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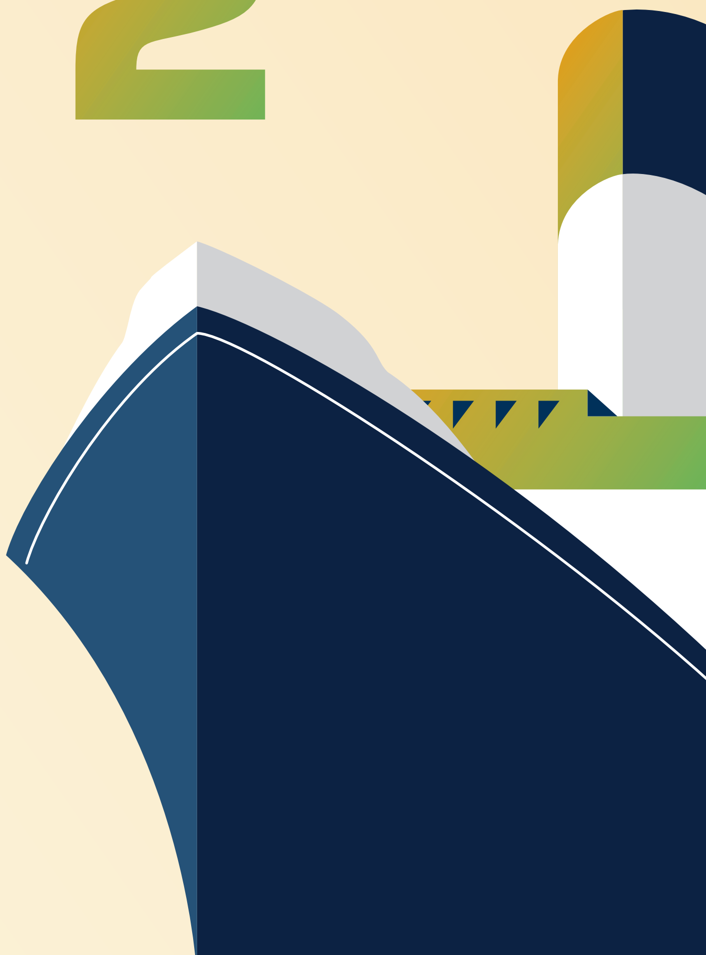
MARITIME TRANSPORT SERVICES AND INFRASTRUCTURE SUPPLY



The present chapter focuses on development in the supply of shipping services, freight rates and transport costs, as well as port-related infrastructure, superstructure and services. It presents data and trends pertaining to developments observed in 2018 in three main areas: the world fleet, the container shipping segment and port businesses and operations.

Mainstreaming sustainability dimensions (economic, social and environmental), including through IMO regulations and voluntary measures by industry, has become a priority in maritime transport. This chapters focuses on selected issues related to the supply of maritime transport and sustainability, such as regulatory developments affecting the supply of maritime transport, notably the IMO 2020 regulation, scheduled to come into force on 1 January 2020, imposing a more stringent sulphur cap on bunker fuels. The new regulation entails important implications for the maritime sector, including transport costs and the broader sustainable shipping agenda, as IMO 2020 will help address air emissions in shipping and ports.

World fleet developments examine annual fleet growth, changes to the structure and age of the world fleet and highlights from selected segments of the maritime supply chain, such as shipbuilding, ship demolition, ship ownership and ship registration. A more sustainable shipping scenario, driven by an expanding regulatory agenda, could mean short-term disruptions to vessel supply and increased compliance costs, decisions to scrap or to upgrade vessels, as well as incentives to innovate and invest in a new generation of vessels.

The container shipping section identifies leading shipping companies, reviews the evolution of freight rates, earnings and revenues, as well as the increased consolidation and market concentration affecting this shipping segment. A more sustainable shipping scenario, particularly from the perspective of the entry into force of the IMO 2020 regulation, could mean higher costs and price volatility, as well as longer transit times.

The port-related infrastructure and services section presents market shares of global port operators, increased competitive pressures and sustainability expectations affecting port services and infrastructure, and factors underpinning port competitiveness. Faced with increased sustainability expectations, ports are confronted with greater investment needs.

Potential implications for developing countries as providers and users of maritime transport infrastructure and services are also considered.

MARITIME TRANSPORT SERVICES AND INFRASTRUCTURE SUPPLY

In 2019

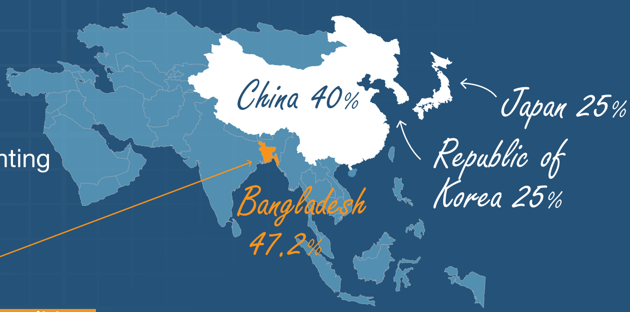
95,402 ships

1,976,491 thousand dwt

+2.6% carrying capacity

Average age of ships when scrapped
21 years

In 2018, China, Japan and the Republic of Korea retained their traditional leadership in global ship production, representing 90% of shipbuilding activity.



Bangladesh is now the main country of demolition.

Oil tankers = 59% of tonnage sold for demolition

Growth in container fleet capacity **+6%**

2018
2017
2016
2015
2014
2013
2012

Compliance with IMO 2020

will bring new challenges in the shipping industry, particularly in container shipping. Key issues for consideration may include higher costs and price volatility, as well as reduced capacity and increased transit time.

global delivery

China

- **60%** *of bulk carriers*
- **47%** *of general cargo ships*
- **49%** *of container ships*
- **45%** *of offshore vessels*

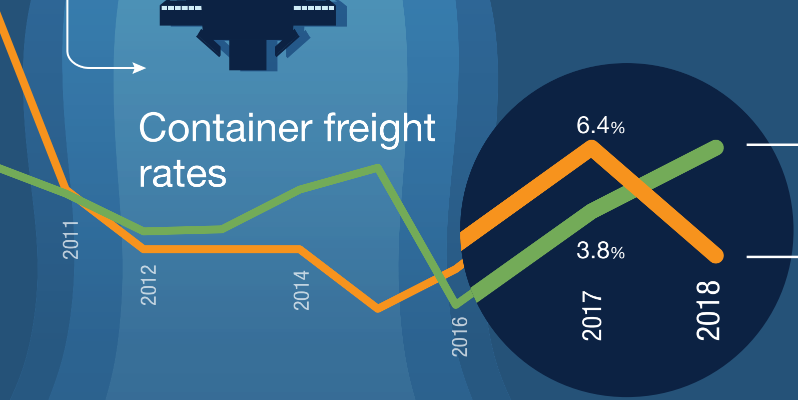
Republic of Korea

- **64%** *of gas carriers*
- **42%** *of oil tankers*

Japan

- **45%** *of chemical tankers*

Container freight rates



6% *Supply growth*

2.6% *Demand growth*

Weak trade growth and the sustained delivery of mega container ships in an overly supplied market exerted further pressure on fundamental market balance, resulting in lower freight rates in general.

Recent regulatory developments and voluntary initiatives of industry are aimed at making ship recycling safer and more environmentally friendly.

A. WORLD FLEET

1. Declining growth amid overcapacity

In early 2019, the total world fleet stood at 95,402 ships, accounting for 1.97 billion dead-weight tons (dwt) of capacity. Bulk carriers and oil tankers maintained the largest market shares of vessels in the world fleet (dwt), at 42.6 per cent and 28.7 per cent, respectively (table 2.1). Carrying capacity grew by 2.6 per cent, compared with the beginning of 2018. The growth rate has been declining since 2011, except for a slight increase in 2017, and remains below the trend for the past decade (figure 2.1).[3]

Developments in the world fleet unfolded against a background of continued oversupply in ship-carrying capacity. Oversupply has remained a structural feature in most shipping segments, causing downward pressure on freight rates in 2018. This is particularly the case in the container ship segment (see D.1. Freight rates: Mixed results). Depressed market conditions and poor financial returns of recent years have been driving container shipping companies to adopt coping strategies, such as mergers and acquisitions, consolidation, vertical integration and change in deployment patterns (see D.3. Increasing consolidation and market concentration in container shipping). These strategies may affect developing countries' connectivity and transport costs (UNCTAD, 2018a).

Gas carriers were the most dynamic segment of the world fleet, experiencing the highest growth rate in the 12 months to 1 January 2019 (7.25 per cent of dwt) (figure 2.2). One of the reasons behind this trend is the liquefied natural gas sector, which has witnessed significant growth in recent years. This is likely to continue in the future, given heightening environmental concerns and the pressure of the maritime sector to switch to cleaner fuels (see chapter 1). Growth in the world container fleet also continued (5 per cent), although at more moderate rates compared with gas carriers. Two segments – chemical tankers and bulk carriers – have shown stable growth, unlike the oil tanker segment, which has undergone declining growth.

[3] Data in this chapter concerning tonnage and number of ships in the world fleet were provided by Clarksons Research. Unless stated otherwise, the vessels covered in the UNCTAD analysis include all propelled seagoing merchant vessels of 100 gross tons and above, including offshore drillships and floating production, storage and offloading units. Military vessels, yachts, waterway vessels, fishing vessels and offshore fixed and mobile platforms and barges are not included. Data on fleet ownership only cover ships of 1,000 gross tons and above, as information on the true ownership of smaller ships is often not available. For more detailed data on the world fleet, including registration, ownership, building and demolition, as well as other maritime statistics, see http://stats.unctad.org/maritime.

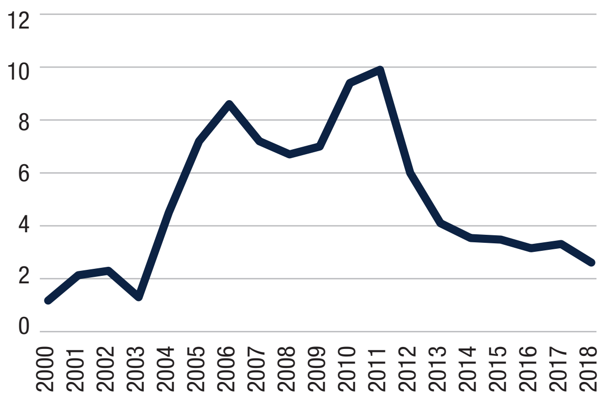
Table 2.1 World fleet by principal vessel type, 2018–2019
(Thousand dead-weight tons and percentage)

Principal types	2018	2019	Percentage change 2019/2018
Oil tankers	562 035	567 533	0.98
	29.2	*28.7*	
Bulk carriers	818 921	842 438	2.87
	42.5	*42.6*	
General cargo ships	73 951	74 000	0.07
	3.8	*3.7*	
Container ships	253 275	265 668	4.89
	13.1	*13.4*	
Other types	218 002	226 854	4.06
	11.3	*11.5*	
Gas carriers	64 407	69 078	7.25
	3.3	*3.5*	
Chemical tankers	44 457	46 297	4.14
	2.3	*2.3*	
Offshore vessels	78 269	80 453	2.79
	4.1	*4.1*	
Ferries and passenger ships	6 922	7 097	2.53
	0.4	*0.4*	
Other/ not available	23 946	23 929	-0.07
	1.2	*1.2*	
World total	**1 926 183**	**1 976 491**	**2.61**

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

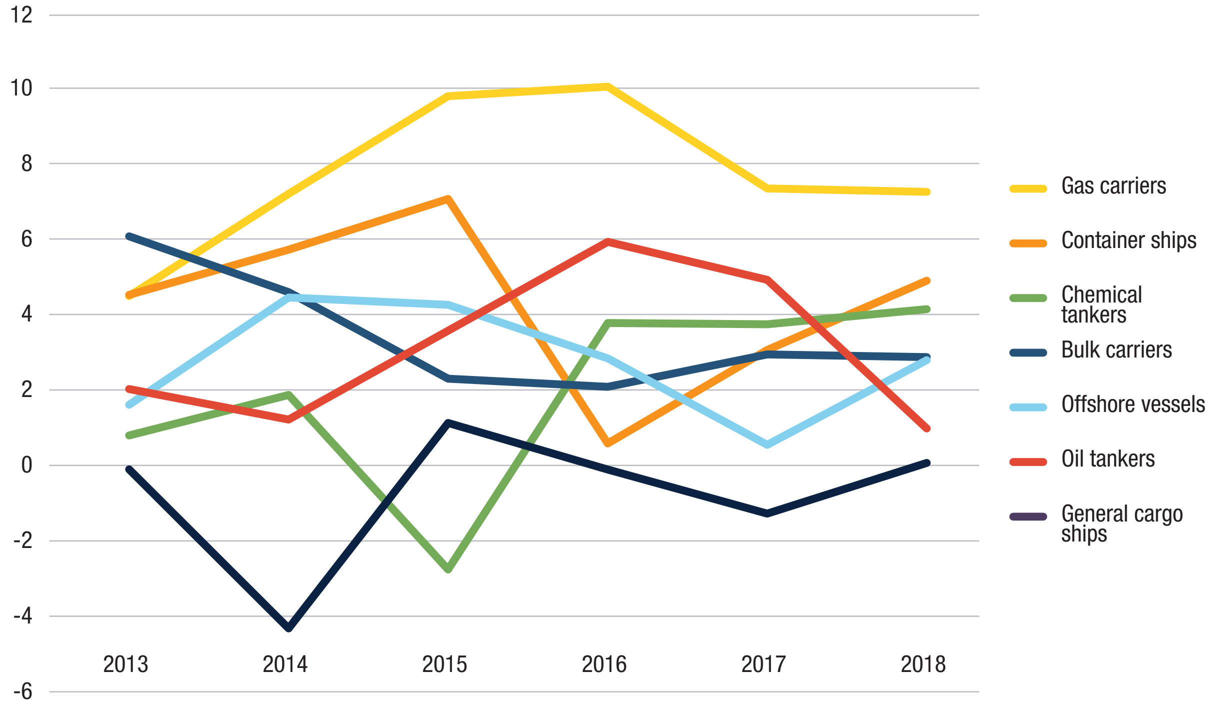
Notes: Propelled seagoing merchant vessels of 100 tons and above; beginning-of-year figures.

Figure 2.1 Annual growth of world fleet, 2000–2018
(Percentage of dead-weight tonnage)



Source: UNCTAD, *Review of Maritime Transport*, various issues.

Figure 2.2 **Growth of the world fleet in dead-weight tonnage, selected vessel types, 2013–2019**
(Annual percentage change)



Sources: UNCTAD secretariat calculations, based on data from Clarksons Research and *Review of Maritime Transport*, various issues.
Notes: Propelled seagoing vessels of 100 gross tons and above as at 1 January; does not include inland waterway vessels.

2. Young fleets

The age of the world fleet has some implications for the sustainability of shipping, as younger vessels tend to be more efficient and less likely to break or cause environmental damage. A young fleet makes up most of the carrying capacity of the world fleet. The age of the fleet has implications for the sustainability of shipping and is an important factor to be considered in the transition to sustainable shipping operations – as these implications determine decisions to upgrade, renew and scrap the fleet, thereby affecting the supply of capacity, which also has an impact on freight rates and earnings.

In early 2019, the average age of the world merchant fleet was 21 years (dwt) (table 2.2), representing a slight increase over the previous year. However, this is not uniform across vessel types. As shown in figure 2.3, ships below 10 years of age represent a high proportion of the carrying capacity of bulk carriers (71 per cent), followed by container ships (56 per cent) and oil tankers (54 per cent). On the other hand, only 35 per cent of the carrying capacity of general cargo ships and 41 per cent of “other types” of vessels correspond to ships below 10 years of age, suggesting that these two segments are not undergoing fleet renewal.

The entry into force of the IMO 2020 regulation, which will limit the amount of sulphur for marine fuel oil to 0.50 per cent as of 1 January 2020, may disrupt the supply of vessels. In the short run, a reduction in the supply of vessels could occur due to the temporary withdrawal of vessels, particularly bigger ones, to be fitted for scrubbers. This is expected to cause vessels to be out of service for a few months and reduce carrying-capacity supply across the major segments by 0.5–1.4 per cent in 2019 and by 0.3–0.7 per cent in 2020 (Clarksons Research, 2019a).

Scrapping of less fuel-efficient vessels in the form of older ships may also increase, with an estimated projection of 26 million dwt equivalent in 2019 and 44 million dwt equivalent in 2020, reducing the growth in the world fleet by 0.8 per cent in 2020, notably 1.1 per cent across the bulker fleet, 0.8 per cent across the tanker fleet, and 0.7 per cent across the container ship fleet (Clarksons Research, 2019a). A more detailed discussion on the potential implications of the IMO 2020 regulation is set out in section D.2.

B. SHIPBUILDING, NEW ORDERS AND DEMOLITION

1. Bulk carriers, oil tankers and container ships take the lead in shipbuilding

In 2018, China, Japan and the Republic of Korea retained their leadership in global ship production (table 2.3), representing together 90 per cent of shipbuilding activity and individually, 40 per cent (China), 25 per cent (Japan) and 25 per cent (Republic of Korea). In 2018, China built 60 per cent of the global delivery of bulk

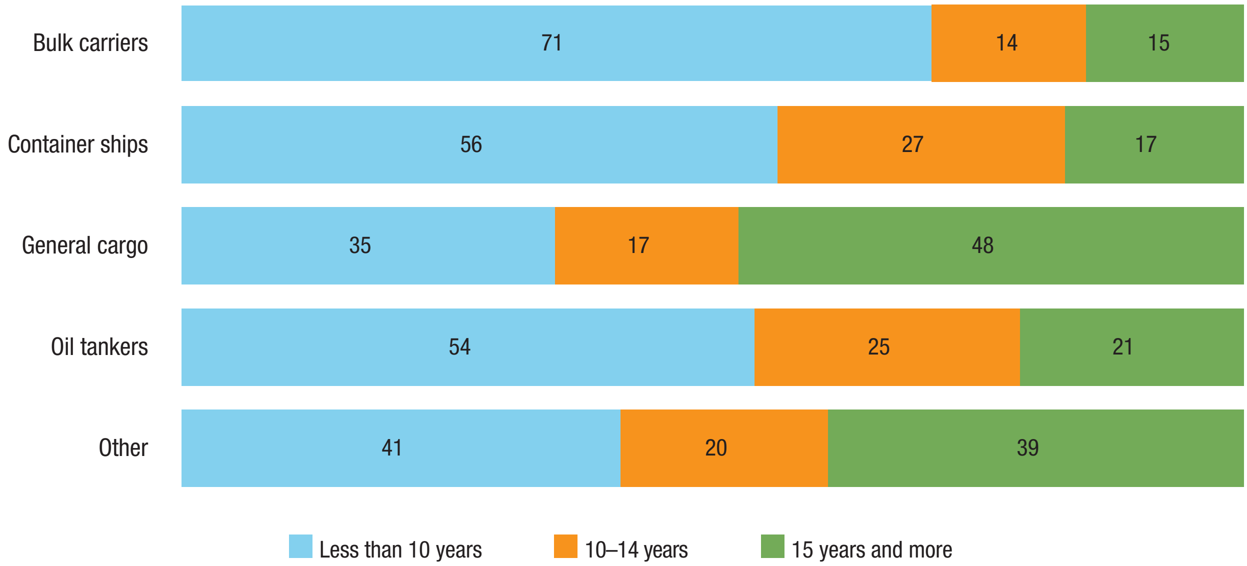
Table 2.2 Age distribution of world merchant fleet by vessel type, 2018–2019
(Percentage of total ships and dead-weight tonnage)

Country grouping and vessel type		Years					Average age	Average age
		0–4	5–9	10–14	15–19	20 +	2019	2018
World								
Bulk carriers	Percentage of total ships	22.84	44.09	14.64	8.70	9.74	9.72	9.07
	Percentage of dead-weight tonnage	25.12	46.28	14.15	7.53	6.92	8.88	8.27
	Average vessel size (dwt)	81 482	77 757	71 592	64 156	52 622		
Container ships	Percentage of total ships	16.68	21.77	31.32	13.95	16.28	12.34	11.89
	Percentage of dead-weight tonnage	27.58	28.52	27.06	10.52	6.32	9.44	9.02
	Average vessel size (dwt)	83 362	66 050	43 565	38 031	19 579		
General cargo	Percentage of total ships	4.71	14.60	14.38	7.11	59.20	26.39	25.64
	Percentage of dead-weight tonnage	9.34	25.85	17.23	9.57	38.01	18.95	18.37
	Average vessel size (dwt)	8 770	7 507	5 255	6 360	2 725		
Oil tankers	Percentage of total ships	14.67	21.73	18.22	9.40	35.98	18.87	18.53
	Percentage of dead-weight tonnage	22.54	31.41	24.97	15.74	5.35	10.11	9.97
	Average vessel size (dwt)	82 577	78 314	73 092	90 578	8 241		
Other	Percentage of total ships	12.62	19.01	13.45	8.27	46.65	22.85	22.39
	Percentage of dead-weight tonnage	22.00	19.32	19.57	10.92	28.19	15.44	15.44
	Average vessel size (dwt)	10 461	6 548	8 839	8 136	4 214		
All ships	Percentage of total ships	12.72	21.56	15.29	8.53	41.91	20.98	20.48
	Percentage of dead-weight tonnage	23.76	35.76	19.73	10.76	9.99	10.44	10.06
	Average vessel size (dwt)	44 370	39 985	30 696	30 946	6 342		
Developing economies – all ships								
	Percentage of total ships	12.92	22.92	14.83	7.75	41.58	20.06	19.61
	Percentage of dead-weight tonnage	22.85	35.94	15.90	10.35	14.97	11.18	10.85
	Average vessel size (dwt)	34 032	31 822	21 007	26 505	7 124		
Developed economies – all ships								
	Percentage of total ships	13.69	22.39	17.85	10.62	35.45	19.64	19.13
	Percentage of dead-weight tonnage	24.75	36.02	22.37	10.95	5.92	9.72	9.33
	Average vessel size (dwt)	58 320	50 545	40 750	35 471	7 175		
Countries with economies in transition – all ships								
	Percentage of total ships	5.95	9.25	7.69	3.80	73.31	29.94	29.38
	Percentage of dead-weight tonnage	9.00	25.75	22.60	15.09	27.55	16.45	16.06
	Average vessel size (dwt)	13 224	21 478	23 065	28 397	2 648		

Source: Clarksons Research.

Notes: Propelled seagoing vessels of 100 gross tons and above; beginning-of-year figures.

Figure 2.3 Age distribution of the merchant fleet, as at 1 January 2019
(Percentage of dead-weight tonnage)



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

carriers, 49 per cent of container ships, 47 per cent of general cargo ships and 45 per cent of offshore vessels. The Republic of Korea led globally in newbuildings of gas carriers (with a share of 64 per cent), followed by oil tankers (42 per cent). The top segment in Japan was chemical tankers, which represented 45 per cent of global newbuilding deliveries, and bulk carriers, 33 per cent.

Ships delivered in 2018 were mostly bulk carriers (26.7 per cent of total gross tons), followed by oil tankers (25 per cent), container ships (23.5 per cent) and gas carriers (13 per cent) (table 2.3). Between 2014 and 2018, dry bulk carriers recorded the most newbuilding deliveries, although they experienced a downturn trend starting in 2016 (figure 2.4). Subsequently, oil tankers recorded the second-highest delivery level since 2016, overtaking container ships, which stood third, followed by gas carriers. The trendline during this period suggests an increasing number of container ships and gas carriers and a decreasing number of oil tankers and dry bulk carriers. This could be attributed to a demand for container ships of large capacity (above 15,000 TEUs), which grew by 33 per cent in 2018 (Clarksons Research, 2019b) and lower growth in demand for oil tankers and bulk carriers due to existing oversupply capacity (BIMCO, 2019; Gasparoti and Rusu, 2018).

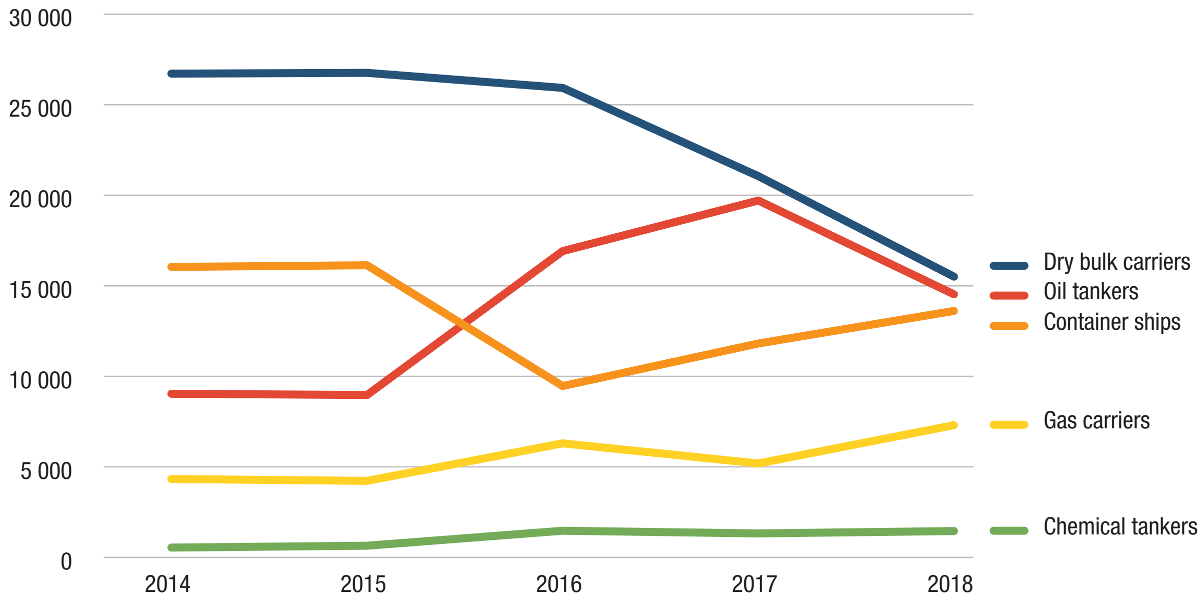
Table 2.3 Deliveries of newbuildings by major vessel types and countries of construction, 2018
(Thousand gross tons)

	China	Japan	Philippines	Republic of Korea	Rest of world	World total	Percentage
Oil tankers	4 505	2 819	288	6 046	865	**14 524**	25.0
Bulk carriers	9 274	5 134	654	352	91	**15 505**	26.7
General cargo ships	416	159	-	74	234	**884**	1.5
Container ships	6 630	3 020	992	2 632	341	**13 614**	23.5
Gas carriers	762	1 754	52	4 709	26	**7 302**	12.6
Chemical tankers	466	647	-	274	64	**1 452**	2.5
Offshore vessels	774	18	-	472	453	**1 718**	3.0
Ferries and passenger ships	162	72	2	51	1 573	**1 860**	3.2
Other	270	816	-	24	76	**1 186**	2.0
Total	**23 260**	**14 440**	**1 988**	**14 633**	**3 724**	**58 045**	**100.0**
Percentage	40.1	24.8	3.4	25.2	6.4	**100.0**	

Source: Clarksons Research.

Notes: Propelled seagoing merchant vessels of 100 gross tons and above. For more data on other shipbuilding countries, *see* http://stats.unctad.org/shipbuilding.

Figure 2.4 Deliveries of newbuildings for selected vessel types, 2014–2018
(Thousand gross tons)



Source: UNCTAD, *Review of Maritime Transport*, various issues; based on data from Clarksons Research.

2. Vessel orders

Orders for the delivery of bulkers and oil tankers declined, in favour of orders for large and feeder vessels servicing container ships. World tonnage on order for all main vessel types further decreased in the 12 months to January 2019 (figure 2.5), reflecting a drop in orders since 2016 (Barry Rogliano Salles, 2019). The reduction is particularly marked for dry bulk carriers (37 per cent) and oil tankers (48 per cent).

In the container ship segment, it is expected that most orders will cover large vessels (above 10,000 TEUs of capacity) and feeder ships (below 3,000 TEUs of capacity) (IHS Markit, 2019; Clarksons Research, 2019c). The gas tanker segment could also witness an increase in the number of orders, as this fleet may not suffice to meet the growing demand for trade in liquefied natural gas.

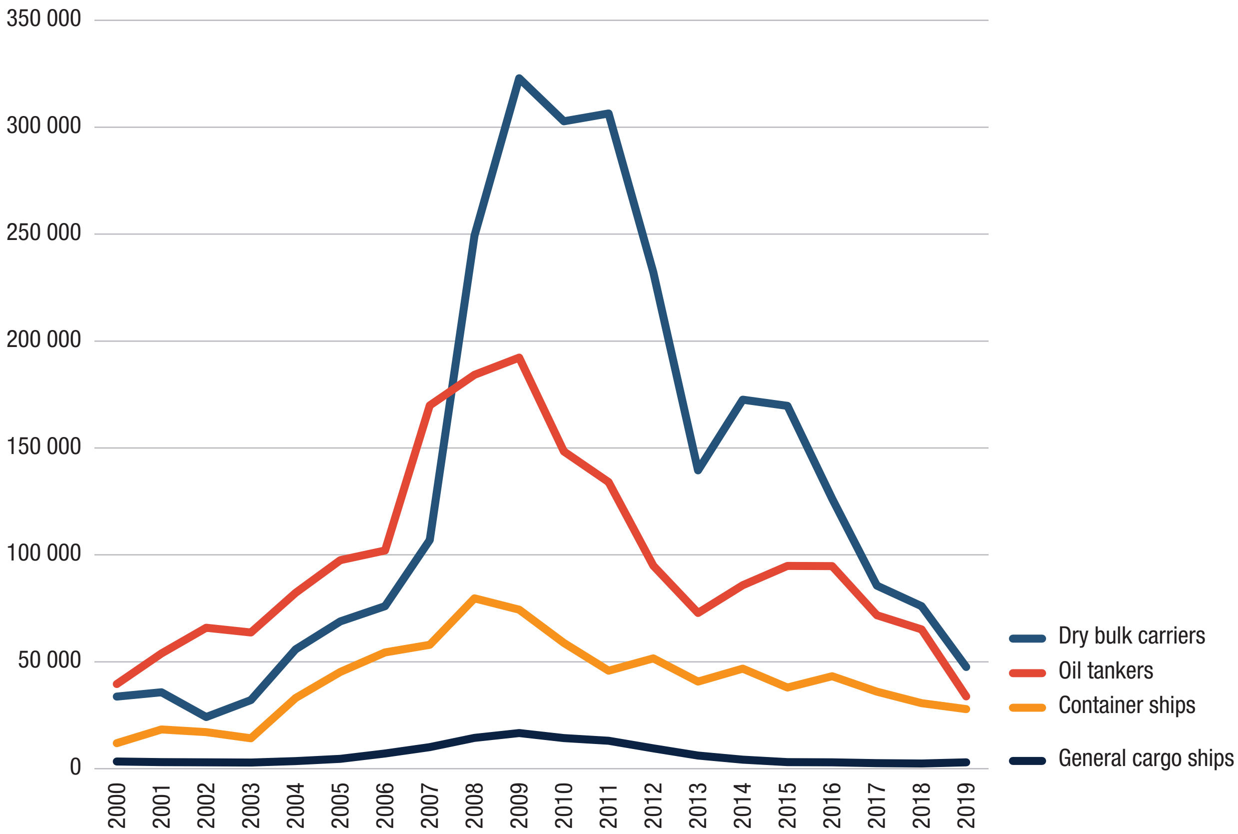
The shipbuilding sector has been undergoing reforms to ensure competitiveness in a context of declining orders, mitigate the impact on a labour-intensive sector and develop a modern vessel-construction model fit for the future. In several Asian countries, Governments have taken various initiatives to support the shipbuilding industry. The use of public funds to finance shipbuilding prompted a complaint at WTO against the Republic of Korea in November 2018, on grounds that it may grant subsidies that may have a substantial impact on the price of ships, ship engines and maritime equipment, affecting trade flows in these products. At the same time, the shipbuilding industry in several European countries has called for increased Government support to help achieve the target of zero-emission shipping by 2050 (JOC.com, 2018a, 2018b).

Instances of consolidation have also been observed in the shipbuilding industry, namely in China and the Republic of Korea, where Korea Development Bank, which is the main shareholder of Daewoo Shipbuilding and Marine Engineering, has agreed to sell 55.7 per cent of its controlling stake in the yards to Hyundai Heavy Industries (Splash247.com, 2019a). This would result in control of 20 per cent of the global market for new ships, and an even bigger share of the market for liquefied natural gas carriers (*The Wall Street Journal*, 2019). Another potential merger between two main shipbuilders in China, namely China State Shipbuilding Corporation and China Shipbuilding Industry Corporation, is also being planned (Splash247.com, 2019b).

3. Sustainable ships: The path to developing zero-emission vessels

The entry into force of several global environmental instruments and the adoption of voluntary standards in the sector will have an impact on the maritime transport industry, particularly in the shipbuilding subsector, which will be responsible for incorporating these new standards into the design and construction of ships. Accordingly, considerable investments are going into research and development for better hydrodynamics, more energy-efficient engines, lower carbon fuels and carbon-free fuels for ships (United Kingdom Chamber of Shipping, 2018). For example, the Green Maritime Methanol consortium of leading international maritime companies, shipowners, shipyards, manufacturers, ports and research institutions, supported by the Ministry of Economic Affairs and Climate Policy of the Netherlands have joined forces to investigate the

Figure 2.5 World tonnage on order, 2000–2019
(Thousand dead-weight tons)



Source: UNCTAD secretariat calculations, based on data from Clarksons Research.
Notes: Propelled seagoing merchant vessels of 100 gross tons and above; beginning-of-year figures.

feasibility of methanol as a sustainable alternative transport fuel in the maritime sector in 2019 (Hellenic Shipping News Worldwide, 2019a). In another example, Maersk invested approximately $1 billion per year in innovation and technology between 2014 and 2019 to improve the technical and financial viability of carbon-free solutions and develop and deploy energy-efficient solutions (Novethic, 2019). Table 2.4 outlines the measures being considered to produce cleaner and more energy-efficient vessels.

In addition, as the sector is increasingly heading towards decarbonization, voluntary ship environmental evaluation schemes are also emerging. Examples include the Clean Shipping Index, Clean Cargo Working Group, Environmental Ship Index, Green Award and Ship Energy Efficiency Management Plan. Shipbuilding countries, for which the sector is of national importance in terms of direct financial returns, employment and supply-chain contributions, are also exploring options to remain competitive in this new context.

Table 2.4 Efficiency-improvement measures to achieve zero-emission shipping by 2050

Technological measures to improve ship-design efficiency	Use of alternative zero-carbon fuels or energy sources
Light construction materials	Batteries to power ships
Slender design	Hydrogen fuel cells
Propulsion-improvement devices	Hydrogen as fuel for internal combustion engines
Bulbous bows	Ammonia fuel cells
Air lubrication systems	Ammonia as fuel for internal combustion engines
Advanced hull coating	Synthetic diesel
Ballast water-system design	Synthetic methane
Energy-efficiency measures	Advanced biofuels
Engine and auxiliary systems improvement	Electricity to power ships
	Wind assistance

Sources: Organization for Economic Cooperation and Development and International Transport Forum, 2018, *Decarbonizing Maritime Transport: Pathways to Zero-carbon Shipping by 2035*; European Federation for Transport and Environment, 2018, *Road Map to Decarbonizing European Shipping*; University Maritime Advisory Services, 2019, How can shipping decarbonize?

Important elements that could mainstream sustainability considerations into shipbuilding and equipment manufacturing and help seize new opportunities include the following: building awareness about emerging standards among marine equipment manufacturers and suppliers; promoting research and development in environmentally friendly ship-related technologies, energy saving and carbon emissions reduction for ships; developing environmentally friendly maritime expertise; and promoting partnerships with technical and training institutes to spur innovation and the uptake of energy-saving and eco-friendly technologies (Global Environment Facility et al., 2018a; Lee and Nam, 2017).

The implementation of activities that can support the shipping industry's transition to a low-carbon future will require cooperation among stakeholders in the industry. This would have cost implications, require the development of human and technological capabilities, and involve technology adoption and transfer, especially in developing countries. Several initiatives have emerged in recent years to help Governments and maritime stakeholders achieve these objectives. There are several examples. First, the Global Maritime Energy Efficiency Partnerships Project, launched in 2015, aims to support increased uptake and implementation of energy-efficiency measures for shipping. It is actively involved in capacity-building for maritime administrations on data collection with regard to fuel oil consumption and emissions, which is an obligation derived from MARPOL, annex VI. Second, the Global Industry Alliance to Support Low-carbon Shipping, launched in 2017, is a public–private partnership initiative involving leading shipowners and operators, classification societies, engine and technology builders and suppliers, big data providers, and port and oil companies. They are working to eliminate common barriers to the uptake and implementation of energy-efficient technologies and operational measures. In March 2019, the Panama Canal Authority became the first developing country entity to join the Alliance. Third, an initiative called Green Voyage-2050 was launched in May 2019 to promote and test technical solutions to reduce emissions, as well as enhance knowledge and information sharing to support the IMO greenhouse gas reduction strategy. As part of this initiative, eight countries from five regions (Africa, Asia, the Caribbean, Latin America and the Pacific), will assume pilot roles and take action at the national level. The project will also build capacity in developing countries, including in small island developing States and the least developed countries, to fulfil their commitments to meet climate-change and energy-efficiency goals for international shipping. (For further information on regulatory activities related to greenhouse gas emissions reduction, see chapter 4.)

4. Ship demolition: Making ship recycling more environmentally friendly and safer

From a sustainability perspective, ship demolition has been associated with adverse environmental effects on ecosystems and occupational health hazards. Scrapping is a segment of the maritime supply chain dominated by developing countries due to several factors, including lower labour costs, a high proportion of utilization of steel from recycled ships for domestic manufacturing and, at times, weak enforcement of regulations.

Most of the tonnage sold for demolition relates to oil tankers, bulk carriers and container ships. However, in contrast with prior figures identifying bulk carriers as the most frequent vessel type sold for demolition, oil tankers took the lead in 2018 (table 2.5).

In 2019, Bangladesh, India, Pakistan and Turkey maintained their leadership in this segment of the maritime supply chain (table 2.5). However, for the

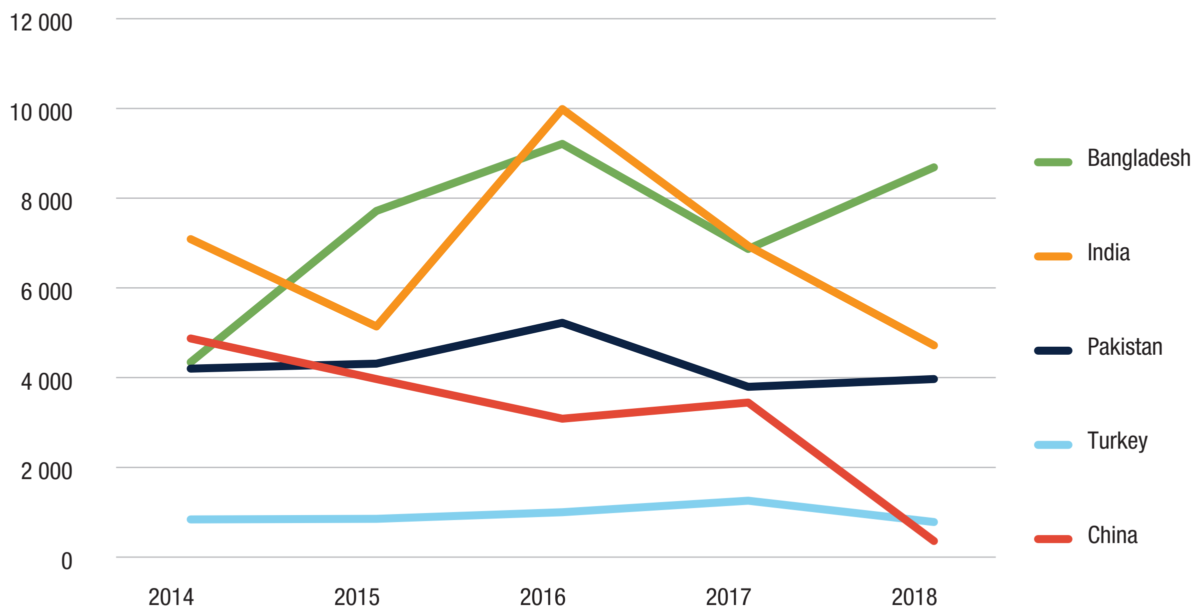
Table 2.5 Reported tonnage sold for demolition by major vessel type and country of demolition, 2018
(Thousand gross tons)

	Bangladesh	India	Pakistan	Turkey	China	World total	Percentage
Oil tankers	5 989	1 946	2 824	66	14	**10 884**	**59.5**
Bulk carriers	1 115	465	829	18	53	**2 495**	**13.6**
General cargo ships	127	149	57	65	5	**405**	**2.2**
Container ships	620	402	38	54	152	**1 284**	**7.0**
Gas carriers	347	455	48	3	97	**951**	**5.2**
Chemical tankers	43	167	28	28	2	**268**	**1.5**
Offshore vessels	181	581	72	143	30	**1 156**	**6.3**
Ferries and passenger ships	..	171	..	14	..	**185**	**1.0**
Other	210	353	47	29	5	**673**	**3.7**
Total	**8 632**	**4 690**	**3 943**	**418**	**359**	**18 300.9**	**100.0**
Percentage	**47.2**	**25.6**	**21.5**	**2.3**	**2.0**	**100**	

Source: Clarksons Research.

Notes: Propelled seagoing vessels of 100 gross tons and above. Estimates for all countries available at http://stats.unctad.org/shipscrapping.

Figure 2.6 Reported tonnage sold for demolition, selected countries, 2014–2018



Source: UNCTAD, *Review of Maritime Transport*, various issues, based on data from Clarksons Research.

first time, Bangladesh became the main country of demolition. Figures for the period 2014–2018 show that China and India, and to a lesser extent, Turkey, show a decrease in scrapping activity (figure 2.6). Recent regulatory developments and voluntary initiatives by the industry to make ship recycling more environmentally friendly and safe to humans explain these trends.

In recent years, several countries have tightened regulations pertaining to ship demolition. This move is linked to the anticipation of the entry into force of the IMO Hong Kong [China] International Convention for the Safe and Environmentally Sound Recycling of Ships of 2009, as well as a European Union regulation in force since 31 December 2018. The latter requires certification to include shipyards in the list of yards where European Union-flagged ships can be dismantled and introduces requirements relating to shipping companies.

Voluntary initiatives by industry associations and other domestic policy priorities are also inducing changes in the sector. The latter is the case of China, whose ban on the entry of all foreign ships to China for recycling, represents one of a wide range of measures aimed at controlling environmental pollution in the country. India is pursuing the voluntary application of requirements of the Hong Kong [China] International Convention for the Safe and Environmentally Sound Recycling of Ships of 2009 and to achieve this, is investing heavily in introducing upgrades to its facilities (Splash247.com, 2019c; *The Economist*, 2019). Preparations for the entry into force of the IMO 2020 regulation could affect scrapping activity in 2019, as the scrapping of old vessels of smaller tonnage will probably increase to avoid the costly investment of upgrading them.

C. SHIP OWNERSHIP AND REGISTRATION

1. Five countries own more than half of the world fleet

As of 1 January 2019, the top five shipowning economies were Greece, Japan, China, Singapore and Hong Kong China, accounting for more than 50 per cent of the world's tonnage (table 2.6). Data for the last five years reveal that Germany, Japan and the Republic of Korea have been losing ground, while Greece, Singapore, China and Hong Kong, China have sustained an increasing trend (figure 2.7).

More than 70 per cent of the fleet (tonnage) is registered under a foreign flag. In a minority of countries (10 out of the leading 35 shipowning countries), however, the number of vessels flying under the national flag represent more than half of their fleet. These are as follows: the Islamic Republic of Iran (98 per cent), Indonesia (93 per cent), Viet Nam (81 per cent), Thailand (73 per cent), Hong Kong, China (72 per cent), Saudi Arabia (72 per cent), Malaysia (72 per cent), India (66 per cent), Italy (61 per cent) and Singapore (56 per cent) (table 2.6). Malaysia had the largest increase in the share of its nationally flagged fleet, from about 50 per cent in January 2018 to 72 per cent in January 2019.

In terms of the commercial value of the fleet, the top five shipowning countries in 2019, representing 45 per cent of the world total, are Greece, Japan, the United States, China and Norway. Greece is among the leading owners of oil tankers, bulk carriers and gas carriers; Japan and

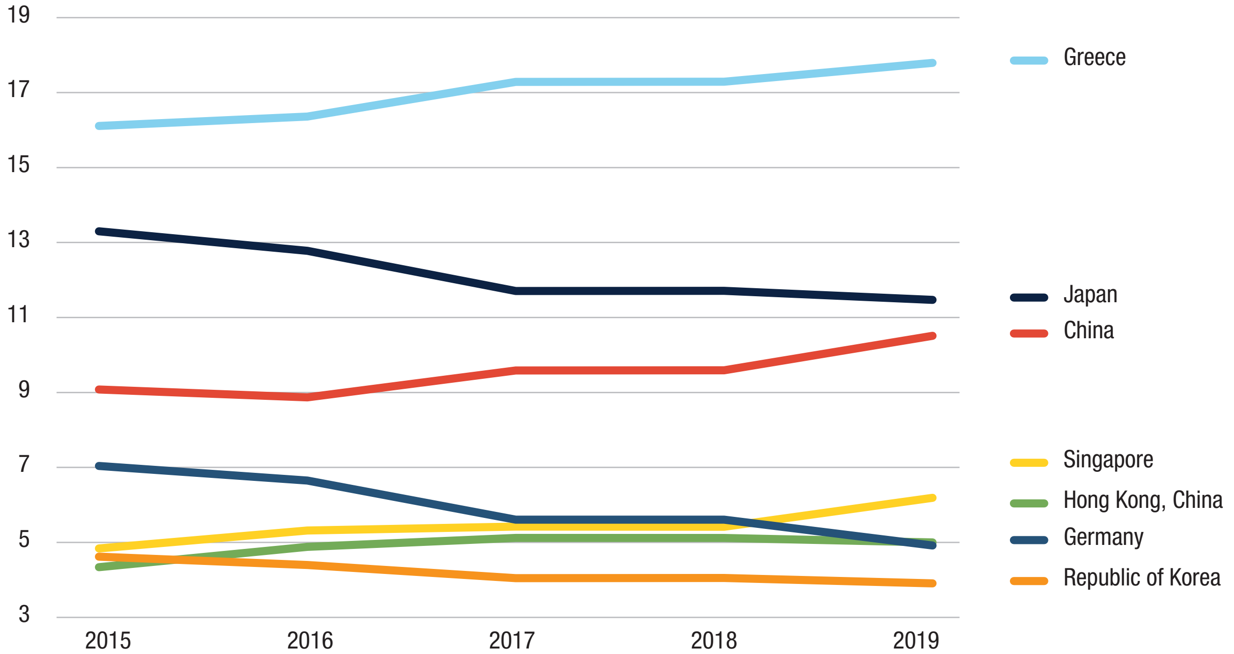
Table 2.6 Ownership of world fleet ranked by dead-weight tonnage, 2019

	Country or territory of ownership	Number of vessels			Dead-weight tonnage				
		National flag	Foreign flag	Total	National flag	Foreign flag	Total	Foreign flag as a percentage of total	Total as a percentage of total
1	Greece	670	3 866	4 536	60 776 654	288 418 535	349 195 189	82.60	17.79
2	Japan	875	2 947	3 822	35 532 308	189 588 907	225 121 215	84.22	11.47
3	China	3 987	2 138	6 125	90 930 376	115 370 656	206 301 032	55.92	10.51
4	Singapore	513	1 214	2 727	71 287 105	50 198 543	121 485 648	41.32	6.19
5	Hong Kong, China	890	738	1 628	72 311 219	25 817 099	98 128 318	26.31	5.00
6	Germany	212	2 460	2 672	8 365 247	88 167 113	96 532 360	91.33	4.92
7	Republic of Korea	774	873	1 647	12 418 609	4 282 908	76 701 517	83.81	3.91
8	Norway	367	1 671	2 038	1 758 664	59 356 435	61 115 099	97.12	3.11
9	United States	822	1 153	1 975	9 518 623	48 859 083	58 377 706	83.69	2.97
10	Bermuda	14	518	532	337 958	57 894 249	58 232 207	99.42	2.97
11	Taiwan Province of China	134	871	1 005	5 651 439	45 439 668	51 091 107	88.94	2.60
12	United Kingdom	327	1 000	1 327	6 665 237	42 008 100	48 673 337	86.31	2.48
13	Denmark	26	954	980	29 405	42 974 866	43 004 271	99.93	2.19
14	Monaco	-	448	448	-	42 277 013	42 277 013	100.00	2.15
15	Belgium	107	191	298	10 155 219	20 011 240	30 166 459	66.34	1.54
16	Turkey	484	1 038	1 522	7 164 081	20 445 631	27 609 712	74.05	1.41
17	India	854	165	1 019	16 602 223	8 256 940	24 859 163	33.21	1.27
18	Switzerland	30	405	435	1 225 335	23 412 718	24 638 053	95.03	1.26
19	Russian Federation	1 356	351	1 707	7 772 112	14 975 374	22 747 486	65.83	1.16
20	Indonesia	2 063	82	2 145	20 768 274	1 526 652	22 294 926	6.85	1.14
21	Netherlands	708	487	1 195	5 802 564	12 348 682	18 151 246	68.03	0.92
22	United Arab Emirates	117	796	913	418 544	17 689 385	18 107 929	97.69	0.92
23	Saudi Arabia	133	151	284	12 877 984	5 214 501	18 092 485	28.82	0.92
24	Islamic Republic of Iran	172	64	236	3 981 632	13 927 633	17 909 265	77.77	0.91
25	Italy	514	178	692	12 058 223	5 803 985	17 862 208	32.49	0.91
26	Brazil	300	101	401	4 859 921	8 807 661	13 667 582	64.44	0.70
27	France	93	342	435	574 475	12 659 787	13 234 262	95.66	0.67
28	Cyprus	128	172	300	3 950 928	7 076 469	11 027 397	64.17	0.56
29	Viet Nam	880	140	1 020	7 736 562	1 896 794	9 633 356	19.69	0.49
30	Canada	217	156	373	2 636 754	6 460 998	9 097 752	71.02	0.46
31	Malaysia	458	141	599	6 283 692	2 448 601	8 732 293	28.04	0.44
32	Oman	5	44	49	5 704	7 871 432	7 877 136	99.93	0.40
33	Qatar	63	68	131	1 143 727	5 877 576	7 021 303	83.71	0.36
34	Thailand	337	69	406	5 036 967	1 826 924	6 863 891	26.62	0.35
35	Sweden	85	213	298	931 752	5 682 725	6 614 477	85.91	0.34
	Subtotal, top 35 shipowners	**19 715**	**26 205**	**45 920**	**507 569 517**	**1 364 874 883**	**1 872 444 400**	**72.89**	**95.41**
	Rest of world and unknown	*2 841*	*2 923*	*5 764*	*34 528 774*	*55 608 866*	*90 137 640*	*61.69*	*4.59*
	World total	**22 556**	**29 128**	**51 684**	**542 098 291**	**1 420 483 749**	**1 962 582 040**	**72.38**	**100.00**

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

Notes: Propelled seagoing vessels of 1,000 gross tons and above, as at 1 January 2019. For the purposes of this table, second and international registries are recorded as foreign or international registries, whereby, for example, ships belonging to owners in the United Kingdom registered in Gibraltar or the Isle of Man are recorded as being under a foreign or international flag. In addition, ships belonging to owners in Denmark and registered in the Danish International Ship Register account for 43.7 per cent of the Denmark-owned fleet in dead-weight tonnage, and ships belonging to owners in Norway registered in the Norwegian International Ship Register account for 26.6 per cent of the Norway-owned fleet in dead-weight tonnage. For a complete listing of nationally owned fleets, see http://stats.unctad.org/fleetownership.

Figure 2.7 Percentage of world fleet ownership, selected countries, 2015–2019



Source: UNCTAD, *Review of Maritime Transport*, various issues, based on data from Clarksons Research.

China, of bulk carriers; Germany, of container ships; and the United States, of ferries and passenger ships (table 2.7).[4]

2. Sustainability considerations result in expanded regulatory control by the flag State

Owners can choose to register their ships in national registers, which are often run by public administrations, or in open registries that are often privately operated as commercial operations with a strong service orientation as competitive advantage. Most owners prefer to register their ships in another country.

The registration segment of the maritime supply chain has been traditionally dominated by developing countries with their open registries. Historically, the decision to "flag out" was associated with reducing operational costs through lower registration costs, the recruitment of foreign labour, lower taxes, at times lower compliance with environmental and safety regulations (Non-governmental Organization Shipbreaking Platform, 2015) and avoidance of political restrictions. Nowadays, other factors are also considered when deciding to flag out. These include efficiency (for instance, reducing delays due to port inspections because of a ship register's good reputation), certification, links to a supportive cluster of financial and logistic services (enabling higher logistics performance) and the presence of a cybersecurity framework.

Maintaining their leadership, Panama, Liberia and the Marshall Islands are ranked first, second and third among the top 35 flags States, in terms of tonnage (table 2.8). In terms of fleet value, Panama, the Marshall Islands and the Bahamas are the leading flags of registration (table 2.9). In the case of Panama, the vessel types representing most of the value are bulk carriers; in the case of the Marshall Islands, bulk carriers and oil tankers; and in the case of the Bahamas, chemical tankers and ferries and passenger ships.

Flag States have an important role to play in enforcing sustainable shipping because they exercise regulatory control (i.e. apply the law and impose penalties in case of non-compliance) over the world fleet on issues such as ensuring safety of life at sea, protection of the marine environment, and the provision of decent working and living conditions for seafarers. Several methods are used to assess the performance of flag States based on different criteria. For instance, the grey, black and white lists under the Paris Memorandum of Understanding on Port State Control measure flag performance from the angle of the outcome inspections at the port (Paris Memorandum of Understanding on Port State Control, 2019). These inspections examine compliance with

[4] The aggregate fleet values published by Clarksons Research are calculated from estimates of the value of each vessel based on type, size and age. Values are estimated for all oil/product tankers, bulk carriers, combined carriers, container ships and gas carriers, with reference to matrices based on representative newbuildings and on second-hand and demolition values provided by Clarksons Platou brokers. For other vessel types, values are estimated with reference to individual valuations, recently reported sales and residual values calculated from reported newbuilding prices. As coverage concerning specialized and non-cargo vessels may not be complete, figures might not accurately represent the total value of the world merchant fleet above 100 gross tons. Desktop estimates are made on the basis of prompt charter-free delivery, as between a willing buyer and a willing seller for cash payment under normal commercial terms. For the purposes of this exercise, all vessels are assumed to be in good and seaworthy condition.

Table 2.7 Top shipowning countries, as at 1 January 2019
(Million dollars)

Country or territory	Oil tankers	Bulk carriers	General cargo ships	Container ships	Other vessel types	Gas carriers	Chemical tankers	Offshore vessels	Ferries and passenger ships	Other /not available	Total
Greece	30 569	37 218	197	7 463	17 842	13 593	1 049	175	2 522	503	93 288
Japan	8 634	35 492	3 577	9 489	34 910	12 268	4 866	4 828	3 080	9 868	92 102
United States	5 562	4 102	984	1 112	76 499	1 831	1 893	24 346	47 625	804	88 260
China	9 666	27 833	5 341	14 385	24 044	3 472	2 959	9 605	5 145	2 863	81 270
Norway	5 423	3 942	1 021	2 108	40 306	6 130	2 533	25 856	2 467	3 320	52 800
Singapore	10 481	12 674	980	5 715	14 565	3 342	4 692	5 804	118	609	44 415
Germany	2 416	6 694	3 957	17 685	12 037	1 842	925	758	8 116	395	42 789
United Kingdom	3 375	4 164	995	3 446	25 811	5 012	1 686	11 714	4 530	2 869	37 791
Hong Kong, China	6 244	12 461	774	9 073	5 869	1 322	291	125	2 982	1 149	34 422
Bermuda	5 507	5 200	0	1 328	14 293	8 190	432	5 602		69	26 329
Republic of Korea	4 475	7 830	949	2 623	9 733	3 922	1 749	538	505	3 019	25 610
Denmark	3 952	1 669	806	9 655	7 102	2 200	900	2 850	1 029	123	23 183
Netherlands	449	857	3 680	416	17 025	674	1 387	12 335	522	2 109	22 428
Switzerland	673	1 107	268	5 274	10 768	237	241	3 388	6 892	11	18 090
Italy	2 219	1 273	2 563	5	11 380	357	617	2 829	7 103	475	17 440
Brazil	907	196	20	214	15 588	140	90	15 284	72	2	16 925
Taiwan Province of China	1 635	7 438	626	4 144	871	434	208	40	87	102	14 713
France	144	424	221	4 154	8 139	453	127	5 635	1 682	241	13 082
Monaco	6 042	3 874		828	972	872	34		33	33	11 716
Turkey	1 345	3 456	2 060	1 273	2 525	163	1 187	763	387	24	10 658
Malaysia	303	231	109	60	9 125	1 958	129	6 848	15	175	9 828
Russian Federation	3 455	329	1 094	79	4 471	1 520	672	1 391	93	794	9 428
Belgium	3 885	1 430	725	343	1 895	1 230	97	25		542	8 278
Indonesia	1 754	811	1 076	772	3 586	462	366	994	1 723	41	7 999
Qatar	104	95	0	38	7 727	7 492	6	226		3	7 963
Other	19 064	15 836	8 746	3 808	52 621	7 508	4 688	25 606	11 744	3 076	100 076
World total 2019 (million dollars)	**138 283**	**196 638**	**40 769**	**105 490**	**429 704**	**86 623**	**33 825**	**167 566**	**108 472**	**33 219**	**910 885**
Growth 2019/2018 (percentage)	5.8	-0.9	-6.1	5.1	2.1	10.4	1.6	-4.5	6.6	4.6	1.9

Source: UNCTAD secretariat calculations, based on data from Clarksons Research.
Note: Value is estimated for all commercial ships of 1,000 gross tons and above.

requirements pertaining to the condition of the ship, its equipment, operations and social conditions (as per the International Labour Organization Maritime Labour Convention). In case of non-compliance, ships can be denied entry to a port, inspected at length, or detained when attempting to enter a port. The Shipping Industry Flag State Performance Table: 2018/2019 of the International Chamber of Shipping contains additional criteria such as the average age of the fleet and ratification of International Labour Organization conventions.

Given the increased awareness of environmental considerations and the probability of increased environmental standards, the scope of regulatory control by the flag State is likely to expand. Current developments suggest an increasing expectation for expanded compliance enforcement by flag States. Examples of such developments include the following new requirements: issuing a statement of compliance of ships with emissions, based on fuel consumption (IMO fuel oil consumption data collection system); reporting on emissions (European Union system for monitoring, reporting and verification) or proving compliance with environmental and other regulations to call at ports in the United States (United States Coast Guard Qualship 21 certification scheme/2019–2020 roster) (Hellenic Shipping News Worldwide, 2019b; Safety4sea, 2019a).

Table 2.8 Leading flags of registration by dead-weight tonnage, 2019

	Flag of registration	Number of vessels (percentage)	Vessel share of world total	Dead-weight tonnage (1,000 dwt)	Share of world total dead-weight tonnage (percentage)	Cumulated share of dead-weight tonnage	Average vessel size (dwt)	Growth in dead-weight tonnage 2019/2018 (percentage)
1	Panama	7 860	8.16	333 337	17	16.87	44 930	-0.57
2	Marshall Islands	3 537	3.67	245 763	12	12.43	69 878	3.23
3	Liberia	3 496	3.63	243 129	12	12.30	69 704	7.98
4	Hong Kong, China	2 701	2.80	198 747	10	10.06	75 083	8.17
5	Singapore	3 433	3.57	129 581	7	6.56	39 785	1.16
6	Malta	2 172	2.26	110 682	6	5.60	51 890	1.39
7	China	5 589	5.80	91 905	5	4.65	19 646	8.16
8	Bahamas	1 401	1.45	77 844	4	3.94	56 449	1.26
9	Greece	1 308	1.36	69 101	3	3.50	64 339	-4.28
10	Japan	5 017	5.21	39 034	2	1.97	10 263	4.23
11	Cyprus	1 039	1.08	34 588	2	1.75	34 110	-1.36
12	Isle of Man	392	0.41	27 923	1	1.41	71 232	2.28
13	Indonesia	9 879	10.26	23 880	1	1.21	4 674	5.54
14	Danish International Ship Register	566	0.59	22 444	1	1.14	41 717	15.86
15	Norwegian International Ship Register	611	0.63	19 758	1	1.00	32 550	1.08
16	Madeira	465	0.48	19 107	1	0.97	41 179	-1.14
17	India	1 731	1.80	17 354	1	0.88	10 633	-6.41
18	United Kingdom	1 031	1.07	17 041	1	0.86	19 930	1.64
19	Italy	1 353	1.41	13 409	1	0.68	12 015	-11.82
20	Saudi Arabia	374	0.39	13 128	1	0.66	45 583	-2.97
21	Republic of Korea	1 880	1.95	13 029	1	0.66	7 915	-6.65
22	United States	3 671	3.81	11 810	1	0.60	6 373	-1.03
23	Belgium	201	0.21	10 471	1	0.53	60 180	18.88
24	Malaysia	1 748	1.82	10 162	1	0.51	7 202	1.45
25	Russian Federation	2 739	2.84	9 132	0	0.46	3 416	5.05
26	Bermuda	148	0.15	9 088	0	0.46	62 245	-15.62
27	Germany	609	0.63	8 470	0	0.43	16 607	-16.74
28	Viet Nam	1 868	1.94	8 469	0	0.43	4 844	3.27
29	Antigua and Barbuda	780	0.81	7 501	0	0.38	9 715	-13.88
30	Turkey	1 234	1.28	7 489	0	0.38	7 866	-5.76
31	Netherlands	1 217	1.26	7 192	0	0.36	7 016	-1.78
32	Cayman Islands	170	0.18	6 743	0	0.34	42 678	8.76
33	Registre international français	94	0.10	6 231	0	0.32	66 287	3.91
34	Taiwan Province of China	389	0.40	5 751	0	0.29	19 105	19.35
35	Thailand	825	0.86	732	0	0.29	8 367	-8.66
	Top 35 total	**71 528**	**74.28**	**1 875 024**	**94.87**	**94.87**		
	Rest of world	***24 767***	***25.72***	***101 467***	***5.13***	***5.13***		
	World total	**96 295**	**100.00**	**1 976 491**	**100.00**	**100.00**	**25 024**	**2.61**

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

Notes: Propelled seagoing merchant vessels of 100 gross tons and above, as at 1 January. For a complete listing of countries, see http://stats.unctad.org/fleet.

Table 2.9 Leading flags of registration, ranked by value of principal vessel type, 2019
(United States dollars)

Flag of registration	Oil tankers	Bulk carriers	General cargo ships	Container ships	Gas carriers	Chemical tankers	Offshore vessels	Ferries and passenger ships	Other/not applicable	Total
Panama	12 783	44 379	3 871	14 555	5 505	10 611	8 943	21 185	7 815	129 648
Marshall Islands	23 637	28 792	487	6 314	4 631	1 341	15 145	20 085	2 607	103 040
Bahamas	7 595	4 982	86	425	123	28 627	11 517	23 885	2 757	79 996
Liberia	17 412	22 108	1 091	15 973	2 263	150	5 287	11 812	1 741	77 837
Hong Kong, China	10 467	26 125	1 849	18 073	1 906	46	5 201	306	123	64 095
Malta	9 736	11 221	1 664	8 401	1 899	11 609	4 569	4 875	950	54 924
Singapore	11 138	13 039	1 191	11 109	3 141		5 756	6 558	1 724	53 657
China	4 928	13 892	2 827	2 615	1 511	4 526	705	6 784	2 663	40 451
Greece	9 210	3 547	38	257	68	1 576	4 506	1	96	19 299
Italy	1 185	831	2 521	103	467	12 474	286	521	473	18 862
Subtotal top 10	**108 090**	**168 918**	**15 625**	**77 826**	**21 514**	**70 959**	**61 915**	**96 013**	**20 949**	**641 809**
Other	***30 193***	***27 720***	***25 143***	***27 664***	***12 311***	***37 513***	***24 708***	***71 553***	***12 270***	***269 075***
World total	**138 283**	**196 638**	**40 768**	**105 490**	**33 825**	**108 472**	**86 623**	**167 566**	**33 219**	**910 884**

Source: UNCTAD secretariat calculations, based on Clarksons Research data, as at 1 January 2019 (estimated current value).

D. CONTAINER SHIPPING

The container shipping industry has been undergoing a challenging phase in recent years, driven by a persistent market imbalance between trade and fleet supply capacity that has been intensifying with the influx of mega vessels, rising trade tensions and increased protectionism, as well as changing environmental regulations. These factors have increased the volatility of freight rates and transport costs in 2018/2019, a feature that will continue through 2020.

1. Freight rates: Mixed results

In 2018, container freight rates showed mixed results. Weak trade growth and the sustained delivery of mega container ships in an overly supplied market exerted further pressure on fundamental market balance, resulting in lower freight rates in general. However, towards the second half of the year, a temporary surge in seaborne trade was triggered by an increase in shipments from China to the United States before the potential application of higher tariffs on Chinese imports and more effective capacity management from carriers.

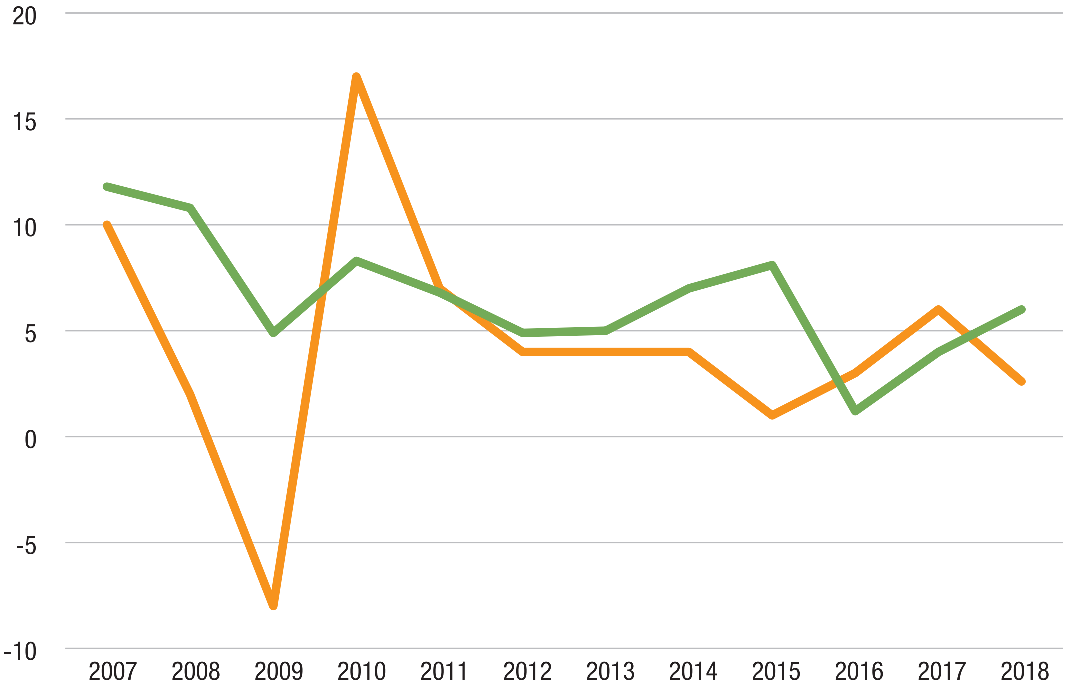
As illustrated in figure 2.8, container fleet supply capacity increased in 2018 by 6 per cent, compared with 4 per cent in 2017. Such capacity surpassed expansion in global seaborne container trade, which increased by 2.6 per cent as of 1 January 2019, reaching an estimated total volume of 152 million TEUs (see chapter 1).

Imbalances between supply and demand drove down freight rates on mainlane container trade routes during the first half of 2018, reaching as low as $1,200 per FEU on the Shanghai–United States West Coast routes and $2,200 per FEU on the Shanghai–United States East Coast routes (JOC.com, 2019a). These routes were faced with low volumes and excess capacity due to the continual deployment of mega large vessels. At the beginning of 2019, 25 per cent of capacity deployed on the Trans-Pacific route was accounted for by container ships of more than 12,000 TEUs of capacity, up from 19 per cent at the start of 2018 and 7 per cent at start of 2016 (Clarksons Research, 2019d). In the face of declining rates and a difficult and unpredictable environment, carriers reorganized to reduce capacity, increasing cascading practices and introducing a series of blank, or cancelled, sailings hence disrupting regular schedules on these routes. (For further information, see Universal Cargo, 2016).

In the latter half of the year, mixed trends in freight rates were observed across the trade lanes. Demand on Trans-Pacific routes grew to avoid anticipated United States tariffs on imports from China scheduled for January 2019, which were subsequently delayed. Spot rates on the Shanghai–United States West Coast route reached a six-year high in late 2018, rising 11 per cent in the last quarter in comparison with the same period in 2017, to an average $2,286 per forty-foot equivalent unit (FEU) (Clarksons Research, 2019d). This brought the full-year 2018 average to $1,736 per FEU, up 17 per cent from the yearly average in 2017. Average spot rates for the Shanghai–United States East Coast route reached $2,806 per FEU, an increase of 14 per cent from 2017 average (table 2.10).

The Far East–Europe routes witnessed decreasing average freight rates. The Shanghai–Northern Europe route averaged $822 per TEU in 2018, down 6.2 per cent compared with the 2017 average, and the

Figure 2.8 Growth of demand and supply in container shipping, 2007–2018
(Percentage)

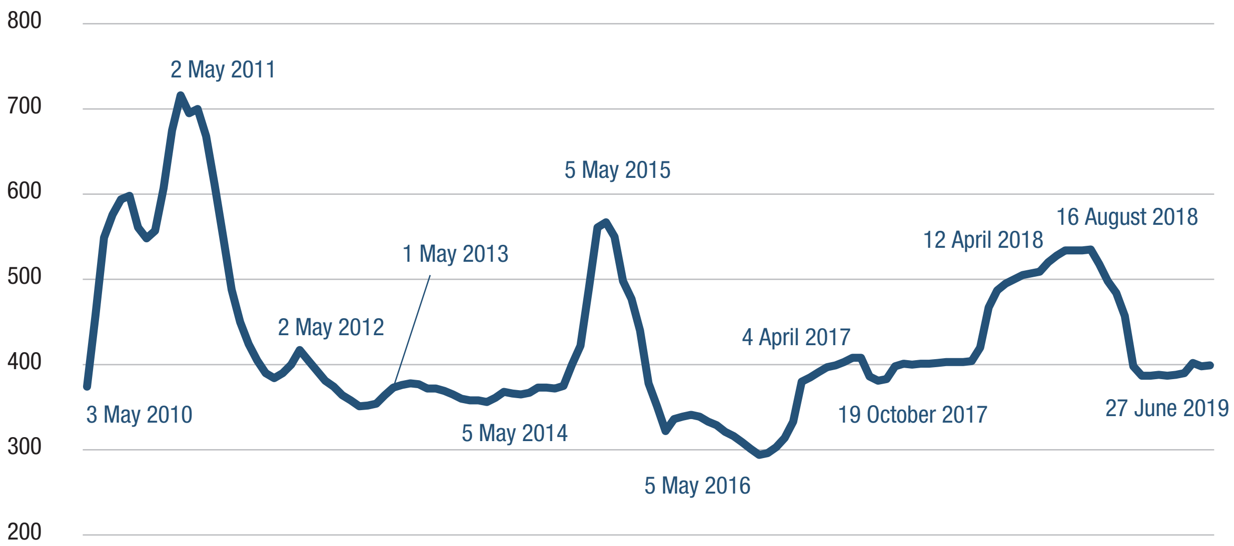


	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Supply	11.8	10.8	4.9	8.3	6.8	4.9	5.0	7.0	8.1	1.2	4.0	6.0
Demand	10.0	2.0	-8.0	17.0	7.0	4.0	4.0	4.0	1.0	3.0	6.0	2.6

Source: UNCTAD secretariat calculations. Demand is based on data from figure 1.5, and supply is based on data from Clarksons Research, *Container Intelligence Monthly*, various issues.

Notes: Supply data refer to total capacity of the container-carrying fleet, including multipurpose and other vessels with some container-carrying capacity. Demand growth is based on million TEU lifts.

Figure 2.9 New ConTex index, 2010–2019
(Index base: October 2007 – 1,000 points)



Source: UNCTAD secretariat calculations, based on data from the New ConTex index produced by the Hamburg Shipbrokers Association. See www.vhss.de.

Notes: The New ConTex is based on assessments of current-day charter rates of six selected container ship types, which are representative of their size categories: Type 1,100 TEUs (charter period of one year), Type 1,700 TEUs (charter period of one year), Type 2,500 TEUs (charter period of two years), Type 2,700 TEUs (charter period of two years), Type 3,500 TEUs (charter period of two years) and Type 4,250 TEUs (charter period of two years).

Table 2.10 Container freight market rates, 2010–2018

Freight market	2010	2011	2012	2013	2014	2015	2016	2017	2018
Trans-Pacific	(Dollars per 40-foot equivalent unit)								
Shanghai–United States West Coast	2 308	1 667	2 287	2 033	1 970	1 506	1 272	1 485	1 736
Percentage change	68.2	-27.8	37.2	-11.1	-3.1	-23.6	-15.5	16.7	16.9
Shanghai– United States East Coast	3 499	3 008	3 416	3 290	3 720	3 182	2 094	2 457	2 806
Percentage change	47.8	-14.0	13.56	-3.7	13.07	-14.5	-34.2	17.3	14.2
Far East–Europe	(Dollars per 20-foot equivalent unit)								
Shanghai–Northern Europe	1 789	881	1 353	1084	1161	629	690	876	822
Percentage change	28.2	-50.8	53.6	-19.9	7.10	-45.8	9.7	27.0	-6.2
Shanghai–Mediterranean	1 739	973	1 336	1 151	1 253	739	684	817	797
Percentage change	24.5	-44.1	37.3	-13.9	8.9	-41.0	-7.4	19.4	-2.4
North–South	(Dollars per 20-foot equivalent unit)								
Shanghai–South America (Santos)	2 236	1 483	1 771	1 380	1 103	455	1 647	2 679	1 703
Percentage change	-8.0	-33.7	19.4	-22.1	-20.1	-58.7	262.0	62.7	-36.4
Shanghai–Australia/New Zealand (Melbourne)	1 189	772	925	818	678	492	526	677	827
Percentage change	-20.7	-35.1	19.8	-11.6	-17.1	-27.4	6.9	28.7	22.2
Shanghai–West Africa (Lagos)	2 305	1 908	2 092	1 927	1 838	1 449	1 181	1 770	1 920
Percentage change	2.6	-17.2	9.64	-7.9	-4.6	-21.2	-18.5	49.9	8.5
Shanghai–South Africa (Durban)	1 481	991	1 047	805	760	693	584	1 155	888
Percentage change	-0.96	-33.1	5.7	-23.1	-5.6	-8.8	-15.7	97.8	-23.1
Intra-Asian	(Dollars per 20-foot equivalent unit)								
Shanghai–South-East Asia (Singapore)	318	210	256	231	233	187	70	148	146
Percentage change		-34.0	21.8	-9.7	0.9	-19.7	-62.6	111.4	-1.4
Shanghai–East Japan	316	337	345	346	273	146	185	215	223
Percentage change		6.7	2.4	0.3	-21.1	-46.5	26.7	16.2	3.7
Shanghai–West Japan	Not available	Not available	Not available	Not available	Not available	Not available	Not available	215	223
Percentage change	Not available	Not available	Not available	Not available	Not available	Not available	Not available	Not available	3.7
Shanghai–Korea, Republic of	193	198	183	197	187	160	104	141	163
Percentage change		2.6	-7.6	7.7	-5.1	-14.4	-35.0	35.6	15.6
Shanghai–Persian Gulf/Red Sea	922	838	981	771	820	525	399	618	463
Percentage change		-9.1	17.1	-21.4	6.4	-36.0	-24.0	54.9	-25.1

Source: Clarksons Research, *Container Intelligence Monthly*, various issues.

Note: Data are based on yearly averages.

average rates on the Shanghai–Mediterranean route declined by 2.4 per cent reaching $797 per TEU. This decline is partly attributable to weaker performance in European economies such as Germany and the United Kingdom, as well as the economic crisis in Turkey (see chapter 1) and the continued oversupplied routes. These were driven mainly by the upsizing of vessels. Container ships of capacities greater than 15,000 TEUs accounted for 53 per cent of total capacity deployed on these trade routes at the end of 2017, up from 44 per cent at the end of 2017 and 33 per cent at the end of 2016 (Clarksons Research, 2019d).

In 2018, freight rate movements on the non-mainlane container trade routes were also mixed, with variation between routes. Rates on the Shanghai–Australia route went up 22 per cent, averaging $827 per TEU in 2018. On the other hand, rates on the North–South routes weakened, generally due in part to a drop in Latin American and sub-Saharan Africa imports attributed to weakened economic activities in those regions, namely in Nigeria and South Africa and in Argentina, Brazil and the Bolivarian Republic of Venezuela (see also chapter 1), while the total deployment of vessels continued to increase. As such, the rates on the Shanghai–South America (Santos) route averaged $1,703 per TEU in 2018, down 36.4 per cent from 2017, and the rates on the Shanghai–South Africa (Durban) route averaged $888 per TEU, down 23.1 per cent from 2017.

In addition, higher average bunker prices (31.5 per cent higher in 2018, compared with 2017) added pressure to operating expenses of carriers and contributed to weakening their operating margins (Barry Rogliano Salles, 2019). An increase in bunker prices, which were not fully offset by an increase in freight rates, had a negative impact on profits.

However, a rise in freight rates and demand in late 2018, combined with better supply management, enabled some container carriers to improve their results. In 2018, CMA CGM recorded revenues of $23.5 billion, up 11.2 per cent. Maersk Line, including Hamburg Süd, posted revenues of $28.4 billion, an increase of 29 per cent, and Hapag-Lloyd, $13.6 billion, compared with $11.2 billion in 2017.[5]

Compliance with the IMO 2020 regulation will bring new challenges in the shipping industry, particularly in container shipping.

Charter rates and earnings improved on a full-year average basis in 2018 but deteriorated during the second half of the year. Despite strong regional trade volumes and limited capacity expansion in the small sizes of vessels, rates and earnings made progress in the first half of the year, dropping to just above operating expenses in the second half, as carriers consolidated into larger alliances and were able to use their bargaining power to keep rates under pressure (Barry Rogliano Salles, 2019). The 12-month charter rate increased to an average of 502 points in 2018, compared with 378 in 2017 (figure 2.9).

It remains to be seen how freight rates will hold in 2019–2020. Intensified trade tensions, which had helped boost container ship freight rates at the end of 2018 and improved carriers' profitability (Universal Cargo, 2019), could have a negative impact on the development of freight markets in 2019 and 2020. Demand for cargo may be affected at a time when the industry is confronted with new challenges and additional costs of complying with the new IMO 2020 regulation on sulphur fuel limits that will be applied on 1 January 2020 (Universal Cargo, 2019). Capacity management will therefore be key to reconciling slow growth in demand, high supply capacity and high operating costs. Non-mainlane routes are expected to remain the principal driver of growth in 2019 and 2020 (Clarksons Research, 2019c).

2. IMO 2020 regulation: A game changer for the shipping industry

As noted previously, 1 January 2020 will mark the full implementation of the IMO 2020 regulation reducing the content of sulphur in fuel oil from 3.5 per cent applied since 2012, to 0.5 per cent in 2020 (see chapter 4). This will significantly reduce the amount of sulphur oxides emanating from ships, improve air quality in port cities and coastal areas and meet global climate change objectives.

Maritime shipping relies heavily on fossil fuels. About 3.5 million barrels of high sulphur residual fuel oil (bunker fuel) per day were consumed by the sector in 2017, which represent about 50 per cent of the global fuel oil demand (McKinsey and Company, 2018). Most of this fuel oil has high sulphur content, which results in the emission of sulphur oxides into the atmosphere. The sector consumes just over 1 million barrels per day of marine gas oil, which is a lower-sulphur, higher-value distillate oil (Hellenic Shipping News Worldwide, 2018). This represents only 5 per cent of the global demand for diesel and gas oil, the majority of which is consumed in the heavy-duty trucking sector (Hellenic Shipping News Worldwide, 2018).

Bringing emission levels to under 0.5 per cent mass/mass will mark the beginning of a new era that will bring about fresh challenges and require a radical change by the shipping industry. This section will emphasize the impact of this change on the container segment, which in turn will have repercussions on transport costs and the price that shippers will pay and may therefore have an impact on the price of goods to consumers.

For carriers to comply with the new IMO 2020 regulation, three main options are currently available. As outlined below, each has its advantages, disadvantages and cost implications (CAI International, 2019).

Option 1. The most direct option is for carriers to switch to low-sulphur fuels such as low-sulphur residual fuel oil, very-low-sulphur fuel oil, or low-sulphur distillates such as marine gas oil. This would inevitably entail additional costs and higher freight rates, given that the price of high-sulphur fuel is lower than that of low-sulphur fuels, as the latter are more costly to produce. As a reference, the price of low-sulphur fuel stood at about $600–$700 per metric ton in March and April 2019, while that of the traditional bunker fuel oil was about $400–$450 per metric ton (Seeking Alpha, 2019), and the price differential between high-sulphur bunkers and marine gas oil was about $170 and $320, respectively, per metric ton (JOC.com, 2019a). Ensuring the availability of low-sulphur fuels and bridging the gap between demand and supply of these fuels will be among the main concerns of carriers in the near future. Refineries have a key role to play in increasing the production of low-sulphur marine fuels. Big refiners such as Exxon Mobil, British Petroleum and

[5] Data were derived from the annual reports of various companies.

Compañía Española de Petróleos, commonly known as Cepsa, are preparing to produce a large quantity of such fuel as the IMO 2020 deadline draws near (Forbes, 2019a; gCaptain.com, 2019).[6]

Option 2. Carriers could continue to use cheaper high-sulphur fuel oil and install scrubbing equipment to remove sulphur from the ship engines' exhaust system (CAI International, 2019). However, installing these scrubbers will come at a cost. Various sources have estimated that installing scrubbers can cost between $2 million and $10 million (IncoDocs, 2019; Seeking Alpha, 2019). They are also made by a limited number of manufacturers around the world that may not be able to meet all demand. Hence, as mentioned previously, this would influence the carriers to turn to scrapping, in particular for older vessels of smaller tonnage, with more ships likely to be scrapped towards the end of 2019 (IncoDocs, 2019). Another concern for ships fitted with scrubbers would be the availability of high-sulphur fuel oil to meet the demand and the impact on price if refiners move to significantly restrict the sale of such fuel oil.

Option 3. Carriers can also use cleaner alternative fuels such as liquefied natural gas or methanol. However, it is estimated that liquefied natural gas production could cover only 10 per cent of the required shipping fuel by 2040 (CAI International, 2019). In addition, ships fitted with liquefied natural gas tanks will require more physical space on board, taking up almost 3 per cent of a vessel's TEU slots. As a result, this will reduce the number of containers that can be carried. Also, due to the expected large increase in demand for liquefied natural gas fuels, it has been reported that the price of liquefied natural gas may increase as much as 50 per cent (IncoDocs, 2019). As for other alternative sources of fuel, such as biofuels and hydrogen, they are mostly sin the research and development stages.

Therefore, compliance with the IMO 2020 regulation will bring new challenges in the shipping industry, particularly in container shipping. Key issues for consideration may include higher costs and price volatility, as well as reduced capacity and increased transit time,

Higher costs and price volatility

Container shipping industry costs associated with meeting the IMO 2020 mandate are estimated to range from $5 billion to tens of billions of dollars (JOC.com, 2018c). Cost increases would mainly reflect increases in fuel prices and investments made to ensure compliance. For context, a round trip from Asia to Northern Europe could cost an additional $1 million to $2.5 million after implementation of the sulphur emission rules (Bunker Trust, 2019; The Loadstar, 2018). Calculations by MDS Transmodal using its online bunker adjustment factor calculator suggest that a switch from intermediate fuel oil with a maximum viscosity of 380 centistokes (IFO 380) to marine gas oil on a benchmark Far East–Europe service using ships with a capacity of 18,500 TEUs would increase the bunker cost per TEU by $62 for the headhaul direction and $39 for the backhaul direction (MDS Transmodal, 2019).

These additional costs may have an impact on the price to be paid by the end user (Forbes, 2019b), as carriers will attempt to pass on increased costs to shippers through various forms, including new bunker surcharge formulas (IHS Markit et al., 2019). It is argued that if these costs are not passed on to shippers, profit margins in the container shipping industry would be reduced and may lead to bankruptcies of the most financially vulnerable carriers (Safety4sea, 2019b). This may also prompt further consolidation in the container shipping industry.

> Additional costs may have an impact on the price to be paid by the end user, as carriers will attempt to pass on increased costs to shippers through various forms, including new bunker surcharge formulas.

In recent years, carriers have been struggling to find ways to cover their losses and have applied various bunker charge programmes to mitigate these costs. For example, in 2018, carriers turned to a cost-recovery programme applying emergency bunker surcharges and passed the costs on to shippers (Forbes, 2019b). Shippers may be at risk of receiving a new set of emergency bunker surcharges that is projected to be 15–20 per cent higher once the regulations enter into force (Forbes, 2019b). Six global container lines – Maersk Line, Mediterranean Shipping Company, CMA CGM/American President Lines, Hapag-Lloyd, Orient Overseas Container Line and Ocean Network Express (ONE) – had already outlined a new price mechanism for the bunker adjustment factor (also known as marine fuel recovery at Hapag-Lloyd or the bunker recovery charge) that would replace the old formulas on 1 January 2020 to cover fuel costs, as prices are expected to surge because of tighter environmental standards from 2020. For example, Maersk Line and the Mediterranean Shipping Company have estimated at least a $2 billion increase in cost due to the various changes made to their fleet and its fuel supply, while Hapag-Lloyd estimates that using low-sulphur fuel will add about $100 per TEU (JOC.com, 2019b).

However, shippers have complained that the carriers' methods of calculating the bunker adjustment factor to help them cope with unexpected fuel price fluctuations are usually not transparent, they lack uniformity and

[6] Other sources include company websites.

could comprise an element of revenue generation, rather than serving solely to recover real bunkers costs (The Loadstar, 2018).

Reduced capacity and increased transit time

Another effect that may emerge with the application of the IMO 2020 regulation are the temporary and long-term disruptions in supply capacity. As noted earlier, supply capacity may be temporarily reduced due to the time that vessels will be out of service to install the scrubbers. Estimates show that container capacity may be reduced by 1.2 per cent in 2019 for scrubber retrofitting (Clarksons Research, 2019a).

In the long term, however, supply capacity will be permanently eliminated because of the space that scrubbers and liquefied natural gas tanks would occupy on the vessel, and old vessels that will be phased out or scrapped.

Lastly, practices by carriers such as blank sailing and slow steaming could become more common as a means of lowering fuel costs. These practices will also reduce supply capacity while increasing transit times (Forbes, 2019b). This in turn will have an impact on the number of direct port calls, which may decrease and trigger a greater need for trans-shipment (World Maritime News, 2019).

In conclusion, in an already uncertain climate of demand growth, additional uncertainty arising from factors relating to supply, fuel costs and investment in new technologies such as scrubbers, could drive up the costs of complying with the IMO 2020 regulation and make freight rates more difficult to predict. At the same time, compliance with the IMO 2020 regulation would be a practical test as to how the shipping market, as well as shippers and consumers, would respond and adapt to changes, namely in the context of the IMO strategy aimed at reducing greenhouse gas emissions from ships by at least 50 per cent by 2050, compared with the 2008 level.

3. Increasing consolidation and market concentration in container shipping

Consolidation in the global container shipping industry has gathered pace in recent years, leading to mergers and acquisitions between container lines and a reshuffling of shipping alliances. Three alliances dominate the container shipping market and capacity deployed on the three major East–West trade routes (figure 2.10). Since 2014, the top 10 container shipping lines (figure 2.11), most of which are part of these alliances, increased their combined market share from 68 per cent to 90 per cent, and their deployed capacity from some 55 million TEUs to 96.4 million TEUs.

Container shipping is an increasingly concentrated sector in terms of operations and alliances, ship deployment and major ports of call. Data related to annual deployed capacity by operators for Pacific routes provide an indication of how maritime transport services have evolved between 2006 and 2019. Under most criteria, the level of concentration has increased over the years (table 2.11).

For instance, using several measurements as per table 2.11, the level of concentration increased in 2019 in the case of the Pacific Islands, in comparison with 2006. However, the level of concentration decreased for one measurement (number of companies).

However, consolidation could increase pressure faced by smaller operators and have an impact on freight rates, as well as on the frequency, efficiency, reliability and quality of services in small and remote islands and in the least developed countries, given their increased vulnerability to reduced connectivity and access to transport services, hence, the need to monitor its evolution and impact (UNCTAD, 2017, 2018b).

A case in point are markets for the island regions in the Caribbean, the Indian Ocean, and the Pacific (figure 2.12). A comparison of 2006 and 2019 shows that there are fewer operators today, each carrying higher average volumes per company. The decline in percentage terms is similar in all regions, considering that the initial scenario in the Caribbean (2006) is already more concentrated than that of the Pacific and Indian Ocean islands.

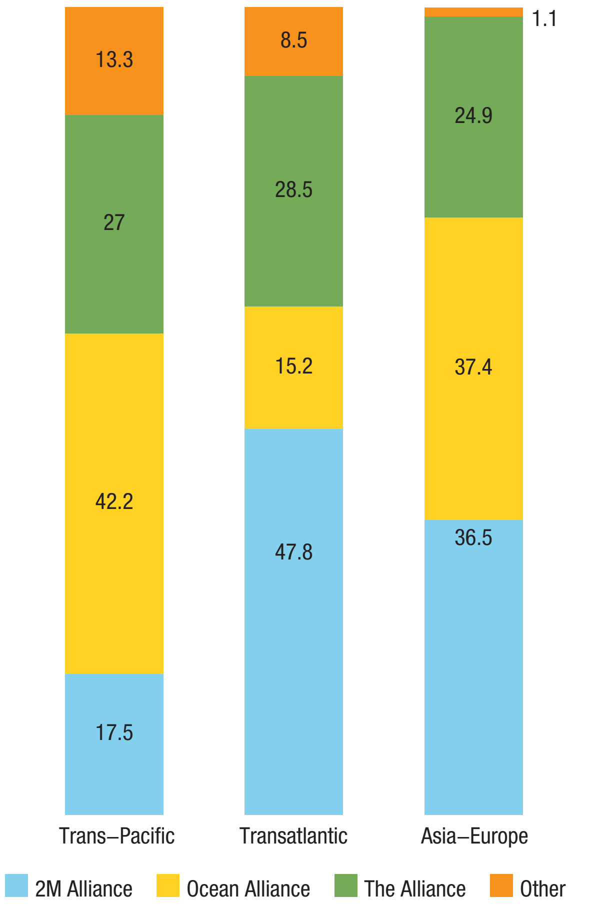
From the perspective of shippers that are clients of an alliance, the participation of shipping lines in an alliance has led to more deep-sea maritime services, ships per service, higher vessel size and lower average round-trip duration, compared with services offered

Table 2.11 Concentration indicators in liner shipping for Pacific routes, 2006 and 2019

Concentration indicators	2006	2019	Trend
Share of top shipping company (percentage)	29	33	Concentration increased
Share of top four shipping companies (percentage)	57	60	Concentration increased
Herfindahl–Hirschman Index	1 253	1 497	Concentration increased
Number of companies	22	24	Concentration decreased
Gini coefficient	0.53	0.59	Concentration increased

Source: UNCTAD secretariat calculations, based on data from MDS Transmodal, February 2019.

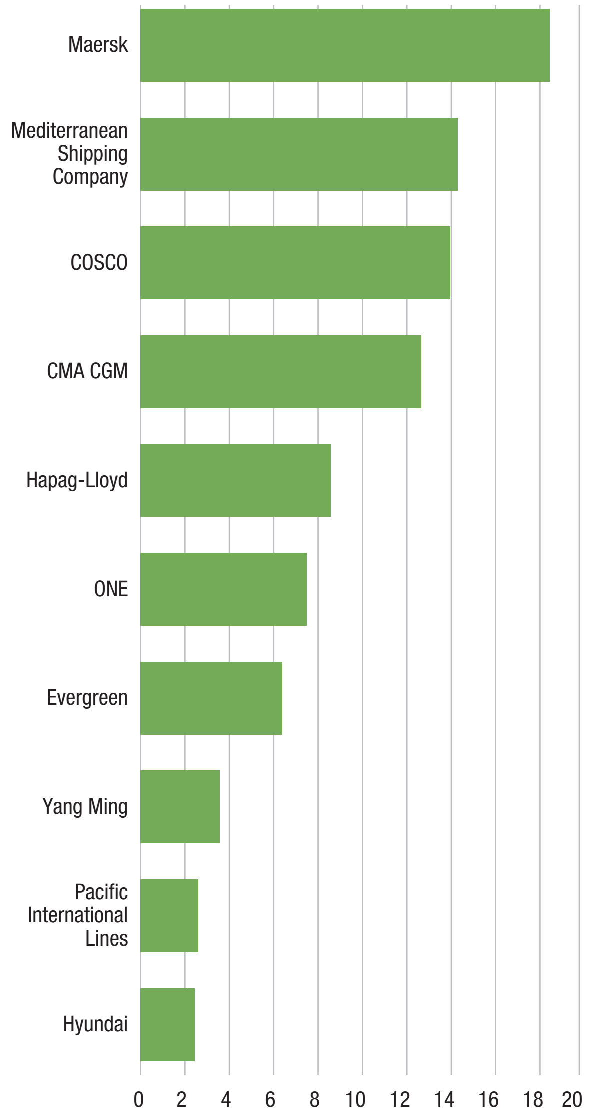
Figure 2.10 Market share of the three container shipping alliances in major East–West trade routes, deployed capacity in TEUs, as of February 2019



Source: UNCTAD secretariat calculations, based on data from MDS Transmodal Container Ship Databank, February 2019.

Note: 2M alliance includes Maesrk and Mediterranean Shipping Company; Ocean Alliance includes COSCO, CMA CGM and Evergreen; The Alliance includes ONE, Yang Ming and Hapag-Lloyd.

Figure 2.11 Top 10 deep-sea container shipping lines and market share in deployed capacity February, 2019 (Percentage)



Source: UNCTAD secretariat calculations, based on data from MDS Transmodal Container Ship Databank, February 2019.

Note: Data refer to fully cellular container ship tonnage and do not include intraregional services.

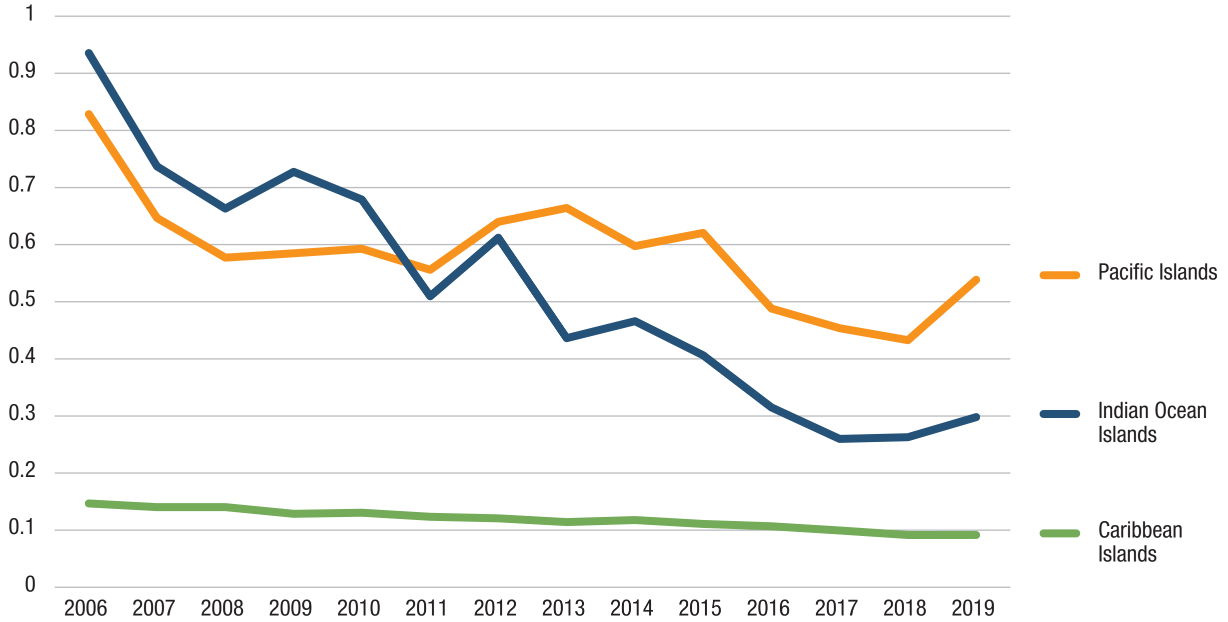
Table 2.12 Major changes in deep-sea maritime services offered by all operators, 2014–2019

	Services offered by all operators			Services offered by all operators that are members of an alliance			Services offered by all operators that are not members of an alliance		
	2014 Q1	2019 Q1	Percentage change	2014 Q1	2019 Q1	Percentage change	2014 Q1	2019 Q1	Percentage change
Number of services	504	455	-9.7	150	285	90.0	431	223	-48.3
Number of ships per service	7	8	12.3	8	9	8.5	7	5	-23.0
Average ship size (TEUs)	4 869	6 636	36.3	5 933	7 823	31.8	4 453	3 040	-31.7
Average round trip (days)	64	65	1.9	66	64	-2.5	63	68	7.5

Source: UNCTAD secretariat calculations, based on data from MDS Transmodal Container Ship Databank, February 2019.

Abbreviations: Q, quarter.

Figure 2.12 Container shipping operators by annual deployed capacity, 2006–2019
(Operators per million 20-foot equivalent units)



Source: UNCTAD secretariat calculations, based on data from MDS Transmodal.

by operators not members of an alliance since 2014 (table 2.12). This suggests greater flexibility and adaptability to changing market conditions. However, perceived container shipping transparency, especially with regard to surcharges, is a matter of concern for shippers (World Maritime News, 2019).

E. PORT SERVICES AND INFRASTRUCTURE SUPPLY

1. Increased sustainability expectations

Ports are infrastructure assets that play a key role in international trade. As shown in chapter 1, global port traffic has been expanding over the years, reflecting growth in the economy and in trade. As a sea–land interface and point of convergence between various modes of transport, ports act as gateways to trade, providing access to global markets, including for landlocked countries.

Ports are increasingly expected to align their performance with sustainability expectations, namely, to deliver optimum economic and social gains while causing minimum environmental damage. This is forcing them to rethink their strategies and operations.

From the perspective of optimum economic gains, ports face pressures to improve efficiency and reduce costs. In a context characterized by heightened intra-port and inter-port competition (see section below) and larger vessels, shipping operators expect ports to increase their capacity to handle higher cargo volumes in an optimum way.

Developing and improving port infrastructure and facilities are important elements of port strategies to improve attractiveness as ports of call for shipping companies. This concerns both the physical and digital infrastructures. Table 2.13 summarizes the objectives of selected investment projects that were carried out between 2017 and 2019, with a view to developing or upgrading port infrastructure and service.

Along with improved economic efficiency, ports are expected to deliver on other sustainability parameters, such as security and safety, social inclusiveness, resource conservation and environmental protection. This is because ports can produce negative environmental impacts on the one hand, and are directly or indirectly affected by climate change on the other.

Ports are highly exposed to climate-related events such as sea-level rise, strong exposure to winds, changes in storm patterns and coastal currents, and flooding. These can increase the risk of delays, cause significant logistic and service disruptions, and damage to coastal transportation infrastructure, resulting in significant economic costs and affecting the trading and development prospects of most vulnerable regions (box 2.1). A recent study estimated that global damage due to sea-level rise and related extreme events could amount to $10.8 trillion per year, about 1.8 per cent of global GDP, for a scenario of 1.5 degrees Celsius warming by 2100. If warming is not mitigated, the costs could reach even higher levels (Jevrejeva et al., 2018).

Table 2.13 Type of infrastructure investment in ports and examples of ports and projects, 2017–2019

Investment related to developing or upgrading	Project objectives	Examples, projects or results
Maritime access	Dredging and/or increasing cargo-handling capacity through automation (investment in cranes)	Investments in port and terminal infrastructure to accommodate larger vessels in Zhuhai, China; resulted in 70 per cent increase in container traffic
Equipment and superstructure		3.5 billion Euros invested in Tanger Med Port complex expansion; expected to triple handling capacity from 3 million to 9 million TEUs
Expansion of port capacity to accommodate larger vessels		Dredging investments in Port of Hamburg, Germany; Tanjung Pelepas, Malaysia; Jan de Nul, Bangladesh; and Rotterdam, Netherlands
		Investment in Port of Piraeus, Greece (2018): 6 electric rubber-tyred gantry cranes, 30 terminal tractors and 30 terminal chassis; upgrade of terminal operating system to cope with increased traffic and in anticipation of new services in medium-term derived from takeover by COSCO
		Investment in new cranes in Port of Savannah, United States and Sines, Portugal
Smooth transport flows within port area	Reducing congestion and cargo dwell times	Improving facilities to ensure fluidity in storing and handling return of empty containers
		Improving ability to share information among different facilities to increase port efficiency (artificial intelligence and blockchain investments in Port of Rotterdam)
Connections to/from port using different modes of transport (hinterland strategies)	Improving intermodal capabilities	Improvements in hinterland connectivity in Tangshan, China; results: attract more service calls and services (30.7 per cent increase in container traffic)
Sites for port-related logistic and manufacturing activities in port area	Developing functional and spatial clusters of industrial or services activities that are directly or indirectly linked to maritime transport to increase traffic or business opportunities for port and to diversify revenue sources	Special economic zones in several ports in China and in Port Klang, Malaysia
		Development of e-logistics facilities such as e-commerce parcel-sorting hubs in Portugal and United Kingdom
Energy-related infrastructure	Developing facilities for bunkering; adapting to make liquefied natural gas available as marine fuel	Facilities currently under construction in ports of Cologne, Germany; Marseille Fos and Dunkirk, France; Antwerp, Belgium; and Barcelona, Spain
Reducing environmental footprint of port and shipping operations	Reducing emissions in port vicinity	Electrification (Turkey)
		Predictive capacity to calculate when vessels approaching port will arrive at berth (Port of Rotterdam)

Sources: European Seaports Organization, 2018; Lloyd's List, 2018a, 2018b, 2019; International Association of Ports and Harbours, 2019; and International Port Collaborative Decision-making Council (www.ipcdmc.org/organisation).

Box 2.1 Adapting coastal transport infrastructure to the impacts of climate change: The special case of small island developing States

Adaptation and resilience measures are essential to reducing the negative impacts of climate change. However, a recent UNCTAD port industry survey on the impacts of climate change on adaptation for ports revealed large gaps in terms of relevant information available to seaports of all sizes and across regions, with implications for effective climate risk assessment and adaptation planning. Relevant information and adequate climate adaptation efforts are urgently needed, especially for ports in developing regions, including small island developing States.

Adaptation is an urgent imperative for small island developing States, as they are often particularly exposed and vulnerable to the impacts of climate change while, at the same time, critically dependent on coastal transport infrastructure for external trade, food, energy and tourism. Climate-related events, which are expected to increase in severity and frequency, may cause major disruptions to the connectivity of small island developing States to international markets, as well as to related economic sectors such as tourism.

From 2015 to 2017, UNCTAD implemented a technical assistance project with a focus on climate change impacts and adaptation for coastal transport infrastructure in the Caribbean (see https://sidsport-climateadapt.unctad.org/ and chapter 4 of this report), drawing on earlier work and in collaboration with a range of partners. Key project outcomes include an assessment of operational disruptions and marine flood risk for eight ports and airports in Jamaica and Saint Lucia, as well as a transferable methodology to assist policymakers in small island developing States in taking effective adaptation action.

Sources: Asariotis et al., 2017; Intergovernmental Panel on Climate Change, 2018; UNCTAD, 2018c, 2018d, 2018e.

Ports also face increased scrutiny to reduce externalities – pollution, noise and environmental impact – from their operations. As major hubs of economic activity that are usually located near highly populated areas, seaports are an important source of air pollution for coastal areas and urban communities. With growing port activities and more attention focused on reducing emissions from the maritime transport sector, ports are seeking to understand the magnitude of their air emissions and pollution and the impact of alternative actions to reduce them.

Possible sources of emissions in ports include the following: seagoing vessels, domestic vessels (fireboats, pilot boats, police boats, push-boats, tugboats, tenders), cargo-handling equipment, heavy- and light-duty vehicles, locomotives, electrical grids, power plants, industrial and manufacturing facilities, administrative offices, and logistics infrastructure or warehouses (Global Environment Facility et al., 2018a, 2018b; Safety4Sea, 2019c).

A variety of measures can be taken to reduce port emissions:

- Exploring the potential of using alternative fuels, introducing differentiated port dues, providing onshore power supply, switching to low-sulphur fuels at berth and establishing speed limits in ports.
- Improving the exchange of information between ports and ships so than ships can sail at optimal speed (virtual arrival).
- Giving preferential treatment to harbour crafts with engines that meet stringent emissions standards.
- Strengthening port State control inspection regimes for visiting ships, relating to compliance with MARPOL, annex VI.
- Designating additional emission-control areas, leading to stricter environmental emission standards enforced at certain ports (ships going through them should use fuel with a sulphur content lower than 0.10 per cent (below the 0.5 per cent limit applicable on 1 January 2020).

2. Increased competition and competitiveness drive port infrastructure and services supply

Intra- and inter-port competition are key features of the supply of port infrastructure and services. Intra-port competition stems from the diversity of actors involved in the administration of different terminals and services within a port. This is a consequence of the increased use of concessions for the management of terminals and port services. Table 2.14 identifies the 21 main global players in this field, which control 80 per cent of global terminal operations, and indicates their current throughput and scope for capacity expansion.

Technology underpinning productivity (i.e. reduced times for loading and unloading) and fees associated with services are important differentiating factors at the intra-port level. The use of specialized terminals by type of cargo is increasingly being used to raise operational efficiency in the handling of cargo. For example, in the port of San Antonio, Chile, each terminal handles a different type of cargo.

Compared with intra-port competition, inter-port competition is affected by other variables besides technology, namely conditions of access to transport networks, and economic and regulatory issues (see table 2.15).

Terminal operators are also engaging in consolidation, motivated by the interest of ports to attract shipping companies as ports of call; increase port throughput, efficiency and economies of scale; and diversify

Table 2.14 Top 21 global terminal operators, throughput and capacity, 2018
(Million 20-foot equivalent units)

Ranking 2018 (throughput)	Company	Headquarters	Million TEUs	Percentage share	Growth/ decline (million TEUs)	Growth/ decline 2017–2018	Million TEUs	Growth/ decline 2017–2018 (percentage)
1	COSCO	China	105.8	13.5	14.5	15.9	130.0	17.8
2	Hutchison Ports	Hong Kong, China	82.6	10.5	0.2	0.3	112.0	1.6
3	PSA International	Singapore	80.1	10.2	6.2	8.4	112.6	7.9
4	APM Terminals	Netherlands	78.6	10.0	2.3	3.1	99.7	-2.0
5	DP World	United Arab Emirates	70.0	8.9	1.3	1.9	89.7	3.2
6	Terminal Investment Limited	Switzerland	47.7	6.1	3.7	8.4	62.4	8.7
7	China Merchants Ports	China	34.5	4.4	3.5	11.4	42.9	5.2
8	CMA CGM	France	25.6	3.3	0.9	3.5	38.4	1.6
9	Eurogate	Germany	13.7	1.7	-0.1	-1.1	22.6	-7.0
10	SSA Marine	United States	12.6	1.6	1.3	11.4	20.2	2.5
11	NYK Lines (Nippon Yusen Kabushiki Kaisha)	Japan	10.6	1.4	-0.4	-3.4	23.8	34.6
12	Evergreen	Taiwan Province of China	10.4	1.3	0.1	0.9	17.2	3.6
13	International Container Terminal Services	Philippines	9.7	1.2	0.6	6.4	17.9	13.7
14	Hyundai	Republic of Korea	7.6	1.0	1.4	23.1	12.3	10.8
15	HHLA (Hamburger Hafen und Logistik)	Germany	7.4	1.0			10.3	8.4
16	MOL (Mitsui Osaka Shosen Kaisha Lines)	Japan	7.3	0.9	0.2	3.4	10.0	4.8
17	Yildirim/Yilport	Turkey	6.4	0.8	0.3	4.4	10.1	-0.2
18	Bollore	France	5.3	0.7	0.5	11.5	9.4	6.2
19	Yang Ming	Taiwan Province of China	4.4	0.6	-0.3	-5.5	8.4	-5.9
20	"K" Line (Kawasaki Kisen Kaisha)	Japan	3.3	0.4	-0.2	-5.3	5.7	44.1
21	SAAM Puertos (Sudamericana Agencia Aéreas y Marítimas)	Chile	3.2	0.4	0.1	4.9	5.2	8.4
	Global operators total		**626.6**	**80.0**	**43.70**	**7.50**		

Source: Drewry, 2019, *Global Container Terminal Operators Annual Review and Forecast 2019*.

Table 2.15 Inter-port competition: Factors that influence port competition and competitiveness

Factors	Impact on port competition and competitiveness
Logistics related to maritime transport access	Operational capacity of port to receive larger vessels perceived as an imperative to maintain port competitiveness, for example in Asia and Europe Operational incapacity of port to receive larger vessels results in losing maritime connections, for example, as in Port of Santos, Brazil, or the need for trans-shipment, inducing higher freight costs Vertical integration between shipping companies and terminal operators can affect competition if all terminals in a port are controlled by the same company, and that company merges with a shipping company. In this case, the merged entity will have an incentive to discriminate against other shipping companies by providing lower quality services or charging higher prices.
Logistics related to land transport access	Land transport access to and from port is as important for competitiveness of port as access to maritime transport networks Negative impact on activities of terminal operator likely, even if operator is highly efficient, owing to lack of or ineffective connection between terminal and centres of production, distribution and consumption Need for public policies aimed at developing competitive freight markets that comprise whole logistics chain, for instance aligning incentives related to railways concessions and port concessions, for example in Brazil
Economic factors	Domestic regulation to ensure adequate fees for services rendered in relation to operational costs and to avoid anticompetitive behaviour necessary to oversee role of ports as public utilities, particularly in context of greater participation of private sector and increased consolidation among key actors
Regulatory frameworks	Legal certainty (predictability in treatment of goods by customs authorities) is factor of competitiveness; unpredictability associated with higher costs

Source: UNCTAD, forthcoming, *Challenges in Competition and Regulation of Port Infrastructure and Services and Maritime Transport: Focus on the Latin American Region*.

business opportunities. Between 2018 and 2019, several alliances and joint ventures were established between terminal operators to allow the joint operation of berths and between liner companies and terminal operators.

In Hong Kong, China, four terminal operators joined forces to operate 23 berths. Given that almost all the berths and terminals at the Port of Hong Kong, China are grouped under the Hong Kong [China] Seaport Alliance, the competition agency of Hong Kong, China has launched an investigation. Further, the authorities of Taiwan Province of China have announced the formation of joint ventures between port and terminal operators in that province to run several terminals in Kaohsiung.

In December 2018, pan-Japanese liner group ONE and the Port of Singapore Authority launched a joint venture to operate four berths at Pasir Panjang Terminal, Singapore. Instances of mergers and joint ventures between ports in China (regional hubs merging with smaller ports and between ports and terminals) have also been reported, resulting in the emergence of larger port groups (International Association of Ports and Harbours, 2019).

Terminal operators are also pursuing vertical integration – integrating logistic networks to expand activities beyond the port gate to diversify sources of revenue – and are competing with liner shipping companies with the same aim. This is illustrated by the acquisition in 2018 by DP World of Unifeeder, a Danish logistics company that operates a container feeder and shortsea network in Europe. Some of the concerns associated with these developments and their impact on terminal operations in Australia are described in box 2.2.

Box 2.2 Significant increases in container terminal operations in Australia generate concern of competition agency

The Australian Competition and Consumer Commission has expressed concern over unilateral infrastructure surcharges imposed by the two main terminal operators, Patrick and DP World Australia, since late June 2010, to recover landside investments. DP World Australia at Melbourne, for example, introduced a charge of $A3.45 (about US$2.87) per box in 2017 and increased it to $A85.30 (about US$58) in 2019 – an increase of more than 2,000 per cent. In Brisbane, DP World set charges at $A18 (about US$12) per box in 2010 and increased them to $A65.15 (about US$44) in 2019. Sydney also witnessed a steep rise in charges: DP World increased charges of $A21.16 (about US$14.4) per box to $A63.80 (US$44.5) per box. In practice, users – shippers and trucking companies – have no choice in the selection of terminal operators; therefore, they cannot avoid imposed surcharges.

The Commission believes these charges are disproportionately affecting the competitiveness of small trucking companies, as they are forced to pass on the extra costs to shippers, unlike bigger operators. Exporters have also expressed concerns, indicating that the extra charges are eroding their trade competitiveness.

In July 2019, fees to use the vehicle booking system that enables trucking companies to organize the receival and delivery of ocean shipping containers were also increased. The costs to transport operators of using such systems for the allocation of container slots with the two major container stevedores in Australia, DP World and Patrick Terminals, have risen 87.95 per cent and 73.33 per cent respectively.

Sources: Freightwaves 2019a, 2019b, 2019c.

F. OUTLOOK AND POLICY CONSIDERATIONS

Maritime businesses, including shipping companies and ports, face mounting sustainability expectations and more stringent environmental standards. In this context, the maritime transport sector is expected to deliver economic and social gains, with minimum environmental damage. This is producing a sea change in the sector, transforming operations across different segments of the maritime supply chain. One example of this trend is the pressure on the sector to switch to cleaner fuels, owing to growing environmental concerns.

From this perspective, the entry into force of the IMO sulphur cap of 0.5 per cent for marine fuel oil in January 2020 is a major game changer, with potential far-reaching implications on the cost, price volatility and supply of maritime transport. There are several sources of concern. One relates to higher and more volatile freight and charter rates stemming from the additional costs of more expensive fuel options; another relates to investments that are being made to ensure compliance, while yet another relates to the possibility that active supply capacity may be reduced owing to short-term disruptions in vessel supply. Such disruptions can occur in the following circumstances: the installation of scrubbers on younger ships accounting for greater carrying capacity, scrapping of less fuel-efficient vessels, blank sailings and slow steaming.

The entry into force of this regulation brings uncertainty to future shipping operations. From the perspective of carriers, this uncertainty relates to the installation of scrubbers and the availability of alternative fuels. From the perspective of shippers, emerging concerns relate to clarity of application of bunker fuel surcharges and how the entry into effect of this regulation will affect international shipping costs. It is argued that if the additional costs are not passed on to shippers, profit margins, particularly in the container shipping segment, could be reduced and lead to further consolidation and bankruptcy of the most financially vulnerable carriers.

To cope with low and volatile freight rates, reduced earnings and profitability caused by structural oversupply and weak growth in demand, container shipping companies have continued to engage in consolidation. In February 2019, the 10 deep-sea container-shipping lines represented 90 per cent of deployed capacity and dominated the major East West trade routes through three alliances.

Consolidation can increase the pressure faced by smaller operators and may have an impact on freight rates, frequency and efficiency, reliability and quality of services in small and remote islands and the least developed countries. Between 2006 and 2019, the level of concentration in terms of operations and alliances, ship deployment and major ports of call increased in the Pacific Islands. Data suggest that between 2006 and 2019, the number of companies providing transport services on Pacific routes decreased. At the same time, each company providing services on those routes was carrying bigger cargo volumes.

However, from the perspective of customers of the alliances, the participation of shipping lines in an alliance appears to provide more services, ships per service, higher vessel sizes and smaller average round-trip durations, compared with services offered by operators that are not members of an alliance, suggesting greater flexibility and adaptability to market conditions.

Patterns of the participation of developing countries in the maritime transport supply chain have changed over the last 50 years. The trends mentioned in this report suggest that the segments in which they have traditionally led are being affected and transformed because of sustainability considerations. For instance, the entry into force of several global environmental instruments and the adoption of voluntary standards in the sector are likely to have an impact on shipbuilding. This is because shipbuilding will be responsible for incorporating these elements into the design and construction of ships. Shipbuilding countries, for which the sector is of national importance in terms of direct financial returns, employment and supply-chain contributions, are exploring options to remain competitive in this new environment. These would include the following:

- Making an in-depth assessment of operations and services being provided by shipyards.
- Raising awareness about emerging standards among marine equipment manufacturers and suppliers.
- Developing environmentally friendly maritime expertise.
- Forging partnerships with maritime experts, technical and training institutes to promote innovation and the uptake of energy-saving and eco-friendly technologies.

The registration segment of the maritime supply chain has been traditionally dominated by developing countries and their open registries. Given the increased awareness of environmental considerations and the probability of stricter environmental standards, the scope of regulatory control by the flag State is likely to expand. Other decisive factors influencing the decision to flag out to open registries and to build awareness of emerging standards should be considered part of the strategy to retain competitiveness in this segment of the maritime supply chain.

Developing countries have also traditionally dominated ship demolition. Recent regulatory developments and industry voluntary initiatives aimed at making ship recycling more environmentally friendly and safer for humans could change this. Some of the countries that have traditionally participated in this supply chain segment – China, India and Turkey, for example – have shown declining demolition figures in recent years.

For port infrastructure and service providers, greater sustainability means improved economic efficiency, resilience, and environmental and social sustainability. In an increasingly competitive environment, both at the intra-port and intra-port levels, the port sector is witnessing increased consolidation, alliances and vertical integration in connection with logistic activities.

To achieve greater sustainability in the port sector, it is essential to make further investments to upgrade port infrastructure and operations. To carry out activities that will reduce externalities such as air pollution, it is necessary to develop capabilities and encourage the uptake of energy-efficient technologies and operational measures aimed at reducing emissions. Public and private cooperation is key in this regard. A challenge faced by shipping and port businesses is that of ensuring technology uptake and transfer to avoid falling behind in maritime sector capabilities and of increasing financing and investment with a view to developing and upgrading infrastructure and services. It is important to make transport infrastructure climate-proof, strengthen resilience, finance research and development for innovation, develop human capital development and reinforce regulatory and institutional frameworks for compliance.

Advancing towards sustainable shipping offers opportunities for developing countries. By moving towards cleaner transport alternatives and applying new technologies, several problems can be addressed simultaneously, for example, improving efficiency in transport operations, lowering energy consumption, mitigating climate change, and reducing local air pollution and traffic congestion. This is particularly important for developing countries, as they can consider integrating relevant sustainability principles and criteria at early stages of infrastructure investment and planning, given their stage of development and current focus on infrastructure development.

Further, many developing countries have expressed heightened interest in harnessing the potential of the blue economy. The sustainable use of ocean resources to ensure economic growth and improved livelihoods, jobs and ocean ecosystem health involves a wide range of activities. These include coastal tourism, the exploitation and conservation of living marine resources (fisheries management), the use of non-living marine resources (seabed mining), and activities relating to the maritime supply chain (port activities, shipbuilding and repair and shipping services).

To leverage opportunities and address challenges from a sustainable development policy perspective, there is a need to adopt a systemic approach to assess how best to support the development of national port and shipping sectors so as to promote competitiveness and connectivity, and seafaring and shipping-related work as viable employment options, and, at the same time, tackle environmental challenges. Understanding how sustainability parameters affect sectoral performance at the national level and linkages across segments is a key element of this assessment. So are leveraging on digitization as an enabling force and promoting cooperation within the ports and towards external actors.

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