2

MARITIME TRANSPORT SERVICES AND INFRASTRUCTURE SUPPLY

The present chapter focuses on key developments related to the supply of maritime transport during this past year. It also assesses the early impact of the COVID-19 pandemic on the supply of maritime transport services and industries and discusses the responses, lessons learned and possible implications of the pandemic in terms of forces shaping supply and the industry's long-term goal of decarbonization.

The pandemic has had a significant impact on the shipping industry. On the one hand, lockdowns and factory closures gradually affected demand for maritime transport, due to reduced cargo volumes (see chapter 1). On the other hand, safety measures applied to contain the spread of the virus, such as lockdowns and travel restrictions, affected the movement of maritime transport workers and procedural changes introduced in ports, and induced operational disruptions in the supply of maritime transport. These prompted changes in shipping operations and requests for government support in the sector. They made the industry reflect on ways to enhance resilience of the sector to future shocks.

This chapter reviews world fleet developments such as annual fleet growth, changes to the structure and age of the fleet. It considers selected segments of the maritime supply chain, such as shipbuilding, ship recycling, ship ownership, ship registration and the maritime workforce, emphasizing the impacts of the pandemic on maritime transport and marine manufacturing industries and on the supply of shipping services.

It also examines the impact of the pandemic on the container, dry bulk and tanker freight markets; government responses to support shipping; and industry prospects, in particular with regard to accelerated digitalization and the prioritization of environmental sustainability. Lastly, it explores the impact of the pandemic on the supply of port-related infrastructure and services, explaining how technology-based solutions relating to trade facilitation, automation and digitalization could support increased resilience to future shocks.

MARITIME TRANSPORT SERVICES AND INFRASTRUCTURE SUPPLY

In early 2020,
the world fleet totalled
98,140 ships
of 100 gross tons and above
2,061,944 thousand dwt
of capacity

Ship types representing largest proportion of global fleet value

Bulk carriers	**19.6%**
Oil tankers	**17.3%**
Offshore vessels	**17.1%**

FREIGHT RATES

Container ships

Blank sailing and other capacity-management measures applied to adapt supply capacity to reduced demand for seaborne trade and allow freight rates to remain strong

- Third quarter of 2020: capacity-reduction measures pursued in container shipping, although demand picking up, keeping freight rates on the rise.
- Sustaining these measures for a long period during recovery may lead to dysfunctionalities in the sector, undermining performance of shippers and global supply chains.

Tankers

Lockdown repercussions, geopolitical events, oil price fluctuations and increased use of vessels for floating storage --> higher freight rates (March–April 2020)

Dry bulk carriers

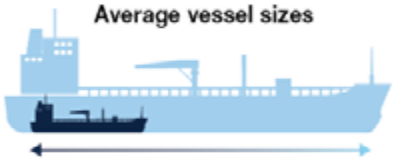
Oversupplied market and shock of negative demand from China, owing to the outbreak of the pandemic, pulled down dry bulk freight rates

FLEET CHARACTERISTICS

Average fleet age

9.28 years	*Bulk carriers*
9.91 years	*Container ships*
10.38 years	*Tankers*
19.46 years	*General cargo ships*

Average vessel sizes



Ships built **20 years ago** ⟷ Ships built **in the last 4 years**

*Oil tankers **9 times** bigger*
*Container ships **4 times** bigger*
*General cargo ships **3 times** bigger*
*Bulk carriers **twice** as big*

FLEET GROWTH

Newbuildings
65,911,000 gross tons delivered in 2019
of which:

Bulk carriers	**34.5%**
Oil tankers	**30.2%**
Container ships	**16.5%**

Decreasing global volumes of **ship recycling** tonnage
(thousand gross tons)

29,135	2016
23,138	2017
19,003	2018
12,218	2019

- COVID-19 crisis: container shipping industry sustained earnings as carriers applied discipline and strict capacity management
- 2008–2009 crisis: freight rates reached dramatic lows, as carriers sought to gain greater market shares through scale and capacity expansion, leading to great losses in container shipping trade

A. WORLD FLEET AND MARITIME WORKFORCE

1. Structure and age of fleet and vessel sizes

In early 2020, the total world fleet amounted to 98,140 ships of 100 gross tons and above, equivalent to 2,061,944,484 dwt of capacity. In the 12 months prior to 1 January 2020, the global commercial shipping fleet grew by 4.1 per cent (table 2.1), registering the highest growth since 2014, but still below levels observed during the 2004–2012 period. The market segment that achieved the highest growth was that of gas carriers, followed by that of oil tankers, bulk carriers and container ships. Gas carriers remained the most dynamic segment, recording the highest growth throughout the 2015–2020 period. In 2019–2020, growth in the oil tankers segment was the highest observed since 2015. In comparison, for the first time in many years, the slowest-growing segment was not that of general cargo ships, but of offshore vessels, where tonnage declined year on year (figure 2.1).

At the start of 2020, the average age of the global fleet was 21.29 years in terms of number of ships, and 10.76 years in terms of carrying capacity in dwt (table 2.2). In terms of dead-weight tonnage, bulk carriers are the youngest vessels, with an average age of 9.28 years, followed by container ships (9.91 years) and oil tankers (10.38 years). On average, general cargo ships are the oldest vessel type (19.46 years). Box 2.1 explains why the age of the fleet matters for decarbonization and provides an example illustrating the case of the Pacific islands.

The highest average vessel sizes are found within the youngest fleet segments (zero to four years). Among this group, oil tankers have the highest average size, followed by bulk carriers and container ships (figure 2.2). In terms of country groupings, developed and developing countries record higher average sizes fleets aged zero to nine years, whereas for countries with economies in transition, the highest average sizes are found in vessels that are between 10 and 19 years old.

Over the past 20 years, vessel sizes have been increasing to optimize costs through economies of scale (see chapter 3). Average bulker and container ship sizes have grown significantly since the 1990s – the average size of container ships has more than doubled since 1996.

The distribution of average sizes across vessel types (figure 2.2) suggests that the average capacity of vessels built in the last four years is much greater than those built 20 years ago. For example, compared with vessels built 20 years ago, the average capacity of oil tankers is nine times greater; of container ships, four times greater; of general cargo ships, three times greater; and of bulk carriers, two times greater.

Table 2.1 World fleet by principal vessel type, 2019–2020
(Thousand dead-weight tons and percentage)

Principal types	2019	2020	Percentage change 2020 over 2019
Bulk carriers	846 418 *43 per cent*	879 330 *43 per cent*	3.9
Oil tankers	568 244 *29 per cent*	601 163 *29 per cent*	5.8
Container ships	266 087 *13 per cent*	274 856 *13 per cent*	3.3
Other types	226 568 *11 per cent*	232 012 *11 per cent*	2.4
Other vessels	80 262 *4 per cent*	79 862 *4 per cent*	-0.5
Gas carriers	69 081 *3 per cent*	73 586 *4 per cent*	6.5
Chemical tankers	46 157 *2 per cent*	47 474 *2 per cent*	2.9
Ferries and passenger ships	7 096 *0 per cent*	7 289 *0 per cent*	2.7
Other/ not available	23 972 *1 per cent*	23 802 *1 per cent*	-0.7
General cargo ships	74 192 *4 per cent*	74 583 *4 per cent*	0.5
World total	**1 981 510**	**2 061 944**	**4.1**

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

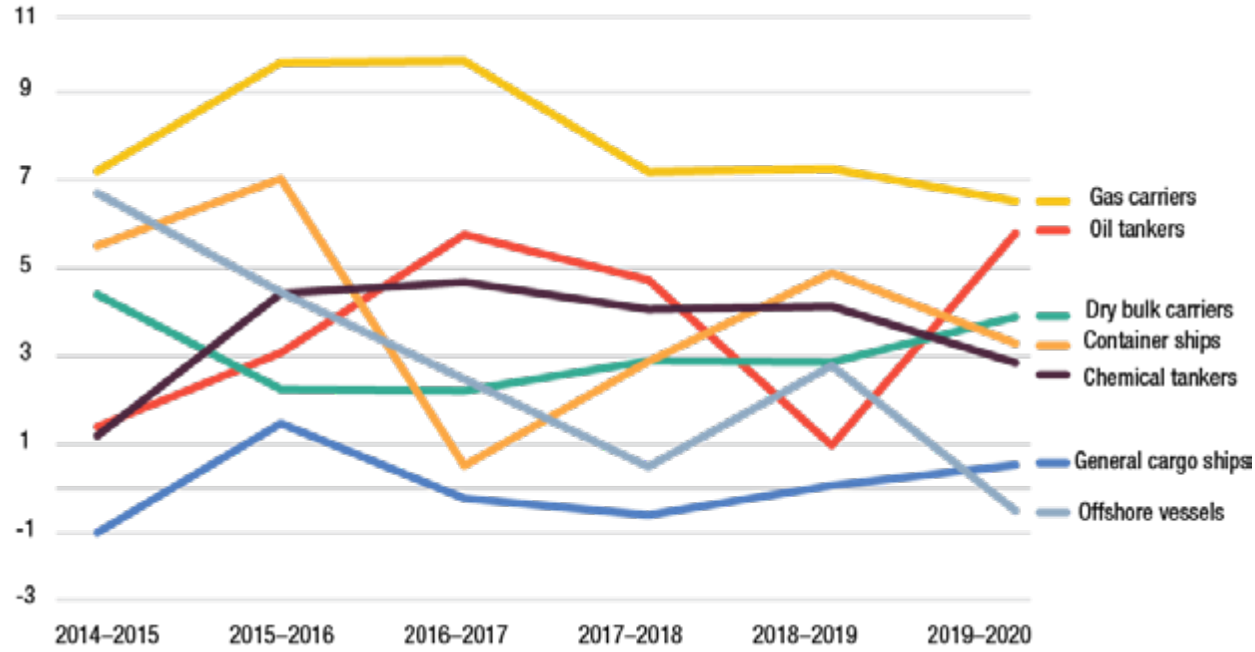
Notes: Propelled seagoing merchant vessels of 100 tons and above; beginning-of-year figures.

2. Ship ownership and registration

Ship ownership

Greece, Japan, and China remain the top three ship-owning countries in terms of cargo-carrying capacity (table 2.3), representing 40.3 per cent of the world's tonnage and 30 per cent of the value of the global fleet (table 2.4). The list of the top 35 ship-owning countries in terms of cargo-carrying capacity has remained stable since 2016. In the 12 months prior to 1 January 2020, countries recording the highest increases in carrying capacity compared with the previous year included Nigeria (up 17.2 per cent), the United Arab Emirates (up 5 per cent) and the United Kingdom (up 11.9 per cent). By contrast, Germany, Saudi Arabia and Malaysia lost ground (minus 6.2 per cent, 3.6 per cent and 3.4 per cent, respectively).

Figure 2.1 Growth of world fleet by principal vessel type, 2014–2020
(Dead-weight tonnage and percentage change)



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

The value of the fleet is linked to expectations of revenue and performance of shipping markets (Hellenic Shipping News Worldwide, 2020a; Marine Insight, 2019) and hence to return on investment, an important consideration from the perspective of owners. The value of the fleet can also be linked to the transport and logistics value chain and to the level of sophistication of the fleet, that is, the embedded digital technology making it possible to improve efficiency, safety, equipment maintenance and operational processes (Riviera Maritime Media, 2020). At the beginning of 2020, the main ship types representing the highest proportion of the value in the global fleet were bulk carriers, oil tankers and offshore vessels (table 2.4).

The top three ship-owning economies (Greece, Japan and China) represent a higher share of the global carrying capacity than of the global value of the fleet (figure 2.3), unlike the fourth- and fifth-ranked countries (United States and Norway, respectively). The characteristics and composition of commercial fleets explain the contrast between the two percentage shares. In some countries, this is linked to high-value non-cargo ships. For instance, the highest proportion of the value of the fleet of Norway, the United Kingdom, the Netherlands and Brazil comes from offshore vessels, whereas in the case of the United States, Switzerland and Italy, it comes from cruise ships.

Ship registration

Panama, Liberia and the Marshall Islands remain the three leading flags of registration, in terms of carrying capacity (table 2.5) and of value of the fleet registered (table 2.6). As of 1 January 2020, they represented 42 per cent of the carrying capacity and 33.6 per cent of the value of the fleet. The flags of the Islamic Republic of Iran, Taiwan Province of China and Thailand registered the highest increases in terms of dead-weight tonnage. Ships under the flag of the Islamic Republic of Iran more than tripled their growth compared with 2019. The three registries that saw the level of tonnage decrease in the 12 months preceding 1 January 2020 were the United Kingdom, Bermuda and the Isle of Man.

The quadrupling of the number of ships flying under the flag of the Islamic Republic of Iran derives from increased pressure exerted by sanctions, which led several registries, including those of Liberia, Panama, Sierra Leone and Togo (Reuters, 2019a), to de-flag vessels associated with trade from that country (Lloyd's List, 2020a). The most recent guidance to the maritime industry, issued in May 2020 by the Office of Foreign Assets Control of the United States Department of the Treasury, was an important milestone. The guidance expanded the compliance responsibility for fleet control and monitoring to actors beyond shipowners and operators, including flag registries, port operators, freight forwarders, classification societies and financial institutions (Lexology, 2020; The Maritime Executive, 2020a).

Between 1 January 2019 and 1 January 2020, the registries from the United Kingdom and some of the international registries categorized as crown dependencies and overseas territories – Gibraltar and the Isle of Man – witnessed a reduction. Tonnage registered under the flag of the United Kingdom

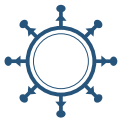


Table 2.2 Age distribution of world merchant fleet by vessel type, 2019–2020
(Percentage and dead-weight tonnage)

Country grouping		Years					Average age	Average age
		0–4	5–9	10–14	15–19	More than 20	2020	2020
World								
Bulk carriers	Percentage of total ships	20.22	42.17	18.70	8.99	9.93	10.18	9.69
	Percentage of dead-weight tonnage	23.30	44.86	16.73	8.22	6.89	9.28	8.87
	Average vessel size (dead-weight tonnage)	84 714	78 169	65 767	67 246	50 973		
Container ships	Percentage of total ships	15.60	20.39	32.79	14.67	16.55	12.72	12.29
	Percentage of dead-weight tonnage	24.41	29.14	28.19	11.74	6.53	9.91	9.43
	Average vessel size (dead-weight tonnage)	80 070	73 137	43 993	40 934	20 186		
General cargo ships	Percentage of total ships	4.64	12.34	15.67	7.99	59.36	26.93	26.30
	Percentage of dead-weight tonnage	8.52	23.16	19.76	9.88	38.69	19.46	18.89
	Average vessel size (dead-weight tonnage)	7 933	8 029	5 455	5 902	2 772		
Oil tankers	Percentage of total ships	14.45	18.95	20.19	11.11	35.32	19.12	18.77
	Percentage of dead-weight tonnage	24.73	24.99	26.57	17.52	6.20	10.38	10.11
	Average vessel size (dead-weight tonnage)	93 311	72 952	71 391	86 251	9 924		
Other	Percentage of total ships	11.21	18.05	15.53	8.28	46.93	23.18	22.70
	Percentage of dead-weight tonnage	21.56	16.94	22.22	10.57	28.71	15.59	15.42
	Average vessel size (dead-weight tonnage)	11 613	6 267	8 682	8 034	4 304		
All ships	Percentage of total ships	11.64	20.11	17.42	8.98	41.85	21.29	20.83
	Percentage of dead-weight tonnage	23.14	33.04	21.85	11.72	10.25	10.76	10.43
	Average vessel size (dead-weight tonnage)	47 901	40 986	30 290	32 742	6 661		
Developing economies (all ships)								
	Percentage of total ships	11.26	21.72	17.31	8.49	41.21	20.38	19.90
	Percentage of dead-weight tonnage	21.75	33.21	18.22	11.62	15.21	11.56	11.15
	Average vessel size (dead-weight tonnage)	37 438	32 440	20 900	27 950	7 544		
Developed economies (all ships)								
	Percentage of total ships	13.33	20.35	19.82	10.67	35.84	19.95	19.54
	Percentage of dead-weight tonnage	24.52	33.42	24.42	11.68	5.97	9.96	9.71
	Average vessel size (dead-weight tonnage)	61 465	52 885	40 792	38 294	7 305		
Countries with economies in transition (all ships)								
	Percentage of total ships	6.38	8.19	8.63	4.34	72.47	30.33	29.82
	Percentage of dead-weight tonnage	8.94	20.19	27.46	15.58	27.83	16.99	16.39
	Average vessel size (dead-weight tonnage)	12 644	18 987	25 905	25 880	2 724		

Source: Clarksons Research.

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

Box 2.1 Reducing carbon dioxide emissions: The case of the Pacific islands

The average age of a vessel can be an indirect indication of its environmental performance. In most cases, younger vessels are more fuel-efficient and less polluting because of technological advances. Bringing down the carbon footprint of shipping is not only a function of the age of the fleet (which could be associated with the introduction of technical improvements) but could also be a function of operational measures, such as speed optimization, or of shifting to alternative fuels. Other factors that also come into play are maintenance schemes or fleet-renewal trends linked to scrapping patterns and financial incentives (either to scrap or to order newbuildings).

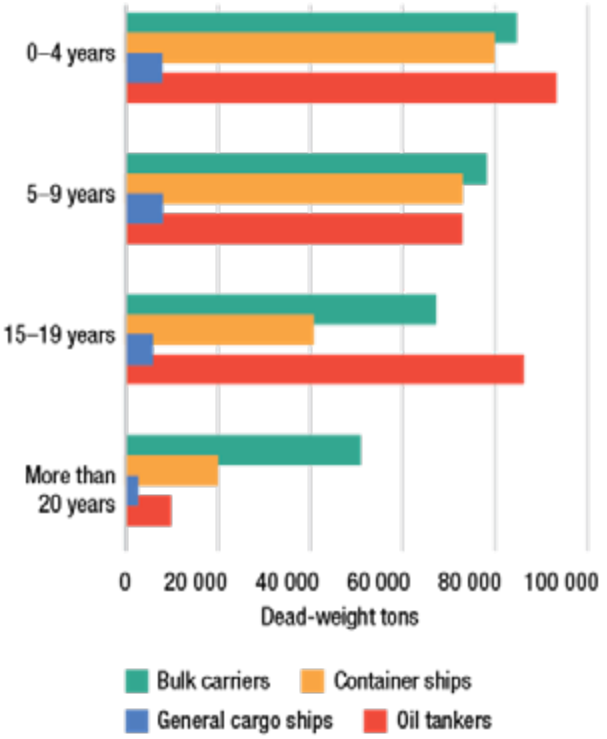
Recent studies were conducted in the Pacific to assess different carbon dioxide reduction pathways, as several of the islands in the region have launched regional and national initiatives to develop low-carbon coastal maritime transport. The age of the fleet was an important consideration to inform decision-making related to maritime transport strategies and objectives. According to recent estimates by the Pacific Community, 41 per cent of the vessels from Fiji, Kiribati, the Marshall Islands, Samoa, Solomon Islands and Vanuatu are less than 20 years old; 20 per cent, between 20 and 30 years old ; and 38 per cent, more than 30 years old. There is a large proportion of older vessels because many of them were donated or bought second-hand. These vessels have low carrying capacity (less than 5,000 tons) and entail economic costs due to increasing maintenance and survey costs.

Although newbuildings would result in an 80–90 per cent improvement in operational efficiency, they would require significant investment to enable fleet replacement to meet the emission-reduction targets set in regional and national decarbonization strategies, highlighting the need for financing.

To abate emissions in the existing fleet, the Pacific islands are retrofitting vessels with wind propulsion and using wind and solar as auxiliary power supply. Such retrofits were found to be more suitable to the characteristics, financial capabilities, level of technological uptake and maritime heritage of the Pacific fleet than other options being considered in other countries, such as shifting to some alternative fuels and the use of onshore electrification. The studies found a potential to scale up such retrofits but acknowledged that retrofits could not achieve the same degree of savings and emission reduction as newbuilds.

Sources: Government of Fiji, 2018; Micronesian Centre for Sustainable Transport, 2019a, 2019b, 2020.

Figure 2.2 Average vessel size and age distribution, selected vessel types, 2020
(Dead-weight tons)



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

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

declined by 29.8 per cent, that of the Isle of Man by 13.5 per cent and Gibraltar, by 7.4 per cent. These developments could be linked to geopolitical tensions with the Islamic Republic of Iran, which led to changes in ship registration (United Kingdom Department for Transport, 2020) but also to uncertainty related to the Brexit process (Lloyd's List, 2019a; Reuters, 2019b).

Plans for improving the competitiveness and attractiveness of the United Kingdom registry, particularly for low or zero-emission technology vessels and, in the long-term, for autonomous and semi-autonomous ships, include digitalization initiatives. These are aimed at reinforcing paperless maritime governance and e-registration and enhancing the quality of service through new standards and practices pertaining to inspections, certifications and business facilitation (United Kingdom Department for Transport, 2019).