as well. While Singaporean owners control a fleet of 42 billion CGT, Singapore is such an important place for the management of other fleets that the figure almost doubles when measured in managed fleet. The effect is even stronger in Busan. The city manages a fleet that is almost four times as large as the owned fleet. We also see similar effects in Limassol and Manila.

It should also be noted that while New York plays a key role in financing maritime operations, the commercial and operational capacity of the city is weak. The fleet managed from New York is less than 40 percent of the city's controlled fleet. We see a similar, but somewhat weaker effect in Tokyo as well.

NUMBER OF SHIPPING HEADQUARTERS

While Oslo has the highest number of shipping companies with headquarters in the city-region, it is surpassed by both Athens, Copenhagen and London when looking at the market value of these companies. Still it is impressive to be home to more than 20 different listed shipping companies. Copenhagen is home to one of the world's most valued shipping companies, A.P. Møller-Mærsk A/S. While being home to only five companies, the total value of Maersk makes the value of the Danish shipping companies rank second, only beaten by Athens. Athens comes first when measured in value and second when measured in number of companies. While home to the leading shipowning community in the world, the financial market in Athens is small. Most of the Greek shipping companies are therefore listed in New York or in other leading maritime financial markets. ■

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

Source: Menon (2017)



Fig. 2 - Preferred city for relocation of headquarter or operations. Number of shipping companies selecting each city

Source: Menon (2017)



Fig. 3 - Size of fleet (CGT) controlled by shipowners registered in the city and managed from the city

Source: Clarksons/ Menon (2017)



Fig. 4 - Value of fleet controlled from the city region in 2016

Source: Menon/Clarksons (2017)

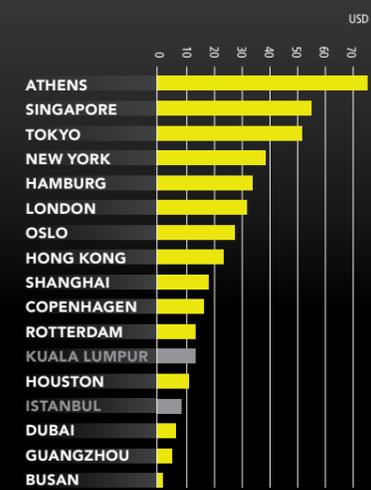


Fig. 5 - Value of listed shipping companies with headquarters in the city

Source: Bureau van Dijk (2017)

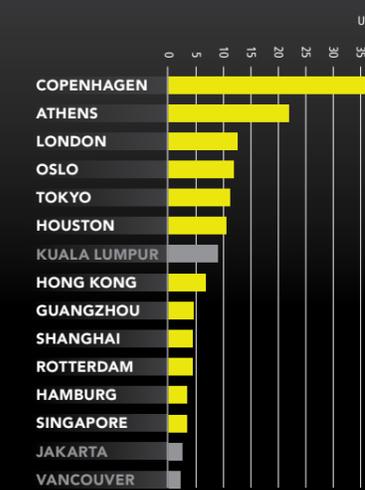


Fig. 6 - Number of listed shipping companies with headquarters in the city

Source: Bureau van Dijk (2017)



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, New York and Oslo are the clear leaders within this field, according to the industry experts.

The experts rank London as the most important financial maritime center of the world due to its dominant position, especially in law, insurance and brokering services. Singapore is ranked second, followed by Oslo.

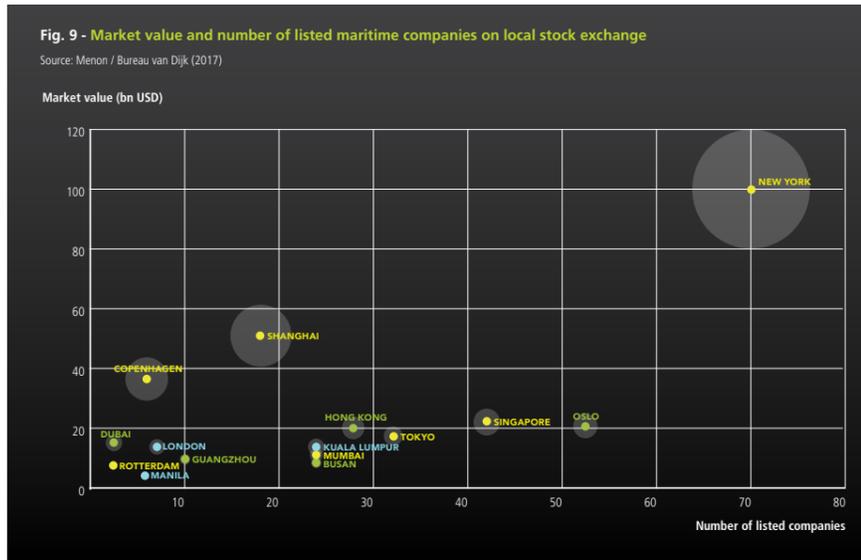
Maritime companies also need services other than those that directly relate to financing the company. Marine insurance and legal services are incorporated in the objective criteria. When asked what cities are home to world-class maritime brokering services, London, Singapore and Oslo were mentioned time and again. In these cities we find specialized companies such as Simpson Spence & Young, Braemar ACM, Lorentzen & Stemoco, and Clarksons Platou.

“Oslo’s strength lies in the totality of the four dimensions. Oslo has its strongest position in brokerage and shipping finance, maritime law, insurance and technology”

Industry expert

LEADING FINANCIAL CITIES

Of the five leading cities for maritime finance, all have stock exchanges with key industry players listed in their own cities. 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. Oslo and Singapore are second and third when it comes to the number of tradable stocks. This reflects that Oslo and Singapore are attractive markets for registering new stocks. Shanghai has the second largest market capitalization of maritime stocks, followed by Copenhagen. 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 51 bn, while A.P. Møller-Mærsk A/S traded at a total value of US\$49 bn on the stock exchange in Copenhagen. That is more than world-leading companies in other industries such as Sony, Kraft Foods and Yahoo.

BANKS – SHIP FINANCING

While New York and London stand out as leading financial capitals of the world, 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 (Dealogic, 2016).

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 (MLA). 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.

The experts were asked to assess maritime competence of the banks and financial service providers in their own city. In Oslo, New York, London and Rotterdam, almost all experts agree that the banks and financial service companies have highly specialized maritime competence. Most experts agree with this statement in Singapore, Hong Kong and Hamburg as well. The experts in Dubai, Busan and Houston are in the other end of the scale. As we have seen from the figures above, the experts’ assessments of their own cities correspond with the rankings of the cities – with one exception: Although the experts from Rotterdam are highly confident with the maritime competence of the banks and finance companies, very few experts regard Rotterdam as one of the leading cities of maritime finance.

LEGAL CENTERS

It is difficult to find relevant statistics to assess the strength of the cities when it comes to maritime law. The number of leading legal experts within maritime law gives an indication of the importance of the city for financial and legal transactions. Strong knowledge centers with many experts also attract more business to a city. Who’s Who Legal has identified the foremost legal practitioners in business law based upon comprehensive, independent research. London has by far the largest number of leading legal experts in maritime law (81) followed by Singapore (43), with New York and Hong Kong following closely. As already stated, London is the most important center for law in the world, and English law is still the most widely applied in shipping disputes.

For Singapore, in particular, the efforts of the Singapore Maritime Foundation (SMF) to develop Singapore’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 Hong Kong and Singapore seems to be related to their proximity to commercial operations and access to key industry players. Following these four cities are ten other cities with between 10-20 experts.

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. London was home to the first marine insurance company, Lloyd’s of London, and is still by far the most important center for marine insurance. In this year’s report, we have divided the national insurance markets into different leading marine insurance centers. London is then the clear market leader followed by Tokyo, Oslo and Shanghai. While the Chinese and Japanese companies focus on domestic clients, British and Norwegian companies focus on international clients. Singapore is making attempts to increase their marine insurance activities by introducing their own Singapore War Risk Mutual, through the effort from their industry association (Singapore Shipping Association or SSA). ■

Fig. 7 - The five leading maritime financial and legal centers, according to industry experts

Source: Menon (2017)



Fig. 8 - Industry experts’ answer to the question “In which cities do you find companies offering world-class maritime brokering services?”

Source: Menon (2017)



Fig. 10 - Value of loans from the 10 leading shipping banks. The banks functioned either as maritime syndicate loan arranger or bookrunner (bn USD). Numbers allocated to the bank’s maritime headquarter

Source: Dealogic (2016)



Fig. 11 - Own city assessment: The banks and financial service providers have highly specialized maritime competency

(1=Disagree; 4=Agree)



Fig. 12 - Number of leading maritime legal experts practicing in the city

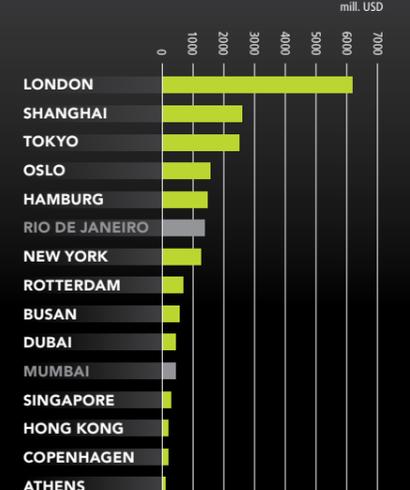
Source: Who’s Who Legal & Chambers and Partners (2017)

This number only includes leading experts within the field as defined by research conducted by Who’s Who Legal and Chambers and Partners



Fig. 13 - Insurance premiums (mill. USD) collected in 2015 - national figures allocated to cities

Source: IUMI (2015)



EXPERT ASSESSMENTS

Singapore is ranked as the world's leading maritime technology center by our experts, followed by Oslo, Hamburg and Busan. Hamburg and Oslo both have strong R&D institutions and a highly advanced maritime equipment industry. The manufacturing of equipment is often located outside of the city region, whereas technology development and engineering are to a large extent within. Busan, Shanghai and Tokyo follow on the next places, all strong on shipbuilding.

"One of Singapore's strengths is in the technology-driven arena. We have an increasing number of marine and offshore engineering entities located here. By collaborating across different levels of the value chain, and with active support from research bodies and tertiary institutions, these companies help expand Singapore's technological boundaries and continuously enhance its competitiveness as a global maritime capital."

Wong Weng Sun
President & CEO, Sembcorp Marine Ltd

Singapore's high ranking is due to the city being a market place where buyers and sellers can meet, without the companies necessarily producing ship equipment and technological products in Singapore. 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.

KNOWLEDGE CENTERS – R&D AND EDUCATION

In 2015, the maritime experts pointed to Hamburg and Oslo as the leading maritime knowledge centers. This year, Singapore has surpassed them both (see scores on this indicator in appendix A). Two thirds of the experts consider Singapore as one of five leading centers of maritime R&D and education, while six out of ten say the same about Oslo. However, when we ask the experts to assess the institutions of R&D and education in their own city, Rotterdam, London and Hamburg get the highest scores. Rotterdam has several universities and research institutions specialized in maritime. 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 Master of Science program in Shipping and Transport (both full and part time) and has been set up in close cooperation with the maritime business community. London is particularly strong in maritime finance, for example with a specialized MSc in Shipping, Trade & Finance at Cass Business School.

For Singapore, the relatively strict assessment by the experts locally on this indicator might be explained by lack of maturity of the local institutions as compared with other leading research centers in key maritime European cities such as Rotterdam and Hamburg. For Oslo the slightly weaker score among the city's own experts than by the maritime experts from other cities, can probably be explained by the fact that Trondheim

is the national knowledge center in Norway for maritime R&D and technology oriented education, while the University of Oslo has its strength in IT and maritime law.

High labour costs have forced the Norwegian and German maritime industry to become technologically advanced. Close links between the education centers, shipowners and manufacturers are critical for being a strong maritime center for research and development. The closely knit Norwegian maritime industry gives Oslo an advantage, and from Oslo you can easily connect to other local maritime clusters in Norway.

Hamburg is the center of gravity 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.

MARITIME EQUIPMENT

The maritime industry often demands specialized equipment to handle conditions at sea. Increasingly, environmental regulations create new niche markets for maritime equipment. A recent example is the regulations on ballast water, which has created a completely new market for ballast water treatment systems. Around 60,000 vessels world-wide will need to install these systems in the coming years.

The panel of experts point to Hamburg, Singapore and Oslo as the places to go for world-class specialized maritime equipment. Also, Busan and Shanghai score high, with one of two experts holding them as top five on maritime equipment. Still, Chinese yards import around 50 percent of the equipment installed in vessels, illustrating 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 percent from 2008 to 2013.

Germany and Norway both have a long tradition of producing maritime equipment within a high cost environment. This has forced German and Norwegian maritime equipment suppliers to deliver innovative and advanced equipment with a high level of added value. Singapore's high ranking could be attributed to the availability of all major marine equipment players operating out of Singapore, and the level of sophistication and competence available 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.

The experts were also asked in which cities they find companies producing world class maritime IT services and IT-based products. On this Singapore and Oslo score highest, followed by London, Hamburg and Copenhagen. It is interesting to observe that one third of the experts point to Copenhagen as a city of world class

maritime IT. As the final chapter of this report will reveal, Copenhagen is also regarded as the third best prepared city for the digital transformation of the maritime industry.

"The world isn't standing still, and shipping can't afford to. There's no doubt that digital technology will be at the heart of the next generation of shipping solutions. Here the Nordic countries have taken a clear lead"

Birgit Liodden
Director Nor-Shipping

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 labour. 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 value of European yards' orderbook with the size of the orderbook. Measured in size, European yards have less than 2 percent of the world orderbook (dwt), whereas measured in value, European yards are home to 22 percent of the world orderbook. This is due to the European yards' focus on high-end markets such as cruise, offshore 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.

Most shipyard activities are centered in a few Asian countries. In 2016, more than 1600 vessels

Fig. 14 - Share of industry experts that select the city as a leading center for maritime technology (R&D, education, ship building and maritime equipment)



Fig. 15 - Own city assessment
Our maritime research and educational institutions are among the best in the world (1=disagree; 4=Agree)

	Maritime research	Maritime education
ROTTERDAM	3.70	3.80
LONDON	3.64	3.68
HAMBURG	3.75	3.38
OSLO	3.54	3.30
COPENHAGEN	3.44	3.33
SINGAPORE	3.32	3.14
SHANGHAI	3.20	3.00
NEW YORK	2.80	2.60
HONG KONG	2.33	3.00
ATHENS	2.67	2.67
HOUSTON	2.60	2.60
TOKYO	2.50	2.50
BUSAN	2.60	2.20
DUBAI	1.85	1.74

Fig. 16 - Share of industry experts that mention the city as "a place you can find companies producing world-class specialized maritime equipment"



Fig. 17 - CGT delivered from shipyards in the city-region in 2016

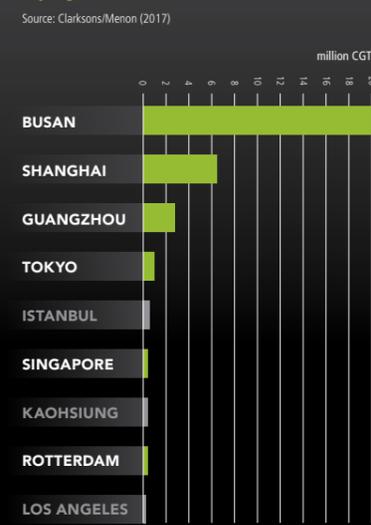


Fig. 18 - Size of fleet by classification societies headquarter (million CGT)



Fig. 19 - Number of maritime-oriented personnel working in the leading classification societies in the city



above 100 GT were delivered from yards globally (Clarksons, 2017). Of these, more than 80 percent were delivered from China, South Korea and Japan. 9 percent of deliveries were from European yards, while the remaining 10 percent were delivered from other yards in Asia, Brazil, USA and others. The shipbuilding industry is currently characterised by over-capacity, after strong increase in yard capacity. In 2017, deliveries are expected to fall by 10 percent.

The region surrounding Busan, Gyeongnam, is the center for the South Korean shipbuilding cluster. The area has deep waters free from sandbanks. 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 value, but is not yet as technologically advanced as the South Korean shipyards. Japan, with its large domestic market, comes third. Tokyo’s low ranking by our expert assessment indicates that the Japanese shipbuilding industry is not very important for markets outside Japan.

Italy, Germany, Norway and the Netherlands are the leading shipbuilders in Europe. The Norwegian industry focuses on highly advanced offshore vessels that can be used for construction and well intervention. Recently, cruise has taken over as an important market.

The data does not include offshore rigs used in the oil and gas industry. A single rig can cost several hundred million dollars and if incorporated in the figures below, they would have increased the value of deliveries from the three major rig building countries; China, Singapore and South Korea. In addition, Dubai’s numbers would have increased based on deliveries from drydocks.

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.

Although DNV GL became the largest classification society after the merger between Norway’s DNV and Germany’s Germanischer Lloyd, Tokyo with ClassNK takes first place when measuring the classified fleet. Despite DNV GL headquarters are in Oslo, we chose to split the number of ships between Oslo and Hamburg. This since the headquarter of DNV GL’s maritime division is located in Hamburg. That leads to



Oslo taking fourth place after Tokyo, Houston and London. Lloyd’ Register’s headquarters, the oldest classification society with a history from 1760, places London in third place in our ranking of classification societies.

Houston does well on the objective technology measures much due to being home for American Bureau of Shipping (ABS). Houston is also one of the leading centers of the world for offshore oil and gas activities, by many regarded as the world’s leading center for oilfield equipment.

Some cities that don’t host the headquarters of classification societies may still have significant presence of them. Hence, we have included the number of maritime oriented personnel working in the leading classification societies in the city, among the indicators. Shanghai, lacking their own classification society, has the highest number, followed by Houston and Oslo.

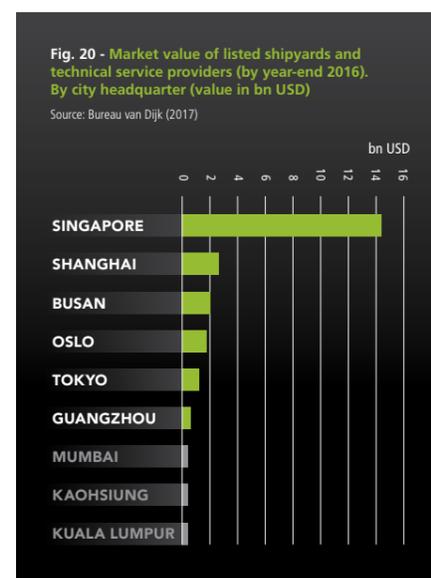
MARKET VALUE OF MARITIME TECHNOLOGY COMPANIES

Many of the largest companies offering products to the maritime industry are conglomerates such as Siemens and Rolls-Royce covering many different industries. Hence, it is difficult to measure their footprint on the maritime industry. Government controlled and small sized companies are also usually not listed, making data on their activities less available. Still we have identified more than 100 listed companies with focus on shipbuilding and/or offering maritime technology in the world market.

Singapore is home to the world’s largest listed companies with a focus on maritime technology. The market value of Keppel alone is more than USD 8 bn (year-end 2016). Keppel is one of the world’s leading marine engineering companies, making Singapore an important hub for building

offshore rigs and FPSO/FSU conversion and modification projects. The offshore and marine unit is one of several business segments within this conglomerate. Sembcorp Marine is another major player in Singapore, with extensive track record in newbuilding and conversion of high value offshore assets inclusive turnkey solutions for complex projects. From 2015 to 2016, lower activity within the global offshore oil and gas markets made revenues from the marine and offshore segment decline by more than 50 percent.

Shanghai and Busan follow Singapore on the list. The companies in these cities are mainly shipbuilding and marine engineering companies such as Hyundai Mipo Dockyard in the Busan region and Saintry Marine and Shanghai Bestway in Shanghai. ■



PORTS AND LOGISTICS SERVICES

SUMMARY



WHILE SHANGHAI IS RANKED FIRST ON the objective criteria, Singapore comes first overall as the leading city today for port services and logistics. Singapore is home to the world's second largest port and our industry experts rank the city as the leading port city of the world. Shanghai comes second followed by Rotterdam, Hong Kong and Hamburg.

Shanghai is home to the world's largest container port and has been expanding its operations rapidly during the last decades. Only in the last ten years, the number of containers handled in the port is more than doubled. Singapore's cost level, combined with the growing importance of the Chinese market, might push Shanghai or another Chinese city ahead of Singapore in the future. Following Shanghai on the objective criteria is Rotterdam. The port city in the Netherlands is home to the largest port in Europe and also one of the world's most advanced. 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 fieldlab 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.

The objective ranking focuses on the size of the city's port, the size of leading port operators and port calls of cruise ships. Since these indicators by themselves are quite narrow, the subjective view of the industry experts becomes important to cover other areas that influence the quality of port and logistics services. The industry experts identified five tier-one cities for maritime port and logistics services. Besides the Asian trio of Singapore, Hong Kong and Shanghai, the two European cities Rotterdam and Hamburg are included. Rotterdam's diverse port with well-established link to the European continent is emphasised by the experts. Hamburg is a strong shipping center and is the most important access point to the large German market.

Dubai is increasing its importance as a logistics center. 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 sixth overall. ■



RANKING

■ OBJECTIVE INDICATORS ■ EXPERT ASSESSMENTS

Rank	Objective Indicators	Expert Assessments	City
1	2	1	SINGAPORE
2	1	3	SHANGHAI
3	4	2	ROTTERDAM
4	3	5	HONG KONG
5	6	4	HAMBURG
6	5	6	DUBAI
7	7	7	BUSAN
8	8	10	TOKYO
9	10	9	GUANGZHOU
10	13	8	HOUSTON
11	9	12	NEW YORK
12	12	11	ATHENS
13	11	13	LONDON
14	14	15	COPENHAGEN
15	15	14	OSLO

EXPERT ASSESSMENT

The last edition of this report from 2015 ranked Singapore and Rotterdam as the world's two leading centers for port and logistics services. This has not changed. Singapore has the benefit of proximity to the Asian market, and, as one of the experts pointed out, has "an excellent legal framework with strong support for industry from the local government." 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. Rotterdam is seen as the second most important center for port and logistics services. According to one of our industry experts it might have a small lead on Singapore when it comes to digitalization:

"Rotterdam will probably have the first robotized harbour; it will come before Singapore. In Asia manpower is so cheap that you don't have the same incentives to save costs on that as you do in Europe."

Industry expert

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, according to the experts, 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 ranked almost as high as Singapore and Rotter-

dam. 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.

Hong Kong is ranked fifth by the expert panel. 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 ranked sixth by the experts; a middle position between the five top cities and the rest. Dubai is a regional maritime center that focuses on increasing its presence in the industry. In the Dubai Strategic Plan (2007–2015), transportation and storage have together been identified as one of the six building blocks for future growth. 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 upgraded and modernized to comply with today's standards and to lower the cost of transportation. 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 specialised logistical services.

The industry experts point to Singapore and

Rotterdam, followed by Shanghai, as the leading cities for highly specialised 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.

"Singapore's long term plan to remain at the forefront of port and specialized logistical services includes developing a new, highly automated megaport at the westernmost tip of the island with capacity upto 65 million TEUs. This new location will also allow consolidation of maritime and supply chain activities within proximity, combined with leisure and recreational facilities to bring life and vibrancy to the area."

Tan Chong Meng
Group CEO, PSA International

PORT VOLUME

The world's largest ports are found in Asia, with Shanghai, Singapore and Shenzhen being the three largest. 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. Earlier, Hong Kong experienced a lot of direct trade for cargoes originating in Hong Kong and the southern Chinese city of Shenzhen, but the cargo mix has changed in the last decade, so that

transhipments now make up 75% of its total annual output. If we also included ports outside the 15 cities we are examining, 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 world's 100 largest ports handled close to 550 million TEU in 2015, of which 40 percent were handled in China. This is another indication of the importance of China in the global maritime industry.

The largest ports after Shanghai, Singapore and Hong Kong are found in the United Arab Emirates (UAE). Dubai's Jebel Ali together with the other ports in the UAE handled a total of 25 million TEU in 2015. Dubai and the surrounding region is 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.

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.

PORT OPERATORS

As part of the ever-increasing specialization, the largest and best port operators are branching out to operate new ports. The ranking below includes the volume of goods handled by port operators with headquarters in the different cities. Despite a weak development in the port of Hong Kong itself, Hutchison Port Holdings is the

world's largest port operator. Together with China Merchant Port International and two other large operators, Hong Kong is the largest center for port operators in the world. Combined companies with headquarters in Hong Kong control more than 120 million TEU each year.

Four cities follow Hong Kong closely; Rotterdam, Dubai, Shanghai and Singapore. Rotterdam comes second, much due to APMT, a subsidiary of the Danish maritime giant AP Moller-Maersk. After rapid expansions at home and abroad, Dubai comes third. Dubai's DP World is the leading port operator in the Middle East. The Dubai region is also home to Gulftainer, another large operator with terminals in six different countries. Following Dubai are Shanghai and Singapore.



Singapore is home to PSA, one of the leading global port groups. PSA participates in around 40 terminals in 16 countries across Asia, Europe and the Americas with flagship operations in PSA Singapore Terminals and PSA Antwerp. Shanghai is home to several port operators that combined handled more than 60 million TEU in 2014.

Following Singapore, 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

the market. According to Drewry, the world's ten largest port operators handled two-thirds of all containers in the world in 2014.

MARITIME TOURISM A GROWING SEGMENT WITHIN THE INDUSTRY

While some market segments such as offshore and traditional shipbuilding are struggling with overcapacity and weak markets, maritime tourism is growing quickly. In the OECD report "Ocean Economy 2030", maritime tourism is placed among the largest segments both today and for the future. Cruise vessels make up 8 percent of the world orderbook (measured in value) and currently we find several cruise companies

among the most valuable of all the listed shipping companies. To reflect the importance of this growing market we have included number of cruise calls as an objective criterion. Of the 15 cities in this report, Athens is the most important cruise destination, followed by Hamburg and London. While many of the European cities have seen a steady growth during the last decade, the activity in Asia, and also Dubai, is increasing at a more rapid speed. Cities such as Shanghai will probably outpace centers in Europe within a few years. ■

Fig. 21 - Percentage of industry experts that consider the city home to leading ports and logistics services



Fig. 22 - Container volume handled in city port (million TEU)



Fig. 23 - Percentage of industry experts that regard the city port as leading supplier of logistical services



Fig. 24 - Volume of cargo handled in ports in the city region (million tons)



Fig. 25 - The largest port operators in the world by headquarters (million TEU)



Fig. 26 - Number of cruise calls to ports in the city region



ATTRACTIVENESS AND COMPETITIVENESS

SUMMARY



“Never resting on our laurels but striving for constant improvements is what has brought Maritime Singapore to where it is today. With its business-friendly policies, great efficiency, stability and easy access to talent – Singapore is a truly attractive place to operate shipping businesses.”

ESBEN POULSSON,
President Singapore Shipping Association

THE FINAL PILLAR in our ranking, attractiveness and competitiveness, points to the future. The more attractive a city is, the stronger growth can be expected in the future. Cities must be regarded attractive by the incumbent companies in the city to retain them – and by external companies to attract them. Hence, we measure both in this chapter: To what extent are the incumbent companies satisfied with location factors like policy framework, quality and relevance of R&D and educational institutions, and the maritime competence of specialized suppliers. And, which cities are regarded as the most attractive for relocating headquarters, operations and R&D.

Singapore is clearly the most attractive and competitive maritime city in the world, both measured by objective indicators and the experts’ assessments. Singapore gets the highest score on “ease of doing business” and “burden of customs procedure”. However, it is in terms of perceived attractiveness Singapore stands out. 7 of 10 experts regard Singapore as one of the three most attractive cities in the world for relocating their headquarter. There are many reasons for this, for instance the strategic location and connectivity and the completeness of the cluster. However, the favorable and predictable policy framework is probably the most important source of attrac-

tiveness. The incumbent experts in Singapore are more satisfied with the policy framework than the incumbents in any other maritime city in the world.

Oslo is the second most attractive and competitive city, ranked third on the objective indicators and second by the experts. Oslo scores very high on all indicators, but doesn’t stand out as number one on any of them. Oslo is the leading city of maritime *technology*, something that also characterizes the attractiveness of the city. 21 percent of the experts hold Oslo as their first choice for relocating R&D functions, only beaten by Singapore with 28 percent. Oslo is also regarded as the second most innovative and entrepreneurial maritime city.

Copenhagen is number two on the objective indicators of attractiveness and competitiveness, with top score on ease of doing business and transparency & corruption. Copenhagen is only ranked sixth by the experts, but the incumbent experts in Copenhagen are highly satisfied with the governmental support to the maritime industry in the city. Two other cities that score high on policy framework, are Dubai and Vancouver. On overall attractiveness and competitiveness, Dubai is ranked fifth. While Dubai scores particularly well on the objective indicators, Hamburg gets higher scores by the experts, and ends fourth in total. ■



RANKING

■ OBJECTIVE INDICATORS ■ EXPERT ASSESSMENTS

Rank	Objective Indicators	Expert Assessments	City
1	1	1	SINGAPORE
2	3	2	OSLO
3	2	6	COPENHAGEN
4	7	4	HAMBURG
5	4	8	DUBAI
6	10	3	LONDON
7	6	7	HONG KONG
8	5	9	ROTTERDAM
9	14	5	SHANGHAI
10	9	10	NEW YORK
11	8	12	HOUSTON
12	12	11	ATHENS
13	11	14	TOKYO
14	13	13	BUSAN
15	15	15	GUANGZHOU

ATTRACTING COMPANIES

We asked the experts to consider the following: If your company should consider relocating, which cities would in your opinion be the most attractive location for the headquarter, operations and R&D functions? The experts were asked to rank the most, second most and third most attractive for each three functions. Altogether, 44 cities were mentioned by the 260 experts. The 15 leading cities that are benchmarked in this report constituted more than 90% of the selections. Moreover, the six most attractive cities had 2/3 of all selections. Hence, there is no doubt that the leading maritime cities in this report are regarded as the most attractive cities for maritime companies.

The diagram shows the 17 cities that are selected more than 10 times by the experts. Three of these, Limassol, Mumbai and Manila, are not among the leading 15 cities on objective indicators. These three cities are particularly attractive for maritime operations. In addition, Limassol is number 12 on headquarter locations, making it more attractive in total than Tokyo.

In line with the results on other pillars of the total ranking, Singapore stands out as the most attractive city for locating both headquarters, operations and R&D. However, this does not imply that all experts regard Singapore as the most attractive location. Six out of ten experts had other cities on top for both headquarters and operations, and three of four had other cities on top for R&D.

The figure below shows the five cities that received the highest number of number one selections, and how they vary in attractiveness for different functions. First, note that Oslo has more number one selections than both London and Hamburg, most of them for locating R&D. Hamburg also has its highest attractiveness as a location for R&D, while London is the second most attractive city for headquarters. Half of the



experts that have selected London as the most attractive HQ location, are owners or managers in maritime finance.

Note also that Shanghai, number five on the total ranking of attractiveness, is regarded as the second or third most attractive location for a high number of maritime companies, but the most attractive location for relatively fewer. The opposite is true for Rotterdam.

The five cities in the figure dominate the attractiveness of headquarters and R&D functions, but not so much for operations. One third of the experts have selected other cities, particularly Shanghai, Dubai and Mumbai.

POLICY FRAMEWORK

Moving from attracting to retaining companies, we asked the experts about the policy framework for maritime companies in their own city, both in terms of taxes, subsidies and regulations, and whether they perceive the governments as supportive to the maritime industry. The experts in Singapore are very satisfied with the government and governmental bodies. More than 90%

of the experts in Singapore fully agree that the government and governmental bodies are supportive to the maritime industry, and all of them regard the policy framework attractive or highly attractive.

Apart from Singapore, no city has a more attractive policy framework than Vancouver, according to the experts' assessments of their own cities. This is not by coincidence. Vancouver, with a strategic location on the Pacific rim of Canada, has a clear aspiration to become a global maritime HQ/management center through broad tax incentives for shipping and auxiliary services. Favorable policy framework, supportive government, and attractive living conditions, are attractiveness factors that probably will lead Vancouver to climb on the rankings of maritime cities in the years to come.

The second most favourable policy framework – taxes, subsidies and regulations – is found in Dubai. 50% of the experts in Dubai regard the policy framework highly attractive. Also, Copenhagen and Oslo score high on policy framework. In addition, two of three experts in Copenhagen fully agree that the government and governmental bodies are supportive to the maritime industry.

CLUSTER DYNAMICS – OPENNESS AND INFORMATION SHARING

In the long run, the competitiveness of the maritime companies in the cities is shaped by the cluster dynamics, that is, by the relationships between the actors. Openness and information sharing is particularly important, both for reducing transaction costs, and even more important for knowledge flows and innovation. On this issue, we see important differences, not just between cities, but also between continents. Europeans in general, and Scandinavian companies in particular, seem to have higher trust and share more information in their business relationships.

“The maritime industry is unique in that you socialize a lot with your competitors. You must share information to get information. In Singapore, there is not much of a sharing culture between the companies and much higher turnover than in, say, Norway. However, high turnover leads to sharing after all.”

Industry expert

19 of 20 experts in Scandinavia 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. In the Middle East the share is less than 60%. Observe also that in the Americas, only 1 of 10 agree that the relationships among the companies in the maritime cluster in their own city are characterized by openness and information sharing.

On city level we have to be careful with drawing too strong conclusions, because the number of experts is limited in Hong Kong, Tokyo, Athens and Shanghai. Having this in mind, we observe that the business relationships in Oslo, Rotterdam, Hong Kong and Tokyo seem to be characterized by openness and information sharing. In the other end of the scale, Shanghai, Dubai, Houston and Busan have lower levels of openness and information sharing. Singapore also scores below average, and significantly lower than Oslo and Rotterdam.

We also asked the experts whether they agreed with the following statement: When we do business with other companies in the

city, we trust their intentions; i.e. we don't expect them to have a hidden agenda. On this, Rotterdam, Hamburg and Oslo scored highest, while Shanghai, Houston and Dubai received the lowest scores. Finally, on the cluster dynamics measures, the experts were asked about degree of competition within the maritime industry of the city. Again, Rotterdam and Hamburg came out on top.

EASE OF DOING BUSINESS

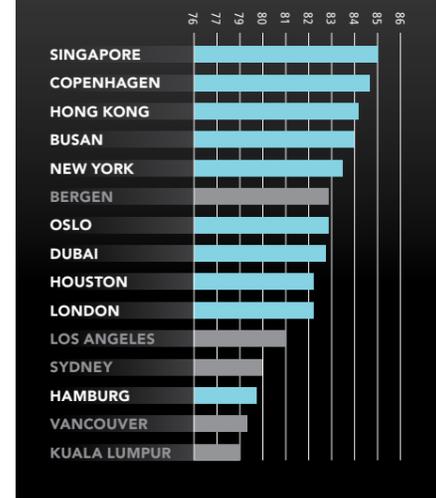
The maritime industry is international in nature, and that makes competitive regulation important for cities to attract and retain business. Both maritime specific regulation and the overall regulatory framework for conducting business is important in this aspect. While it is difficult to measure maritime specific regulations on a global scale, the *Ease of Doing Business Index* developed by the World Bank gives insight into the wider set of regulations. 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, we find that small city states perform very well on the index, with Singapore and Hong Kong among top-three performers. There are relatively small differences between the top 10-cities. What is as interesting is that cities in China score low. Shanghai and Guangzhou are not included in top 15 cities and behind countries such as Colombia, Rwanda and Kyrgyzstan. China is ranked 78th of the 190 economies included, and scores low on topics such as “starting a business”, “paying taxes” and “dealing with construction permits”.

Rotterdam, Athens and Tokyo are also not in the top-15, but are found in 16th, 17th and 18th place, respectively.

Fig. 32 - Ease of Doing Business Index

Source: The World Bank, (2016)



INNOVATION AND ENTREPRENEURSHIP

The maritime experts were asked to select the three cities they perceive as the most innovative and entrepreneurial for maritime business. Two cities stand out: Singapore and Oslo. 75 experts hold Singapore as the most innovative, while 74 rank Singapore the second or third most innovative and entrepreneurial city. Oslo is a clear number two: 62 experts rank Oslo the most innovative and entrepreneurial city, while 103 have Oslo as one of three.

Hamburg, London, Copenhagen and Dubai are also ranked top three on innovation and entrepreneurship by many experts. Surprisingly few cities outside the top 15 are selected by the experts. Bergen is the only exception, selected by six experts. ■

Fig. 27 - 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 (2017)



Fig. 28 - Maritime experts' opinion of the five most attractive cities for relocating maritime companies. Number of experts that rank the cities the most attractive for different functions (HQ, Operations and R&D.)

Source: Menon (2017)

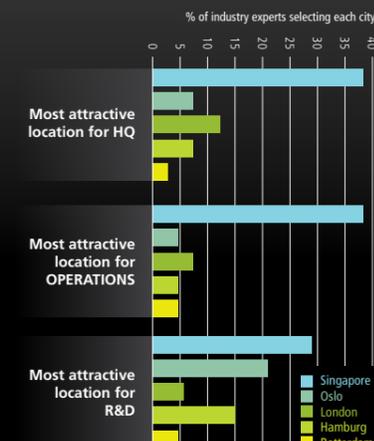


Fig. 29 - The experts' assessments of the policy framework in their own city. (Cities ranked by the average score on the two indicators.)

Source: Menon (2017)

■ Policy framework - overall assessment of taxes, subsidies and regulations (1=Highly unattractive; 4= Highly attractive)
■ The government and governmental bodies are supportive of the maritime industry (1=Disagree; 4= Agree)



Fig. 30 - 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 (2017)

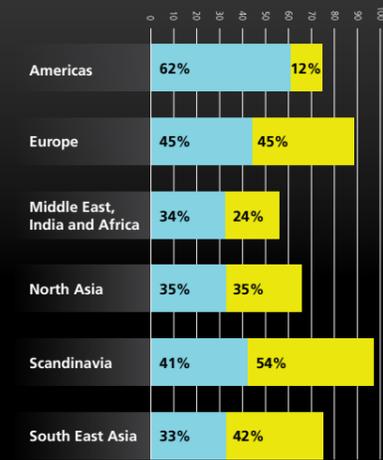


Fig. 31 - Share of maritime experts who agree that relationships among the companies in the maritime cluster are characterized by openness and information sharing

Source: Menon (2017)



Fig. 33 - Number of industry experts selecting the cities as one of three most innovative and entrepreneurial for maritime activities

Source: Menon (2017)



THE LEADING MARITIME CITIES OF THE FUTURE

As part of this study, we also asked the experts to make predictions about the leading maritime capitals of the world in five years ahead (2022). The figure below shows which cities the expert panel predict will be important in five years from now.

There seems to be a clear consensus among the experts that Singapore will remain the most important city in 2022, 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. The Philippines, for instance, surpassed its European competitors to become the fourth largest shipbuilding nation in 2014 (measured in dwt). The country currently has the world's fourth largest orderbook measured in dwt, but falls behind European yards measured in value.

The experts seem to be more in doubt when it comes to selecting a clear third most important leading city as they ranked six cities almost equally in this place. Oslo, London, Hamburg and Athens are four European cities

that are expected to retain their positions. However, the city they believe will increase most in importance compared to today's situation, together with Shanghai, is Dubai. One of the experts highlights that the city is developing quickly, while another points to a strong political will from the local government to increase Dubai's presence in the industry. Dubai is today an important trading center in the region and is becoming the preferred city for maritime activity within the wider region covering Middle East, India Sub-continent and Africa.

Compared with the experts' predictions in 2015, the main picture is unchanged. As in 2015, Singapore is expected to retain its position as the leading maritime city, while Shanghai is expected to be number two. Behind these two cities, there are several interesting changes. One is that Rotterdam drops from position three to 9. Two years ago, 41% of the experts expected Rotterdam to be among the top five cities in 2020. Now, only 23% expect the same. Oslo and London strengthen their expected positions somewhat, while Hamburg retains its position. Dubai climbs one place in expected rank, from no 7 to 6. In the other end, the experts seem to have lost faith in Busan. Only 9% expect Busan to be top 5 in 2022.

CITIES PREPARED FOR THE DIGITAL TRANSFORMATION OF THE MARITIME INDUSTRY

As we started this report to emphasize, the maritime industry is expected to go through

a digital transformation over the next years. Hence, an intriguing question is which cities are best prepared for this transformation. The experts believe that Singapore has strong capabilities for handling the digital transformation. More than half of the experts also expect Oslo to be one of the best positioned cities. It is interesting to observe that while only 13% of the experts expect Copenhagen to be one of five leading maritime cities in general, 40% of them believe Copenhagen to have strong capabilities for the digital transformation. In general, European cities seem to score higher on digital transformation compared to cities elsewhere.

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. The graph below depicts the orderbook of shipowners located in different cities. It is dominated by a mix of well-known Asian and European shipowning hubs. Greek owners in Athens come first, followed by owners from Tokyo, Hong Kong, Singapore and Shanghai. As share of existing fleet, owners in Los Angeles, Rio, and Shanghai are expanding most rapidly. All these three cities have an orderbook larger than 20 percent of their existing fleet. That is more than twice the average of all the cities combined. Hong Kong, Tokyo and Copenhagen follow, all with an expected fleet expansion above 15 percent. ■

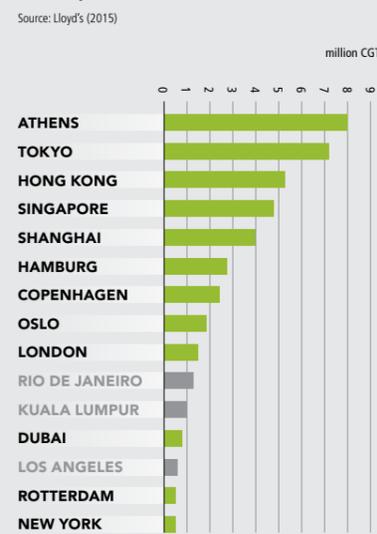
Industry experts answer to: "Looking forward five years from now, which cities will be the five leading maritime centers of the world?"



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



Size of orderbook from shipowners based in the city



APPENDIX A: LIST OF OBJECTIVE INDICATORS OF 30 CITIES

CITY	SHIPPING					FINANCE & LAW					PORTS AND LOGISTICS				MARITIME TECHNOLOGY			ATTRACTIVENESS AND COMPETITIVENESS						
	Fleet size - owner	Fleet size - management	Fleet value - owner	Number of shipping company headquarters	Market value - shipping companies	Legal expertise	Insurance premiums	Maritime syndicate loan arranger/bookrunner	Shipping banks portfolio	Market value of maritime companies listed	Number of maritime companies listed	Port handling - TEU	Port handling - Total cargo	Size of port operators	Port cruise calls	Shipyards (CGT)	Classified fleet	Employees in R&D	Market value of shipyards, technological services and equipment producers	Ease of doing business	Transparency and corruption	Entrepreneurship	Housing prices (1 = Least expensive)	Burden of customs procedure
SINGAPORE	4	2	2	4	13	2	5	-	10	3	3	3	4	5	7	6	12	7	1	1	5	4	26	1
TOKYO	2	5	3	2	5	15	2	4	4	7	4	14	7	7	26	4	1	8	5	17	14	4	27	11
OSLO	10	16	7	1	4	5	3	1	2	4	2	28	30	-	19	21	4	3	4	6	2	11	23	6
HAMBURG	3	3	5	15	12	8	7	-	3	20	17	8	10	6	3	11	5	5	15	13	7	11	18	17
SHANGHAI	6	7	9	13	10	7	4	-	1	2	10	2	3	4	8	2	-	1	2	24	27	7	25	21
ROTTERDAM	14	15	12	22	11	6	9	2	5	14	18	9	5	2	12	8	-	13	-	16	2	17	7	4
LONDON	7	6	6	7	3	1	1	5	6	10	12	13	25	-	4	26	3	6	11	9	7	1	30	5
HONG KONG	5	4	8	6	8	4	18	-	11	6	5	5	8	1	17	15	-	16	10	3	14	7	29	1
NEW YORK	13	25	4	7	18	3	6	3	9	1	1	16	19	10	15	10	-	21	13	5	11	3	28	14
DUBAI	12	11	19	15	21	8	10	-	-	8	18	4	14	3	9	12	-	10	-	8	16	11	17	3
COPENHAGEN	8	9	10	12	2	10	20	6	7	5	14	27	15	-	6	17	-	20	19	2	1	4	16	10
ATHENS	1	1	1	2	1	12	28	7	8	18	12	17	28	-	2	20	11	15	-	20	21	27	9	24
BUSAN	22	8	24	15	24	29	14	-	-	12	6	6	1	12	14	1	6	4	3	4	19	17	14	19
HOUSTON	21	24	15	26	6	24	23	-	-	-	-	24	6	-	21	23	2	2	12	9	11	16	3	14
GUANGZHOU	17	18	20	18	9	18	12	-	-	13	11	1	2	-	30	3	-	12	6	25	27	25	19	21
KUALA LUMPUR	15	17	13	7	7	20	22	-	-	9	6	10	11	-	18	16	-	14	9	15	20	17	1	8
MUMBAI	16	13	21	10	17	20	11	-	-	11	6	19	13	-	23	24	8	9	7	30	25	17	24	20
ANTWERP	19	22	18	18	16	16	13	-	-	17	18	11	12	-	13	26	-	19	-	18	10	22	6	11
SYDNEY	29	28	26	26	-	12	17	-	-	19	16	23	9	9	11	25	-	25	-	12	9	7	21	8
JAKARTA	11	12	14	4	14	27	29	-	-	16	9	18	23	-	16	14	7	22	16	26	29	27	5	26
LOS ANGELES	25	26	22	26	-	24	19	-	-	-	-	7	17	-	1	9	-	24	-	11	11	7	10	14
BERGEN	18	20	16	11	19	26	15	-	-	-	-	30	22	-	5	19	-	18	14	6	2	15	15	6
ISTANBUL	9	10	17	26	-	18	16	-	-	21	18	21	21	11	24	5	9	17	18	21	23	17	12	28
VANCOUVER	27	21	25	18	15	17	27	-	-	-	-	22	16	-	10	22	-	28	-	14	6	14	22	11
KAOSIUNG	26	27	28	22	25	29	24	-	-	-	-	12	18	-	28	7	-	26	8	28	17	25	20	21
RIO DE JANEIRO	20	23	11	22	26	10	8	-	-	-	-	26	26	-	20	13	-	11	-	29	25	24	4	30
Limassol	23	14	23	13	20	20	30	-	-	22	18	29	29	13	25	26	-	30	-	19	18	1	2	18
MANILA	24	19	27	18	22	27	21	-	-	15	14	20	24	8	27	26	-	23	17	27	30	29	11	29
PANAMA CITY	28	29	30	26	-	12	25	-	-	-	-	15	27	-	22	26	-	26	-	22	24	30	8	24
CAPE TOWN	30	30	29	22	23	20	26	-	-	-	-	25	20	-	29	18	-	29	-	23	22	22	13	26

APPENDIX B: METHODOLOGY AND DATA SOURCES

DEFINITIONS

What is the definition of maritime activity? During 15 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."

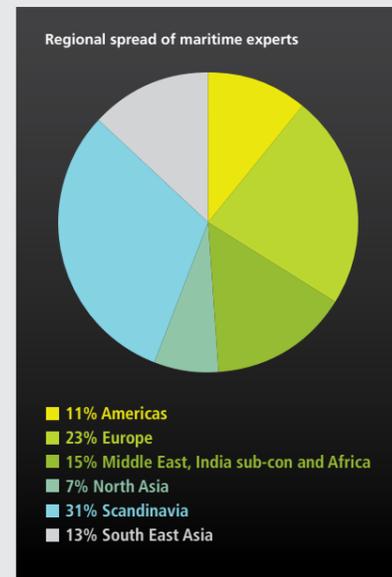
How do we set the geographic boundaries of a city-region?

In the report, we have defined a city as encompassing an area that can be reached within a two-hour drive from the city center. This definition is transparent, reflects actual proximity and is not sensitive to artificial administrative borders.

DESCRIPTION OF DATA SOURCES

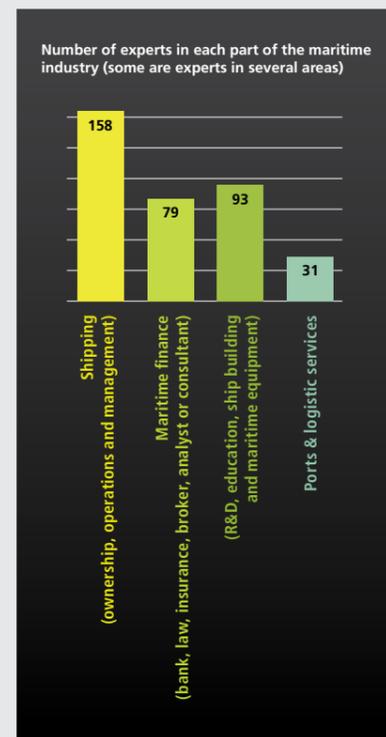
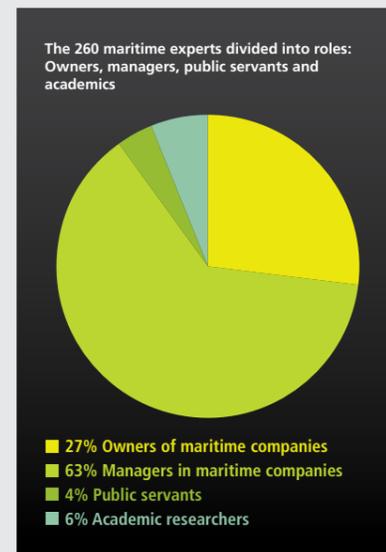
Expert assessments

We have built up a global panel of Maritime Industry Experts that both have made thorough assessments of their own cities and ranked the nominated cities on a wide specter of indicators. The experts are in 52 different cities in 40 countries on all continents:



More than 50% of the experts are European, while the six European cities constitute only 40% of the 15 cities that are benchmarked in this report. Accordingly, 3 of 10 experts are Scandinavians, while Copenhagen and Oslo only constitute 2 out of 15 cities. Hence, it is important to investigate whether there is a "home bias" in the data that favor cities with many expert assessments. When we dig deep into the data, we find a mixed pattern.

Some experts are surprisingly strict in their assessments of own cities, while others seem to give higher scores to their own cities than experts from other cities do. On average, our analyses show that there is a minor "home bias" in the assessments, but the analysis also shows that if we had controlled for this bias, the results would not have been significantly influenced.



Shipping Centers

CLARKSONS DATABASE
The data for the location of shipowners, managers was retrieved from the Clarksons Research World Fleet Register. The data was retrieved and analyzed by a Menon analyst. The database also provides data on national fleet value. To find city values, we estimated the price per GT based on Clarksons data, and multiplied this price with the GT value we estimated for each city according to our classification.

BUREAU VAN DIJK

The market value of shipping companies and number of listed companies on the stock exchange was obtained from Bureau van Dijk's ORBIS-database. Both variables were distributed to cities according to the location of company headquarters.

Maritime Finance and Law

DEALOGIC

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

WHO'S WHO LEGAL & CHAMBERS AND PARTNERS

In each of the cities we have identified the number of experts in maritime law on *Who's Who Legal* and *Chambers and Partners* lists of legal practitioners. Both sources include a comprehensive list of experts and firms in over 100 national jurisdictions. We used the average from the two sources when attributing number of lawyers to the cities.

THE INTERNATIONAL UNION OF MARINE INSURANCE

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 located to a city based on location of maritime financial center in the country or based on location of key maritime insurance institutions.

BUREAU VAN DIJK

The market value and number of listed maritime companies on each stock exchange was retrieved from Bureau van Dijk's database Orbis. Depend on the variable, values were allocated to cities according to the location of



the stock exchange or location of company headquarters.

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

CLARKSONS WORLD FLEET DATABASE

The size of the fleet registered in each society is allocated to the location of the societies' headquarters. For DNV GL, the number of vessels was split between Oslo and Hamburg according to the number of ships classed by GL and DNV before the merger. The data that describes the location of shipyards, where ships were manufactured, and total CGT carried by each ship in 2016, was retrieved from the Clarksons Research World Fleet Register. This is the most complete ship database in the world.

BUREAU VAN DIJK – ORBIS DATABASE

The data for the market value of shipyards and technical services was based on Bureau van Dijk's database ORBIS. Values were allocated to cities based on company headquarters.

Ports and Logistics

THE AMERICAN ASSOCIATION OF PORT AUTHORITIES

We used the *World Port Ranking* list provided by The American Association of Port Authorities when we allocated total cargo throughput to cities. The list includes the top hundred ports in the world.

LLOYD'S LIST

Lloyd's List rates the top 100 ports in the world based on TEU throughput. For cities without ports figuring on this list, we complemented with TEU-figures from other sources. We also used Lloyd's List (Seasearcher) as source for cruise calls to port combined with research from DNV GL.

DREWRY

Drewry provides a list with the top 37 port operators in the world, based on TEU throughput. Values were allocated to cities based on the location of company headquarters.

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.

GLOBAL PROPERTY GUIDE AND NUMBEO

Global Property Guide lists the average buying price of 120 square feet apartments in city centers around the world. For cities in this report that do not figure in the list, we have estimated the price using information from Numbeo. The latter source provides relative square feet prices in city centers across nations.

NOTES

1. See Jakobsen, Erik W, et al. (2003): Attracting the winners. Oslo, Kolofon.
2. We include the shipping part of Nordea as an Oslo based company, even though Nordea now has reorganized into a Swedish bank with a NUF in Norway: Nordea Bank Ab (Publ).
3. The differences between continents/regions are statistically significant on 0,99 level.
4. A survey was sent out to approximately 2,000 maritime professionals, i.e. owners, managers and academics from all over the world. A total of 260 answered, giving us a response rate of 13 %.



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